EAST AFRICAN
CRUDE OIL PIPELINE

Volume 1 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

Export Pipeline

Submitted for approval to:
National Environment Management Authority

By:
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EXECUTIVE SUMMARY

Introduction

The East African Crude Oil Pipeline (EACOP) System is a planned export pipeline project that will transport oil from an inlet flange at the Kabaale pumping station (PS1), in Hoima district, Uganda, to an export flange at a proposed marine storage terminal (MST) at Chongoleani, Tanga district, on the East African coast of Tanzania. The Uganda National Oil Company (UNOC) and the Tanzania Petroleum Development Corporation (TPDC) will be shareholders in a pipeline company with Total E&P, Uganda B.V. (TEPU), Tullow Uganda Operations Pty Ltd (TUOP) and CNOOC Uganda Limited (CUL) that will develop, construct and operate the pipeline. Total East Africa Midstream (TEAM) BV is the developer of the project.

This environmental impact statement (EIS) is a report of the environmental and social impact assessment conducted to identify, describe and assess the likely interactions of the portion of the EACOP project in Uganda with environmental and socio-economic receptors, termed as “valued environmental and social components” (VECs).

This ESIA has been prepared pursuant to the Government of Uganda Environmental Impact Assessment Regulations (1998) and conducted in accordance with the Scoping Report and terms of reference approved by NEMA, dated 19 September 2017.

Project Description

In Uganda, the EACOP project comprises the following components:

- 296 km of insulated, electrical heat-traced, buried 24” pipeline
- aboveground installations (AGI):
    - two pumping stations (PS) (PS1 and PS2)
    - 19 intermediate block valves (15 standalone, and four co-located with electric substations) and electric heat trace substations
- roads:
    - new and upgraded permanent access roads
    - new and upgraded construction facility access roads
- construction facilities:
    - four main camps and pipe yards (MCPY1 through to MCPY4).

The EACOP project in Uganda is shown in Figure ES1.

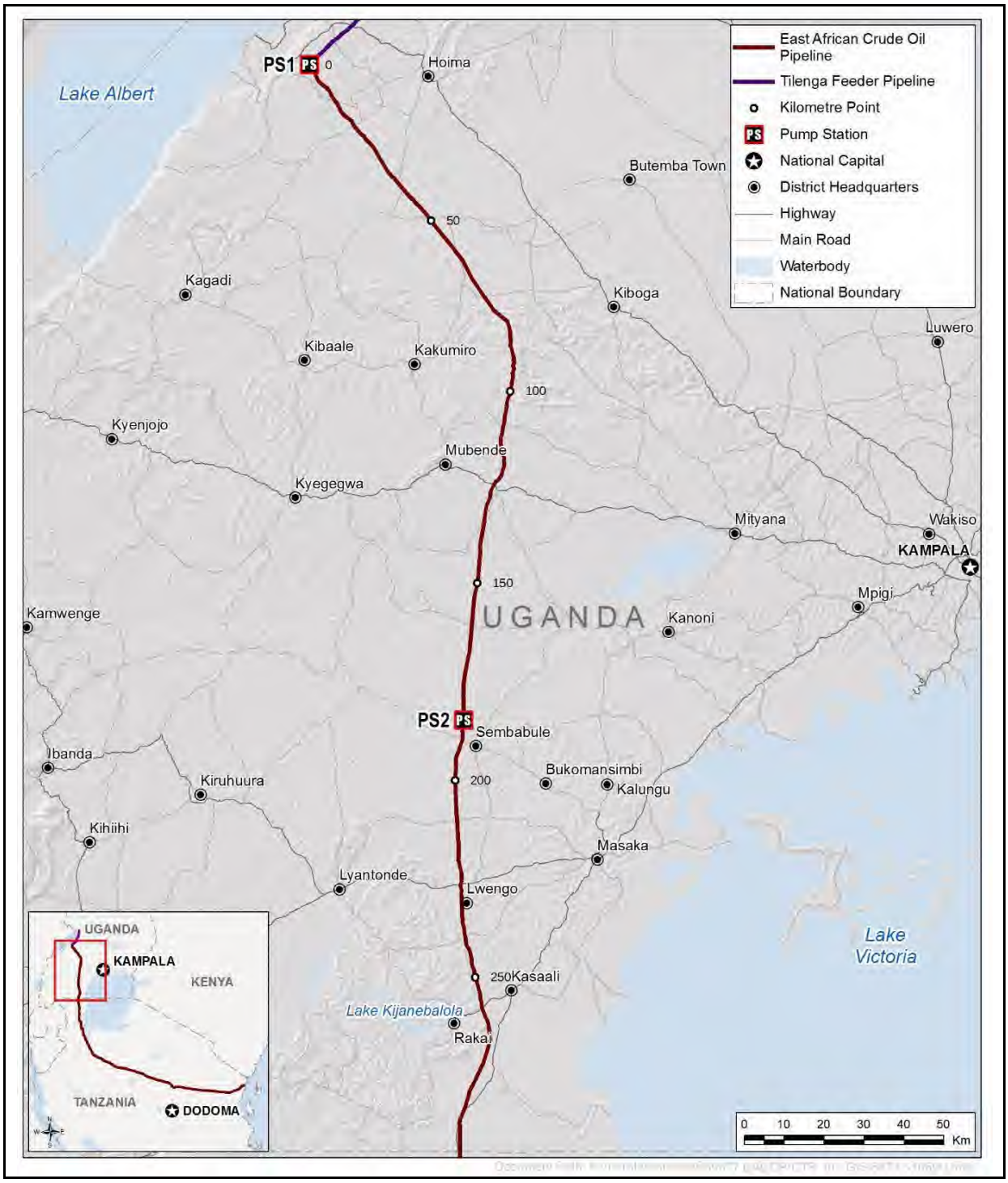

Figure ES1 EACOP Project

The export pipeline originates at the PS1 located at the future Kabaale Industrial Park, in Hoima district. Initially, it crosses relatively low terrain with undulating topography characterised by widespread cropland, settlement and transport infrastructure between Hoima and Mubende districts. The RoW also traverses gently undulating grass and farmland, hills with open plateaus, open grassland, wetlands in Gomba and Ssembabule districts and a relatively flat land scape towards Mutukula near the border with Tanzania.

In Hoima district, the corridor passes in between Wambabya and Bugoma Forest Reserves, and traverses through a modified section of Taala Forest Reserve in Kyankwanzi district, and crosses near the eastern border of Kasana-Kasambya Forest Reserve in Mubende district. There are watercourse crossings including the Kafu River between Hoima and Kakumiro districts, Nabakazi River between Mubende and Gomba districts, Katonga River between Gomba and Ssembabule districts, and Kibale and Jemakunya Rivers in Kyotera district.

On the approach to the Tanzania border, and the north-western corner of Lake Victoria, the corridor crosses a substantial zone of wetlands in a high average rainfall zone that is also characterised by almost unbroken crop land, a substantial proportion of which is under rice cultivation, cattle grazing land and settlement for approximately 90 km. The main alignment broadly follows a ridgeline that defines a watershed for the many watercourses and wetlands as part of the Victoria basin. The corridor nearly clips an abandoned airfield in Kyotera district as well as the former Sango Bay refugee camp close to the Tanzania border. The corridor avoids the large local settlement of Mutukula at the border as it progresses into Tanzania.

Project Alternatives

Project alternatives have been considered for:

- pipeline routing
- siting facilities
    - AGIs
    - construction facilities
- technology
- construction techniques.

Routing

Several alternative pipeline routes were identified during the early stage of the development of the EACOP Project.

The routing process began with the identification of starting point and a flexible end point which was then followed by numerous screening studies to evaluate environmental, social, geo-hazards, constructability and terrain (river crossings and slopes) constraints for pipeline routing at a broad scale. This work culminated in the selection of eleven 50-km-wide corridor combinations for more detailed evaluation. Secondary information was then used to assess the potential corridors using a geographical information system (GIS) and three corridor options were selected:

- Kenya North
- Kenya South
- Tanzania.

Using higher-resolution satellite imagery, the corridors were refined through further analysis of the constraints noted above. Following this work, the Government of Uganda announced the selected Uganda-Tanzania route in April 2016.

Facility Siting

Alternatives were assessed for the number, location, layout and footprint of the following surface facilities:

- AGIs
- construction facilities including MCPYs.

The functional requirements of the surface facilities have been the main driver for the identification, screening and final location selection.

AGIs

The selection of appropriate sites for the PS's was determined before front end engineering design (FEED) by pipeline hydraulic studies. Other criteria considered were:

- thermal design requirements
- safety and environmental risk factors
- site physical conditions (topography, accessibility, proximity to existing infrastructure)
- environmental and social constraints.

Satellite imagery and site visits were used to establish locations during FEED. Siting of the heat trace substations is ongoing and will be refined based on further electrical studies, whereas the block valve locations have been defined based on detailed technological risk analysis.

Construction Facilities

The construction facilities site selection process has taken into consideration the requirement to:

- minimise land acquisition
- minimise distance from existing road networks
- avoid populated areas and nationally protected areas of biodiversity value
- take cognisance of the terrain type and topography suitability.

Technology

Technology alternatives for the following were considered:

- pipeline (diameter and wall thickness)
- pumps
- power generation
- insulation
- heating.

Pipeline

A partially above ground pipeline alternative was considered during early stages of project development but was discounted for numerous reasons including issues associated with security and safety, risk of interference by third parties, permanent land take, visual impacts

and impacts to large wildlife movement. The concept selected for study was a trenched and buried pipeline.

Due to the oil characteristics two strategies were considered to enhance oil flow:

- a cold transport option requiring the partial removal of paraffinic components ensuring that gelling of the oil is prevented. This requires some oil processing and is extremely expensive. Consequently, this alternative was screened out.
- a hot transport option aimed at maintaining the fluid temperature above 50°C with the use of thermal insulation, and a combination of heating options. Hot transport was selected as the base case for further study.

Pumps

The pump technology selection has been determined by the characteristics of the Albertine Graben fluid (viscous with no gas volume fraction) which means that volumetric pump types are not viable. Therefore, centrifugal pumps are considered to be the most suitable design for the fluid type because they are proven technology, robust, and cost effective.

Insulation

Early studies concluded that heat losses with un-insulated pipe would require 35 separate crude fired heating stations resulting in high crude consumption by the heaters, a larger project footprint, larger environmental and social impacts and higher operational costs. By applying thermal insulation on the pipeline it was concluded that the heating requirements could be optimised with power for heating being provided from six stations with lower crude consumption, lower project footprint, less requirement for facilities and with a higher initial cost, but more economical over the lifetime of the project.

Three types of insulation were considered:

- polyurethane foam (PUF)
- glass
- pipe in pipe (PiP).

PUF was selected as the base case as it offers the highest thermal efficiency with lowest capital expenditure (Capex).

Heating

Three heating configurations were considered:

- Case 1 – electric heat tracing (EHT) only case
- Case 2 – bulk heating (BH) only
- Case 3 - EHT + BH (mixed heating architecture).

Case 3 was selected on the basis of higher efficiency compared to Case 1 and the large heat loss associated with Case 2.

Construction Techniques

Several aspects of pipeline construction techniques have been considered for general pipeline construction and for crossings of watercourses and infrastructure:

- open cut
- horizontal directional drill (HDD)
- micro tunnel
- auger bore.

For tarmac roads and railways, the auger boring technique will be used to prevent disruption to services. Other techniques such as direct pipe and micro-tunnelling were discounted during FEED due to the requirement for a much larger construction footprint and greater Capex.

Legislative, Policy and Administrative Framework

The ESIA was developed in accordance with the relevant legislation, policy, plans and regulations, including:

- the National Environment Act, Cap 153, 1995
- the National Environment (Environmental Impact Assessment) Regulations,1998
- the Guidelines for Environmental Impact Assessment in Uganda, 1997
- the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014.

The ESIA will be submitted to the National Environment Management Authority (NEMA).

The ESIA has also been developed in compliance with the International Finance Corporation Performance Standards (IFC) (2012).

Project standards have been developed for air emissions, emissions to water and noise, taking into consideration the requirements of national legislation and international best practice.

Considering the transboundary nature of the project, the Governments of Uganda and Tanzania signed an intergovernmental agreement (IGA) with the aim of streamlining the legal regime for the EACOP across the two countries. Respective host government agreements (HGAs) will operationalise the IGA.

ESIA Methodology

ESIA Process

The ESIA has included the following steps:

- Screening of potential project impacts was undertaken early in the development of the project, primarily through routing studies
- A scoping exercise to identify potentially significant impacts for taking forward as the focus for the further impact assessment phase, identify data availability and gaps,

determine the spatial scope (area of influence, AOI) and temporal scope for the assessment and define baseline studies
- Baseline studies (desk-based analysis and field surveys) to obtain sufficient information to characterise the environmental and social conditions
- Identification of project impacts and development of mitigation measures iteratively with the project planning and design (the process will continue through the construction phase). Project-only and potential cumulative impacts with other projects have been considered
- Collation of the mitigation and management measures into an environmental and social management plan (ESMP).

Stakeholder engagement has been undertaken throughout the ESIA process and results have been used to inform the ESIA.

Valued Environmental and Social Components

Environmental and social features and receptors assessed in this ESIA are referred to as valued environmental and social components (VECs). Project and cumulative impacts on VECs and their associated ecosystem services are assessed in this ESIA.

VECs are valued and have high sensitivity to project interactions by definition. For VECs that exhibit gradations of sensitivity, a ranking system has been used to describe their sensitivity. VECs with standards and thresholds, for example, air quality, compliance to the standard or threshold have also been used to establish magnitude or to inform impact significance directly.

Impact Assessment

The ESIA systematically identifies, describes and assesses the potential impacts from the EACOP project on VECs.

Normal Operations

The assessment of impacts from normal project operations considered:

- generic and location specific project impacts
- cumulative impacts
- transboundary impacts.

Impacts were considered before mitigation was applied and after mitigation was applied. The development of measures to mitigate the impacts was an iterative process and continued until an impact was deemed as not significant as reasonably practicable. Residual impacts were those that remained after the completion of this process.

For normal project operations, an impact is assumed to occur, i.e., 100% probability of occurrence.

The significance of impacts on VECs is determined based on scoring VEC sensitivity and the consequence of the impact taking account of:

- magnitude – measure of the degree of change that will be caused by an aspect or activity
- duration – the length of time over which an impact may occur

- extent – the geographical area that may be impacted.

To determine whether an impact is significant, the impact score is a sum as follows:

magnitude + extent + duration + VEC sensitivity = impact score

A threshold score was set to determine if an impact was considered significant.

Abnormal or Unplanned Events

Abnormal operations and unplanned impacts were considered including:

- geotechnical events (e.g., earthquakes, landslides)
- accidental events (e.g., traffic accidents, fire, collision of vehicles with equipment and damage of pipe due to unauthorised digging).

Given the inherent uncertain nature of potential unplanned events, the potential variability of such events in terms of geographic location and coverage, and limitations of directly relevant event statistics, no significance determination was undertaken, but likelihood was estimated for terrestrial events.

Environmental and Social Baseline Conditions

The baseline condition of VECs are summarised below:

Biodiversity

Habitats of Conservation Importance

The majority of habitat types in the AOI are modified (IFC 2012) with some natural habitats still remaining both within and outside of protected areas. Guineo-Congolian semi-evergreen forest and riverine and swamp forest (wetland forests) are of conservation importance in the context of habitat quality within the AOI. These habitats are highly threatened and unique ecosystems (as defined in IFC 2012). Connected forest habitat within and between Budongo, Bugoma and Wambabya Forest Reserves is also of conservation importance, for both the habitat itself and the presence of threatened species (e.g., chimpanzees).

Flora and Fauna Species of Conservation Importance

Ten vascular plants species of conservation importance are present in the AOI and the majority of these species were recorded in swamp and riverine forests and Guineo–Congolian semi-evergreen forest. Species of conservation importance include one IUCN vulnerable vascular plant species, six Ugandan Red List (WCS 2016) species with threat categories ranging from critically endangered to vulnerable, and two Gold Star endemic species, as defined by the Rapid Botanical Survey (the methodology used to characterise the baseline habitats and flora).The presence of *Nymphaea nouchali* (Ugandan Red listed critically endangered) and *Rytigynia beniensis* (endemic) in the Right Of Way (ROW) requires further verification.

Baseline surveys identified the presence or likely habitat usage of thirteen fauna species of conservation importance within the AOI which are nationally and / or globally rare and threatened. These include, but are not limited to, Bohor reedbuck (*Redunca redunca*; IUCN least concern, Uganda endangered), African golden cat (*Caracal aurata*; IUCN vulnerable,

Uganda endangered), hippopotamus (*Hippopotamus amphibious*; IUCN and Uganda vulnerable) and spot-necked otter (*Hydrictis maculicollis;* IUCN near threatened, Uganda endangered). Chimpanzee (*Pan troglodytes* ssp. *Schweinfurthii*) inhabit Wambabya Forest Reserve, Bugoma Forest Reserve and use connecting habitats in the surrounding landscapes. As chimpanzees are IUCN and Ugandan endangered, they have a very high sensitivity to change.

Avifauna species of conservation importance use habitats within Wamababya FR, papyrus swamps and other wetlands in the AOI, and in valleys throughout southern Uganda. These species are nationally and / or globally rare and threatened, namely, grey-crowned crane (*Balearica regulorum;* IUCN and Uganda endangered) and hooded vulture (*Necrosyrtes monachus;* IUCN critically endangered, Uganda endangered). Kafu, Nabakazi, Katonga and Kibale rivers are sensitive receptors for fish and aquatic macro-invertebrates. Rare or threatened fish and macro-invertebrates were not identified during baseline surveys but are likely to be present. Two migratory fish species were recorded, namely *Barbus kerstenii* and *Schilbe intermedius*.

Habitat loss and fragmentation is driving declines in many species of conservation importance and this trend is likely to continue with increased population pressure and use of natural resources.

Legally Protected, Internationally or Nationally Recognised Area

Wambabya and Taala Forest Reserves, Nabakazi River and Katonga River are legally protected areas of high sensitivity that support species of conservation importance.

Physical Environment

Geology

In Uganda, Precambrian crystalline rock constitutes approximately 90% of the land area. The remaining rock types are mostly younger volcanic and sedimentary rocks. The EACOP project traverses Precambrian gneiss and granite complexes up to the Uganda–Tanzania border. Regolith over this crystalline rock varies from rock fragments near the bedrock interface to well-weathered soil and hardened laterite at the surface. This regolith layer varies in thickness, but averages approximately 30 m.

The occurrence of earthquakes in Uganda is associated with the East African Rift system however the proposed EACOP route does not traverse the system. However, the pipeline RoW crosses six major faults.

Landslides and sinkholes have not been identified across the AOI.

Soil

Soil types with a high sand content, i.e., sandy clay loam and sandy loam, were found to be present along the majority of the route. Topsoil depth within the majority of the AOI was found to be 20–30 cm depth, although thin topsoil (less than 5 cm depth) is likely to exist. Soil within the AOI is mainly characterised as low to medium productivity, supporting grazing, commercial plantations and subsistence farming. Most topsoils were of low to medium organic matter content and high base status, indicating that soils could be productive if well managed. Continued use of the land within the study area for agriculture and grazing is likely to cause continuing deterioration in soil quality.

The soil erosion risk varies across the AOI reflected by the change in soils and terrain. There are both very high risk areas, with very steep slopes, and low risk areas, where the land is flatter and soils heavier.

There is no evidence of noteworthy existing contamination within the AOI.

Surface Water

The pipeline route crosses several permanent and ephemeral watercourses and wetlands belonging to the Lake Albert, Victoria Nile and Lake Victoria basins.

The morphology and stability of the watercourses throughout the AOI are mostly considered very stable, with the exception of Jemakunya River. This is because the floodplains contain swamp vegetation that limits flow velocities and inhibits erosion. The Jemakunya River has a relatively narrow zone of riparian vegetation along its channel, which increases the risk of instability.

Water quality is considered relatively good in the rivers and is consistent with rivers in catchments with dispersed rural settlement, frequent use by livestock and people and for domestic purposes, and in which there is an abundance of swamp vegetation and high rates of biological activity. It is therefore sensitive to change. There are currently few sources of contamination, limited to the frequent use by livestock and by people for domestic purposes in these areas, which could cause an increase in organic compounds within surface water bodies.

Local communities use surface water mainly for livestock watering and domestic purposes. As populations grow this may lead to increased abstractions for water supply, irrigation and commercial uses.

Groundwater

Groundwater quality is generally good in the water basins traversed by the pipeline. The aquifers in the AOI ranged from having low to high vulnerability based on permeability and depth to the water table. All aquifers are recharged by rainfall.

In the AOI, groundwater is the most important source of public water supply being of high quality, used as drinking water and for domestic and agricultural purposes.

Population growth is likely to increase the requirement for groundwater for domestic use. Groundwater in both the sedimentary and basement aquifers is therefore considered highly sensitive to change.

Landscape

The pipeline route traverses a mixed landscape of gently undulating grasslands and farmland, hills with open plateaus and bare rocky outcrops, forested areas, wetlands and, near the border with Tanzania, a drier, more sparsely vegetated landscape. Most of the route has already been affected by human activity for farming and grazing, and areas affected are of low landscape sensitivity. The landscape of PS1 consists of undulating to hilly terrain, which has been affected by human activity for farming and grazing and areas affected are of low landscape sensitivity; the Wambabya Forest Reserve is located 3 km to the east but has no views of PS1 and is therefore not considered sensitive to the project. Similarly, PS2 has been affected by human activity for grazing land and areas affected are of low landscape sensitivity.

The landscape is able to tolerate further similar modification without changing its present character, so it is not regarded as sensitive to change.

Stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape.

Air Quality

Concentrations of NO_2, NO_x, VOC, CO and SO_2 are low at all locations surveyed (i.e., the pumping stations). The baseline environment is characterised by moderate to high levels of airborne fine particulate matter due to natural conditions (dry soils which are easily mobilised in windy conditions). Much of the project's AOI is sparsely populated areas and infrequently populated. There is capacity in the atmospheric environment for gaseous emissions to increase without levels which exceed national standards (and project environmental standards) being reached.

Acoustic

The noise environment in the AOI, particularly around AGIs, is dominated by human induced sources such as road traffic, farming and general human interactions, and by natural noises such as bird song and wind.

The noise environment at locations proposed for the RoW, MCPYs and pumping stations ranged between 26 and 55 dB(A) $L_{90,1hr.}$

There is an absence of industrial and commercial noise throughout the AOI.

Socio-economic and Health

The pipeline traverses 9 districts, 41 parishes, 22 subcounties, 4 town councils and an estimated 172 villages and hamlets. The main livelihood activity in the AOI is agriculture and most settlements are concentrated along national and secondary roads. Villages often have a central trading place in which main business and social activities take place

The main ethnic groups found in the districts in the southern part of the AOI are the Baganda and Banyankole. In the northern part of the AOI, the main ethnic group is the Banyoro. The dominant religions in the AOI are Christianity and Islam often mixed with traditional beliefs.

The population is rapidly increasing, causing pressure on natural resources and social services. The population is young and highly mobile and the districts in the AOI experience urbanisation. Hoima municipality and the urban centres Mbirizi and Kinoni in Lwengo district, have become attractive to rural migrants due to employment and business opportunities and relatively better infrastructure.

Uganda experiences both in and out migration. Migration to Uganda has been driven by civil war and political instability in the Democratic Republic of Congo (DRC), Rwanda and South Sudan.

Adult literacy rates for persons above age 18 range between 66 % and 76% in the districts traversed by the AOI. Males are more literate than females. School attendance rates are improving, however educational services are faced with several challenges including lack of trained teachers, equipment and buildings.

Economy

East Africa is the fastest growing economic region in Africa with recorded regional growth estimated at 6–7% for 2016 and 2017.

Uganda, as a member of the East African Community (EAC) since 2010, shares a common market with Kenya, Tanzania, Burundi and Rwanda. Uganda's Gross Domestic Product (GDP) is approximately 60% of Kenya's GDP (the largest economy in the EAC), placing it behind Tanzania and just ahead of Rwanda (AfDB et al. 2016). The EAC is economically more diverse than other regional African communities because it is less dependent extractive industries.

Uganda's economy collapsed during the 1970s and 1980s due to political uncertainty and ongoing civil war (Byrnes 1990). Since then, the government has acted to rehabilitate the economy and economic reforms have ushered in a period of solid economic growth and lower inflation. Nevertheless, overall productivity remains hampered by supply-side constraints including underinvestment and high production costs in the agricultural sector (CIA 2017, Internet site).

The Ugandan economy is characterised by formal and informal economic activity with the informal sector accounting for approximately 45% of all economic activity (UBOS 2016a). The informal economy refers to a diverse set of economic activities, enterprises and jobs that are not taxed nor regulated by the state and offer little social protection to workers (WIEGO 2018, Internet site).

The service industry typically contributes most to the formal economy with community services, wholesale and retail trade being the most important service sub-sectors, followed by transport and communication (Wiegratz 2009). Tourism is one of the fastest growing service sectors in the Ugandan economy and is the largest foreign exchange earner. Agriculture has traditionally been a major economic activity however it has decreased relative to other sectors in recent years primarily as a result of growth in other sectors such as manufacturing.

The industrial sector is relatively small but has recorded high growth rates over the past three decades. However, the industrial sector is dependent on imported equipment and energy (oil) and is impeded by poor infrastructure, high energy costs and low levels of private investment.

Local Economy

Although primary agriculture is the most important livelihood in the districts traversed by the AOI, the following economic activities are also important (DDPs 2015, Atacama Consulting 2017):

- small-scale processing of agricultural products
- small-scale trade in retail merchandise and agricultural produce
- provision of services including tourism and transport.

Local economic activities are predominantly small scale. Business owners are reliant on good road connections between rural communities and urban centres to source supplies and market their goods.

Land-Based Livelihoods

Most farming activities are small-scale and characterised by low-input, low-output subsistence farming with trading of surplus crops. Crop production is predominantly rain fed as irrigation infrastructure is absent in the majority of districts traversed by the AOI. Challenges faced by households engaged in crop farming include limited access to alternative sources of income, lack of education, skills and experience.

Livestock rearing is an important economic activity at household level. The main livestock species are cattle, goats, sheep, poultry, pigs and donkeys. Key challenges include the prevalence of diseases and livestock theft. Localised nomadism, which involves movements of livestock herds (usually cattle) between villages within and occasionally between districts, is common in the sample PACs and essential for the larger herds of cattle.

Artisanal scale mining (ASM) in the districts traversed by the AOI focuses mainly on construction materials such as sand, stone for aggregates, laterite soils for brick making and gold. ASM of gold takes place in Kakumiro, Kyankwanzi and Mubende districts, however it is difficult to determine the exact numbers of people involved, since activities are informal in nature and operations are transient. Women involved in ASM are considered very highly sensitive as they have less access to productive capital than men and may be relying on ASM as a sole livelihood. Children involved in ASM are very highly sensitive since they may be exposed to safety risks and may lack access to education as a result of working in mining activities.

Natural resources play a vital part in the subsistence of rural communities in terms of energy for cooking, food security, construction materials for shelter, medicine and income. Key challenges for natural resource users include the high cost of alternative sources of energy for cooking and lighting and pressure on natural resources due to a growing population encroaching on wetlands and forest areas for dwellings, farming and grazing. Female firewood collectors and wild food users are deemed highly sensitive VECs.

River and Lake-based Livelihoods

Lake fishing and aquaculture are small-scale subsistence activities. There is pressure on the fisheries sector due to increasing crop failures caused by drought or floods forcing crop farmers to look to fishing as an alternative income source. Young people are becoming more attracted to fishing activities as the size of farming plots for the younger generations is diminishing, rendering crop farming less profitable. Fish stocks are decreasing due to overfishing with decreasing fish stocks encouraging the use of illegal fishing gear (e.g fine-meshed nets), which is a major challenge facing lake fisheries. Other major challenges for fisherfolk in the AOI include low returns (owing to use of basic fishing techniques) and increased conversion of wetland areas for agricultural activities, while aquaculture is affected by poor productivity and disease decreasing yields. Fisherfolk, who fish full time, particularly women, landless who fish on rivers and employees of aquaculture enterprises are ranked as very highly sensitive receptors as they have no or limited alternative income generating opportunities.

Land and Property

The Land Act identifies four forms of land tenure: customary, leasehold, freehold and mailo. Most citizens hold their land under customary tenure, which applies to specific land areas that are governed by customary laws. Over 60% of land is held under a customary tenure

system, most of which is found in the northern, western and southern parts of the country and in Hoima, Kakumiro and Kyankwanzi. Key problems associated with this tenure include lack of security for landowners and disadvantages for women.

The Land Act (1998; 2010) provides for two mechanisms in which rights held under customary tenure can be formally recognised:

- acquiring a Certificate of Customary Ownership (CCO). Any person, family or community holding land under customary tenure on former public land may acquire a certificate of customary ownership. A CCO can be acquired through a tiered application process. Applications are reviewed by the Area Land Committee and certificates are eventually issued by the district land board.
- forming a Communal Land Association (CLA) by any group of persons under the Land Act for any purpose connected with the communal ownership and management of land, whether under customary law or otherwise (GOU 2013b).

The third land tenure system (freehold) is similarly governed by the Registration of Titles Act. Under this system, a registration of title in perpetuity and conferment of full powers of ownership is provided to the land holder, who may use the land for any legal purposes. Only national citizens are legally entitled to own land under the freehold system and there is little land held under freehold tenure.

Under the mailo tenure system, land is registered under the Registration of Titles Act, which grants the holder a land title and absolute ownership in perpetuity. Land held under mailo tenure (approximately 23,300 km^2) is confined to Buganda (central Uganda) and Bunyoro (western Uganda). At present there are over 250,000 mailo land title holders in Uganda.

Land and property sensitivity is ranked as very high for female headed households, who are particularly vulnerable due to long-standing discrimination that excludes women from owning, inheriting and controlling land. Households and individuals who have been previously displaced and resettled are also deemed very highly sensitive. Sensitivity is ranked as high for landholders without title deeds as without title deeds, landholders will not be eligible for compensation (only for crops grown). Youths are potentially highly sensitive VECs as a result of having limited access to land outside their customary rights.

Land conflicts form the highest percentage of disputes reported both in formal and informal dispute resolution systems in Uganda. Common concerns reported are landlord-tenant relations on mailo land, disputes over land expropriation by the Government and the implications of oil exploration and mining for local land tenure systems and rights

Workers' Health, Safety and Welfare

Many companies in Uganda have had little previous exposure to basic health and safety standards and occupational health and safety is largely unregulated. Legislation on workers' rights and working conditions exists, however, in practice workers are not always provided with adequate information regarding their terms of employment and their labour rights, particularly workers active in informal economic sectors. Baseline data revealed a low awareness level of health, safety and workers' rights and of a non-discriminatory work culture in the PACs.

The sensitivity of the workers' health, safety and welfare is ranked as very high for the local workforce owing to low levels of occupational health and safety awareness.

Social Infrastructure and Services

PACs rely on radio as the main means of receiving information, although mobile phones and the internet are becoming increasingly important means of information exchange. Rural electrification is still low, limiting general development.

Social infrastructure and services sensitivity is ranked as low for PACs in relation to media; all households have access to one or more media information sources. PACs are ranked as moderately sensitive VECs in relation to electricity; most PACs do not have access to grid electricity and rely on other means for cooking and lighting. Households without mobile phones and internet access are also ranked as moderately sensitive VECs; they may not receive information shared through those platforms.

Community Health

Most of the population residing in the AOI are now using the formal health care system as well as traditional medicine. This was attributed to ongoing efforts on health education and system strengthening including provision of outreach services. Use of traditional medicine has generally decreased as more people embrace modern healthcare.

There is an increasing trend in noncommunicable diseases, particularly hypertension, heart disease and diabetes, occurring nationwide, which has been linked to urbanisation and associated changes in lifestyle. Chronic malnutrition rates have decreased and acute malnutrition rates have generally remained low and stable at district level.

There has been a decrease in the burden of diarrhoeal diseases in most of the districts traversed by the AOI. This was partly attributed to improvements in hygiene behaviour, with access to safe drinking water and basic sanitation facilities improving. The potential for cholera, dysentery and typhoid outbreaks remain high in all the project districts as a result of underlying challenges in environmental health conditions.

A decrease of HIV prevalence over the past three years was reported in more than half of the districts traversed by the AOI and attributed to the upscale of interventions such as health education, free condom distribution, increased availability and uptake of HIV care and treatment and reduction in HIV-related stigma.

Zoonotic diseases remain a risk to PACs, in particular those that are impacted by influx. Environmental sanitation, health care services and prophylaxis, vector control programmes and influx management are key for controlling vector-related diseases, such as malaria.

Community health sensitivity is ranked as potentially high for children, the elderly, pregnant women, people living in overcrowded areas, PACs with decreased access to appropriate healthcare facilities, people with poor access to clean water and adequate sanitation, women headed households, sex workers and PACs near to artisanal mining sites, along transport route, and access roads. Sensitivity is ranked as potentially very high for immuno-compromised individuals.

Community Safety, Security and Welfare

There are effective established mechanisms for conflict resolution and support groups at village level. Although PACs are generally peaceful, conflicts arise as a result of changing demographics and decentralisation, underlining the requirement for effective stakeholder engagement. There are vulnerable groups, including widow-headed households, children

and people with ill health or living with a chronic illness, which will need special consideration.

Sensitivity regarding community safety, security and welfare is ranked as very high for women; cultural attitudes towards women and their role within the household hinders many females in PACs from engaging in income-generating activities and decision-making processes. Widow headed households, the elderly and the disabled are ranked as very highly sensitive because they are challenged to meet basic household needs and afford healthcare. Children are ranked as very highly sensitive VECs, particularly those from poor households, AIDS orphans and boys from cattle keeping and plantation agriculture communities. Youths are also ranked as very highly sensitive VECs due to their limited access to productive assets, lack of education and vocational skills and scarce employment opportunities. People living with illnesses are ranked as very highly sensitive as they rely on others for financial and food security. Land users without land titles are also deemed very highly sensitive because they will not be eligible for compensation without formal acknowledgement of land ownership (only for crops grown).

Traffic

Roads in Uganda vary in condition; they can have sealed and unsealed surfaces. The use of the roads by pedestrians is common due to the lack of a pavement for walking in most rural areas. Cyclists and boda boda also use the roads extensively, particularly in the more urban areas and the risk of accidents involving pedestrians, cyclists and boda boda is considered high.

Traffic levels are low in the AOI, so congestion is rare, except at the border with Tanzania and in Kampala. The only locations within the project area where some congestion can be experienced are Hoima municipality, and Mutukula town (on the border with Tanzania).

Many of the unsealed roads in the project area are being upgraded and new roads are being constructed by UNRA to support oil and gas infrastructure development.

Cultural Heritage

The definition used by the project for tangible cultural heritage is that it is moveable or immovable objects, sites, structures, or groups of structures having archaeological, palaeontological, historical, cultural, artistic, and religious values. Intangible cultural heritage is defined as cultural resources, knowledge, innovations and practices of local communities embodying traditional lifestyles.

The tangible and intangible cultural heritage identified in the AOI is considered a representative sample. More features will be present in the AOI which will be identified by pre-construction surveys, further consultations with local communities and during construction.

There are no known nationally or internationally designated sites or critical cultural heritage (as defined in IFC PS8) sites identified within the AOI.

Archaeological sites identified include pottery, stone tools, rock-art sites, and iron working sites. Religious structures are the most common cultural heritage with a physical location and a strong intangible sensitivity, including four churches within 100 m of the project footprint, and three cemeteries, two of which two are within the project footprint and a third within 100 m.

Intangible cultural heritage is closely linked to individual and group identity and therefore sensitive to cultural change. Examples of this type of heritage include sacred natural sites and trees, traditional dances, ritual involving the ancestors, traditional healing and medicine, meeting places and sacred rivers and beliefs about twins.

Climate

Since 1960, mean annual temperatures have risen by 1.3°C and annual and seasonal rainfall has decreased considerably across Uganda. Rainfall has also become more unpredictable and evenly distributed over the year.

Uganda is vulnerable to increased climate variability and climate change. For example, the severity and frequency of extreme events such as droughts and floods is projected to increase.

Global anthropogenic GHG emissions, together with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming of the global climate since the mid-20th century. Between 1990 and 2014 Uganda's GHG emissions increased by 71%. However, Uganda has one of the lowest levels of GHG emissions in the world, estimated at 1.6 tCO_2e per capita for 2014, totalling absolute emissions of 59.9 $MtCO_2e$ which is approximately 0.12% of the world total.

Ecosystem Services Provided

Biodiversity

The habitats of conservation importance provide provisioning services such as the collection of timber and other wood fibres for fuel, charcoal production and construction, the collection of plants for food and medicinal purposes and the collection of fibres, resins and other materials. They also provide regulating services (water, erosion, local air quality and local climate regulation) and cultural services (sense of place/way of life, spiritual, sacred and religious values, inspiration for culture, art and design and cognitive development. Habitats also provide important refuge, feeding, watering breeding and nursery areas for a host of terrestrial and aquatic wildlife.

The flora and fauna species of conservation importance provide provisioning services such wild food via hunting, fishing and foraging of plants for personal use or for trade. Keystone predatory bird and large mammal species provide pest and control and regulate ecosystems, while certain fauna species, in particular large mammals and their associated habitats can be vital for eco-tourism. Cultural ecosystem services are provided for in the inspiration for culture, art and design and cognitive development.

Protected areas provide provisioning services (wild foods by hunting and foraging), regulating services (water regulation, local climate regulation and erosion regulation) and cultural services (inspiration for culture, art and design and cognitive development). Certain protected areas are vital for eco-tourism.

Physical Environment

Soil provides both regulating ecosystem services (e.g., erosion regulation and soil quality regulation) and provisioning ecosystems services (e.g., aggregate for construction).

Surface watercourses provide water as a vital provisioning service, for both local people in rural communities and their livestock. People collect water for domestic purposes and small-scale subsistence agriculture. The watercourses and associated floodplains also provide two important regulating services. Firstly, they help to regulate floods by slowing water velocities; storing water on their floodplains; and transmitting water relatively slowly downstream and reducing peak flows. Secondly, the water courses help to regulate water quality in particular where aquatic vegetation is present.

Groundwater is an important provisioning ecosystem service, supplying freshwater for community use. Groundwater also plays an important habitat support role for aquatic and riparian habitats and wildlife, both directly (where groundwater feeds habitats) and indirectly (where groundwater maintains surface water flows).

Landscape has the potential to provide cultural ecosystem services, including nonmaterial benefits from the sense of wellbeing and value provided to people by living in natural environment. However, stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape.

Air quality and the acoustic environment do not provide ecosystem services.

Socio-economic and Health

The Ugandan economy is heavily dependent on agriculture, forestry, fishing, mining and tourism.

Crop farming is a vital provisioning ecosystem service and undertaken throughout the AOI PACs, sometimes providing their only source of food. Livestock rearing also provides a provisioning service, primarily as mitigation against shock events. Land provides a provisioning service resource for livestock keeping, grazing, water sources, range land allowing for livestock herd movements and trees for shelter and medicinal herbs. Natural resources such as fuel (firewood, charcoal), wild foods (honeys, insects, mushrooms, bush meat), timber, medicinal plants and grasses are also provisioning ecosystem services in the form of energy for cooking, construction materials, traditional medicine and income. Artisanal and small-scale mining (ASM) is an abiotic provisioning ecosystem service undertaken primarily in the dry season within portions of the AOI.

Fishing exploits a provisioning ecosystem service, as well as a cultural ecosystem service due to its long standing importance in communities, in particular for the lake fishermen.

Local economy does not have any ecosystem services but relies on ecosystem services discussed in land-based livelihoods.

Safe water as a natural resource is significant provisioning service and plays an important role in the general health and livelihood activities.

Land and property, workers' health, safety and welfare, social infrastructure and services and community safety, security and welfare do not have any ecosystem services associated with it.

Cultural Heritage

Cultural heritage provides cultural ecosystem services, including knowledge systems which provide a framework for understanding the natural environment and ecosystems, and influence social systems, social relations and sense of place in a complex and changing

world, and functioning cultural systems which support subsistence activities, control the use of land, the resolution of conflicts and the day-to-day performance of all the social duties that make the local society 'work'.

Climate

There are no ecosystem services associated with climate.

Stakeholder Engagement

Stakeholder engagement has been an integral part of the development of the EACOP. It is also an integral component of the environmental and social impact assessment (ESIA) process and the foundation for developing and maintaining the project's social licence to construct and operate. It has been undertaken in accordance with the requirements of Ugandan legislation, international requirements as set out in the Equator Principles III and the International Finance Corporation Performance Standards (IFC) (2012) and EACOP principles, protocols and policies for stakeholder engagement.

Stakeholder engagement has been inclusive of all stakeholder categories, including government, civil society, directly and indirectly affected people and communities, with a particular attention paid to the needs of women and those vulnerable to potential impacts. It also included engagement activities regarding human rights.

Stakeholder engagement has been tailored to fit the EACOP project, the ESIA process and the local context, including the nature of the stakeholders. A Stakeholder Engagement Plan (SEP) to support effective engagement throughout the ESIA process was developed. It provides direction for the ESIA engagement approach, stakeholder identification, specific engagement plans for the different ESIA phases and the key deliverables from engagement activities. It focuses on:

- a stakeholder identification and analysis process
- methods, materials and protocols for stakeholder engagement including information disclosure, consultation, and reporting to stakeholders
- the ESIA stakeholder engagement activities
- a data management system for all stakeholder data and minutes of meetings for analysis and follow up
- a project grievance procedure, which also serves as the ESIA grievance procedure.

Stakeholder engagement was conducted during the scoping phase, the baseline and impact assessment phase and pre-ESIA submission to fulfil the objectives. The objectives of stakeholder engagement included:

- obtaining an understanding of the number and types of stakeholders in the socioeconomic study area
- informing stakeholders about the ESIA baseline studies in the areas traversed by the project and associated infrastructure
- obtaining stakeholder input into the scope of the ESIA, including the development of valued environmental (and social) components (VECs), impact identification, mitigation measures and potential sources of cumulative impact and impact mitigation

- listening to questions and concerns from stakeholders and ensure these are addressed in the ESIA
- conducting pre-submission meetings to consult a sample of potentially impacted local stakeholders, prior to the submission to NEMC to acquire their feedback on ESIA findings (impacts and mitigation measures), cumulative impact assessment and mitigation measures.

The engagement provided stakeholders with information about the project and the ESIA, including the engagement process and grievance management. It also provides a mechanism for ongoing stakeholder engagement.

Stakeholder Concerns

A summary of the stakeholder concerns raised and how the project intends to address them is provided below.

Socio-economic and Health

Most stakeholder concerns related to socio-economic and health matters.

Stakeholders raised concerns over land acquisition and compensation for loss of land, livelihoods and properties. The difficulty of finding and acquiring replacement land, the timing of compensation and compensation needs for land-owners and tenants were also raised. There were also concerns about forced resettlement, choice of host area and livelihood restoration, and clarifications were sought about the project right-of-way (RoW).

Stakeholders were informed that the project will manage land acquisition by developing a resettlement action plan (RAP) and a livelihood restoration plan (LRP) and that compensation will be provided in accordance with national law and international standards and before construction begins. It was explained that during construction a permanent 30-m RoW would be required, and a permanent 10-m RoW for operations.

Concerns were raised about project induced in-migration (PIIM), influx management and PIMM related impacts. Stakeholders were informed that an in-migration management plan will be developed and implemented with the objective of reducing the number of people that come to the project-affected communities (PACs) for either direct or indirect project opportunities.

Stakeholders were interested in employment opportunities and procurement opportunities for local people, particularly for women and youths. In response, stakeholders were informed that a transparent recruitment strategy would be developed and shared with communities; about the local content plan developed to maximise the purchase of goods and services from within Uganda; and about the procurement and supply chain management plan which reinforces the use of local workers and suppliers.

Community health and safety concerns were raised, with questions asked about the potential health impacts of the project, including the spread of communicable diseases, road safety, and potential impacts on water quality and of dust generation water quality. In response, information was provided about the health impact assessment and the traffic impact assessment included in the ESIA, the community health, safety and security plan containing the appropriate mitigation, and the pollution prevention plan including dust suppression measures. Stakeholders were also advised that water quality will be monitored regularly and alternative community water sources will be provided where access to water

sources would be restricted by construction. It was noted that the project construction workforce would be accommodated in camps with health and recreational facilities to avoid impacts on local health and other public infrastructure, that camps would be closed and that interactions with local communities would be discouraged.

Physical Environment

Stakeholders raised concerns that the heat from the pipeline would affect the soil productivity and the potential effects on community water sources. The stakeholder engagement team explained that the pipe would be insulated and that the heat from the pipe would not affect soils or crop productivity, and informed stakeholders of the pollution prevention plan which includes measures to minimise impacts on water sources.

Concerns were raised about potential project impacts on air quality and climate change. The stakeholder engagement team explained that the project engineering team will ensure compliance with applicable emission standards.

Biodiversity

Stakeholders raised concerns about the impact of the project on Lake Albert fisheries and impacts on biodiversity in the project area, including impacts on sensitive ecosystems, the interconnectivity of habitats for migratory and endemic species and loss of biomass. Stakeholders were informed that the selection of the pipeline route included consideration to avoid environmental and social sensitivities and that the pipeline will be constructed along existing infrastructure corridors where feasible. They were also informed of the biodiversity management plans and the project aims for no net loss for biodiversity.

Project and ESIA-Related Matters (Including Stakeholder Engagement)

Questions were asked about the ESIA, a definition of the AOI and the grievance mechanism. Stakeholders also requested information about pipeline routing and project design. The stakeholder engagement team informed stakeholders about the ESIA process and stakeholders were advised on the various levels of handling grievances within the grievance mechanism. Feedback was also provided on project design such as pipeline routing, including emphasis of the fact that the route would only be finalised once all studies were completed, oil spill contingency and emergency response planning, and security planning.

Grievance Procedure

EACOP has established a non-judicial grievance procedure to respond to stakeholders' concerns and to facilitate resolution of stakeholders' grievances. The grievance procedure is compliant with the United Nations Guiding Principles on Business and Human Rights effectiveness criteria for project level grievance procedures.

The grievance procedure describes the process available to stakeholders for lodging a grievance during pre-construction, construction and project operations, and is accessible to all stakeholders at no cost and without retribution. Judicial and administrative options can also be pursued by stakeholders.

The project's grievance procedure has been presented to stakeholders during each consultation phase and is managed by EACOP staff (CLO and grievance administrator).

Ongoing Stakeholder Engagement

Post submission stakeholder engagement on the disclosure of the ESIA report will be undertaken after the ESIA report has been submitted to the regulators. The engagement will focus on key stakeholders identified in the scoping and baseline phases. The government EIS disclosure will be conducted in concordance with the National Environmental Act (1998).

Following the ESIA disclosure phase, the project stakeholder engagement team will continue to engage with stakeholders at national, regional and local level throughout the project lifecycle to further discuss the results of the ESIA and how stakeholder concerns have been considered in the ESIA. The engagement strategy will also include targeted engagement with identified vulnerable stakeholders or their representatives.

Engagement activities will be adjusted to reflect evolving project activities, stakeholder preferences and concerns over the life of the project. The project will also seek to build partnerships with NGOs, CSOs and communities to support the development and implementation of practical impact management strategies.

During the construction phase of the EACOP project, local community offices will be established at locations along the route to provide stakeholders direct access to community relation coordinators (CRCs), community liaison officers (CLOs) and grievance officers.

The grievance procedure will continue to provide opportunities for stakeholders and PACs to express grievances about project activities.

A stakeholder engagement monitoring and evaluation programme will be developed to ensure efficient and effective stakeholder engagement, in parallel with community awareness programmes.

Impacts – Normal Operations

A primary project objective is to design, construct and operate, and decommission a pipeline and its AGI with minimal risk, injury or harm to personnel, host communities and their ecosystem services.

Potential impacts on biodiversity, the physical environment, socio-economic and health, and archaeology and cultural heritage during the construction and operation phases are considered in the ESIA.

The following section presents the significant residual impacts remaining after proposed mitigation is applied, and the procedure for decommissioning. Beneficial project impacts are also discussed. All potentially significant ecosystem services related impacts are addressed by the VEC impact assessments and associated management plans.

Beneficial Impacts

A number of potential project impacts, predominantly relating to socio-economic VECs, will be beneficial, including:

- contribution to the national economy from investment
- generation of national and local employment opportunities
- provision of training and skill development opportunities
- opportunities for national and local businesses through project procurement

- improvement in the health and safety of employees from disease awareness and reduction programmes
- increased knowledge and recording of tangible and intangible cultural heritage.

Where possible, enhancement measures will be implemented to increase the benefits to local people, and the local and national economy.

Potential Negative Impacts

The impact assessment process included the application of mitigation to the potential pipeline impacts identified for each VEC. Potential impacts include:

- biodiversity:
    - permanent loss of habitat from operational RoW
    - PIIM to areas around the MCPY causing increased pressure on natural resources
    - stress or mortality to flora and fauna
    - loss of chimpanzee habitat and disturbance to chimpanzees
    - reduced primary productivity in watercourses
    - temporary or permanent loss of breeding and foraging habitat
    - modified habitats due to non-native species establishment
    - loss of ecological function and integrity of protected sites
- physical environment:
    - loss of soil structure, drainage, fertility and seed bank
    - soil contamination
    - contamination of surface and groundwater
    - deterioration of water quality
    - decreased water level due to abstraction for project use
    - reduced air quality from combustion of fuel in construction equipment and vehicles
    - disturbance or nuisance from noise from construction on the RoW and traffic movement
- socio-economic and health:
    - dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities
    - competition over employment opportunities
    - inflation and effects on supply owing to project procurement
    - increased transportation costs and travel time with economic consequences
    - permanent loss of land used for crop farming and grazing
    - permanent loss of natural resources
    - temporary loss of access to fishing grounds (rivers, Lake Albert, dams and ponds)
    - permanent loss of private land due to project land acquisition
    - land and property speculation by landowners and third parties
    - increased risk of vector-related diseases among the local workforce

- traffic congestion leading to delays
- increased pressure on regional waste management facilities due to project activities
- an increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases
- nutrition of PACs compromised by reduced food security
- community health and safety incidents associated with accidents during construction
- change in local community dynamics due to employment opportunities
- damage, disturbance or disruption of access to cultural heritage.

The potential impact of the project on climate change has also been assessed.

Significant Residual Project Impacts

The impact assessment process included a process of applying proposed mitigation to the potential project impacts identified for each VEC. Table ES2 summarises the number of generic and location-specific impacts assessed and the mitigation measures for each VEC group.

The significance of impacts was then re-assessed. Based on the mitigation measures planned, including for aspects of biodiversity, for which further enhancement and conservation measures will be developed and implemented through the production of a site-specific biodiversity action plan and support for ongoing forest conservation initiatives, no significant residual impacts are predicted.

Table ES1 Impacts Assessed and Mitigation Measures

	Generic Impacts	**Generic Impact Mitigation Measures**	**Location-Specific Impacts**	**Location-Specific Impact Mitigation Measures**
Biodiversity	33	49	33	28
Physical Environment	25	33	101	36
Social	59	51	158	42

Transboundary Impacts

There are no significant residual transboundary impacts identified.

Cumulative Impacts

Hoima municipality is likely to experience a general economic boost due to the beneficial cumulative impacts from employment, training and purchasing associated with the EACOP project and its associated facilities (Tilenga and Kingfisher projects), and other third-party developments.

The upgrade of the EACOP project access road and the third-party road upgrades is also a long-term beneficial cumulative impact, which will enhance access to the national road network and to health care and reduce travel times including response times in emergency situations.

After mitigation measures have been implemented, a potential cumulative impact remains significant:

- The EACOP project, associated facilities and other third-party developments will change the characteristic rural quality of the landscape and visual receptors around PS1, although the contribution from the EACOP project and associated facilities is small.

    The EACOP project and associated facilities will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. An example is the joint forest conservation initiative mentioned below.

Enhancement and conservation measures that will be developed and implemented through the production of a site-specific biodiversity action plan and support for ongoing joint forest conservation initiatives will not only reduce the project impact on chimpanzee habitat but will also reduce the potential cumulative impacts from associated facilities and third party projects.

Associated Facilities

Tilenga Project, Kingfisher Oil Project and concrete batch plants, borrow-pits and waste management facilities (where they meet the IFC definition of associated facilities) have been identified as associated facilities (AFs). The locations of concrete batch plants, borrow-pits and any waste disposal sites required have yet to be defined and so will be subject to the management of change process.

The beneficial impacts of the Tilenga Project and Kingfisher Oil Project are similar to the EACOP project, e.g., increased economic growth, increased employment opportunities and improved health planning.

The Tilenga Project and Kingfisher Oil Project have significant residual impacts on biodiversity and social VECS, particularly impacts relating to PIIM, as well as impacts on surface water, the acoustic environment and landscape character. While the Tilenga feeder pipeline is part of the Tilenga project, the residual impacts are presented separately as a separate ESIA has been produced for the feeder pipeline, however there are no significant residual impacts from the Tilenga feeder pipeline.

Potential Impacts – Unplanned Events

Unplanned events considered include:

- traffic accidents
- fires
- damage to third-party assets
- release of diesel from fuel storage tanks at the MCPY and construction sites

- release of hydrotest water during commissioning
- oil spills
- sabotage
- geophysical hazards.

The project has adopted engineering design criteria that aim to reduce the probability and consequences of unplanned events that could lead to impacts to social or environmental receptors. At each stage of the design process, a series of health, safety and environmental (HSE) studies has been, and will continue to be, undertaken.

The project has completed a technological risk assessment (TRA) during front end engineering design (FEED) in accordance with the EACOP Project HSE risk assessment methodology.

Risk assessment has been undertaken to inform:

- the design process
- the ESIA process, and the development of mitigation measures.

Additional risk assessment will be undertaken during detailed engineering and construction planning.

An emergency response plan will be prepared which clearly identifies possible emergency scenarios, sets out actions to be taken in the event of an emergency, and defines resources that will be made available to respond to an emergency event. It will comprise of several management plans and procedures, such as an oil spill contingency plan, spill management and response plan, and a community health, safety and security plan.

Work has been undertaken that supports the establishment of a preliminary rating of the risks and related significance, based on existing engineering knowledge and project design, and professional judgement.

The project will reduce risk through:

- design and construction mitigation
- health, safety, security, society and environment (H3SE) systems and procedures
- emergency response planning.

The project has considered design and construction opportunities to reduce risk during construction and operation throughout the design process and will have in place an HSE Management system with which contractors will be required to comply during construction.

Decommissioning

The project components (i.e., pipeline, PS) will be decommissioned based on Ugandan regulations and standards and international standards and protocols.

A decommissioning plan, which includes a social management component that addresses the impact of decommissioning (loss of jobs, economic activity), will be prepared and the scope will be developed in consultation with stakeholders at that time. The decommissioning plan for the construction facilities will ensure that all the project components that were required for constructing the pipeline, but that will no longer be required during the operational phase, are removed and land is returned to the Government. The

decommissioning plan will include specific consideration of unplanned events which may occur during decommissioning consistent with EACOP project requirements.

Environmental and Social Impact Management Plans

In accordance with the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014, an environmental and social management plan (ESMP) has been developed.

The project ESMP is consistent with the EACOP code of conduct and H3SE policy, and charters.

The ESMP presents monitoring parameters and proposed performance indicators and targets that will steer environment and social performance toward continuous improvement. A comprehensive reporting system will also be developed.

A suite of management plans will be prepared to support implementation of the ESMP. Minimum content of these management plans are the mitigation commitments developed throughout the ESIA.

A separate suite of management plans will be drafted for:

- terrestrial construction
- terrestrial operations
- marine construction
- marine operations.

The following is a list of the management plans that will be developed prior to the commencement of construction and operation activities:

- biodiversity management plan
- pollution prevention plan
- waste management plan
- natural resource management plan
- soil management plan
- cultural heritage management plan
- reinstatement plan
- stakeholder engagement plan
- resettlement action plan
- labour management plan
- project induced in-migration management plan
- procurement and supply chain management plan
- infrastructure and utilities management plan
- community health, safety and security plan
- occupational health, safety and security plan
- transport and road safety management plan
- emergency preparedness and response plan

- monitoring and reporting plan
- decommissioning plan.

Changes to the project may occur subsequent to preparation and submission of this ESIA. A management of change procedure will be implemented, that includes:

- environmental and social appraisal of the change, including the identification of new or revised mitigation measures
- health and safety evaluation
- consultation with engineering and H3SE disciplines
- consultation with NEMA on the need for amendments to the ESIA permit
- management of change approval process.

After management of change approval, changes to the ESMP and supporting management plans will be implemented.

Recommendations

The ESIA has been prepared by an experienced team with extensive pipeline engineering, environmental and social impact assessment knowledge, including Ugandan partners with expertise in ESIA development in the Ugandan oil and gas sector. The team has quantitatively and qualitatively identified and assessed potential interactions between the project and VECs in the project AOI. The recommended measures, consolidated in the ESMP, which are either incorporated into project design, or actioned during project implementation, are intended to mitigate the impacts and their significance.

The EACOP project, with due consideration to the management of associated environmental and social impacts, will:

- contribute to the economy
- provide business opportunities for different sectors of the economy and enhance capacities of local companies
- provide employment, knowledge transfer and skills development opportunities during construction and operation.

As these are benefits in the public interest, it is requested that NEMA approves this environmental impact statement.

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GLOSSARY

Symbols	
%	percent
<	less than
>	greater than
°C	degrees Celsius
µ	micro – one millionth, 10^{-6}
µg/L	micrograms per litre (1000 µg/L = 1 mg/L)
µg/m^3	micrograms per cubic metre
µS/cm	microsiemens per centimetre: a unit of electrical conductivity
ρ	fluid (water) density (1000 kg/m^3)
Ω	stream power per unit channel length (W/m)
A	
A	cross-section area of flow in a channel (m^2)
A horizon	surface horizon (topsoil layer) composed of mainly mineral matter with well-incorporated organic matter
ACEMP	African Centre for Energy and Mineral Policy
ACODE	Advocates Coalition on Development and Environment
Acric	property of ferralsols with very low cation exchange capacity in the subsoil/B horizon
Acric Ferralsol	description of soil classification: good physical properties, poor fertility, less susceptible to erosion than most other intensely weathered tropical soil; dominated by low-activity, iron-rich clay
ACT	artemisinin-based combination therapy
AGI	aboveground installation
AHAP	area of high archaeological potential
AIDS	acquired immune deficiency syndrome
anadromous	fish that are born in fresh water then migrate to the ocean as juveniles where they grow into adults before migrating back into fresh water to spawn
ANARDE	Advocates for Natural Resources and Development
AOI	area of influence
AP	aerial photograph
APHA	American Public Health Association
Aquaread	trademark multiparameter water quality probe

aquatic	freshwater habitats or species only, in the context of this report
aquifer	stratum or zone below the earth's surface capable of producing water for human use
AREA	drainage basin area (km^2) (a parameter used to calculate the mean annual flood)
Arenosol	description of soil classification: deep sandy soil, sometimes calcareous; low water and nutrient storage capacity
ARI	acute respiratory infection
ASM	artisanal and small-scale mining
A-weighting	'A' weighting is standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. At low and high frequencies, the human ear is not very sensitive, but between 500 Hz and 6 kHz the ear is much more sensitive.
B	
B horizon	subsurface, or originally subsurface horizon, in which the original rock or parent material has been mostly or entirely altered by weathering and soil-forming processes
bajaj	three-wheeler motorcycle taxis
bankfull discharge, level, width	discharge, water level or width of a river whose flow is just contained within the banks
BAU	business as usual
BBL/D	barrels per day
BCC	Behaviour Change Communication
BCG	Bacillus Calmette-Guerin
BID	background information document
bioquality	aspect of a plant community's conservation value, derived from the concentration of restricted range species occurring in the community.
Black Star species	plant species of highest conservation concern as a result of their very small global area of occupancy
blasting	assumed use of charges less than 5 kg for the purpose of this project
BLB	Buganda Land Board
Blue Star species	plant species of modest conservation concern as a result of their somewhat restricted global range (24 degrees square on average)
BMU	beach management unit
BOD	biochemical oxygen demand
boda boda	motorcycle taxis
bomas	livestock enclosure

BS	British Standard
BTEX	benzene, toluene, ethylbenzene and xylene
BTVET	Business Technical Vocational Education and Training
C	
Calcisol	description of soil classification: calcareous, mostly alluvial, colluvial and aeolian deposits; occasionally salt affected
CAO	chief administrative officer
cascade	tumbling, white water, for example, waterfall. Substrate is usually bedrock or possibly boulders.
CBOs	community based organisations
CCO	Certificate of Customary Ownership
CDO	community development officer
CES	cultural ecosystem services, the adoption of ecosystem services to cultural heritage
CFR	central forest reserve
CFU	colony forming units (bacteria)
CFU/100 ml	colony forming units (unit of measurement of abundance of coliform bacteria) per 100 millilitres
CHA	critical habitat assessment
CHU	cultural heritage Uganda
CLA	Communal Land Association
CLTS	community-led total sanitation
CMS	Convention on the Conservation of Migratory Species of Wild Animals, aka Convention on Migratory Species
CNOOC	China National Offshore Oil Corporation
CO	carbon monoxide
CO_2e	carbon dioxide equivalent, a standard unit for measuring GHG emissions (carbon footprints). The impact of each different greenhouse gas is expressed in terms of the amount of carbon dioxide that would create the same amount of warming. A GHG emission consisting of different greenhouse gases can be expressed as a single number.
COD	chemical oxygen demand
COFTU	Central Organisation of Free Trade Unions
COMESA	Common Market for Eastern and Southern Africa
CSCO	Civil Society Coalition for Oil and Gas
CVD	cardiovascular disease

D	
DAMBO	(dimensionless) proportion of the drainage basin covered by wetland (a parameter used to calculate the mean annual flood)
dB	decibel
dB(A)	A-weighted decibel
dB(lin)	zero or flat weighted decibel
DDP	district development plan
DEFRA	Department of Environment, Food and Rural Affairs
DGSM	Directorate of Geological Survey and Mines
DHMT	district health management team
DHO	district health officer
diagnostic horizon	soil horizon, some or all of whose properties are used for classification purposes in the FAO Soil Legend
diffusion tube	plastic monitoring tubes for inorganic compounds – they work by molecular diffusion, with compounds moving from an area of high concentration (air) to an area of low concentration (tube), where the compounds collect on the absorbent at the end of the tube.
DIN	German Institute for Standardisation
DLB	District Land Board
DLO	District Land Office
DMU	discrete management unit – defined in IFC PS6 as an area with a definable boundary within which the biological communities or management matters have more in common with each other than they do with those in adjacent areas
DO	dissolved oxygen (mg/L or % saturation)
DOSH	Department of Occupational Safety and Health
DOTS	directly observed treatment short-course
DRC	Democratic Republic of Congo
DSIP	development strategy and investment plan
DWD	Directorate of Water Development
DWO	District Water Officer
DWRM	Directorate of Water Resources Management under the Ministry of Water and Environment, Uganda
Dystric Regosol	description of soil classification: weakly developed, fine grained, extensive on eroded land
E	
E. coli	*Escherichia coli* (bacteria)
EAC	East African Community

EACOP	East African Crude Oil Pipeline
EC	electrical conductivity (µS/cm)
ECO	Ecological Christian Organisation
EHA	environmental health area
EIA	environmental impact assessment
ENSO	El Niño–Southern Oscillation
ERU	existing road upgrade
ESIA	environmental and social impact assessment
F	
FAO	Food and Agriculture Organization of the United Nations
fault	fracture or fracture zone along which there has been displacement of the sides relative to another parallel to the fracture
FDI	foreign direct investment
Ferralsol	description of soil classification: strongly weathered soils of the humid tropics with high iron and aluminium oxide contents.
FFI	Fauna & Flora International
FGD	focus group discussion
FR	forest reserve
fractures	breaks in rocks due to intense folding or faulting
G	
g	acceleration due to gravity (9.81 m/s^2)
gauged watercourse	watercourse on which a river gauging station is located. A river gauging station is a location where flow and water quality are monitored by hydrologists and environmental scientists
GBV	Gender-based violence
GDP	gross domestic product
GH	general hospital
GHG	greenhouse gases
GHI	genetic heat index – a measure of the conservation importance of vegetation. High index represents higher importance. A continuous metric used to measure bioquality.
GIS	geographic information system
Gleyic Arenosol	description of soil classification: deep sandy soil, sometimes calcareous, low water and nutrient storage capacity; wet
Gleysol	description of soil classification: soils saturated with groundwater for long enough periods to develop features of reduction and re-oxidation characterised by grey and rust-coloured mottles.

glide	flowing water with an unbroken or undisturbed surface
Gold Star species	plant species of high conservation concern as a result of their small global area of occupancy
GoU	Government of Uganda
GPS	global positioning system
GR	game reserve
Green Star species	plant species of no conservation concern with respect to their area of occupancy. Could be of concern due to other characteristics, such as local use, or ecological dominance.
H	
h	hour
H_2S	hydrogen sulphide
ha	hectare
Haplic Ferralsols	description of soil classification: ferralsols (see above) with the normal horizon (soil layer) sequence
HAT	human African trypanosomiaisis
HC	health centre
HDI	Human Development Index
HGV	heavy goods vehicle
HH	household
HHI	household interview
HIA	health impact assessment
HIPC	heavily indebted poor countries
Histosol	description of soil classification: organic peaty, swamp forest soil, fragile, nutrient rich
HIV	human immunodeficiency virus
HMIS	health management and information system
HODIFA	Hoima District Farmers Association
horizon	See “soil horizon” below
HPP	hydropower plant
hr	hour
HRT	human rights team
HSB	health-seeking behaviour
HT	health team
I	
IAP	International Accountability Project
ICH	intangible cultural heritage

IFC	International Finance Corporation
ILO	International Labour Organisation
IRS	indoor residual spraying
ISO	International Organization for Standardization
ITN	insecticide treated net
IUCN	International Union for Conservation of Nature
J	
JGI	the Jane Goodall Institute
K	
KBA	key biodiversity area, a site that contributes to the global persistence of biodiversity; identified using 11 criteria across five categories
KET	key employment terms
kg	kilogram
kgm^{-2}	kilograms per square metre
KII	key informant interview
km	kilometre
km^2	square kilometre
KP	kilometre point
kraal	livestock enclosure
L	
L	litre
$L_{10(T)}$	noise level exceeded for 10% of the time of the measurement duration; often taken to represent traffic related noise
$L_{90(T)}$	noise level exceeded for 90% of the time of the measurement duration; often taken to represent the ambient or background noise level. For time (T) see $L_{eq,(T)}$
LDL	laboratory detection limits
Leptosol	description of soil classification: coarse and thin, probably gravely, maybe thin layer of peat; common on slopes; can be fertile but prone to erosion
$L_{eq(T)}$	The sound level in decibels equivalent to the total sound energy measured over a stated period of time. T is over a general period of time where a number illustrates a specific averaging or measurement period (typically $L_{eq,1hr}$).
LGDPs	local government development plans
LIDAR	light detection and ranging: an airborne or satellite-borne detection system that works on the principle of radar, but uses light from a laser and is used to map topography

linear weighting (zero weighting or flat weighting)	'l' or 'z' or '0' sound level meter frequency weighting, flat over a frequency range that must be stated. No weighting is applied.
Lixic Ferralsol	description of soil classification: good physical properties, poor fertility, less susceptible to erosion than most other intensely weathered tropical soil; dominated by low-activity, iron-rich clay
L_{max}	root mean squared maximum level of a noise source or given environment.
L_P	sound pressure level
LRA	Lord's Resistance Army
Luvisol	description of soil classification: higher clay content in subsoil than topsoil; podzolic; common on flat or gently sloping land; fertile, high silt content and prone to erosion on slopes
L_w	sound power level
M	
m	metre
m/s	metres per second
m^3	cubic metres
m^3/h	cubic metres per hour
m^3/s	cubic metre per second
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
macrophyte	aquatic plant that is easily visible with the naked eye
MAF	mean annual flood. The mean annual flood has a theoretical statistical return period of 2.3 years
MAR	mean annual rainfall (mm). (a parameter used to calculate the mean annual flood)
marginal vegetation	predominantly or fully aquatic vegetation growing in the marginal areas of a river (i.e., in the water along the edge of the river under typical flow conditions)
masl	metres above sea level
mbgl	metre below ground level
MCPY	main camp and pipe yard
MDA	ministries, departments and agencies
MDG	Millennium Development Goals
MDRI	Multilateral Debt Relief Initiative
MDR-TB	multidrug-resistant TB
MEMD	Ministry of Energy and Minerals Development
meq/100 g	milliequivalents per 100 grams
mg	milligram

mg/kg	milligrams per kilogram
mg/L	milligrams per litre
MGLSD	Ministry of Gender, Labour and Social Development
MIC	maximum instantaneous charge
micro-blasting	assumed use of charges less than 1 kg for the purpose of this project
microliths	small shaped flint, typically part of a composite tool such as a spear.
midstream bar	raised area of the substrate forming a mound or hump running along the middle of the channel. The upper part may or may not be exposed above the water surface.
migratory [fish]	fish that undertake longitudinal movements within rivers or between lakes and rivers or the sea and rivers usually for spawning (reproduction) purposes. See also anadromous and potamodromous
min	minute
mL	millilitre
MLHUD	Ministry of Land, Housing and Urban Development
mm	millimetre
mm/a	millimetres per annum
MMR	maternal mortality rate
mms^{-1}	millimetre per second
MoU	Memorandum of Understanding
mS/m	millisiemens per metre
$MtCO_2e$	million metric tonnes of carbon dioxide equivalent
MTWA	Ministry of Tourism, Wildlife and Antiquities
MWE	Ministry of Water and Environment, Uganda
N	
n	roughness factor in the Manning uniform flow equation
NA	data not available
NAADS	National Agricultural Advisory Services
NAP	national action plan
NAPE	National Association of Professional Environmentalists
NARL	National Agricultural Research Laboratories
NARO	National Agricultural Research Organisation
NCD	noncommunicable disease
ND	not detected
NDP	National Development Plan

NDPII	Second National Development Plan
NEMA	National Environment Management Authority (Uganda)
NER	net enrolment ratio
NFA	National Forestry Authority
NGO	non-governmental organisation
Nitisol	description of soil classification: deep, well-drained, red tropical soil with at least 30% clay and moderate to strong angular blocky structure; rich in iron; very productive land
NMCP	National Malaria Control Programme
NMT	nonmotorised transport
NO_2	nitrogen dioxide
NOTU	National Organisation of Trade Unions
NO_x	nitrogen oxides: a generic term for the nitrogen oxides that are most relevant for air pollution, namely nitric oxide (NO) and nitrogen dioxide (NO_2). Calculated as the sum of the volumetric concentrations of these substances and, when in mass terms, reported as NO_2.
NRH	national referral hospital
NSSF	National Social Security Fund
NTD	neglected tropical disease
NTLP	National TB and Leprosy Programme
NTU	nephelometric turbidity unit
O	
O_3	ozone
octas	unit of measurement used to describe the amount of *cloud* cover at any given location. Ranging from 0 to 8
ODAI	other degree-awarding institution
ODF	open defecation free
online pond	pond directly connected to a river
OPM	Office of Prime Minister
OSH	occupational safety and health
OTI	other tertiary institutions
overpressure	overpressure (or blast overpressure or air overpressure) is the pressure caused by a shock wave over and above normal atmospheric pressure.
P	
P	wetted perimeter of a channel (m)
PACs	project-affected communities

PAGI	permanent aboveground installation
PAH	polycyclic aromatic hydrocarbon
PAR	permanent access road
PAU	Petroleum Authority of Uganda
PES	project environmental standard
Petric Plinthosol (Acric)	description of soil classification: iron rich, humus poor, kaolinitic clay, strongly cemented
PFM	public financial management
PFP	private-for-profit
pH	numeric scale used to specify the acidity or basicity of an aqueous solution: pH1 is extremely acidic, pH14 is extremely alkaline and pH7 is neutral
Planosol	description of soil classification: periodically waterlogged, coarse topsoil over dense slowly permeable clay subsoil; medium fertility
PM	particulate matter
PM_{10}	particulate matter less than 10 µm in diameter
$PM_{2.5}$	particulate matter less than 2.5 µm in diameter
PNFP	private-not-for-profit
polity	a form or process of civil government or constitution
pool	still water area, i.e., no discernible flow, usually with a water depth greater than the main channel
potamodromous	fish that undertake migrations (usually for spawning) entirely in freshwater
PPE	personal protective equipment
PPG	public and publically guaranteed
ppm	parts per million
PRS	pressure reduction station
PS	pumping station
PS6	IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
PSA	Production Sharing Agreement
PSPS	public service pension schemes
PVC	polyvinyl chloride
PY	pipe yard
Q	
Q	discharge (m^3/s)
Q_T	peak flood flow with an estimated return period of T years

R	
R	hydraulic radius (m), calculated as the ratio A/P
RAP	resettlement action plan
rapid	fast-flowing water with standing waves and white water. Loud sound
RBS	rapid botanical survey
RCP	representative concentration pathway
RDC	resident district commissioner
REA	Rural Electrification Agency
RESP-2	rural electrification strategy and plan
return period	average number of years in the long term between hydrometeorological events of a similar magnitude
Rhodic Ferralsols	description of soil classification: strongly weathered tropical soils with a red to dusky red B horizon/subsoil
Rhodic Nitisols	description of soil classification: tropical soils with an accumulation of clay in a red to dusky red B horizon/subsoil with prominent, shiny clay surfaces.
riffle	fast-flowing water with a broken surface and small standing waves but no white water. Some sound
riparian vegetation	predominantly terrestrial vegetation growing on the banks of a river but not in the river (except perhaps during times of flood)
RoW	right-of-way
RRH	regional referral hospitals
run	flowing water with a broken surface but no wavelets, white water or sound
rural roads	roads that traverse rural areas, generally unsealed and often single tracks
S	
s	second
S1085	slope of the catchment between the 10 and 85 percentiles of the main stream length (m/km) (a parameter used to calculate the mean annual flood)
S_b	channel bed slope (m/m)
SC	subcounty
S_e	energy slope in a channel (m/m). S_e approximated by the channel bed slope (S_b)
sealed road	road in Uganda that may be constructed of tarmac, bitumen or concrete
SEDAF	Sembabule Farmers Association

SFREQ	stream frequency calculated as the number of stream junctions on a 1:50,000 scale map divided by AREA (a parameter used to calculate the mean annual flood)
SGI	small group interviews
SGS	African Assay Laboratories Ltd, in Mwanza, Tanzania
SHIS	Social Health Insurance Scheme
side bar	raised area of the substrate forming a mound or hump running along the edge of the channel which may or may not be connected to the bank. The upper part may or may not be exposed above the water surface.
SIP	sector investment plans
Skeletic Leptosols	description of soil classification: soils that are <50 cm deep or consist of very stony, unconsolidated material and imperfectly weathered rock or rock fragments (>40% of the soil volume is coarse rock fragments)
SLM	sound level meter
SO_2	sulphur dioxide
soil horizon	layer of soil, usually approximately parallel to the soil surface, with distinct characteristics produced by soil-forming processes
SOP	standard operating procedure
sp and spp.	abbreviation of species, singular and plural
SSA	Sub-Saharan Africa
ST	social team
Star rating	conservation rating for a species derived from the global range of the plant species, in terms of the number of degree squares in which a species is recorded as being present in (worldwide).
STI	sexually transmitted infections
SU	standard unit
surface density	calculated as mass per unit area
T	
t/ha/a	tonnes per hectare per annum
TAGI	temporary aboveground installation
TAR	temporary access road
TB	tuberculosis
TC	Town Council
TCH	tangible cultural heritage
tCO_2e	tonnes of carbon dioxide equivalent
TDS	total dissolved solids (mg/L)
TEPU	Total E&P Uganda

TIs	tertiary institutions
TM	traditional medicine
TPH	total petroleum hydrocarbons (mg/L)
trunk roads	national or international route linking two or more regional headquarters
TSS	total suspended solids (mg/L)
turbidity	measure of relative clarity of a liquid. It is an optical characteristic of water and an expression of the amount of light that is scattered by material in the water when a light is shined through the water sample
tuyere	mechanism for controlling air flowing into an ironworking furnace
U	
UAE	United Arab Emirates
UBC	Uganda Broadcasting Corporation
UBOS	Uganda Bureau of Statistics
UCA	Uganda Census of Agriculture
UDHS	Ugandan Demographic Health Survey
UEDCL	Uganda Electricity Distribution Company Limited
UEGCL	Uganda Electricity Generation Company Limited
UETCL	Uganda Electricity Transmission Company Limited
UGX	Ugandan shilling
UK	United Kingdom
UKAS	United Kingdom Accreditation Service
UMEMD	Uganda Ministry of Energy and Mineral Development
UMWE	Uganda Ministry of Water and Environment
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNOC	Ugandan National Oil Company
UNRA	Uganda National Roads Authority
unsealed road	road in Uganda constructed from earth or gravel
urban roads	roads that pass through cities, small towns and built up areas
URC	Uganda Railways Corporation
USD	United States Dollar
USDA	United States Department of Agriculture
UWA	Uganda Wildlife Authority
UWEP	Uganda Women Entrepreneurship Programme

UXO	unexploded ordnance
V	
VAT	value added tax
VEC	valued environmental and social component
VHF	viral haemorrhagic fever
VHT	village health team
VOC	volatile organic compound or compounds
W	
W	watt
W/m^2	watt per square metre
WCS	Wildlife Conservation Society, Uganda
WGS84	World Geodetic System established in 1984. It is currently the reference system being used by global positioning systems
WGS84 TM35E_S	World Geodetic System 1984 Transverse Mercator zone 35 East-South (the EACOP project map projection)
WHO	World Health Organization
WSC NF	Water & Sewerage Corporation, nonfunctioning water supply schemes
Y	
YF	yellow fever
YLP	Youth Livelihood Programme

1 INTRODUCTION

1.1 General

This introduction to the East African Crude Oil Pipeline (EACOP) project environmental impact statement (EIS) describes the following:

- project purpose and need
- project overview:
  - EACOP System
  - EACOP Uganda
- developer contact information
- EIS overview
- EIS structure.

1.2 Purpose and Need for Project

The purpose and the need for the EACOP project is, with due consideration to the management of associated environmental and social impacts, to enable crude oil produced from the Lake Albert development area to be transported to the coast of Tanzania and exported to international markets, net of Uganda supply commitments. In addition, the construction and operation of the pipeline will:

- contribute to the economy
- provide business opportunities for different sectors of the economy
- provide approximately 3 years of employment opportunities for highly and semi-skilled workers and labourers during construction and 25 years for highly skilled workers during operational phases.

1.3 Project Overview

1.3.1 EACOP System

Total E&P, Uganda BV (TEPU), Tullow Uganda Operations Pty Ltd (TUOP) and CNOOC Uganda Limited (CUL) (“UPSTREAM PARTNERS”) hold interests in petroleum resource licences near Lake Albert.

The production licences held by the UPSTREAM PARTNERS include the following:

- Tilenga (Buliisa and Nwoya) contract area (CA-1 and northern portion of LA-2)
- the Kingfisher Development Area (KFDA) on the southeast shoreline of Lake Albert
- the Kaiso Tonya licence area (LA-2) on the central part of the east shoreline of Lake Albert.

The crude oil produced from those areas (CA-1, LA-2 and KFDA) will be stabilised at their respective central production facilities (CPFs) and transported via feeder pipelines to the Delivery Point. The Delivery Point, EACOP pumping station (PS1)

and a refinery will be in the future Kabaale Oil and Gas Industrial Park, in Hoima district.

The UPSTREAM PARTNERS, Uganda National Oil Company and the Tanzania Petroleum Development Corporation will be shareholders in a pipeline company that will develop, construct and operate a pipeline to export the Lake Albert area crude oil reserves to international markets, net of supply commitments to the planned refinery at Kabaale, Uganda. Total East Africa Midstream (TEAM) BV is the developer of the project.

Figure 1.3-1 is a map of the upstream areas, the CPFs, their respective feeder lines, and the refinery, collectively referred to as the Lake Albert Development Area.

The export pipeline, also known as the EACOP System, is defined in the Inter-Governmental Agreement signed by Government of Uganda and Government of Tanzania on 26 May 2017. The EACOP System means the petroleum export pipeline system intended to traverse from the inlet flange at the Kabaale pumping station (PS1), in Hoima district, Uganda, to an export flange at a proposed marine storage terminal (MST) at Chongoleani, Tanga district, on the East African coast of Tanzania. The system will include:

- 1443 km of insulated, electric heat-traced, buried 24-in. pipeline
- aboveground installations:
  - six pumping stations to provide the pressure for crude oil flow at the production rate of 216 kbopd
  - electric heat trace stations
  - block valves
  - two pressure reduction stations on the pipeline, and a pressure reduction system at the MST, to ensure the maximum allowable operating pressure is not exceeded upon arrival at the crude oil storage tanks
  - the MST, which includes storage tanks and load-out facility (LOF) comprising a trestle and loading
- facility access roads.

Figure 1.3-2 is a map of the EACOP System.

1.3.2 EACOP Uganda

In Uganda, the EACOP project comprises the following components:

- 296 km of insulated, electrical heat-traced, buried 24-in. pipeline
- aboveground installations:
  - two pumping stations (PS1 and PS2)
  - main line block valve stations and electric heat trace substations
- roads:
  - new and upgraded permanent access roads
  - new and upgraded construction facility access roads
- four main camps and pipe yards (MCPY1 through to MCPY4) for the construction phase.

The project description for EACOP Uganda, including maps, is included in Section 2.

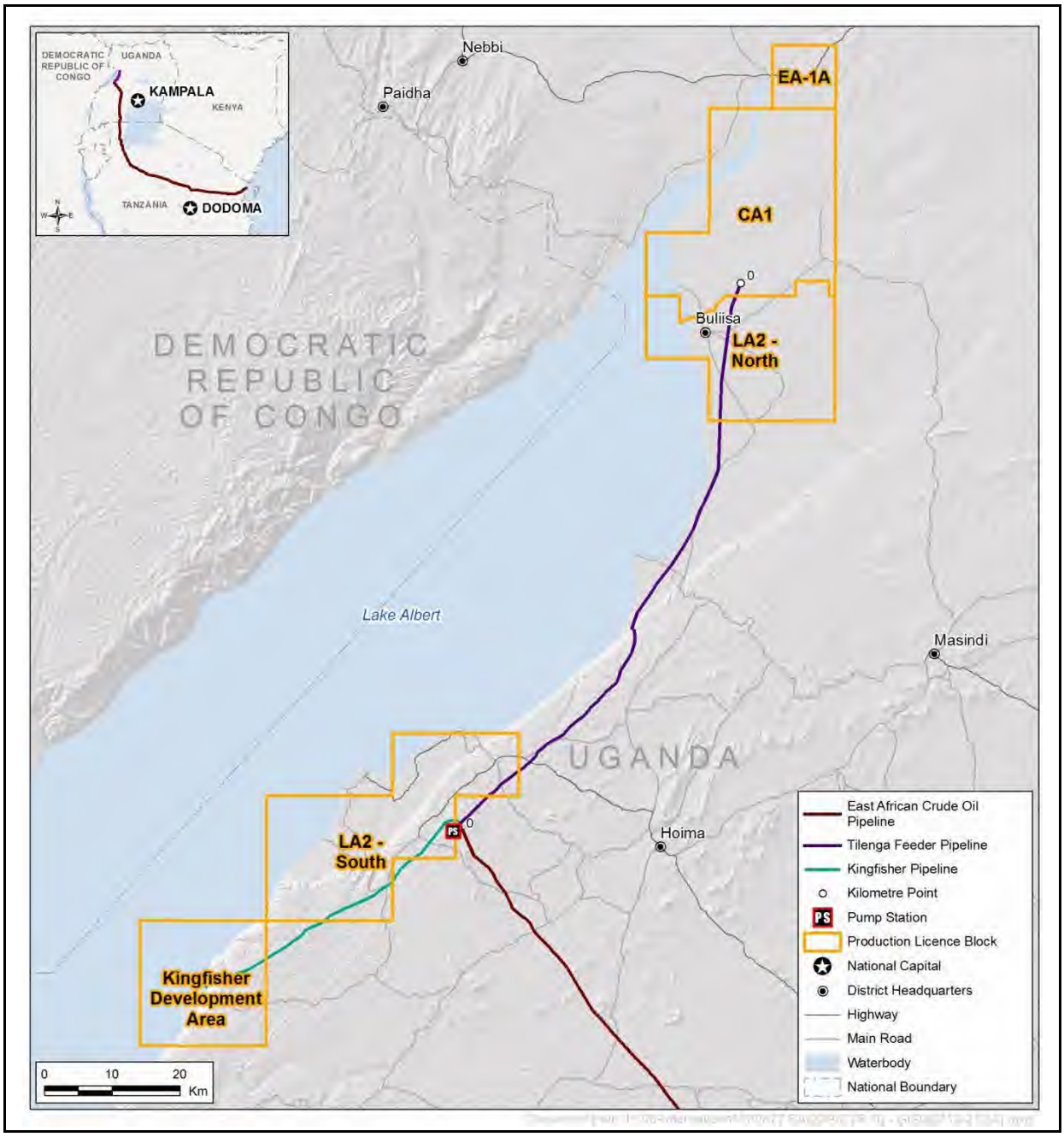


Figure 1.3-1 Lake Albert Development Area

Figure 1.3-2 EACOP System

1.3.3 Developer Contact Information

The developer of the EACOP is Total East Africa Midstream (TEAM) BV. Table 1.3-1 provides the Uganda contact information of the project developer.

Table 1.3-1 Contact Information

Name of Developer	Address	Named Key Contact	Telephone
Total East Africa Midstream BV	Course View Towers, Plot 21 Yusuf Lule Road, Kampala, Uganda	Maxime Marchenko	+256 204 916 000

1.4 Environmental Impact Statement Overview

1.4.1 Purpose

This EIS is a report of the environmental and social impact assessment conducted to identify, describe and assess the likely interactions of the EACOP project in Uganda with environmental and socio-economic receptors, termed as the “valued environmental and social components” (VECs). The phrase, environmental and social impact assessment (ESIA), will be used interchangeably for both EIS and environmental impact assessment in this report.

The objective of the ESIA is to document the:

- potential impacts of the project on the physical, biological and human environment
- identified mitigation measures, where necessary, to eliminate or reduce impacts through early recognition and incorporation to engineering, construction and operation
- significance of the impacts.

This ESIA has been prepared pursuant to:

- the National Environment Act, Cap 153, 1995
- the Environmental Impact Assessment Regulations,1998
- the Guidelines for Environmental Impact Assessment in Uganda, 1997
- the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014.[1]

[1] The Environmental Impact Assessment Guidelines for the Energy Sector (NEMA 2004) encompass all types of energy projects, including oil pipelines, whereas the 2014 guidelines refer to oil only in the context of thermal generation. Nonetheless, the 2014 guidelines include text from both the 2004 guidelines and refinements, such as additional information on scoping report and ESIA format content, and hence are considered current best practice.

The impact assessment also concords with international guidance to enable the developer to apply for international funding. International guidance includes:

- the International Finance Corporation's environmental and social performance standards
- Equator Principles
- other relevant international standards and guidelines (see Section 4).

The ESIA has been conducted in accordance with the Scoping Report and terms of reference (ToR) approved by the National Environmental Management Authority (NEMA) by way of correspondence to TEAM dated 19 September 2017. The approval contained comments and recommendations, which have been addressed in this ESIA. A concordance table has been included in Appendix K.

1.4.2 Environmental and Social Impact Assessment Team

An experienced ESIA team with extensive pipeline engineering, environmental and social impact assessment knowledge was formed to prepare this ESIA, which included Ugandan partners experienced in ESIA development in the Ugandan oil and gas sector. The interdisciplinary team comprised:

- registered independent environmental and social consultants working for Eco & Partner Consult Partnership and RSK Environment Limited
- ESIA and HSE management from TEAM
- an international engineering consultancy, Gulf Interstate Engineering (GIE).

The registered and key contributing environmental and socio-economic expert members of the ESIA team are listed in Table 1.4-1.

Table 1.4-1 Registered and Key Contributing Members of the Environmental and Social Impact Assessment Team

Name	Expertise/Qualifications	Role	Registered (Signature)/Contributing
Registered EIA Practitioners			
David Taylor	BSc (Hons) Geology; MSc (by research) Marine Geology and Geophysics	ESIA oversight and coordination/team leader	
Nicola O'Donnell	BSc (Hons) Environmental Biology with a Modern Language; MSc Environmental Science	Biodiversity lead	
Peter Baur	MSc Engineering Hydrology; BSc (Hons) Geography	Hydrology lead	
Srinivas Srimath Tirumala Gudimella	BEng Civil Engineering; MEng Environmental Engineering; PhD in Air Quality Modelling and Monitoring	Climate and air quality lead	
Eddie Luyima	MSc in Environment Management; BA in Environmental Management; Dip in Env Mgt, IEMA	In-country ESIA team leader	
Amos Mafigiri	BA in Environmental Management; Cert ISO 14001	ESIA quality control	
Diana Nakalanzi	MSc in Environmental Science – Limnology and Wetland Management, BSc in Environmental Science	Water quality specialist	
Daniel Clare	BSc (Hons) Environmental Science; IOA Diploma in Acoustics and Noise Control	Environmental acoustics lead	
Francis Lugemwa	MA Sociology (Candidate); MA Land-use Planning and Regional Development; BA in Geography; Dip in EIA; IEMA	Socio-economic and stakeholder engagement in-country lead	
Eng Daka Michael	MSc Engineering; BSc Civil Engineering	Road engineer and traffic surveyor	
David Maynard	Certificate in Practical Archaeology (credit); BA Prehistory and Archaeology	Cultural heritage lead	

Table 1.4-1 Registered and Key Contributing Members of the Environmental and Social Impact Assessment Team

Contributing Specialists		
Name	**Qualification**	**Role**
Dr Lodewijk Werre	PhD Anthropology; Executive Education for Sustainability Leadership Program	Uganda EACOP project manager
Dr Hilde Van Vlaenderen	Licentiate in the Psychological and Pedagogical Sciences; PhD Psychology	Stakeholder engagement and social lead
Tom Smith	PDip Ecology and Environmental Management; BSc (Hons) Applied Ecology	Ornithology expert
Simon Boulter	BSc (Hons) Zoology; MSc Primate Conservation	Fauna expert
Joanne Nightingale	DPhil Ecology and Conservation; BSc (Hons) Environmental Biology	Botany expert
Will Hawthorne	BA (Hons) Botany; PhD Botany	Botany expert
Steven Heathcote	Botany BA (Hons) Natural Sciences; DPhil Botany	Botany expert
Dr Peter Walker	BSc (Hons) Marine and Freshwater Biology; MRes Applied Fish Biology; PhD Fish Parasitology	Aquatic biodiversity expert
Mark Olokutum	MSc Limnology and Wetland Management; MSc Zoology; BSc Fisheries & Aquaculture	Aquatic ecologist
Dr Perpetra Akite	PhD Plant Pathology; MSc in Environment and Natural Resources; BSc Botany	Invertebrate ecologist
Erin Parham	BSc Biodiversity and Conservation; BA Geographic Information Systems	Critical habitat assessment expert
Pippa Howard	BSc Marine Biology and Environmental Sciences	Critical habitat assessment expert
John Cornell	MA Geography; BSc (Hons) Ecology & Conservation	Critical habitat assessment expert
Dr Robert Kityo	PhD in Zoology; MSc and BSc in Vertebrate Ecology	Mammal specialist
Dr James Kalema	PhD in Botany; MSc Botany; BSc Botany & Zoology	Botany specialist
Prof. Derek Pomeroy	PhD in Animal Ecology; Natural Sciences Tripos (Cambridge)	Avifauna specialist
Dr Timothy Twongo	PhD in Zoology; MSc Biology; BSc Zoology & Botany	Aquatic biology expert
Dr Mathias Behangana	PhD Environment and Natural Resources; MSc Zoology; BSc Zoology	Herpetofauna specialist
Tim Newton	BSc (Hons) Zoology; MA Environmental Impact Assessment and Management	Soils and geology lead
Julius Opio	MSc Physical Land Resources – Soil Science; BSc (Hons)	Soil expert

Table 1.4-1 Registered and Key Contributing Members of the Environmental and Social Impact Assessment Team

Contributing Specialists		
Name	**Qualification**	**Role**
Syliver Wadamba	MSc in Tropical Hydrogeology; MSc in Watershed Management; BSc (Hons), Diploma in Groundwater Exploration, Exploitation & Management	Hydrology expert
Dr Hamdi Mohamed Riad El-Ghonemy	BSc Geology; MSc Hydrogeology; PhD Hydrogeology	Hydrogeology lead
Robert Naguyo	MSc in Water Resources Surveys, Groundwater; BSc Geography/Chemistry	Hydrogeology, soils and geology
Daniel Leaver	Bachelor in Landscape Design; BSc (Hons) Zoological Science	Landscape lead
Richard Appleyard	BEng (Hons) Environmental Engineering with Resource Management	Climate, air quality and best available techniques expert
Deo Okure	MSc in Energy and Environmental Management; BSc Mechanical Engineering (Hons)	Climate and air quality
Abraham Ochola	BA in Environmental Management, Cert in Oil & Gas, Cert in GIS	Noise expert
Kate Blacklock	Master's in Education and Development	
Dr Dauda Batega	PhD in Sociology; MA (Sociology); BA in Social Sciences (Hons)	Lead sociologist
Birungi Judith	MA in Social Sector Planning (Candidate); BA in Social Sciences (Sociology and Gender Studies)	Sociologist
Opesen Chris Columbus	PhD (Candidate) Social Anthropology; MSc in Development Management; BA in Social Sciences	Sociologist
Glorius Kasande	MA in Rural Development; BA in Social Sciences (Sociology and Gender Studies)	Gender issues specialist
Dr Mark Divall	Bachelor of Medicine and Bachelor of Surgery; postgraduate diplomas in Anaesthesia, Occupational Medicine and Health, Tropical Medicine and Health, Health Impact Assessment	Health lead
Izak Olivier	Bachelor of Medicine and Bachelor of Surgery; Advanced University Diploma in Occupational Health	Health expert
Dr Alex Mukasa	MSc in Livestock Development Planning and Management, Veterinary Medicine	Livestock specialist
Ian Wickett	HNC Civil Engineering	Traffic lead
Gerry Wait	MA Anthropology and Archaeology; DPhil European Prehistory, Registered Consultant (Heritage) for UNESCO	Intangible cultural heritage lead

Table 1.4-1 Registered and Key Contributing Members of the Environmental and Social Impact Assessment Team

Contributing Specialists		
Name	**Qualification**	**Role**
Sarah Musalizi	MSc Palaeontology for Lacustrine; Postgraduate Diploma in Museum and Heritage Studies; BA Tourism and Geography	Lead archaeologist

1.5 Environmental Impact Statement Structure

The EIS comprises 11 sections and 12 appendices (A–M), as outlined in Table 1.5-1.

Table 1.5-1 Environmental Impact Statement Structure

Section	Description of Section
Executive Summary	Summary of the key findings of the ESIA
Table of Contents	Table of contents
Glossary	Definition of terms, acronyms and abbreviations used

Section 1
Introduction
	Introduction to the ESIA report, including:
	• project purpose
	• project overview
	• EIS overview
	  o purpose
	  o team and list of authors and contributors to the ESIA
	• ESIA structure

Section 2 Project Background and Description	Description of: • project components and associated facilities including functions, locations and layouts • pre-construction, construction, commissioning, operation and decommissioning activities
Section 3 Alternatives	Review of the alternatives considered during the design of the project
Section 4 Legislative, Policy and Administrative Framework	Overview of the project applicable legal, policy and administrative frameworks
Section 5 ESIA Process and Methodology	Description of the ESIA process and methodology for identifying and assessing and determining the significance of potential impacts
Section 6 Environmental and Social Baseline Conditions	Description of the baseline conditions in the project area of influence (AOI), including existing (pre-project) trends in the condition of VECs. This section will be based on the data collected during the scoping and the ESIA stages.

Table 1.5-1 Environmental Impact Statement Structure

Section	Description of Section
Section 7 Stakeholder Engagement	Description of the stakeholder engagement process
Section 8 Potential Impact Identification and Evaluation – Normal Construction and Operations	Identification and assessment of predicted potential impacts during normal construction, commissioning, operation and decommissioning activities
Section 9 Potential Impact Identification and Evaluation – Abnormal Operations and Unplanned Events	Identification and assessment of predicted potential impacts that may occur in the event of abnormal operation or unplanned events (e.g., fire or breakage of the pipeline)
Section 10 Environmental and Social Management Plan	A consolidation description of the management plans developed to prevent or reduce potential impacts, and proposed monitoring
Section 11 Summary and Recommendations	Summary of the key ESIA findings and recommendations of the ESIA
Section 12 References	A list of the published and unpublished reports and other sources of data consulted
Appendices	
Appendix A Baseline Reports	Compilation of the baseline field survey reports
Appendix B Company Certificate of Registration	A company registration certificate registered in Uganda
Appendix C Stakeholder Engagement	• List of the projects' stakeholders identified during the ESIA process • Summary of stakeholder concerns • Records of stakeholder engagement
Appendix D Magnitude and Sensitivity Ranking Tables	Tables defining the VEC-specific criteria for assigning magnitude and sensitivity rankings
Appendix E Impact Assessment Tables	Registers of all expected impacts and mitigation measures • E1: Aspects and Activities Register • E2: Generic Impacts Register • E3: Location-specific Impacts Register • E4: Commitments Register • E5: Content Tables of Management Plans
Appendix F Project Environmental Standards	Project environmental standards proposed for air, water, noise and soil

Table 1.5-1 Environmental Impact Statement Structure

Section	Description of Section
Appendix G Impacts Assessments	Modelling and data analysis carried out in support of the impact assessments: • Erosion Risk Assessment • Acoustic Impact Assessment • Greenhouse Gas Emissions Calculations
Appendix H Cumulative Impact Assessment Supporting Information	• Sources of Cumulative Impact • Location of Screened-in Developments • Cumulative Impacts Matrix • Screened-out Sources of Cumulative Impacts
Appendix I Oil Spill Modelling	An assessment of the environmental risk posed by an oil spill and modelling of oil spill dispersion
Appendix J Environmental and Social Management Plan and Monitoring Parameters	Environmental and social management plan and monitoring parameters for the construction and operational phases of the project
Appendix K Resettlement Policy Strategy	A strategy for the land acquisition and resettlement process
Appendix L Concordance Table	Table showing how NEMA comments made on the scoping report have been addressed in the ESIA
Appendix M Acknowledgements	Acknowledgements of contributions made to producing the ESIA
Appendix N Project Chemicals	Chemicals to be used during the project

2 PROJECT BACKGROUND AND DESCRIPTION

2.1 Introduction

2.1.1 Project Description Contents

This section describes the components of the EACOP System in Uganda for the export of crude oil (Figure 2.1-1) and includes information on the:

- project design:
  - project design overview
  - typical pipeline section
  - international standards
  - pre-front-end engineering and design (FEED) and FEED studies
- project components:
  - pipeline
  - aboveground installations (AGI) including pumping stations (PS), electric substations and mainline block valves (MLBV)
  - construction facilities
  - access roads
  - land requirements
- project activities:
  - feasibility studies
  - construction
  - soil management, erosion control and reinstatement
  - pre-commissioning, commissioning and start-up
  - operations
  - decommissioning
- associated[1] facilities
- schedule.

This project description, including FEED and subsequent design optimisation information, has been used in the development of an environmental and social impact assessment (ESIA) of the EACOP System in Uganda. An information cut-off date of 15 March 2018 was implemented. It is recognised that some design refinements may be made during the detailed engineering influenced by site-specific conditions.

If design changes are made and the effects of these changes require assessment by NEMA then an ESIA addendum will be submitted to NEMA.

[1] Associated facilities are those facilities that are not funded as part of the project (funding may be provided separately by the client or third parties including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project (IFC Performance Standard 1, Social and Environmental Assessment and Management Systems)

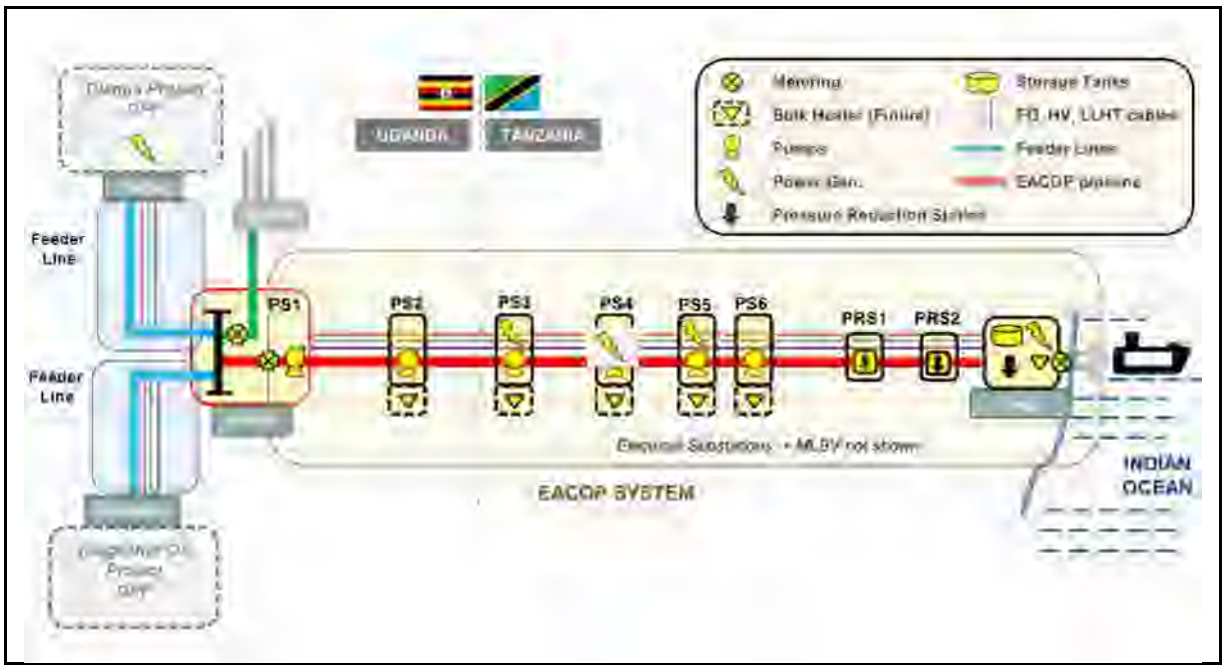


Figure 2.1-1 EACOP System Components[2]

2.2 Project Design

2.2.1 Project Design Overview

The characteristics of Albertine Graben oil, particularly the pour point and wax appearance temperature require a fit-for-purpose pipeline, storage and loading project design. Table 2.2.1 includes some of the key design basis parameters.

Table 2.2.1 Project Design Basis

Parameter	Value
Design flow rate	216,000 barrels per day
Pipeline diameter	24 in. nominal
Pipeline minimum operating temperature	50°C

The pipeline will be buried, thermally insulated with polyurethane foam (PUF) and electrical heat tracing (EHT) will be installed for the entire pipeline length.

The EACOP System consists of a 1443-km long, carbon steel pipeline of 24-in. outside diameter, designed to American Society of Mechanical Engineers standards with design pressures varying between 9.46 MPa, 14.97 MPa and 16.7 MPa. The pipeline system will cross Uganda and Tanzania, with 296 km in Uganda (see Figure 2.3-1).

[2] Central Processing Facility (CPF), Pumping Station (PS), Pressure Reduction Station (PRS), Main Line Block Valve (MLBV), Fibre Optic Cable (FO), High Voltage Cable (HV) and Long Line Heat Tracing (LLHT) thermal Insulation with polyurethane foam (PUF)

A key design element is to maintain the crude oil above its pour point and, as much as possible, above its wax appearance temperature. The project components responsible for this task are:

- EHT
- pumping station bulk heaters (potentially used later in the project life).

During pipeline commissioning, the EHT will continuously heat the crude oil to maintain an internal pipeline temperature above 50°C. At plateau production, pipeline insulation will maintain crude temperature above 50°C without any additional heat supply. As production begins to decline, the transit time of the oil through the pipeline will increase and thus the crude oil will have more time to cool. Then, crude oil temperature will be maintained above 50°C using EHT and, potentially later in the project life, bulk heaters.

Figure 2.2-1 provides an overview of the thermal, hydraulic and power design principles.

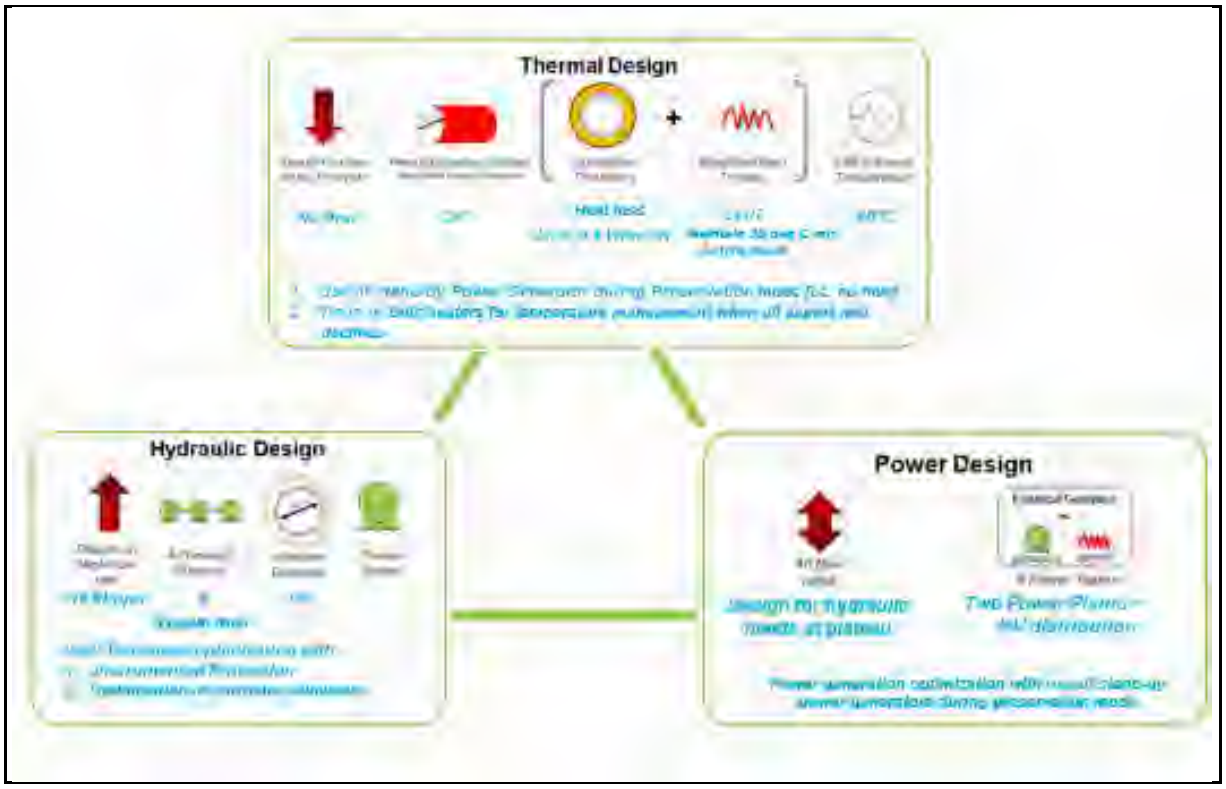


Figure 2.2-1 Design Principle Overview

NOTES: EHT – electric heat tracing, HV – high voltage, CA – corrosion allowance, Uv – ultraviolet

The base case operating philosophy for the pumping stations (PS) 1 and 2 is that they will not be manned. Due to the distance between AGIs, a design principle is that operations can be managed remotely from either of the two control rooms (CR) located at the entrance and exit of the pipeline.

2.2.2 International Standards

The pipeline technical design has been primarily based on the following industry standards:

- ASME B31.4 – 2016 “Pipeline Transportation Systems for Liquids and Slurries”
- ASMEB31.3 – Gas Transmission and Distribution Piping Systems (US/International Standard).

2.2.3 Pre-Front-End Engineering and Design, and Front-End Engineering and Design Studies

The completed early stage studies (feasibility and concept) and pre-FEED study scope of work included:

- a study to identify several potential corridors for a pipeline that would terminate at a port on the Indian Ocean where tankers could be loaded
- a high-level evaluation and identification of 11 potential 50 km-wide corridors
- further evaluation resulting in a reduction from 11 to 3 corridors
- several helicopter flight trips (2016) to support selection of the final route and reduce the 50-km-wide corridor to a 10-km-wide corridor
- an initial ground truthing site visit (2016) to identify a 2-km-wide corridor that would be suitable for a light detection and ranging (LIDAR) survey and collection of aerial imagery
- assessment of oil export technology including flow assurance and thermal management.

Section 3, Alternatives, describes the pipeline route selection and optimisation process, AGI siting, fixed facility technologies and construction technologies.

FEED was undertaken during 2017 with input from disciplines including environment, social, health and safety, and engineering specialists. It consisted of:

- project optimisation with upstream project facilities in Uganda
- refinement of the pipeline route
- refinement of AGI locations and concepts
- civil works design
- development of a project logistics philosophy plan.

FEED optimisation was undertaken for:

- centralised power generation to be provided by the Tilenga Project CPF for PS1 and 2, resulting in no additional equipment for power generation required for the Uganda section of the EACOP pipeline[3]
- the number and layout of AGIs including PSs, electric substations and main line block valves (MLBV).

[3] Details for power generation architecture for the Lake Albert development are provided for in the Tilenga Project ESIA.

2.3 Project Components

2.3.1 Pipeline

Route identification began in 2012 with participation of the Government of Uganda. The final route was selected in 2016 with participation of the Governments of Uganda and Tanzania. The routing included technical, environmental, social and security considerations. The initial technical considerations used to evaluate the constructability of the route were:

- pipeline hydraulics (topography, friction related to oil flow and pipe size)
- remoteness from infrastructure
- topography
- road and watercourse crossings
- flooding and landslide hazards
- seismic activity
- shallowness of bedrock
- geohazards.

The initial environmental and social considerations used to evaluate the proposed route were:

- cultural
- environmental
- populations
- security
- tourism
- infrastructure
- crossings
- land use (such as urban centres, protected areas and intensive agriculture)

The initial security considerations used to evaluate the proposed route were:

- potential risk associated with criminality, including organised crime, and separatist groups and radical groups operating in eastern Africa
- risks for host communities.

The EACOP project considered alternative routes from the Kabaale area, Uganda, to potential deep-water ports on the East African coast for year-long uninterrupted loading operations to the large ‘Suezmax’ tankers that are essential for the EACOP operability. Multiple port and loading locations were screened with a few identified as providing the necessary characteristics (water depth and favourable weather conditions) and resulting in the potential 50-km-wide pipeline corridors evaluated (see Section 3.5 Alternatives). Secondary information, including remote sensing, was used to assess potential corridors from Uganda through Kenya and Tanzania. Using a geographical information system (GIS), quantitative and qualitative considerations were identified and weighted.

The Government of Uganda selected the Kabaale Uganda to Tanga Tanzania pipeline corridor option (see Figure 2.3-1). A description of the route selection

process is provided in Section 3.5, Alternatives. The portion of EACOP that is in Uganda is shown on Figure 2.3-1.

PS1
Hoima
Kiboga
Mubende
Kyegegwa
Lira
Masindi
Kakumiro
Kyenjojo
Kibaale
Kamwenge
Kyenjojo
Kabwoya
Buhimba
Kyangwali
Kiryandongo
Lwampanga
Nwoya
Pakwach
Arua
Moyo
Adjumani
Gulu
Amuru
Nebbi
Koboko
Yumbe
Zombo
Arua
Kitgum
Pader
Oyam
Apac
Lira
Dokolo
Amolatar
Kole
Alebtong
Otuke
Lamwo
Agago
Kaabong
Abim
Kotido
Nakapiripirit
Amudat
Moroto
Napak
Nakapiripirit
Pallisa
Kumi
Bukedea
Soroti
Katakwi
Amuria
Kaberamaido
Serere
Kapchorwa
Bukwo
Kween
Kapchorwa
Bulambuli
Sironko
Mbale
Manafwa
Tororo
Busia
Bugiri
Namutumba
Iganga
Mayuge
Jinja
Kamuli
Buyende
Kaliro
Namutumba
Luuka
Kamuli
Mukono
Kayunga
Buikwe
Jinja
Mayuge
Kamuli
Buyende
Kaliro
Luuka
Iganga
Bugiri
Busia
Tororo
Mbale
Sironko
Manafwa
Bulambuli
Kween
Bukwo
Kapchorwa
Amuria
Katakwi
Soroti
Kaberamaido
Serere
Pallisa
Kumi
Bukedea
Nakapiripirit
Amudat
Moroto
Napak
Nakapiripirit
Abim
Kotido
Kaabong
Agago
Otuke
Alebtong
Lamwo
Kole
Amolatar
Dokolo
Apac
Lira
Oyam
Kitgum
Pader
Arua
Koboko
Yumbe
Zombo
Nebbi
Pakwach
Nwoya
Amuru
Gulu
Adjumani
Moyo
Arua
Lira
Masindi
Kakumiro
Kyenjojo
Kibaale
Kamwenge
Kyenjojo
Kabwoya
Buhimba
Kyangwali
Kiryandongo
Lwampanga
Kyegegwa
Mubende
Kyegegwa
Kiboga
Hoima
PS2
Kampala
Entebbe

(RoW) also traverses gently undulating grass and farmland, hills with open plateaus, open grassland, wetlands in Gomba and Sembabule districts and a relatively flat landscape toward Mutukula near the border with Tanzania.

In Hoima district, the corridor passes between the Wambabya and Bugoma Forest Reserves (FR), and traverses through a modified section of Taala FR in Kyankwanzi district, and crosses near the eastern border of Kasana–Kasambya FR in Mubende district. There are watercourse crossings including the Kafu River between Hoima and Kakumiro districts, Nabakazi River between Mubende and Gomba districts, Katonga River between Gomba and Sembabule districts, and Kibale and Jemakunya Rivers in Kyotera district.

On the approach to the Tanzania border, and the northwestern corner of Lake Victoria, for approximately 90 km the corridor crosses a substantial zone of wetlands in a high average rainfall zone. This section is also characterised by almost unbroken crop land (a substantial proportion of which is under rice cultivation), cattle grazing land and settlement. The main RoW alignment broadly follows a ridgeline that defines a watershed for the many watercourses and wetlands of the Victoria basin. The corridor nearly clips an abandoned airfield in Kyotera district and the former Sango Bay refugee camp close to the Tanzania border. The corridor avoids the large local settlement of Mutukula at the border as it progresses into Tanzania.

2.3.2 Typical EACOP Section

For precautionary purposes, the pipeline is specified with a fusion-bonded epoxy anticorrosion coating applied to protect the pipe over the course of its operational life against external corrosion. This fusion-bonded epoxy coating will act as a second barrier in case of water ingress below the bonded thermal insulation system. To provide additional corrosion control, cathodic protection measures may be implemented.

As described in Section 2.2.1, temperatures will be maintained by a combination of PUF insulation and an EHT system. Bulk heaters may be installed later in field life to manage the temperature losses in the pipeline. The EHT system consists of three heat tracing electric cables inserted through three dedicated aluminium channels within the typically 70–80-mm thick PUF insulating material which is protected by a high-density polyethylene extruded covering. The EHT system and bulk heaters will only need to operate for flow conditions lower than the design capacity and, as required, start-up, during maintenance or when there may be no flow.

The EHT system will receive power from three high-voltage electrical power cables buried in a dedicated trench, parallel to the pipeline trench. Power will be supplied from the Tilenga Project CPF. Electric substations will be installed at 50–60 km intervals along the route to transform electricity from the high-voltage power cable to the voltage required by the EHT system. The electric generation and distribution system is described in Section 2.3.3.3.

A main fibre-optic cable will be laid in the same trench above the pipeline over the full distance (see Figure 2.3-2). This cable is designed for communications and transmitting control data between AGIs. The fibre-optic cable will also be used for

pipeline leak detection and, as an option, intrusion detection. In areas prone to faulting or risks of landslides, a second fibre optic-cable cable will be installed for strain detection.

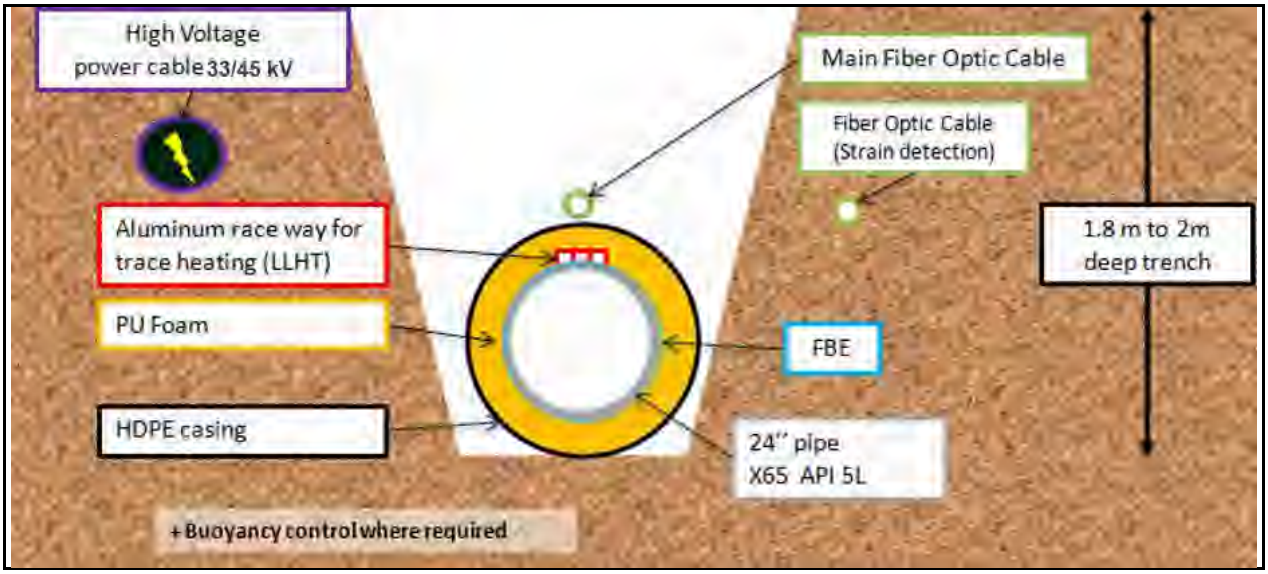


Figure 2.3-2 Typical EACOP Pipeline Cross-Section

NOTES: Material X65 as per API5L (65000 PSI specified minimum yield strength); EHT – electric heat tracing

2.3.3 Aboveground Installations

2.3.3.1 Introduction

Table 2.3.1 lists the AGI components of the EACOP System in Uganda.

Table 2.3.1 Components of the EACOP System in Uganda

Component	Aspect
PSs	PS1 – KP0 (Kabaale Industrial Park) PS2 – KP186
MLBV stations	15 in the operational RoW
Stand-alone electric substations	1 in the operational RoW
Electric substation combined with a MLBV station	4 in the operational RoW
Electric substation combined with PS	2 at PS1 and PS2
New or upgraded permanent access roads to PSs	6.8 km
New or upgraded construction facility access roads	2.4 km new access roads 5.9 km of upgrades to existing roads
Main camps and pipe yards (MCPY)	MCPY1 – kilometre point (KP) 39.3 MCPY2 – KP124.6 MCPY3 – KP191.2 MCPY4 – KP282

2.3.3.2 Pumping Stations

Function

The function of a PS is:

- pressurisation for the transport of crude oil through the pipeline
- crude oil temperature management (power supply for EHT and for bulk heaters).

Power required to operate PS1 and 2 will be supplied by the Tilenga Project CPF which includes an integrated power and heat generation system. The impacts associated with the power generation package at Tilenga Project CPF are the subject of a separate ESIA (refer to Section 2.5 Associated Facilities).

Locations and Size

PS locations are determined by pipeline hydraulics, taking into account factors such as pipe size, topography, frictional losses related to oil flow and location of other pumps in the system. The selection of PS locations also considered proximity to roads, power lines, land use and environmental characteristics.

Based on these criteria the final locations of the EACOP project PSs were selected; see Table 2.3.1 and Figure 2.3-1. Figure 2.3-3 depicts a typical PS layout without power generation.

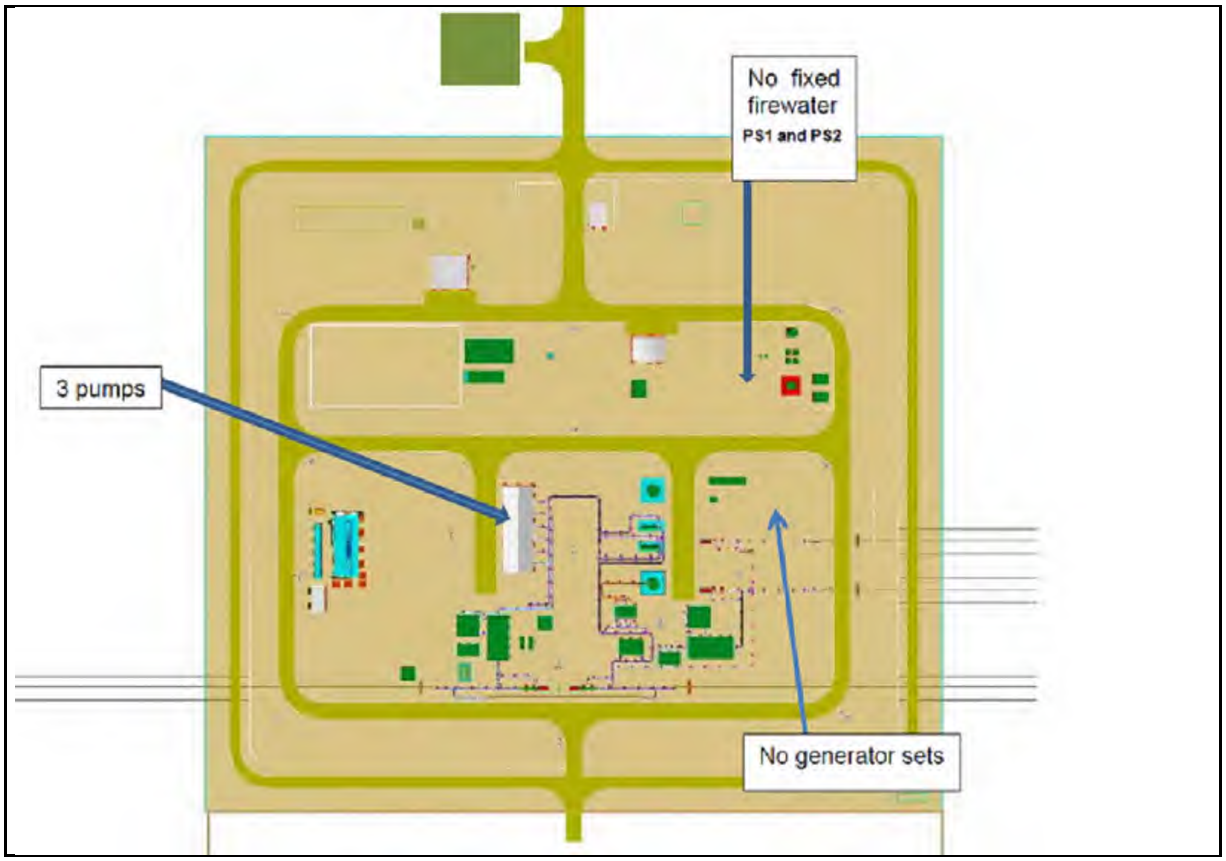


Figure 2.3-3 Typical Pumping Station

PS1 will require an area of 277 × 320 m while PS2 requires an area of approximately 277 × 277 m. During FEED, the footprint of the PS1 and 2 were optimised with the removal of power generation and one pump from each facility. For the construction phase, a temporary worksite will be established that accommodates a storage area, workshops and construction workforce camp.

Security facilities and an emergency evacuation area will be established outside the PS fence.

The emergency pipeline repair system (EPRS) described in Section 2.4.5.6 may be at one of the PSs, most likely at PS1 or close to existing industrial activities near the EACOP route (the exact location of the EPRS centres will be defined in a later phase).

Layouts and Components

The design basis for the PSs is as follows:

- pumping:
  - the PSs will be self-contained and independent of any locally supplied electricity, water, and waste or sanitary treatment (with the Tilenga Project CPF acting as the power generation centre and distributing the required power to PS1 and 2)
  - each PS will have three electrically powered pumps, based on the 216,000 barrels a day flow rate
- power generation:
  - PS1 and 2 power requirements will be serviced, as mentioned above, entirely by the Tilenga Project CPF, but with an emergency diesel generator supporting activities during commissioning, start up and for emergency and planned shutdown activities
- temperature management:
  - the EHT will provide heating during reduced flow rates, shutdowns or when maintenance is required
  - when the upstream production declines, the Tilenga Project CPF will continue to provide power to the PS1 and 2. However, an option will be retained to install a crude oil bulk heating system at each PS to provide intermediate heating of the crude oil and to reduce the use of the EHT for operating cost efficiency. Space and tie-in points for future bulk heaters will be provided at both PSs.
- other facilities:
  - fire protection pumps and fire-water storage tanks will be sized according to applicable national and international codes and standards.
  - all PSs will include operator facilities and an office building
  - diesel storage will be provided for the emergency generator
  - at PS2, a surge relief skid will be included for over pressure from closed valves at PS1. The surge relief will be directed to a surge relief tank.

- pig[4] launchers and receivers will be installed at the inlet and outlet. Collected wax will be reinjected into the pipeline facility (see Section 2.4.5.1).
- one communication tower (approximately 100 m high will be subject to optimisation during detailed design).

The PSs will be fenced.

2.3.3.3 Electric Substations

Function

The electric substation houses transformers and switchgears for power transmission through a high-voltage cable and step-down transformers to provide the required voltage for the EHT system.

The high voltage cable is installed underground next to the pipeline.

Figure 2.3-4 depicts the power generation and EHT supply architecture.

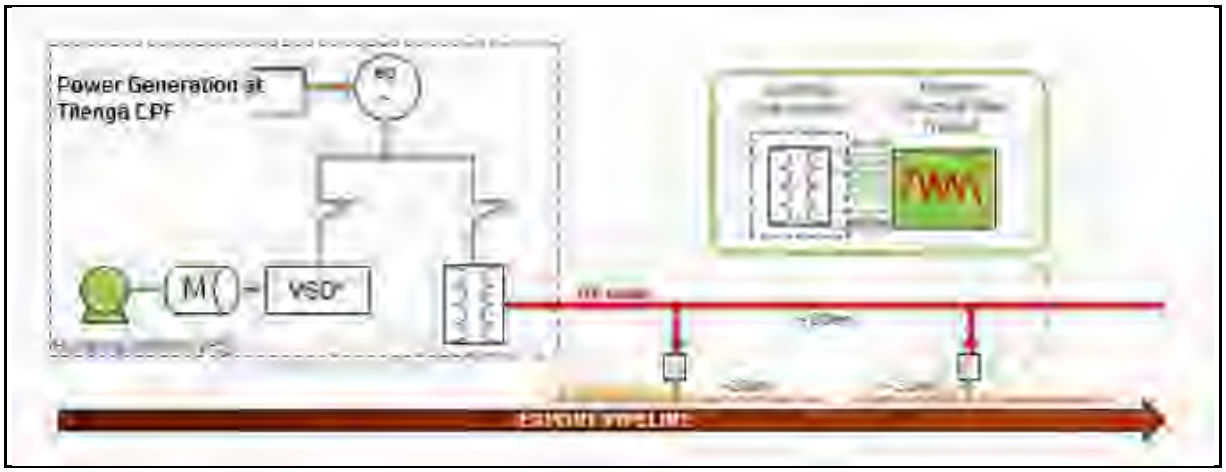


Figure 2.3-4 Power Generation Architecture

NOTES: M – motor; VSD – variable speed drive; EG – electrical-driven generator

Locations and Size

Figure 2.3-5 depicts the electrical distribution system for the entire EACOP System, with power provided in the EACOP System in Uganda by the Tilenga Project CPF, at a distance 50–60 km between electric substations.

There will be seven electric substations associated with the Uganda EACOP project (Figure 2.3-1). All but one will be co-located with other AGIs. The independent substation (ST-31) will occupy an area of 24 × 18 m. The four electric substations combined with MLBV stations have a footprint of 24 × 28 m. The other two electric substations are included in the footprints for PS1 and 2.

[4] Pipeline intelligence gauging system (pigs) for integrity testing and maintenance introduced into the line via a pig trap, which includes a launcher and receiver. Without interrupting flow, the pig is then forced through or towed by another device or cable. Pigs sweep the pipeline by scraping the sides of the pipeline and pushing debris ahead of the pig to the pig receiver where the debris and the pig are recovered without interrupting the flow. Smart pigging for pipeline Integrity purposes will be conducted periodically.

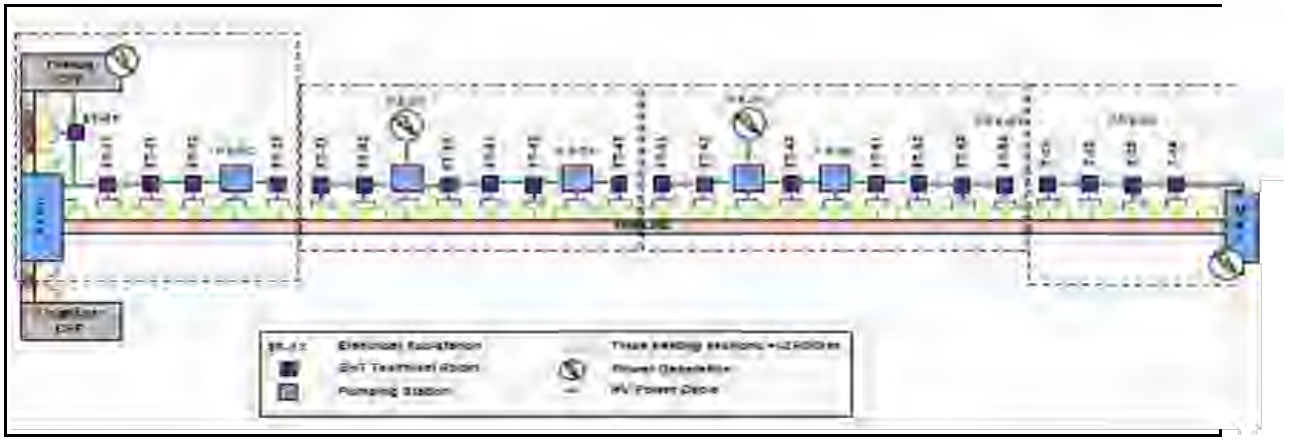


Figure 2.3-5 Electrical Distribution System

Layout and Components

The layout of the electric substations, depicted in Figure 2.3-6 consist of:

- a building that houses the electrical and instrument technical rooms with associated heating, ventilation and air conditioning
- a voltage-regulating transformer that reduces the voltage provided by the high-voltage cable to the voltage required to power the EHT
- transformers that power the EHT
- a fibre-optic system for intrusion and leak detection.

Each substation will be fenced. A workstation desk will be available for personnel during maintenance visits.

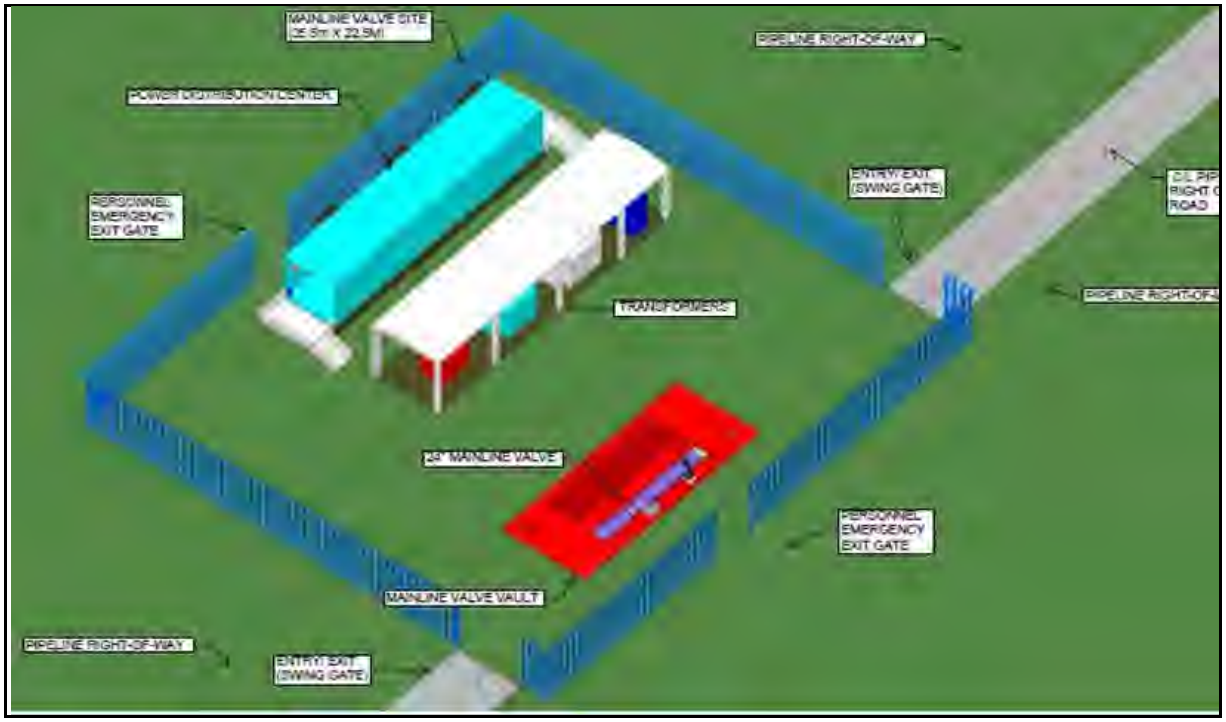


Figure 2.3-6 Typical Electric Substation with Main Line Block Valve

2.3.3.4 Block Valves

Function

MLBV stations will be installed with the pipeline to prevent oil from flowing into a damaged pipeline section and to isolate the damaged pipeline section. In addition to the MLBVs, the pipeline design includes a fibre-optic-cable leak detection system for the entire pipeline.

Locations and Size

The number and locations of MLBVs was determined by environmental considerations and access for repair and regular maintenance. The environmental considerations were based on crossing points of critical areas such as major rivers, roads crossings and active geological fault zones. MLBVs are installed:

- at each PS
- along continuously ascending or descending elevation profiles
- on each side of wetlands
- at each watercourse that is more than 30 m wide, and at each watercourse that is less than 30 m wide if it meets one or more of the following criteria, having direct or downstream flow to:
  - a populated area
  - a reservoir holding water intended for human consumption
  - a navigable waterway
  - an environmentally sensitive area.

Fifteen MLBVs will be within the permanent RoW, four of which will be combined with electric substations.

Layout and Components

The pipeline enters the MLBVs, as depicted in Figure 2.3-7, where the block valve is installed inside an underground reinforced concrete vault or directly buried and supported by a slab in a pit. A leak detection system and emergency flow restriction device reduces the probability and quantity of spills. Emergency flow restriction devices are either check or ball valves that are activated remotely from the CR (see Section 2.4.5.2).

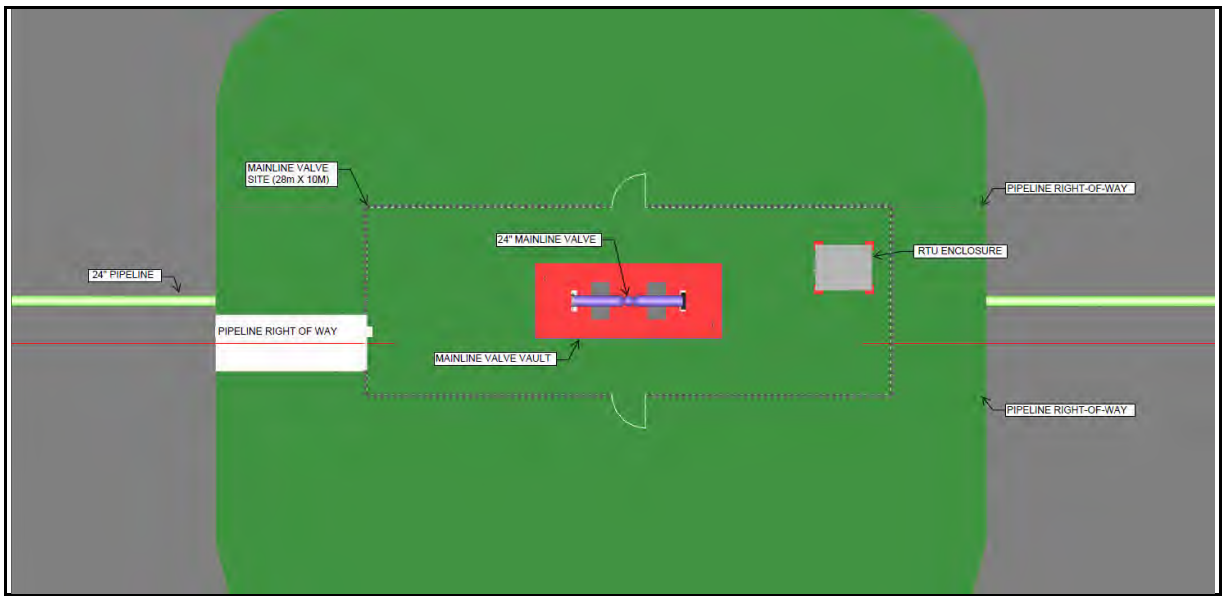


Figure 2.3-7 Typical Main Line Block Valve

A series of photovoltaic solar panel arrays, depicted in Figure 2.3-8, and batteries with six days autonomy, will provide the low power supply required at the MLBV, with a 1.1 kV total power consumption estimated (ICSS, telecom and electro-hydraulic actuated valves).

Leak detection is part of the operational monitoring system described in Section 2.4.5.6. Each MLBV will be fitted with a remote terminal unit controller for block valve protection. All MLBV station process and safety signals will be directly connected to the remote terminal unit via telecommunication system. Synchronisation of these terminal units is required for accurate leak detection and location. The remote terminal unit is within the MLBV footprint (see Figure 2.3-7) and is in direct communication with the CR. In the event of abnormal pipeline operation, block valves can be closed from the CR.

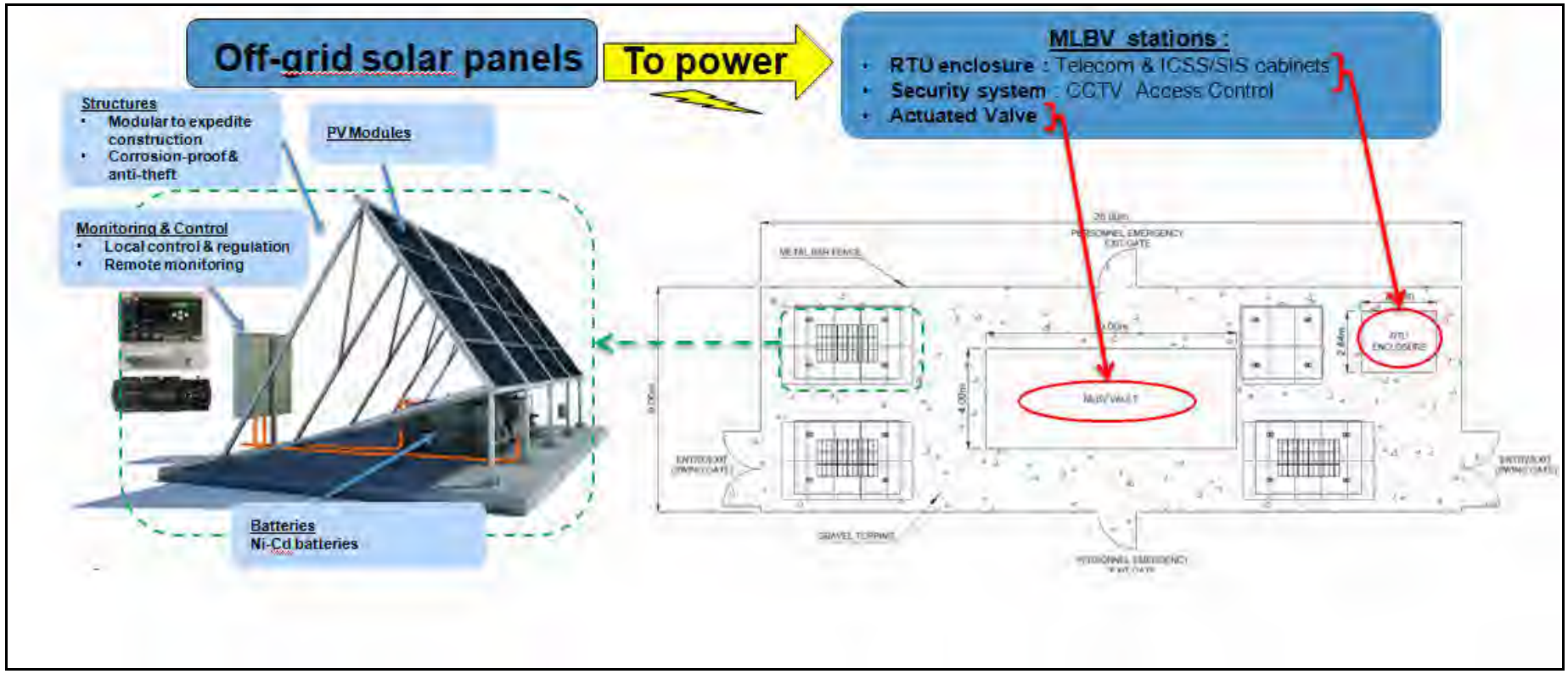


Figure 2.3-8 Typical Solar Panel Array at Main Line Block Valve Stations

2.3.4 Construction Facilities

Facilities will be required to support pipeline construction and will include MCPYs (Figure 2.3-9).

Figure 2.3-9 Construction Facility Locations

2.3.4.1 Camps

Function

Four MCPYs will be established along the pipeline corridor to accommodate workers and store line pipe before distribution along the RoW.

The camps have been designed to accommodate 800–1000 people. Among the criteria for identifying camp locations was the requirement to minimise the daily commute from the camp to the work site. Depending on where the work will be conducted, it may be possible for local workers to commute from their homes. The construction of these campsites will require a temporary workforce, which will be accommodated where possible using local infrastructure and, where infrastructure is not available, small fly camps at the MCPYs and AGIs. (The scale and duration of fly camps is such that the impacts are not substantive enough to require assessment. However, the same level of mitigation will be applied to the operations of these camps as the rest of the project.)

Locations and Size

MCPY locations are based on site selection criteria (see Section 3.6.4) that include being sited within approximately 50 km of the most remote work site, minimising the land required and distance from existing road networks, and avoiding populated and protected areas. MCPY locations are provided in Table 2.3.2.

Table 2.3.2 Main Camp and Pipe Yard Locations

MCPY	KP
MCPY1	39.3
MCPY2	124.6
MCPY3	191.2
MCPY4	283

A footprint of approximately 350 × 500 m will be required for each MCPY. The camp section of an MCPY will be approximately 350 × 220 m and the pipe yard 350 × 280 m. All MCPYs are on agricultural land.

Camp Layout and Components

The shape and extent of the camp footprint will vary with consideration of local, environmental, social and cultural features, and will contain the following components:

- accommodation and sanitary facilities
- recreation facilities
- a kitchen and canteen
- offices
- workshops
- a first aid post
- water supply and treatment

- a sewage treatment system
- waste storage and processing
- power generators
- fuel storage
- an emergency evacuation area.

MCPYs will have a non-electrical wire perimeter fence with entrance control gates and a security post. A typical MCPY layout is depicted in Figure 2.3-10.

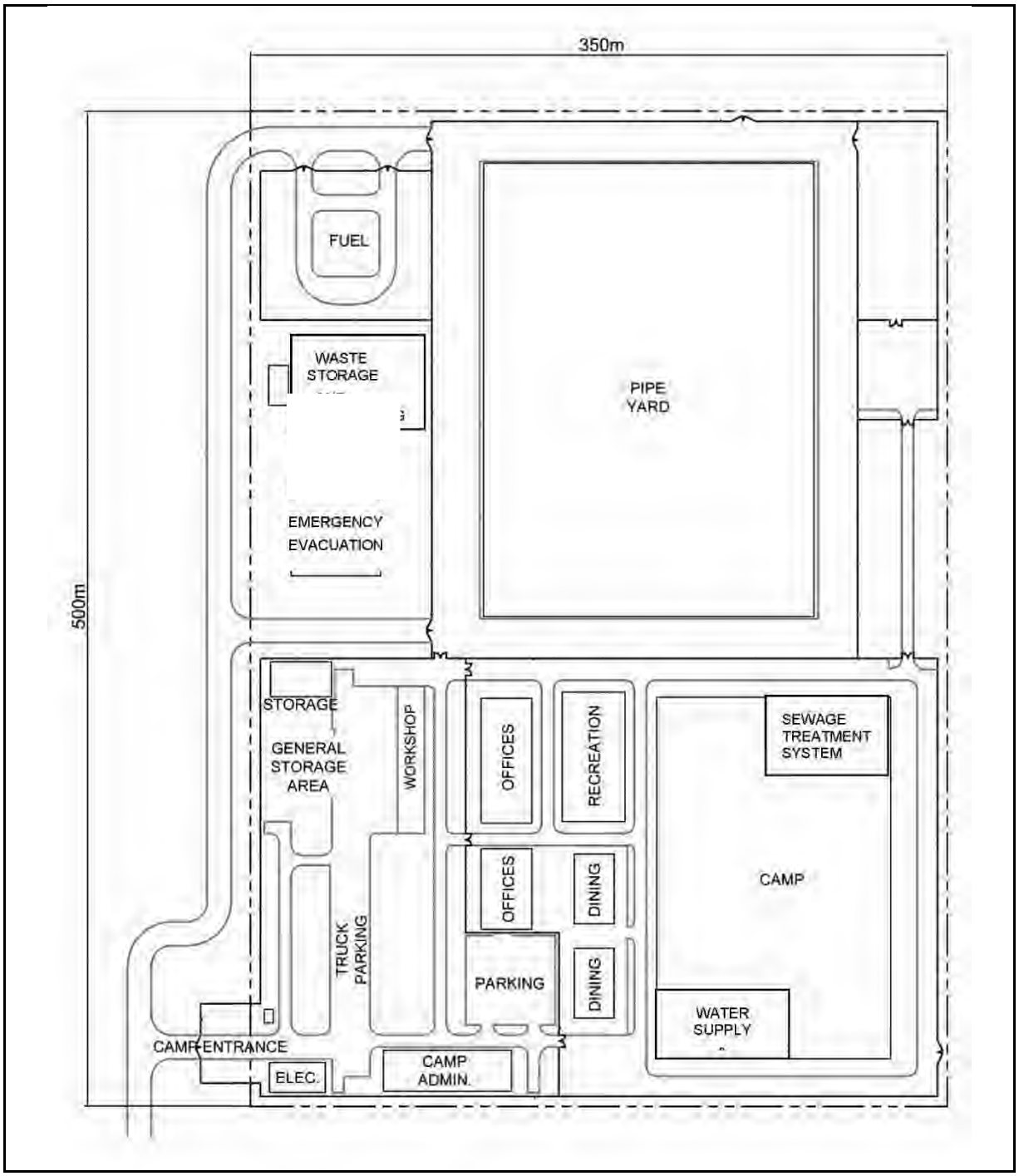


Figure 2.3-10 Typical Main Camp and Pipe Yard

2.3.4.2 Pipe Yards

Pipe yards can store up to 7000 sections of 18-m-long coated pipe. Pipe yards, depending on their locations can store pipe for direct transport to the RoW. MCPY1 and 2 are marshalling yards for both the distribution of line pipe to the RoW and other MCPYs, thus optimising transportation requirements.

Other material and equipment will be stored in the pipe yard storage areas before being dispatched to the RoW, including high-voltage, EHT and fibre-optic cable drums, MLBVs, and electrical and instrumentation shelters. Coated pipe will be transported to the marshalling yards and MCPY by truck from the coating facility in Tanzania.

2.3.5 Access Roads

Two types of access roads will be constructed by the project:

- permanent new and upgraded existing access roads to PS1 and PS2
- new and upgraded existing access roads to construction facilities.

The location of the facility dictates the route selection for each type of road. The selection process aimed to optimise the use of existing roads that could be upgraded to meet project requirements, taking into consideration affected communities. For example, the main access road to a pipe yard will avoid, as far as practical, passing through a community. The length of access roads required for AGIs and construction facilities is provided in Table 2.3.3.

Table 2.3.3 Access Roads and Approximate Lengths

Facility Type	New Access Road (m)	Existing Road Upgrade (m)
Permanent Facilities (AGIs)		
PS1	5625	0
PS2	0	184
Construction Facilities		
MCPY1	558	0
MCPY2	560	0
MCPY3	738	1710
MCPY4	535	4148

All roads will be surveyed, designed, constructed, repaired and maintained to Uganda National Roads Authority (UNRA) standards, with the cooperation of UNRA.

Permanent access roads will be 8 m wide and construction access roads will be 5 m wide. Unless otherwise specified, the roads will have a design speed of 40 km/h.

All access roads to construction facilities will have a murram (laterite) surface while permanent facilities will have sealed tarmac access roads. During the construction phase, when the roads will be used extensively, graders will be used for regular

maintenance. After completion of the construction phase, road maintenance will be supplied by the Government as part of its regular road maintenance programme.

Access to the stand-alone electric substations and those associated with MLBVs will be, as a base case, via the permanent RoW. Their access requirements will be reviewed during the detailed design to ensure practical access from the nearest existing infrastructure. When the locations are identified environmental and social evaluation will be undertaken.

2.3.6 Land Requirements

2.3.6.1 Area Requirements

There are two categories of project land requirements:

- construction phase only for the camps and pipe yards
- construction and operation of the EACOP System.

All land required for the project in Uganda, summarised in Table 2.3.4, will be acquired on a permanent basis, even for construction facilities. Land will be acquired and consolidated on a permanent basis, by the Government of Uganda, and provided for use through a lease arrangement with the Uganda Land Commission.

Table 2.3.4 Land Requirements

Phase	Estimated Affected Area
Construction Facilities	
4 MCPYs (marshalling yards)	74 ha
Hydrotest water storage	To be confirmed
Construction and Operation	
New access roads to construction facilities, pipeline RoW and AGIs	74 ha
Operational Facilities	
Export Pipeline	
30-m-wide construction corridor	889 ha
Estimated additional temporary work space (crossings)	333 ha
Permanent AGI	
2 PSs (includes buffer, additional construction worksite and helicopter pad)	30 ha (2 ha additional temporary workspace)
MLBV stations and electrical substations	Constructed within pipeline corridor, no additional land required
Total project land requirement[5] (construction and operation)	1402 ha

[5] This excludes “orphaned land” where the pipeline corridor dissects a field, leaving small portions which are no longer viable to cultivate or use and are classed as “uneconomic”.

Land will be required for construction facilities such as MCPYs and associated access roads. On average the lifespan of these facilities will be three years, with the land leases being up to five years, after which they will be decommissioned (see Section 2.4.6) and returned to the Government unless otherwise negotiated and agreed between the project and third parties or the Government.

During the construction phase, the pipeline RoW will mostly be kept within a width of 30 m. On completion in agricultural areas, the corridor will be reinstated with commercially available seed of local species, potentially supplemented by locally collected seeds, and maintained as grassland. In areas previously categorised as reserve land and designated as protected and or designated area (e.g., Forest Reserves, Game Reserves, Wildlife Management Areas, Game Controlled Areas and Open Areas), land cover will be restored and land use managed to achieve equivalent biological capability.

During operations, in agricultural areas, crossing of the corridor by pedestrians and livestock will be allowed, with provision for vehicle crossings at existing roads. During operations the pipeline RoW will continue to be 30 m.

Land will be required for the AGIs that will also remain operational over the lifespan of the project, after which these facilities will be decommissioned (see Section 2.4.6) and the land returned to the Government unless otherwise negotiated and agreed between the project and third parties or the Government.

2.3.6.2 Land Acquisition

A resettlement policy strategy (Appendix K) has been developed for the project in Uganda that sets out the principles and methodology for land acquisition, which are consistent with national and IFC requirements (see Section 8.15.3). Community-based social, land and environment teams will provide oversight of the land acquisition process to ensure that a fair and transparent process is implemented for land acquisition and reinstatement for the construction and operational facilities.

Land additional to that required for operations and construction facilities, such as borrow pits, will be temporarily secured by contractors. EACOP will require contractors developing new borrow pits on the project's behalf to assess and mitigate potential environmental and social impacts consistent with regulatory, legal and IFC requirements and manage associated land access in compliance with national and international standards, as described in the project's resettlement policy strategy. Where an existing borrow-pit is used, EACOP will conduct due diligence of the operator to ensure that all legal and regulatory requirements are met.

2.4 Project Activities

2.4.1 Feasibility Surveys

Pre-construction feasibility surveys were undertaken to confirm the feasibility of the pipeline corridor. The results of these studies will inform the detailed engineering phase.

2.4.1.1 Geological, Geotechnical and Geophysical Survey

Geological, geotechnical and geophysical surveys are being undertaken to:

- identify potential geological hazards in the pipeline route corridor
- determine the need for rock blasting, fault-line crossing, engineered retaining structures and unrestrained pipe sections
- develop site-specific mitigation strategies to be implemented during construction.

Geological and Geophysical Surveys

Geological and geophysical surveys are being undertaken to evaluate soil conditions and to assess potential geohazards (e.g., faulting) on the pipeline route.

The geological survey team walked the pipeline route to record the geology and conduct geological mapping. Based on the maps, the most suitable construction methodology for each geological group will be established.

For sections of the pipeline route where there is uncertainty on the soil and ground conditions, geophysical seismic data will be acquired. The data will provide information on subsurface conditions, which will support identification of potential constraints for the construction of the pipeline and other installations.

Geotechnical Survey

The physical (geotechnical) properties of subsurface soils have been established by geotechnical surveys. These surveys require drilling of boreholes to sample and test subsurface geological layers.

The geotechnical study scope includes:

- boreholes drilled to extract cores of soils, rocks and water for sampling
- trial pits dug to expose the soil layers for easy visual examination.

The soils, rocks and water samples will be analysed in a laboratory to determine structure and characteristics.

Piezometers have been installed in some of the geotechnical boreholes to measure groundwater levels and fluctuations.

2.4.1.2 Water Supply Study

Permits for surface and groundwater abstraction will be acquired and permit conditions complied with by the EACOP project.

A study to identify and evaluate potential water sources to support construction, commissioning and operations is being undertaken in stages in collaboration with the Directorate of Water Resource Management. Thus far, the project has completed some preliminary studies including:

- a study of potential existing and new water supply sources for construction facilities, AGIs and hydrostatic testing. In addition, Uganda and international potable water standards, effluent discharge standards, and Uganda abstraction and discharge permitting requirements were evaluated.

- field investigations to evaluate the availability, quality and local community use of the potential water sources previously identified. These investigations were conducted to provide data on:
  - water resource availability for engineering studies and discharge requirements
  - water resources to support permit applications
  - community water source baseline conditions.

New water supply sources for the project will be required as existing water sources are considered inadequate. A third stage that will be implemented before construction starts, will include aquifer testing, borehole siting and production well drilling. Potential water sources for the construction facilities are shown in Table 2.4.1.

Table 2.4.1 Potential Construction Facilities Water Sources

MCPY	KP	Potential Water Source	Borehole, New/Existing
MCPY1	39	Groundwater	New
MCPY2	124	Groundwater	New
MCPY3	191	Groundwater	Existing/new borehole
MCPY4	283	Groundwater/surface water (Kibale River)	New/direct river abstraction

Water will be required for hydrotesting of the pipeline and a hydrotest management plan will be prepared, both described in Section 2.4.2.2.

The hydrotest management plan will include hydrostatic test water abstraction quantity and quality requirements and procedures to avoid harm to the environment or adverse effects on downstream users.

Surface water will be the primary source of water for hydrostatic testing. Where surface water is not available to make up losses incurred during testing, groundwater, if permitted, and without causing impacts to local groundwater resources, may be used to make up losses.

2.4.2 Construction

2.4.2.1 Strategy and Logistics

Overview

EACOP construction will be primarily influenced by logistics, the mobilisation of materials and labour to the remote portions of the pipeline corridor and AGI sites, rather than by construction processes.

Early Works

For construction work to begin, some preparatory activities, commonly referred to as early works, are required. Early works provide the required facilities needed for construction to start in locations where there is no existing infrastructure.

Spread Strategy

The export pipeline is expected to be constructed in one spread in Uganda, as shown in Figure 2.4-1. The direction of construction is expected to be from east to west. Each spread's location, length and major components are described below. The plans will be progressed after the pipeline laying contractor is confirmed.

Construction from the Kabaale Industrial Park (KP0) to the Uganda–Tanzania border (KP296) will be undertaken as Spread 1, which will include:

- 296 km of 24-in. pipeline
- fifteen MLBV sites
- four MLBV sites co-located with electric substations
- one standalone electric substation
- two electric substations, one each at PS1 and 2.

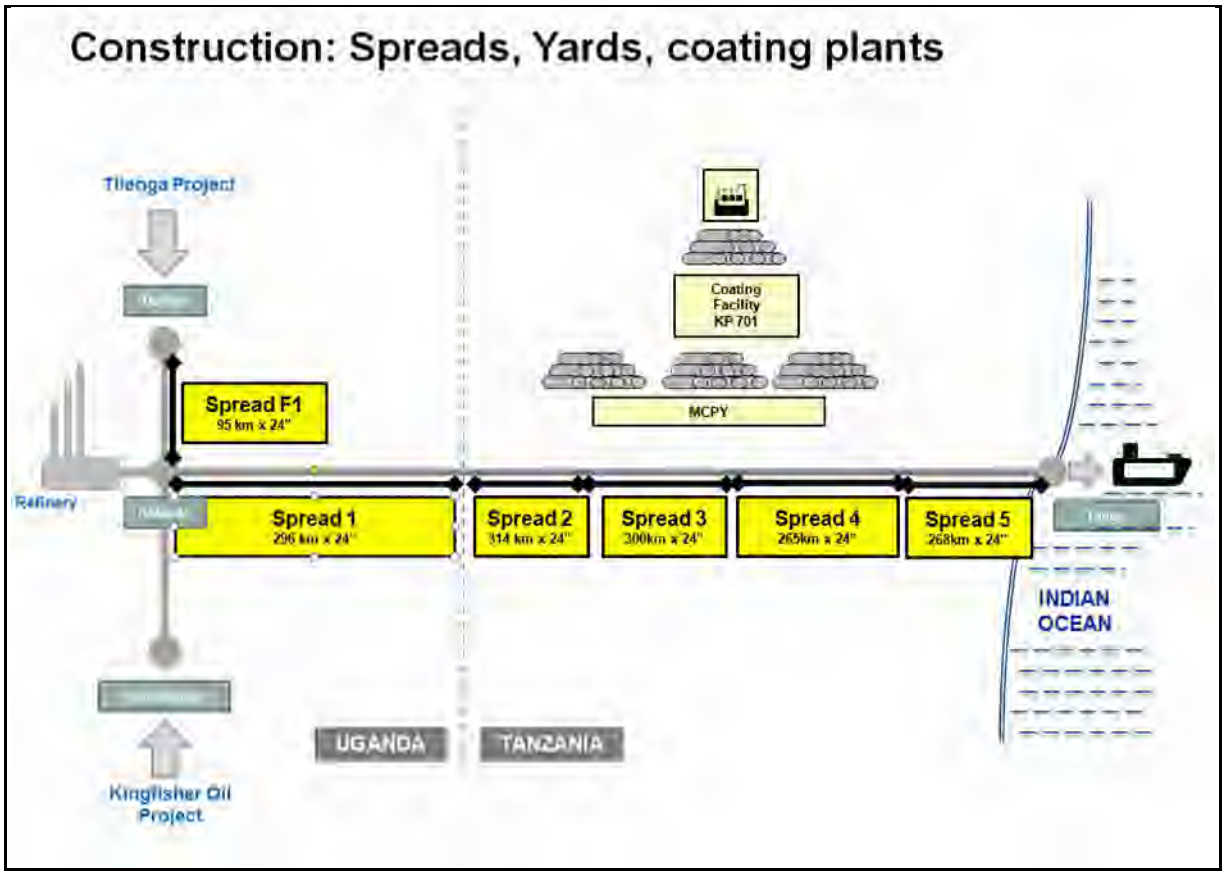


Figure 2.4-1 Construction Spreads

Pipe and Material Transportation

The project has undertaken an evaluation of logistics options and developed a strategy for the delivery of supplies and construction materials to predetermined locations on schedule.

Transportation requirements for approximately 17,500 × 18-m-long pipe sections, and associated infrastructure constraints and opportunities, were considered to

identify the optimum logistics strategy. Section 3.8.2, Alternatives, addresses the logistics strategy selection process.

Imported construction materials will enter Tanzania via the ports of Dar es Salaam and Tanga. From there, the pipe (only via Dar es Salaam) will be transported to a coating plant in Nzega district, Tabora region Tanzania. AGI components and construction materials will be transported to Uganda and between storage facilities and construction sites.

Construction materials sourced domestically will be delivered through a combination of local and project suppliers.

Payload will be recorded at the start and end of journeys and monitored.

Road

The insulated and coated pipe will be transported from the pipe coating plant by road to the EACOP MCPYs and, in some cases, despatched directly to the work sites. The road network used by the trucks transporting pipe and construction materials is mostly in good enough condition to permit trucks to travel 320 km per day at an average speed of 40 km/h.

Trucking requirements are summarised as:

- one driver per truck
- driving between 06:30 and 18:30
- 2 hours maximum continuous driving
- 10 hours maximum driving per day.

Project traffic information is included in Section 8.16.2.1, Tables 8.16-1 and 8.16-2.

Maintenance and Upgrades of National Roads

The Government of Uganda through the UNRA has an ongoing road maintenance and upgrade programme. The project will work with the UNRA to have planned road maintenance and upgrades sequenced to facilitate project logistics.

Permanent and construction access roads required by the project are addressed in Sections 2.3.5, below in this section, and in Section 2.4.2.1.

Rest Stops

Drivers will be required to take day rest stops every two hours of driving and overnight rest stops every 10 hours of driving. A survey of suitable rest stops along the proposed routes has concluded that existing facilities are sufficient.

Labour Transportation

Buses and four-wheel drive vehicles will transport personnel from the MCPYs to the different construction locations. Local hires from the surrounding areas who live outside the camps will travel to work by shuttle bus service.

Construction Facilities

The fundamental aspects of the construction philosophy for MCPY and access roads include:

- the sequential use of construction crews contributing to a smaller construction footprint, as fewer construction personnel require less camp facilities
- modularisation and commonality leading to assembly instead of “stick-building” on site, which reduces construction time and construction waste generated at the sites
- the close coordination of construction, and the supply and delivery of pre-purchased equipment to reduce construction time.

An associated advantage of this construction philosophy is that the facilities will be constructed with a high degree of safety and reliability.

Aboveground Installations

The fundamental aspects of the AGI construction philosophy are similar to those for construction facilities and include:

- the sequential use of construction crews, starting near major AGI equipment and material supply laydown areas, contributing to a smaller construction footprint, as fewer construction personnel require less camp facilities
- modularisation and commonality leading to assembly instead of “stick-building” on site, which reduces construction time and construction waste generated at the sites
- the close coordination of construction and the supply and delivery of pre-purchased equipment reduces construction time.

An associated advantage of this construction philosophy is that facilities will be constructed with a high degree of safety and reliability.

Crossings

One of the pipeline route selection considerations was that the selected route should have a minimal number of crossings (see Section 2.3.1). Even so, owing to the relative long distance traversed, the pipeline will require 222 crossings of the various types described in Section 2.4.2.5.

When the pipeline corridor crosses large infrastructure or watercourses, special construction methods (see Section 2.4.2.5) will be employed to reduce the effects on road and rail use, resource users and biodiversity. These crossings will be managed as separate construction activities, which can be completed independently to the main pipeline construction sequence.

Roads

Access Roads Philosophy

The creation of new access roads will be required in some areas of Uganda. However, because the pipeline has been routed as much as possible near existing infrastructure, the need for new access roads has been reduced.

AGI and construction facility selection criteria included minimisation of their distance from the national road network and optimisation of existing roads that can either be used directly, or that will need an upgrade to accommodate project traffic volumes.

National and District Road Upgrades

The Government of Uganda through the UNRA is currently upgrading key road networks required for oil activities. Planned upgrades, shown in Table 2.4-2 and Figure 2.4-2, will support project logistics.

Table 2.4-2 Road Upgrades

Road Section	Length (km)	Type
Kyenjojo–Kabwoya	69	Murram road to be converted to sealed tarmac
Kabwoya–Hoima–Bulima	66	Murram road to be converted to sealed tarmac
Bulima–Masindi–Kiguma	107	Murram road to be converted to sealed tarmac
Mubendi–Kakumiro–Kabaale–Kagadi	159	Murram road to be converted to sealed tarmac
Hoima–Butiaba–Wanseko	111	Murram road to be converted to sealed tarmac
Buhimba–Nalweyo–Bulamagi and Bulamagi–Igayaza–Kaumiro	93	Murram road to be converted to sealed tarmac
Lusalire–Nkonge–Lumegere–Ssembabule Roads	97	Murram road to be converted to sealed tarmac
Masindi–Biiso, Kabaale–Kizirafumbi and Hohwa–Nyairongo–Kyaruseha	106	Murram road to be converted to sealed tarmac
Kabwoya–Buhuka and Ntoroko–Karugutu	98	Murram road to be converted to sealed tarmac

SOURCE: UNRA presentation at 4th annual O&G Convention, 28 April 2018

Figure 2.4-2 Road Upgrades

Resources and Local Resourcing

Construction Materials

Construction materials will be sourced from inside and outside the country.

The project has undertaken preliminary resource abstraction studies that require the following guiding principles to be implemented by contractors:

- local resources will be sourced in a way that limits impacts on local use
- sourcing will be as close as possible to the locations requiring the resource
- sourcing from resource locations should be minimised and sustainable.

The sources of materials from Uganda will be identified in later project phases. One of the EACOP project objectives is to optimise the use of locally available materials.

Estimated quantities for the primary construction materials required are:

- gravel – 44,000 m^3
- sand – 52,000 m^3
- cement – 4400 m^3
- murram – quantities will be identified during construction.

In addition, the following materials will also be sourced locally:

- concrete blocks
- engineered backfill soils
- fencing
- rebars
- geotextile materials
- lumber
- tarmac asphalt.

Materials Sourced Abroad

Materials sourced outside Uganda and that will be assembled or installed at site include, but are not limited to:

- pipe
- high-voltage cable for power distribution
- heating equipment including 888 km of heat tracing cables
- fibre-optic cables
- valves and metering equipment.

Water Requirements

The estimated project water requirements are:

- construction camps – potable water 200 m^3/day at maximum occupancy (up to 1000 people)
- construction activities – 100–200 m^3/day
- hydrostatic testing 16,000 m^3 per test section required, see Section 2.4.4.2.

A water study is being undertaken and is described in Section 2.4.1.2.

Construction Equipment

Construction will require equipment including, but not limited to:

- trucks to transport pipe
- bulldozers and graders for site preparations
- tippers for materials
- backhoes for excavation
- trenching machines
- cold bending machines
- welding and weld testing equipment
- side boom cranes to lift pipe string
- cranes, forklifts and cement mixers.

Labour

A labour management plan will be prepared that will set forth the policies, objectives and procedures to maximise local content employment for the project, including relevant training and job-readiness support for host communities. Direct recruitment for suitable positions to support the development and indirect recruitment of Ugandan nationals by contractors and suppliers supporting the development will be targeted.

As well as technical and commercial criteria, contractors will be evaluated based on their commitment to local content and on their training and capacity building plan. The contractors will be assessed for the number of positions, the nature of the roles and associated training, and the commitment to local content optimisation.

Project Requirements

The approximated size of the construction labour force for the different project components is as follows, for the:

- MCPYs and access roads – 200–250 skilled and 20–40 unskilled workers
- pipeline spreads – 900–1700 skilled and 100–150 unskilled workers per spread depending on the stage of construction
- PSs – 130–200 skilled and 10–20 unskilled workers
- EHT – 20–40 skilled and 5–10 unskilled workers.

Local Content Management

A local content plan for the project will be established. This will identify:

- areas and disciplines where Ugandan companies can gain valuable capacity in partnership with international contractors
- ways to maximise Ugandan manpower
- opportunities for capacity building and technology transfer
- local communities' development initiatives.

The project has already taken some initiatives to proactively work with Ugandan companies and encourage their participation in the project and field development activities. The objective is to focus on identifying and promoting the use of local

resources and working collaboratively to develop the resources on a long-term basis by:

- maintaining communication between the project and potential Ugandan suppliers by initiating a regular and supervised dialogue
- providing assistance to Ugandan companies by offering support to specific sectors
- supporting the educational system by reinforcing the best academic institutions already in place to focus on certification programmes to develop qualified technicians.

The pipeline will be constructed near villages, towns and cities. Inhabitants from these communities will have the opportunity to provide labour and the supply of goods and services. Table 2.4.3 lists the population centres nearest to project facilities.

Table 2.4.3 Population Centres Near Project Facilities

Site	Population Centres	Distance in (km)
PS1 and MCPY1	Hoima	30
MCPY1	Kakumiro	43
MCPY1 and MCPY2	Kyankwanzi	57 and 83
MCPY2	Mubende	17
PS2 and MCPY3	Kyengera	24 and 30
PS2 and MCPY3	Sembabule	7 and 4
MCPY3	Lwengo	39
MCPY4	Rakai	20

Supply Chain Management

Supply Chain Management Philosophy

The project will follow competitive tendering process to select contractors to complete construction activities.

Local content will be a criterion among others for selection of the contractors.

Contractors and subcontractors will be required to implement and optimise local content by adhering to local content principles set out in the local content plan and be encouraged to propose ‘enhanced’ local content initiatives that go beyond such requirements.

2.4.2.2 Pipeline

When the land acquisition process is completed as described in Section 2.3.6.2, construction activities will be sequenced as follows:

Pipe Storage

For pipe storage in the RoW where soil (sand, loam or similar) berms are used, the following minimum measures will be applied:

- lay-down areas will be covered with polyethylene sheets or similar
- the soil or sand used for lay-down areas will be sifted and free from rocks and gravel.

Right of Way Clearing and Grading

Before clearing, a risk management process will be conducted for land mine potential, primarily for the pipeline near the national boundary and for MCPY4. It will include four steps:

- explosive remnants of war risk assessment
- nontechnical survey depending on risk assessment findings
- technical survey depending on nontechnical survey results and impact on the project
- clearance programme depending on technical survey results and impact on the project.

After clearance the 30-m-wide RoW will be grubbed to remove all organic material and cleared of debris to permit the movement of work crews, pipe and equipment. Topsoil and subsoil will be stockpiled, and silt fences will be installed to control erosion. Figure 2.4-3 is a photo of typical topsoil removal. Drainage and sediment mitigation measures will be implemented in areas prone to run-off and near surface water, see Section 2.4.3.3.

Where required existing services will be temporarily removed or permanently relocated.

Where the pipeline is routed along a side slope, benching of the RoW may be required to create a safe work area. On steep gradients or narrow ridges where successful reinstatement is difficult to establish, benching may become permanent.

Figure 2.4-3 Typical Topsoil Removal

Stringing

Pipe will be delivered to its pre-determined location, unloaded and positioned in a way that avoids damage to both the pipe and its coating. Pipe will be supported by skids to avoid contact with the ground. Figure 2.4-4 shows typical pipe stringing.

Figure 2.4-4 Typical Stringing

Bending

Bending accommodates elevation and directional changes and can be executed in two ways:

- Hot bending will be done during the pipe manufacturing process for tight-radius directional bends. This process allows for precise control of the specific bend angles.
- Cold bending, mostly done in the field and outside the insulated pipe, is used to bend steel pipe up to a maximum cold bending angle (approximately 10° per joint). The maximum allowable angle for the pipeline route will have to be taken into consideration and if this angle is exceeded hot bends are required. Figure 2.4-5 shows a typical cold-pipe bending machine.

Figure 2.4-5 Typical Cold Bending Machine

Welding

Pipe sections will be prepared and welded together. For main line welding the pipe sections are assembled in long strings that are placed in the RoW beside the trench. Tie-in welds, usually performed in the trench, connect pipeline sections. Figure 2.4-6 shows typical pipe welding.

Figure 2.4-6 Typical Pipeline Welding

Nondestructive Testing

Nondestructive testing is performed to identify joint weld flaws. The linear welds undergo testing at the place of manufacture.

Two nondestructive testing methods can be used:

- Industrial radiography tests for hidden flaws and defects in the weld with X-ray or gamma radiation. Film or specific sensor may be used.
- Manual or automatic ultrasonic testing are used for defect detection in steel components or welds. Figure 2.4-7 shows automatic ultrasonic testing. Ultrasonic testing makes use of high frequency (ultrasonic) sound waves. When the ultrasonic waves travel through a material, they will reflect or diffract (scatter in all directions) at inconsistencies and travel back to a transducer. The transducer records an electric signature that allows for the identification of inconsistencies.

The radiographic test and manual or automatic ultrasonic testing methods will be evaluated by the pipeline construction contractor, who will also be responsible for the selection of the most suitable method.

Figure 2.4-7 Automatic Ultrasonic Testing

Field Joint Coating

Joints will be protected with a coating that is compatible with the pipe anti-corrosion coating and thermal insulation system and that is applied in the field. Figure 2.4-8 shows an anti-corrosion field joint coating.

The weld surface will be cleaned and grit blasted in preparation for coating. A two-part liquid epoxy resin will be sprayed around the entire circumference of the pipe. A high-density polyethylene sleeve will be made for the joint and fuse welded to the pipe's high-density polyethylene outer jacket ensuring water tightness and protection before injection of thermal Insulation into the sleeve.

On completion of the process, inspections will be conducted of the coated field joints.

Figure 2.4-8 Anti-Corrosion Field Joint Coating

Trenching

Trench Location

The trench centre line will be as identified and marked by the pre-construction survey team, taking into consideration the location indicated on approved pipeline alignment drawing and local topography (drains, rock and outcrops) restrictions. Local deviations may be required to facilitate construction.

Location of Services, Pipelines and Cables

Before any excavation, the owner and or operator of any facility or utility expected to be crossed or encountered closely by the pipeline will be informed.

Services, pipelines and cables that will be crossed will be located as accurately as possible by:

- assessment of available drawings
- electronic sounding
- hand digging.

Excavation

A trench will be excavated, approximately 1.8–2 m deep, in which the pipe will be installed. The trench bottom and walls are prepared to a condition that allows for the coated pipeline to be lowered in without damage.

Topsoil Segregation

In agricultural land, the topsoil and subsoil will be stripped and stored along the RoW on the side opposite to the working side. Topsoil will be stored separately from subsoil. Additional description of topsoil stripping is included in Section 2.4.3.2.

Excavation in Normal Soils

For excavation through normal soils, the trench will be advanced using a tracked excavator or a continuous trenching machine (Figure 2.4-9). The depth of the trench excavated will provide pipeline cover in accordance with the approved alignment drawing. The depth and width of the trench will be checked as excavation progresses by using gauge canes or templates, held by worker in front of the operator.

Figure 2.4-9 Typical Trenching Machine

In areas where personnel safety or the integrity of adjacent facilities is a concern, the trench will be sloped back to an appropriate angle, to prevent material from collapsing into the trench. Material excavated from the trench will be piled on the

side of the trench opposite to the work side and sufficiently far back from the edge of the trench to prevent overloading of the trench walls.

The approximately 1 m wide trench bottom will be smooth with no rocks exceeding 25 mm in diameter and will match the pipeline profile.

Consistent with pipeline construction best practices, the trench will be excavated complete with escape ramps, or side cuts into the trench wall, to allow a safe exit from within the trench. The slope of the escape ramps should not exceed 45°. The ramps should be excavated every 500–1000 m (terrain dependent) to provide an escape route for any personnel working or animals that may become trapped in the trench.

Excavation in Rock

In areas of rock, when the grading is completed, a large machine that can rip rocks and a backhoe will be used to assess if the trench can be dug, ripped or requires blasting.

When the trench is to be excavated through areas of rock that can be ripped, the rock will be ripped using large construction equipment pulling a single shank ripper.

If blasting is required, it will be conducted by licensed contractors who will develop site specific plans that include:

- notification requirements for workers and surrounding population
- controls to prevent rock projectiles
- procedures that reduce environmental impacts (e.g., noise and vibrations).

On completion and implementation of the blasting plan, tests will be undertaken and geologists will:

- inspect the rock to determine blast effectiveness
- evaluate microblasting criteria for potential implementation.

Microblasting avoids rock projectiles and creates less noise and vibrations but can only be used under certain conditions. Sections suitable for microblasting will be identified during construction, based on geology, and proximity to infrastructure and environmentally sensitive features. If blasting is required, the excess blasted rock, which is unsuitable for use as backfill will be disposed of in approved rock disposal areas.

Excavation through Wetlands

Topsoil normally is not segregated in wetland areas. Dry wetland areas will be excavated using normal methods to the extent possible.

For saturated wetlands, the trench will be excavated using tracked excavators fitted with swamp mats, board roads, timber riprap or similar devices. Excavated spoil will be stockpiled on the nonworking side of the RoW for seasonal wetlands.

The extent of disturbance will be restricted to that which is required for the excavation of the trench. Traffic through the wetland is to be restricted to only those vehicles necessary to install the pipe, to the extent practical.

Flooded wetlands will be excavated using either tracked excavators or draglines from barges or similar equipment, or using marsh equipment excavators. Spoil will be piled adjacent to the pipe ditch.

Padding and Lowering and Laying

Before pipeline installation, the trench bottom will be cleared of hard and sharp elements and unstable soil encountered at the trench bottom removed. Figure 2.4-10 shows a pipe being lowered and laid.

Figure 2.4-10 Lower and Lay

The trench bottom, where necessary, will be covered with a continuous layer of soft padding material, using approved material. Padding material, free from rocks, stones and debris, will be placed to provide uniform bearing and support for each pipe section.

When the pipeline padding coating has been inspected and approved, side booms will lift the welded string, and lower and lay it into the trench.

Pipe sections will be lifted in a way that reduces the risk of damage to the coating. Booms will be fitted with padding and when lifting the pipe, the booms will be evenly spaced along the section for an even load.

When the pipe section has been placed in the trench, the ends will be welded to the adjacent sections, or sealed with caps to prevent the entry of dirt or animals until welded.

Backfilling

Initial backfill, free from large rocks and stones, will be placed from the padding material to approximately 0.3 m over the top of the pipe and will be placed as soon as possible to maintain pipe alignment and provide protection.

A high visibility polyethylene pipeline warning net, with a width equal to the pipeline diameter, will be placed 0.3 m above the pipeline over the entire route.

Final backfill will extend from the initial backfill to the top of the trench. Final backfill will be placed in layers of 0.3 m. No rocks or stones will be allowed within 1 m of the pipe. A front-end loader or a bulldozer will be used to push the spoil bank into the trench at an angle so that impact on the pipe is avoided. Surplus material will be spread over the trench.

High-Voltage Cables

The high-voltage power cables will be installed approximately 4.5 m from the pipeline centre or as far away from the pipe as possible, in a separate trench within the RoW, as shown in Figure 2.3-2. The required depth of burial will be approximately 1.25 m to top of the cable. In addition to the separation distance, the high-voltage line will be in an armoured cable, protecting the pipe from the induced electromagnetic field.

The high-voltage cables are installed using the same methods as the pipeline installation. The trenching and laying of the cable as shown in Figure 2.4-11, will be done concurrently using a trencher and cable laying equipment. Backfilling of the trench will use the same methods as for the pipeline.

Figure 2.4-11 High-Voltage Power Cable Installation

2.4.2.3 Construction Facilities

Civil Construction

Civil construction of construction facilities will include:

- cut and fill
- building of foundations
- laying drainage and underground services
- compacting soils for the stability of the site
- site surfacing.

Main Camp and Pipe Yard

MCPY construction will include:

- installation of fencing, a generator set, water wells and sewage treatment
- installation of camp materials and equipment that can be portacabins, containers or flat pack units. At some MCPY, buildings will be erected using concrete blocks.
- installation of offices and accommodation on wooden skids and connected to distribution networks
- building of concrete-block facilities, such as bunded fuel storage and workshops, by local subcontractors
- maintenance of access roads during construction activities.

2.4.2.4 Aboveground Installations

The remoteness of some of the AGIs may require the installation of construction infrastructure such as concrete batch plants. When possible, pre-fabricated construction will be employed to reduce field construction requirements.

AGI construction will begin with site preparation and establishment of drainage and erosion mitigation measures to assure that the site remains ready for further construction under all weather conditions. Once the site preparation crew executing civil construction is finished, they will begin preparation at another AGI site.

After the site is ready, foundations will be poured for major equipment, buildings, and pipe supports. Concurrently, equipment such as pumps, generators, other process equipment and tankage will be delivered to the construction site for setting. The lifting crews and equipment will move from site to site.

When the major equipment has been installed, piping and cables will be laid out and connected. When piping, electrical and instrumentation connections are completed, testing of each portion of the AGI facility will begin.

On completion of the primary AGI construction activities, fencing, station roads, guard houses and entry gates will be constructed.

2.4.2.5 Crossings

Overview

There will be a need to construct pipeline crossings of watercourses and wetlands, roads and infrastructure. Crossing alternatives are described in Section 3.8.3.3.

The construction for all crossings will require a temporary workspace area of approximately 1.5 ha that may extend beyond the 30-m wide construction RoW.

Where possible, the pipeline will intersect crossings at an angle as close to 90° as possible to reduce addition to pipeline length. External casing will be installed for the auger-bored crossings and where specifically requested by regulatory agencies and utility owners.

Pipe with a larger wall thickness will be used for waterbody and wetland crossings. For anti-buoyancy, pipe will be coated with concrete. Geotextile bag weights, concrete set-on weights, screw anchors or concrete coating could also be applied at the wetlands.

Regular pipe will be used for road and railroad crossings. Sealed tarmac roads and railroads will be bored with 36-in. casing, and murram roads and dirt tracks will be open cut without casing.

The project will consult with relevant government agencies responsible for infrastructure such as tarmac roads, power lines and the railway before constructing crossings to discuss crossing locations, timing, and infrastructure crossing guidance.

Types and numbers of crossings are provided in Table 2.4.4 and described below.

Table 2.4.4 Crossings

Type of Crossing	Number	Length (m)
Perennial Rivers	4	506
Perennial Streams	2	91
Ephemeral Streams	28	1387
Wetlands	56	24649
Murram Roads	166	1885
Sealed tarmac Roads	4	156
Railway	1	36
Powerline	17	TBD[6]
Fault lines	TBD	TBD
TOTAL	278	28710

Watercourse Crossings

Strategies for crossing watercourses depend on several site-specific factors, most importantly, the size and nature of the watercourse, and the nearby environmental

[6] To be determined during detailed engineering.

and social features. Open-cut is the default crossing method for all watercourse crossings in Uganda based on the FEED concept design. However, final site specific watercourse crossing methods will be chosen during detailed design and site evaluation by the selected construction contractors.

Wet Open Cut

A wet open cut crossing does not require a diversion of stream flow and includes the following steps:

- survey of the crossing location
- preparation of the pipeline string that will be installed
- digging a 1.8 m deep trench, starting and ending approximately 50 m either side of the watercourse
- pulling the prepared pipeline string, fitted with concrete weights where required, into the trench
- natural backfilling in turbid streams and engineered backfilling in the trench for clear-water streams.

Open-cut watercourse crossing methods will include the following mitigation measures:

- a reduced working width will be used
- a wider RoW will be used on either side of the crossing to accommodate the temporary storage of bed and bank material
- seasonal watercourses will be crossed during the dry season where practical
- sediment control will be installed
- fuel will not be stored within 30 m of the crossing.

Figure 2.4-12 depicts a typical open-cut crossing.

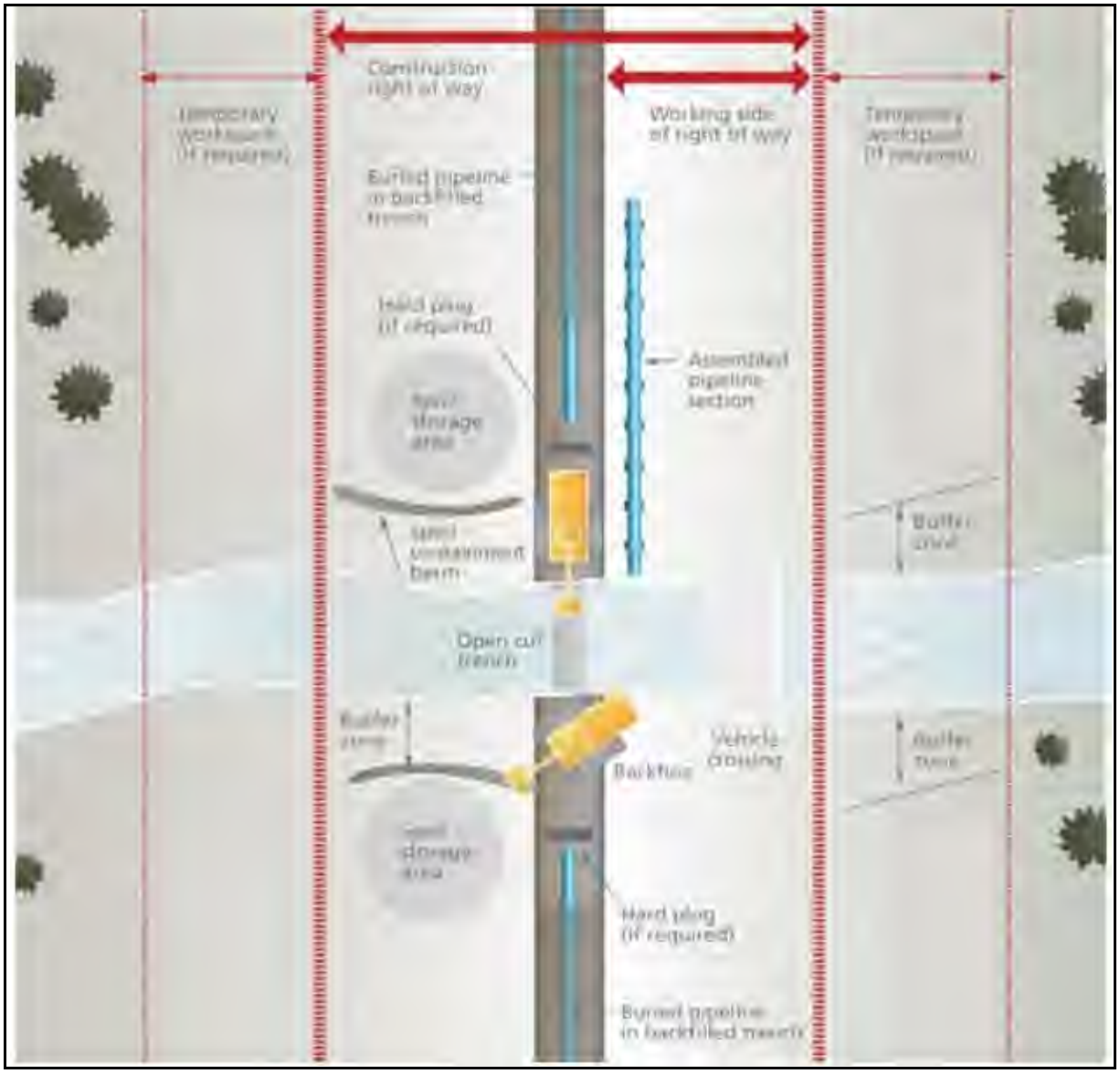


Figure 2.4-12 Open Cut Crossing

Wetland Crossings

Wetland crossings have been identified from LIDAR data and verified through field surveys.

Strategies for crossing wetlands will depend on several site-specific factors, most importantly, the size and nature of the wetland, and the nearby environmental and social features. Open-cut is the default crossing method for all wetland crossings based on the FEED concept design. However, the final site-specific wetland crossing method will be chosen during detailed design and site evaluation by the selected construction contractors

For open-cut crossings of annual wetlands (standing water or saturated soil for most of the year), construction equipment used (e.g., an amphibious excavator or floating pontoon) will have prefabricated equipment mats to reduce soil erosion. The amphibious excavators have a reach of up to 20 m in front and can operate in

down to 10 m water depth. The specific type of equipment to be used will be selected during detailed engineering and site inspection. Sediment control measures will be installed to avoid impacts on adjacent wetland, and fuel will not be stored within 30 m of the wetland. Figure 2.4-13 shows a cross-section of an annual wetland crossing.

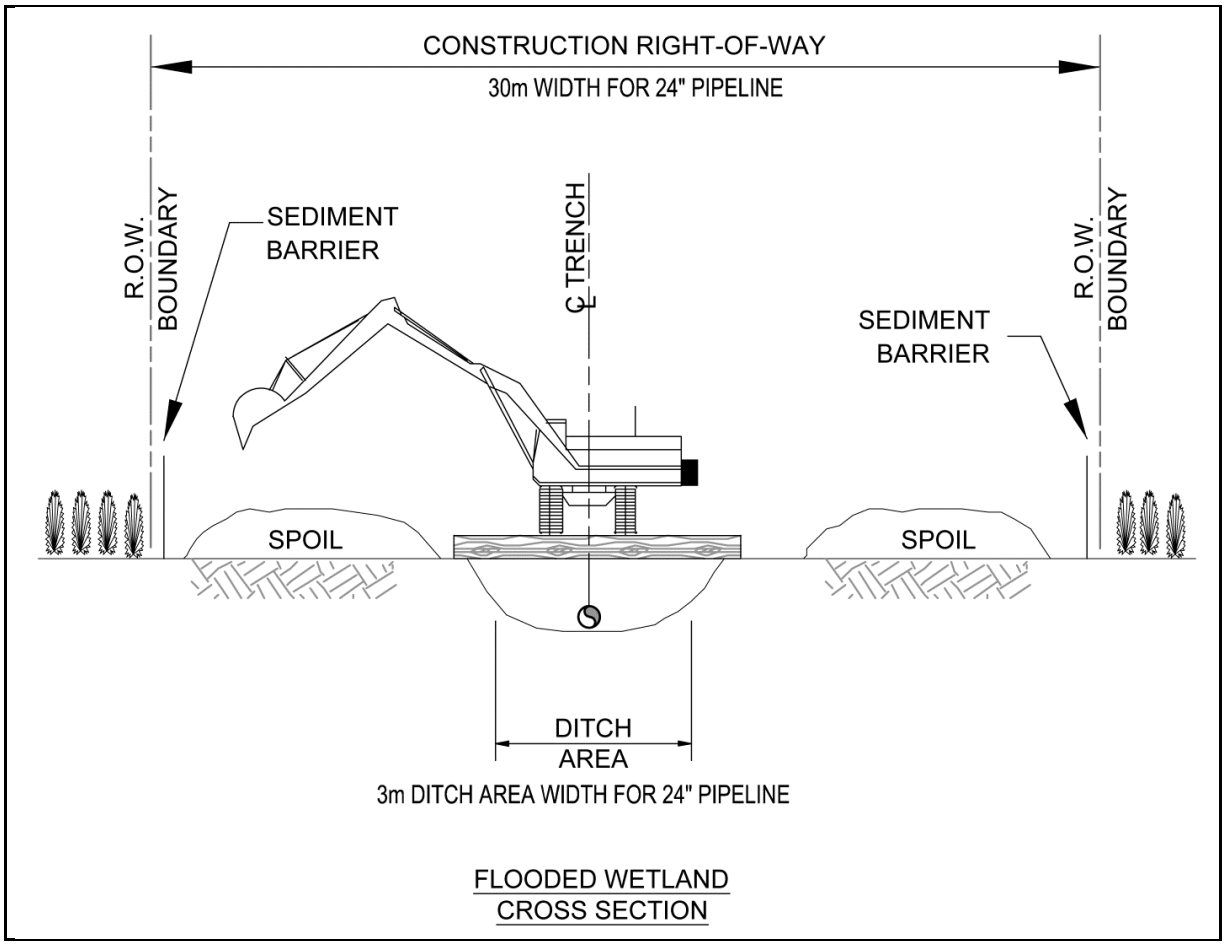


Figure 2.4-13 Crossing of Annual Wetlands

Seasonal wetlands (no standing water or saturated soil for most of the year) will be open cut with a narrower trench, as erosion is not as great a concern. Construction equipment will use prefabricated equipment mats to reduce soil erosion. Sediment control measures will be installed to avoid impacting on adjacent wetland, and fuel will not be stored within 30 m of the wetland. Figure 2.4-14 is a cross-section of a seasonal wetland crossing.

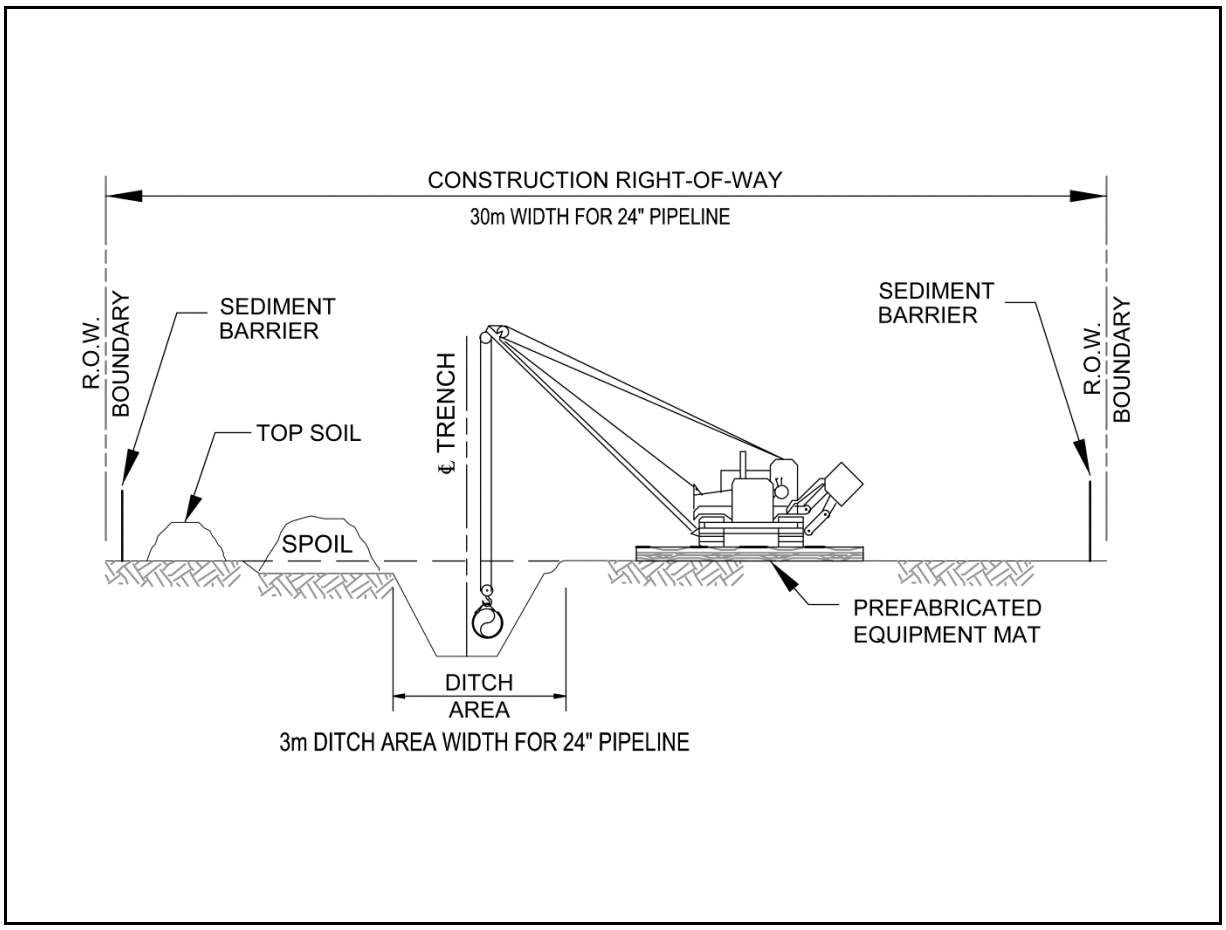


Figure 2.4-14 Crossing of Seasonal Wetland

Major Road and Railroad Crossings

Auger boring requires the excavation of access pits on either side of a crossing so that boring equipment can be lowered to the depth of the bore. Figure 2.4-15 is a photo of an auger bore. The auger will bore horizontally under the crossing emerging in the access pit on the other side.

Figure 2.4-15 Auger Bore

Fault Line Crossings

Locations of fault lines will be identified by the geological field survey. For fault lines, a crossing angle will be calculated depending on type of fault and activity. The pipeline will be constructed with a straight alignment for 100–200 m on each side. The trench will be backfilled with granular material and not machine compacted. Figure 2.4-16 depicts a typical fault crossing plan.

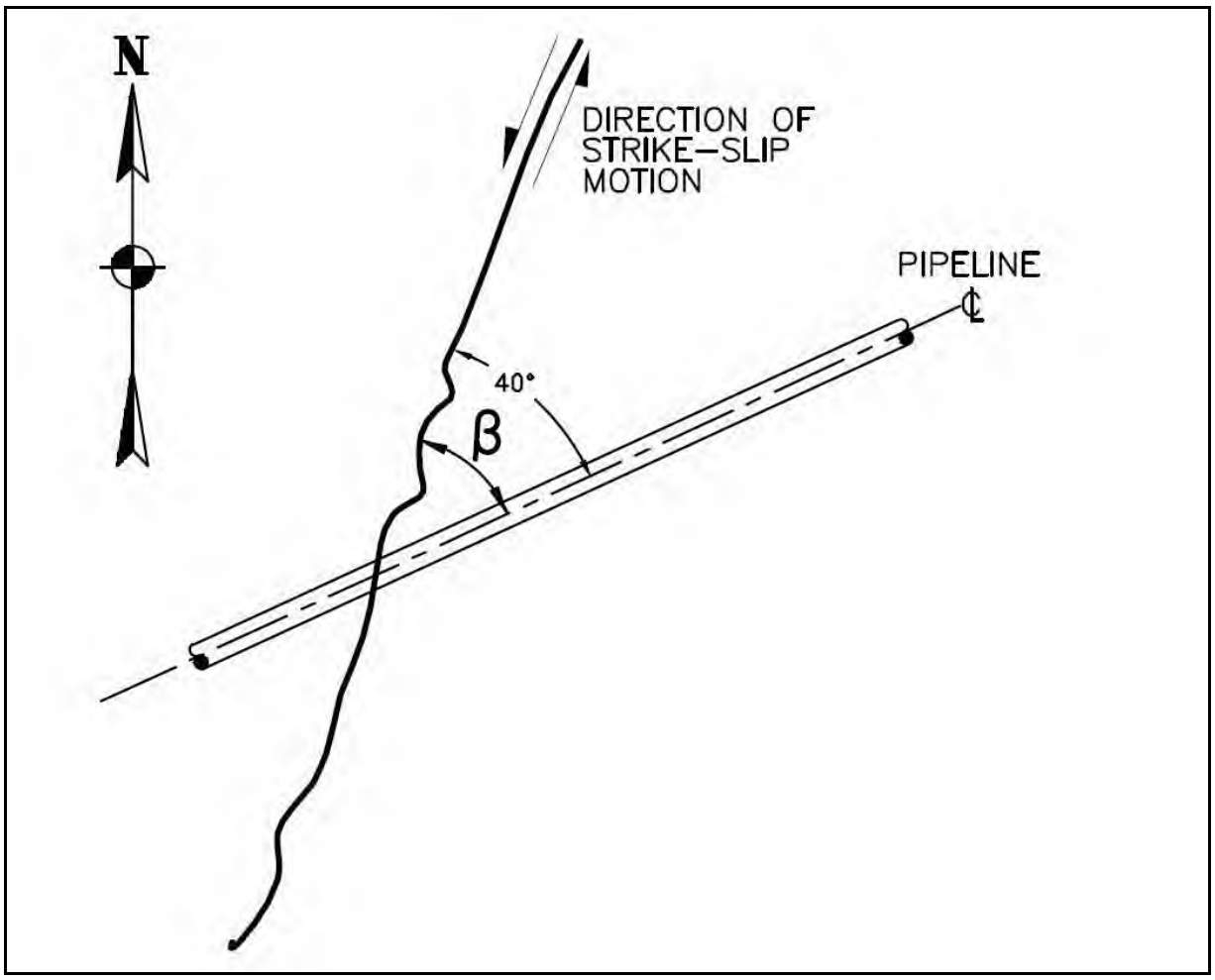


Figure 2.4-16 Typical Fault Crossing Plan

Underground Line Crossings

Underground lines to be crossed potentially include water, sewer and storm water lines, and fibre-optic, electrical and communications cables. The pipeline will cross a minimum of 0.3 m below underground lines.

2.4.2.6 Roads

Permanent and construction access roads can be:

- upgrades of existing murram roads
- newly constructed murram roads.

Access road construction will include, but not be limited to, the following equipment:

- bulldozers and graders for route preparation
- compactors for surface compression
- excavators for trenching
- pavers for surface preparation.

All new access roads will be graded to prepare the road base that will be compacted. Excavated materials approved for use as fill or backfill will be stored in

the road RoW. Excavated materials which are not needed or are unsuitable for use as fill or backfill will be removed from the RoW and stored at district approved locations. Where additional material is required, locally available murram will be used.

The roads will be crowned with 2.5% slope for drainage and drainage diversion ditches will be constructed. Corrugated metal pipe culverts will be installed where the road crosses watercourses.

The extent of existing road upgrades will be identified in later phases of project development. Construction methods for upgrades will be the same as for new access roads.

The road RoW will be kept free from waste material. Waste and surplus materials will be removed from work areas and disposed of in accordance with the waste management plan (see Section 2.4.2.8).

Road Maintenance

Access roads will be maintained until project completion. Road safety measures will be implemented and where work will be carried out close to an existing road, the safety of vehicular and pedestrian traffic will be maintained at all times.

Acceptable dust reduction measures will be implemented for vehicles and sprinkling or other dust-control measures will be implemented as necessary.

2.4.2.7 Emissions, Discharges and Chemicals

During construction, the following sources of air emissions are expected:

- power generation using diesel-fired engines
- construction equipment and vehicle exhausts
- dust from vehicle movement and construction activities
- welding.

Section 8.22.2 and Appendix G3 discuss and quantify the greenhouse gas emissions from the construction phase.

During construction, the only expected water discharge from construction facilities is rainwater surface runoff and treated sewage water. Additional information on water discharges is included in various parts of Section 8, Potential Impact Identification and Evaluation – Normal Construction and Operation.

A HSE risk assessment will be completed for all chemicals to be used during construction before chemicals are brought to site.

Risk assessment results will be documented in chemical-specific procedures that will prescribe PPE to be used and environmental protection measures to be implemented.

A chemical register will be included in the chemical management plan. Chemical-specific procedures, chemical register and inventory, storage, use, disposal and waste management will be subject to weekly audit. Material safety data sheets (MSDS) will be displayed at point of use and place of storage for each chemical.

Appendix N lists chemicals that are likely to be used. Final chemical selection will occur during procurement and subject to risk assessment.

2.4.2.8 Construction Waste Management

The construction waste management will be based on the following elements:

- **avoidance** – establishing contracts to allow the return of excess product and packaging
- **reduction** – construction processes to reduce waste generation (e.g., accurate calculation of concrete mixes) and waste reduction techniques (e.g., volume reduction of waste materials).
- **reuse and recycling** – all categories of waste will be segregated to facilitate recycling and reuse. Waste materials which cannot be recycled either locally or shipped to recycling facilities (e.g., plastics) will be treated at site.
- **disposal** – where wastes cannot be treated onsite, residual waste will be transported offsite to a project- and regulatory-approved waste disposal facility.

A construction waste management plan will be developed which identifies waste types and volumes, and locations where these may be generated. Expected waste types will include

- solid waste
  - metal
  - concrete
  - combustible materials
- liquid waste
  - surface run-off collected at AGIs and the MST
  - other waste waters collected in the site drainage system
- hazardous waste
  - lubricants
  - organic solvents
  - chemical additives
  - waste containing heavy metals
  - hazardous chemicals used in the coating facility to create PUF
- Sanitary waste will be generated at all construction camps
  - sewage
  - grey water generation from sinks and wash-downs.

Sanitary waste will be treated to discharge quality standards. Dedicated bio-oxidation treatment facilities that treat sewage and grey water will be installed at all the MCPYs.

There will be periodic removal of sewage sludge from the units for treatment at an approved waste management facility. If there is no treatment facility or where effluent discharge is not permitted, raw sewage or effluent will be transferred by tanker to the closest available project facility for processing.

Food waste will be shredded, dewatered and composted into soil enhancer using an in-vessel composter.

Waste Reduction

Strategies will be employed to reduce the volume and hazardousness of waste, including a:

- **purchasing strategy** – procurement personnel will routinely employ strategies to identify and acquire environmentally 'favourable' products and to identify waste generation avoidance or minimisation opportunities
- **material reuse and recycling strategy** – materials will be identified and used that have a potential beneficial post-project use for local contractors working on the project.

Where it has been assessed safe to do so, waste that will not be reused by the project or contractors, will be made available to local communities (e.g., containers and wood).

Storage

All hazardous and nonhazardous waste generated, collected, segregated, stored in temporary stockpiles and removed from site will be managed in compliance with environmental regulations and legislation.

Collection Points

During construction, waste will be collected at worksite waste collection points. Segregation will be promoted via the provision of multiple waste containers. Waste will be transported from the waste collection points to a waste storage area for further segregation, treatment and compaction.

Storage Area

The MCPYs will include a waste storage area. The size of this area will be based on a factor of at least 1.5 above maximum capacity to account for unforeseen circumstances (e.g., inclement weather) and additional guests and workers. The waste storage area will be placed downwind of the construction camp.

The waste storage area will have dedicated storage areas for hazardous and nonhazardous wastes. Segregation and physical treatment of wastes will be undertaken to increase reuse and recycling opportunities.

Each MCPY will include dedicated waste management areas (WMAs). WMAs will be sized and laid out commensurate to the type and quantity of waste expected at each site such that:

- waste separation as per reuse, recycle/recover or disposal option is facilitated
- waste will be segregated and incompatible waste will not be stored together such that:
  - hazardous and non-hazardous waste will not be stored together
  - liquid and solid waste will not be stored together
  - chemically incompatible waste will not be stored together.

WMAs will be designed to facilitate safe drive through and loading by waste transfer services. WMAs will include all necessary pollution prevention measures such as bunding, roofing and wind-proofing as necessary. Subject to site-specific

requirements and the type of waste to be managed at each site, WMA design may include the following:

- security such as chainlink fence and lockable gate to prevent unauthorised access
- equipment such as crushers, balers and shredders
- for non-hazardous waste, roofed storage areas where necessary (such as for paper and cardboard temporary storage)
- for hazardous waste, bunded (impermeable, blind-bund, i.e., no drainage) and roofed as per GIIP
- for domestic wastewater solids: sloped, concrete dehydration ponds.

Designated areas for each segregated waste type will be clearly signed. Only authorised personnel will have access to WMAs. WMA personnel will be fully trained and use appropriate personal protective equipment supplied by the project or the contractor as applicable. For hazardous waste, MSDS will be displayed at the storage place. WMA site layout plans will be on display at each WMA gate. Onsite temporary storage of waste (pending transfer) will meet applicable national regulatory requirements pertaining to maximum storage periods, maximum volumes and packaging requirements.

Disposal

Waste treatment will be implemented to render waste less hazardous and reduce its volume before final disposal. Waste incinerators will be used at the MCPYs for final disposal. Where waste cannot be incinerated onsite, residual waste will be transported offsite to a project and regulatory approved waste disposal facility.

General Waste Transport Requirements

All collected loads will be properly labelled in compliance with national waste management regulations, and all wastes will be accompanied by relevant MSDS and waste transfer notes.

Waste Collection and Transfer at Facilities

Wastes will be stored at the dedicated locations and collected by a licensed waste contractor.

Hazardous Waste

Hazardous waste will be collected, stored and transported by an authorised third party. MSDS will be available for all products and substances used.

Tracking System

A waste tracking system will ensure appropriate management of wastes produced.

Waste transfer notes will be used to ensure that wastes are transferred from the producer, through the transportation chain to the final disposal point and will provide a record of due diligence across the system. Each waste transfer note will track the consignment of waste from the point of origin to the final location.

2.4.3 Soil Management, Erosion Control and Reinstatement

2.4.3.1 Philosophy

Good soil management practices reduce the potential for erosion and will be the basis for reinstatement.

2.4.3.2 Soil Management

Topsoil Stripping

Topsoil and subsoil will be stripped and stored separately to avoid co-mingling.

In areas with thin topsoil, constant supervision during topsoil stripping will be implemented to preserve topsoil for reinstatement.

Topsoil and Subsoil Storage

Topsoil and subsoil will be stored away from project activities and protected from wind and water erosion.

If sufficient storage space exists, topsoil and subsoil may be stored on the same site. Signs will be erected on the topsoil and subsoil stockpiles to avoid mixing during removal and reinstatement.

Topsoil Maintenance

If topsoil is stored for more than six months, stockpiles will be monitored for anaerobic conditions that may affect soil fertility and subsequent success of reinstatement. Manual aeration will be undertaken if necessary.

2.4.3.3 Erosion and Sediment Control

Erosion and sediment control during construction is required to prevent sediment from entering watercourses and to reduce areas requiring erosion associated reinstatement.

Erosion Control

On pipeline construction sites erosion is mostly caused by heavy rain, which creates sediment laden run-off.

To prevent erosion and damage to soil structure, movement along the RoW by vehicles will be discouraged, especially in wet conditions. Erosion control measures will be installed on steep gradients and high-risk areas to reduce sediment laden run-off.

Erosion control measures may include, but not be limited to, French drains. Detailed erosion control measures will be defined during detailed engineering work. Figure 2.4-17 depicts a typical French drain. They may be installed across the RoW to restrict the movement of surface run-off. The collected run-off is discharged to the side of the RoW.

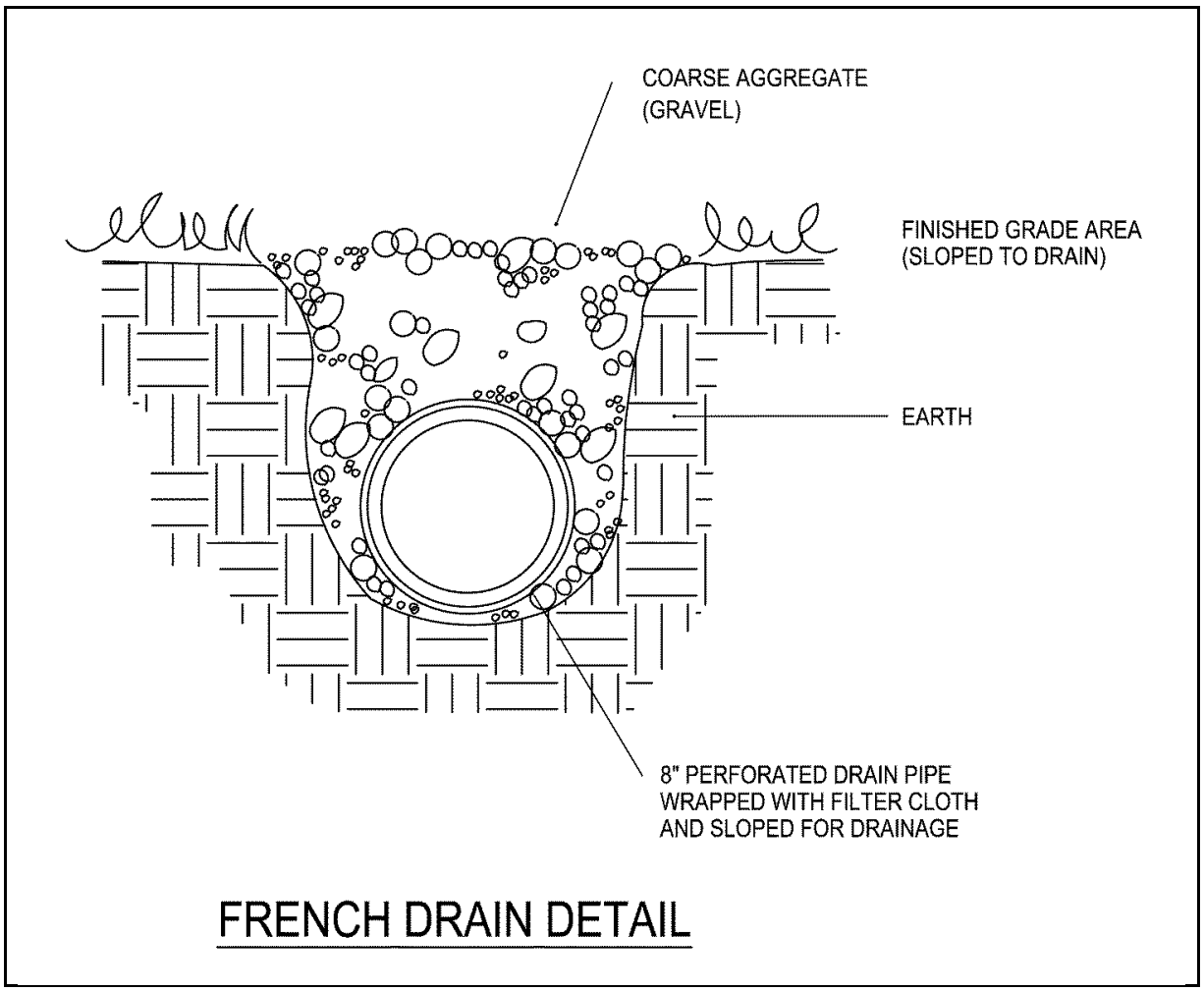


Figure 2.4-17 Typical French Drain

Sediment Control

Sediment control measures will be installed to remove sediment from run-off and may include, but not be limited to, straw-bale filters, silt fences, sediment traps and sediment basins.

Straw-bale filters could be installed at the bottom of slopes or across drainage ditches during road construction and at the time of ditch cleaning. Figure 2.4-18 depicts a typical straw-bale filter. The bales must be inspected often and replaced as required.

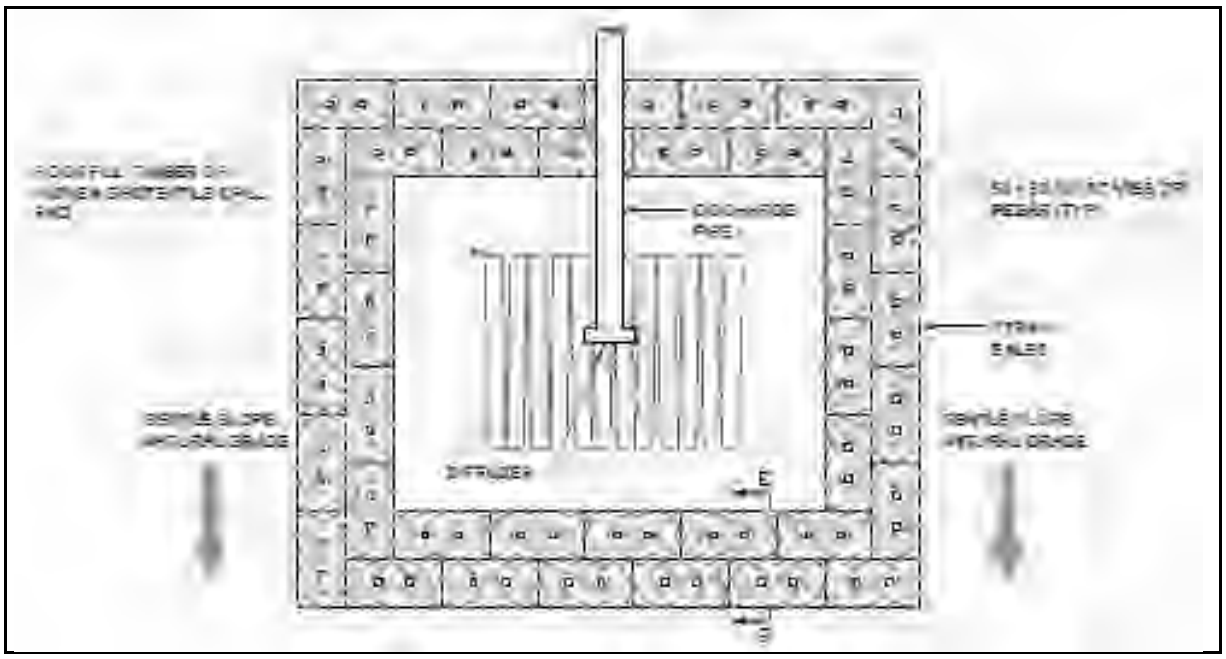


Figure 2.4-18 Straw Bale Filter

Silt fences could be installed at the side of the RoW and function as a run-off sediment filter. Figure 2.4-19 depicts a typical silt fence. Routine maintenance must be carried out on the silt fences to remove sediments.

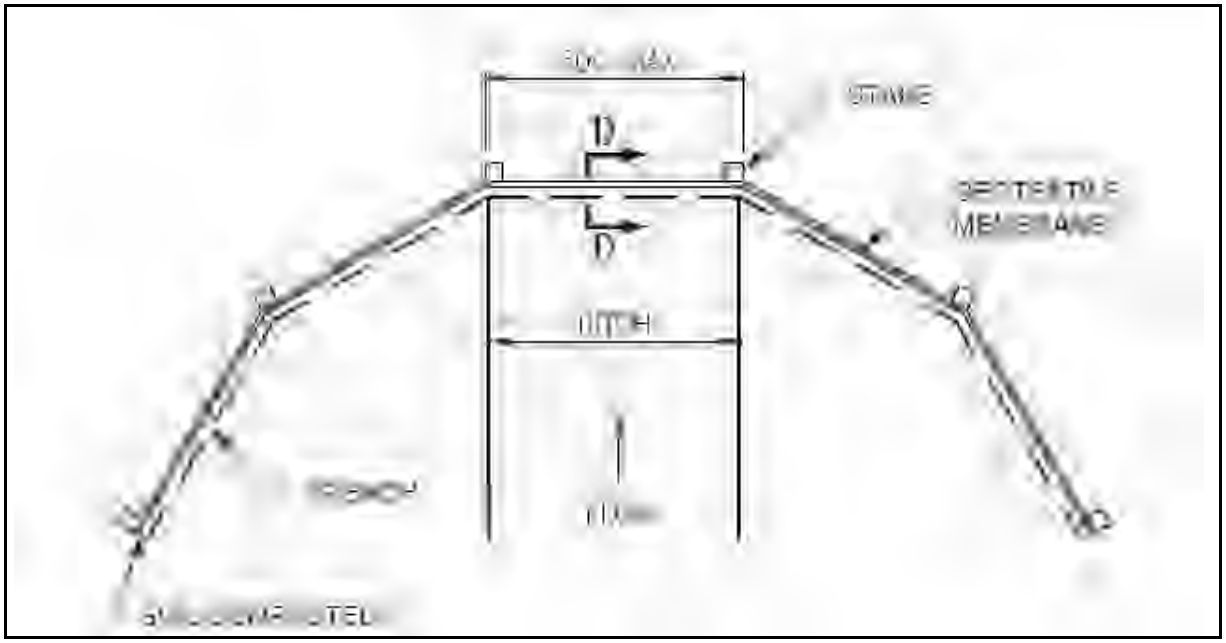


Figure 2.4-19 Typical Silt Fence

Sediment traps could be dug within the RoW to slow run-off and trap sediment. Figure 2.4-20 depicts a typical sediment trap. The number and spacing of sediment traps depends on the slope of the terrain.

When the sediment trap is half full, trapped sediment must be removed and filter material cleaned or replaced.

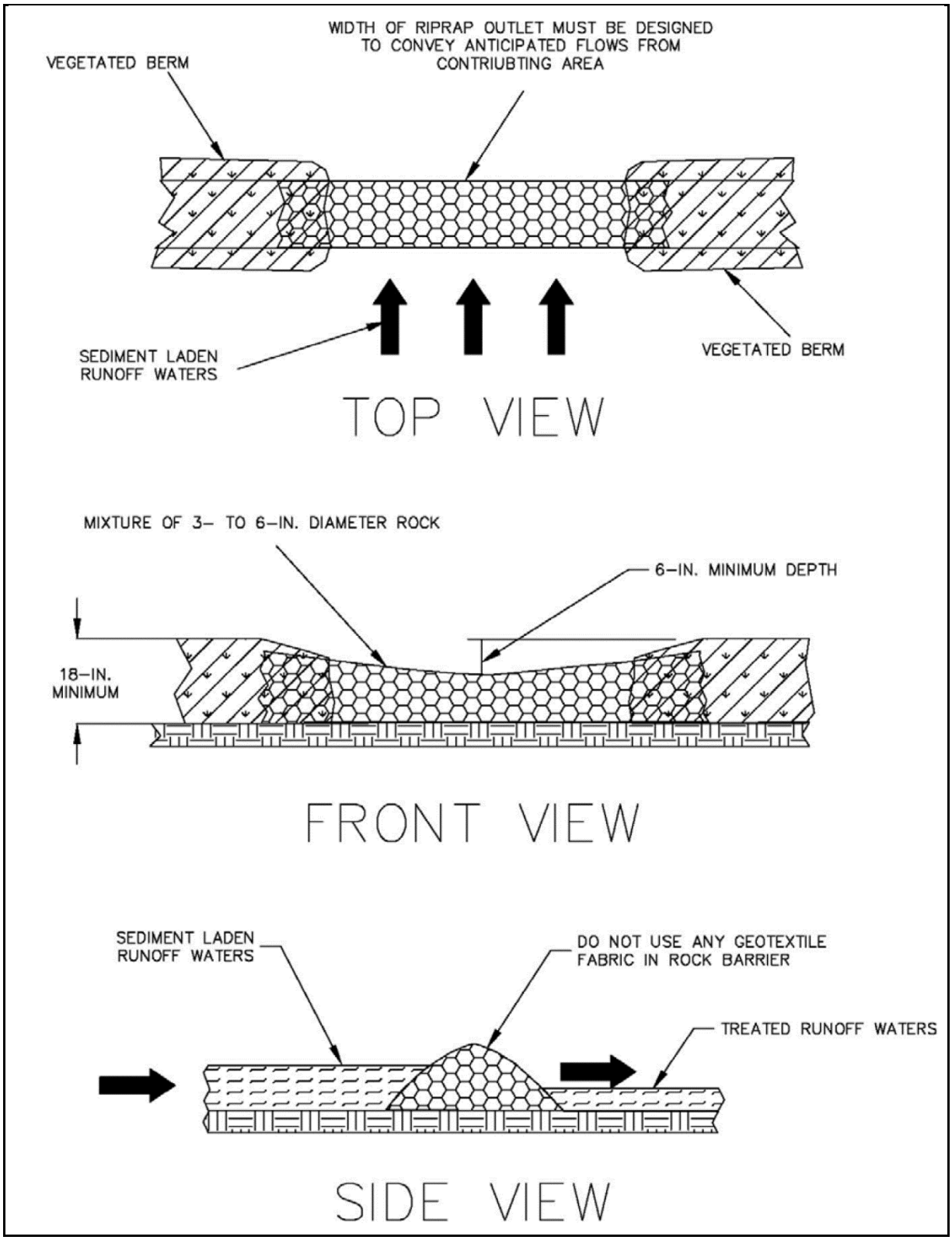


Figure 2.4-20 Typical Sediment Trap

Sediment basins are similar to sediment traps and can be used to collect sediment laden water and for settling of the sediment. Figure 2.4-21 depicts a typical sediment trap.

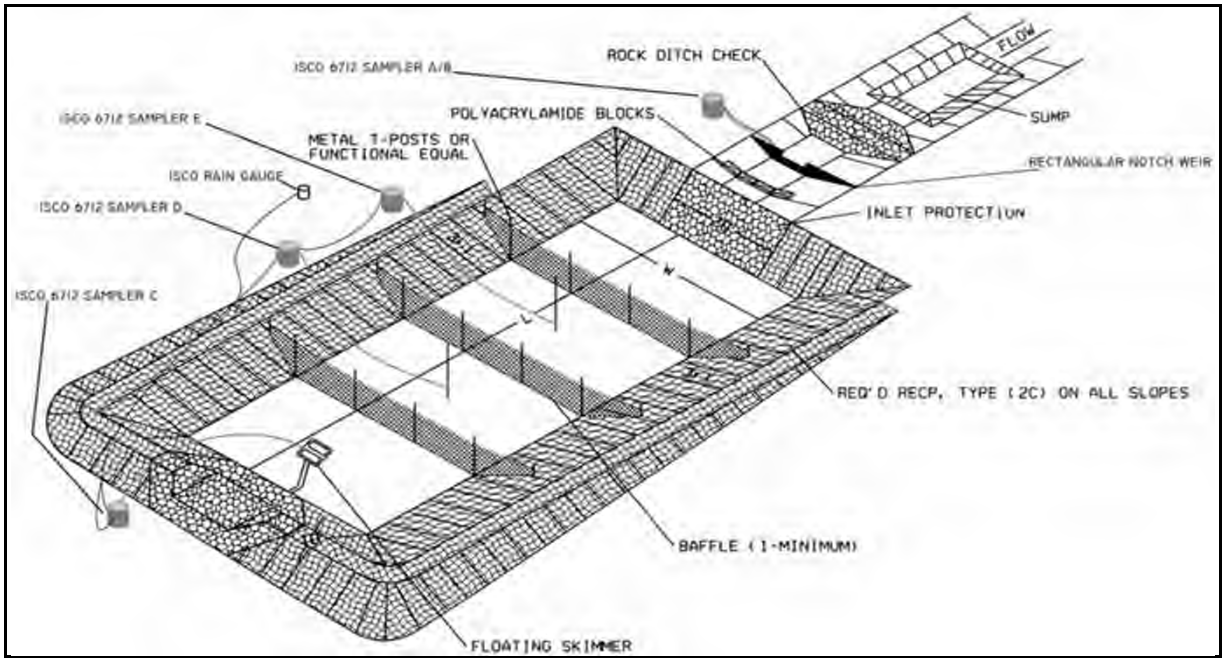


Figure 2.4-21 Sediment Basin

When the basin is half full, the sediments will be removed, and, if necessary, the filter material must be cleaned or replaced.

2.4.3.4 Reinstatement

On completion of construction activities, the following reinstatement activities will be undertaken:

- all debris, equipment and excess materials will be removed from construction areas
- disposal locations or the potential for local use of excess material (e.g., soil, rock) will be identified through engagement with local districts
- construction areas will be reinstated to their original profile
- the stored topsoil will be placed on construction areas
- stones lying on the surface from construction activities that may interfere with tilling of the land will be removed
- soil compacted by traffic in construction areas will be tilled
- temporary access paths that may be damaged by project traffic will be restored to their original condition
- fences (around the MCPYs), embankments, irrigation systems and ditches will be restored to a working condition
- in the steeply sloping areas of the RoW, drainage and erosion control measures will be provided
- construction in non-agricultural areas will be reinstated using natural revegetation to avoid the introduction of invasive species

- construction in agricultural areas will be reinstated as grassland
- in areas prone to erosion, native plant seeds will be used to expedite revegetation
- roads crossed during pipeline construction will be reinstated to pre-project condition at the minimum.

2.4.4 Pre-commissioning, Commissioning and Start-up

2.4.4.1 Overview

On completion of the construction phase, there will be a pre-commissioning phase and then a commissioning phase, followed by the introduction of oil into the pipeline through the inlet flange at the Kabaale Hub, Uganda.

EACOP System commissioning will be complete following detailed checks on all systems, successful transport of oil to the marine storage terminal in Tanzania and storage testing of the tanks.

Start-up sequences will drive the priorities for pre-commissioning activities. Start-up optimisation includes the timely and sequential completion of operational systems. For example, fuel distribution, power generation, EHT and pumping are required for start-up.

As part of the overall commissioning philosophy, the pipeline is divided into systems and subsystems.

The basic commissioning unit is the subsystem and there will be several hundred subsystems on EACOP. Each of these subsystems must reach a completion status during pre-commissioning, which includes three main types of activities:

- conformity checks
- static or de-energised tests
- piping tests.

When the tests are completed, a ‘Ready for Commissioning’ certificate will be issued for each subsystem. A subsystem is ‘Ready for Commissioning’ when all pre-commissioning operations on that subsystem are completed and there are no outstanding items.

Commissioning is the final quality check before transfer to the start-up team and includes:

- dynamic verification
- testing with substitute fluids
- preparing the pipeline system for start-up.

Commissioning Execution

A commissioning execution plan will be developed during detailed engineering. It will govern and describe all aspects of pre-commissioning and commissioning for all components. The plan will also define the entire internal commissioning organisation with a mobilisation plan and the corresponding witnessing required for all the phases of commissioning.

2.4.4.2 Pipeline

Before commissioning can begin, the following core pre-commissioning activities will be completed:

- controls and instrumentation system check and verification
- flushing with water and initial cleaning of the pipeline with gauging of pipeline wall thickness
- hydrostatic testing consisting of a strength and leak test
- final cleaning and dewatering or nitrogen fill after completion of hydrostatic testing
- communications systems check and verification.

Flushing, Initial Cleaning and Gauging

The water used to flush and subsequently clean the pipeline will be filtered and normally no additives are required.

Cleaning will use a pig fitted with water jetting, brushes and magnets to collect debris. Reuse of pre-commissioning water will be optimised. Used water will also be analysed to assess substance presence and concentration, and solid content, and will be released consistent with regulations and industry best practice.

Gauging will include the deployment of gauging plates on pigs that monitor pipeline diameter. Deviations will be analysed and repairs made to maintain structural integrity.

Hydrotesting

The pipeline will be hydrostatically tested to confirm pipeline integrity and strength.. Pipeline sections of approximately 35–50 km will be cleaned and gauged using several large batches of approximately 16.000 m^3 of water separated by pigs. The water used for cleaning will be reused in the next pipeline section or released to environment after suitable filtration. The water will be released to the environment when analysis indicates that the water parameters comply with water discharge regulations. When satisfactorily cleaned and gauged, the pipeline section will be filled with water to remove all air from the test section and will be pressurised, over a minimum of 8 hours at 1.25 times the design pressure, as a combined strength test and leak test. The strength tests will confirm the integrity of the pipe and welds, and establish the operating pressure limit of the pipeline section.

All MLBV assemblies will be tested separately from the mainline hydrostatic testing.

A hydrotest management plan will be prepared that will include information on the quantity and quality of water needed, the potential use of chemical additives, an evaluation of available water resources in the relevant regions and proposed abstraction points, as well as discharge proposals in accordance with the requirements of the project environmental standards and relevant specifications. Among others, the plan will include the following procedures:

- abstraction points will have filters to reduce the entrapment of fish, sediment and residues in the hydrostatic test water

- opportunities will be assessed for hydrostatic test water to be reused between test sections to reduce the overall volume of water required
- locations for discharging hydrostatic test water will be assessed; discharge locations will be selected carefully based on environmental sensitivity and assimilative capacity of the receiving waters
- preferred discharge is to surface waters in which case hydrostatic test water will be discharged through diffusers to re-oxygenate the water
- filtration mediums will be used to reduce suspended solid content before final discharge
- flow rate will be controlled to reduce the risk of soil erosion and disturbance to riverbed sediment and erosion protection measures implemented as required.

The project will also be responsible for obtaining all necessary approvals and permits for hydrostatic test water discharge and will implement a monitoring regime to ensure compliance with requirements of discharge permits. All monitoring will be undertaken in compliance with the requirements of the monitoring and reporting plan.

Hydrostatic test water discharge locations will be assessed on the basis that all discharges will comply with discharge permit conditions in addition to the relevant water discharge standard documented in Appendix F.

A table of contents of the hydrotest management plan is included in Appendix E5.

Final Cleaning and Gauging

The final cleaning process will follow the same steps as those described for initial cleaning.

The pipeline will be dewatered and filled with nitrogen for corrosion prevention. No drying is anticipated, as the oil fill will contain up to 0.5% water.

Commissioning Completion

When these commissioning activities are completed, and the marine storage terminal has been commissioned and is ready, oil will be introduced in a controlled way until it arrives at the terminal. Commissioning will be considered complete once all the above testing activities have been performed successfully.

Markers and Signs

Markers in English and the respective local languages will identify the pipeline and high-voltage cable locations and direction every 500 m. Warning signs will identify the pipeline and high-voltage cables at road, railroad, stream and river crossings. Warning signs will be on both banks of every waterbody crossed by the pipeline. Additional warning signs will be installed in areas at greater risk of excavation and construction activities. These signs will identify the presence of the pipeline and high-voltage cables, and provide company telephone numbers.

2.4.4.3 Aboveground Installations

Pumping Stations

Each system will be checked for operational preparedness. Table 2.4.5 lists the major checks that will be conducted.

Table 2.4.5 Pumping Station Function Checks

System	Function Tests
Pumps	Turn in correct direction
Process piping	Flushing, initial cleaning, hydrotesting, and cleaning and drying performed similar to that described is Section 2.4.4.2 except that the water source will be AGI's water wells and disposal will be through the AGI's water management system.
Fuel tankage and piping	As for process piping, but with tank leak testing and level monitoring testing
Alarms	Tested
Fire and gas detection	Tested

Performance testing will be completed for major systems (e.g., pumps) when crude oil enters the PSs. Stops and starts are to be expected as the systems are brought to operational capacity. Operators, engineers and construction personnel will be at the PSs to monitor commissioning.

Electric Substations

The EHT electric substations will be checked for proper operation. The following fundamental checks of major items will be conducted:

- transformer operates properly
- switch isolates and connects properly
- heating cables checked for shorts or opens
- remote operation of switch checked.

The electric substations will all be set at maximum power for commissioning so that the EHT system can be powered to prevent flow stoppage. Operators will control the substations manually during early operating stages.

2.4.5 Operations

2.4.5.1 Operating Philosophy

The operating philosophy establishes the facility design requirements to ensure safe, efficient and cost-effective operations. This philosophy will guide the principles for field operation organisation and implementation.

2.4.5.2 Operations and Maintenance

The EACOP System in Uganda, including PSs, electric substations and MLBVs, will be managed from either the MST CR in Tanzania or the CR at the Tilenga Project

CPF in Uganda. Automation capabilities with special focus on a remote start–stop control will ensure emergency response in the event of unplanned incidents.

Operations will follow work permit procedures. Maintenance and inspection activities will be executed to complete scheduled interventions required to retain the integrity and reliability of the installations.

An EPRS (Emergency Pipeline Repair System) will be established for the pipeline, and equipment and procedures to manage abnormal operation and incidents.

Security measures are described in Section 2.4.5.6.

Wax deposition during start up and when the pipeline starts to operate below design capacity is expected to be low with EHT active. However, some wax deposits may still form requiring pigging.

Residue collection from pig trap receivers will normally be heated and reinjected into the pipeline. At each PS, the waste storage system will accommodate residuals not suitable for reinjection.

A maintenance team will be dedicated and trained to execute repairs that may be required due to:

- corrosion (internal or external)
- seismic events
- landslides
- erosion or scouring
- external causes (vandalism and accidental digging).

Complex repairs will be conducted by specialists for:

- pipeline section replacement
- thermal insulation (PUF) repair
- fibre optic cable repair
- high-voltage power cable repair
- electric heat tracing repair.

In areas where the pipeline traverses natural habitat, manual vegetation management of the operational RoW will be undertaken to ensure that a width of 10 m is kept free of deep-rooted plants to maintain pipeline integrity and facilitate access. In other areas, vegetation management to support grassland will be undertaken across the full width of the operational RoW.

The design of the not permanently manned stations will take into consideration that up to four operators may be required to be present during the day time for daily operational activities (not campaigns). However, local security will be present 24 hours a day.

2.4.5.3 Resources and Local Resourcing

Services and Supplies

During the operation phase, services and supplies for the project will be sourced in accordance with applicable national legislation and project commitments. Services and supplies include:

- maintenance and inspection activities
- catering and camp operation services
- supporting services (e.g., logistics, medical services and civil works).

Labour

Production, maintenance and inspection personnel will be locally recruited and trained during the construction phase to ensure that there is a trained resource pool that can be used for pre-commissioning, commissioning and operations.

Approximately 16 personnel are planned.

Local Content Management

An operations local content strategy and plan will be established for the project. This will:

- aim to maximise Ugandan manpower
- identify areas and disciplines where Ugandan companies can gain valuable capacity in partnership with the project.

The objective will be to focus on identifying and promoting the use of local resources, and working collaboratively to develop these resources on a long-term basis by:

- maintaining communication between the project and Ugandan suppliers by initiating a regular and supervised dialogue
- supporting the educational system by reinforcing the best academic institutions already in place to focus on certification programmes to develop qualified technicians.

Supply Chain Management

The project will follow competitive tendering process to select contractors for operations activities.

Local content, see above, is a core criterion for selection of these contractors.

For operations the project will:

- use Ugandan companies, when possible, for the provision of goods and services
- prioritise when possible the purchase and use of goods produced or manufactured in Uganda
- invest in training and technology transfer with the objective of enhancing the performance or capacity of local suppliers.

2.4.5.4 Emissions, Discharges and Chemicals

During operations, the following sources of air emissions are expected:

- occasional operation (including regular testing) of standby generators
- vehicle movement, and operation and maintenance activities
- oil-fired bulk heaters using heating medium heaters (later in the project life).

Section 8.22.2 and Appendix G3 discuss and quantify the greenhouse gas emissions from the bulk heaters.

During operations, the only expected discharge from project facilities is rainwater surface runoff and treated sewage water. Additional information on water discharges is included in various parts of Section 8, Impact Identification and Evaluation – Normal Construction and Operation.

A HSE risk assessment will be completed for all chemicals to be used during operation before chemicals are brought to site.

Risk assessment results will be documented in chemical-specific procedures that will prescribe the PPE to be used and environmental protection measures to be implemented.

A chemical register will be included in the chemical management plan. Chemical-specific procedures, chemical register and inventory, storage, use, disposal and waste management will be subject to weekly audit. MSDS sheets will be displayed at point of use and place of storage for each chemical.

Appendix N lists chemicals that are likely to be used. Final chemical selection will occur during procurement and subject to risk assessment.

2.4.5.5 Operations Waste Management

An operational waste management plan will be developed which identifies waste types and volumes, and locations where these may be generated. The plan will be based on the same elements as the construction waste management described in 2.4.2.8, waste avoidance, reduction, reuse and recycling, and disposal. Expected waste types will include:

- solid – wax deposited in the pipeline will be cleared from the pipeline by pigging operations. Most of the wax will be reinjected into the pipeline. Disposal space will be provided for residual wax not deemed suitable for reinjection.
- liquid – primary liquid waste will be from spills that are contained in open drains flowing to the water treatment system of each PS. The fully treated effluent water will be recycled as fire water and or discharged to the environment according to regulatory discharge standards for water quality.
- hazardous – operational hazardous waste plans will be generated. Other than trace amounts of biocide; anti-corrosive, oxygen scavenger; and maintenance wastes, no hazardous wastes are expected from typical pipeline operations. The preferred and alternative waste management methods used will be waste specific. When these methods are not available, the waste will be stored safely while a method is developed.
- Sanitary – there will be minimal sanitary waste requirements at unmanned AGIs (PS1 and 2). All sanitary waste from unmanned facilities will be treated and or disposed of in accordance with regulatory requirements. Food waste will be

shredded, dewatered and composted in an in-vessel composter for soil enrichment at a suitably licensed facility.

Segregation

The objective of waste segregation will be to achieve a high recovery of recyclables, in particular, all wood, paper, plastic, packaging materials, glass and scrap metal.

The waste bins or skips for segregation of waste will be colour coded with appropriate signage and labels to facilitate segregation.

Waste Storage

Wastes will be stored to prevent:

- accidental spillage or leakage
- contamination of soils and groundwater
- corrosion or wear of containers
- loss of integrity from accidental collisions or weathering
- scavenging and infestation of vermin and disease bearing insects.

Each AGI will have dedicated WMAs that meet the requirements of the waste types expected to be managed at each site. WMAs will be sized and laid out commensurate to the type and quantity of waste expected at each site such that:

- waste separation as per reuse, recycle/recover or disposal option is facilitated
- waste will be segregated and incompatible waste will not be stored together such that:
  - hazardous and non-hazardous waste will not be stored together
  - liquid and solid waste will not be stored together
  - chemically incompatible waste will not be stored together.

WMAs will be designed to facilitate safe drive through and loading by waste transfer services. WMAs will include all necessary pollution prevention measures such as bunding, roofing and wind-proofing as necessary. Subject to site-specific requirements and the type of waste to be managed at each site, WMA design may include the following:

- security such as chainlink fence and lockable gate to prevent unauthorised access
- equipment such as crushers, balers and shredders
- for non-hazardous waste, roofed storage areas where necessary (such as for paper and cardboard temporary storage)
- for hazardous waste, bunded (impermeable, blind-bund, i.e., no drainage) and roofed as per GIIP
- for domestic wastewater solids: sloped, concrete dehydration ponds.

Designated areas for each segregated waste type will be clearly signed. Only authorised personnel will have access to WMAs. WMA personnel will be fully trained and use appropriate PPE supplied by the project or contractor as applicable. For hazardous waste, MSDS will be displayed at place of storage. WMA site layout plans will be on display at each WMA gate. Onsite temporary storage of waste

(pending transfer) will meet applicable national regulatory requirements pertaining to maximum storage periods, maximum volumes and packaging requirements.

Disposal

Waste treatment will be implemented to render waste less hazardous and reduce its volume before final disposal.

General Waste Transport Requirements

All collected loads will be properly labelled in compliance with applicable Uganda waste management legislative requirements. Any hazardous wastes will be accompanied by relevant MSDS with the Waste Manifest Transfer Note (WMTN).

Waste Collection and Transfer at Facilities

All waste not suitable for incineration and the product of incineration (incinerator ash) will be stored at dedicated locations and collected by a licensed waste management contractor.

Hazardous Waste

Hazardous waste will be transported to a licensed waste facility for appropriate treatment and or disposal in accordance with the applicable waste acceptance criteria for the facility. MSDSs will be available, where applicable, for all waste products and substances produced.

Tracking System

A waste tracking system will be adopted to ensure appropriate management of wastes produced from operations activities.

WMTNs will be used to ensure that wastes are transferred from the producer, through the transportation chain, to the final disposal point and will provide a record of due diligence across the system. Each WMTN will track the consignment of waste from the point of origin to the final location.

Signed WMTNs will be returned to the site of generation, and scanned for filing. Hard copies will be stored on site for a period of one year, and thereafter transferred to the marine storage terminal for longer term retention.

2.4.5.6 Monitoring

Pipeline Operational Monitoring

Pipeline monitoring along the RoW may be assisted by a ‘community watch’ system and or unmanned aerial vehicles. These people and equipment will monitor for intrusions or other activities on the RoW.

Pipeline Integrity

The supervisory control and data acquisition (SCADA) system will be operated from the CR for centralised monitoring and control of process and safety systems for the pipeline and AGIs. A pipeline acoustic intrusion system may be installed along the pipeline and connected to the fibre optic cable. The pipeline acoustic intrusion

system will identify disturbances (e.g., unauthorised digging or blasting) in the pipeline RoW and communicate these disturbances via the fibre-optic cable to the security control room.

An EPRS will form part of the pipeline system's contingency plan. The contingency plan will be designed to facilitate rapid and safe repair of pipeline damage. The EPRS will integrate leak detection with operations and emergency response and repair. Additional information on contingency planning is included in Section 9.2.

Corrosion Management

For precautionary purposes, the pipeline is specified with a fusion-bonded epoxy anticorrosion coating applied to protect the pipe against external corrosion over the course of its operational life. This coating will act as a second barrier in case of water ingress below the bounded thermal insulation system. To provide additional corrosion control, cathodic protection measures may be implemented.

Cathodic protection measures will only be provided on AGIs. For the pipeline, internal corrosion will be monitored by intelligent pigging, see footnote in Section 2.3.3.3, and for microbiologically induced corrosion. (To further manage oil spill risk at sensitive locations, such as water crossings, block valves will be installed, see Section 9.5.2.12.)

The intelligent pigs that will be used travel through the pipeline to monitor its integrity and diagnose matters such as metal defects. Intelligent pigging will be conducted as follows:

- during commissioning to establish a baseline
- initial in-service inspection in year five or earlier
- subsequent in-service inspections every five years (or more often depending on monitoring results).

Biocide injection will be required if microbiologically induced corrosion is confirmed.

Security

The project will abide by the national laws of the country and will develop its security based on international standards and best practices. A security risk assessment has identified a set of security measures for each phase of the project.

Physical Security

Physical security includes passive and active measures to protect personnel and facilities against potential threats. Passive measures include the use of architecture, landscaping and lighting to achieve improved security by deterring, disrupting or mitigating potential threats. Active measures include the use of systems and technologies designed to deter, detect, report and react against potential threats.

During the operations phase, closed-circuit television and intrusion detection systems will be in place and will be monitored from a security control room.

Operational Security

Operational security is the process of creating policies and procedures, and establishing controls to protect the facilities and assets of the project. It includes:

- policies and procedures to establish controls to prevent unauthorised access to a facility or assets, whether through carelessness, criminal intent or an outside threat
- controls that are performed on a regular basis to ensure that the requirements are met by all security stakeholders.

The project's facilities will be secured by local security providers who have been trained by professionals with expertise in voluntary principles on security and human rights.

Other Monitoring

Environmental and social monitoring is described in Section 10.7.18 and Appendix J.

2.4.6 Decommissioning

2.4.6.1 Construction Facilities

A decommissioning plan for the construction facilities will be developed, which includes a social management component that addresses associated impacts (e.g., loss of jobs and economic activity). In addition, the plan will ensure that all the project components that were required for constructing the pipeline, but that will no longer be required during the operational phase, are removed and the land returned to the Government. This will be based on the following principles:

- engagement with stakeholders at local, regional and district levels to determine potential use of all redundant equipment and structures
- project structures to be removed from land that is no longer required for operations
- before decommissioning, site environmental due diligence will be undertaken based on historical site data and monitoring data done throughout the life of the field
- land to be reinstated to a capability similar to that which existed before construction activities.

As described in Section 2.3.6, the land required for facilities will be leased from the Government. When the operational phase has been completed, and after decommissioning, the leases will be surrendered. Some of the facilities, such as the camps, after the construction phase, may be transferred to the Government with some structures left in place. The Government may convert the camps into community facilities and manage them on behalf of the host communities.

2.4.6.2 Pipeline

When pipeline oil shipping volumes diminish to the point that it becomes inefficient to transport oil via the pipeline, the pipeline will be decommissioned based on Ugandan regulations and standards, and international standards and protocols. The decommissioning process will be based on the following principles:

- engagement with stakeholders at local, regional and district levels to determine potential use of all redundant equipment and structures

- project structures to be removed from land that is no longer required for operations
- environmental due diligence to ensure that substance-affected soil is managed
- land to be reinstated to a capability similar to that which existed before pipeline construction.

A decommissioning plan, which includes a social management component that addresses the impact of decommission (loss of jobs and economic activity), will be prepared and the scope will be developed in consultation with stakeholders at that time.

2.5 Associated Facilities and Third-Party Developments

2.5.1 Associated Facilities

Associated facilities are those projects that would not normally be developed independently without the development of the EACOP project. See the definition in the footnote in Section 2.1.1. Additional summary information on the associated facilities is included in Appendix H.

Associated facilities include the:

- Tilenga Project which comprises the upstream field development (including production wells, in-field pipelines and roads) and CPF (including electrical power generation, oil heating facility and a PS for the Tilenga feeder pipeline) and the Tilenga feeder pipeline.
- Kingfisher Oil Project on the southeast shoreline of Lake Albert, which includes a MCPY near PS1 of the Uganda EACOP project. The Kingfisher Oil Project will comprise field development, a CPF, a water abstraction station, flow lines and a feeder pipeline to PS1.

There will be a need to source aggregate from borrow pits. The current plan is that either existing borrow pits will be sourced or borrow pits will be developed by the project construction contractor after acquiring requisite land rights as described in Section 2.3.6.2, and regulatory approvals. If the supply from either of those options is not adequate and existing borrow pits need to be expanded, or new ones need to be developed by external developers, those pits will be considered associated facilities. The external developers are expected to conduct requisite environmental evaluations, develop mitigation and reinstatement measures, and acquire approvals.

As mentioned in Section 2.4.2.4, owing to the remoteness of some AGIs, construction infrastructure (concrete batch plants) may be required and would be developed in the early stages of construction. If it is decided that some of the concrete batch plants are best developed by external contractors, the plants will be considered associated facilities. The contractors would be expected to conduct requisite environmental evaluations, develop mitigation and reinstatement measures, and acquire approvals.

The construction waste management plan described in Section 2.4.2.8 refers to the potential use of existing waste management facilities and the operations waste

management plan described in Section 2.4.5.5 refers to the potential use of a waste management service provider. If the existing waste management facilities and service providers are not adequate to receive construction and operation wastes, and the facilities and services needed to be expanded, they will be considered associated facilities. Similar to the borrow pits and concrete batch plants mentioned previously, contractors would be expected to conduct requisite environmental evaluations, develop mitigation and reinstatement measures, and acquire approvals.

Since the need for development of new facilities or expansion of existing facilities is uncertain, and potential locations and design of such facilities are not known, they have been screened out of the cumulative impact analysis of associated facilities (see Appendix H).

2.5.2 Third-Party Developments

Third-party developments that are reasonably defined, reasonably predictable or foreseeable have been identified to assess cumulative impacts within the spatial and temporal boundaries of the EACOP project. These are described below.

- Kabaale International Airport will be expanded to facilitate the delivery of equipment and transportation of personnel during oil-field exploration and development phases.
- A 132-kV electricity transmission line from the Tilenga Project CPF to Kabaale Industrial Park. The line will evacuate excess power generated at the Tilenga CPF and import power to the Tilenga CPF when excess gas is reduced or depleted. The line will also be used to provide power to the Kabaale Industrial Park and surrounding areas. A preliminary route is available.
- Two 33-kV transmission lines to Kabaale Airport will be installed, associated with the Kabaale Airport development.
- A 60,000-barrel-per-stream-day hydrocracker and coker refinery will be constructed at Kabaale within the 29 km^2 area of land already acquired for the Kabaale Industrial Park.
- A 210-km long Hoima–Buloba Pipeline will be built for transporting refined petroleum products from the refinery in Hoima (see UG07) to a distribution terminal in Buloba, Kampala.
- Road improvements will be developed under the jurisdiction of UNRA to supporting the oil industry. These include the following roads:
  - Kabaale–Kiziranfumbi
  - Kaseeta Lwera via Bugoma Forest
  - Hohwa-Kyarushesha-Karokarungi
  - Buhimba–Kakumiro
  - Bulima–Kabwoya and construction camp
  - Kyotera–Rakai.
- Transmission line upgrade – construction of 33 kV overhead lines in Hoima district.
- A 2-ha opencast gold mine in the hills of Kamusenene village, Kitumba subcounty, Mubende district.

- A gold processing plant on 0.873 ha of land for the existing gold mine in the Namwasa Forest Reserve.
- Information and communication technology infrastructure – a 1536.39-km long buried optical fibre cable to be laid across the country to build the National Data Transmission Backbone.

2.6 Schedule

A schedule for the project is shown on Table 2.6.1. Project activities are progressing with construction being planned after the conclusion of the Uganda Environmental Impact Statement regulatory process and the resettlement action planning study and implementation.

Table 2.6.1 Project Schedule

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Regulatory approval												
Detailed engineering												
Logistics												
Construction facilities												
Pipeline												
AGIs												
Stakeholder engagement												

3 ALTERNATIVES

3.1 Introduction

This section summarises the process undertaken during pre-front-end engineering and design (FEED) (design process before FEED) and FEED to evaluate the technically and financially feasible alternatives for the East African Crude Oil Pipeline (EACOP) project while considering environmental and social impacts. The alternatives have been broadly categorised as follows:

- project zero alternative
- pipeline routing
- facility siting
- technology
- construction techniques.

3.2 Overview

The project alternatives considered and the decisions taken by the EACOP project during the pre-FEED and FEED phases have led to the validation of the project base case as it is described in Section 2 Project Description. The objective of this section is to document how the project design was optimised to reduce environmental and social impacts while being technically and financially feasible. This is based on assessment of the alternatives for each of the key strategic alternative themes, i.e., the “zero” project alternative and the main alternative areas mentioned in Section 3.1.

While the base case concept for technology was defined during pre-FEED phase, routing and siting alternatives have been analysed progressively in the context of the engineering, environmental, socio-economic and cultural heritage constraints identified during baseline surveys undertaken as part of the environmental and social impact assessment (ESIA) process. It should be noted that there is a requirement to provide flexibility for construction contractors that will develop the most efficient and cost-effective construction techniques while ensuring compliance with project standards. As mentioned in Section 2.1.1, refinements to design may be made during the detailed engineering and pre-construction phases influenced by site-specific conditions.

3.3 Approach to Alternatives Assessment

The environmental impact assessment (EIA) regulations for Uganda require an examination of feasible project alternatives and an explanation of the rationale for selecting the proposed project scheme. The specific requirements are detailed below:

The Environmental Impact Assessment Regulation 13/1998 requires the EIA to provide:

- a description of the proposed site and reasons for rejecting alternative sites
- the technology and processes that shall be used, and a description of alternative technologies and processes, and the reasons for not selecting them,
- the environmental effects of the project including the direct, indirect, cumulative, short-term and long-term effects and possible alternatives,
- an indication of whether the environment of any other State is likely to be affected and the available alternatives and mitigating measures.

In addition, the International Finance Corporation (IFC) Performance Standards Guidance Note 1: Assessment and Management of Environmental and Social Risks and Impacts (Ref. 4.4), requires:

> "…an examination of technically and financially feasible alternatives to the source of such impacts, and documentation of the rationale for selecting the particular course of action proposed."

The alternatives assessment process is shown in Figure 3.3-1.

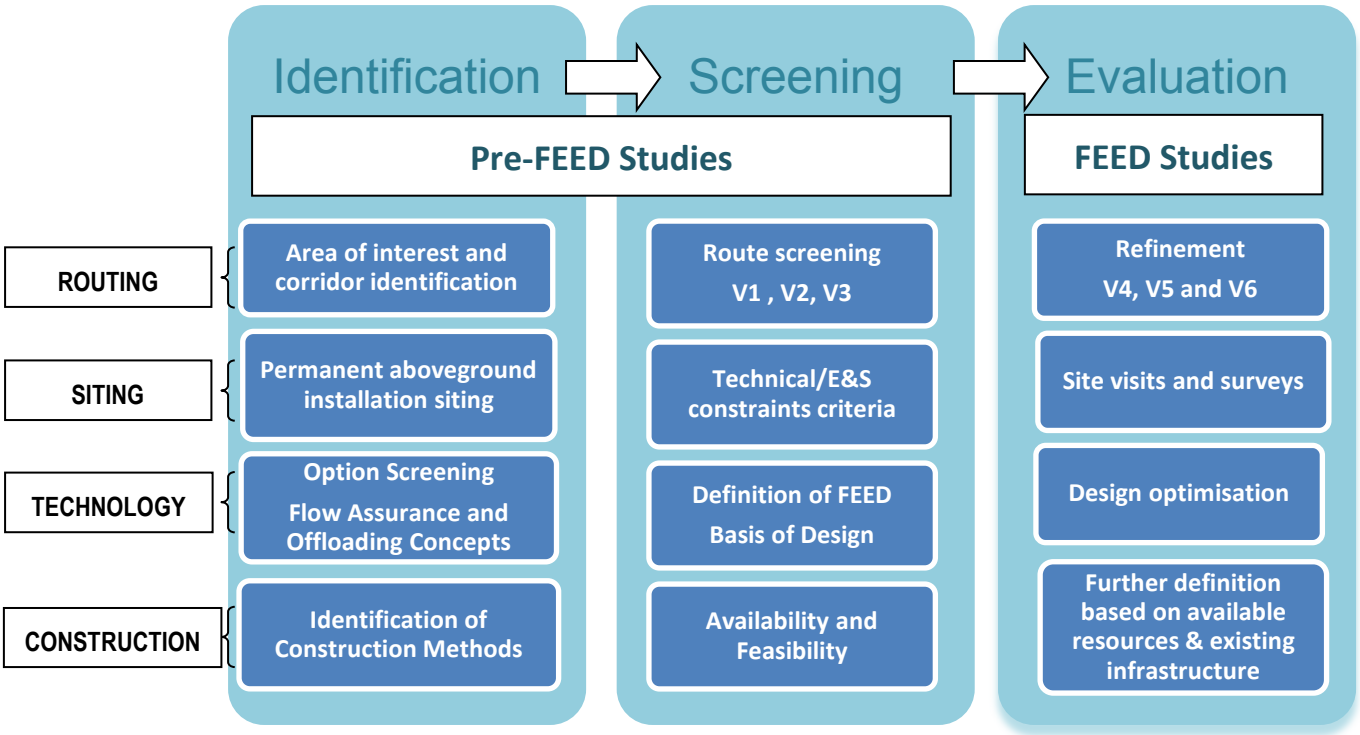


Figure 3.3-1 Alternatives Assessment Process

3.4 Zero Project Alternative

3.4.1 Overview

The "Zero Project Alternative" for the purposes of this alternatives assessment is the situation where the project, i.e., the EACOP System, does not proceed. The development of oil pipelines are large-scale projects and under the zero project alternative there would be no environmental or social impacts, on land or in associated waters because no construction nor operation activities would occur. However, the discovery of oil in the Albertine Graben area of Uganda and the

opportunity to access global markets, provide a new resource revenue stream for Uganda and employment opportunities for the host countries. A decision not to proceed with the project would result in the absence of revenue from crude oil production, crude oil export sales and associated economic development. Furthermore, benefits for Uganda, and for the district level would not materialise from the opportunities that the project would provide such as employment, skills development, technology transfer and growth in other business sectors such as fabrication, construction and waste management.

As part of the zero project alternative assessment, other modes of crude oil transport were assessed.

3.4.2 Rail

Rail has been considered as a potential mode of crude oil transport from Uganda to international markets. There is an existing narrow-gauge rail link from Uganda to the Mombasa port. This link was constructed in the 1900s, as a narrow-gauge rail system. Narrow gauge rail is considered less stable and therefore slower than a standard gauge rail system and transporting the projected peak production of 216 thousand barrels per day (kbpd) would be a significant challenge. The network would require extensive upgrades, risks would be associated with carriage stability and the network capacity would not be sufficient for the planned transportation rate of approximately 350 tank cars per day of oil. These combined factors resulted in the decision to consider alternative crude oil transport modes.

3.4.3 Road

Road transport via Kenya to the Indian Ocean coast was considered as a potential mode of transporting oil. It was estimated that it would take approximately 14 days for a shipment to travel from Hoima to Mombasa. There are large sections of the existing road infrastructure that are in poor condition in both countries and it would require extensive upgrades over large areas to ensure un-interrupted transportation. To export the projected amount of oil would require 1000 trucks on the road, which would create a substantial amount of traffic over the lifetime of the project and would result in increased emissions, disturbance and public road safety risks. These combined factors resulted in the decision to consider alternative crude oil transport modes.

3.4.4 Summary

A pipeline provides a well-established, comparatively safe system for the long-term export of oil. In addition, design specifications for pipeline systems are supported by robust international standards. Construction of a pipeline can be completed in a relatively short time. Once operational, pipelines have limited impacts that are localised and can be managed. A buried pipeline system provides the most efficient and dependable method of transport while minimising EIAs during the operational phase. Consequently, the project made the decision to progress the oil transportation project as a buried pipeline (see Section 3.7.2 for information on the consideration of aboveground versus buried pipeline).

3.5 Pipeline Routing

3.5.1 Overview

Several alternative pipeline routes were identified during pre-FEED. The routing process began with the identification of starting point and a flexible end point, which was then followed by numerous screening studies. This work culminated in the selection of eleven 50-km-wide corridor combinations for evaluation. Secondary information was then used to assess the potential corridors using geographic information system and three main corridor options were selected:

- Kenya North
- Kenya South
- Tanzania.

Using higher-resolution satellite imagery, the corridors were further refined by using several constraints criteria including environmental and social, geohazards, constructability and terrain (river crossings and slopes). Further to consideration of the study of the three identified corridors, the Government of Uganda announced the selected Uganda–Tanzania route on 23 April 2016 as shown in Figure 2.3-1. This section provides an overview of the route alternatives considered.

3.5.2 Prior Front-End Engineering and Design

3.5.2.1 Initial Pipeline Corridor Options

Routing studies of a crude oil export pipeline from a fixed point at Lake Albert in Uganda to several terminal options situated at multiple end point locations on the East African coastline were conducted. The resulting area of interest was defined for the preliminary routing and included areas in Uganda, South Sudan, Kenya and Tanzania. The common starting point of all potential routes studies was northeast of Hoima with the end points at Malindi (Kenya), Tanga (Tanzania), Juba (South Sudan), Lokichogio (Kenya) and Lamu (Kenya).

Exclusion criteria were applied to the area of interest which included slopes over 45°, elevation above 2500 m; lakes, active volcanoes, protected areas, cities and a 1-km buffer around cultural, archaeological and touristic sites. The resulting area of interest and exclusions zones are shown in Figure 3.5-1.

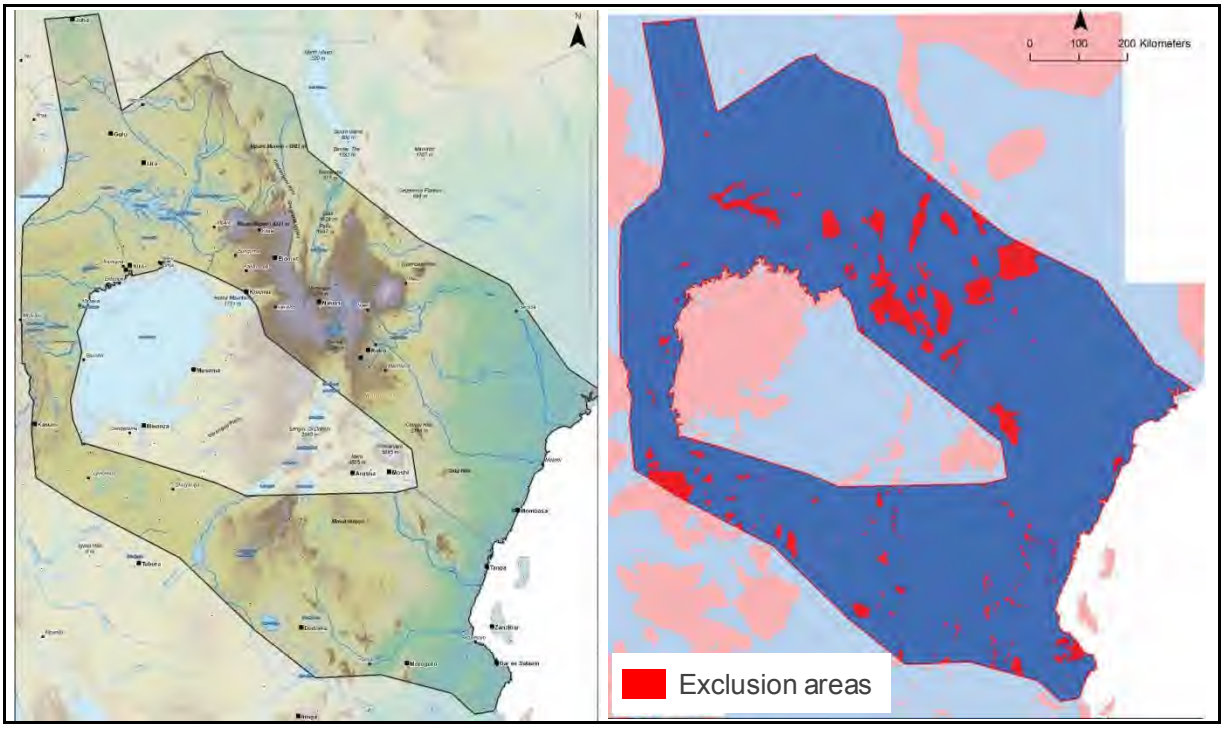


Figure 3.5-1 Routing Area of Interest (left) and Excluded Areas (right)

As a result of the spatial multi-criteria analysis, 11 potential 50-km-wide corridor combinations were identified as shown in Figure 3.5-2. Following route optimisation and offloading potential solutions were evaluated using the corridor and siting criteria, corridors 3 (South Kenya), 6 (Tanzania) and 11 (North Kenya) were selected as the most viable options and were recommended for further study.

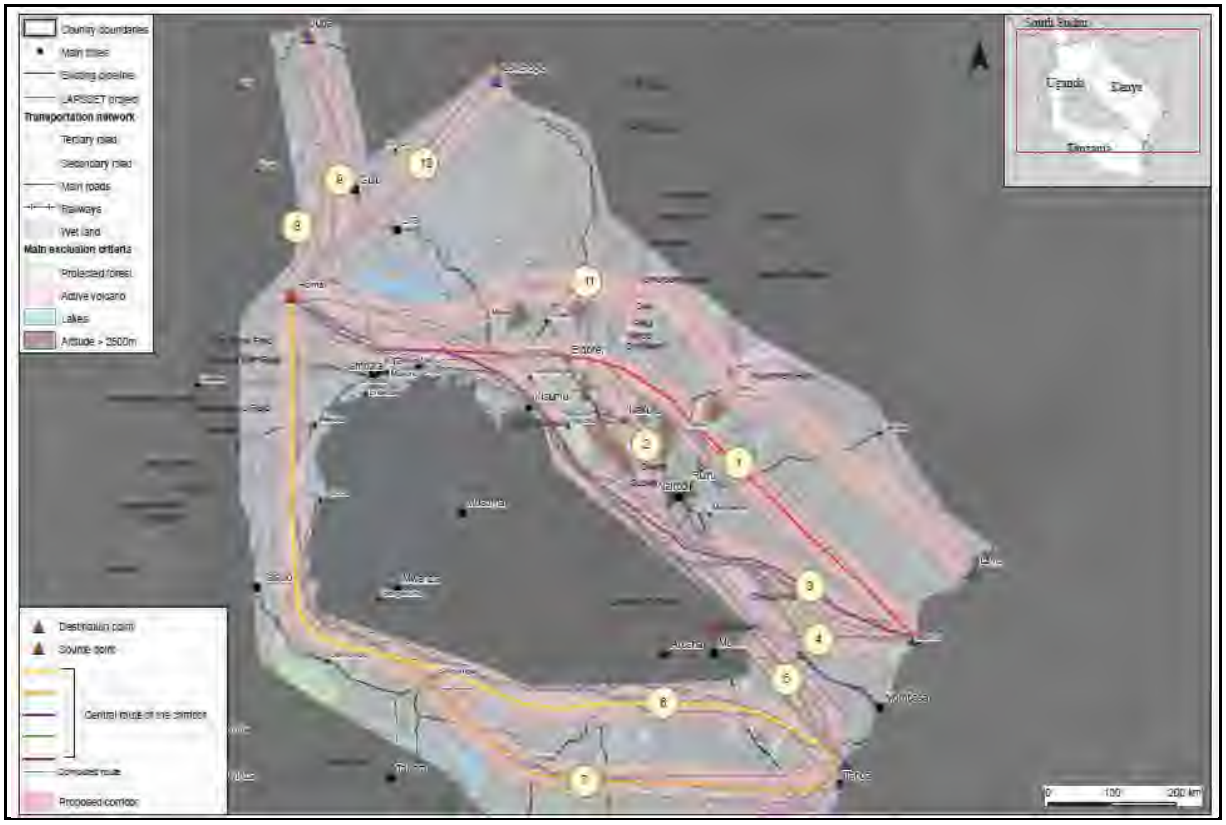


Figure 3.5-2 Pipeline Corridors

3.5.2.2 Corridor Options Screening

Corridors 3 (South Kenya), 6 (Tanzania) and 11 (North Kenya) were screened by applying biological, geological, physical, and socioeconomic criteria and using a range of secondary data. The screening assessment considered physical factors including topography, climate, hydrology and hydrogeology, geology and geohazards and soils.

The screening assessment identified some disadvantages of Kenya routing alternatives:

- North Kenya (Corridor 11) was routed through the northern portion of Kenya where there is a lack of existing transport and communications infrastructure, vast wetlands north of Lake Kyoga, proximity to active volcanoes and large areas of flash flooding (scour risks) potential.
- South Kenya (Corridor 3) would utilise the existing refined product pipeline corridor from Mombasa to Eldoret. The corridor would then pass through a highly populated region of Uganda along the north side of highway A104 into Uganda and then traversing northwest and south of Lake Kyoga toward Kabaale. The corridor does pass through densely populated areas and where encroachment within the corridor has occurred both in Mombasa and near Eldoret. The use of this corridor would lead to more extensive impacts on local population.

Feasibility studies highlighted the potential benefits of pipeline corridor options in Tanzania, which involves routing the Uganda section of the pipeline west of Lake Victoria in a southerly direction. After further investigation of corridor 6 it was

identified that the corridor was in proximity to two national parks, and therefore it was abandoned for the lengthier corridor 7. In particular, corridor 7 was found (as shown in Figure 3.5-2) to:

- be closer to existing infrastructure (roads, railway)
- reduce the number of river crossings
- provide a more suitable elevation profile for pipeline hydraulic design.

In early 2015 the project concluded that corridor 6 was not viable owing to the difficult mountainous terrain, remote areas, nationally protected biodiversity areas and touristic areas within Tanzania. Although the Uganda section of the EACOP pipeline for corridors 6 and 7 are the same (see Figure 3.5-2), the southern Tanzania option (corridor 7), was selected as the base case from Kabaale in Uganda (pipeline eventual starting point at kilometre point [KP] 0) to Tanga, Tanzania, and was subsequently used to develop route version V1.

The V1 route avoids most environmentally sensitive zones, i.e., protected land – forest reserves (FRs), wildlife reserves and national parks. An environmental and social screening study was then conducted that confirmed that constraints along the route were considered less substantial than the other routing options. For example, the South Kenya route crossing the Tsavo National Park and both Kenyan routes crossing the Nile River.

While there are some constraints (several rivers, Forest Reserves, cultivated areas and the presence of archaeological and heritage sites) in proximity of the pipeline route, much of the route traverses areas with low or negligible sensitivity.

The screening study also concluded that the pipeline constructability risks are substantially less because of the proximity of most of the route to existing transportation infrastructure. By avoidance of the technically challenging and environmentally sensitive areas, the pipeline operability is likely to be high, resulting in secure, dependable flows of crude oil through the lifetime of the pipeline.

3.5.2.3 Route Refinement

Figure 3.5-3 shows the selection process undertaken from pre-FEED versions V1, V2 and V3 through the FEED phase versions V4 to V6. With the inputs from detailed mapping, multidisciplinary studies and site visits, the pipeline corridor width was incrementally narrowed down from several kilometres through to 2000 m (V3) to 100 m (V4 and V5) and finally to a 30-m right-of-way (RoW) (V6) with a centreline.

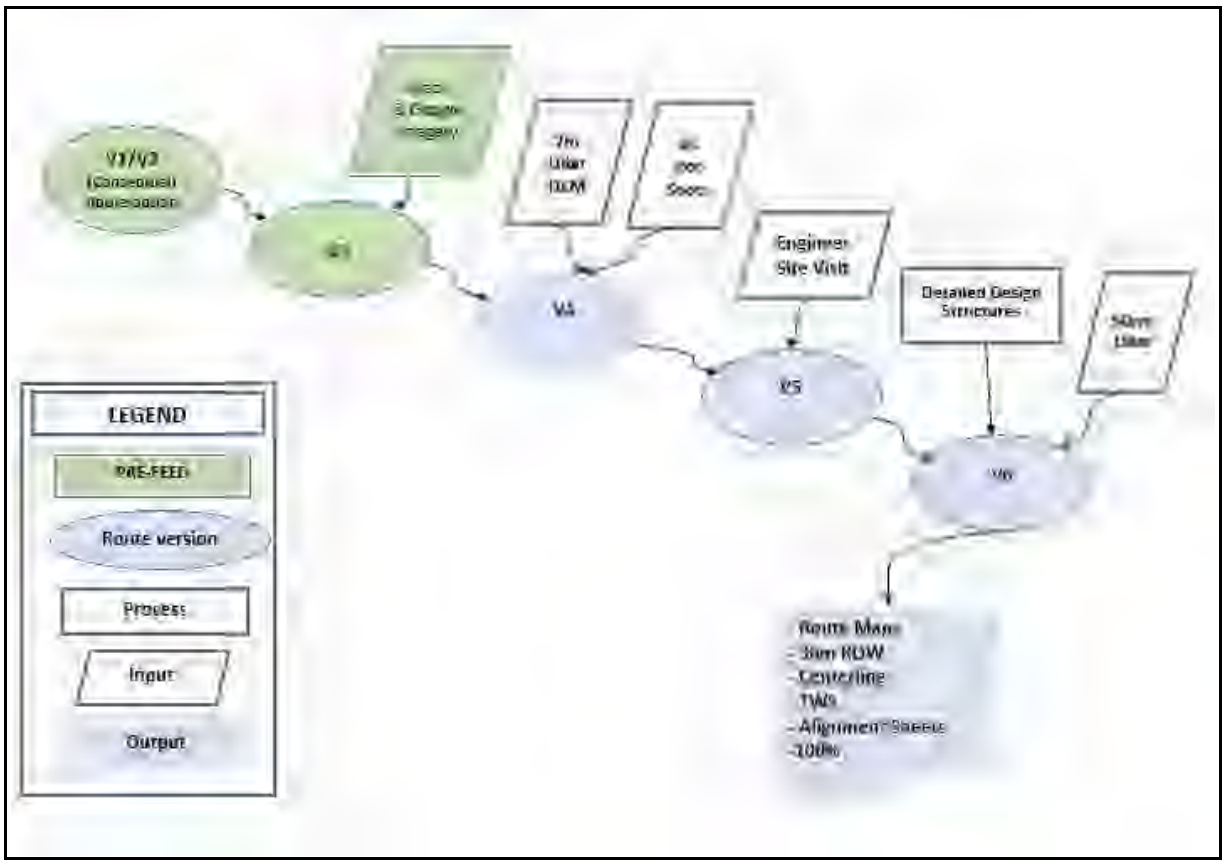


Figure 3.5-3 Route Refinement Process

The main routing criteria used to assess potential routes are shown in Table 3.5.1.

Table 3.5.1 Route Refinement Criteria

Technical Criteria	Environmental Criteria	Socio-economic and Cultural Heritage Criteria
Route length Lateral slope (>10° No Go unless very short distance or single instance) Front slope (>20° No Go unless very short distance or single instance) Number of cold bends and tie-ins due to terrain undulations Shallow bedrock (granite, gneiss – No Go) Wetlands (permanent and seasonal) River and stream crossing Road and track or rail crossing Fault crossing Other types of crossings Flooding hazard Landslide hazard Karsts, tunnels and mines (settlement hazard) Seismic zone with liquefaction risk (No Go) Earthquake zone Geological features Infill land and waste disposal sites, including those contaminated by disease, radioactivity or chemicals	Internationally Protected Areas (Ramsar sites, UNESCO World Heritage Sites) (No Go) Nationally Protected Areas (national park, wildlife reserve, wildlife sanctuary, FR, community wildlife management area, high biodiversity wilderness area) Waterbodies (lake, reservoir) (No Go) Internationally Designated Protected Areas (IUCN Category Ia, Ib and II) Internationally and Nationally Designated Protected Areas (IUCN III, IV, V and VI) Critical habitats[1] Natural habitats[2] Other notable biodiversity areas	Industrial areas (mines, factories, power plants) (No Go) Social and community infrastructure (including places of worship) RoW of existing or planned linear facilities Transport infrastructure Settlements (urban area, town, village) Structures within 50 m of corridor centreline Trees and timber forest Cash crop (e.g., tea, coffee plantation, sisal, sugar cane, banana) Water points, sources and wells Cultural heritage sites Tourism facilities and sites

Application of the criteria highlighted key routing constraints. These include routing around extensive shallow bedrock, passages between protected areas and through hilly terrain. For the sections of the pipeline route external to these constraints, further optimisation was implemented with the aim to balance pipeline length proximity to existing roads and the length of new access roads required. The route that best met the criteria was selected as the base case and was identified as version V2.

[1] Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and Endangered species; (ii) habitat of significant importance to endemic or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species or congregatory species; (iv) highly threatened or unique ecosystems; or (v) areas associated with key evolutionary processes (IFC PS6, 2012).

[2] Natural habitats are defined as areas composed of viable assemblages of plant and animal species of largely native origin, or where human activity has not essentially modified an area's primary ecological functions and species composition (IFC PS6, 2012).

3.5.2.4 Pre-Front-End Engineering and Design Route Optimisation (V2 to V3)

The V2 route was evolved to V3 route during pre-FEED as a result of multidisciplinary workshops including engineering, environmental and social input. The focus and effort to optimise the route was intended to improve the side and front slopes, avoid nationally protected areas, reduce impacts to perennial rivers and wetlands, and where possible, reduce the overall length. Improvement of the side and front slopes along the route is important for several reasons:

- During construction, the rate of elevation change (i.e., front slope) can increase the pipeline's cost and create challenges for accessibility to the RoW.
- Elevation difference is important, as it affects system hydraulics.
- Side slopes require side cuts and fills necessary for construction equipment to safely manoeuvre and install the pipeline. During operation, the RoW will tend to retain water which can destabilise the ground supporting the pipeline.

Route optimisation also identified pinch points where routing options are restricted as shown in Figure 3.5-4.

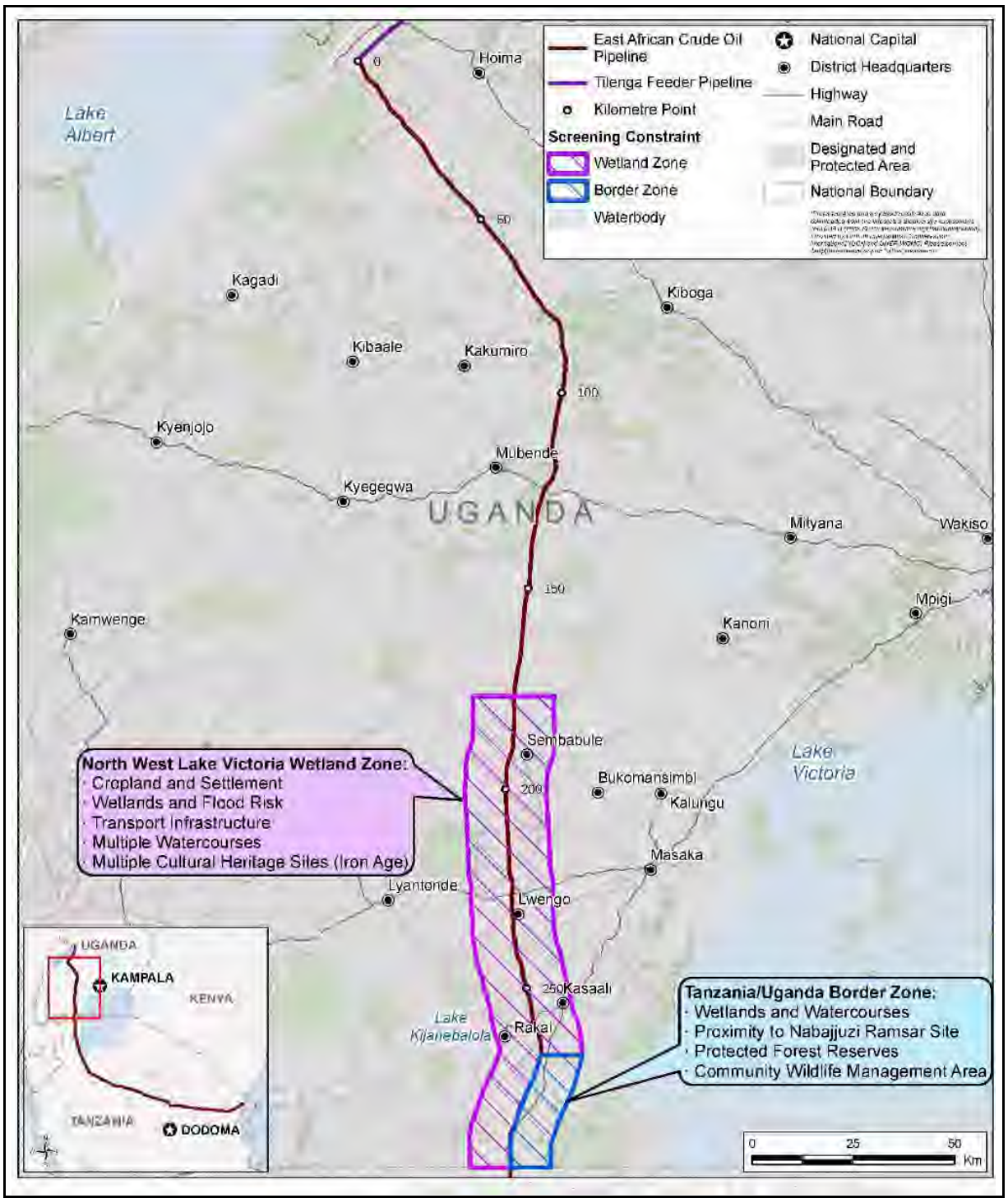


Figure 3.5-4 Pre-Front-End Engineering and Design Corridor EACOP Uganda Corridor Summary Constraint Zones

3.5.3 Front-End Engineering and Design

3.5.3.1 (V4 and V5) Routing Refinements

Version V3 was a 2000-m-wide corridor to guide the light detection and ranging (LIDAR) survey from the Kaabale industrial area to the Uganda–Tanzania border.

The LIDAR survey data produced a digital elevation model, which was used, along with other routing tools to select and refine the route. The DEM was used, along with other routing tools to select and refine the route. This included using satellite imagery to identify dwellings and other structures to aid routing. The output of this work was route version V4. The V4 corridor was then mapped with a 100-m-wide corridor, suitable for technical verification during engineering site visits to Uganda.

Data collected and ground truthing performed during an engineering site visit (April 2017) by a multidisciplinary team including environmental and social specialists was used to establish a centreline within the 100-m-wide corridor and to advance the V4 route to V5. Route V5 was then used:

- to produce route maps with a 100-m-wide corridor and a centreline
- as a basis for engineering, i.e., procurement of essential materials and long lead items, such as pipe, heat tracing, valves and hot bends
- to prepare the EACOP Uganda Scoping Report.

The following environmental and social constraints were applied during FEED to refine the pipeline corridor through route versions V4 to V5:

- avoid:
  - physical resettlement of local population to the greatest extent possible
  - creation of access roads to otherwise inaccessible areas
  - cultural heritage and archaeological sites to the greatest extent possible
- reduce:
  - economic resettlement, disruption to livelihood of local population
  - combustion, metal vapour emissions
  - project footprint (including the RoW, aboveground installations [AGIs], work sites, access roads)
  - land take; habitat and agricultural land lost
  - project disturbances (such as noise, light, vibration, dust)
  - groundwater abstraction and discharge
- restore habitats and hydrogeological regimes after construction.

Consistent application of this criteria has been of paramount importance while narrowing the study corridor from 2000 m down to the 100-m wide corridor with pipeline centreline (V5) and the 30-m-wide RoW (V6), see Section 3.5.2.3.

Route version V5 was used to support the ESIA scoping report, risk assessment, site-specific geotechnical and geophysical surveys, and in development of the main scope of work for detailed engineering.

An example of route V4 to V5 refinements for EACOP Uganda are shown in Figure 3.5-5 and include:

- minor route changes to avoid structures, villages, road crossings, tree plantations and to improve slope crossings
- slight route adjustment to accommodate the location of the proposed site for PS2.

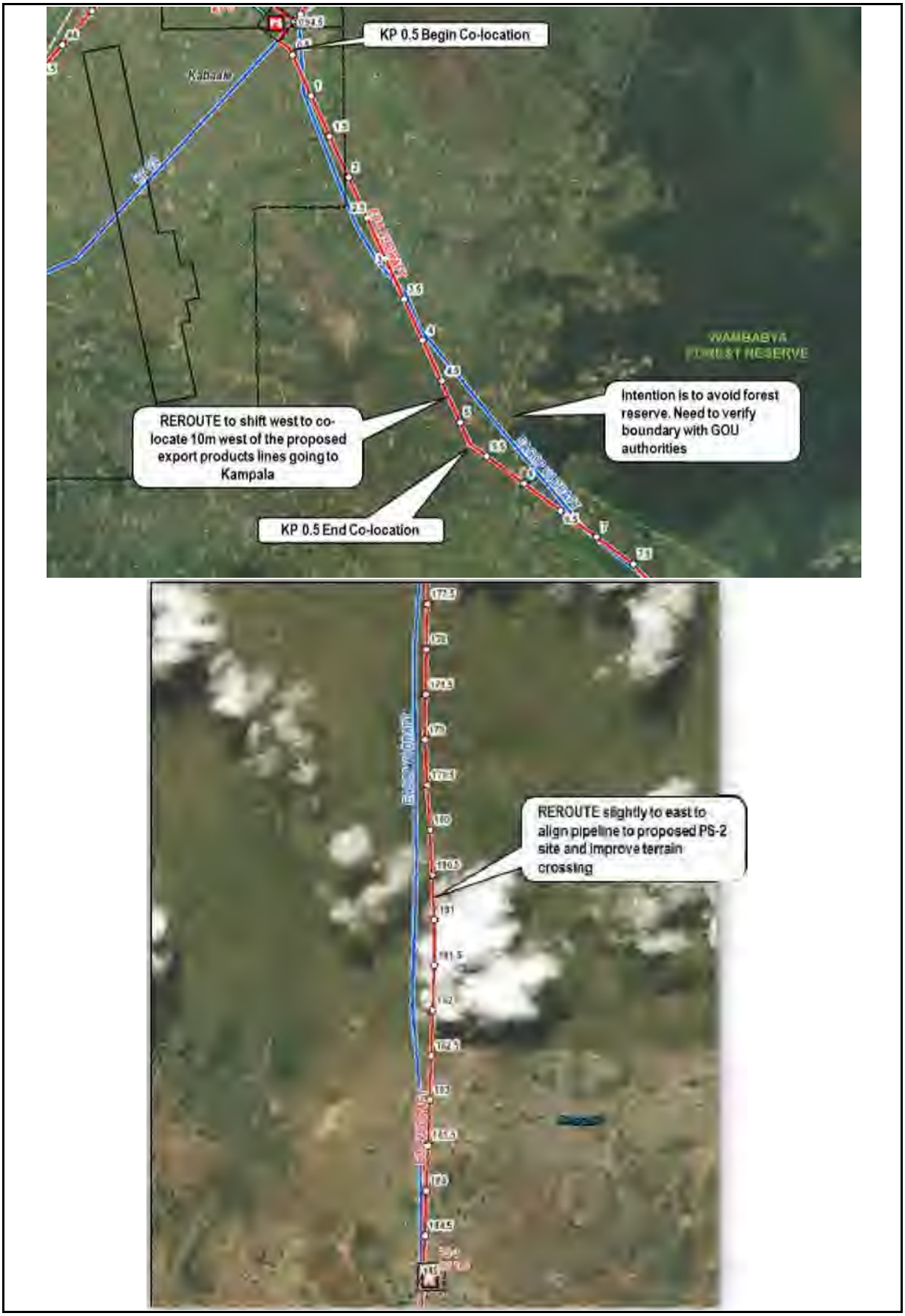


Figure 3.5-5 EACOP Uganda Route Refinements V4 to V5

In addition, specific consideration was given to potential impacts on chimpanzees. Preliminary studies demonstrated that the area west of Wambabya Forest Reserve traverses an area known as chimpanzee habitat.

The EACOP route passes in between Wambabya and Bugoma FRs which is an important chimpanzee migration corridor. In considering the potential effects in the area, two alternative routes circumventing the FRs were investigated and are shown in Figure 3.5-6 and are detailed below:

- northern alternative route toward the north of Wambabya FR and then travel southeast and reconnect with EACOP at KP20
- southern alternative route traversing south from Kabaale (instead of east between Wambabya and Bugoma FRs) and run parallel to Bugoma FR before turning east near the southern end of Bugoma and continuing along to travel in a north-easterly direction to connect back with the main alignment at KP58.

The study found evidence of chimpanzee presence along both northern and southern route alternatives, concluding that these alternatives would not provide better avoidance of chimpanzee disturbance. The main proposed route (V5 at the time of the study) was found to be the most viable option in conjunction with robust mitigation measures to reduce chimpanzee disturbance during pipeline construction (see Section 8 for proposed mitigations in the area).

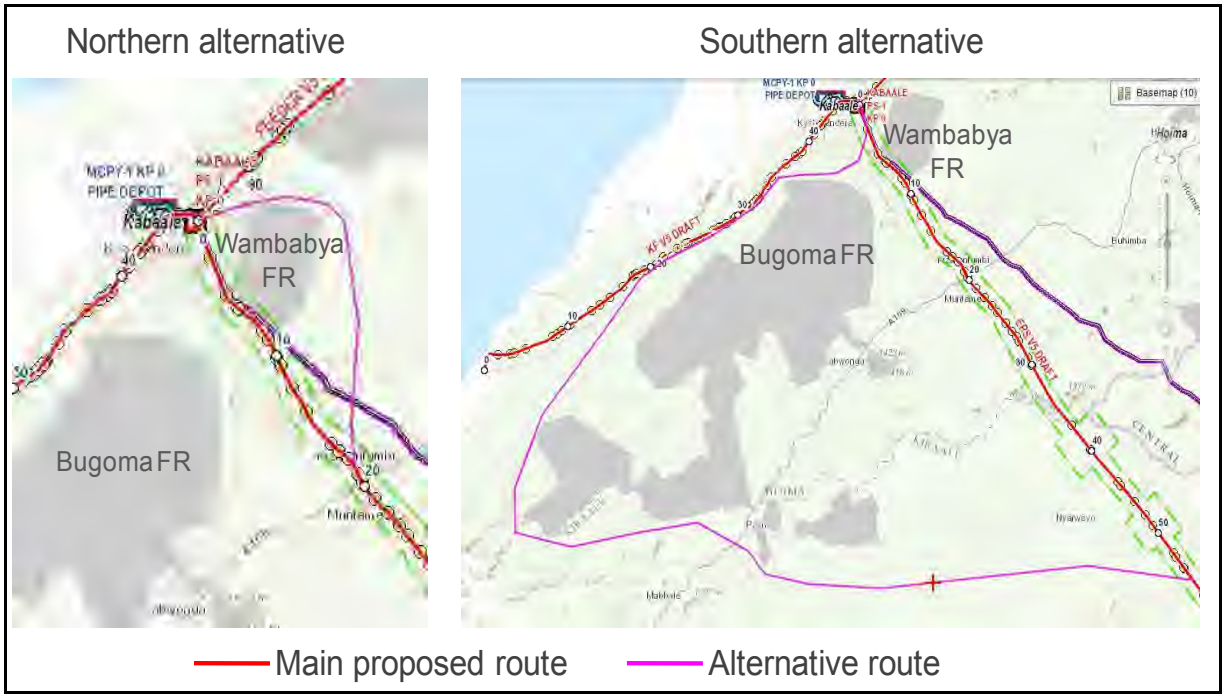


Figure 3.5-6 Alternative Routes around Wambabya and Bugoma Forest Reserves

3.5.3.2 V5 to V6 Routing Refinements

All refinements were minor, with most pertaining to constructability considerations and avoidance of structures, ecologically sensitive areas and watercourses. Updates in route version V6 also included:

- location and size of AGIs
- locations of the main line block valves, most of them aligned with intermediate electrical substations
- locations of construction camps and pipe yards.

3.5.3.3 V6 Base Case Route

The base case route of the 30 m RoW is shown in Figure 2.3-1. However, as investigations are on-going at the time of writing this ESIA, e.g., geophysical and geotechnical surveys, small-scale adjustments may still be made.

3.6 Facility Siting

3.6.1 Overview

This section describes the main alternatives assessed for the number, location, layout and footprint of the following facilities:

- AGIs
- construction facilities.

The functional requirements of the surface facilities have been the main driver for the identification, screening and final location selection.

The selection of appropriate sites for the PS was determined during pre-FEED by pipeline hydraulic studies. Additional imagery and site visits were used to establish locations during FEED. Siting of the electric substations is ongoing and will be refined based on further electrical studies, whereas the block valve locations have been defined based on detailed technological risk analysis.

The functional requirements vary for each type of facility and are described in this section. The selection process has also considered relevant safety, environmental and social constraints.

3.6.2 Aboveground Installations

The main driver for the type, number and location of the AGIs has been the technical specifications. In particular, the pumping station (PS) locations have been selected based on pipeline hydraulic requirements (design pressure and maximum operating pressures). However, additional criteria have been considered:

- thermal design requirements
- safety and environmental risk factors
- site physical conditions (topography, accessibility, proximity to existing infrastructure)
- environmental and social constraints.

3.6.2.1 Pumping Stations

During pre-FEED, three hydraulic design scenarios were considered. The requirement to maintain the hydraulic profile was the main influencing factor in determining the number and location of the PSs (see Figure 3.6-1).

Figure 3.6-1 Pressure Profile and Pumping Station Locations

The PS locations (PS1 at Kabaale Industrial Park and PS2 for EACOP Uganda) have been identified by the points on the pipeline where at maximum flow, the pressure in the pipeline falls to approximately 6 barg; regard was also taken of topographical profile so as not to locate the PS in a deep dip.

Table 3.6.1 summarises the design alternatives considered for the pipeline. Case 2 was assessed to reduce design pressure and Case 3 was assessed to reduce the number of PSs.

Table 3.6.1 Pipeline Design Cases During Pre-Front-End Engineering and Design

Design Case	Scenario	Key Drivers
Case 1 Base Case	24 in. 6 PSs	Confirmed base case for FEED
Case 2 – Design Pressure Reduction Case	26 in. 6 PSs	Reduce design pressure to continue with Class 600 piping
Case 3 – PS Reduction Case	24 in. 5 PSs	Reduce number of PSs

The studies concluded that Case 1 should be maintained as the base case for FEED.

Preliminary locations based on hydraulic modelling are shown in Table 3.6.2. The actual location of the PSs has been amended iteratively concurrently with pipeline route refinement. In addition, a site visit was undertaken in May 2017 to validate the proposed locations of the AGIs based on the following:

- accessibility and distance to infrastructure (suitable access roads)
- geotechnical information (expected ground conditions, presence of escarpments, wetlands, flood potential, seismic data)
- societal impact (population displacement and land use).

The initial locations of PSs during pre-FEED, summary of site visit findings and iterations undertaken with the routing team are summarised in Table 3.6.2.

Table 3.6.2 Preliminary and Final Pump Station Locations for EACOP Uganda

	PS1	**PS2**
KP (Concept Study, Route V1)	0	228
Results of Site Visit May 2017	Access to PS1 will require 5 km of access road Steep (7%) grade leading to PS1 site	PS2 to be moved to south (KP181 – KP182) Shorter access and wider high ground.
KP (Final Route V6)	0	184.5

3.6.2.2 Electric Substations

As described in Section 2.3.3.3, the electric substations house transformers required for power transmission through the high voltage cable and step down transformers to provide the required voltage for the electrical heat tracing (EHT) system. The rationale for siting of electric substations is based on the overall number of substations required by the trace heating system, i.e., maximum cable length of 30 km and therefore, the maximum distance between power supplies required would be 60 km.

During FEED, the siting of the electric substations was reviewed and, where possible, combined with the AGIs and block valves. The number of substation combinations with AGIs and block valves, and the standalone substations are shown in Table 3.6.3.

Table 3.6.3 Electric Substation Siting – Combined and Standalone

Facility	**EACOP Uganda**
Standalone electric substations	1
Substations combined with AGI	2
Substations combined with block valves	4
Total	7

3.6.3 Block Valves

The primary function of block valves is to isolate sections of the pipeline and the number and location of block valves is based on ASME B31.4 (434.15), which requires that block and isolating valves shall be installed to:

- limit hazard and damage from accidental discharge
- facilitate maintenance of the piping system.

The number and location of valves has also been informed by risk assessment based on safety and environmental risk considerations. Preferred locations include:

- upstream side of major river crossings and public water supply reservoirs
- at other locations appropriate for the terrain features
- at remotely controlled pipeline facilities to isolate segments of the pipeline
- on the inlet and outlet of pump stations whereby the pump station can be isolated from the pipeline
- in industrial, commercial, and residential areas where construction activities pose a risk of external damage to the pipeline.

Based on these preferences, block valves were sited at:

- every PS
- long continuously ascending or descending elevation profile
- on each side of wetlands and major water crossings (> 30 m wide)
- at each river or stream < 30 m wide, where downstream impacts from a pipeline leak could impact populations, reservoirs, waterways and sensitive areas.

Further evaluation and optimisation of block valve locations was undertaken when the list of electric substations required for the pipeline heat tracing system became available during FEED. Additional work was then performed to combine the locations for block valves and electric substations as much as possible to optimise facilities' footprint and access requirements.

The results of the optimisation process of block valve placement for EACOP Uganda pipeline are as follows:

- elimination of 8 block valves
- combining 4 block valves with electric substations
- 15 standalone block valve stations along the RoW
- total of 19 block valves in the RoW.

3.6.4 Construction Facilities

There is a requirement to establish four main camp and pipe yards (MCPY) within Uganda to support construction operations. The construction facilities site selection process has taken into consideration the requirement to:

- minimise land acquisition
- reduce distance from existing road networks
- avoid populated and protected areas
- take cognisance of the terrain type and topography suitability
- water availability.

In September 2016, a construction site overview was undertaken to assess locations proposed for the V3 route. The locations were subject to preliminary assessment based on the criteria in Table 3.6.4.

Table 3.6.4 Construction Facility Location Selection Criteria

Technical	Environmental	Social
Facilitate access to RoW for the MCPY Facilitate access for pipes from main roads and rail for coating facility (CF) Availability of water Availability and capability of local contractors to undertake the required scopes	Limit footprint and impact by minimising requirements for temporary roads Avoid nationally protected sites and internationally recognised sites of conservation interest and critical habitats Topography Terrain type (avoiding wet areas) Potential geo-hazards (such as flood zones, faults)	Avoiding resettlements or limiting extent of resettlement Clear of villages and schools Social and community infrastructure (including places of worship) Settlements (urban area, town, village) Cash crop (e.g., tea, coffee plantation, sisal, sugar cane, banana) Water points, sources and wells Cultural heritage sites, Tourism facilities and sites Land use Avoid the clearance of trees/timber forests, existing crops and bush in dry areas (where crops would be easier to restore) Clear of military facilities

The three criteria for construction facility location as shown above were applied together with the relevant criteria used for the pipeline route selection as shown in Table 3.6.4.

Each of the MCPY locations identified in Uganda have been evaluated and the optimum locations selected and as shown in Figure 2.3-9. During the construction site overview, for each of the MCPY locations three options were identified:

- V3 route suggestion identified in early FEED
- Alternate 1
- Alternate 2.

The location selection process for the main camps is provided below.

3.6.4.1 MCPY 1

Figure 3.6-2 shows the three alternative locations considered for MCPY1.

Alternative 1

Alternative 1 is in Kigujula village, Kakumiro district near KP49 and approximately 1.8 km west of the EACOP RoW along Nkoko-Nalweyo road (Figure 3.6-3). Houses are within the footprint of Alternative 1; to avoid physical resettlement, this site was not selected.

Alternative 2

Alternative 2 is close to the EACOP RoW at KP39 (Figure 3.6-4). The footprint for Alternative 2 includes several houses and is close to the Kasambya trading centre. To avoid physical resettlement and the potential to impact negatively on the Kasambya trading centre, this site was not selected.

Alternative 3

Alternative 3 is in Kasambya village, Kakikara subcounty, Kakumiro district near KP39.3 along the Buhimba–Nalweyo road (Figure 3.6-5). Alternative 3 was selected as the MCPY 1 location because it does not include houses thus avoiding physical resettlement. The location is also near the main road (currently being upgraded to tarmac), the pipeline RoW and level terrain used for farming, and therefore is of low biodiversity value.

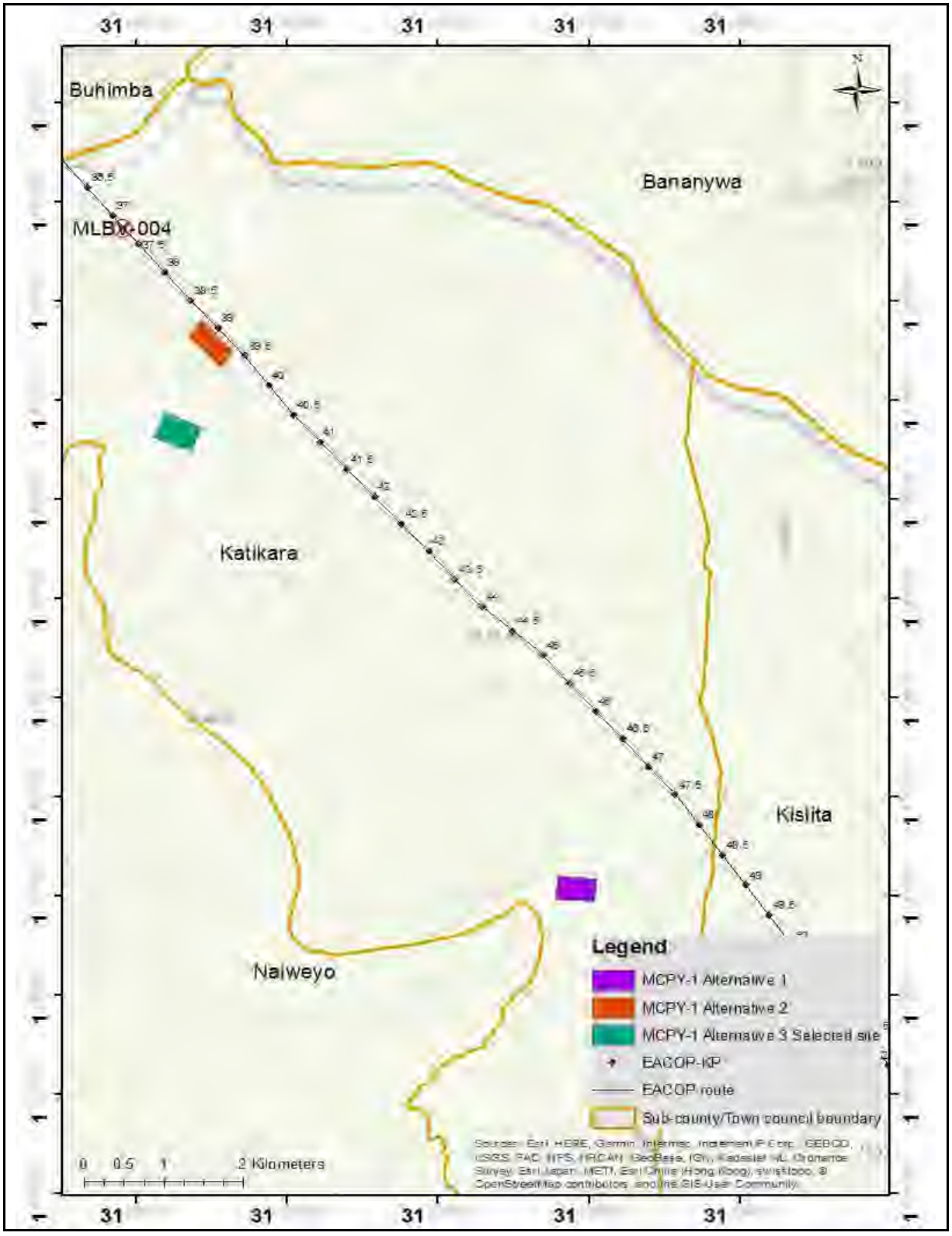


Figure 3.6-2 Main Camp and Pipe Yard 1 Alternative Locations

Figure 3.6-3 Main Camp and Pipe Yard 1 Alternative 1

Figure 3.6-4 Main Camp and Pipe Yard 1 Alternative 2

Figure 3.6-5 Main Camp and Pipe Yard 1 Alternative 3 – Selected Location

3.6.4.2 MCPY 2

The three alternative locations considered for MCPY2 are shown on Figure 3.6-6.

Alternative 1

Alternative 1 at KP122 (Figure 3.6-7) was rejected because of the presence of rock outcrops, a community access road and uneven terrain within the site footprint, and a settlement directly outside the fence line.

Alternative 2

Alternative 2, near KP122 in Lugala LC1 village, Kagoma parish, Kitenga subcounty, Mubende district (Figure 3.6-8), was also rejected. Although the site is level and well drained, it overlays coffee and banana plantations and a graveyard with six graves (see Figure 3.6-9), with one house in and another eight directly outside the fence line. Access to this location would require relocation of houses close to the road or acquisition of land for a 2.7-km long new road. This location was not selected owing to cultural and social constraints.

Alternative 3

Alternative 3, directly adjacent to Alternative 1 (Figure 3.6-7), is along the Mubende–Kampala road in Mijunwa village, Kitenga subcounty, Mubende district. This location was selected for MCPY2 owing to its proximity to a sealed (tarmac) road near the RoW, a key requirement for the safe and reliable delivery of

construction materials. The location has some terrain and drainage challenges, but these can be addressed through engineering designs that allow ample room for maintaining natural drainage (see Section 2.3.3.2 for general surface water design for site layout and Section 2.3.4.1 for location-specific surface water management considerations).

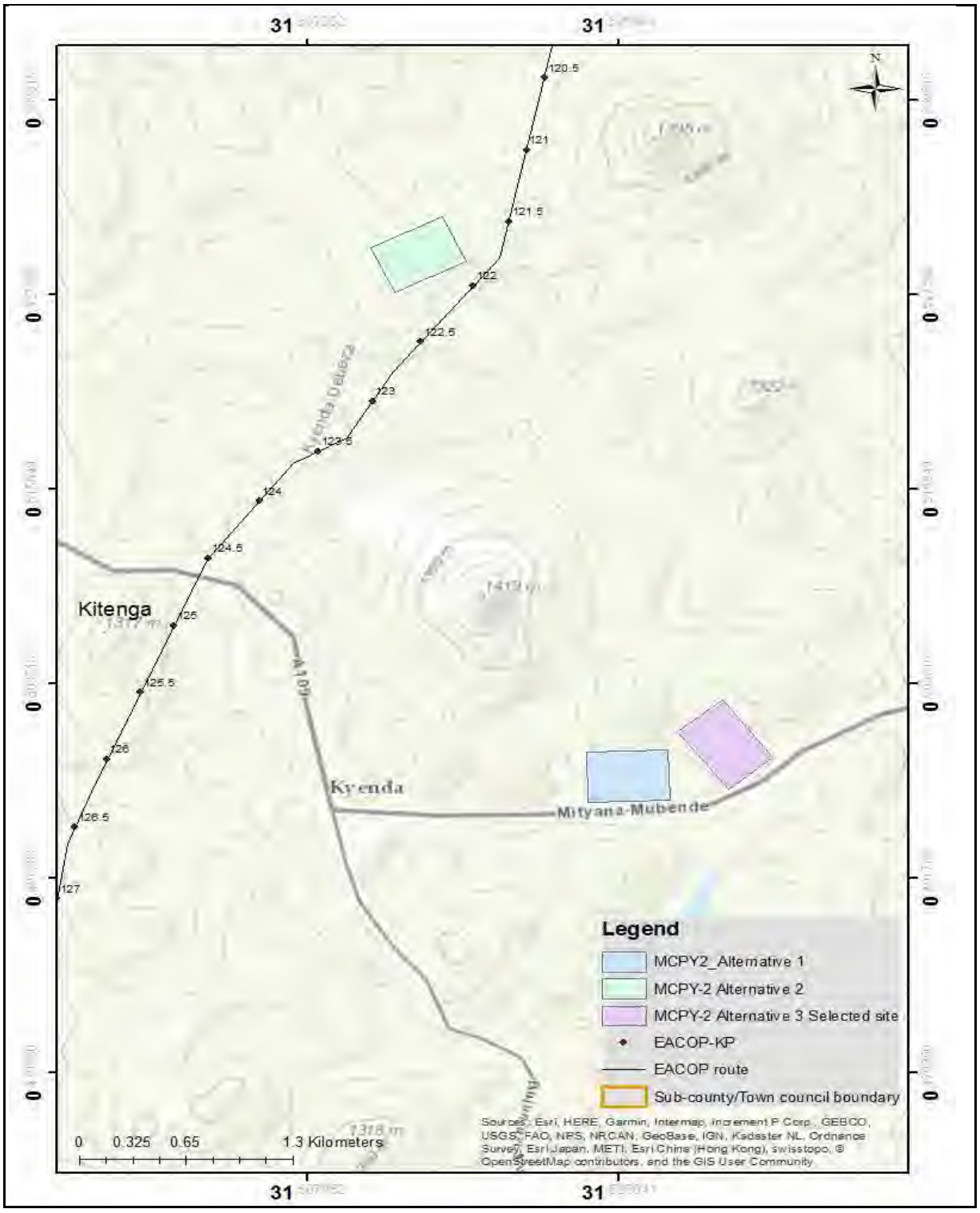


Figure 3.6-6 Main Camp and Pipe Yard 2 Alternative Locations

Figure 3.6-7 Main Camp and Pipe Yard 2 Alternative 1 and 3 - Selected Location

Figure 3.6-8 Main Camp and Pipe Yard 2 Alternative 2

Figure 3.6-9 Main Camp and Pipe Yard 2 Alternative 2 – Graveyard

3.6.4.3 MCPY3

The three alternative locations considered for MCPY3 are shown on Figure 3.6-10.

Alternative 1

Alternative 1 is 360 m south of Villa road in Sembabule district near KP190 (Figure 3.6-11). During the location selection process, there was a much larger coffee plantation at this location. The location was not selected because of the potential livelihood and social impacts.

Alternative 2

Alternative 2 is near Villa road in Sembabule town council (Figure 3.6-12). As a section of the location lies within a floodplain, which poses flood and drainage risks, this location was not selected.

Alternative 3

Alternative 3 is in Sembabule district near KP191.2 (Figure 3.6-13). The location is level and, since completion of the location selection process, coffee plantations have been established within the footprint. However, with due consideration that adequate and fair compensation and livelihood restoration will be provided to the PAPs, this location was the selected MCPY3 location owing to its advantages over the other two alternatives.

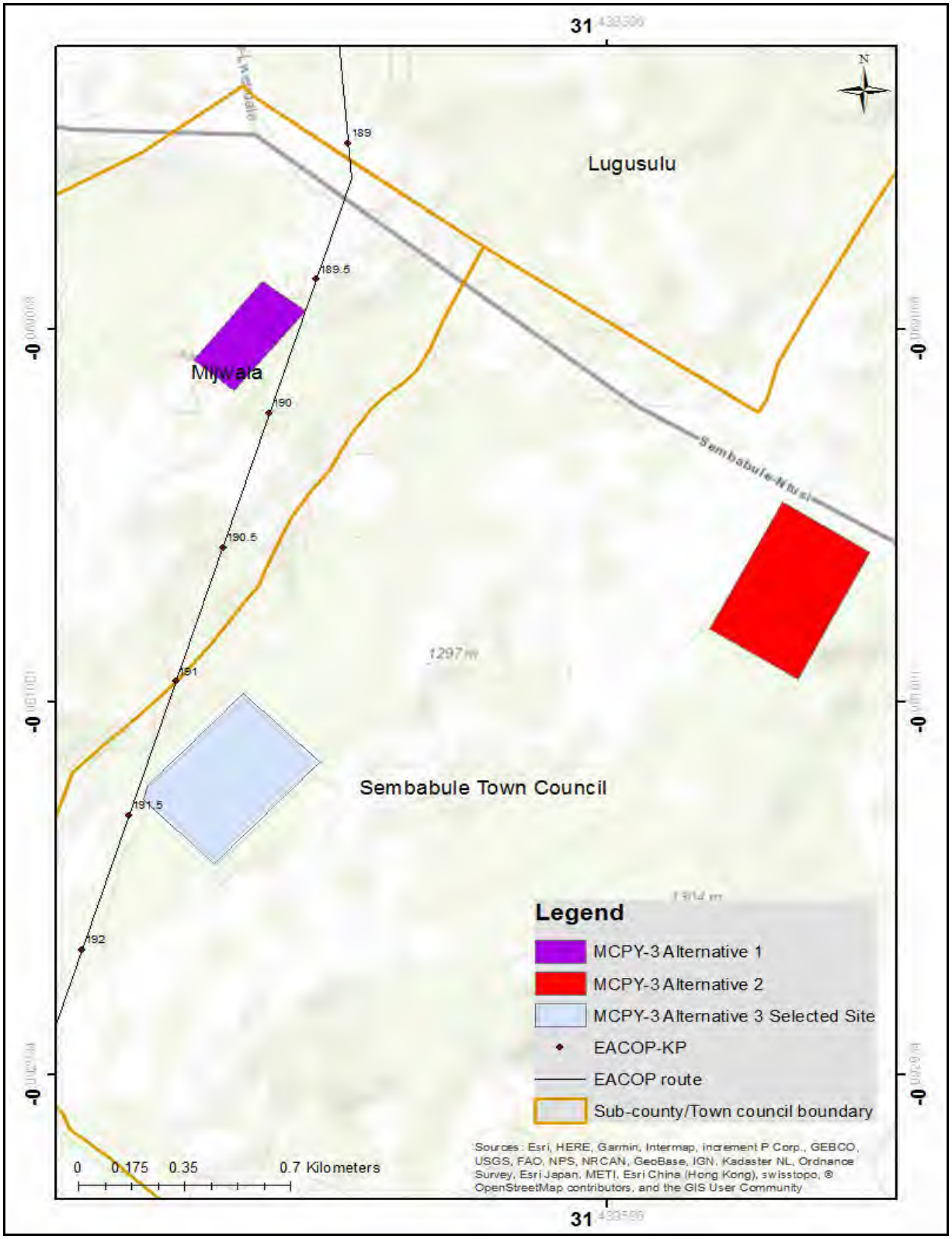


Figure 3.6-10 Main Camp and Pipe Yard 3 Alternative Locations

Figure 3.6-11 Main Camp and Pipe Yard 3 Alternative 1

Figure 3.6-12 Main Camp and Pipe Yard 3 Alternative 2

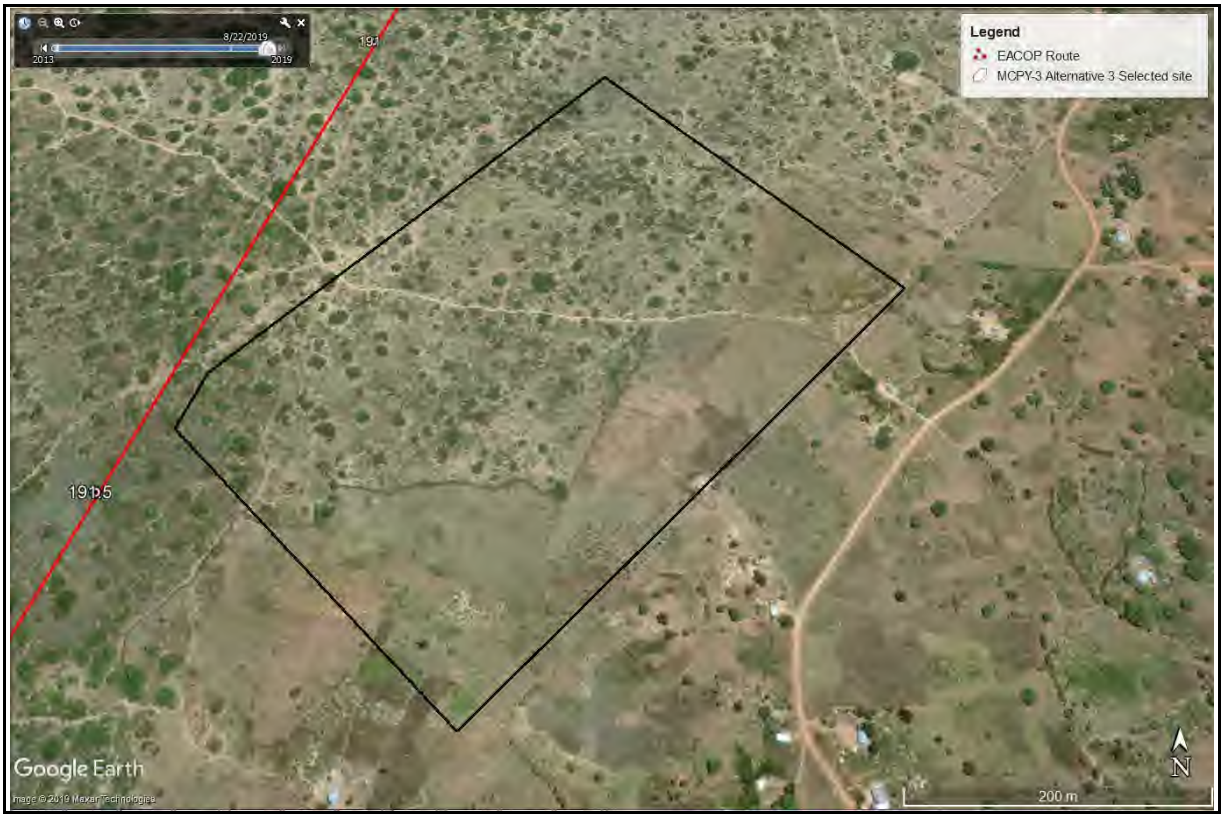


Figure 3.6-13 Main Camp and Pipe Yard 3 Alternative 3 – Selected Location

3.6.4.4 MCPY4

A four-phase process was undertaken for selecting a location for MCPY4:

- Phase 1: A selection process undertaken in 2016 identified a preferred location at KP259.5 shown on Figure 3.6-14.
- Phase 2: Subsequent Alternative 1 at KP258, shown on Figure 3.6-15, and Alternative 2 at KP262.5, shown on Figure 3.6-16, were identified following subsequent social and environmental constraints and constructability studies. Considerations of these alternatives included:
  - identified houses, crops and terrain constraints at the original site location. Alternative 1 proposed at KP258
  - area between KP261 and 262.5 was acceptable for Alternative 2
  - Phase 2 Alternative 1 and 2 may require some resettlement
  - Phase 2 Alternative 2 is on higher ground than the other locations
  - relocation to KP258 recommended: large flat area (groves of wild coffee) east of RoW (Alternative 1, sandy ground showing white on Figure 3.6-15) with good track access)
- Phase 3: Construction facilities assessment work undertaken during FEED identified further constraints associated with flood risk, increased infrastructure requirements and societal impact owing to proximity to population; therefore, an additional site was identified at KP288. The location at KP288 as shown in Figure 3.6-17 was found to be generally level with no, or limited, agricultural activity, required no relocation of structures and had good access to a main tarmac road. Although there are ecologically valuable habitats adjacent to the

site, the avoidance of population, seasonal wetlands, fewer impacts from shorter access roads and the avoidance of agricultural lands was considered an appropriate compromise. Therefore, this location was chosen as the optimum location for MCPY4.

- Phase 4: In mid-2018, the KP288 location had to be rejected because of a dispute between two landowners and the identification of caves on the location that serve as habitat for an endangered species of butterfly. Alternative 1 at KP283, as shown Figure 3.6-18, and Alternative 2 at KP282, shown on Figure 3.6-19, were identified. Considerations of these alternatives included:
  - Phase 4 Alternative 1 is mainly used for cattle grazing with a small portion of the area used for crop cultivation and forestry. The cultivated area represents approximately 10% of the area, is flat and is not near a protected area.
  - Phase 4 Alternative 2 has a neighbouring Catholic church and several homesteads. About 90% of the land is used for community crop cultivation, and the soils within the location are quite fertile.
- Because of the potential impacts to community livelihood and local food security and livelihood restoration risks associated with Phase 4 Alternative 2, Phase 4 Alternative 1 has been selected as the optimum location for MCPY4.

Figure 3.6-14 Phase 1 Location Selected for Main Camp and Pipe Yard 4 at KP259.5

Figure 3.6-15 Phase 2 Alternate 1 for Main Camp and Pipe Yard 4 at KP258

Figure 3.6-16 Phase 2 Alternate 2 for Main Camp and Pipe Yard 4 at KP262.5

Figure 3.6-17 Phase 3 Main Camp and Pipe Yard 4 Location at KP288

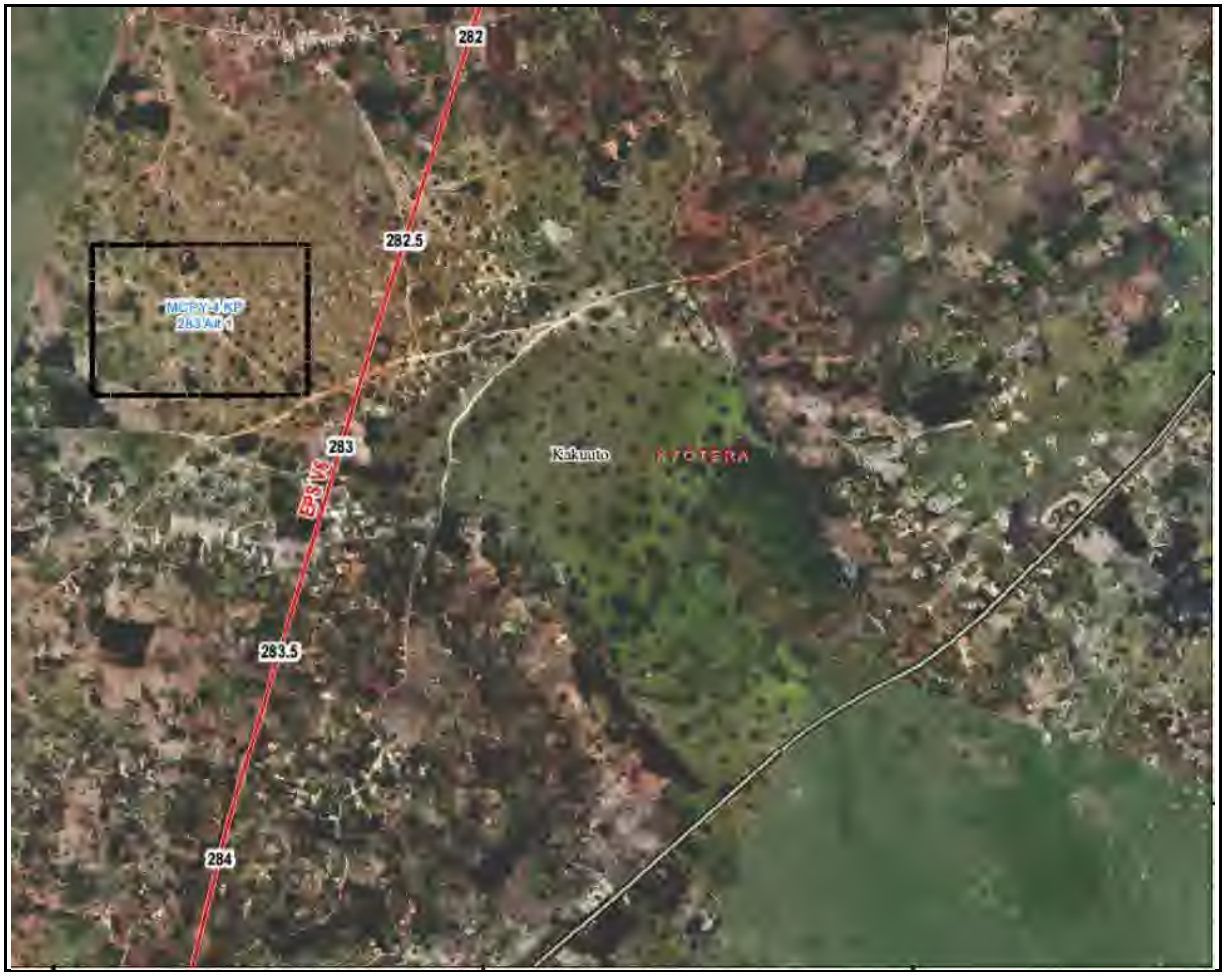


Figure 3.6-18 Phase 4 Alternative 1 for Main Camp and Pipe Yard 4 at KP283 – Selected Location

Figure 3.6-19 Phase 4 Alternative 2 for Main Camp and Pipe Yard 4 at KP282

3.7 Technology

3.7.1 Overview

This section describes the main design alternatives to the project base case as described within Section 2.3. The pre-FEED phase focused on the screening and option evaluation of the main technology alternatives while FEED has concentrated on further refinement. The process has focused on the following elements of the design:

- pipeline (diameter and wall thickness)
- pumps
- power generation
- insulation
- heating.

The challenges associated with flow assurance as well as the requirement to select the most suitable option for storage and loading have been the main considerations throughout pre-FEED and FEED with respect to technology selection. Several design alternatives have been subject to screening and evaluation as described in the following sections.

3.7.2 Pipeline

A partially aboveground pipeline alternative was considered during early pre-FEED but was discounted for numerous reasons including concerns associated with security and safety, risk of interference by third parties, permanent land take, visual impacts and impacts to large wildlife movement. Furthermore, pipeline design codes that would later be adopted by the EACOP project require pipelines to be buried. Therefore, the concept selected for study at pre-FEED was a trenched and buried pipeline.

Two strategies were considered to enhance oil flow required by the oil characteristics:

- a cold transport option requiring the partial removal of paraffinic components ensuring that gelling of the oil is prevented. This requires some oil processing and is extremely expensive. Consequently, this alternative was screened out.
- a hot transport option aimed at maintaining the fluid temperature above 50ºC with the use of thermal insulation, and a combination of heating options. Hot transport was selected as the base case for further study.

Various studies considered the alternative pipeline options and recommended the most suitable and practical means to be taken forward for study during FEED. The key consideration at that stage was the hydraulic design concept, namely:

- Case 1 (Base Case): 24'' – six PS
- Case 2 (Design Pressure Reduction): 26'' – six PS
- Case 3 (PS Reduction): 24''-26''-24'' – five PS.

The main conclusions from the pre-FEED studies were that Case 1 (24 in. with 6 PS) should be taken forward as it is the most balanced option in terms of meeting technical and economic criteria. Case 1 is also considered to be the most suitable case for phasing of bulk heaters as no heating is required at commissioning, ramp up and production plateau.

3.7.3 Pumps

3.7.3.1 Type

The pump technology selection has been determined by the characteristics of the Albertine Graben fluid (viscous with no GVF[3]), which means that volumetric pump types are not viable. Therefore, centrifugal pumps are considered the most suitable design for the fluid type because they are proven technology, robust, and cost effective.

3.7.3.2 Number and Configuration

During pre-FEED, the number of PSs for the EACOP System was optimised from seven to six. The effect of removing a PS was studied to evaluate the impact on the maximum design pressure. It was decided to eliminate one PS from the design and relocate PS3 and PS4 to compensate for the eliminated PS.

[3] Gas Volume Fraction

The crude oil pump configuration was optimised during FEED from four with an operating capacity of 33% per pump (3+1) to three with an operating capacity of 50% per pump (2+1). This was possible through a review of the pump sizes required for the standard pumping requirements for PS1 to PS5, and for the higher manual of practice requirements at PS6. The study concluded that the 3 x 50% configuration requires a smaller overall footprint owing to the removal of one pump.

3.7.4 Power Generation

The power generation for the EACOP Uganda facilities is described in Section 2.3.3.2 and its primary function is to:

- provide power for pumps
- energise the EHT.

The pre-FEED for power generation studies confirmed that PS2 to PS6 would be self-contained with individual crude oil fired power generation units. For EACOP Uganda, an optimisation study was undertaken during FEED. The objective of the study was to clarify the interfaces between Tilenga upstream and EACOP projects in terms of power supply considering that both PS1 and PS2 could be powered from the Tilenga CPF. The outputs from the flow assurance studies were reviewed and the consequences on power requirements (in terms of design and operation) on the Tilenga CPF were assessed mainly with regard to:

- power demand under flowing mode (3 × pumps at 216 kbpd)
- power demand during preservation mode with EHT
- essential power required for EACOP during shutdown of Tilenga CPF.

The main conclusions from the study are as follows:

- Under flowing conditions, PS1 and PS2 are supplied from Tilenga CPF power generation package and shall be designed for full load under “normal” operating conditions.
- Under static conditions (preservation mode), the normal power generation of Tilenga Project CPF must be designed to preserve the pipeline and will thus meet the load demand of the EHT at 30 W/m.
- No standalone power generation at PS1, provision shall be made at PS1 for connection of a temporary generator to meet EHT demand in preservation mode if necessary.
- No standalone power generation at PS2, provision shall be made at PS2 for the connection of a temporary generator to meet EHT demand in preservation mode if necessary.

The study conducted during FEED allowed the requirement for standalone power generation at PS1 and PS2 to be removed from project scope thus reducing emissions, visual impact and footprint at the PSs for power generation facilities.

Power generation for the MCPYs will be provided by generators. The project evaluated the option of power supply from the grid, but this was not taken forward due to the lack of required infrastructure in the vicinity of the camps as well their temporary nature. However, the use of generators for power supply will be reassessed by the responsible contractor prior to camp construction.

If generators are selected, they will meet the PES for noise and emissions.

3.7.5 Thermal Insulation

The pre-FEED assessed insulated and un-insulated pipeline options. The steady state analysis concluded that heat losses with the un-insulated case would require 35 separate crude fired heating stations resulting in high crude consumption, larger project footprint, larger environmental impact and operational costs. Conversely, applying thermal insulation on the pipeline concluded the heating requirements could be optimised with power for heating being provided from six stations with lower crude consumption, lower project footprint, less requirement for facilities, higher initial cost, but more economical over the lifetime of the project.

Several existing pipe thermal insulation alternatives were screened in terms of thermal efficiency, availability and constructability as summarised in Table 3.7.1. The decision was taken to incorporate poly-urethane foam (PUF) as the base as it offers the highest thermal efficiency with lowest Capex.

Table 3.7.1 Insulation Alternatives

Insulation Type	Characteristics		Conclusion
PUF	Lower thermal conductivity New coating plant required with high productivity Two methods possible for foam application: spray or moulding Excess foam material above heat tube or raceway is to be removed with spray process Polyethylene jacket added over foam to provide mechanical protection Many references of pipeline in service		Accepted as base case
Glass	Higher thermal conductivity makes it less efficient Conventional pipeline construction including bends Field applied in long lengths with glue or resin and external membrane High manpower requirement making it not suitable for long pipelines Very limited references essentially for piping in plants Pre-cut grooves fit over pipe or channel/heat tape		Not selected for main line because of lower thermal efficiency and lack of references – possible use at field cold bends (approx. 4000 pipe joints, i.e., 70 km) Under evaluation vs cold bending of high-density PUF application

Table 3.7.1 Insulation Alternatives

Insulation Type	Characteristics		Conclusion
Pipe in Pipe (PIP)	High linear weight making it suitable for wetlands Water ingress risk very low owing to welded construction Field bends possible with care External steel sleeve implies additional welding and coating		Not selected because of higher Capex

3.7.6 Heating

The temperature management principles of the pipeline are to:

- maintain operating temperature above 50°C at all times during export conditions (normal, transient and degraded modes)
- ease commissioning and ramp-up phases by maintaining fluid temperature above 50°C
- under no flow condition, i.e., preservation, temperature shall be maintained by the EHT above 50°C
- allow a cold restart from minimum ambient temperature up to 50°C.
- no bulk heating (BH) will be required during production plateau, providing the fluid export temperature from Tilenga Project CPF is exported at 80°C
- after plateau and throughout production decline, BH may be introduced to support EHT in maintaining the crude oil temperature above 50°C in flowing conditions to provide a more energy efficient solution overall for the low flow cases. EHT will still be required for cold restart.

Three heating configurations were considered to maintain the oil temperature above 50°C:

- Case 1 – EHT only case
- Case 2 – BH only
- Case 3 - EHT + BH (mixed heating architecture).

EHT is considered the optimal design case during commissioning, ramp up and production plateau for flowing conditions as it provides numerous operational advantages by providing:

- active heating to maintain fluid temperature continuously in all export modes
- preservation management to maintain temperature above 50°C during no flow condition
- the only method of heating the pipeline in the event of cold restart.

For Case 1, although EHT is considered less efficient than BH in terms of crude consumption, the implementation of EHT is mandatory from a flow assurance perspective. A screening exercise was undertaken during pre-FEED to assess operating the pipeline with EHT only throughout field life. Although the study concluded that EHT can provide the heat required throughout field life, the use of

combined BH and EHT is considered more efficient during operations to compensate crude oil temperature during the latter stages of production with low flow cases.

Case 2 includes localised heating at each station with a discharge temperature such that the fluid arrival temperature at the next station is maintained above the minimum (50°C). This type of heating has large heat losses in comparison to EHT as shown in Figure 3.7-1. It is estimated that up to 13 BH stations would be required along the pipeline route. The study concluded that the flow assurance requirement for EHT was deemed to be the most critical factor and this option was discounted.

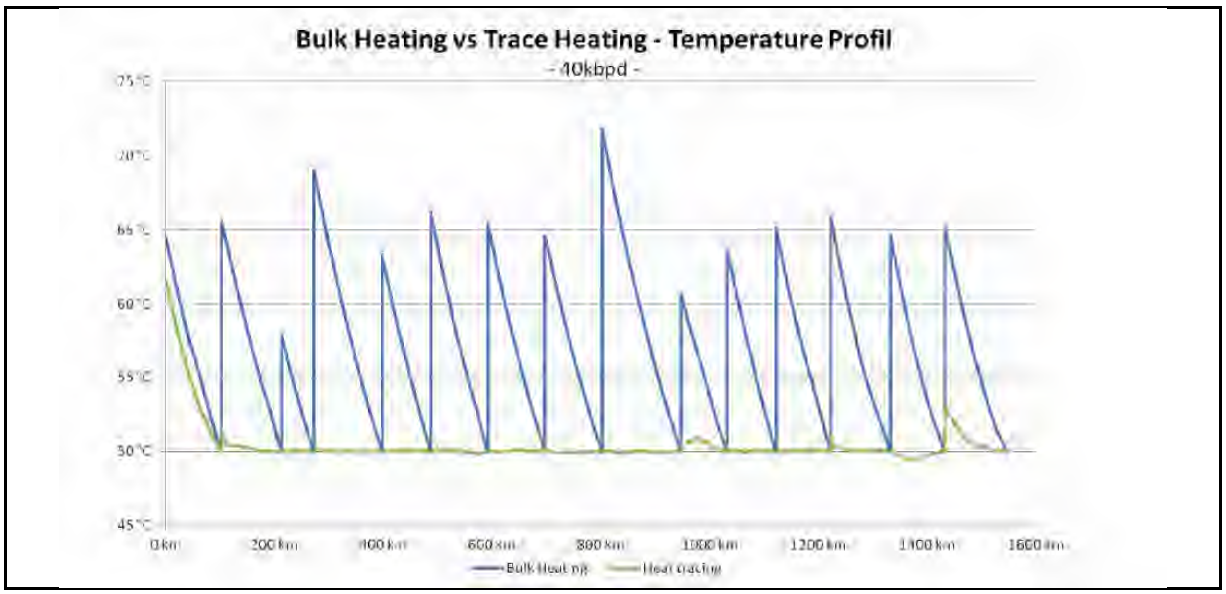


Figure 3.7-1 Bulk Heating vs Electric Heat Trace Heat Loss

Case 3 (combination of EHT and BH) was assessed to address the heat losses as production comes off plateau. It shows that that the use of BH is required to maintain crude oil temperatures above 50°C minimum (above wax appearance temperature), 80°C maximum and EHT to maintain temperatures above 50°C in no flow conditions. Although BH has larger heat losses than EHT, there is less overall crude consumption and it is therefore favoured (both environmentally and economically) as the primary source of heat after production plateau.

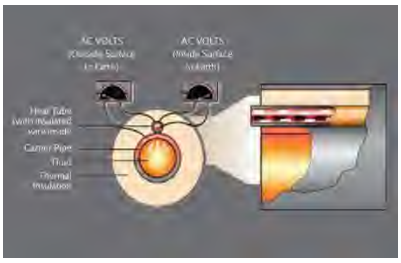
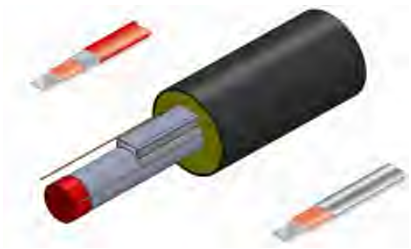
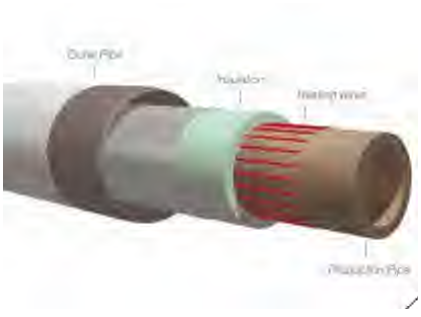
The overall conclusions from the study were:

- EHT only to be adopted as the base case design for commissioning, ramp-up and plateau
- BH may provide additional heating inputs used in combination with EHT after production plateau
- EHT will provide active heating throughout field life for maintaining temperature above 50°C in combination with BH and ensuring temperature above 50°C in no flow conditions and allowing cold restart.

3.7.6.1 Electrical Heat Tracing System Types

Several EHT alternatives were screened during pre-FEED as both primary and secondary sources of heat input. Aspects of the screening study are shown in Table 3.7.2. The three systems reviewed were skin effect heat tracing (SEHT), long line heat tracing (LLHT) and pipe in pipe (PIP).

Table 3.7.2 Electrical Heat Tracing Alternatives

System	Characteristics		Conclusions
SEHT	Current flows through centre of insulated wire and returns though heat tube Requires special transformers Welding and coating for tubing increases cost and schedule Coverage 9–12 km maximum with one tube Field proven used for most of trace heating pipelines		Not selected on basis of less coverage over long distances, more cabling required and more electric substations required More power consumption (as one phase out of the three is not used) Higher Capex than LLHT
LLHT	Experience of use on plants and some buried pipelines All three phases used Requires transformers Uses standard pipe Coverage up to 30–50 km		Selected as base case as greater coverage over long distances, less core cable quantities and less electrical substations required (lower overall project footprint)
PIP	Application for short subsea lines with steel pipe encased in large diameter steel pipe Multiple cables (24) provide redundancy Pre-constructed lengths welded and heating cables jointed on site. Includes insulation (needs to be dry)		Not selected because not considered suitable for length of line Will require an extra 1550 km of at least 28 in. steel pipe to serve as external jacket to 24 in. pipe Highest Capex of the three options

3.7.6.2 Bulk Heater Technology

Several BH alternatives were screened during pre-FEED. A summary is shown in Table 3.7.3. The types of heaters considered were direct heating, indirect heating and steam boilers. The indirect method was selected as the most feasible based on experience and technical challenges faced by direct heating and steam boilers.

Table 3.7.3 Bulk Heater Alternatives

System	Characteristics	Conclusions
Direct heating	Crude oil is extracted at 50°C from the pipeline heated and reintroduced at 80°C 6 heating stations	Not selected for pipeline owing to acid corrosion concerns
Bulk heaters (indirect heating)	Fired heaters using heating medium at higher temperature (water or oil) to heat the crude oil 6 heating stations	Selected as base case as proven technology
Steam boilers	Use of steam turbines for crude oil pumping fed by steam generated in steam boilers. Boilers less efficient but less NOx Concerns with water treatment	Not selected owing to matters associated with water treatment and efficiency

3.8 Construction Techniques

3.8.1 Overview

This section describes the various construction techniques considered during pre-FEED and FEED phases. The most critical factors in defining the construction strategy are:

- route optimisation and siting
- logistics strategy (optimisation of road and rail networks)
- weather conditions and seasonal constraints
- biodiversity-related seasonal constraints
- availability and proximity of existing infrastructure for material transport and for siting of facilities
- sequencing of pipeline insulation and coating activities with pipelay
- availability of materials and labour
- trenchability, including blasting requirements.

This section identifies the main alternatives reviewed during pre-FEED that have culminated in the definition of the constructions strategy as described in Section 2.4.2.

3.8.2 Strategy and Logistics

A traditional “spread” construction approach is proposed for the EACOP facilities. During FEED, numerous site visits and surveys along the pipeline route made important observations on the approach to construction and concluded that most of the pipeline is on relatively flat or rolling hill areas, which present few construction difficulties. However, several different options for scheduling were considered during an early constructability study during pre-FEED. Two initial options were identified for construction execution:

- 36-month schedule utilising five spreads, one for EACOP in Uganda
- 42-month schedule utilising three spreads.

The study concluded that, owing to constraints on the sizes, length and particularly the type of thermal insulation, efficient coordination of insulation and coating activities with the pipelay schedule are the most critical factors for construction execution. In addition, the study identified the requirement to ensure fully free access to the RoW to prevent delays to mobilisation for construction. The conclusions from the study have been used to develop the base construction strategy, and schedule as presented in Section 2.6.

The logistics strategy has been developed during the pre-FEED and FEED phases based on the following principles:

- achieve early enough, but not too early, material delivery (knowledge of all material flows is the key to a smooth transportation plan)
- provide smooth equipment replenishment to avoid unnecessary costs as well as delays.
- synchronise material supply with the construction schedule to make reliable estimation of material requirement and locations where the material required
- align the equipment resourcing and transportation plan with fuel supply strategy to reduce delay
- estimate the optimum storage capacity to reduce the cost of storage while maintaining reliability of timely material supply to the project
- eliminate or reduce potential unpredicted delays at border crossings, custom clearance and other logistics bottlenecks by making realistic predictions and observing local/country capacity and calendar
- ensure availability of trucks and site transportation and plan for importing or sourcing adequate equipment and vehicles to fulfil the project requirements
- determine the season dependency of the road conditions, availability of transportation vehicles and border crossing times, and prepare for it.

An example of logistics optimisation is the transportation of line pipe. Three options were reviewed as described in Table 3.8.1.

Table 3.8.1 Line Pipe Transportation Options

Transportation Method	Advantages	Disadvantages
Bare pipe, insulated at CF	More pipes per truck load, reducing number of cross country trips by approx. 1/3 Lower shipping cost as transported from pipe mill to port of entry Opportunity to utilise local content and optimise schedule by combining insulation application activities with CF Overall the most cost effective when considering all logistics constraints and coating plant costs	Insulation costs may become more expensive owing to requirement for dedicated facility Additional transportation between insulating facility and pipe yard Additional schedule constraint with land access, construction, set up and qualification of insulation facility
Insulated pipe	Transportation directly to site for lay	Less pipe per truck load increases no of trips by 1/3 Higher shipping costs (transported to insulating facility and then to port of entry)
Bare pipe shipped and insulated at port of entry	Maximum use of local content Lower shipping costs Not as cost effective as coating plant near to mid-way of pipeline route.	Cost and schedule constraints associated with land access, set up and qualification of insulation facility at port of entry Less pipe per truck load increases no of trips by 1/3

The review concluded that transportation of bare line pipe is the best solution on the basis that more pipes can be transported (thus reducing shipping costs and truck movements) while providing maximum opportunity to utilise local content.

3.8.3 Pipeline Construction

3.8.3.1 Construction Techniques

The pipelay sequence is described in Section 2.4.2.2 and is comprised of three main aspects:

- open areas where the spread technique is utilised, i.e., pipe storage, RoW clearing and grading, stringing, bending, welding and trenching
- crossing locations where specialist crews and specific techniques are used, e.g., auger boring
- special sections such as restricted working areas, difficult terrain and environmentally and socially sensitive areas.

During pre-FEED the spread technique was considered the most suitable for onshore pipe lay and therefore no other alternative construction strategies were considered during FEED.

3.8.3.2 Blasting and Micro-blasting

In rocky sections of the pipeline route, where normal excavation is not possible, blasting may be required to fracture the rock and enable pipeline trench excavation.

Micro-blasting avoids rock projectiles and creates less noise and vibrations but can only be used under certain conditions. Sections suitable for micro-blasting will be identified during construction, based on geology, the proximity to infrastructure and environmentally sensitive features.

3.8.3.3 Crossings

Several pipeline crossing methods exist, i.e., open cut and trenchless (auger boring, horizontal directional drilling (HDD), and micro-tunnelling). EACOP will choose from these alternatives as described below. The crossing alternatives are provided in Table 3.8.2.

Watercourses and Wetlands

The pipeline route crosses numerous watercourses and wetlands, some of which are permanent and others are of a seasonal nature. Open-cut is considered the default method for all rivers, streams and wetland crossings in Uganda based on the FEED concept design. However, the final site-specific watercourse and wetland crossing method will be chosen during detailed design and site evaluation by the selected construction contractors. Identification of the appropriate technique will be based on a systematic assessment of each site using the following criteria:

- nature of the crossing (length, location, terrain, geotechnical and hydrogeological constraints)
- environmental aspects (ecological value including critical habitat qualifying features, e.g., presence of species of conservation concern, protected and iconic species)
- social attributes (community water use, wetland resource utilisation, commercial use, e.g., fishing)
- constructability (access restrictions, size of construction spread required).

In the event that another method other than open cut is chosen as the preferred method, EACOP will conduct an environmental and social assessment of the crossing based on the chosen method. This will subsequently serve as supporting documentation for the river/wetland crossing permit application to the relevant regulatory authority.

Infrastructure and Utilities

The GoU and the project have agreed on the following infrastructure crossing arrangements in the draft Host Government Agreement (HGA):

- For crossing infrastructure that exists on the project land before the land acquisition for the EACOP System, the relevant State Authority and the project

will enter into a crossing agreement. The GoU and the project agree that the integrity of the existing crossing infrastructure must be maintained.

- For crossing infrastructure that may need to be installed by the State/State Authority after the land has been acquired for the EACOP System, then the State/State Authority will submit a request to cross the project land in writing. The GoU and the project agree that the integrity of the EACOP System must be maintained. If the State/State Authority and the project agree that the proposed crossing infrastructure is acceptable, then they will enter into a crossing agreement.
- If the State/State Authority and the project do not reach agreement on the proposed crossing infrastructure because of the technical aspects (access to and the safety and integrity of the EACOP System, conduct of the project activities) then an independent expert will determine these technical aspects in accordance with draft HGA and thereafter the parties will enter into a crossing agreement as provided for under the draft HGA.

The pipeline will cross existing infrastructure such as roads, buried utilities and railways. Railways, main tarmacked national and district roads will be crossed by auger boring. Non-tarmacked national and district roads, smaller local and private roads will be crossed by open cut methods. The ESIA has considered this the base case. Site conditions could require a change in method in which case an assessment using the selection criteria provided above will be undertaken prior to final choice of an appropriate method. Any changes will be communicated to the relevant regulatory authority.

Table 3.8.2 shows the finalised crossing list for EACOP Uganda.

Table 3.8.2 Crossing Alternatives

Criteria	Open Cut	HDD	Micro-tunnel	Auger Boring
Summary	Excavation of a trench, installation of a pre-fabricated section of pipes (potentially concrete weight coated), backfilling and restoration of watercourse banks and wetlands	Drilling of an annulus, along a pre-determined alignment, and installing pre-fabricated length of pipeline from the opposite side of the crossing back through the drilled annulus Can be used for crossing distances of up to 1.5 km	Circular precast concrete pipe sections being pushed (hydraulically jacked) through the ground behind a tunnel boring machine along a predetermined alignment to create a tunnel for installation of the product pipe. Can be used for potentially longer distances than HDD	Well proven technique that requires excavation of pits on either side of the crossing to aid the installation of the pipeline. The depth of the pits depends on the physical characteristics of the crossing. Can be used for crossing distances of up to 120 m
Cost	Lowest potentially	Low (in comparison with micro-tunnelling)	Highest (expected to be 50% more than HDD)	Low (comparable with HDD)

Table 3.8.2 Crossing Alternatives

Criteria	Open Cut	HDD	Micro-tunnel	Auger Boring
Logistics	Logistically challenging. Requires several types of equipment. Deep well-point dewatering potentially being required depending on hydrogeological conditions.	Logistically challenging requiring mobilisation of drilling rig, associated power and mud management plant	Logistically challenging requiring mobilisation of concrete caissons or steel sheet piled cofferdam for construction of the tunnelling shafts, tunnel boring machine, associated power plant, mud management plant, excavators, cranes and personnel	Simplest logistically based on required equipment and personnel
Environment	Potential risk from sedimentation but can be controlled with appropriate mitigation. Best undertaken in dry season	Risk of hydrofracture*[4] Lowest spoil generated from process, however, potentially challenging waste management. Larger construction footprint for spread	Risk of hydrofracture* Highest spoil generated Larger construction footprint for spread	Minimal construction footprint required

3.8.3.4 Water Sourcing

Construction activities requiring water comprise mainly concrete mixing and dust suppression. These activities do not require potable water, although potable water must be available for consumption by construction workers (it is assumed bottled water will be provided).

To reduce water abstraction and discharge, the reuse of treated sewage effluent is a viable alternative for industrial water supply. It has been established that it is economically feasible to truck treated effluent to the zone of pipeline construction activity within a range of approximately 10 km of a camp. Potential sources of surface water abstraction for construction activities were identified using satellite imagery analysis. These are water bodies which appear to be perennially available and within approximately 10 km of truckable distance of the pipeline route. Potable water to serve the camps will be sourced through a variety of methods including borehole installation and the purchase of water from water districts and water boards.

[4] The inadvertent seepage of drilling mud onto the ground or into surface waters through fractures in the subsurface. Hydrofracture can occur when using pressurised crossing construction methods such as HDD.

3.8.3.5 Waste Management

Alternative solid waste management solutions are dependent on local, existing recyclers and waste management facilities with capacity to manage project waste.

The EACOP project will follow good international industry practice for waste management and follow the waste management hierarchy (as described in Section 2.4.2.8) of reduce, reuse, recycle/recover. This will be achieved by working with existing recyclers and waste management facilities.

Project waste will be managed as described in Section 2.4.2.8 while pollution prevention measures described in the pollution prevention plan will prevent project solid and liquid waste being a source of pollution to land, water or air.

Project wastewater (e.g., domestic wastewater, vehicle wash) will be treated using onsite water treatment plants at each camp; project wastewater discharges will be compliant with relevant discharge standards included in Appendix F.

4 LEGISLATIVE, POLICY AND ADMINISTRATIVE FRAMEWORK, PERMITTING REQUIREMENTS, AND INTERNATIONAL CONVENTIONS, STANDARDS, GUIDELINES AND AGREEMENTS

4.1 Introduction

This section, focusing primarily on project relevant environmental and social aspects, includes:

- legislative, policy, regulatory and administrative framework
- permitting requirements
- international conventions and agreements that Uganda has signed, acceded or ratified
- international standards and guidance on best practice
- host government agreements.

4.2 Legislative, Policy, Regulatory and Institutional Framework

4.2.1 Legislation

Table 4.2-1 summarises the key legislation and sections that are or may be relevant to the project and the measures that have been or will be taken by the project for compliance. The acts have been categorised according to the Index of Ugandan Laws (2000). The acts considered to have the greatest relevance to the project are the National Environment Act (Cap 153 of the Laws of Uganda); Petroleum (Refining, Conversion, Transmission and Midstream Storage) Act No. 4, 2013, and Occupational Safety and Health Act No. 9, 2006.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Constitution of the Republic of Uganda, 1995	Constitution of the Republic of Uganda, 1995 is the supreme law and forms the basis for national laws. Constitutional objectives and articles relevant to the protection and management of natural resources and land are: • Objective XIII: The state will protect important natural resources, including land, water, wetlands, minerals, oil, fauna and flora on behalf of the people of Uganda. • Objective XXIV obliges the state to promote and preserve those cultural values and practices which enhance the dignity and wellbeing of Ugandans. • Objective XXV obliges the state and citizens to preserve and protect the culture of preservation of public property and Uganda's heritage. • Objective XXVII (i) obliges the state to promote sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable way for present and future generations. • Objective XXVII (iii) stipulates that energy policies, implemented by the state, should ensure that people's basic needs and those for environmental preservation are met. • Article 26 enshrines the right of every Ugandan to own property and specifies the conditions under which these rights may be waived in the public interest. • Article 36 states the right of minorities to participate in decision-making processes such as national plans and programmes. • Article 39 enshrines the right of every Ugandan to a clean and healthy environment. • Article 237 (2b): the government holds in trust for the people, and is required to protect natural lakes, rivers, wetlands, forest reserves, game reserves, national parks and any land to be reserved for ecological or tourism purposes for the common good of all citizens. • Article 237 (3) defines land tenure systems: customary, freehold, mailo and leasehold. • Article 237 (2a): The government or a local government may acquire land in the public interest.	The project will be constructed and operated in Uganda.	An EIS including baseline information and potential impacts on natural resources, cultural heritage and biodiversity has been undertaken and mitigation measures proposed to avoid or reduce impacts. The ESIA seeks to protect natural resources, biodiversity and cultural heritage and reduce any impacts on them (Sections 8.2-8.4, 8.20 and Appendix J). A programme of consultation with stakeholders is being undertaken including vulnerable people and minority groups (Section 7 and Appendix C). A resettlement strategy has been developed (Section 8.15 and Appendix K) and resettlement action plans (RAPs) and livelihood restoration plans (LRPs) will be prepared.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
	• Article 244: Parliament is mandated to pass laws for regulating the exploitation of minerals and petroleum; the sharing of royalties arising from oil exploitation; the conditions for payment of indemnities arising out of exploitation of petroleum and minerals; and the restoration of derelict lands. • Article 245: Parliament is mandated to pass laws for: (a) protecting and preserving the environment from abuse, pollution and degradation; (b) managing the environment for sustainable development; and (c) promoting environmental awareness.		
National Environment Act (Cap 153 of the Laws of Uganda) *at the time of writing under government review*	The National Environment Act provides a framework for environmental management. Amongst many other provisions, the Act: • establishes the National Environment Management Authority (NEMA) as the principal government agency for environmental management (see Table 4.2-4) • establishes requirements for project briefs and environmental impact assessment of activities listed in the Third Schedule • prohibits a range of activities in a lake or river unless the requirement is waived by NEMA (Section 34) • provides for establishment of protected zones along riverbanks and lake shores and for obtaining consent for sustainable uses in such zones (Section 35) • prohibits a range of activities in wetlands unless written approval is obtained from NEMA (Section 36) • establishes a framework for the management of hilly areas • sets requirements for waste management • sets a framework for conservation of biological diversity, including specification of national strategies, plans, and programmes for conservation and sustainability. • requires NEMA, with the assistance of local environment committees, district environment committees and the lead agency, to identify those elements,	The principal regulatory authority for the environmental aspects of the project is NEMA. The project is a pipeline project requiring an EIA under the Act's Third Schedule.	An ESIA study has been undertaken according to the Act and The National Environment (Environmental Impact Assessment) Regulations, 1998 (SI No. 153-1). Licences or permits will be obtained as required under subsidiary regulations for activities in wetlands, riverbanks, hilly areas, emissions and waste management (see Table 4.3-1).

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
	objects and sites in the natural environment which are of cultural importance to the various peoples of Uganda • provides for licensing of activities that cause pollution in excess of prescribed standards.		
Petroleum (Refining, Conversion, Transmission and Midstream Storage) Act No. 4, 2013	The Act: • establishes a legal framework to ensure that midstream operations in Uganda are conducted in a sustainable way. The objectives of the Act are to regulate, manage, coordinate and monitor midstream operations; to enable the construction, placement and ownership of facilities; and to provide for third-party access to facilities and to regulate tariffs for facilities. • outlines the duty of the licensee to comply with environmental principles under the National Environment Act, including management of transportation, storage, treatment and disposal of waste arising from midstream operations (Section 3) • promotes state participation and national content in midstream operations (Sections 52–55).	The project is a transmission pipeline and is therefore subject to the Act.	The ESIA includes provisions for the management of waste in compliance with legislation and best practice (Section 2.4.2.8, Section 2.4.5.5, Appendix J). Arrangements will be described in waste management plans (Section 10 and Appendix E5). The project will develop and implement labour management and procurement plans that include national content requirements (Section 10). Possession of a valid licence issued by the Minister under this Act and compliance with conditions thereof.
Occupational Safety and Health Act No. 9, 2006	The Act provides for the general safety, health and environmental requirements for the workplace to be applied during the construction and operational phases of a project, including obligations to inspect statutory equipment and register workplaces. The Occupational Safety and Health Act consolidates, harmonises and updates the law relating to occupational safety and health, and repeals the Factories Act, Cap 220.	The project will employ skilled and unskilled labour and is responsible for their health and safety.	An assessment of workforce health, safety and welfare impacts has been undertaken and associated health and safety mitigation measures proposed (Section 8.16). Occupational health and safety will be managed based on the Total East Africa Midstream (TEAM) BV Health, Safety, Security, Society and Environment (H3SE) Charter and a project occupational health and safety plan (Section 10 and Appendix E5).

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Administration of Justice, Courts, Arbitration			
Equal Opportunities Commission Act No. 2, 2007	The Act: • establishes the Equal Opportunities Commission • mandates the Commission to investigate practices that undermine equal opportunities • defines as an offence the refusal of employing a person based on the ground of sex, age, race, colour, ethnic origin, tribe, birth, creed or religion, health status, social or economic standing, political opinion or disability. (see Sections 14 and 31(3)).	The project will employ skilled and unskilled labour.	The Act's provisions will be adopted in the labour management and occupational health, safety and security plans (Section 10 and Appendix E5).
Prevention and Prohibition of Torture Act No. 3, 2012	The Act: • gives effect to the obligations of Uganda as a State Party to the United Nation's Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment • prohibits torture, cruel, inhuman or degrading treatment or punishment in any circumstances • provides for the right to complain and investigation procedures. (see Sections 3, 11 and 12).	The project will employ security personnel during construction and operations to protect employees and pipeline assets.	The project will: • undertake due diligence checks during security provider selection • develop rules of engagement for security personnel • train security personnel engaged by the project on the Voluntary Principles on Security and Human Rights • monitor performance.
Uganda Human Rights Commission Act (Cap 24 of the Laws of Uganda)	The Act provides for: • the establishment of the Uganda Human Rights Commission • witness attendance and immunities • application of High Court Rules and appeals.	The project will undertake land acquisition and resettlement and employ workers.	A human rights assessment has been undertaken as part of the ESIA study. A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared to ensure land acquisition and resettlement respects and protects human rights. The project will develop and implement labour management plans that respect and protect the human rights of workers,

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
			including equal opportunities, non-discrimination and prohibition of child labour (Section 10 and Appendix E5).
Whistleblowers Protection Act No. 6, 2010	The Act provides for: • the procedures of the disclosure of information that relates to illegal practices • protection against victimisation of persons who make disclosures.	The project will employ workers and undertake resettlement.	Grievance procedures have been implemented and the project will strive to remove barriers that may discourage its use. Reporting of potential concerns will be encouraged.
Agriculture			
Plant Protection and Health Act No. 6, 2015	The Act: • provides for prevention and control of pests, weeds and diseases. This includes the duty of land occupiers to take measures necessary for eradication, reduction or prevention of the spread of harmful organisms • regulates the export and import of plants. A permit and a phytosanitary certificate are required for import of plants.	The project's activities have the potential to introduce or spread invasive species and plant pests and diseases, e.g., through moving soil, using equipment from outside the area or biorestoration.	Pest and invasive species control measures will be implemented (Sections 8.2–8.5)
Prohibition of the Burning of Grass Act (Cap 33 of the Laws of Uganda)	The Act: • prohibits the unauthorised burning of grass in a forest reserve, national park, wildlife reserve or wildlife sanctuary • requires the proponent to take appropriate measures to prevent burning of grass in the project area as a consequence of project activities.	The project will clear vegetation before construction of the right-of-way (RoW), project roads and facilities.	The burning of grass will not be permitted during construction or operations.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Animals			
Animals (Prevention of Cruelty) Act (Cap 39 of the Laws of Uganda)	The Act prohibits any cruel treatment of any animals. Offenders found guilty under this Act may be subject to a fine, imprisonment or both.	The project footprint will include areas used by wildlife, cattle and other domesticated stock.	The policy of safe and humane handling of wild and domestic animals will be included in the biodiversity management plan (Section 10) and workers code of conduct and included in inductions and toolbox talks.
Arts, Entertainment and Recreation			
Historical Monuments Act (Cap 46 of the Laws of Uganda)	Section 8 of the Act provides for: • the protection of objects declared to be preserved or protected under the Act and outlines activities that will be prohibited where such objects are found • any person who discovers any object that may reasonably be considered of archaeological, paleontological, ethnographical, historical or traditional interest will, in 14 days, report it to the conservator of antiquities, a district commissioner or the curator of the museum (Section 11).	Cultural heritage features may be found in the project area and will need to be managed accordingly.	Measures to identify and protect cultural heritage will be defined in a cultural heritage management plan, including chance finds reporting (Section 8.20, Section 10 and Appendix E5).
Civil Laws and Procedures			
Illiterates Protection Act (Cap 78 of the Laws of Uganda)	The Act provides for: • the protection of illiterate persons in relation to writing and signing of documents on behalf of such persons • the proponent to ensure adherence to this Act during any writing, signing or endorsement of documents pertaining to land acquisition or compensation related to the project.	The project will affect vulnerable people including illiterate persons during resettlement, employment and other project activities.	The Act's provisions will be adopted in the RAPs, LRPs, labour management and occupational health, safety and security plans (Section 10 and Appendix E5).

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
The Domestic Violence Act No. 3, 2010	The Act provides for: • protection and relief of victims of domestic violence • punishment of perpetrators of domestic violence • the procedure and guidelines to be followed by the court in relation to the protection and compensation of victims of domestic violence and to provide for the enforcement of orders made by the court.	The project will interact with vulnerable people who may include victims of domestic violence and potentially perpetrators during resettlement, employment and other project activities.	The Act's provisions will be taken into account during preparation and implementation of the RAPs, LRPs, labour management, occupational and community health, safety and security plans (Section 10 and Appendix E5) and ongoing stakeholder engagement.
Commerce and Industry			
Investment Code Act (Cap 92 of the Laws of Uganda)	The Act: • establishes the Uganda Investment Authority • regulates foreign investment, for example, an investment licence is required for a foreign investor to operate in Uganda.	The project is an investment activity in Uganda.	The project will acquire a valid investment licence and comply with conditions.
Criminal Law and Procedure			
Anti Corruption Act No. 6, 2009	The Act provides for the prevention of corruption in public and private sectors. Bribery of public officials is a criminal offence. The Act addresses such areas as tendering, conflict of interest, loss of public property and illicit enrichment.	The project will require public sector approvals and in the private sector involves resettlement, employment and the purchase of goods.	Project anti-corruption policies and code of conduct will be implemented
Energy and Natural Resources			

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Atomic Energy Act No.24, 2008	The Act establishes the Atomic Energy Council and prescribes the authorisation process required for use of ionising radiation. The Act requires the proponent to: • possess a valid authorisation for the use of ionised radiation • employ a suitably qualified radiation safety officer • manage the use of ionising radiation for project activities according to Act's legislative framework, including safety requirements and waste management • prepare an emergency response plan.	The project will use nondestructive testing to check pipe welds, which may include radiography	Nondestructive testing materials will be transported, stored and disposed according to legislative requirements and manufacturers' instructions. The project will obtain necessary licences and authorisations and comply with approval conditions. Occupational health and safety policies and procedures will be implemented. A radiation protection plan, including emergency response, will be developed and implemented (Section 10).
National Forestry and Tree Planting Act, No.8, 2003	The Act provides for: • the conservation, sustainable management and development of trees and forests for the benefit of the people of Uganda • any person intending to undertake any project or activity that is likely to have significant impact on a forest will need to undertake an environmental impact assessment (EIA) (Section 38). The Act requires the proponent to acquire a licence before undertaking activities in a forest reserve. The Act also defines central forest reserves in two main categories: for production and for protection, although there may be an overlap between actual activities in some forest reserves.	A section of the pipeline route crosses the Taala Forest Reserve. Some trees in commercial plantations will be felled.	An ESIA study has been undertaken. Biodiversity baseline surveys and an impact assessment for the Taala Forest Reserve have been undertaken and proposed mitigation measures will be implemented (Sections 6 and 8). The project will obtain necessary licences and authorisations before commencing activity in the Taala Forest Reserve and will comply with their conditions.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Water Act (Cap 152 of the Laws of Uganda)	The Act's objectives are to: • promote the rational management and use of water resources of Uganda • promote the provision of a clean, safe and sufficient supply of water for domestic purposes to all persons • allow for orderly development and use of water resources for purposes other than domestic use • control pollution and to promote the safe storage, treatment, discharge and disposal of waste that may pollute water or otherwise harm the environment and human health. Section 18 stipulates that the necessary permits will be obtained before any abstraction of water from natural surface waters (lake, river or stream) and groundwater (aquifer, spring). Section 31 prohibits the discharge of waste into any natural waters unless authorised under the Act.	The project will use water resources, particularly for construction camp water supply, hydrostatic testing and operation of aboveground installations (AGIs). The pipeline route will cross watercourses and water supply infrastructure. The project will discharge treated waste water.	Approvals to abstract water and discharge treated waste water will be obtained. Baseline surveys and a water supply study are being undertaken to identify sustainable water sources for the project (Section 2.4.1.2 and Section 6.4.2.2).
Finance			
Public Finance Management Act No. 3, 2015	The Act provides for: • government revenues from the petroleum industry to be paid into the Petroleum Fund. From this fund, the revenues may be transferred either to the Consolidated Fund to support the national budget or to the Petroleum Revenue Investment Reserve. • royalties arising from the Petroleum Revenue Investment Reserve; the government retains 94% and local governments in the petroleum exploration and production areas share the remainder.	When operational, the project will generate government revenue through taxes on profits and the Government's equity share of tariffs and profits from operations.	The project will pay taxes due and the Government will receive its share of tariff and profits subject to the terms of the as yet to be completed Host Government Agreement.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Fish and Game			
Fish Act (Cap 197 of the Laws of Uganda)	The Act provides for: • the control of fishing, the conservation of fish and purchase, sale, marketing and processing of fish • Section 12 (4) stipulates that "except where otherwise expressly provided by any written law, no person shall divert the waters of any lake, river, stream, pond or private waters in which fish, their eggs or progeny have been introduced with the consent of the chief fisheries officer" • the proponent to liaise with the chief fisheries officer to obtain approval for the designs of proposed water abstraction facilities.	The project will need to abstract water, primarily for construction camps, hydrostatic testing and operation of AGIs. The pipeline route will also cross watercourses. The project may affect fishing at watercourse crossings during construction.	The project will liaise with the authorities to ensure the required approvals are obtained before construction. Impacts on fishing and livelihoods have been assessed (Section 8.14).
Wildlife Act (Cap 200 of the Laws of Uganda) *at the time of writing under government review*	The Act provides for: • the conservation of wildlife throughout Uganda so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use to allow for sustainable utilisation of wildlife for the benefit of the people of Uganda and the global community • the protection of rare, endangered and endemic species of wild plants and animals • the enhancement of economic and social benefits from wildlife management by establishing wildlife use rights and the promotion of tourism. The ownership of every wild animal and wild plant existing in its wild habitat in Uganda is vested in the government, on behalf and for the benefit of the people of Uganda. Any developer desiring to undertake a project that may have a significant effect on any wildlife species or community needs to undertake an EIA according to the National Environment Act.	The project has potential impacts on wildlife.	Baseline biodiversity surveys have been undertaken (Section 6.4.1 and Appendices A1–A4). A biodiversity impact assessment has been undertaken and mitigation measures developed to avoid or reduce impacts on wildlife (Sections 8.2–8.4).

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Labour			
Employment Act No. 6, 2006	The Act: • mandates labour officers to conduct regular inspections to ensure workers' rights are observed, basic provisions are made and workers' welfare is attended to • provides for the freedom of association of workers, permitting them to join labour organisations. Similar provisions are supported in the Labour Unions Act, 2006 • prohibits the employment of children under the age of 12 years and states the conditions under which a child under fourteen years might be allowed on the work site • stipulates working conditions including hours of work, holidays and termination processes.	The project will employ skilled and unskilled labour.	Worker health, safety and welfare impact assessment, including employment, has been undertaken and mitigation measures proposed (Section 8.12 and 8.16) The Act's provisions will be adopted in the labour management and occupational health, safety and security plans (Section 10 and Appendix E5).
Labour Disputes (Arbitration and Settlement) Act No. 8, 2006	The Act provides procedures for: • labour disputes being referred to the labour officer or, if necessary, to the Industrial Court • industrial action and collective agreements.	The project will employ skilled and unskilled labour.	The Act's provisions will be adopted in the labour management plans (Section 10 and Appendix E5). A workers' grievance mechanism will be implemented.
Labour Unions Act No. 7, 2006	The Act regulates the establishment, registration and management of labour unions.	The project will employ skilled and unskilled labour.	The Act's provisions will be adopted in the labour management plans (Section 10 and Appendix E5).
Minimum Wages Advisory Boards and Wages Councils Act (Cap 221 of the Laws of Uganda)	The Act provides for the establishment of minimum wages advisory boards and wages councils, and for the regulation of the remuneration and conditions of employment for employees.	The project will employ skilled and unskilled labour.	The Act's provisions will be adopted in the labour management plans (Section 10 and Appendix E5). A workers' grievance mechanism will be implemented.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Workers Compensation Act (Cap 225 of the Laws of Uganda)	The Act: • establishes the employer's liability for personal injury, which arises out of and in the course of a worker's employment • provides procedures for accident notification, medical examination and treatment, and compensation.	The project will employ skilled and unskilled labour.	The Act's provisions will be adopted in the labour management and occupational health, safety and security plans (Section 10). A workers' grievance mechanism will be implemented. Incidents will be reported and investigated as part of the emergency preparedness and response plan, which will incorporate the Act's requirements.
The Children Act (as amended), 2016	The Act provides for the protection of children and prohibits the use of child labour or employment in any activity that may be harmful or hazardous to his or her health (s.8). It stipulates that the minimum age of employment of a child shall be 16 years.	The project will employ skilled and unskilled labour.	The Act's provisions will be adopted in the labour management plan (Section 10).
Land			
Land Acquisition Act (Cap 226 of the Laws of Uganda)	The Act provides for: • the compulsory acquisition of land for public purposes and for other matters incidental thereto • adequate compensation to project affected persons (PAPs) in the case of compulsory acquisition for a project	The project will lease land that will be acquired by compulsory purchase. Resettlement is required to make the leased land available to the project .	A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared. Resettlement will be undertaken and PAPs compensated according to the Act. A programme of consultation with relevant stakeholders is being undertaken (Section 7).

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Land Act (Cap 227 of the Laws of Uganda, as amended in 2010)	The Act: • provides for the tenure, ownership and management of land. • establishes a number of land administration institutions • provides the valuation principles for compensation. The 2010 amendment aims to enhance the security of occupancy of lawful and bona fide occupants on registered land according to Article 237 of the Constitution (Section 43).	The project will lease land that will be acquired by compulsory purchase. Resettlement is required to make the leased land available to the project.	A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared and implemented according to the provisions of this Act.
Registration of Titles Act (Cap 230 of the Laws of Uganda)	The Act stipulates the requirements relevant to the registration and issuance of titles for land transfer of registered land.	The project will lease land	Titles of land acquired for the project will be acquired according to the provisions of this Act.
Survey Act (Cap 232 of the Laws of Uganda)	The Act provides for, and guides, the surveying of land in Uganda, including aspects such as access to lands to be surveyed, and compensation for injury caused during survey activities. The Act: • requires the proponent to undertake land acquisition activities according to the requirements of the Act, including provision of prior notice and compensation for trees, fences or crops cleared or damaged as part of a survey • stipulates provisions for licensing of surveyors and confers upon government surveyors the power to enter onto any land during execution of their duties.	The project will lease land.	Surveys conducted for the project have been and will continue to be conducted according to the provisions of the Act.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Local Government			
Local Governments Act (Cap 243 of the Laws of Uganda, as amended in 2010)	The Act: • establishes a decentralised form of government based on the district as the main unit of administration. Districts are given legislative and planning powers, including land administration and planning, and planning for the conservation of the environment in their boundaries. • requires District Environment Committees, established under Section 15 of the National Environment Act, to guide the district authorities in matters relating to conservation of the environment • specifies functions and services of the Government and local governments (Second Schedule). These include: o Government responsibility for the national monuments, antiquities, archives and public records as Parliament may determine o district council responsibility for aiding and supporting the establishment and maintenance of social amenities such as art galleries, museums and tourist centres.	The project will need to consult and cooperate with local government administrations.	District and local government authorities have been engaged during the preparation of this ESIA and will continue to be engaged as part of project planning and implementation.
Physical Planning Act No. 8, 2010	The Act: • makes it mandatory for any person undertaking a development in a planning area to obtain development permission • development permission is subject to obtaining an EIA certificate according to the National Environment Act • stipulates that the Minister may, on the recommendation of the National Physical Planning Board, declare an area (such as the Albertine Graben) with unique development potential or problems as a special planning area and require the preparation of a physical development plan (PDP) (Section 24 (1)), see Table 4.2-2.	The entire country of Uganda is declared a “planning area” and therefore this Act applies to the entire country.	This ESIA has been undertaken according to the requirements of the Act. The project will obtain development permission and comply with conditions. Local authorities will review the construction plans for project facilities.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Traditional Rulers Act (Restitution of Assets and Properties) (Cap 247 of the Laws of Uganda)	Under the Act, confirmed by the Constitution of Uganda in 1995, kings and chiefdoms are given the right to own their assets and property, including cultural property.	Traditional rulers are the custodians of cultural sites and traditional belief systems, hence key stakeholders. Sections of the pipeline will cross traditionally owned land.	Traditional institutions that own assets and property have and will continue to be engaged during the resettlement process and will be included in the RAPs and LRPs. The provisions of these Acts will be adopted in the cultural heritage management plan. A consultation programme with traditional and cultural leaders has been and will continue to be undertaken as part of the ESIA and project planning (Section 7 and Appendix C).
Institution of Traditional Leaders or Cultural Leaders Act, 2011	To provide for the existence of traditional or cultural leaders, their privileges and benefits, and the resolution of issues relating to traditional or cultural leaders.	Traditional leaders are present in the project area of influence.	
Copyright Act and Neighbouring Rights Act, 2006	To provide for the protection of literary, scientific and artistic intellectual works and their neighbouring rights, including traditional folklore and knowledge, handicrafts.	Project may impact on cultural heritage.	
Public Health			
Public Health Act (Cap 281 of the Laws of Uganda)	The main objectives of the Public Health Act are to: • safeguard and promote public health • provide a general prohibition of nuisances or conditions liable to be hazardous to health (Section 54).	Project activities will produce nonhazardous and hazardous waste, effluent and air emissions with potential effects on public health.	Impacts of waste and air emissions on community health have been assessed and mitigation measures identified to avoid the creation of a nuisance and risk to public health (Section 8.18). Waste management, pollution prevention and community health, safety and security plans will be prepared that will include mitigation measures (Section 10 and Appendix E5).

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Security, Defence and Public Order			
Explosives Act (Cap 298 of the Laws of Uganda)	The Explosives Act provides for: • the legal regime for the importation, manufacture, storage and use of authorised explosives and blasting materials • permitting the manufacture, sale, storage and handling of explosives.	Unlikely to be relevant as blasting is not required during construction.	The pipeline has been routed, in part, to avoid rocky areas that would need blasting (Section 3).
Public Order Management Act No. 9, 2013	The Act provides for: • the regulation of public meetings • the duties and responsibilities of the police, organisers and participants of public meetings • measures for safeguarding public order.	Public meetings have been and are being held as part of the ongoing stakeholder engagement.	Public meetings have been and are being conducted with due regard to the requirements and provisions of the Act.
Transportation			
The Uganda National Roads Authority Act, 2006	The Act provides for establishment of the Uganda National Roads Authority (UNRA) responsible for the provision and maintenance of national roads.	The project will: • use existing public roads, some of which are being upgraded by UNRA • develop new access roads where necessary.	The Authority will regulate the proposed upgrade and construction of roads that are planned for the project. The project will liaise and work with UNRA before undertaking works across public roads to ensure that any works take into account proposed upgrades and any remedial works after construction comply with national standards.

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance
Access to Roads Act (Cap 350 of the Laws of Uganda)	The Act provides for: • the procedure by which a proponent may obtain access from a public highway. The proponent is to consult adjoining landowners before the construction of access roads to project facilities. • the establishment of a legal regime to limit damage to land adjoining the access road, for maintenance of the access road, and for payment of compensation by the applicant in respect of the use of land, the destruction of crops or trees and such other property • a proponent, who is unable through negotiations to obtain leave from adjoining landowners to construct a road of access to the public highway, to apply to a magistrate for leave to construct a road of access over any land lying between their land and the public highway.	The project will develop new access roads where necessary.	A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared that will include consultation with adjoining landowners and compensation for new access roads. The impacts of access roads on land-based livelihoods, including crops has been assessed and mitigation measures proposed to reduce impacts (Section 8.13).
Rivers Act (Cap 357 of the Laws of Uganda)	The Act requires a licence to dredge in any river and provides regulation on dredging activities. The licensee is required to prevent erosion or other damage to the riverbed or banks.	The Act regulates the construction, operation and maintenance of watercourse crossings for the pipeline.	The project will obtain the necessary licences and comply with their conditions. Baseline surveys and impact assessments have been undertaken for riparian biodiversity, soil and surface water and mitigation measures will be implemented, including erosion control and reinstatement of watercourse bed and banks (Sections 8.2, 8.3 and 8.6).

Table 4.2-1 Ugandan Legislation

Legislation	Summary of Requirements	Relevance to the Project	Compliance

Roads Act (Cap 358 of the Laws of Uganda)	The Act provides:
	• for the maintenance of roads by granting the Ministry of Works and Transport, the UNRA and local governments powers to:
	  ○ declare road reserves
	  ○ prescribe building lines
	  ○ remove interferences to roads
	  ○ extract materials required for construction or maintenance of roads from a road reserve without compensation to any person
	• that no person will, except with the written permission of the road authority, erect any building or plant any tree or permanent crops in a road reserve (Section 3)
	• that the road authority has power to dig and take away materials required for the construction and maintenance of roads in any part of a road reserve approved by the district commissioner without payment to any person (Section 6).
		New access roads will be constructed and some existing roads repaired or upgraded.
		Access roads will be maintained by the government.
			The provisions of this Act will be applied to road works for the project.

Traffic and Road Safety Act (Cap 361 of the Laws of Uganda)	The Act provides: • the overarching requirements for the use of road vehicles in Uganda, including registration of vehicles, issuance of driver permits, licensing of public service, omnibuses and goods vehicles • the enabling framework for related traffic and road safety regulations.	On-road vehicles will be used as part of project activities. The provisions of the Act are important in ensuring safety on the roads.	The provisions of the Act will be adopted in the transport and road safety and emergency preparedness and response plans (Section 10 and Appendix E5).

4.2.2 Policies and Plans

Ugandan ministries and authorities issue policies and plans that serve a variety of purposes, such as formulating visions and goals, defining strategies to achieve the goals and considering the development of appropriate administrative, legislative and managerial frameworks to achieve the goals of the plan or policy. Table 4.2-2 summarises some of the policies and plans that are or may be relevant to the project including those relating to planning for the Albertine Graben region.

In addition, district physical development plans and other local development plans have been considered during ESIA preparation. In the interests of brevity these are not listed below.

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Policies			
Energy Policy for Uganda, 2002	The goal of the Energy Policy for Uganda is to ensure that the country's energy needs are met in an environmentally sustainable way. The policy proposes general strategies, including the development of mitigation plans, to reduce environmental hazards in all oil operations such as: • establish availability, potential of and demand for the various energy resources in country • increase access to modern and reliable energy services to help eradicate poverty • improve energy governance • stimulate economic development • manage energy-related environmental effects. The policy requires that impacts of oil and gas activities are managed through relevant institutions (NEMA and lead agencies). The policy requires ESIA to be undertaken before the project.	The project is an oil pipeline.	The project contributes to the fulfilment of the goal of the policy. An ESIA has been undertaken and submitted to NEMA. It has been undertaken according to the Environmental and Social Impact Assessment Guidelines for the Energy Sector (NEMA, 2014).
Land Acquisition, Resettlement and Rehabilitation Policy (Draft 1, April 2017)	The Ministry of Lands, Housing and Urban Development is drafting a Land Acquisition, Resettlement and Rehabilitation Policy.	The project will lease land in its footprint that will be acquired by compulsory purchase. The project will entail some physical and economic displacement.	The policy will be adopted in the RAPs and LRPs that will be prepared. A programme of consultation with relevant stakeholders is being undertaken (Section 7).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Museums and Monuments Policy (2015)	The main aim of the policy is to "create a framework for preservation and sustainable development of Uganda's Museums and Monuments for the benefit of the people of Uganda and posterity." The policy further provides guidance on collection, research and museum services.	Cultural heritage may be encountered in the project area and will need to be managed accordingly.	Cultural heritage baseline surveys and impact assessments are being undertaken (Section 6.4.3, Section 8.20 and Appendix A13). Measures, including chance finds procedures, to identify and protect cultural heritage will be included in the cultural heritage management plan (Section 10 and Appendix E5).
National Child Labour Policy, 2006	The policy provides a framework for addressing child labour and actions that aim to eradicate child labour.	The project will employ labour.	Aspects of the policy will be adopted in the labour management plan (Section 10 and Appendix E5).
National Content Policy for the Petroleum Subsector in Uganda, 2018	The policy, which has been developed by the Ministry of Energy and Minerals Development, aims to promote competitiveness of Ugandan labour and enterprises in the oil and gas industry and the overall economy. According to the policy, licenced oil companies, their contractors and subcontractors are required to: • publicly advertise all available positions • give priority to Ugandans in recruitment and training • establish operational bases in Uganda • put in place procurement and contracting procedures and practices to benefit Ugandan enterprises; locally available goods and services are to be exclusively tendered to Ugandan enterprises • prepare and implement plans for the transfer of technology and knowhow to Ugandan institutions.	The project will employ skilled and unskilled labour. The project will procure materials and supplies.	Policy and related legislative requirements will be adopted in the labour management and procurement and supply chain management plans (Section 10 and Appendix E5).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Environmental Action Plan, 1994 and National Environment Management Policy, 1994	The National Environmental Action Plan (NEAP) provides a framework for addressing gaps in environment management as well as a strategy for integrating environmental issues into national socio-economic development. One of the outcomes of the NEAP was the formulation of the National Environment Management Policy (NEMP) in 1994. Among other environmental principles highlighted in the policy are the: • polluter pays principle: to ensure that true and total costs of environmental pollution are borne by the polluter • public participation principle: to encourage the maximum participation by the people of Uganda in developing policies, plans and processes for managing the environment • precautionary principle: to conserve the cultural heritage and use the environment and natural resources of Uganda for the benefit of both present and future generations • clean environment: to assure all people living in Uganda the fundamental right to an environment adequate for their health and wellbeing Requires EIA for any activities that might affect wildlife both inside and outside the protected areas system (Section 4.3)	The project may potentially cause environmental and social impacts. An EIA is required for the project.	An ESIA study has been undertaken for the project according to the requirements of the policy. A stakeholder engagement programme is being undertaken (Section 7 and Appendix C).
National Fisheries Policy, 2004	The National Fisheries Policy provides strategies for sustainable management of fisheries though decentralisation and community involvement. Policy goals include social, economic and environmentally sustainable use and development of fisheries and minimisation of adverse environmental impacts.	The pipeline route will cross watercourses and may affect access to fishing areas during construction. Project induced in-migration (PIIM) may increase pressure on fish stocks.	The ESIA has included assessment of impacts on fisheries and mitigation measures (Section 8.14).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Forestry Policy, 2001	The policy: • outlines guiding principles for management of forest resources including conservation and sustainable management • outlines strategies for management of forest resources that include social and environmental impact assessments for commercial forest plantations and forest products producing industries.	The project will conduct activities in forested areas. A section of the pipeline route crosses the Taala Forest Reserve. Some trees in commercial plantations will be cut down	Biodiversity baseline surveys and impact assessment has been undertaken and mitigation measures in the Taala forest reserve will be implemented (Sections 8.2–8.4). A programme of consultation with relevant stakeholders is being undertaken (Section 7).
National Oil and Gas Policy, 2008	This policy provides for the administration, regulation and management of the upstream petroleum sector and presents a basis for regulating and investing in the midstream petroleum subsector. The policy contains a set of guiding principles, objectives and strategies addressed to stakeholders involved in oil and gas development in Uganda. The key points relevant to the project are: • It is the responsibility of licensed oil companies to protect the environment where they work or any areas in the country impacted by their operations while the Government shall legislate on, regulate and monitor compliance. • The interests of local communities in areas where oil and gas production is undertaken shall be taken into account. • The oil companies operating in the country shall be expected to contribute to capacity building and the transfer of technology.	The project is a midstream petroleum subsector project.	An ESIA has been undertaken for the project for the purpose of protecting the environment. A programme of consultation with stakeholders has been and is being undertaken (Section 7). National content will be promoted and implemented as part of the labour management and procurement and supply chain management plans (Section 10 and Appendix E5).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Orphans and Other Vulnerable Children Policy, 2004	The policy provides the framework for responding to the concerns and needs of orphans and other vulnerable children. The policy also outlines the responsibility of the private sector to: • design and implement initiatives for improved protection and care • contribute resources • design and implement work place policies that protect orphans and other vulnerable children from exploitation and abuse • collaborate with government and other actors to implement this policy.	The project may differentially affect children, including orphans and other vulnerable children during construction (for example, risk of accidents, other effects on health, resettlement) and care needs to be taken to ensure they are not employed in the supply chain.	A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared that will consider the needs of vulnerable groups including orphans and other vulnerable children. The provisions will be adopted in the labour management, procurement and supply chain, community and occupational health, safety and security plans to ensure protection of orphans and other vulnerable children (Section 10). A programme of consultation with relevant stakeholders is being undertaken that includes those representing vulnerable groups (Section 7 and Appendix C).
National Policy for Disaster Preparedness and Management, 2011	The Policy calls for strict and effective mechanisms and risk-reduction strategies to avert disasters related to oil exploration, transportation and use, including environmental degradation. Proposed measures include implementing environmental impact assessments and protecting local livelihoods. The Ministry Responsible for Energy and Mineral Development is charged with vital disaster risk management functions for the oil and gas sector. Paragraph 4.15 stipulates that private sector organisations have a responsibility to ensure their operations do not pose a risk to their workers, the general public or the environment. The owners of installations are responsible for educating workers on safety measures and emergency response measures.	The project includes activities that can potentially result in an accident.	This ESIA includes an assessment of the effects of unplanned events (Section 9 and Appendix I). The project is implementing a phased programme of risk assessment and reduction to reduce risks to levels that are as low as reasonably practicable. Emergency preparedness and response plans will be developed for the construction and operations phases in consultation with the government. Personnel will be trained in prevention and response and regular exercises will be held (Section 9 and Section 10).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Policy for the Conservation and Management of Wetland Resources, 1995	The policy: • provides the guiding principles and strategies for sustainable wetland use • emphasises the need for users of wetlands to consider the knock-on effects of their activities, and identifies non-destructive wetland uses that may be allowed (Section 7.2) • emphasises the need for users of wetlands to consider the requirements of other wetland users in the community (Section 7.3) • identifies the need for EIAs for development activities that are likely to impact wetlands (Section 7.8).	The pipeline route crosses wetlands and watercourses that flow into wetlands.	The ESIA includes assessment and mitigation of impacts on wetlands and associated ecosystem services (Section 8.2–8.4 and 8.6), including from unplanned events (Section 9 and Appendix I).
National Population Policy for Social Transformation and Sustainable Development, 2008	This policy was developed by the Ministry of Finance, Planning and Economic Development and aims to improve the quality of life of the people of Uganda through achieving of the following objectives: • monitoring of population data and integration of population variables into development policies, plans and programmes • improvement of population health, family planning and social welfare • development of skills and human capital • improvement of nutrition and food security, increase in household incomes, protection of the environment and sustainable use of natural resources • planned urbanisation and human settlements development.	The project may induce in-migration of people seeking employment and other opportunities.	The potential for in-migration and associated unplanned development and impacts on existing infrastructure has been assessed and mitigation measures considered throughout the ESIA (e.g., Sections 8.17, 8.18).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Water Policy, 1999	The policy promotes an integrated approach based on the principles of sustainable development. The future framework for management and functioning of the water sector is based on the Water Act (1995), National Water Policy (1999), Local Government Act (1997) and ongoing water sector reforms. The National Water Policy has two distinct categories: water development and use, and water resources management.	The project will abstract water, primarily for camps and hydrostatic testing and may temporarily disrupt water supplies during construction.	Approvals to abstract water will be obtained before construction. Baseline surveys and a water supply study are being undertaken to identify sustainable water sources for the project (Section 2.4.1.2 and 6.4.2.2). Disruption of water supplies during construction will be minimised through the preparation and implementation of an infrastructure and utilities management plan (Section 10 and Appendix E5).
Uganda Gender Policy, 2007	The policy establishes a framework to achieve gender equality and women's empowerment in Uganda. The policy places responsibilities on the private sector, such as incorporation of gender equality principles in corporate policies, broadening corporate social responsibility and interventions that promote gender equality.	The project may affect women in a variety of ways, including resettlement, livelihood opportunities, health and safety.	The project will consider gender in project planning and implementation. Gender issues have been addressed in the resettlement strategy (Section 8.15 and Appendix K), RAPs and LRPs. The promotion of gender equality and mainstreaming will be policies included in project plans including the labour management plan and community health, safety and security plans (Section 10 and Appendix E5). The programme of consultation that is being undertaken includes and ensures adequate representation of women (Section 7 and Appendix C).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Uganda National Climate Change Policy, 2015	The goal of the policy is to ensure a harmonised and coordinated approach towards a climate-resilient and low-carbon development path for sustainable development in Uganda. The overarching objective of the policy is to ensure that all stakeholders and economic sectors address climate change impacts and their causes through appropriate measures, while promoting sustainable development and a green economy. The Uganda National Climate Change Policy is based on the following priority concerns: adaptation (the priority for Uganda), mitigation, research and observation.	Project activities will generate greenhouse gas (GHG) emissions. Sources of emissions include: • construction vehicles and equipment (Section 2.4.2.7) • operation of bulk heaters (Section 2.4.5.4).	A climate impact assessment has been undertaken, and mitigation measures identified (Section 8.22). Project GHG emissions will be monitored and reported (Section 10).
Uganda National Culture Policy, 2006	The policy was developed to promote culture, enhance contribution of culture to community empowerment and to protect and promote Uganda's tangible and intangible cultural heritage. One of the core principles of the policy is promoting environmental protection by recognising the role of the environment in cultural practices. The private sector is named as a major partner in realisation of the Culture Policy through industrial and commercial patronage of culture through organisation of activities for their own personnel, supporting specific activities and institutions and contributing to or setting up foundations and trusts to finance culture activities.	Both tangible and intangible cultural heritage will be encountered in the project area and will need to be managed accordingly.	A cultural heritage impact assessment has been undertaken. Measures to identify and protect cultural heritage will be implemented, including further preconstruction cultural heritage survey, relocation of graves and chance finds procedures (Section 8.20). A cultural heritage management plan will be prepared and implemented that will also include measures to support an increase in knowledge of tangible and intangible cultural heritage because of project research and finds (Section 10).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Uganda National Land Policy, 2013	The policy seeks to harmonise and streamline the complex tenure regimes in Uganda for equitable access to land, and to clarify the complex constitutional and legal framework for sustainable management and stewardship. It also aims to ensure sustainable utilisation, protection and management of environmental, natural and cultural resources on land for socio-economic development. Paragraph 3.8 of the policy outlines government strategies for managing land resources with respect to minerals and petroleum development.	Land needs to be acquired for the project for the RoW, and project facilities. This policy and relevant legislation (in particular the various Land Acts (see Table 4.2-1) need to be taken into account when formulating and implementing project-related land acquisition and resettlement plans.	A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared to guide land acquisition according to this policy. All land acquisition will recognise the land rights of customary owners, individuals and communities owning land. Prompt, adequate and fair compensation will be paid for those displaced from their land. Biodiversity, resource management, soil and cultural heritage mitigation measures and management plans will be implemented to reduce impacts on land and associated resources (Sections 8 and 10, and Appendix E5).
Uganda Vision 2040	Vision 2040 sets out the goals, targets and strategy for achieving the socioeconomic transformation of Uganda from a predominantly low income to a competitive upper middle income country in 30 years.	Oil and gas exploration and development is expected to present the country with opportunity to spur economic growth, create employment, foster technology transfer and generate revenues for investments in development of other strategic sectors such as infrastructure and human resource development and the implementation of the vision more generally.	Implementation of EACOP is consistent with Vision 2040.

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Uganda Wildlife Policy, 2014	The policy guides the conservation and development of wildlife resources in Uganda. The policy requires that new developments and interventions with potential to affect wildlife resources are subject to EIAs.	The project footprint includes protected areas and areas used by wildlife.	The pipeline has been routed, in part, to avoid protected and wildlife areas as much as possible (Section 3). An ESIA has been undertaken for the project and biodiversity baseline surveys and impact assessments have been undertaken of protected areas and wildlife that may be affected (Section 6.4.1, Appendices A1–A4, Sections 8.2–8.4). Mitigation measures have been proposed for affected areas and wildlife (Section 8.2–8.4) and will be adopted in the a biodiversity management plan (Section 10).
National Employment Policy for Uganda, 2011	The purpose of the policy is to guide all stakeholders on creation and enhancement of the quality and availability of employment opportunities. The policy objectives are to: • increase productivity, competitiveness and employability of the labour force • promote in-employment skills development, training and apprenticeships • promote and protect the rights and interests of workers according to existing labour laws and fundamental labour standards. The policy emphasises the promotion and expansion of private sector investment, in accordance with the government strategy of a private sector-led economy.	The project will recruit and employ skilled and unskilled labour.	A labour management plan that optimises local recruitment, ensures equal opportunities, develops skills through training and enshrines workers' legal rights will be developed and implemented (Section 10).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Equal Opportunities Policy, 2006	The policy aims to establish and promote a just and fair society, where all citizens participate in and benefit from the development process. It promotes the fulfilment of the fundamental rights of all Ugandan citizens to social justice and economic development. The policy places responsibilities on the private sector, such as incorporation of equal opportunities principles in corporate policies, broadening corporate social responsibility and interventions that promote equal opportunities.	Project activities have the potential to impact positively and negatively on equal opportunities, including employment and procurement.	The project will give due consideration to equal opportunities in project planning and implementation. In particular, the labour management and procurement and supply plans will help promote equal opportunities through recruitment, purchasing, training and skill development (Section 10).
National Housing Policy, 2016	The policy seeks to provide a national framework for housing development that shall increase access to affordable housing and improve the quality of existing housing stock and security of land tenure, among other objectives. Policy Statement 10 states that “the Government shall develop a mechanism for the construction and management of institutional / employer housing, and outlines strategies that include a review of guidelines on standards, construction and management of employer housing”. Additionally, Policy Statements 6 and 14 outline strategies to promote the use of indigenous materials and energy efficient construction technologies, and to revise and implement housing planning, housing and building standards.	The requirements of this policy are relevant to the planning and construction of construction camps and resettlement housing.	The design of camp accommodation and resettlement housing will be compliant with the policy.
Oil and Gas Revenue Management Policy, 2012	The policy articulates the operational framework for prudent management of oil and gas resources, through establishment of a legal institutional framework.	Once operational, the project will generate government revenue.	The project will work with the responsible government financial institutions as provided for in this policy.

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Second National Health Policy, 2010	The policy goal is to attain a good standard of health for all people in Uganda and to promote population health and productivity that contributes to socio-economic growth and national development.	A variety of project activities may impact positively and negatively on health, including employment, resettlement, project traffic and PIIM.	A health impact assessment was conducted as part of the ESIA and mitigation measures developed to promote occupational health and reduce negative impacts on community health (Section 8.16 and 8.18). Occupational and community health, safety and security plans will be developed to help ensure worker health and reduce health impacts on PACs (Section 10). Health sector stakeholders have and will continue to be engaged (Section 7 and Appendix C) in project impact assessment and mitigation.
National Industrial Policy, 2008	The vision of the policy is to build the industrial sector into a modern, competitive and dynamic sector fully integrated into the domestic, regional and global economies. Some of the policy objectives are: • exploiting and developing natural domestic resource-based industries such as petroleum • creating a business-friendly environment for private sector-led industrialisation • encouraging and fostering innovation and entrepreneurship, and adjusting and adopting best management practices in the quest for improved competitiveness • supporting the growth and development of a skilled and productive labour force with participation of disadvantaged sections of society • promoting safe workplace practices.	The project will help develop the national petroleum sector. The project will employ skilled and unskilled labour, procure goods and services and contribute to national industrial growth.	The project will ensure that positive impacts are realised and where possible enhanced. National content, including recruitment of local labour and capacity development will be promoted and implemented as part of the labour management and procurement and supply chain management plans (Section 10).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Policy for Older Persons, 2009	The policy seeks to provide for equal treatment, social inclusion and provision of livelihood support for older persons. The policy also recognises provision of income support and social insurance as social protection instruments for addressing the needs of older people. The policy stresses importance of private sector participation and collaboration in achieving social inclusion of older people, for example, via the incorporation of concerns for older people in corporate policies and practices.	The project may differentially affect older people during construction (for example, risk of accidents, health, and nutrition impacts, livelihoods, resettlement)	A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared that will consider the needs of vulnerable groups such as older persons. Provisions will be adopted in the community and occupational health, safety and security plans to help ensure protection of older people (Section 10 and Appendix E5). A programme of consultation with relevant stakeholders is being undertaken that includes vulnerable groups such as older people (Section 7 and Appendix C).
National Policy on Disability, 2006	The policy aims to develop a framework for the promotion of equal opportunities, care and support for the protection of people with disabilities. The objectives of the policy are to: • create an environment for participation for people with disabilities • promote effective service delivery to people with disabilities • build capacity for service providers and caregivers for effective prevention and management of disabilities. The policy highlights the need for the private sector to design and construct infrastructure accessible to people with disabilities.	The project may differentially affect disabled people during construction (for example, risk of accidents, health, and nutrition impacts, resettlement)) and care needs to be taken to ensure they included in procurement and employment opportunities.	A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared that will consider the needs of vulnerable groups including disabled people. Provisions will be adopted in the labour management, procurement and supply chain, community and occupational health, safety and security plans that • promote and enable equal opportunities for vulnerable groups such as the disabled that may need additional support and • promote their safety (Section 10). A programme of consultation with relevant stakeholders is being undertaken that includes vulnerable groups such as disabled people and those representing them (Section 7 and Appendix C).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Social Protection Policy, 2015	This policy aims to provide comprehensive social protection services to address risks and vulnerabilities in society. The objectives of the policy are to: • increase access to social security • enhance care, protection and support for vulnerable people • strengthen the institutional framework for social protection service delivery. The policy emphasises collaboration with the private sector in financing and implementing social protection interventions, to incorporate social protection in corporate policies and programmes and to support social protection programmes as part of corporate social responsibility.	The project may differentially effect vulnerable people in a number of ways (for example, increased risk of accidents, positive and negative effects on health, resettlement).	Provisions will be adopted in the procurement and supply chain, community and occupational health, safety and security plans that • promote and enable equal opportunities for vulnerable groups that may need additional support and • promote their safety (Section 10). A resettlement strategy has been developed (Section 8.15 and Appendix K) and RAPs and LRPs will be prepared that will consider the needs of vulnerable groups. A programme of consultation with relevant stakeholders is being undertaken that includes vulnerable groups and those representing them (Section 7 and Appendix C).
National Youth Policy, 2001	The policy recognises the strategic importance and potential of the youth for the development of Uganda. The main policy objectives are to: • promote programmes and services targeting the youth • promote social and economic empowerment of the youth • increase youth involvement in communities and decision making. The policy places responsibilities on the private sector, such as provision of opportunities for employment and promotion of entrepreneurship development and training opportunities.	The project will employ skilled and unskilled labour. Youth may be leading to changes in communities that affect the way the project will affect communities (for example, youth unemployment and unrest).	The labour management and community and occupational health, safety and security plans (Section 10) will consider and incorporate relevant elements of the policy. The stakeholder consultation programme includes youths (Section 7 and Appendix C) and the results will be used to guide the development and implementation of these plans.

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Uganda National HIV and AIDS Policy, 2011	The policy aims to create a protective and supporting environment in which the national response to HIV and AIDS is systematic, effective and coherent. The policy also aims to prevent new infection and to eliminate the socio-economic impacts of HIV and AIDS nationwide. The policy objectives are: • coordinated management of the national response to the epidemic • prevention of HIV transmission • mitigation of adverse health impacts on the infected • minimisation of socio economic impacts on the population • reduction of vulnerability to HIV via enhanced access to services • identification and reduction of gender-based vulnerability to the disease • promotion of HIV and AIDS related research.	PIIM, mobilisation of the workforce and interaction between the workforce and local communities may increase incidence of sexually transmitted diseases such as HIV.	Community and worker health and PIIM impacts have been assessed and mitigation measures developed. These will be included in management plans for occupational and community health and safety and PIIM (Section 8.16, 8.18 and Section 10).
Plans			
Albertine Graben Physical Development Plan, 2015	The plan provides a planning framework to promote and guide the physical development process in the Albertine Graben in a sustainable way over a 25-year period. The plan gets its overall guidance from Uganda's Vision 2040 and the Second National Development Plan.	The project is partly in the Albertine Graben and is a component of the oil exploration and development programme that is a key economic driver in the region and the main reason for the plan's development.	The project will take the guidance and measures in the plan into account. In particular, the ESIA has assessed and will aim to mitigate impacts on cultural heritage and biodiversity, which the plan recognises as requiring protection. The project will target maximising the economic benefits associated with the pipeline, such as local employment and improvement of infrastructure.
National Biodiversity Strategy and Action Plan II (2015–2025)	The strategy and plan provide • an overview of biodiversity status, trends, importance, new and emerging issues including oil discovery in the Albertine Graben, and threats	The project is partly in the Albertine Graben, where oil development poses challenges to	Direct and indirect impacts on biodiversity have been assessed in the ESIA (Section 8). A range of measures will be implemented in the biodiversity management plan, reinstatement plan and other plans (for example the pollution prevention and waste

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
	• background to the plan, strategic objectives (SOs) and associated action plans, including SO3: To reduce and manage negative impacts while enhancing positive impacts on biodiversity • implementation arrangements, including the role of the private sector • monitoring and innovative finance arrangements.	preserving and enhancing biodiversity. The project causes potential impacts on biodiversity including direct habitat loss and disturbance, spread of alien invasive species, the effects of PIIM and accidental spills.	management plans, see Section 10) to reduce and mitigate impacts. The project will work with NEMA and others to implement the new financing arrangements and to support appropriate initiatives on biodiversity conservation.
National Forest Plan 2011/12–2021/22, 2013	The National Forest Plan acknowledges that oil exploitation can have negative effects on forest resources through deforestation and environmental degradation, including indirect effects resulting from induced development. However, the plan also recognises that revenue from the Albertine Graben developments provides an opportunity to invest in sustainable forest management. Objectives of the National Forest Plan: • enhance the capacity of forestry institutions to enable them to perform their mandates effectively • increase the forest resource base by increasing forest cover to the 1990 levels • increase economic productivity of forests and employment in the forestry sector • raise incomes for households through forest-based initiatives • restore and improve ecosystem services derived from sustainably managed forests.	A section of the pipeline route crosses the Taala forest reserve. Some trees in commercial plantations will be cut down.	Biodiversity baseline surveys and impact assessment undertaken and mitigation measures to reduce impacts will be implemented (Sections 8.2–8.4).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
National Transport Master Plan, 2009	The plan describes key issues, such as road safety and road condition and sets out a framework for developing the transport sector between 2008 and 2023. The plan acknowledges that, owing to development of oil reserves, pipelines are becoming an important component of the transport sector. The plan recognises the need for close cooperation between Ministry of Works and Transport (MoWT) and the Ministry of Energy and Mineral Development, the primary body responsible for oil and gas pipeline infrastructure. Environmental requirements for oil pipelines and depots will also need to be strictly enforced, following NEMA requirements. The plan also states that it is important to avoid oil spillages and explosion risks at intermodal transfer points with road and rail.	The project will generate significant traffic on public roads during construction. The project will not employ intermodal transfer points.	Road maintenance and improvements will be undertaken to help ensure traffic safety during construction (Section 2.3.5, Section 8.17). A transport and road safety management plan will be prepared to guide project logistics and help ensure community and driver road safety (Section 10). An ESIA study has been undertaken and will be implemented according to NEMA requirements.
Strategic Environmental Assessment (SEA) for the Albertine Graben, 2013	The SEA was undertaken to support and guide the National Oil and Gas Policy. The objective of the SEA is to ensure that environmental and socio-economic concerns contribute to a balanced and sustainable development of the oil and gas sector. The SEA includes the entire Albertine Graben with a focus on ongoing and planned activities in Exploration Areas 1, 2 and 3A, and the development of a refinery and potential export of products and crude to international markets.	The project is required for the development of petroleum resources in the Albertine Graben.	The ESIA has considered the key concerns, information, advice and recommendations contained in the SEA, for example on conservation of biodiversity and cultural heritage, maximisation of national content and management of waste and pollution.
Strategic Plan for the North Albertine Rift of Uganda, 2011-2020	This plan establishes a common vision for the sustainable management of forests and environment in the Northern Albertine Rift, highlights threats that need to be addressed and sets out a strategy to execute the vision.	The project has potential impacts on forests and the environment generally.	Biodiversity baseline surveys have been undertaken (Section 6.4.1 and Appendices A1–A4). Biodiversity impact assessments have been undertaken and mitigation measures including a biodiversity management plan are proposed to reduce impacts (Sections 8.2–8.4 and Section 10). Broader issues such as impacts on ecosystem services (Section 8.21) and climate change (Section 8.22) have been assessed and mitigation considered in the ESIA.

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Uganda Green Growth Development Strategy, 2017/18 – 2030/31	The Uganda Green Growth Development strategy seeks to operationalise the tenets of a green economy as espoused in the Uganda Vision 2040 and the second National Development Plan. The strategy aims to catalyse green economic growth through the efficient use of the country's natural, human, and physical capital in an inclusive way along a low carbon emissions, climate resilient development pathway.	Project should embody and implement the sustainable development goals, principles and strategies outlined in Agenda 2030, Uganda Vision 2040, the second National Development Plan and the Green Growth Strategy.	The mitigation measures and management plans in this ESIA are designed for the project to be implemented in a sustainable and socially inclusive way. The government revenue generated by the project, as well as the technical expertise generated, can be used to fund Uganda's transition to a green economy.
Uganda Second National Development Plan (NDPII) 2015/16–2019/20, 2015	The NPDII sets out the plan for achieving the Uganda Vision 2040, including investment in infrastructure and human capital. Petroleum (oil and gas) is identified as one of the key sectors and the NDPII identifies key actions required to: • increase exploitation of oil and gas • increase efficiency and effectiveness in managing and extracting oil and gas resources • produce refined oil and oil by-products for local and export markets • increase efficiency in transportation, storage, handling and security of stock petroleum products • improve protection of the environment against oil and gas activities and mitigate the likely effects of GHG emissions. • improve stakeholder relationships in the development of a desirable oil and gas sector.	The project will help to fulfil some of the plan's focus areas. The project has potential effects on the environment and will emit GHGs The project will employ skilled and unskilled labour. The project will procure materials and supplies.	An environmental *a*nd social impact assessment has been undertaken and mitigation measures proposed to ensure the project is developed in a sustainable way (Section 8). National content and capacity building will be promoted and implemented as part of the labour management and procurement and supply chain management plans (Section 10 and Appendix E5).

Table 4.2-2 Policies and Plans

Policies and Plans	Summary of Requirements	Relevance to the Project	Compliance Measure
Uganda Wildlife Authority Strategic Plan 2013–2018	The plan provides for sustainably managed wildlife areas and wildlife populations inside and outside protected areas.	The project has potential impacts on two protected areas and on areas used by wildlife.	Biodiversity baseline surveys have been undertaken (Section 6.4.1 and Appendices A1–A4). Biodiversity impact assessments have been undertaken and mitigation measures including a biodiversity management plan are proposed (Sections 8.2–8.4 and Section 10) to reduce impacts.

4.2.3 Regulations and Guidelines

Table 4.2-3 summarises Ugandan national regulations and guidelines that are or may be relevant to the project and the measures that have been or will be taken by the project for compliance with the regulations and guidelines.

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
Regulations			
The National Environment (Environmental Impact Assessment) Regulations, 1998 (SI No. 153-1) *at the time of writing under government review*	The EIA Regulations, 1998 specify the general requirements for good EIA practice in Uganda: • The proponent is required to undertake an ESIA according to the regulations, including preparation and submission of Terms of Reference, and provision of all contents for an environmental impact statement outlined under Regulation 14. • Regulation 12 (1) requires the developer to take all measures necessary to seek the views of the people in the communities that may be affected by the project. Regulations 19, 20, 21, 22 and 23 outline further requirements for public participation. For instance, under Regulation 21 (2), a public hearing is required where the project may have transboundary impacts. • Regulation 39 provides requirements for disclosure, review and consultation for projects with likely transboundary impacts.	The project is subject to EIA regulations as it is listed in the Third Schedule of the National Environment Act, Cap 153.	The ESIA has been prepared according to these regulations.
The National Environment (Air Quality) Regulations	The Regulations: • prescribe emission limits of various substances, standards for ambient air and emission standards for point sources and motor vehicles.	Project activities will generate air emissions. Sources of emissions include: • construction vehicles • construction equipment and power generators • operation of bulk heaters.	Baseline air quality surveys have been undertaken to assess ambient air quality (Section 6.4.2 and Appendix A9). An air quality impact assessment has been undertaken and mitigation measures proposed (Section 8.9). The project will comply with the most stringent Ugandan emission standards and will target international ambient air and emission standards (Appendix F).

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
The National Environment (Audit) Regulations, 2006 (SI No. 12 of 2006) *at the time of writing under government review*	• Environmental audits to be conducted only by certified and registered auditors. • Every owner or operator of a facility whose activities are likely to have a significant impact on the environment is required to establish an environmental management system and may conduct voluntary environmental audits.	The project will establish an environmental management and monitoring system.	Environmental audits of project activities will be undertaken to assess project compliance with legal requirements, project policy and the environmental and social management system.
The National Environment (Certification and Professional Conduct of Environmental Practitioners) Regulations, 2003 (SI No. 85 of 2003)	The Regulations: • provide for certification, registration of environmental practitioners and for the practice of EIA in Uganda • require a proponent to engage a competent team of registered environmental practitioners to undertake the EIA, and to adhere to the requirements of the regulations.	The project requires an EIA.	The ESIA has been undertaken by a competent team of registered environmental practitioners.
The National Environment (Industrial and Consumer Chemicals Control) Regulations, 2014 (Draft)	The Regulations: • provide for the management of chemicals, including risk assessment, remediation and emergency response. A licence is required to store regulated chemicals.	The project will manage limited amounts of chemicals and fuel during construction and operations.	Pollution prevention and chemical management plans will be developed and implemented as part of the environmental and social management plan (ESMP) (Section 10).
The National Environment (Management of Ozone Depleting Substances and Products) Regulations, 2001 (SI No. 63 of 2001)	The Regulations: • operationalise Uganda's commitment to the Montreal Protocol through restrictions on the trade of controlled substances and licensing of persons intending to import or export controlled substances • state that resourcing of goods and materials should not be from a country that is not a signatory of the Montreal Protocol • state that imports of controlled substances should be licensed by the relevant authority and free of prohibited materials.	The project will manage limited amounts of chemicals during construction and operations.	The project is not intending to use ozone depleting substances during construction or operations. The requirements of the regulations will be adopted in the procurement and supply chain management plan (Section 10).

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
The National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001 (SI No. 59 of 2001) *at the time of writing under government review*	The Regulations establish: • the minimum standards required to maintain, restore and enhance the long-term productivity of the soil • standards for management of soil quality associated with agriculture • criteria and procedures for determining soil quality.	Project construction will involve removal, handling, storage and reinstatement of soils.	Soil handling, erosion control and reinstatement measures will be implemented to maintain soil quality (Section 8.5). Project will comply with the soil quality standards (Appendix F).
The National Environment (Mountainous and Hilly Areas Management) Regulations, 2000 (SI No. 153-6)	The Regulations: • provide for the sustainable management of mountainous and hilly areas, and prescribe rules for soil conservation • prohibit the introduction of (invasive) alien species.	The pipeline will cross mountainous and hilly areas.	The pipeline has been routed to avoid steep slopes where possible (Section 3). Soil handling, erosion control and reinstatement measures will be implemented (Section 8.5). Pest and invasive species control measures will be implemented (Section 8.2–8.4).
The National Environment (Noise Standards and Control) Regulations, 2003 (SI No. 30 of 2003) *at the time of writing under government review: The National Environment (Noise and Vibrations) (Standards and Control) Regulations, 2013*	The Regulations: • establish permissible noise levels for a factory, workshop, construction site and mines and quarries • impose a duty on the owner of machinery or the owner or occupier of a facility or premises to use the best practicable means to ensure that the emission of noise from that machinery, facility or premise does not exceed permissible noise levels and require installation of noise monitoring equipment • require a licence for generating noise in excess of permissible noise levels.	The project will generate noise during construction and operation.	Noise and vibration baseline surveys have been undertaken (Section 6.4 and Appendix A10). An assessment of emissions of noise and vibration has been undertaken and mitigation measures proposed (Section 8.10). The project will comply with the most stringent Ugandan noise standards and will target international environmental noise standards (Appendix F).

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
The National Environment (Oil Spill Prevention, Control and Management) Regulations, 2014 (Draft)	The Regulations: • provide for prevention, control and monitoring of oil spill in waters and on land under Ugandan jurisdiction • establish the basic principles to be observed in handling oil and other harmful or dangerous substances, emergency response and cleanup.	There is a risk of oil spills from the pipeline.	Design and operational measures such as leak detection systems and block valves will be implemented to reduce the impact of oil spills (Section 2). Oil spill modelling has been undertaken as part of the ESIA and emergency preparedness and response planning will be implemented (Section 9, 10 and Appendix I).
The National Environment (Petroleum Waste Management) Regulations, 2014 (Draft)	The Regulations: • establish the duty of care in waste handling and contain provisions for risk assessment and management practices • state that transport and disposal of oil and gas waste is subject to permit.	The project will generate petroleum wastes.	A waste management system and waste management plans will be developed and implemented (Section 10 and Appendix E5). The project will necessary waste licences and comply with conditions.
The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations (SI No 153-3) *at the time of writing under government review: The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations (Draft)*	The Regulations: • provide the standards for effluent or waste water before it is discharged into water or onto land • provide for the general obligation to mitigate pollution and require every industry or establishment to install, at its premises, antipollution equipment for the treatment of effluent or chemical discharges • state that antipollution equipment has to be based on the best practicable means for environmentally sound practice • require records to be kept of the amount of waste generated by the activity and of the parameters of the discharges.	The project will generate effluent and sewage.	Sewage and effluent will be treated as described in Sections 2.4.2.8 and 2.4.5.5. The project will comply with the most stringent Ugandan and international effluent emission standards (Appendix F). Records of discharges will be maintained and submitted to NEMA and relevant authorities.

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
The National Environment (Waste Management) Regulations, 1999 (SI No. 153-2) *at the time of writing under government review*	The Regulations: • apply to all categories of hazardous and nonhazardous waste not classified as petroleum waste • prescribe requirements for the management of waste, including storage, transport, treatment and disposal • require use of licensed waste contractors to transport, store, treat or deposit hazardous waste • ensure that operations are undertaken in an environmentally sound way.	The project will generate various types of waste.	Waste management plan will be developed and implemented as part of the ESMP to ensure compliance with these regulations (Section 10). The project will obtain necessary waste licences and comply with conditions.
The National Environment (Wetlands, Riverbanks and Lakeshores Management) Regulations, 2000 (SI No. 153-5).	The Regulations: • ensure the central or local governments shall hold in trust and protect wetlands, riverbanks and lakeshores for the common good of the citizens of Uganda • provide a list of regulated activities whose implementation in wetlands is subject to issuance of a permit granted by NEMA in consultation with the relevant lead agencies ○ This applies to a range of recreational and commercial activities, including construction of transport and communication facilities such as roads, railways, telephone lines and any other activity that is of a commercial nature. • ensure every landowner, occupier or user who engages in activities adjacent or contiguous with a wetland, riverbank and lakeshore has a duty to prevent degradation or destruction and maintain the ecological and biodiversity conservation functions of the wetland.	The pipeline will cross wetlands and watercourses.	The ESIA has assessed the impacts of crossing wetlands and watercourses on biodiversity and associated ecosystem services and has proposed mitigation measures (Sections 8.2–8.3). The project will obtain the necessary permits and authorisations and comply with conditions .

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
National Forestry and Tree Planting Regulations, 2016 (SI No. 57 of 2016)	The regulations include all aspects of sustainable management of forests. The regulations: • outline the rules for establishment and management of community and private forest reserves • provide for registration of protected trees and reserved species • regulate introduction of alien and exotic species • require the consent of the owner before any tree can be disturbed, uprooted or cut (Regulation 80) • list the activities for which a person may apply for a licence to operate in a forest (Regulation 89).	The pipeline route crosses the Taala forest reserve and some commercial plantations.	The pipeline has been routed to reduce impacts on forests (Section 3). The project will obtain all necessary consents before tree removal and comply with conditions . Native species will be used where trees are planted as part of the reinstatement plan (Section 10).
Petroleum (Refining, Conversion, Transmission and Midstream Storage) (National Content) Regulations, 2016 (SI No. 34 of 2016)	The Regulations: • promote the empowerment of Ugandan citizens and entities during the execution of midstream operations • require licence holders to submit procurement forecasts, prioritise Ugandans during procurement of goods and services and submit plans for recruitment and training of Ugandans.	The project is a midstream petroleum activity subject to these regulations. The project will employ skilled and unskilled labour and procure goods and services.	The provisions of the regulations will be adopted in the the labour management and procurement and supply chain management plans (Section 10).
Petroleum (Refining, Conversion, Transmission and Midstream Storage) Regulations, 2016 (SI No. 36 of 2016)	Part III of the Regulations include pipelines, including: • requirements associated with pipeline construction, routing, design and safety considerations, pressure testing, operations and maintenance • submission of routeing, design, project execution strategy and flow assurance plan for approval • requirement for licences to construct and begin operation of a pipeline and a permit to operate • regulation of third party use of pipelines • regulation of ground disturbance by third parties around an operational pipeline.	The project is a midstream petroleum activity subject to these regulations.	A comprehensive routing survey has been conducted according to the regulations (Section 3) and submitted for approval. The project will be designed, constructed and operated in compliance with the regulations (Section 2). Documents will be submitted for approval as required by the regulations. The project will obtain necessary permits and comply with conditions.

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
Petroleum (Refining, Conversion, Transmission and Midstream Storage) (Health, Safety and Environment) Regulations, 2016 (SI No. 35 of 2016)	The regulations contain detailed requirements for health, safety and environment management, risk management, occupational health and safety including handling of hazardous materials and personal protective equipment, fire protection, emergency preparedness and response, medical and first aid facilities. Additional safety requirements for pipelines are included in Regulations 134–140. Incident reporting and investigation is included in Regulations 153-158 and specific requirements for spillages in Regulation 159. Effluent and drainage disposal requirements are specified in Section 160.	The project is a midstream petroleum activity subject to these regulations.	The project will be designed, constructed and operated in compliance with the regulations (Section 2 and Section 9). Risk assessments have been conducted and results adopted in the the design (Section 9). The detailed requirements of the regulations will be adopted in the the project ESMP and management plans, in particular, the occupational and community health, safety and security, waste management, chemical management and emergency preparedness and response plans (Section 10) and the training programme (Section 10.9). Documents will be prepared and submitted as required by the regulations, including the safety document, safety instructions and safety audits.
Traffic and Road Safety (Motor Vehicle Inspection) Regulations, 2016 (SI No. 51 of 2016)	The Regulations: • provide for periodic inspection of road vehicles to ascertain their roadworthiness • all vehicles including goods vehicles shall be subject to periodic inspection at approved facilities.	On-road vehicles will be used for project activities.	Fit-for-purpose vehicles will only be used for project activities. Regular maintenance and vehicle inspections will be undertaken. These requirements will be adopted in the transport and road safety management plan (Section 10 and Appendix E5).

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
Traffic and Road Safety (Prescribed Alcohol Limit) Regulations, 2004 (SI No. 31 of 2004)	The Regulations: • prescribe breath alcohol level beyond which a person is not allowed to drive a motor vehicle.	On-road vehicles will be used for project activities.	Strict drug and alcohol tolerance policies will be implemented as part of the occupational health, safety and security and transport and road safety management plans (Sections 9.4 and 10.7).
Traffic and Road Safety (Restriction of Use of Mobile Telephones) Regulations, 2004 (SI No. 99 of 2004)	The Regulations: • restrict the use of mobile phones while driving.	On-road vehicles will be used for project activities.	Mobile phones will be restricted when driving. This will be reinforced by a driver training programme.
Traffic and Road Safety (Speed Limits) Regulations, 2004 (SI No. 33 of 2004)	The Regulations: • prescribe applicable speed limits for various road conditions, locations and vehicle types.	On-road vehicles will be used for project activities.	National and project speed limits will be adhered to (Section 9.4). This will be reinforced by a driver training programme.
Traffic and Road Safety (Wearing of Safety Belts) Regulations, 2004 (SI No. 32 of 2004)	• All seats in a vehicle to be fitted with safety belts • The driver and all passengers in a vehicle must wear safety belts at all times when the vehicle is moving.	On-road vehicles will be used for project activities.	Only vehicles fitted with seat belts will be used. Drivers and passengers will be required to wear seatbelts. This will be reinforced by training.
Traffic and Road Safety (Weighbridges) Regulations, 2010 (SI No. 25 of 2010)	The Regulations: • prescribe the maximum axle load weights for vehicles, trailers and engineering plants of various axle groups.	Pipe, aggregate and other heavy equipment and materials will be transported by road.	The regulation's maximum pay-load limits will be implemented and included in the transport and road safety management plan (Section 10 and Appendix E5).

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
Water (Waste Discharge) Regulations, 1998 (SI No. 152-4)	The Regulations: • prescribe limits for the discharge of waste into water resources, specifying among others restricted activities for which waste discharge permits must be acquired • stipulate that a proponent shall acquire a permit where the discharge of effluent or waste into water or on land is deemed necessary (Regulation 4 (1)).	The project will generate effluent and liquid waste throughout its lifecycle.	The project will obtain necessary licences and authorisations and comply with conditions (Table 4.3-1).
Water Resources Regulations, 1998 (SI No. 152-1)	The Regulations: • licence abstraction from lakes, rivers and groundwater • stipulate that obtaining a licence requires consideration of other uses, including those downstream.	The project will need to abstract water, specifically for construction camps, hydrostatic testing and operation of AGIs.	A water source study is being undertaken to ensure that water abstraction will not affect other uses (Section 2.4.1.2). The project will obtain necessary licences and authorisations and comply with conditions (see Table 4.3-1).
Atomic Energy Regulations, 2012	The regulations seek to specify minimum requirements for the protection of individuals, society and environment from the dangers resulting from ionising radiation and provide for the safety and security of radiation sources.	Project may use radiography to inspect pipeline welds.	If radiography is used to test pipeline welds, radiation risks will be reduced to as low as reasonably practicable through measures such as: • carrying out thorough general and site-specific risk assessments and pre-work planning • preparation and approval of a radiation protection plan including emergency response (Section 10) • use of well-designed shields and/or enclosures.

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
National and Regional Guidelines			
Guidelines for Environmental Impact Assessment in Uganda (NEMA 1997)	• General guidelines on the ESIA process in Uganda. Includes recommendations to project developers, EIA practitioners, lead agencies and NEMA	The project requires an ESIA under the National Environment Act.	This ESIA has been prepared according to the guidelines.
Environmental Impact Assessment Guidelines for the Energy Sector (NEMA 2004)	The Guidelines: • provide practical guidance on the EIA process in Uganda specific to energy development projects and the energy sector in general • contain specific guidance on the environmental impacts of petroleum exploration and appraisal, development and production, transportation, refining, and petroleum storage/trading of petroleum products • contain guidance on compensation for loss of assets and resettlement.	The project requires an ESIA under the National Environment Act.	This ESIA has been prepared according to the guidelines.
Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda (NEMA 2014)	The Guidelines: • provide detailed guidelines for the EIA process as applicable to the energy sector in Uganda • contain specific guidelines on HIV and gender-related issues, climate change, disputes and grievances, public hearing and transboundary aspects • while not specifically relevant to the project, some of the general guidance is more up-to-date than the 2004 guidelines	The project requires an ESIA under the National Environment Act.	This ESIA has been prepared in accordance with the guidelines.

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
Environmental Impact Assessment Guidelines for Road Projects (Ministry of Works and Transport (formerly Ministry of Works, Housing and Communications), 2004)	• Guidelines on EIA process for road projects, such as road upgrades and construction of new roads. Includes guidelines for socio-economic and cultural impact assessment, compensation and resettlement, and public consultation	Project components include construction and operation of permanent roads.	This ESIA has been prepared in accordance with the guidelines.
Environmental Impact Assessment Guidelines for Water Resources Related Projects in Uganda (Ministry of Water and Environment (MWE) 2011)	• Guidelines include groundwater projects (such as borehole drilling and groundwater extraction) and surface water projects (such as industrial water supply and discharge projects)	The project will need to drill boreholes to abstract water.	This ESIA has been prepared in accordance with relevant aspects of these guidelines.
National Physical Planning Standards and Guidelines (Ministry of Lands, Housing and Urban Development 2011)	The Guidelines: • provide a government manual of criteria for determining the scale, location and site requirements of various land uses and facilities • contain standards for industrial areas, roads and vehicle parking.	Project components include construction camps and permanent AGIs.	The standards and guidelines during detailed design of project components.
Operational Waste Management Guidelines for Oil and Gas Operations (NEMA 2012)	The Guidelines: • define guiding principles for waste management • describe international practices for oil and gas waste management and the National Environment (Waste Management) Regulations, 1999.	The project will generate various types of waste throughout its lifecycle.	The guidelines will be taken into account when preparing and implementing the operational waste management plan (Section 2.4.5.5, Section 10 and Appendix E5).

Table 4.2-3 Regulations and Guidelines

Regulations and Guidelines	Summary of Requirements	Relevance to the Project	Compliance Measure
Transboundary Environmental Assessment Guidelines for Shared Ecosystems in East Africa (EAC 2005)	The Guidelines: • define criteria for determining transboundary environmental impacts • describe the process of transboundary impact assessment.	The project is by its nature transboundary (spans across two countries). Guidelines also require transboundary EIA for large diameter oil pipelines.	Transboundary impacts have been assessed in the ESIA according to the guidelines (Section 8).
Uganda Wildlife Authority Operational Guidelines for Oil and Gas Exploration and Production in Wildlife Protected Areas (2014)	The Guidelines: • guide the operations of oil companies in wildlife protected areas • provide specific requirements for construction and operation of access roads and pipelines, materials extraction sites and aboveground installations • contain guidance on addressing potential impacts on tourism and ecosystem health.	The project may impact on wildlife protected areas.	Baseline biodiversity surveys have been completed (Section 6.4.1 and Appendices A1–4), impacts on biodiversity have been assessed and mitigation measures proposed according to the guidelines (Sections 8.2–8.4).
Framework and Guidelines for Water Source Protection (MWE 2013)	The guidelines are for improved water quality, reliable water supply and better livelihood opportunities. Specific guidance is provided for protecting various types of existing or new water infrastructure, including piped water supplies, point water supplies, multipurpose reservoirs and hydroelectric power plants.	The project will use water resources for construction camp water supply and hydrostatic testing. The pipeline route will cross watercourses and water supply infrastructure.	The design of project water abstraction facilities will be compliant with the framework and guidelines.

4.2.4 Forthcoming Legislation

The Government of Uganda is in the process of amending or replacing existing laws and regulations and developing new requirements that could become relevant to the project upon enactment. These include:

- the National Environment Act Cap 153
- amendments to the existing regulations under the National Environment Act Cap 153:
    - Impact Assessment Regulations, 1998
    - Audit Regulations, 2006
    - Minimum Standards for Management of Soil Quality Regulations, 2001
    - Noise Standards and Control Regulations, 2003
    - Standards for Discharge of Effluent into Water or on Land Regulations, 1999
    - Waste Management Regulations, 1999
- new regulations under the National Environment Act Cap 153 (draft provisions included in Table 4.2-3):
    - Air Quality Regulations
    - Industrial and Consumer Chemicals Control
    - Petroleum Waste Management Regulations
    - Oil Spill Prevention, Control and Management Regulations
- Uganda Wildlife Act Cap 200, 1996.

Once enacted, the provisions of the revised act and regulations will be complied with. For the laws under revision, the project has obtained drafts, where available, of the new or amended laws and has considered them when preparing the ESIA and developing mitigation commitments.

4.2.5 Institutional Framework

Uganda is divided into 112 districts across four administrative regions: northern, eastern, central and western. Each district is comprised of sub-counties, parishes or wards, and villages. Parallel with state administration, there are several cultural institutions. The project's pipeline will cross Bunyoro, Buganda and Kooki cultural institutions.

The Government of the Republic of Uganda is a democracy made up of three parts:

1. The Executive, comprising the president, vice president, prime minister and cabinet
2. The Legislature – the Parliament
3. The Judiciary, comprising the Supreme Court, Magistrates' Court, High Court and Court of Appeals (Constitutional Court).

Sector ministries are led by ministers who are appointed by the president, with the prior approval of parliament. National agencies in Uganda consist of publicly funded bodies, commissions, statutory bodies, state-owned enterprises and authorities.

Uganda has been pursuing a major decentralisation programme since the 1980s. The change from a highly centralised state has resulted in the gradual transfer of power, functions and services to local councils. The system of local government in Uganda is based on the district as the basic unit under which there are lower local government and administrative unit councils down to the county, parish, and village levels.

Table 4.2-4 lists the administrative institutions most relevant to the project.

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
Office of the Prime Minister	• Lead government business in parliament • Coordinate the monitoring and evaluation of the implementation of government policies and programmes • Coordinate the implementation of government policies, programmes and projects including joint assessment framework indicators and actions, and Presidential Investment Roundtable decision through the National Institutional Coordination Framework • Undertake coordination of the implementation of the National Development Plan • Coordinate and provide public relations to ensure good Government image, effective coverage of national events, communication of policies and practices, and defining the ideal national character and values for development • Coordinate development of capacities for prevention, preparedness, and response to natural and human induced disasters and refugees • Coordinate and monitor the implementation of special government policies and programmes for Northern Uganda, Luwero-Rwenzori, Karamoja, Bunyoro and Teso Affairs
National Level – Ministries	
Ministry of Water and Environment (MWE)	• Responsible for setting national policies and standards, managing and regulating water resources and determining priorities for water development and management • MWE has three directorates: o Directorate of Water Resources Management (DWRM) o Directorate of Water Development o Directorate of Environmental Affairs. • Reporting to MWE are the: o National Environment Management Authority (NEMA) o National Forestry Authority (NFA) o National Water and Sewerage Corporation.

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
Directorate of Water Resource Management (part of the Ministry of Water and Environment)	• Develops and maintains national water laws, policies and regulations • Manages, monitors and regulates water resources through issuing water use, borehole drilling, abstraction and wastewater discharge permits • Integrates water resources management activities • Coordinated Uganda's participation in joint management of transboundary waters resources and peaceful cooperation with Nile Basin countries
Directorate of Water Development (part of the Ministry of Water and Environment)	• Provides support to local governments and other service providers with respect to water resource issues
Wetlands Management Department (part of the Ministry of Water and Environment)	• Promotes conservation and sustainable use of wetlands and their resources and to ensure sustainable use of wetlands for ecological and tourism purposes • Participates in the evaluation of EIAs for projects in wetland areas
Climate Change Department (CCD) (part of the Ministry of Water and Environment)	The main objective for establishing the CCD is to strengthen Uganda's implementation of the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. • Provides technical support to the Ministry of Water and Environment with regards to climate change issues • Coordinates national climate change mitigation and adaptation actions in different sectors, including energy
Ministry of Gender, Labour and Social Development	Mandated to: • protect vulnerable persons from deprivation and livelihood risks • create an enabling environment for increasing employment opportunities and productivity, especially the poor and vulnerable • address issues of inequality and exclusion in access to services across all sectors.
Department of Occupational Safety and Health, Ministry of Gender, Labour and Social Development	• Responsible for implementing the Occupational Safety and Health Act (2006), and carrying out statutory inspections to ensure proper management of health and safety at workplaces, including the oil and gas industry

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
Ministry of Agriculture, Animal Industry and Fisheries	• Formulates, reviews and implements national policies, plans, strategies, regulations and standards • Enforces laws, regulations and standards along the value chain of crops, livestock and fisheries • Monitors, inspects and evaluates activities in the agricultural sector including local governments • Regulates, among other aspects, the use of agricultural chemicals and planting materials
Directorate of Fisheries Resources (part of Ministry of Agriculture, Animal Industry and Fisheries)	• Promotes, supports and guides the sector • Responsible for setting and enforcing the standards and regulations for practices pertaining to fisheries
Ministry of Energy and Mineral Development (MEMD)	• Establishes, promotes the development of, strategically manages and safeguards the rational and sustainable exploitation and utilisation of energy and mineral resources for social and economic development • Policy guidance for developing and exploiting energy and mineral resources • Creates an enabling environment to attract investment for the development, provision and utilisation of energy and mineral resources • Acquires, processes and interprets technical data to establish the energy and mineral resource potential of the country • Inspects, regulates, monitors and evaluates private companies in energy and mineral sectors so that the resources are developed, exploited and used on a rational and sustainable basis
Petroleum Exploration, Development and Production Department (PEDPD, Directorate of Petroleum, part of Ministry of Energy and Mineral Development)	• Promotes and regulates petroleum exploration in Uganda • Implements the National Oil and Gas Policy for Uganda (2008) with the PEDPD being responsible for initiating policy and legislation on petroleum exploration and development, regulating licensees for undertaking petroleum exploration and production in the country, and building national capacity in the field of petroleum exploration and development
Ministry of Tourism, Wildlife and Antiquities	• Formulates and implements policies, strategies, plans and programmes that promote tourism, wildlife and cultural heritage conservation • Conservation and development of wildlife resources, and provision of advice to government • Promotes and protects the cultural and natural heritage • Provides professional knowledge and information regarding the archaeology and palaeontology of Uganda • Oversees the Uganda Wildlife Authority, among other institutions

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
Ministry of Lands, Housing and Urban Development	Formulates: • policies in relation to land issues • national standards and coordination of all matters concerning land, housing and urban development. Of particular relevance to the project are the following units in the Ministry: • Directorate of Land Management, which is responsible for issues concerning overall land management including management of the national land register, technical support relating to land registration and acquisition processes to local governments, and land valuation • Directorate of Physical Planning and Urban Development, which is responsible for regional planning and formulation of land use related policies, plans and regulations.
National Physical Planning Board (part of the Ministry of Lands, Housing and Urban Development)	• Advises on the declaration of special planning areas as prescribed by the Physical Planning Act, 2010 • Prepares physical development plans • Formulates draft planning policies, standards, guidelines and manuals. As the project's footprint is in a special planning area (the Albertine Graben), the National Physical Planning Board will be a key stakeholder.
Ministry of Works and Transport	• Plans, develops and maintains economic, efficient and effective transport infrastructure and services, which includes roads and pipelines • Develops national policies, laws and regulations for public transport infrastructure and services • Sets standards for the construction industry, transport infrastructure and services • Enforces compliance with the existing policies, laws and regulations • Develops and manages the national road network and provides guidance on matters concerning the national road network to the Uganda National Roads Authority
Ministry of Local Government	• Mandated to guide, harmonise, mentor and advocate for all local governments in support of the vision of government to bring about socio-economic transformation of the country.
Ministry of Education and Sports	• Provides quality education and sports services in the country, which are constitutional obligations for the Ugandan State and Government
Ministry of Defence and Veteran Affairs	• Mandated to defend and protect the sovereignty and territorial integrity of Uganda, and the constitution that encapsulates people's sovereignty through popular will
Ministry of Internal Affairs	• Mandated to ensure and maintain internal security, peace and stability

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
National Level – Agencies and Authorities	
National Environment Management Authority (NEMA)	The principal agency in Uganda charged with the responsibility of coordinating, monitoring, regulating and supervising environmental management. NEMA: • coordinates the implementation of government policies and decisions of the Policy Committee on Environment • ensures the integration of environmental concerns in overall national planning through coordination with the relevant ministries, departments and government agencies • liaises with the private sector, intergovernmental organisations, nongovernmental and government agencies of other states on issues relating to the environment • proposes environmental policies and strategies to the Policy Committee • initiates legislative proposals, standards and guidelines on the environment according to the law • reviews and approves EIAs and environmental impact statements (EIS).
Petroleum Authority of Uganda (PAU)	• Created under Section 9 of the Petroleum (Exploration, Development and Production) Act, 2013, and also carries out functions under the Petroleum (Refining, Conversion, Transmission and Midstream Storage) Act, 2013 • Regulates and monitors the oil and gas sector in Uganda • Ensures that petroleum operations in Uganda are conducted according to the relevant laws
Uganda Wildlife Authority (UWA)	• Established under the Uganda Wildlife Act (2000) • In charge of managing 10 national parks, 12 wildlife reserves, 13 wildlife sanctuaries and 5 community wildlife areas • Mandated to perform all the functions required of a lead agency for purposes of an EIA for any project that may have a significant effect on any wildlife species or community
Uganda Land Commission	• Manages any land in Uganda vested in or acquired by the Government of Uganda according to the constitution • Maintains an updated inventory and database for all government land and property • Protects government lands from unauthorised use • Executes deeds like leases and tenancy agreements for government lands • Handles investigations and litigations arising from disputes over government land • Collaborates with the Ministry of Lands, other stakeholders and responsible organs on the review of land laws • Resettles persons displaced because of government actions, natural disasters or any other cause through outright compensations or provision of alternative land

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
National Forestry Authority (NFA)	• Responsible for managing national forest reserves under the National Forestry and Tree Planting Act, 2003, that provides for the conservation, sustainable management and development of forests for the benefit of the people of Uganda • Coordinates with NEMA and other agencies on managing Uganda's forest resources, and controls industrial developments in central forest reserves in conjunction with other relevant authorities
Uganda National Roads Authority (UNRA)	• Develops and maintains the national roads network, advises government on general roads policy and contributes to addressing transport concerns, among others • Collaborates with the private sector on issues relating to the development and maintenance of roads • The Environment and Social Safeguards department is responsible for identifying and evaluating environmental and social risks and impacts of road and bridge projects and ensuring grievances from affected persons are responded to and appropriately managed.
Uganda Human Rights Commission	• Established under the Constitution of the Republic of Uganda 1995 (Article 51) • Responsible for protecting and promoting fundamental human rights and freedoms in Uganda and implementing international human rights conventions
Uganda Investment Authority	• Established under the Investment Code Act, Cap 92 • A semi-autonomous government agency mandated to initiate and support measures that enhance investment in Uganda and advise Government on appropriate policies conducive for investment promotion and growth • Markets investment opportunities, ensures local and foreign investors have access to relevant information
Uganda National Bureau of Standards	• Established by the Uganda National Bureau of Standards Act, Cap 327 • Formulates, promotes and enforces standards in the interest of public health, safety and the environment • Publishes the Uganda Standards Catalogue, which includes compulsory and voluntary standards for industries, including the oil and gas sector
Civil Aviation Authority	• Promotes the safe, regular, secure and efficient use and development of civil aviation inside and outside Uganda • Licences operators and aviation crew, and certifies operators and aircraft • Provides air navigation services • Establishes, maintains, operates and owns aerodromes

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
Local Level	
District Community Development Officer	• Plays a key role in stakeholder engagement and community projects
District Environment Committee	• Coordinates the activities of the district council and the local environment committees relating to the management of the environment and natural resources • Ensures that environmental concerns are integrated in all plans and projects approved by the district council • Assists in developing and formulating byelaws relating to managing the environment • Coordinates with NEMA on all issues relating to environment management
District Environment Officer	• Advises the district environment committee on all matters relating to the environment • Assists local environment committees in the performance of their functions • Gathers information on the environment and the utilisation of natural resources in the district • Serves as the secretary to the district environment committee
District Health Management Team	• Responsible for implementing health policies and programmes and planning and overseeing health service delivery
District Land Board	• Holds and allocates land in the district that is not owned by any person or authority • Facilitates the registration and transfer of interests in land • Compiles and maintains rates of compensation payable (e.g., crops and nonpermanent buildings) • Acquires rights or interests in land
District Land Office	• Provides technical services to the district administration and the District Land Board
District Technical Planning Committee	• Implements coordination and development planning functions of the local government • Integrates all district sector development priorities and those of lower level local governments for presentation to the district council
District Wildlife Committee	• Advises the district councils, in liaison with UWA, on managing and utilising wildlife in the local jurisdiction

Table 4.2-4 Administrative Institutions

Institution	Roles and Responsibilities
Local Environment Committee	• Monitors all activities in its local jurisdiction to ensure that such activities do not have any significant impact on the environment • Reports any events or activities that have or are likely to have significant impacts on the environment to the district environment officer or the appropriate authority • Identifies riverbanks, lakeshores, wetlands and hilly or mountainous areas that are at risk from environmental degradation or are of local, national and international importance, and takes necessary measures to reduce the risk or recommend to the authority the need for the protection of those areas • Prepares local land use plans

4.3 Permitting Requirements

4.3.1 Environmental and Social Impact Assessment Preparation and Approval Procedure

The main environmental approval required for major projects is the approval of a project environmental impact assessment. The Guidelines for Environmental Impact Assessment in Uganda (NEMA, 1997) and the Environmental and Social Impact Assessment Guidelines for the Energy Sector (NEMA, 2014)[1] describe the EIA basic steps as follows:

1. Project brief and screening: NEMA and other relevant lead agencies[2] determine the extent to which a project is likely to affect the environment and whether further assessment is necessary. If a project type, such as pipelines, is listed in the Environment Act, Third Schedule, Projects to be considered for environmental impact assessment, an EIA is automatically required without the need for submission of a project brief.
2. Scoping and preparation of terms of reference (ToR) for the EIS: the scope of work to be undertaken to identify and assess the likely environmental effects of a proposed project are determined. NEMA reviews the ToR in consultation with an appropriate lead agency before the EIS is conducted to ensure that key environmental concerns associated with the proposed project are included.

[1] An earlier document, Environmental Impact Assessment Guidelines for the Energy Sector (NEMA 2004), encompasses all types of energy projects, including oil pipelines, whereas the 2014 guidelines refer to oil only in the context of thermal generation. Nonetheless, the 2014 guidelines include text from both the 2004 guidelines and refinements, such as additional information on scoping report and ESIA format content, and hence are considered best practice at the time of writing.

[2] According to the National Environment Act 1995 Cap 153, Part I Section 1(gg), 'lead agency' means any ministry, department, parastatal agency, local government system or public officer in which or in whom any law vests functions of control or management of any segment of the environment.

3. EIS: following the scope defined in the ToR, the project proponent describes baseline environmental and social conditions, assesses the significance of likely impacts associated with the project and develops mitigation measures to address the identified impacts. The EIS is submitted to NEMA for review.
4. Review of the EIS and decision making: after receiving the EIS, NEMA reviews it and sends copies to the lead agency and other stakeholders for review and feedback and invites the general public to make comments before making the decision on whether to approve the project.

Figure 4.3-1 shows the key stages of the EIA process.

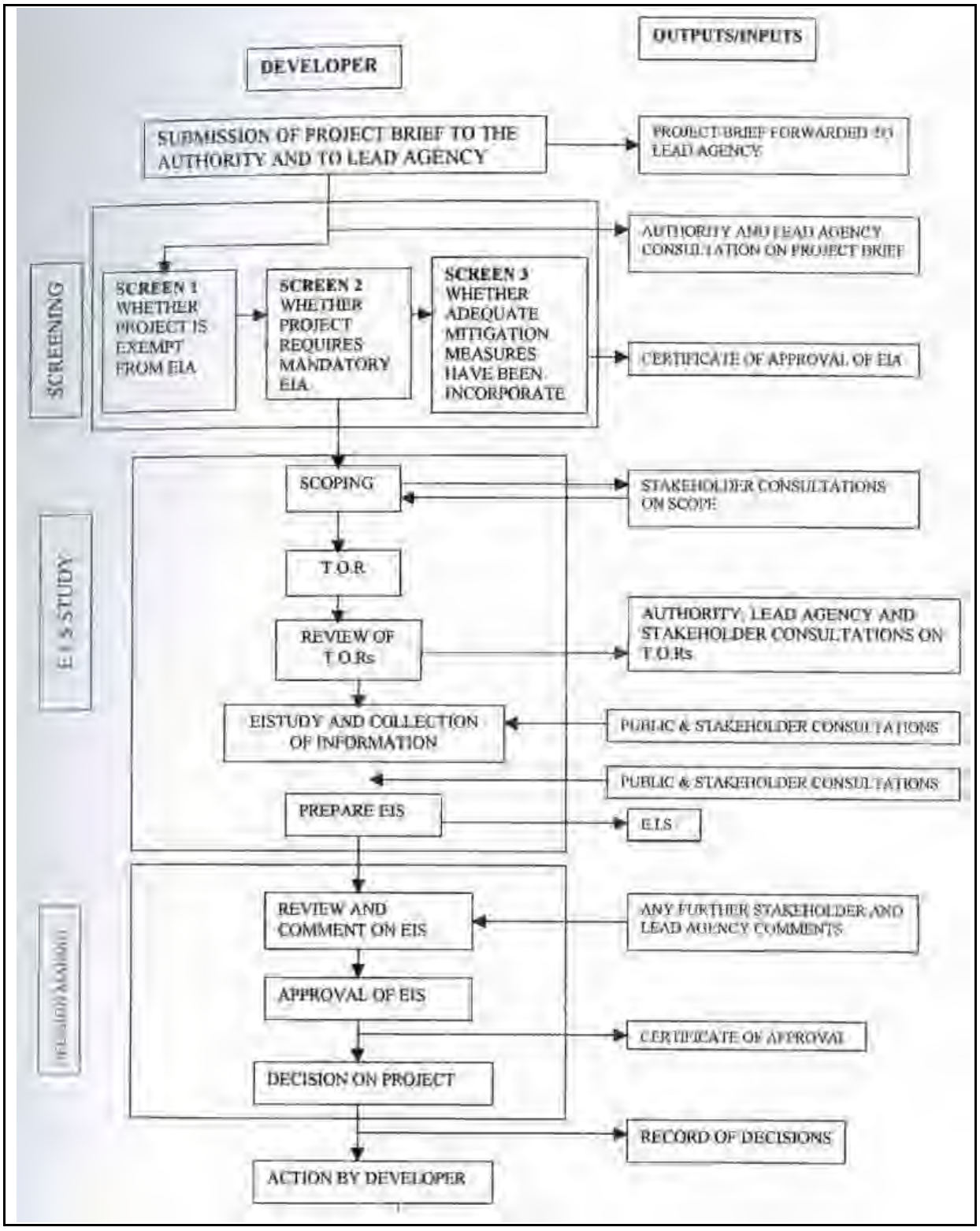


Figure 4.3-1 Environmental Impact Assessment Process

SOURCE: NEMA (2014)

4.3.2 Permits, Licences and Authorisations

The national legislation of Uganda establishes several approvals, permits and licences which must be acquired before a project or specific activities begin. Table 4.3-1 provides an overview of the permits, licences and approvals that are or may be required by the project.

Table 4.3-1 Permits, Licences and Authorisations

Permit, Licence or Approval	Issuing Authority	Legislation or Regulations	Requirement
Authorisation to use radioactive sources	Atomic Energy Council, MEMD	Atomic Energy Act, 2008 (Act No. 24 of 2008)	Section 32 (1): Subject to section 33, no person shall acquire, own, possess, operate, import, export, hire, loan, receive, use, install, commission, decommission, transport, store, sell, distribute, dispose of, transfer, modify, upgrade, process, manufacture or undertake any practice related to the application of atomic energy and regulated by this Act unless permitted by an authorisation issued under this Act.
Borehole construction	Directorate of Water Resource Management (DWRM)	Water Act (Cap 152 of the Laws of Uganda)	Section 18 (1): No person shall construct or operate any works unless authorised to do so under this Part of the Act. Section 18 (2): A person wishing to construct any works or to take and use water may apply to the director in the prescribed form for a permit to do so. A drilling permit and permit for water abstraction are required.
		Water Resources Regulations (SI No. 152-1)	Regulation 16 (2): A person who wishes to engage a driller under sub-regulation (1) to construct a borehole on his or her land for the purpose of, (a) using water; (b) recharging an aquifer; or (c) fitting a motorised pump to a borehole may apply to the Director for a construction permit in Form F1 of the Sixth Schedule.
Construction and operation of midstream storage tank	MEMD	Petroleum (Refining, Conversion, Transmission and Midstream Storage) Regulations, 2016 (SI No. 36 of 2016)	Regulation 109 (1): A person shall not store petroleum commodities or petroleum products in bulk without a licence issued by the Minister under the Act and these Regulations.
Development permission	District Technical Planning Committee	Planning Act, 2010 (Act No. 8 of 2010)	Section 33 (1): A person shall not carry out a development in a planning area without obtaining development permission from a physical planning committee.
Dredging in river	DWRM	Rivers Act (Cap 357 of the Laws of Uganda)	Section 4(1): It shall not be lawful to dredge in any river without a licence from the Minister [. . .].

Table 4.3-1 Permits, Licences and Authorisations

Permit, Licence or Approval	Issuing Authority	Legislation or Regulations	Requirement
Groundwater abstraction Surface water abstraction	DWRM	Water Act, (Cap 152 of the Laws of Uganda)	Section 18 (1): No person shall construct or operate any works unless authorised to do so under this Part of the Act. Section 18 (2): A person wishing to construct any works or to take and use water may apply to the director in the prescribed form for a permit to do so.
		Water Resources Regulations (SI No. 152-1)	Regulation 3 (1): A person who (a) occupies or intends to occupy any land; (b) wishes to construct, own, occupy or control any works on or adjacent to the land referred to in Regulation 10; may apply to the Director for a water permit.
			Regulation 3 (2): An application referred to under sub-regulation (1) shall, (a) be in the form specified in the First Schedule to these regulations except that, i) Form A shall be used for surface water permits; and ii) Form B shall be used for groundwater permits
Lease agreement	District Land Board	Registration of Titles Act, (Cap 230 of the Laws of Uganda)	Section 101: The proprietor of any freehold under the operation of this Act may, subject to any law or agreement for the time being in force, lease that land for any term exceeding three years by signing a lease of it in the form in the Eighth Schedule to this Act.
		Land Act (Cap 227 of the Laws of Uganda, as amended)	Section 73: Where it is necessary to execute public works on any land, an authorised undertaker shall enter into a mutual agreement with the occupier or owner of the land according to this Act; and where no agreement is reached, the Minister may, compulsorily acquire land under section 42.

Table 4.3-1 Permits, Licences and Authorisations

Permit, Licence or Approval	Issuing Authority	Legislation or Regulations	Requirement
		Land Acquisition Act (Cap 226 of the Laws of Uganda)	Section 19: Nothing in this Act shall prevent the Government from entering into an agreement with a person having an interest in land by which— a) that person's interest in land is acquired by the Government; or that person's claim to compensation for land under this Act is settled by the grant of other land or in any other way.
Licence for transportation, storage and treatment of hazardous or nonhazardous waste	NEMA	National Environment (Waste Management) Regulations (SI No. 153-2)	Regulation 6: (1) A person intending to transport waste shall apply to the Authority for a licence in Form I set out in the First Schedule. (2): A person intending to store waste on his or her premises shall apply to the Authority for a licence in Form III set out in the First Schedule. Regulation 13 (1): A person intending to operate a waste treatment plant or disposal site shall apply to the Authority for a licence in Form V set out in the First Schedule.
Licence to erect or carry on a magazine	Ministry of Internal Affairs	Explosives Act, (Cap 298 of the Laws of Uganda)	Section 22 (1): Any person desiring to erect or carry on a magazine for the storage of explosives shall make application for a licence to erect or carry on a magazine.
Licence to operate in a forest	National Forestry Authority	National Forestry and Tree Planting Regulations, 2016 (SI No. 57 of 2016)	Regulation 89 lists the activities for which a person may apply for a licence to operate in a forest. The application form is specified in Schedule 7.
Noise emissions in excess of permissible noise levels	NEMA	National Environment (Noise Standards And Control) Regulations, 2003 (SI No. 30 of 2003)	Regulation 12 (1): An owner or occupier of premises whose works or activities are likely to emit noise in excess of the permissible noise levels shall apply to the Executive Director in the form prescribed in Part I of the Second Schedule, for a Licence to Emit Noise in Excess of the Permissible Levels.

Table 4.3-1 Permits, Licences and Authorisations

Permit, Licence or Approval	Issuing Authority	Legislation or Regulations	Requirement
Permit to carry out activities in mountainous and hilly areas	Local Environment Committee	National Environment (Mountainous and Hilly Areas Management) Regulations, 2000 (SI No. 2 of 2000)	Regulation 8.1: A person who desires to […] (d) carry out any development activity requiring an environmental impact assessment in a mountainous and hilly area where the slope (gradient) exceeds 15% shall make an application to the local environment committee of the lower local governments […].
Pipeline construction	MEMD	Petroleum (Refining, Conversion, Transmission and Midstream Storage) Regulations, 2016 (SI No. 36 of 2016)	Regulation 59 (1): A person shall not construct a pipeline without a licence issued by the Minister according to the Act and these Regulations.
Pipeline operations (licence)	MEMD	Petroleum (Refining, Conversion, Transmission and Midstream Storage) Regulations, 2016 (SI No. 36 of 2016)	Regulation 70 (1): Following the completion of construction of a pipeline or substantial modification of a pipeline to the satisfaction of the Authority, the licensee shall apply to the Minister in writing for a licence to operate the pipeline.
Pipeline operations (permit)	Petroleum Authority of Uganda	Petroleum (Refining, Conversion, Transmission and Midstream Storage) Regulations, 2016 (SI No. 36 of 2016)	Regulation 71 (1): Following the completion of construction of a pipeline or substantial modification of a pipeline, the licensee shall notify the Authority in writing of the completion of construction or substantial modification and shall append to such notification the documentation set out in subregulation.
Registration of a workplace	Department of Occupational Safety and Health Ministry of Gender, Labour and Social Development	Occupational Safety and Health Act No. 9, 2006	Section 40 (2): a person shall not less than one month before he or she begins to occupy any premises as a workplace, serve on the Commissioner, a notice with the particulars prescribed in Schedule 3.

Table 4.3-1 Permits, Licences and Authorisations

Permit, Licence or Approval	Issuing Authority	Legislation or Regulations	Requirement
Regulated activity in a wetland, riverbank or lakeshore	NEMA	National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2000 (SI No. 153-5)	Regulation 12 (1): Subject to the provisions of Regulations, a person shall not carry out any activity in a wetland without a permit issued by the Executive Director. Regulation 12 (2): Any person intending to carry out an activity listed in the Second schedule to these Regulations shall apply to the Executive Director for a permit in Form A of the First Schedule. Regulation 23 (1): A person who intends to carry out any of the following activities shall make an application to the executive Director in Form A set out in the First Schedule to these Regulations (a) use, erect, reconstruct, place, alter, extend, remove or demolish any structure or part of any structure in, under, or over the riverbanks or lake shore; (b) excavate, drill, tunnel or otherwise disturb the riverbank or lake shore; (c) introduce or plant any of a plant whether alien or indigenous on a riverbank or lake shore; (d) introduce any animal or micro-organism, whether alien or indigenous in any riverbank or lake shore; or (e) deposit any substance on a riverbank or lakeshore if that substance would or is likely to have adverse effects on the environment.
Wastewater discharge	DWRM	Water (Waste Discharge) Regulations (SI No. 152-4)	Regulation 4 (1): No person shall discharge effluent or waste on land or into the aquatic environment contrary to the standards established under regulation 3 unless he or she has a permit in the format specified in the First Schedule issued by the Director.

4.4 International Conventions, Agreements, Standards and Guidelines

4.4.1 International Conventions and Agreements

Uganda is signatory to several international agreements listed in Table 4.4-1 that are or may be relevant to the project. International conventions and agreements are implemented in Uganda under the authority of specific Acts, policies, regulations and government departments or agencies.

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
Agenda 2030	Adopted in September 2015	Project should embody and implement the sustainable development goals, principles and strategies outlined in Agenda 2030 and endorsed by the Uganda government in document such as the Uganda Vision 2040, the second National Development Plan and the Green Growth Strategy.	The mitigation measures and management plans are designed for the project to be implemented in a sustainable and socially inclusive way.
African Charter on Human and Peoples' Rights	Ratified in May 1986	The project will give due consideration to vulnerable people in project planning and implementation.	Stakeholder engagement (Section 7). Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8). Resettlement Strategy (Appendix K).
African Charter on the Rights and Welfare of the Child	Ratified in August 1994	The project will give due consideration to children in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
Convention on the Rights of the Child	Ratified August 1990	The project will give due consideration to children in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
African Convention on the Conservation of Nature and Natural Resources (revised), 2003	Signed in December 2003	The project may potentially result in environmental impacts on natural resources.	ESIA study undertaken. Impact assessment and mitigation measures, see Section 8.

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), June 1995	Ratified in December 2000	The project footprint will include areas used by wildlife.	ESIA study undertaken, including potential impacts on biodiversity. Impact assessment and mitigation measures, see Section 8.3.
Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, January 1991	Ratified in October 1998	The project will generate limited amounts of hazardous waste.	Project waste management strategy (see Section 2.4.2.8 and Section 2.4.5.5). Waste management plan will be developed and implemented as part of the ESMP (Section 10).
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, March 1989	Signed in March 1999	The project will generate limited amounts of hazardous waste.	Project waste management strategy (see Section 2.4.2.8 and Section 2.4.5.5). Waste management plan will be developed and implemented as part of the ESMP (Section 10)
Cartagena Protocol on Biosafety, 2000	Ratified in September 2003	The project's activities have the potential to introduce or spread invasive species and plant pest and diseases, for example through moving soil, using equipment from outside the area or biorestoration.	Pest and invasive species control measures (Section 8.2, 8.3)
Convention against Torture and Other Cruel Inhuman or Degrading Treatment or Punishment	Signed in October 1986	The project will employ security personnel during construction and operations to protect employees and pipeline assets.	Due diligence during security provider selection, rules of engagement, Voluntary Principles on Security and Human Rights (Section 8.19)
Convention for the Safeguarding of the Intangible Cultural Heritage, October 2003	Ratified in May 2009	Cultural heritage artefacts may be found in the project area and will need to be managed accordingly.	Measures to identify and protect cultural heritage sites during construction, including chance finds (Section 8.20)

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
Convention on Biological Diversity, (Rio Convention), June 1992	Ratified in September 1993	The project footprint will include areas used by wildlife.	ESIA study undertaken, including potential impacts on biodiversity and ecosystem services. Impact assessment and mitigation measures (Sections 8.2–8.4)
Convention on Protection of World Cultural and Natural Heritage, November 1972	Acceded in 1987	Cultural heritage artefacts may be found in the project area and will need to be managed accordingly.	Measures to identify and protect cultural heritage sites during construction, including chance finds (Section 8.20)
Convention on the Conservation of Migratory Species (Bonn Convention), June 1979	Ratified in August 2000	The project footprint will include areas used by wildlife.	ESIA study undertaken, including potential impacts on biodiversity. Impact assessment and mitigation measures (Section 8.3)
Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), 1979	Ratified in July 1985	The project will give due consideration to women, children and people with disabilities in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
Convention on the Protection and Promotion of the Diversity of Cultural Expressions, October 2005	Ratified in April 2015		
Convention on the Rights of Persons with Disabilities	Ratified in September 2008		
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar), 1971, amended by the 1982 Protocol and the 1987 Amendment to the Convention	Ratified in March 1998	Pipeline route crosses watercourses that flow into Ramsar wetlands.	Pollution prevention measures including pollution prevention and emergency preparedness and response plans (Section 10)

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
Convention Relating to the Status of Refugees (1951) and the Protocol Relating to the Status of Refugees (1967)	Ratified in September 1976	The project will give due consideration to vulnerable people in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
East African Community Protocol for Sustainable Development of Lake Victoria Basin	Signed in November 2003	The pipeline route will cross watercourses of the Lake Victoria Basin.	Commitments developed to mitigate potential impacts on surface water (Section 8.6)
East African Community Treaty	Signed in November 1999	Article 111 outlines the guiding principles for cooperation among partner states to ensure sustainable development.	ESIA study undertaken, including potential transboundary impacts. Impact assessment and mitigation measures, see Section 8.
International Convention on the Elimination of All Forms of Racial Discrimination	Signed in October 1980	The project will give due consideration to vulnerable people in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families	Signed in October 1995	The project will give due consideration to vulnerable people in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
International Covenant on Civil and Political Rights (including the First Optional Protocol on the ICCPR with reservations on Article 5)	Signed June 1995	The project will give due consideration to vulnerable people in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
International Covenant on Economic, Social and Cultural Rights	Signed in January 1987	The project will give due consideration to vulnerable people in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
International Labour Organisation (ILO)[3] C029: Forced Labour Convention, 1930 (No. 29)	Ratified in July 1963	The project will employ skilled and unskilled labour.	Employment policies, labour and working conditions mitigation measures (Section 8.12 and Section 8.16)
ILO C087: Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)	Ratified in June 2005		
ILO C098: Right to Organise and Collective Bargaining Convention, 1949 (No. 98)	Ratified in June 1963		
ILO C100: Equal Remuneration Convention, 1951 (No. 100)	Ratified in June 2005		

[3] At the time of writing, Uganda has ratified 31 ILO conventions, of which 30 are in force and one has been automatically denounced by convention C138: Minimum Age Convention, 1973 (No. 138). The full list of ILO conventions can be found on http://www.ilo.org.

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
ILO C105: Abolition of Forced Labour Convention, 1957 (No. 105)	Ratified in June 1963		
ILO C111: Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	Ratified in June 2005		
ILO C143: Migrant Workers (Supplementary Provisions) Convention, 1975 (No. 143)	Ratified in March 1978		
ILO C182: Worst Forms of Child Labour Convention, 1999 (No. 182)	Ratified in June 2001		
ILO C138: Minimum Age Convention, 1973 (No. 138)	Ratified in March 2003		
ILO C081: Labour Inspection Convention, 1947 (No. 81) (Excluding Part II)	Ratified in June 1963	The project will employ skilled and unskilled labour.	Labour and working conditions commitments (Section 8.12 and Section 8.16)
International Plant Protection Convention (IPPC), December 1951, amended 1997	Acceded in June 2007	The project's activities have the potential to introduce or spread invasive species and plant pest and diseases, for example through the movement of soil, use of equipment from outside the area or biorestoration.	Pest and invasive species control measures (Section 8.2, 8.3)
Kyoto Protocol to the United Nations Framework Convention on Climate Change, December 1997	Ratified in 2005	Project activities will generate GHG emissions. Sources of emissions include: construction vehicles and equipment; operation of bulk heaters (Section 2.4.2.7 and 2.4.5.4).	Climate impacts have been assessed and mitigation measures proposed (Section 8.22). Project GHG emissions will be monitored and reported (Section 10).

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
Nile Basin Initiative, 1999	Ratified in August 2002	The pipeline route will cross watercourses of the Nile Basin.	ESIA study undertaken. No transboundary impacts were identified (Section 8.6.5)
Paris Agreement, 2015	Signed in October 2016	Project activities will generate GHG emissions. Sources of emissions include: construction vehicles and equipment; operation of bulk heaters (Section 2.4.2.7 and 2.4.5.4).	Climate impacts have been assessed and mitigation measures proposed (Section 8.22). Project GHG emissions will be monitored and reported (Section 10).
Protocol Agreement on the Conservation of Common Natural Resources	Signed in 1982	The project may have transboundary and other environmental impacts.	ESIA study undertaken, including potential transboundary and ecosystem services impacts and mitigation measures (Section 8)
Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa	Ratified in July 2010	The project will give due consideration to vulnerable people in project planning and implementation.	Stakeholder engagement (Section 7) Employment policies and procedures, implementation of environmental and social mitigation measures (Section 8) Resettlement Strategy (Appendix K)
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention), September 1998	Acceded August 2008	The project will manage limited amounts of chemicals during construction and operations.	A chemical management plan will be developed and implemented as part of the ESMP. Restrictions on purchase of chemicals will be included in the procurement and supply chain management plan (Section 10).
Stockholm Convention on Persistent Organic Pollutants, 2001	Accession in July 2004	The project will manage limited amounts of chemicals during construction and operations.	

Table 4.4-1 International Conventions and Agreements

Convention	Date Signed or Ratified	Application to the Project	Compliance Measure
United Nations Sustainable Development Goals	Adopted in 2015	The project may potentially result in environmental and social impacts.	ESIA study undertaken Impact assessment and mitigation measures (Section 8)
United Nations Convention Against Corruption, 2003	Ratified in September 2004	The project will require governmental approval.	Project anti-corruption policies and code of conduct
United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), March 1973	Signed July 1991	Some project construction sites will be near areas where protected species might be present.	Biodiversity mitigation measures; employee training (Section 8.3)
United Nations Convention to Combat Desertification, 1994	Ratified in June 1997	Construction of the pipeline will include clearance of the RoW, excavation and eventual reinstatement.	See Section 8 for commitments for reducing project impacts on soil, surface water and groundwater.
United Nations Framework Convention on Climate Change (UNFCCC), 1992	Ratified in 2005	Project activities will generate GHG emissions. Sources of emissions include: construction vehicles and equipment; operation of bulk heaters (Section 2.4.2.7 and 2.4.5.4).	Climate impacts have been assessed and mitigation measures proposed (Section 8.22). Project GHG emissions will be monitored and reported (Section 10).
Vienna Convention for the Protection of the Ozone Layer (March 1985), and the Montreal Protocol on Substances that Deplete the Ozone Layer, September 1987	Ratified in September 1988	The project will manage limited amounts of chemicals and fuel during construction and operations.	A chemical management plan will be developed and implemented as part of the ESMP. Restrictions on purchase of chemicals will be included in the procurement and supply chain management plan (Section 10).

4.4.2 International Finance Corporation Standards and Guidelines

4.4.2.1 International Finance Corporation Performance Standards

The International Finance Corporation (IFC) Performance Standards are listed in Table 4.4-2 below.

Table 4.4-2 International Finance Corporation Performance Standards 2012

Performance Standard[4]	Objectives
Performance Standard 1: Social and Environmental Assessment and Management Systems	• To identify and evaluate environmental and social risks and impacts of the project • To adopt a mitigation hierarchy to anticipate and avoid or, where avoidance is not possible, minimise and, where residual impacts remain, compensate or offset for risks and impacts to workers, affected communities and the environment • To promote improved environmental and social performance of clients through the effective use of management systems • To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately • To promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated
Performance Standard 2: Labour and Working Conditions	• To establish, maintain and improve the worker-management relationship • To promote the fair treatment, nondiscrimination and equal opportunity of workers, and compliance with national labour and employment laws • To protect the workforce by addressing child labour and forced labour • To promote safe and healthy working conditions, and to protect and promote the health of workers
Performance Standard 3: Resource Efficiency and Pollution Prevention	• To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities • To promote more sustainable use of resources, including energy and water • To reduce project-related GHG emissions

[4] Each Performance Standard is supplemented with a guidance note, providing further explanation.

Table 4.4-2 International Finance Corporation Performance Standards 2012

Performance Standard[4]	Objectives
Performance Standard 4: Community, Health, Safety and Security	• To anticipate and avoid adverse impacts on the health and safety of the affected community during the project life from both routine and nonroutine circumstances • To ensure that the safeguarding of personnel and property is conducted according to relevant human rights principles and in a way that avoids or minimises risks to the affected communities
Performance Standard 5: Land Acquisition and Involuntary Resettlement	• To avoid or, when avoidance is not possible, minimise displacement by exploring alternative project designs • To avoid forced eviction • To anticipate and avoid or, where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected • To improve, or restore, the livelihoods and standards of living of displaced persons • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	• To protect and conserve biodiversity • To maintain the benefits from ecosystem services • To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities
Performance Standard 7: Indigenous Peoples	*Not applicable. No indigenous peoples were identified in the area of influence during the baseline surveys.*
Performance Standard 8: Cultural Heritage	• To protect cultural heritage from the adverse impacts of project activities and support its preservation • To promote the equitable sharing of benefits from the use of cultural heritage

4.4.2.2 International Finance Corporation Environmental, Health and Safety Guidelines

The IFC Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of good international industry practice (GIIP). IFC uses the EHS Guidelines as a technical source of information during project appraisal activities.

The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC and generally considered achievable in new facilities at reasonable costs by existing technology. When host country regulations differ from the levels and measures in the EHS Guidelines, IFC performance standard 1 states that projects are expected to achieve whichever is more stringent.

Table 4.4-3 lists the IFC general EHS and sector guidelines of relevance to the project in Uganda.

Table 4.4-3 International Finance Corporation Guidelines

Document	Summary
IFC General Environmental, Health and Safety (EHS) Guidelines, 2007	Contain examples of GIIP on crosscutting environmental, health, and safety issues potentially applicable to all industry sectors. These general guidelines are supplemented by relevant industry-specific EHS guidelines.
IFC industry-specific EHS guidelines	The following industry-specific guidelines are applicable to the project components: • Onshore Oil and Gas (2007) (at the time of writing being updated by the IFC) • Construction Materials Extraction (2007) • Waste Management Facilities (2007) • Water and Sanitation (2007).
IFC Good Practice for Cumulative Impact Assessment	IFC Good Practice Handbook (GPH) Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (IFC 2013) provides guidance for conducting an effective cumulative impact assessment (CIA). The IFC GPH presents a CIA process based on the concept of valued environmental and social components. The CIA guidelines have been applied to this ESIA (Section 5 Methodology).

4.4.2.3 International Finance Corporation and World Bank Social and Stakeholder Engagement Guidelines

In addition to the above, IFC offers several good practice handbooks, including social issues and stakeholder engagement, which will be consulted:

- 2009 IFC and EBRD Guidance note on Workers' Accommodation: Processes and Standards
- 2009 Handbook for Addressing Project-Induced In-Migration
- 2010 Strategic Community Investment: A Good Practice Handbook for Companies Doing Business in Emerging Markets
- 2002 Handbook for Preparing a Resettlement Action Plan
- 2007 Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets
- 2009 Good Practice Note Addressing Grievances from Project-Affected Communities
- 2009 Addressing Project Impacts on Fishing-Based Livelihoods
- 2009 Introduction to Health Impact Assessment

- 2009 World Bank Guidance note Mainstreaming Gender into Extractive Industries Projects
- 2006 Non-Discrimination and Equal Opportunity.

4.4.3 Equator Principles

The project will follow the Equator Principles III (EPs) adopted by financial institutions for determining, assessing and managing environmental and social risk in projects. The EPs III effective from 2013 are summarised in Table 4.4-4 below.

Table 4.4-4 Equator Principles

Equator Principle	Summary
Principle 1: Review and Categorisation	The EP financial institution (EPFI) is required to conduct a preliminary assessment of the level of environmental and social risks associated with a project that is in the scope of the EP III, and to categorise that risk as either Category A (significant risks), B (limited risks) or C (minimal or no risks).
Principle 2: Environmental and Social Assessment	An ESIA (taking a variety of possible forms from full-scale to limited ESIA or compliance audit) must be developed by the project proponent for all Category A and B projects, providing an evaluation of the environmental and social risks of the project and proposing measures to minimise, mitigate and offset adverse impacts of the proposed project.
Principle 3: Applicable Environmental and Social Standards	For projects in nondesignated countries (such as Uganda), the assessment process evaluates compliance with host country laws, regulations and permits and IFC Performance Standards and World Bank EHS Guidelines (see Table 4.4-3). These standards must be met “to the EPFI’s satisfaction”, with any deviation justified.
Principle 4: Environmental and Social Management System and Equator Principles Action Plan	For Category A and B projects, the project proponent is required to develop and maintain an environmental and social management system (ESMS) and an ESMP to address issues raised in the assessment process and incorporate actions required to comply with the applicable standards. An EP action plan, agreed between the EPFI and the project proponent, would outline gaps and commitments to meet EPFI requirements.
Principle 5: Stakeholder Engagement	For Category A and B projects, project proponents are required to show effective stakeholder engagement with affected communities and other stakeholders starting early in the impact assessment process, and to conduct an informed consultation and participation process where there is the potential for significant adverse impacts on communities.
Principle 6: Grievance Mechanism	For Category A and appropriate B projects, the project proponent is required to operate a grievance mechanism to receive and facilitate resolution of concerns and grievances about the project’s environmental and social performance.
Principle 7: Independent Review	For Category A and appropriate B projects, an independent review is required to assist the EPFI’s due diligence, assess EP compliance and propose a suitable action plan capable of bringing the project into compliance with the EP or to indicate if compliance is not possible.

Table 4.4-4 Equator Principles

Equator Principle	Summary
Principle 8: Covenants	The project proponent covenants to comply with all relevant host country environmental and social laws, regulations and permits, as well as the ESMPs and EPs in the case of Category A and B projects, in all material respects.
Principle 9: Independent Monitoring and Reporting	An independent consultant or the project proponents' qualified and experienced external experts should assess project compliance with the EPs and ongoing monitoring and reporting.
Principle 10: Reporting and Transparency	In addition to the disclosure requirements of Principle 5, at a minimum, a summary of the ESIA is to be accessible and available online. Greenhouse gas emission reporting is required for projects emitting over 100,000 tonnes of CO_2 equivalent annually. EPFIs are required to report on their implementation of the EP III framework.

4.4.4 Organisation for Economic Co-operation and Development Common Approaches

The Organisation for Economic Co-operation and Development (OECD) Recommendation of the Council on Common Approaches for Officially Supported Export Credits[5] and Environmental and Social Due Diligence (2016) sets common approaches for undertaking environmental and social due diligence to identify, consider and address the potential environmental and social impacts and risks relating to applications for officially supported export credits as an integral part of OECD Members' decision-making and risk management systems. The key recommendations include:

- screening to identify which applications should be classified and, where appropriate, subsequently reviewed
- classification into one of three categories (A, B or C) according to potential positive and negative environmental and social impacts. A project is classified as Category A if it has the potential to have significant adverse environmental and/or social impacts and should require an ESIA to be undertaken. EACOP is a Category A project.
- benchmarking against all eight IFC Performance Standards and the relevant aspects of the EHS Guidelines (see Section 4.4.2.1 and Section 4.4.2.2 above) or, where appropriate, the relevant aspects of any other internationally recognised standards, such as European Union standards, that are more stringent. Projects should, in all cases, comply with host country standards.
- public disclosure of environmental and social impact information (e.g., ESIA report, summary)
- regular monitoring reports to ensure that relevant potential environmental and/or social impacts are addressed accordingly.

[5] Export credits are government financial support, direct financing, guarantees, insurance or interest rate support provided to foreign buyers to assist in the financing of the purchase of goods from national exporters (OECD Glossary of Statistical Terms).

4.4.5 International Management System Standards

Project partners intend to operate management systems that conform with the requirements of the following international management system standards and will be applied to the project:

- International Organization for Standardization (ISO) ISO 9001:2015 Quality management systems
- ISO 14001:2015 Environmental management systems – requirements with specifications for use
- British Standards Institution BS OHSAS 18001:2007 Occupational Health and Safety.

These management system standards specify the requirements that an organisation can implement to enhance its quality, environmental, occupational health and safety performance. They provide a framework for organisations to manage their responsibilities in a proactive, systematic way.

The standards focus on performance, which is managed through combining consideration of a process approach (i.e., consideration of a project's impacts throughout its life cycle, taking into account both internal and external issues) with risk-based thinking and the application of the plan–do–check–act continuous improvement cycle (see Figure 4.4-1).

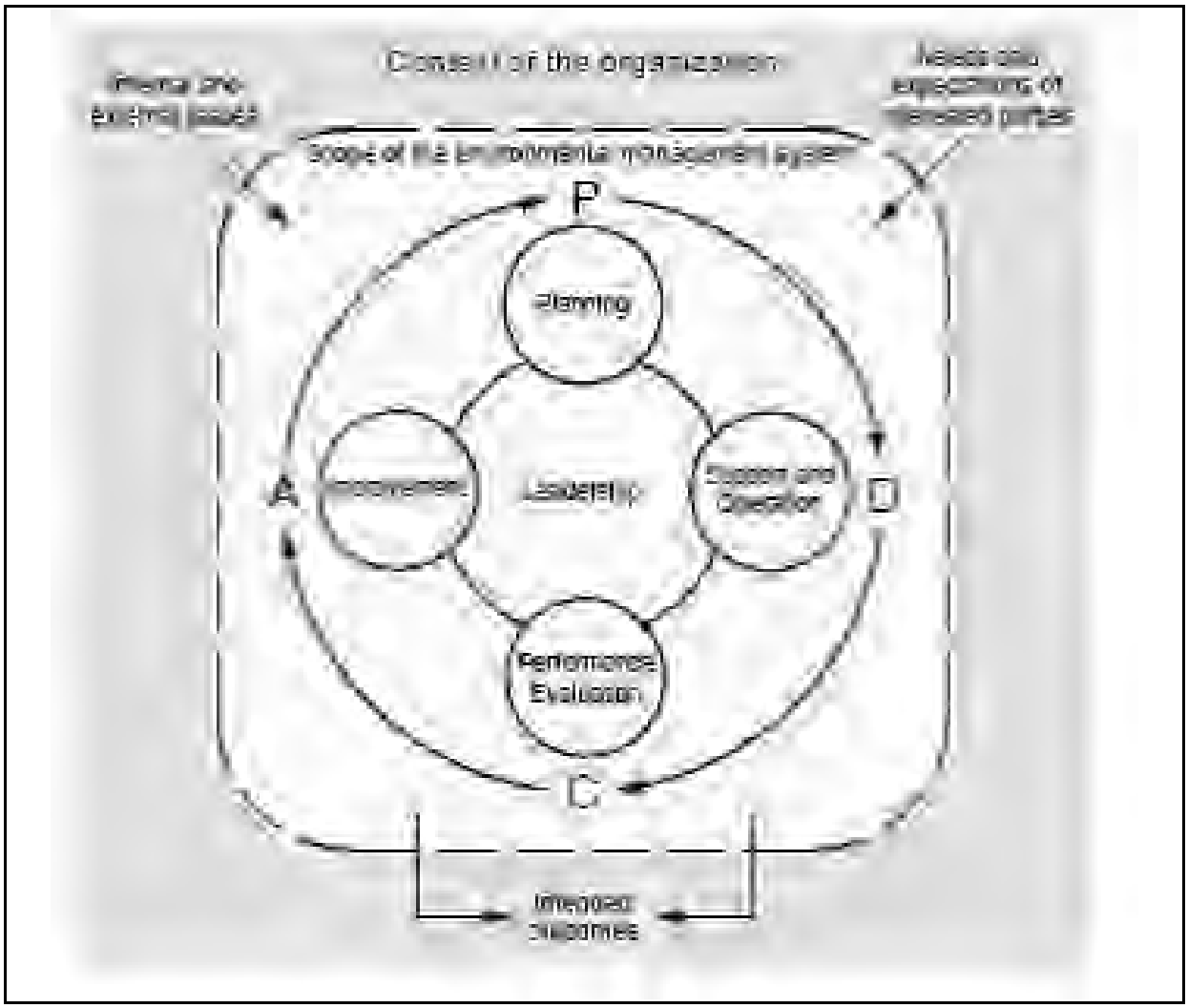


Figure 4.4-1 Plan–Do–Check–Act Continuous Improvement Cycle
SOURCE: ISO 14001:2015

The intended outcome of management systems that comply with the requirements of ISO 9001, ISO 14001 and ISO 45001 include:

- compliance with legal and other requirements (compliance obligations)
- achievement of an organisation's quality, environmental, occupational health and safety objectives
- enhancement of an organisation's quality, environmental occupational health and safety performance.

4.4.6 Other International Good Practice Guidance

In addition to national standards and guidelines and IFC standards and guidelines, several other international organisations provide standards that are often referenced by the IFC or are acknowledged as providing useful information on good practice which have been consulted by the project. These include the:

- World Health Organization (WHO) guidelines on air quality, noise and drinking water

- International Petroleum Industry Environmental Conservation Association (IPIECA) guidance documents:
    - Integrating human rights into environmental, social and health impact assessments, 2013
    - Biodiversity and ecosystem services fundamentals – guidance document for the oil and gas industry, 2016
    - Ecosystem services guidance – Biodiversity and ecosystem services guide and checklist, 2011
    - Good Practices for the Collection of Biodiversity Baseline Data, 2015
    - Guide to Social Impact Assessment in the Oil and Gas Industry, 2004
    - Community Grievance Mechanism toolbox, 2014
    - Local content – A guidance document for the oil and gas industry, 2016
    - A cross-sector guide for implementing the Mitigation Hierarchy, 2015
- International Association for Impact Assessment (IAIA) publications
- International Labour Organisation (ILO), which provides guidance on promoting rights at work, employment opportunities, social protection and discussion on work-related issues
- International Association of Oil and Gas producers (OGP), specifically the following guidelines:
    - Guidelines for Waste Management with Special Focus on Areas with Limited Infrastructure. Oil & Gas Producers Report No. 413, September 2008 (rev 1.1 updated March 2009)
    - Principles for Impact Assessment – the Environmental and Social Dimension, August 1997
- United Nations Environment Programme, specifically:
    - Protocols for the establishment of Environmental Quality Objectives and Targets (EQO/Ts)
- Cross-Sector Biodiversity Initiative:
    - Good Practices for the Collection of Biodiversity Baseline Data, 2015
    - Implementing the Mitigation Hierarchy, 2015
- Energy and Biodiversity Initiative:
    - Integrating Biodiversity into Environmental and Social Impact Assessment Process, undated
    - Good practice in the prevention and mitigation of primary and secondary biodiversity impacts, undated
- Nile River Basin Action Plan and Panel of Experts (POE), 1995
- Extractive Industries Transparency Initiative (EITI), 2007
- Multilateral Financing Institutions Biodiversity Working Group: Good practices for biodiversity inclusive impact assessment and management planning, 2015.

4.4.7 Relevant International Soft Law Instruments

The following soft law instruments are or may be relevant to the project and have also been consulted:

- Helsinki Rules on the Uses of the Waters of International Rivers, 1966
- UNEP Rules on Shared Resources, 1978
- Voluntary Principles on Security and Human Rights, 2000
- United Nations Universal Declaration of Human Rights, 1948
- United Nations Women's Empowerment Principles, 2010
- United Nations Guiding Principles on Business and Human Rights, 2011
- United Nations Declaration on the Rights of Indigenous Peoples, 2007 (and relevant interpretations by the African Commission on Human and Peoples Rights' Working Group on Indigenous Peoples)
- United Nations Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, 1990
- International Code of Conduct for Private Security Service Providers (ICoCA), 2013
- Convention on the Protection of the Rights of All Migrant Worker and Members of Their Families, 1990
- Convention on the Elimination of All Forms of Discrimination against Women, 1979
- ILO Declaration on Fundamental Principles and Rights at Work, 1998
- ILO Hours of Work (Industry) Conventions C1, 1919 and C14, 1921
- ILO Hours of Work (Commerce and Offices) Convention C30, 1930
- ILO Forty-Hour Week Convention C47, 1935
- ILO Weekly Rest (Commerce and Industry) Convention C106, 1957
- ILO Social Policy Convention C117, 1962
- ILO Minimum Wage Fixing Convention C131, 1970
- ILO Holidays with Pay (Revised) Convention C132, 1970
- ILO Workers Representatives Convention C135, 1971
- ILO Minimum Age for Admission to Employment Recommendation, R146, 1973
- ILO Collective Bargaining Convention C154, 1981
- ILO Convention 155 Concerning Occupational Health and Safety and the Working Environment, 1981
- ILO Convention 161 on Occupational Health Services, 1985
- ILO Convention 169 on Indigenous and Tribal Peoples, 1989
- ILO Maternity Protection Convention C183, 2000
- ILO Worst Forms of Child Labour Recommendation R190, 1999
- Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, 1977 (5th edition, 2017)
- OECD Guidelines on Multinational Enterprises, 2015
- WHO Fact Sheet 31: The Right to Health
- Guidance on human rights and health from the World Health Organization: http://www.who.int/mediacentre/factsheets/fs323/en/.

4.5 Inter-Government and Host Government Agreements

Taking into account the transboundary nature of the project, the Governments of Uganda and Tanzania signed an intergovernmental agreement (IGA) with the aim of streamlining the legal regime for the EACOP across the two countries. Respective host government agreements (HGAs) will operationalise the IGA. At the time of writing, an HGA is in the process of being agreed with the government of Uganda.

5 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROCESS AND METHOD

5.1 Introduction

This section describes and defines the project:

- environmental and social impact assessment (ESIA) process
- valued environmental and social components
- scoping process
- impact assessment method.

5.2 Environmental and Social Impact Assessment Process

The key steps of the EACOP ESIA process are illustrated in Figure 5.2-1, including those through to project implementation and the subsequent phase of reporting, audit and corrective actions.

Screening of potential project impacts was undertaken early in the development of the project, primarily by routing and siting studies that were undertaken and described in Section 3, Alternatives.

A preliminary project description was prepared during the scoping phase and was further developed based on front-end engineering design and subsequent optimisation.

The ESIA progressed interactively with project planning and design. Project impacts were identified and mitigation measures developed iteratively during the interaction. The process will continue through the construction phase.

The impact assessment complies with Ugandan legislation and guidelines described in Section 4, Legislative, Policy and Administrative Framework.

This impact assessment also concords with international guidance, also described in Section 4, including:

- International Finance Corporation's (IFC) environmental and social performance standards
- Equator Principles
- other relevant international standards and guidelines.

Baseline studies conducted during the scoping phase subsequently informed the project environmental and social baseline conditions. These are summarised, together with survey methods in Section 6 and documented in Appendix A.

Stakeholder engagement was conducted during the scoping phase, then throughout the baseline studies and impact assessment, and during the pre-submission of the ESIA. A summary of stakeholder concerns and stakeholder engagement methods are described in Section 7, Stakeholder Engagement and Appendix C provides additional information on stakeholder concerns.

The assessment of project impacts and determination of the significance of the impacts is included in Section 8 and a description of the methods is included in Section 5.6. The cumulative impact assessment (CIA) has been fully integrated into the ESIA process.

Environmental and social management plans are described in Section 10 and included in Appendix E4 with associated mitigation measures.

The intent is that this ESIA will be submitted to the National Environmental Management Authority (NEMA), which will initiate a review process during which it will decide whether an EIA certificate can be issued.

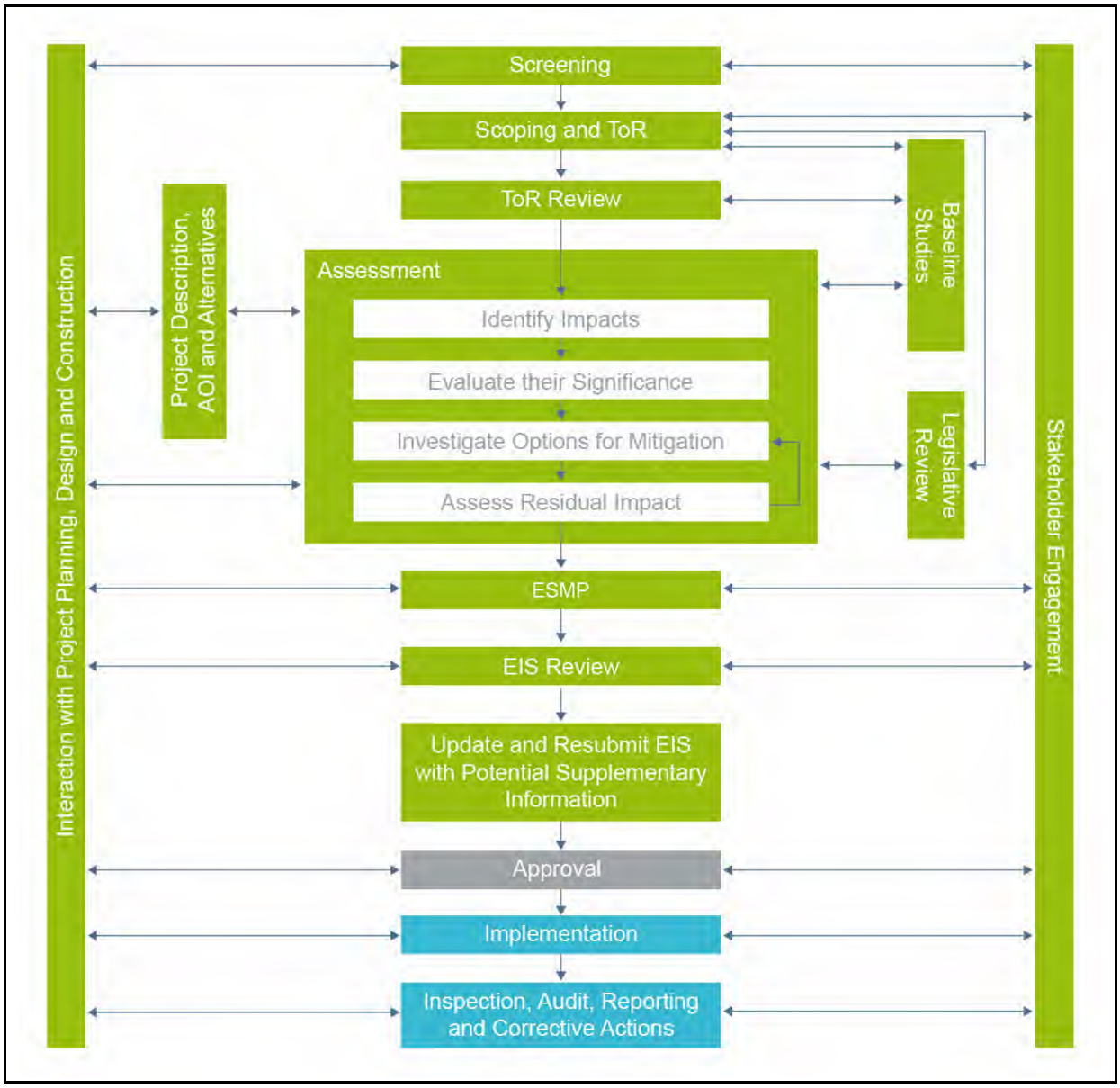


Figure 5.2-1 Key Steps in the EACOP Environmental and Social Impact Assessment Process

5.3 Valued Environmental and Social Components

The environmental and social features and receptors assessed in this ESIA are referred to as valued environmental and social components (VECs). Project and cumulative impacts on VECs, listed in Section 6, are assessed in this ESIA.

The IFC defines VECs as “environmental and social attributes that are considered important in assessing risks”, (IFC 2013). These attributes may be:

- physical features, habitats, wildlife populations (e.g., biodiversity)
- ecosystem services
- natural processes (e.g., water and nutrient cycles, microclimate)
- social conditions (e.g., health, economics), or
- cultural aspects (e.g., traditional spiritual ceremonies).

VECs generally all have a high sensitivity to project interactions, though some will be more sensitive than others. Hence, a ranking system has been used to describe their sensitivity. This is documented in Section 6, Environmental Baseline Conditions and in Section 8, Impact Identification and Evaluation. For VECs with standards and thresholds, such as air quality, compliance to the standard or threshold may also be used to establish magnitude (see Section 5.6.2.5), or to inform significance directly.

A preliminary list of VECs was identified during the impact scoping activity. The list was refined during and after the scoping phase based on:

- stakeholder engagement in the affected communities to identify main concerns
- desk-based review of literature to identify public and scientific concerns
- surveys undertaken during and after scoping
- existing definitions of VECs in the IFC performance standards, such as labour and working conditions (Performance Standard 2)
- VECs included in Scoping Reports for upstream petroleum projects planned for the region.

During ESIA preparation, the titles of two VECs changed slightly from those used in the scoping phase to reflect additional baseline information. A list of the priority VECs, summarising the key reasons for their selection, is provided in Section 6.1.

The baseline condition of the AOI for each VEC is described in Section 6 and more information is included in the baseline reports to be found in Appendix A.

Ecosystem services has been considered for each VEC in Section 6 and the assessment of ecosystem services has been integrated into the impact assessment of VECs included in Section 8.

Human rights were also considered for social VECs in Section 6 and an assessment of potential impacts on human rights has been integrated into the impact assessment of social VECs included in Section 8. A stand-alone human rights impact assessment (HRIA) of the project is being conducted as part of the overall ESIA process and the HRIA team has provided input about human rights standards, potential impacts and mitigation measures that are integrated into the relevant sections of this ESIA report.

5.4 Screening

Screening to determine the requirement for an ESIA was not required as pipelines are included in Annex A, the list of projects for which the Environmental and Social Impact Guidelines for the Energy Sector in Uganda apply, that includes requiring an EIS. This was confirmed in dialogue with NEMA.

5.5 Scoping

An impact scoping process was conducted in concordance with Ugandan environmental impact assessment legislation, regulation and guidelines described in Section 4. A Scoping Report was prepared and submitted to NEMA on 25 July 2017.

The main objectives of the scoping process were, first, to identify potentially significant impacts arising from interaction between project activities and the VECs that require evaluation in the ESIA, and, second, to establish the ESIA terms of reference (ToR). During the scoping phase, project interactions with VECs were evaluated for:

- beneficial impacts. The potential to enhance beneficial impacts has been assessed in the ESIA.
- not significant impacts. The mitigation measures required to render these impacts not significant have been included in the ESIA.
- potentially significant impacts, which are the focus of the impact assessment, and for which mitigation measures have been included in the ESIA.

The scoping impact identification process was based on:

- a social and environmental identification (SENVID) process, comprising workshops and meetings with subject matter experts, the pipeline project team (PPT) and the engineering team
- a site visit to identify technical, environmental and social sensitivities, plus measures to avoid or reduce potential impacts
- stakeholder engagement.

Impact identification and risk analysis during scoping were based on the teams' collective pipeline, environmental and social impact knowledge and experience including:

- general and specific pipeline project engineering design
- impact assessment lessons learned from other pipeline projects
- other oil and gas projects in Uganda.
- environmental and social conditions within the project area acquired during route and site selection studies and knowledge of documentation available at the time of the assessment.

The results of the scoping study were used to develop the ToR that included, among other requirements:

- the scope of work of the baseline studies necessary to gain a better understanding of the environmental and social context of the AOIs
- the impact assessments to be undertaken.

The scoping report was approved on 19 September 2017 by NEMA. The approval included comments, and subsequent comments were issued, which have been addressed in this ESIA. A concordance table that describes where the comments have been addressed in the ESIA is included in Appendix L.

5.6 Impact Assessment

This ESIA systematically identifies, describes and assesses the potential impacts from the EACOP project on VECs.

The international standard ISO 14001:2015 defines an impact as “Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s environmental aspects”. Throughout the document an ‘impact’ is taken to be an adverse impact. Where there is a positive impact this is described as ‘beneficial’. An environmental aspect is defined as an “Element of an organisation’s activities or products or services that can interact with the environment”. Environment is defined as “Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.”

5.6.1 Identification of Project Impacts

Impacts were identified and categorised according to aspect, which is an element of an activity causing an impact. The list of aspects has been numbered for identification and is included in Appendix E1, Impact Assessment Tables.

This ESIA assessed impacts from normal operations, abnormal operations and unplanned events. This assessment has been an iterative process, as engineering has progressed and the project has become better defined.

Impacts are evaluated in terms of construction or operational phase; impact types associated with preconstruction are typically the same as during construction and have been treated as construction phase impacts. Section 5.6.2.1 describes how generic and location-specific impacts are differentiated and treated in the ESIA and hence all impacts, preconstruction, construction and operational are addressed.

5.6.2 Normal Project Construction and Operations

The assessment of impacts from normal project operations, described in Section 8, considered:

- project impacts, generic and location specific
- cumulative impacts
- transboundary impacts.

Minor unplanned events have been included in the assessment of normal project operations, e.g., spills during refuelling or from the failure of a hydraulic hose.

5.6.2.1 Project Impacts - Generic and Location-specific

Generic

Generic impacts could occur from several aspects and can be non-location and location-specific, such as:

- soil erosion from rain fall on bare soil along the pipeline right-of-way (RoW)
- sediment runoff to watercourses.

Location Specific

Location-specific impacts are those that occur from aspects and activities:

- at specific locations that can be defined by KP points or KP ranges, e.g., at a particular river crossing, within a specific habitat or related to a specific soil type, proposed construction facility or above ground installation
- at locations where there is a particular environmental condition that could have implications for impacts, e.g., side slopes
- at locations where there is a particularly sensitive VEC, e.g., a shallow aquifer with overlying permeable geology.

Location-specific impacts are often associated with activity that has the potential to affect VECs at a specific location. For some impacts, it is possible to define a kilometre point (KP) or range of KPs but for other impacts an activity may occur during construction and the locations will only be known when detailed design has progressed, e.g., benching of side slopes. In such instances, mitigation is described but no KPs are allocated.

Location-specific impacts usually require:

- specific mitigation measures in addition to, or instead of, standard good practice mitigation measures, or
- additional monitoring, inspection and audit, and communication with stakeholders to ensure that general mitigation measures are effective.

Examples of generic impacts of the project are summarised in Appendix E2 and location-specific impacts in Appendix E3.

5.6.2.2 Impact Types

Impacts can be classified as the following:

- **direct** – impacts that are from a direct interaction between a planned project activity and the receiving environment, e.g., between occupation of the RoW and pre-existing habitats (clearing the RoW causes habitat loss, if habitat is present)
- **indirect** – impacts that are from the primary interactions between the project and its environment because of subsequent interactions in the environment; e.g., loss of habitat affects the viability of a species population
- **induced** – impacts that result from other activities but which would not occur in the absence of the project; e.g., new business set up to cater for increased traffic on roads
- **in-combination** – in-combination impacts could occur when different types of impacts affect the same VEC; examples include different impacts on the same

habitat or on community health that collectively cause a greater impact than the summed individual impacts. Given that individual impacts are expected to be mitigated, and that many of the impacts are assessed qualitatively, in-combination impacts were not considered

- **transboundary** – project or cumulative impacts that extend or occur across a national boundary.

5.6.2.3 Cumulative Impacts

Cumulative impacts were identified and assessed in accordance with the IFC Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013), in addition to the legislation and guidance listed in Section 5.2. The Handbook suggests that government and regional planners have ultimate responsibility for cumulative impact assessments (CIA). A broad approach on that scale was, therefore, not judged to be within the limits of this ESIA. Figure 5.6-1 summarises the CIA process adopted for the EACOP project, which is based on internationally recognised good practice from the Canadian Effect Assessment Practitioners Guide (1999), as referenced in the IFC Good Practice Handbook.

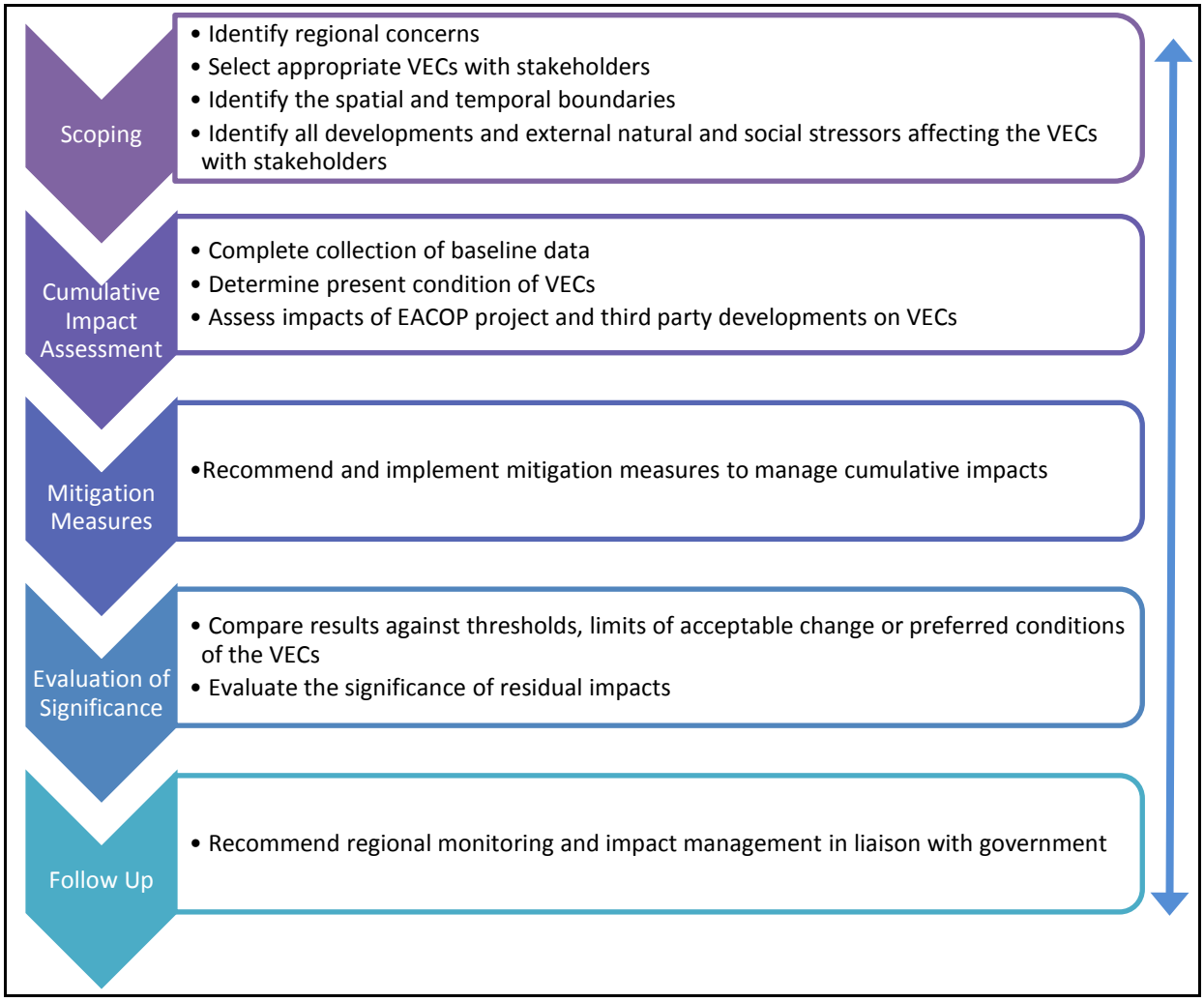


Figure 5.6-1 Cumulative Impact Assessment Process

Identification of Regional Concerns

Stakeholder engagement was conducted during both scoping and baseline data collection. This included national, regional, district and community level stakeholders, industry and the scientific community. The engagement identified regional environmental and social concerns to inform VECs.

VECs

The project VECs have been used for the CIA, see Section 5.3.

Spatial and Temporal Boundaries

The spatial boundaries and temporal boundaries, i.e., area of influence (AOI) is provided in Section 6.

The spatial boundary defined for each VEC is the same for project and cumulative impacts. The temporal boundaries (duration) of project impacts were refined for the CIA to reflect the likely temporal duration of each cumulative impact.

Identification of Activities and Developments with Potential for Cumulative Impacts

Cumulative impacts comprise impacts from past and present activities that are the basis for the baseline conditions, see Section 6 and Appendix A, the project residual impacts, and future developments within the AOI of the EACOP project VECs. Collectively, the project residual impacts and impacts from future developments are termed sources of cumulative impact (SCI).

Planned developments include:

- associated facilities
- third-party developments that are reasonably defined, reasonably predictable or foreseeable[1].

Associated facilities are defined in IFC Performance Standard 1, paragraph 8, as "facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable." This can therefore apply to both new and existing developments where project requirements exceed the associated facility's capacity and substantial expansion is required. Upstream projects and some other developments were identified, based on this definition, as associated facilities.

Third-party developments were identified by:

- review of the national, district and subcounty development plans
- review of sectoral plans, e.g., the National Transport Master Plan
- information requests to key ministries and planning authorities responsible for approving environmental impact assessments
- information requests to NEMA on third-party projects within 20 km of the pipeline route, as cumulative impacts are unlikely to extend further

[1] Definition of projects that are "reasonably defined", taken from IFC Performance Standard 1. Definition of projects that are "reasonably predictable" or that are "foreseeable future developments", taken from the IFC Good Practice Handbook

- review of international finance institutions' (IFI) websites for projects receiving or applying for funding
- review of river basin business plans
- review of other publicly available information on key developments in the region, such as websites of known developers and the press
- consultation with stakeholders, which began during scoping.

An initial screening process was conducted to identify developments that are reasonably defined, reasonably predictable or foreseeable. The screening criteria were:

- Is the development reasonably defined, as described in IFC Performance Standard 1?
  - Is the location confirmed?
  - Is an ESIA publicly available?
- Is the development reasonably predictable or a foreseeable future development, as defined in the IFC CIA Handbook?
  - What is the likelihood of the project occurring?
  - Is it described as a "Core Project" in the National Development Plan?
  - Has the third-party ESIA been submitted or approved six months or more before submission of this ESIA?
  - Will the project occur within the same timescale as the Uganda EACOP project?
- What is the nature of the development?
  - Are there likely to be cumulative impacts with the Uganda EACOP project based on the type and nature of the impacts of the third-party development?
- Do the AOIs of the EACOP project VECs overlap with the third-party development AOIs?

The screened-in SCIs were mapped and compared with the location of the EACOP VECs AOIs. Each SCI has been given a unique identification number to assist with mapping and screening.

For an SCI impact to be assessed as cumulative, the EACOP VEC AOI and the SCI VEC AOIs must overlap and the residual impacts of the EACOP project and the SCI must occur in the same timescale, see Figure 5.6-2. Transboundary cumulative impacts were identified where the shared AOI and impacts may cross a national border.

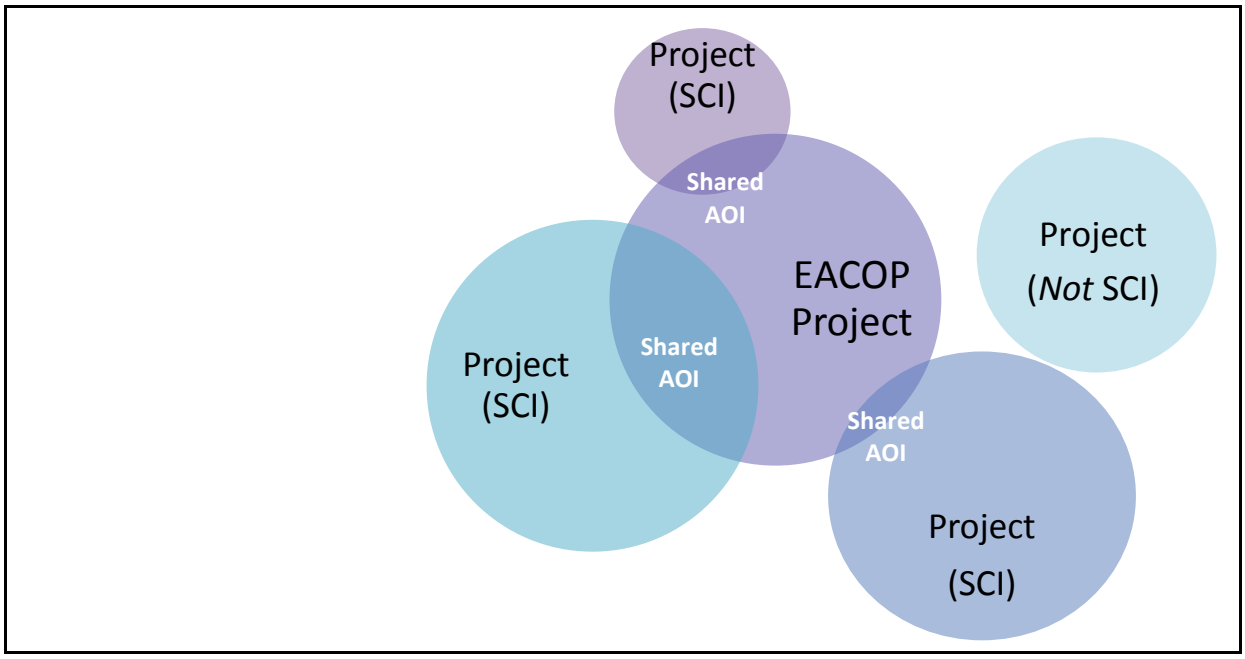


Figure 5.6-2 Schematic of the Shared Areas of Interest

The initial screening of the developments to be included in the CIA was refined by a further process that defined interactions between EACOP VECs and the screened-in developments into three categories:

- Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC.
- Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.
- Category 3: The residual EACOP project impacts have a limited contribution to cumulative impacts.

When the interactions are categorised as 1 or 2, the cumulative impacts are described and assessed in the VEC CIAs in Section 8.

In the VEC CIAs, the potential impacts on the VEC are summarised and described based on the information available. When information was limited, professional judgement was used to predict the likely impacts of the third-party project.

Section 2.6 contains the list of developments included in the CIA.

Appendix H includes information on the SCIs and the screening process and comprises:

- H1: a description of the screened-in developments.
- H2: location maps of the screened-in developments.
- H3: matrices showing the interactions between the EACOP VECs and the impact interaction category (1, 2, or 3, see above).
- H4: matrices showing the developments screened-out during the initial screening process.

Description of Present Condition of the VECs

The present condition, the sensitivity of the VEC to change, and any trends and stressors affecting the VECs are described in the baseline condition for each VEC in Section 6.

The VEC thresholds, limits of acceptable change or preferred condition were defined on a case-by-case basis during the impact assessment process depending on the VEC and the nature of the cumulative impact being assessed. Where objective threshold values are included in the Project Standards, these were adopted, if relevant to the cumulative impact. For most VECs, however, threshold values are not defined, and a preferred condition, or limits of acceptable change, were used based on their pre-construction condition.

Cumulative Impact Assessment

The CIA includes:

- identifying potential activities and impacts from the SCI on VECs
- predicting the cumulative impact on the VECs from the EACOP project and SCI
- predicting the contribution of the EACOP project to the cumulative impact
- predicting the contribution of the SCI to the cumulative impact
- qualitatively determining the significance of the cumulative impact (see Section 5.6.2.5).

Transboundary and in-combination cumulative impacts were also identified and assessed in Section 8.

Where there is no cumulative impact identified on a VEC, this VEC is scoped out of the CIA. This is explained in Section 8.

5.6.2.4 Mitigation Measures

Project Impacts

Mitigation measures are actions or systems that have been or will be used to enhance the benefits provided by the project or avoid, remove, reduce or compensate for adverse impacts. Mitigation of potential impacts has been an integral part of the EACOP project design and ESIA process that will continue through detailed design, construction, operation and decommissioning. This has included:

- an evaluation and selection of the pipeline corridor and aboveground installations (AGIs) based on environmental, social and engineering considerations. This evaluation is described in Section 3.
- avoidance of locations of high environmental and social sensitivity by planning a construction strategy that reduces the need for construction sites.

The design and construction of pipelines has evolved over many years and a substantial body of good design, construction and operational practices exist to

mitigate impacts. Standard good practices[2] are being implemented by the project, including for the pipeline, permanent and construction facilities:

- minimisation of the overall footprint
- burying the entire pipeline along the route to reduce permanent habitat fragmentation, interference by third parties and security concerns
- measures to reduce sediment release during watercourse crossings
- measures to reduce sediment runoff to watercourses, such as silt fences
- reinstatement of the RoW and construction facilities after completion of construction
- waste reduction and waste segregation
- soil-management measures to enhance natural revegetation after reinstatement including topsoil segregation and erosion control.

Design and good practices are described in Section 2 and the evaluation and choice of alternatives in Section 3.

The generic type impacts described in Section 5.6.2.1 are mitigated mostly by standard good practice. The ESIA process included identifying potential significant impacts and technically and financially feasible and cost-effective means of mitigating location-specific impacts described in Section 5.6.2.1. Where a potential significant impact was identified, a hierarchy of options for mitigation was considered including:

- avoid at source – remove the source of the impact
- abate at source – reduce the source of the impact
- attenuate – reduce the impact between the source and the VEC
- abate at VEC – reduce the impact at the VEC
- remedy – correct the impact after it has occurred
- compensate or offset – replace in kind or with a different resource of equal or better value. The EACOP project will develop and implement a Biodiversity Action Plan incorporating enhancement and conservation measures to meet this requirement.

The application of mitigation measures is an iterative process, as shown in Figure 5.2-1. The iteration process continues until an impact is deemed as not significant as reasonably practicable. Residual impacts are those that remain after the completion of this process.

The key management plans for mitigating project generic and location specific impacts are described in Section 8. The specific mitigation measures are included in Appendix E4.

Cumulative Impacts

For EACOP the planned management of cumulative impacts is based on the category of cumulative impact, which are described in Section 5.6.2.3.

Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC. The residual impacts

[2] These are referred to in IFC guidelines as good international industry practice.

from the EACOP project represent a main contributor to the predicted cumulative impacts on a VEC.

In addition to implementing project mitigation measures, the EACOP project will design and implement monitoring or management strategies to appropriately manage cumulative impacts to the extent that it has leverage or influence over the other developers. This will be greater for associated facilities and third-party projects being developed by partners to the EACOP project.

Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.

The EACOP project will design and implement mitigation measures commensurate with the magnitude and significance of its residual contribution to the cumulative impacts. However, the project will use best efforts to engage other developers, governments, and other stakeholders in acknowledging the cumulative impact and in designing management strategies to mitigate them.

Category 3. The residual EACOP project impacts have a limited contribution to cumulative impacts. The EACOP projects contribution to the cumulative impacts on a VEC is negligible.

No cumulative impact mitigation measures are considered necessary.

EACOP will comply with IFC Guidance Note 42, which specifies that commercially reasonable attempts should be made to engage relevant stakeholders (e.g., government authorities, affected communities, other developers) in the assessment, design and implementation of coordinated mitigation measures to manage the potential cumulative impacts resulting from multiple developments in the project's area of influence.

When engaging with other parties, EACOP will endeavour to:

- inform others of the potential cumulative impact
- exchange information, if necessary, to assist in the further definition of the cumulative impact
- discuss and agree on responsibilities, if necessary, for the management of cumulative impacts
- agree on monitoring measures as appropriate.

IFC Guidance Note 40 states that CIAs typically require the cooperation of many diverse stakeholders to agree and coordinate the implementation of potential management and mitigation measures associated with the cumulative impacts and the active participation of government authorities to:

- assess the incremental contribution of each project to the cumulative impacts
- monitor and enforce the implementation of the mitigation measures corresponding to each project.

5.6.2.5 Impact Significance

Project Impacts

The significance of EACOP impacts on VECs was determined by scoring the VEC sensitivity and the impact's magnitude, duration and extent.

For normal project operations, an impact was assumed to occur, i.e., 100% probability of occurrence, so assessing the likelihood of such an impact was not necessary.

Significance was determined for impacts before the application of the proposed mitigation (see Appendix E2 for generic impacts and E3 for location-specific impacts) and determined again on the residual impact after the proposed mitigation. The pre-mitigation significance determination for each VEC is included in Appendix E and the residual impact significance determination is shown in Section 8 and Appendix E.

Magnitude of Impact

The magnitude of an impact is a measure of the degree of change that will be caused by an aspect or activity. The grading was as follows:

- negligible = 2
- small = 4
- medium = 6
- large = 8
- very large = 10.

Grading was from 1 to 10 to give greater weight to magnitude than duration, extent or sensitivity. Impacts recorded as beneficial were not graded.

Appendix D includes magnitude tables for the VECs, using quantitative measures when possible. Professional judgement was used when quantitative information was not available, e.g., for dust emissions from construction equipment. Even though air and noise impacts can be compared to national, international or project standards, gradings were, nevertheless, defined. If predictive modelling indicated that the project environmental standards (PES) would be exceeded, impacts were automatically designated significant.

For the cultural heritage VECs in Category 1 (tangible cultural heritage) and Category 2[3] (tangible cultural heritage with strong intangible elements), impacts are nonreplicable; hence, the cultural heritage sensitivity range was based on a maximum score of ten, as per the following section on sensitivity, and the magnitude scores were halved:

- negligible = 1
- small = 2
- medium = 3
- large = 4
- very large = 5.

Duration of Impact

Impact duration is the length of time over which an impact may occur. Table 5.6-1 shows the grading.

[3] See Appendix D for information on the cultural heritage categories

Table 5.6-1 Impact Duration Grading

Score	Duration	Example
1	Transient: <1 year	Noise, dust and air emissions from construction activities on the RoW Disruption of movement of people and animals across the RoW
2	Short term: 1–5 years	Noise, dust, air, solid and liquid waste emissions from construction facilities Almost all other construction impacts except for habitat degradation or loss and impacts on sensitive soils
3	Medium term: 6–15 years	Recovery of some sensitive soils, flora, fauna and habitats
4	Long term: 16–25 years	Mainly operational impacts that end when the project ends
5	Very long term: >25 years	Permanent land take Impacts that may exist after the end of the project, e.g., removal of mature forest

Extent of Impact

The extent of impact describes the geographical area that may be impacted by the proposed development. Table 5.6-2 shows the grading.

Table 5.6-2 Impact Extent Grading

Score	Environmental VECs	Socio-economic VEC
1	Site, e.g., the impact is restricted to the boundaries of: • the construction RoW • construction facilities and access roads • the operational RoW • AGIs and permanent access roads	Some individuals in the potentially affected communities (PACs)
2	Local, e.g., affecting communities, habitats or land that are close to the construction working areas or facilities or AGIs	Entire PACs
3	Subnational, e.g., affecting habitat that may support species of regional importance, impact on an individual of a species that may have a national designation, but the impact is only on the subnational, and not national population	Districts or regions
4	National, e.g., effects on local population of species that have effects on the national population	National
5	International, e.g., greenhouse gases and transboundary species	International

Sensitivity

The sensitivity of a VEC is based on its vulnerability, value and resilience. It was graded as follows:

- very low = 1
- low = 2
- moderate = 3
- high = 4
- very high = 5.

For the cultural heritage VEC Category 1 (tangible cultural heritage) and Category 2 (tangible cultural heritage with strong intangible elements), the sensitivity scoring was doubled to account for the lack of resilience of such features, plus their high value and vulnerability, as follows:

- very low = 2
- low = 4
- moderate = 6
- high = 8
- very high = 10.

Impact Significance Score

For the determination of impact significance, the following formula was used:

magnitude + extent + duration + VEC sensitivity = significance score

A score of 19 or more is considered a significant impact.

Impact significance scoring was undertaken for each VEC, except for Category 3 (intangible cultural heritage with a less well defined tangible component), when a qualitative approach was applied. This is owing to the:

- sensitivity and value of a Category 3 receptor being defined by the local community who visit, use or engage in an intangible practice that is not objectively measurable. It takes a greater amount of time and the development of relationships of confidence and trust to enable a valuation of the sensitivity associated with intangible cultural heritage, making it difficult to get a real sense of importance to the communities during the baseline work, see Section 6.4.3.16.
- spatial extent of sites often not being defined clearly and may not be relevant to an understanding of the magnitude of effects. For example, a sacred tree occupies a small area but the belief system attached to it may extend to the whole potentially affected community.

A qualitative determination of the significance of a limited number of impacts was undertaken, as described within the VEC assessments in Section 8.

Cumulative Impacts

Residual cumulative impacts were assessed, taking into consideration:

- the residual impacts of the EACOP project
- the additional management strategies and mitigation measures proposed to manage cumulative impacts, see Section 5.6.2.4.

The significance of cumulative impacts was determined qualitatively based on a predicted exceedance of VEC thresholds, limit of acceptable change or preferred condition.

If the governmental agencies identify the need to implement regional management or regional monitoring plans, the project will participate in their development and implementation.

Human Rights

Many social impacts can be understood in human rights[4] terms. This includes recognising project-affected individuals and communities as human rights-holders with legal entitlements, including the right of legal redress for impacts on their human rights. Thus, when a project creates social impacts, it may also have implications for its responsibility to respect human rights. A stand-alone HRIA is being conducted for the project. As per good practice for human rights impact assessment, this assessment is based on national and international human rights laws and standards and focuses on the severity and likelihood of potential adverse impacts on affected stakeholders or rights-holders.

It is important to note that according to the UN Guiding Principles on Business and Human Rights, the criteria for assessing human rights uses a combination of severity and likelihood, which differs from the ESIA approach of determining significance. Regardless, both processes identify risks present in the project baseline that could materialise as project impacts and both processes identify potential mitigation measures for those impacts.

The findings of the HRIA were used in the ESIA where this could further inform the social impact assessment. This inclusion did not change the significance criteria used in the ESIA. Rather, the identification of risks in the project setting and mitigation measures that support proactive “human rights due diligence”[5] were incorporated into the social impact assessment where they were relevant to bolster the understanding of the project setting or of mitigation for inclusion in the environmental and social management plan.

[4] Human rights risks are understood to be the business enterprise’s potential adverse human rights impacts. Potential impacts should be addressed through prevention or mitigation, while actual impacts – those that have already occurred – should be a subject for remediation. See UN Guiding Principles on Business and Human Rights, 17 and Commentary.

[5] Companies must implement a system of human rights due diligence to identify, prevent, mitigate and account for how they address their adverse human rights impacts. The process should include assessing actual and potential human rights impacts, integrating and acting upon the findings, tracking responses, and communicating how impacts are addressed. Human rights due diligence should be initiated as early as possible in the development of a new activity or business relationship. See UN Guiding Principle 17 and Commentary.

5.6.3 Abnormal Operations and Unplanned Events

Abnormal operations and unplanned events include:

- geotechnical events (e.g., earthquakes and landslides)
- accidental events (e.g., fire, collision of vehicles with operational plant and damage of pipe due to unauthorised digging on land).

Section 9 describes the impact assessment for abnormal operations and unplanned events and includes:

- measures considered during engineering design to avoid risks
- a description of the hazard analysis and risk assessment studies conducted to identify
  - risks during project construction and operation
  - mitigation measures to reduce risks to a level as low as is reasonably practicable
- an assessment of impacts of traffic accidents during construction and identification of mitigation measures.

In addition, oil spill modelling (see Appendix I) for the potential impacts of oil spills on land was conducted to inform the design of the project and response planning.

The oil spill modelling included a qualitative assessment of environmental and social risks on the pipeline route and preliminary quantitative fate and transport modelling for locations sensitive to spills.

Qualitative Risk Framework

A qualitative model framework was developed to assess risks posed to key VECs (surface water, groundwater, community health, biodiversity, land) from potential oil release on the pipeline route on land. The model framework takes account of VEC sensitivity, potential oil release volumes and the likelihood of a pipeline failure event.

Sensitivity screening was undertaken using the risk assessment model and applied to select and justify the most suitable locations for preliminary quantitative risk assessment (PQRA).

Preliminary Quantitative Risk Assessment

Risk-based-corrective-action fate and transport modelling of spills was undertaken to assess the potential risks to VECs on land, including:

- the spatial extent of the area that may be affected
- the temporal extent, e.g., the length of time over which water quality standards might be exceeded.

This included modelling of:

- dissolved-phase oil migration in the ground, laterally to surface water VECs (base-flow contribution) and vertically to aquifers
- modelling of free-phase oil in-ground migration to surface waters or groundwater
- modelling of the dispersion of oil as a result of spills directly into a watercourse.

Management and mitigation measures arising from the ERA for developing the oil spill contingency plan were identified.

A more fulsome description of the methodology is provided in the oil spill modelling in Appendix I.

Given the inherent uncertain nature of potential unplanned events, the potential variability of such events in terms of geographic location and coverage, and limitations of directly relevant event statistics, no significance determination was undertaken but likelihood has been estimated.

5.6.4 Environmental and Social Management Plan

The development of an environmental and social management plan (ESMP) was part of the ESIA process.

The management plans are listed in Section 10 and the ESMP (Appendix J) reflects the findings of the ESIA and is based on the impact assessment tables presented in Appendices E2 and E3 and the master commitments register included in Appendix E4, described below.

The aspects, potential project impacts, proposed mitigation measures and significance scores before and after mitigation (residual impact) for VECs are presented in three tables in Appendix E:

- Appendix E1 identifies the EACOP project aspects that could interact with, and cause impacts on VECs.
- Appendix E2 identifies generic impacts caused by the aspects identified in Appendix E1 and provides a determination of significance of the impact before mitigation. The table also summarises the generic mitigation measures and provides post-mitigation significance.
- Appendix E3 identifies location-specific impacts caused by project aspects identified in Appendix E1 and, as Appendix E2, provides a determination of significance of the impact before mitigation, summarises the mitigation measures, and indicates post-mitigation significance.

Appendix E4 includes the master commitments register, containing a list of management plans and mitigation measures that are proposed.

Appendix E5 includes tables of content for each management plan.

6 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

6.1 Introduction

This section describes the existing environmental and social baseline conditions of the valued environmental (and social) components (VEC) for the EACOP project.

Each of the VEC subsections includes:

- a description of the area of influence (AOI)
- the existing baseline condition of the VEC, including:
  - trends in condition
  - ecosystem services provided
  - sensitivity rankings
- key considerations.

The subsections summarise the information in the baseline reports for each VEC. For additional information, including methods, see Appendix A.

6.2 Valued Environmental Components

The VECs that have been selected are described below, along with the rationale for their selection. For the process of VEC selection, see Section 5.3.

VEC	Description
Biodiversity	
Habitats of conservation importance (terrestrial and aquatic)	Habitats of conservation importance include habitats within the project AOI that are not common or support species that are not common and include ecological assemblages that are unique, relict, remnant, have high bioquality or support International Union for Conservation of Nature (IUCN) critically endangered, endangered, vulnerable, migratory, congregatory, endemic or range-restricted species.
Flora and fauna species of conservation importance (terrestrial and aquatic)	Flora and fauna species of conservation importance within the project AOI include species that are IUCN (or national equivalent) critically endangered, endangered, vulnerable, protected, keystone migratory, congregatory, endemic or range restricted species.
Legally protected, internationally or nationally recognised onshore areas	Areas that are internationally or nationally recognised or legally protected within the project AOI such as: national parks; wildlife, forest and game reserves; Ramsar Sites, key biodiversity areas; important bird areas; endemic bird areas; wildlife management areas and alliance for zero extinction sites.

VEC	Description
Physical Environment	
Soil	The layers (soil horizons) above the bedrock are composed of weathered mineral materials, organic material, air and water. Soils support plant growth, agriculture and biodiversity by providing important ecosystem services, such as soil formation, nutrient cycling and primary production.
Surface water	Ephemeral and permanent surface watercourses and waterbodies can be used for domestic, agricultural and industrial supplies and for hydropower generation. The term 'ephemeral' covers those watercourses with seasonal flow and those with flow just following rainfall.
Groundwater	Aquifers and vulnerable groundwater used for abstraction or providing important ecosystem services, such as water purification. Groundwater is an important source of irrigation and potable water. Groundwater bodies can also have a connection with, and hence influence on, surface water.
Landscape	This VEC includes landscapes, valued as a resource in their own right, and the people who experience changes in views.
Air quality	The air quality, including dust within the airsheds of: • the pumping stations (PS) • construction facilities (main camp pipe yards (MCPY) and roads used during construction) • construction work on the pipeline.
Acoustic	The health and wellbeing of humans and fauna is associated with the ambient sound level in the area of their inhabitancy.
Economy	Direct and indirect employment, contracting and procurement, workforce capability and skills, and taxes.
Local economy (non-land-based livelihoods)	Formal and informal (non-land based) economic activities and local economic conditions.
Land-based livelihoods	Land-based livelihood activities include crop farming, livestock rearing, mining and harvesting of natural resources (wild plants and game).
River-, lake- and marine-based livelihoods	Fishing and related economic activities including commercial and artisanal fishing, This VEC focuses on negative displacement impacts.
Land and property	Land and property or housing that may be affected by the project through permanent acquisition or change in value.
Workers' health, safety and welfare	Workforce health, safety, human rights and welfare.
Social infrastructure and services	Physical and social infrastructure such as access to utilities, waste services, roads.
Community health	Includes community health status and, access to health services, water and sanitation.
Community safety, security and welfare	Includes personal safety affected by the project from traffic and road use, and security affected by presence of workers, new populations, and security arrangements. Welfare includes social cohesion and community stability.

VEC	Description
Tangible and intangible cultural heritage	Tangible cultural heritage sites and intangible cultural heritage valued by local communities including cultures and traditions. This also includes any species of cultural or traditional importance not captured by the assessment of potential effects on ecosystem services, e.g., species valued for their part in oral history or traditions, rather than the physical (hunting or gathering) value to the community.
Climate	This VEC includes the global climate, including energy use, greenhouse gas emissions, carbon storage and sequestration, and local and global climate regulation.

6.3 Area of Influence

To identify, assess and manage potential environmental and social impacts, the potential AOI of the project has been defined.

International Finance Corporation (IFC) Performance Standard 1, paragraph 8 (IFC 2012), defines the AOI as encompassing the following components:

- "the area likely to be affected by:
  (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project
  (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location, or
  (iii) indirect project impacts on biodiversity or on ecosystem services upon which affected communities' livelihoods are dependent
- associated facilities, which are facilities that are not funded as part of the project, but which would not have been constructed or expanded if the project did not exist and without which the project would not be viable
- cumulative impacts that result from the incremental impact, on areas or resources used or directly affected by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted."

The whole project AOI is a combination of the AOIs for each VEC. The criteria for defining the AOI for each VEC takes account of the following, the:

- permanent footprint, associated with the operational right-of-way (RoW) for the pipeline and the other operational facilities such as the aboveground installations (AGI)
- temporary footprint associated with construction and other sites, such as borrow pits and waste management facilities, required to construct the project
- area outside the footprint potentially affected by direct impacts such as noise and dust
- area potentially affected by indirect impacts such as villages and towns affected by in-migration of contractor workers
- area potentially affected by unplanned events, such as oil spills during construction and operation
  - area used for assessing cumulative impacts, which is defined as the areas where AOIs for EACOP project and sources of cumulative impact VECs

experience overlapping impacts, spatially and temporally, from past, present and future activities, including from associated facilities and third-party projects.

The AOI for each VEC is defined in the following VEC subsections.

The AOI is different for the construction, operation and decommissioning phases of the projects and different for each VEC.

The study area for each VEC takes account of the AOI but may be larger than the AOI to understand the context in which the VECs exist, including trends and pressures on the condition of the VECs. A broader region is a study area larger than the AOI to provide regional context for biodiversity, geology and soils, economy and greenhouse gas emissions. The study areas are defined in the baseline reports (see Appendix A).

6.4 Environmental and Social Baseline

6.4.1 Biodiversity

6.4.1.1 Legally Protected, Internationally or Nationally Recognised Areas

Introduction

This section describes the following:

- the AOI for legally protected and internationally or nationally recognised areas
- baseline conditions in terms of:
  - international recognised areas
  - legally protected areas
  - trends in condition and sensitivity to change
  - ecosystem services provided
  - sensitivity rankings
- key considerations.

Legally Protected Areas

The following legislation is relevant to the governing of protected areas within the project AOI:

- Constitution of the Republic of Uganda, 1995. Article 237 (2b): the government holds in trust for the people, and is required to protect, natural lakes, rivers, wetlands, FRs, game reserves (GR), national parks and any land to be reserved for ecological or tourism purposes for the common good of all citizens
- National Forestry and Tree Planting Act, 2003: the Act provides for the conservation, sustainable management and development of trees and forests for the benefit of the people of Uganda
- National Environment Act, 1995. Ch. 153: the Act provides for sustainable management for the environment
- Wildlife Act, 1996, Ch. 200: the Act provides for the conservation of wildlife throughout Uganda so that the abundance and diversity of their species are maintained at optimum levels commensurate with other forms of land use to

allow for sustainable utilisation of wildlife for the benefit of the people of Uganda and the protection of rare, endangered and endemic species of wild plants and animals.

The following policies and plans are applicable to protected areas in Uganda:

- National Forest Plan 2011/12–2021/22, 2013. The plan acknowledges that oil exploitation can have negative effects on forest resources through deforestation and environmental degradation, including indirect effects resulting from induced development. However, it also recognises that revenue from the Albertine Graben developments provides an opportunity to invest in sustainable forest management. The National Forest Plan aims to:
  - enhance the capacity of forestry institutions to enable them to perform their mandates effectively
  - increase the forest resource base by increasing forest cover to 1990 levels
  - increase the economic productivity of forests and employment in the forestry sector
  - raise incomes for households through forest-based initiatives
  - restore and improve ecosystem services derived from sustainably managed forests.
- Uganda Forestry Policy, 2001. This policy outlines guiding principles for the management of forest resources, including conservation and sustainable management. It also outlines strategies for the management of forest resources that include social and environmental impact assessments for commercial forest plantations and forest-product-producing industries.
- Uganda Wildlife Authority Strategic Plan 2013–2018. The plan provides for sustainably managed wildlife areas that are providing enjoyment, supporting community livelihoods and contributing to national development.
- Uganda Wildlife Policy, 2014. This policy guides the conservation and development of wildlife resources in Uganda.
- The Ugandan National Policy for the Conservation and Management of Wetlands protects wetlands. This includes elements that protect rivers as a biodiversity area and as a resource for local communities. The policy, designated in 1995 (Ministry of Natural Resources, 1995), aims at protecting and curtailing the rampant loss of wetlands to sustain their ecological and socioeconomic functions (Glass, 2007).

Internationally and Nationally Recognised Areas

Key Biodiversity Areas

Key Biodiversity Areas (KBA) are sites that contribute to the global sustainability of biodiversity, including vital habitat for threatened plant and animal species in terrestrial, freshwater and marine ecosystems. In 2016, the International Union for the Conservation of Nature (IUCN) published a global standard for the identification of KBAs with the following aims:

- harmonise existing approaches to the identification of important sites for biodiversity
- support the identification of important sites for elements of biodiversity not considered in existing approaches

- provide a system that can be applied consistently and in a repeatable manner by different users and institutions in different places and over time
- ensure that KBA identification is objective, transparent and rigorous through application of quantitative thresholds
- provide decision-makers with an improved understanding of why particular sites are important for biodiversity.

Sites qualify as global KBAs if they meet one or more of 11 criteria, grouped into five categories:

- threatened biodiversity
- geographically restricted biodiversity
- ecological integrity
- biological processes
- irreplaceability.

Although anyone with appropriate scientific data may propose a site to qualify as a KBA, consultation with non-governmental and governmental stakeholders at the national level is required during the proposal process.

There are 48 KBAs in Uganda, none of which is crossed by the project AOI at the time of development of this baseline.

Important Bird Areas

Important Bird Areas (IBAs) form the largest subset of KBAs. These are sites of international importance for conservation, identified using birds as qualifying species. The global network of IBAs has been identified using a set of four internationally agreed criteria:

- A1, globally threatened species – the site is known or thought to hold 'significant' numbers of a globally threatened species
- A2, restricted-range species – the site is known or thought to hold a 'significant' component of a group of species whose breeding distributions define an Endemic Bird Area (EBA, see below)
- A3, biome-restricted species – the site is known or thought to hold a 'significant' component of the group of species whose distributions are largely or wholly confined to one biome
- A4, congregations – the site is known or thought to hold congregations of ≥1% of the global population of one or more species on a regular or predictable basis.

Over 12,000 IBAs in over 200 countries have been identified globally. As bird populations have been shown to be effective indicators of wider biodiversity, many IBAs are likely to be KBAs for other animal and plant species, and ecosystems of concern (BirdLife International 2018).

Uganda has 34 IBAs covering about 1.9 million ha. The project AOI does not cross any IBAs.

Endemic Bird Areas

An EBA is defined as an area that encompasses the overlapping breeding ranges of restricted-range species, such that the complete ranges of two or more

restricted-range species are entirely included within the boundary of the EBA. This does not necessarily mean that the complete ranges of all an EBA's restricted-range species are entirely included within the boundary of that single EBA, as some species may be shared between EBAs.

Restricted-range species are defined as land-based birds that historically[1] have a total global breeding range estimated at below 50,000 km^2. Species with historical ranges estimated to be above this threshold, but which have been reduced to below 50,000 km^2 by habitat loss or other pressures, are not covered as EBAs should represent natural areas of endemism for birds.

There are six EBAs in Uganda, none of which is crossed by the project AOI.

Area of Influence

The AOI is the area of any legally protected, internationally or nationally recognised areas directly or indirectly affected by the project and its activities arising from, for example, facilitated access, edge effects, the spread of alien invasive species, and temporary and permanent habitat loss and fragmentation.

Most of the impacts to protected areas will occur during the construction phase and early operation. Indirect impacts such as human influx, including access to previously difficult-to-access land, may extend beyond this duration. As such, the temporal AOI is defined as the construction period and the time required for habitat to re-established to preconstruction condition.

The following legally protected sites were identified within 1 km of the project AOI (including access roads and construction facilities); they are illustrated in Figure 6.4-1 and described herein:

- Wambabya FR
- Taala FR
- Kasana–Kasambya FR.

There are no adopted management plans for these reserves, so there are no formal management objectives other than those outlined in the National Forest Plan 2011/12–2021/22, 2013 (see section above).

[1] Considered since ornithological recording began after 1800

Figure 6.4-1 Protected Areas in the Area of Influence

Baseline Condition

Legally Protected Areas

Wambabya Forest Reserve

Between KP5 and KP9, the pipeline RoW is within 100 m of the Wambabya FR. The southern part of the reserve supports relatively intact forest. Although only 3420 ha in area, the Wambabya FR has the highest population density of chimpanzees in the Albertine Rift (Lamprey 2015) and is important for plant biodiversity. The Wambabya FR and the corridors of remnant riparian forest linking it to the Bugoma Central Forest Reserve (CFR) provides important habitat for the IUCN and Uganda endangered chimpanzee.

Designated in 1965 for environmental and ecological reasons (NEMA, 2010), the Wambabya FR is the largest remnant stand of semi-evergreen forest in the AOI and is of botanical importance because it represents one of a few remnant stands of Guineo–Congolian semi-evergreen forest in the region (Figure 6.4-2). This is likely to be attributable to the site's protected area status.

The Wambabya FR may become an important part of a proposal by non-governmental organisations to restore and enhance ecological corridors in the broader Albertine Rift landscape to enhance the conservation of chimpanzees within these forested areas and sustainable ecosystem services for local communities. These corridors are between the Wambabya FR and the following areas outside the project AOI:

- the Bugoma CFR, which is about 3.5 km southwest of the Wambabya FR in Hoima district
- the Budongo FR, which is about 29 km northeast of the Wambabya FR
- the Mukihani FR, which is about 20 km northeast of the Wambabya FR.

This corridor enhancement programme is being investigated jointly by Ecotrust, the Jane Goodall Institute and Fauna & Flora International (Lamprey 2015).

Additional information on fauna is provided in Section 6.4.1.5 and Appendix A4 Fauna Baseline Report, and 6.4.1.4 and Appendix A3, Avifauna Baseline Report.

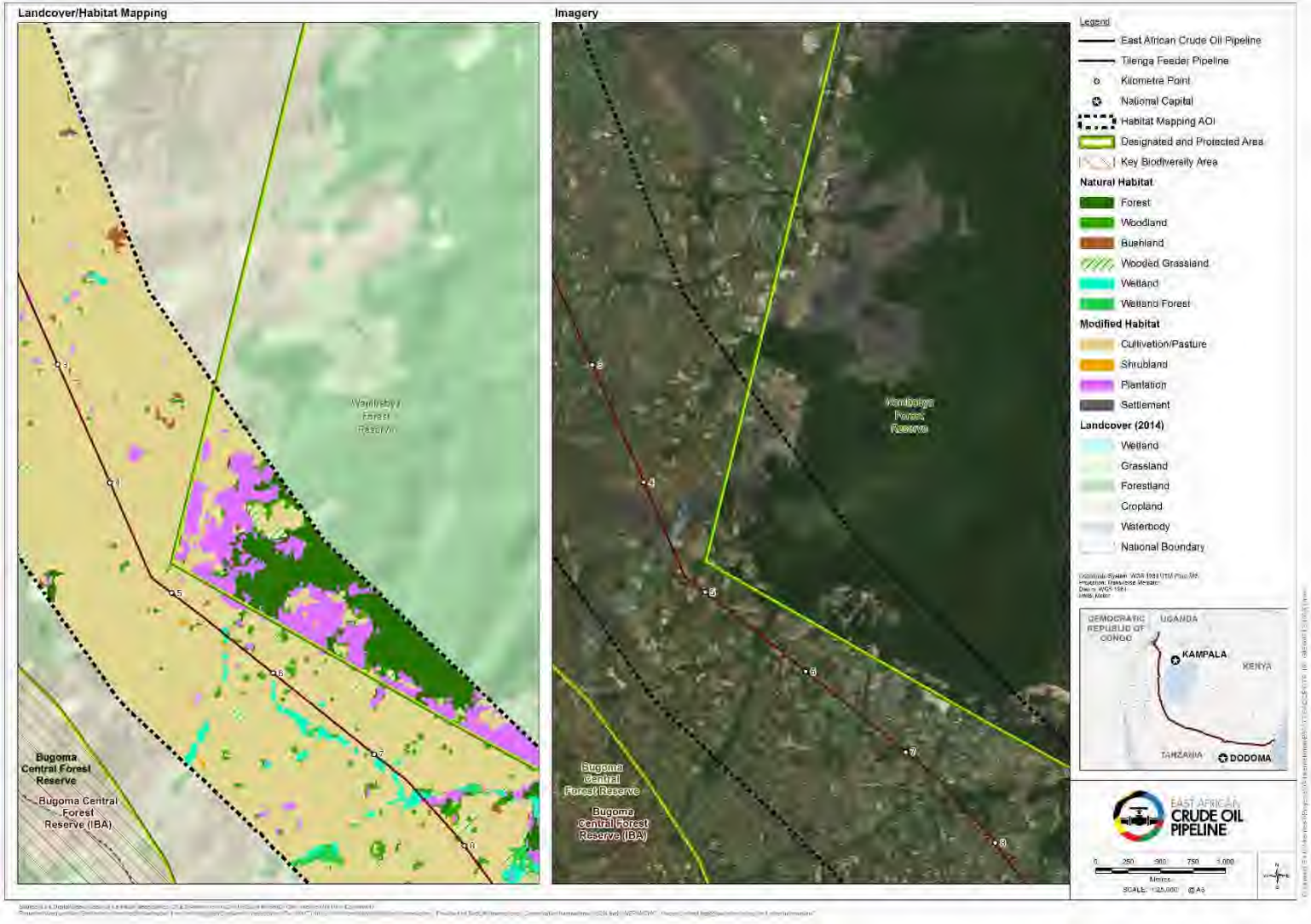


Figure 6.4-2 Wambabya Forest Reserve Land Cover, Habitat and Imagery

Taala Forest Reserve

The pipeline RoW traverses the western part of the Taala FR from KP78–82.5. The project is immediately adjacent to a village enclave and the existing land use is mostly agricultural. Field studies suggest that natural vegetation within the Taala FR only persists in the wet valleys, having been replaced elsewhere by plantations of eucalyptus and pine, and seasonal crops (Figure 6.4-3). The reserve was gazetted for environmental and ecology purposes, as it serves to protect the drainage system of the Kitumbi and Lugulima rivers that join and flow north into the Kafu River (NEMA, 2010). The NEMA Sensitivity Atlas[2] states that the Taala FR is good for biodiversity, particularly for unique butterflies, and has formerly supported hippopotamus and African buffalo (NEMA, 2010). The Sensitivity Atlas also states that 50% of the Taala FR is licensed for commercial tree planting in the private sector.

Additional information on these species is provided in the Fauna Biodiversity Baseline Report (Appendix A4).

[2] The overall aims of the Sensitivity Atlas are to "display, identify and provide the ability to analyse the relative environmental sensitivities (physical, biological and socio-economic) to oil spill and oil development within the exploration areas in the Albertine Graben region of western Uganda" (NEMA 2010)

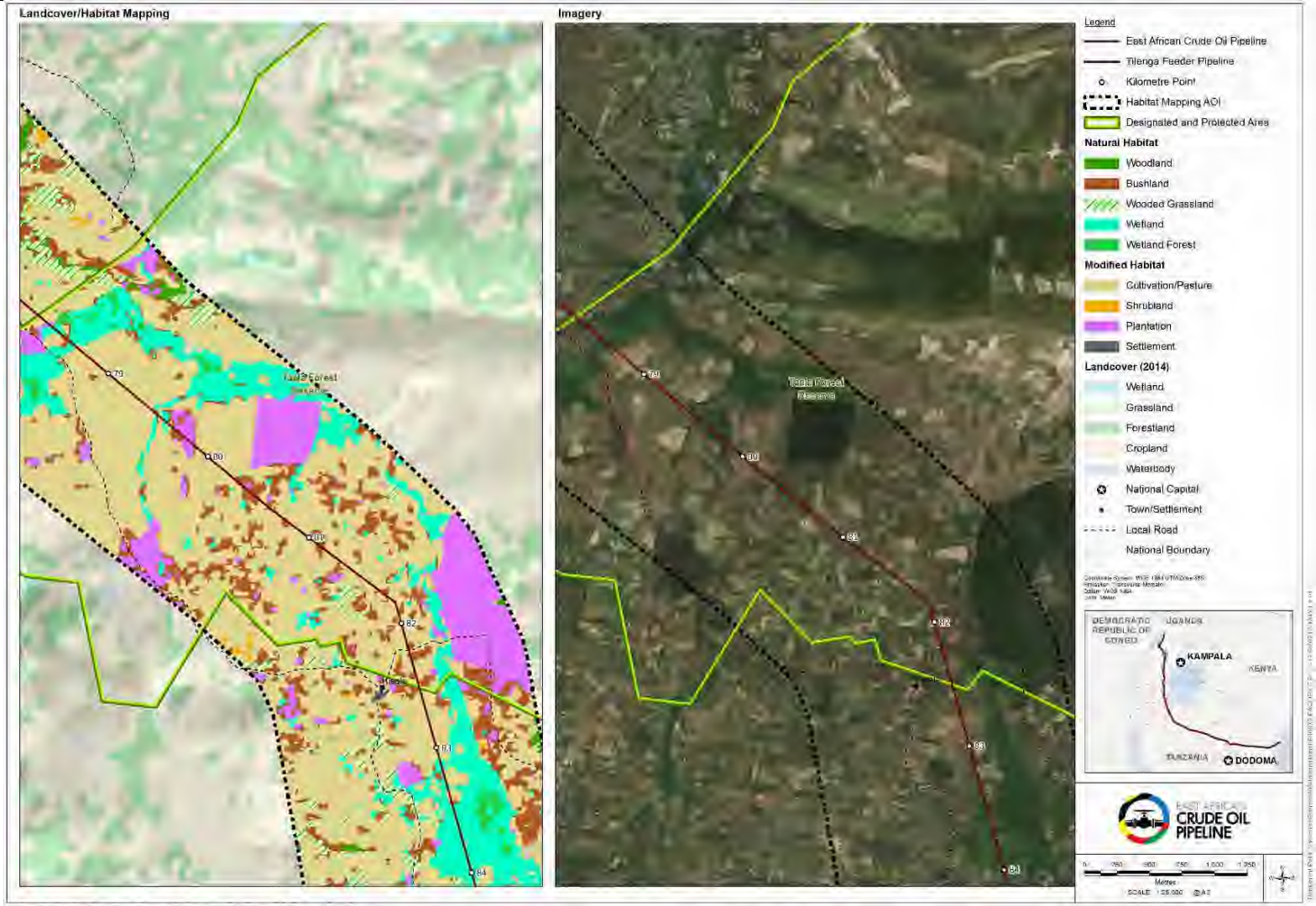


Figure 6.4-3 Taala Forest Reserve Land Cover, Habitat and Imagery

Kasana–Kasambya Forest Reserve

The pipeline RoW is within 100 m of a short section of the Kasana–Kasambya FR near KP123. This part of the reserve is exclusively commercially harvested pine tree plantations (Figure 6.4-4). Field studies suggest that eucalyptus plantations and maize fields are also widely present in the FR.

Additional information on the fauna species of conservation importance found within Kasana–Kasambya FR is provided in Section 6.4.1.5 and Appendix A4, Fauna Biodiversity Baseline.

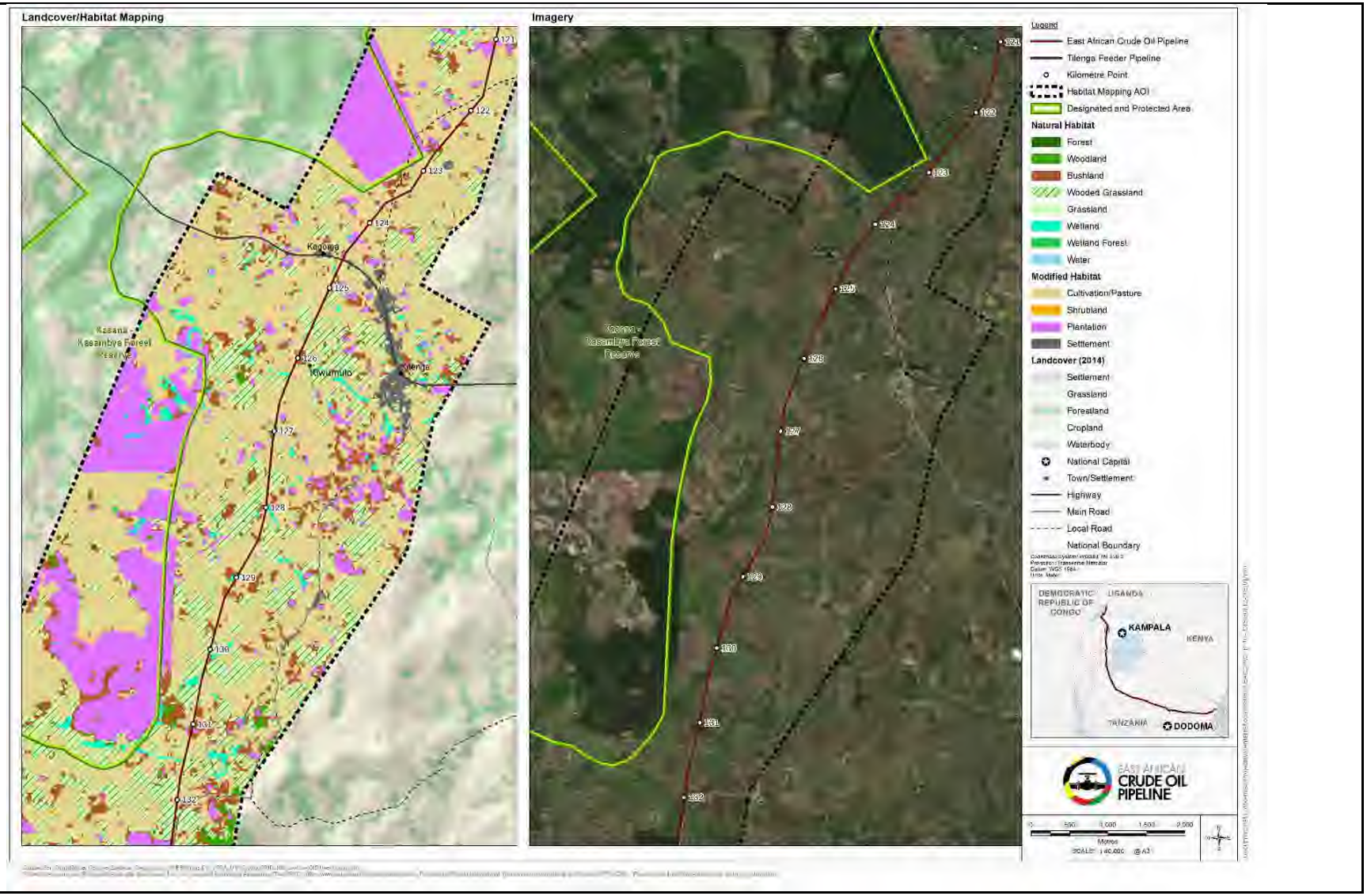


Figure 6.4-4 Kasana–Kasambya Forest Reserve Land Cover, Habitat and Imagery

Trend in Condition and Sensitivity to Change

Legally Protected Areas

Wambabya Forest Reserve

The Wambabya FR is predominantly surrounded by agro-pastoral land and settlements. The FR has an environment and ecological function (NEMA, 2010). Areas of forest habitat along the periphery of the reserve have been cleared for agro-pastoral activities. Selective logging also threatens the integrity of the reserve. However, illegal logging is notably less apparent compared with other FRs in the region, e.g., in the Bugoma CFR. These threats are likely to continue in the absence of intervention, as the local population increases and pressure on natural resources such as timber and land access rises (Hänni 2010).

Afforestation and restoration of the ecological connectivity between the Wambabya FR and Bugoma CFR would potentially reduce pressure on the reserve (FFI 2018). The Ugandan Wildlife Authority also intends to initiate a revegetation programme in degraded parts of Wambabya FR. Should these programmes proceed and be successful, it is anticipated that the condition of the Wambabya FR would improve.

The Wambabya FR is a nationally protected site with high biodiversity value, for example, it supports a population of IUCN endangered chimpanzee. Consequently, it has high sensitivity to change.

Taala Forest Reserve

The Taala FR is a nationally protected site that was originally designated for ecological purposes (NEMA 2010). Although it now comprises modified habitat, it has biodiversity value in some places (see Section 6.4.1.5 and the Fauna Biodiversity Baseline Report in Appendix A4), and so has high sensitivity to change.

Natural forests are coming under increasing pressure of encroachment for agriculture and timber plantations. The project AOI passes through a large village inside the Taala FR, which demonstrates this encroachment. In this location, the FR is already heavily degraded. The project is not aware of any proposals to try to remove the established village or to restore natural vegetation within the FR. There is no anticipated change in condition of this site.

Kasana–Kasambya Forest Reserve

The Kasana–Kasambya FR is a commercial plantation, so there is no anticipated change in condition.

The Kasana–Kasambya FR retains some biodiversity value, see Section 6.4.1.5 and the Fauna Biodiversity Baseline Report in Appendix A4. It is considered to have moderate sensitivity to change.

Ecosystem Services

The legally protected, internationally and nationally recognised areas described herein provide the following ecosystem services.

Provisioning services include:

- wood and wood fuel, including collection for charcoal manufacture. In some areas these activities are legal, in others they are not.
- food (hunting, gathering and foraging). In some areas these activities are legal, in others they are not.
- collection of medicinal products
- trapping of wildlife for the live trade market.

Regulating services include:

- climate change amelioration through carbon sequestration
- local climate regulation - in terms of providing a cooler micro-climate
- local water and air purification - through waste assimilation, and water and air filtration
- water regulation and erosion control (i.e., water catchment protection) in terms of maintaining greater river flows and for longer, reducing flood surges, and reducing erosion and sedimentation from vegetation of steep slopes and river banks.

Cultural services include:

- ethical and biodiversity 'non-use' values - particularly in terms of maintaining populations of endangered and endemic species
- sense of place and way of life - these locations are likely to provide value to local people living near and utilising them in terms of the way of life and special connection with such areas.
- eco-tourism, particularly in protected areas
- aspects of these locations may provide spiritual, sacred or religious values, inspiration for culture and design and cognitive development.

Habitat and species support includes:

- providing refuge, feeding, watering, breeding and nursery areas for a host of animals that spend only part of their life in such areas.

Other supporting services include:

- provision of a range of supporting services such as photosynthesis and water, carbon and nutrient cycling whose values are typically accounted for in other ecosystem services.

Sensitivity Rankings

Based on the results of the studies undertaken, the trend in condition and sensitivity to change, the sensitivity of the VECs has been ranked and is shown in Table 6.4-1.

Table 6.4-1 Protected Area Sensitivity Ranking

Wambabya FR		
Legally protected	High (4)	Nationally protected site with high biodiversity value (see Section 6.4.1.4 and the Avifauna Biodiversity Baseline Report in Appendix A3, and Section 6.4.1.5 and the Fauna Biodiversity Baseline Report in Appendix A4)
Taala FR		
Legally protected	High (4)	Nationally protected site originally designated for ecological purposes (despite now being highly degraded), which supports some fauna species of conservation importance (see Section 6.4.1.5 and the Fauna Biodiversity Baseline Report in Appendix A4)
Kasana–Kasambya FR		
Legally protected	Moderate (3)	Nationally protected site not specifically designated for biodiversity purposes but has biodiversity value in that it supports some fauna species of conservation importance (see Section 6.4.1.5 and the Fauna Biodiversity Baseline Report in Appendix A4)

Key Considerations

The following legally protected sites are key considerations:

- Wambabya FR
- Taala FR
- Kasana–Kasambya FR.

6.4.1.2 Botany Biodiversity

This section describes the:

- botanical biodiversity AOI
- biodiversity baseline condition in terms of:
  - habitats
  - protected areas
  - vascular plant species
  - trends affecting the condition of habitats, vascular plants and protected areas of conservation importance, and sensitivity to change
  - ecosystem services provided
  - botanical biodiversity sensitivity rankings
- key considerations.

For more information, the botanical biodiversity baseline report is included in Appendix A1.

Area of Influence

The spatial AOI encompasses the project footprint and areas within an ecologically relevant distance of the project to account for potential direct and indirect project-

related impacts (i.e., effects of habitat loss, facilitated access, habitat fragmentation, edge effects and spread of invasive species). The definition of an ecologically relevant distance relies on the mobility of a species, habitat connectivity between it and the project, and the potential impact pathways between it and the project.

Where appropriate, the AOI includes downstream wetland and riparian habitats that are potentially at risk from project-related impacts (e.g., from accidental spills or sedimentation). Using a precautionary approach, the spatial AOI for habitats of conservation importance was generally defined by a 2-km-wide corridor centred on the pipeline RoW.

Most impacts to habitats and species of conservation importance will occur during the construction phase and early operation. Indirect impacts such as human influx and facilitated access into previously difficult-to-access land may extend beyond this duration. As such, the temporal AOI is defined as the construction period and the time required for habitat to re-established to preconstruction condition. For new access roads and parts of construction facilities that may be transferred with the land to the Government or a third party when no longer needed for project use, the impacts will be considered permanent.

Habitat Mapping

Habitats were identified and mapped using remote sensing, which is an effective approach for characterising the large area traversed by the project. It was then refined using data collected from the botanical field surveys. The advantage of using remote sensing to map vegetation classes is the ability to cover a large area using data from a representative sample of known sites.

Wet and dry season Sentinel-2 satellite imagery was used to map the habitat types along the extent of the project. The following data sets were also used:

- tree height data derived from LIDAR surveys undertaken in 2017
- slope data derived from the LIDAR Digital Elevation Model (DEM) (EACOP)
- very-high-resolution aerial imagery (EACOP)
- existing Africover land cover mapping (FAO).

Each of the satellite images was enhanced using ERDAS Image 2018 to reduce effects such as topographic shading, and light and shadows from solar illumination and forest fires. Each Sentinel-2 image was clipped to match the 2-km-wide LIDAR data corridor captured in 2017.

Physiognomic habitat classes were mapped based on the occurrence of habitats throughout the AOI and readily distinguishable differences in height and density. Data provided by the field surveys were used to inform this process. These habitat classes are primarily derived from the physiognomic types (Table 6.4-2) defined by White (1983).

Each Sentinel-2 tile was processed using the Random Forests algorithm in the ERDAS Imagine geospatial tool; this allocates a physiognomic habitat class, based on the statistical similarity, to each homogeneous area. Following the automated classification of habitat classes, the habitat map was refined based on the field data and observations.

Physiognomic habitat classes were further categorised into modified and natural habitats in accordance with IFC Performance Standard 6 criteria (IFC, 2012) which defines these as follows:

- Natural habitats are areas composed of viable assemblages of plant and or animal species of largely native origin, and or where human activity has not essentially modified an area's primary ecological functions and species composition.
- Modified habitats are areas of land that support a large proportion of flora and or fauna species that are non-native in origin, and or where human activity has substantially modified an area's primary ecological functions and species composition.

Areas composed of shrubland habitat were considered transitional habitat. These areas are included as modified habitats.

The habitat map is presented in Attachment A1.1 of Appendix A1.

Table 6.4-2 Physiognomic Habitat Classes in the Area of Influence

Physiognomic Habitat Class	**Summary of Description**
Natural Habitats	
Forest	Semi-evergreen rainforest, with canopy >10 m high and emergent trees evident. Crowns generally interlocking.
Woodland	Open stands of trees of at least 8 m in height – canopy cover of 40% or more. Crowns never interlocking. Usually a layer of grass species dominate ground-level vegetation.
Wetland Forest	Tall woody vegetation (>10 m in height) occurring within lower parts of the landscape with evidence of inundation or proximal to other wetland vegetation
Bushland	Open stands of bushes (usually 3–7 m tall) with a canopy cover of 40% or more.
Thicket	Dense growth of bushes 3-7 m tall.
Wooded Grassland	Open woodland habitat dominated by *Combretum* sp. around native grasslands. Trees >7 m tall, bushes (3–7 m), dwarf trees and shrubs <2 m tall.
Wetland	Permanent or seasonally inundated wetland area dominated by closed canopy of papyrus. Habitat periodically harvested in large uninterrupted tracts.
Modified Habitats	
Shrubland	Open or closed stands of shrubs up to 2 m tall.
Cultivation/ Pasture	Mosaic of small-scale cropping, fallow, tree-crops (banana or coffee) and human settlements. Also a modified grassland habitat with clear evidence of livestock grazing.
Plantation	Monoculture of woody species cultivated for timber production.

Most habitat types in the AOI are categorised as modified with only approximately 28% of the AOI classed as natural. Five main habitats are within the AOI that support different types of vegetation, namely:

- Guineo–Congolian semi-evergreen forest
- riverine and swamp forests
- swamp dominated by *Cyperus papyrus*
- secondary Acacia species woodland, bushland and wooded grassland
- cultivated land and plantations.

A description of each of the habitat types within the AOI and in the RoW and their alignment with the physiognomic habitat classes illustrated by the habitat map (Attachment A1.1 of Appendix A1) is presented in Attachment A1.3 of Appendix A1.

Identification of Habitats of Conservation Importance

The conservation value of each habitat was measured using the Genetic Heat Index (GHI) tool which is an integral component of the Rapid Botanical Survey (RBS) methodology (Hawthorne 1996, Hawthorne and Marshall 2016). The GHI tool estimates the botanical importance of the vegetation or plant communities based on a ranking of species rarity using star rating criteria (see Appendix A1) and identifies the concentration of globally rare species in a habitat. GHI scores are high where the habitat supports a high proportion of globally rare species; this is termed a hotspot (Marshall and Hawthorn 2016).

GHIs calculated for habitats across the whole of Africa range from 0 to 2,700 (Marshall and Hawthorn 2016). Botanical specialists from the University of Oxford have confirmed that habitats in the AOI with a GHI between 150 and 249 are considered of moderate conservation importance, while those with a GHI >250 are considered to be of global conservation importance.

Identification of Species of Conservation Importance

In the context of this baseline assessment, the vascular plants of conservation importance are defined as nationally rare species, globally rare species, and endemic and or restricted range species. The presence of these plants in the AOI was identified based on the following criteria:

- IUCN Red List of Threatened Species (2017). The field data were screened against IUCN's defined categories to assess the global rarity of species in the study and their sensitivity to change (see Table A1.2-4 of Appendix A1). In the context of this baseline assessment, only species in the AOI that are listed as IUCN vulnerable, endangered or critically endangered are of conservation importance. It is important to acknowledge that most vascular plant species in the AOI are categorised as IUCN not evaluated
- Species listed on the Uganda Red List prepared by Wildlife Conservation Society (WCS) in 2016 and which was upheld by the lead agencies of the Government of Uganda, conferring official recognition of the lists. Species are classified into Red List categories but based on information at the national level.
- The RBS star rating. The field data were screened against the RBS star rating criteria to determine the presence of endemic and or restricted-range species in

the AOI (see Table A1.2-5 of Appendix A1). This rating ranges from Black Star species (the rarest species on a global scale and of high conservation importance) to Green Star species (species that are common, widespread and of no obvious conservation concern). The global range of each species is expressed as degree squares occupied (1 degree square is approximately 100 × 100 km). All plant species in the study AOI were assigned a star rating (Hawthorne and Marshall 2016). The RBS star rating is described in more detail in the RBS manual (Hawthorne and Marshall 2016), which is presented in Attachment A1.2 of Appendix A1. The RBS star rating does not rely on Red Listing and takes into consideration records of a species' distribution and abundance. The star rating for each species is derived from a database of global plant rarity. This database was compiled from the same data sources used by IUCN when making evaluations on the statuses of vascular plant species (i.e., herbarium records, monographs global and the Genebank Information System). However, in comparative terms, the RBS database is comprehensive with up to date information that accounts for historic and recent taxonomic changes.

Baseline Condition of Botany

Habitats of Conservation Importance

Overview

A description of each of the habitat types within the AOI including their GHI scores and their alignment with the physiognomic habitat classes illustrated by the habitat map (Attachment A1.1 of Appendix A1) are presented in Attachment A1.3 of Appendix A1.

Anthropogenic activities have severely impacted natural habitats in Uganda. Habitats are highly fragmented with low land cover (National Environment Management Authority 2016; Winterbottom and Eilu 2016). Given the status of natural habitats in Uganda, the Guineo–Congolian semi-evergreen forest, and riverine and swamp forest are considered to be of conservation importance in the context of the AOI and broader region. Appendix A1 presents habitats of conservation importance with respect to the project AOI only; all other habitat types, including those not of conservation importance in the AOI are presented in Attachments A1.3 of Appendix A1.

Guineo–Congolian Semi-evergreen Forest

The estimated coverage of Guineo–Congolian semi-evergreen forest in the AOI based on remote sensing is illustrated in Figure A1.3-1 of Appendix A1 and the habitat map (Attachment A1.1 of Appendix A1). Within the broader region, approximately 68% of this habitat type is within the Wambabya FR. Only 34 ha of Guineo–Congolian semi-evergreen forest are outside this protected area, as illustrated by the habitat map. Guineo–Congolian semi-evergreen forest is a highly threatened and unique ecosystem (as defined in IFC 2012).

The RBS characterised the floristic composition of Guineo–Congolian semi-evergreen forest within the Wambabya FR at KP6.7 (approximately 667 m from the RoW centre line). This is the largest remnant stand of forest in the AOI and

represents one of a few forest stands in the region. Hence, Guineo–Congolian semi-evergreen forest is of conservation importance in the context of the AOI.

In Uganda, Guineo–Congolian semi-evergreen forest is restricted to the periphery of Lakes Victoria, Albert and Edward (Kindt et al. 2011; see Figure 6.4-5). This forest type is typically floristically diverse with an estimated 78 species. The understorey is characteristically evergreen and the forest canopy has a short patchy deciduous phase (White 1983).

The survey confirmed the presence of four species of vascular plants at KP6.7 that are listed as nationally rare on the Ugandan Red List (2016), namely:

- Chrysophyllum perpulchrum – vulnerable
- Chrysophyllum albidum – vulnerable
- Citropsis articulata – vulnerable
- Leplaea cedrata – endangered.

The evergreen tree *Leplaea cedrata* is also listed as vulnerable by the IUCN Red List (IUCN 2017).

Figure 6.4-5 Estimated Extent of Guineo–Congolian Semi-Evergreen Forest in the Area of Influence and the Broader Region

Riverine and Swamp Forest

Small and highly fragmented stands of riverine and swamp forests (types of wetland forests) are scattered along the extent of the AOI. These forest stands are restricted to the margins of watercourses and springs and are predominantly surrounded by cultivated land and plantations, and collectively comprise 289 ha in the AOI and approximately 5 ha in the RoW. The extent of riverine and swamp forests within the AOI are illustrated in Figure A1.3-3 of Appendix A1 and by the habitat map (Appendix A1.1 of Appendix A1). Wetland forest (i.e., riverine and swamp forest) is a highly threatened and unique ecosystem (as defined in IFC 2012). While riparian and swamp forests are of low bioquality, they represent one of the few natural habitats (IFC 2012 criteria) found within the broader region (see Figure 6.4-6).

The endemic/restricted range (Black Star) species *Leptonychia mildbraedii,* was recorded in an area of riverine forest of low bioquality (GHI 71) at KP12.3, approximately 967 m from the pipe centre line. The perennial woody climber *Mondia whitei*, was recorded within a swamp forest of low bioquality (GHI 46) in the

RoW at KP106. This species is listed as vulnerable by the National Red List for Uganda (WCS 2016).

Figure 6.4-6 Estimated Extent of Riverine and Swamp Forest

Species of Conservation Importance

In total, 482 species of vascular plants were identified within the AOI during the field surveys. Of these, only 38 species have been assessed by the IUCN Red List of Threatened Species (IUCN 2017, Version 2017-3) and assigned a threat category. Within this survey sample, one tree*, Leplaea cedrata*, is listed as vulnerable. The remainder are categorised as IUCN least concern, and as such are not globally rare or of conservation importance.

The following six plant species recorded during the baseline surveys are listed on the National Red List for Uganda (WCS 2016):

- *Nymphaea nouchali* – critically endangered (further studies would be required to verify presence of this species in the RoW)
- *Leplaea cedrata* – endangered

- Chrysophyllum perpulchrum – vulnerable
- Chrysophyllum albidum – vulnerable
- Citropsis articulate – vulnerable
- *Mondia whitei* – vulnerable.

Leptonychia mildbraedii, a restricted-range or endemic (Black Star) species, was identified in a sample plot in the broader region at KP12.3 (outside of the AOI); further studies would be required to verify the presence of this species in the RoW. *Leptonychia mildbraedii* is of high conservation importance as it has a highly limited distribution.

Rytigynia beniensis, a restricted-range or endemic (Black Star) species, is thought to have been identified in a sample plot in the AOI at KP201.1. Because the identification of the genus *Rytigynia* is particularly complex, correct identification of these species is not guaranteed. Further surveys would be necessary to verify the presence of this species in the RoW.

The botanical survey also confirmed the presence of two Gold Star species of vascular plants, namely *Blepharispermum pubescens* (KP33, 43, 46, 50, 51, 53, 55, 57 and 110) and *Leucas calostachys* (KP39, 51 and KP57). These species are considered by national botanical specialists to be of conservation importance.

Protected Areas

The FRs traversed by, or immediately adjacent to the project AOI,and are described and mapped in Section 6.4.1.1. FRs addressed in this section are identified as protected areas supporting areas of high habitat quality in Uganda and / or vascular plants of conservation importance. Other protected areas that do not meet these criteria (i.e., the Taala FR) are described in Section 6.4.1.1.

The Kasana–Kasambya and Wambabya FRs are of botanical or floristic value. Note that the Bugoma CFR is outside of the AOI.

At KP123, the project AOI is approximately 100 m from the eastern border of Kasana–Kasambya FR. The project AOI is parallel to, and about 450 m from the FR near KP113. Both these sections of reserve closest to the project AOI are exclusively commercially managed pine tree plantations. Field studies indicated that eucalyptus plantations and maize fields are also widely present in the reserve further to the west. While this reserve does not support habitats of conservation importance, the Gold Star evergreen scrambling shrub *Blepharispermum pubescens* was identified on the boundary of the reserve during the botanical survey. This particular area had a low bioquality (GHI 57) and comprised swampy grassland with occasional woody species.

Between KP5 and KP9, the project is within 100 m of the Wambabya FR. This is the largest remnant stand of Guineo–Congolian semi-evergreen forest in the AOI and is of botanical importance as this reserve represents one of a few remnant stands of Guineo–Congolian semi-evergreen forest in the region. This is likely to be attributed to the site's protected area status.

The baseline survey also confirmed the presence of four species of vascular plants within the reserve that are listed on the Ugandan Red List, namely:

- *Chrysophyllum perpulchrum* – vulnerable
- *Chrysophyllum albidum* – vulnerable
- *Citropsis articulata* – vulnerable
- *Leplaea cedrata* – endangered.

The evergreen tree *Leplaea cedrata* is also listed as vulnerable by the IUCN Red List of Threatened Species (IUCN 2017).

Trend in Condition and Sensitivity to Change

Habitats of Conservation Importance

Guineo-Congolian Semi-evergreen Forest

Forest habitats, including Guineo-Congolian semi-evergreen forest, are under major threat in Uganda with rapid losses occurring within, and outside, protected areas. Between 1990 and 2015, Uganda's forest cover was reduced from 4.9 to 1.8 million ha. An average of 86,400 ha (2.1%) of forest cover per year was cleared between 2000 and 2015 (Ministry of Water and Environment 2016).

The primary causes of forest degradation and deforestation are land conversion for agro-pastoral activities and urbanisation; unsustainable exploitation of timber for fuel (firewood and charcoal); illegal and unregulated trade in forest products and unsecure forest tenure rights (Ministry of Water and Environment 2016).

In addition to the increased pressure on forest resources for natural resource collection, remnant forest fragments are vulnerable to edge effects that can have serious impacts on species diversity, composition, community dynamics and ecosystem functioning (Laurance et al. 2010). As such, Guineo–Congolian semi-evergreen forest is considered to have high sensitivity to change.

However, an estimated land area of 8,079,622 ha in Uganda has been identified as suitable forest restoration sites (Ministry of Water and Environment 2016). This indicates that Guineo-Congolian may be effectively restored and recover following clearance.

Riverine and Swamp Forest

The botanical survey indicates that riverine and swamp forests are degraded. Existing threats to the habitat quality and integrity of these forests include over-exploitation of timber resources and habitat clearance for the development of plantations and agro-pastoral activities. This trend is likely to continue in the absence of intervention.

Generally, wetland forests are unlikely to naturally regenerate if upstream seed stock is depleted and edaphic and hydrological dynamics are disrupted by extensive clearance. Consequently, wetland forest, such as riparian and swamp forests, are unlikely to be resilient to substantial disturbance over large areas and as such have a high sensitivity to change.

Species of Conservation Importance

The global population of *Leplaea cedrata* (IUCN vulnerable) is at risk of extinction. This species has undergone a substantial decline in distribution and abundance

from unsustainable harvesting for timber. As *Leplaea cedrata* is IUCN vulnerable and Ugandan Red Listed endangered, it has a high sensitivity to change.

As *Nymphaea nouchali* is listed as critically endangered on the Ugandan Red List (WCS 2016), it has a high sensitivity to change. Vascular plants listed on the Ugandan Red List as vulnerable, *Chrysophyllum perpulchrum*, *Chrysophyllum albidum, Mondia whitei* and *Citropsis articulate*, have a moderate sensitivity to change.

Restricted-range or endemic (Black Star) species (i.e., *Leptonychia mildbraedii* and *Rytigynia beniensis*) have a highly localised distribution, and niche physical or environmental requirements. These species are particularly vulnerable to the impacts of habitat loss, degradation and fragmentation. Restricted-range or endemic (Black Star) species have a high sensitivity to change.

The Gold Star species of vascular plants (i.e., *Blepharispermum pubescens* and *Leucas calostachys*) are relatively more common and widespread that Black Star species and as such have a low sensitivity to change.

Forest Reserves and Other Protected Areas

The Kasana–Kasambya FR is a commercial plantation and there is no anticipated change in condition.

The Wambabya FR is predominantly surrounded by agro-pastoral land and settlements and is threatened by selective logging. The Ugandan Wildlife Authority intends to initiate a revegetation programme in degraded parts of Wambabya FR. Should these programmes proceed and be successful, it is anticipated that the condition of the Wambabya FR would improve. See Section 6.4.1.1 for the trends and sensitivity of protected areas.

Ecosystem Services Provided

The habitats described in the preceding sections, with the species they comprise, generate the range of ecosystem services set out below. Further information on the general nature and extent of the provisioning ecosystem services listed can be found in the Land-based Livelihoods, Section 6.4.3.8 and in Appendix A11, Socio-economic and Health Baseline Report.

Provisioning services include:

- wood and wood fuel, including collection for charcoal manufacture. In some areas these activities are legal, in others they are not.
- food (gathering and foraging). In some areas these activities are legal, in others they are not.
- collection of medicinal products.

Regulating services include:

- climate change amelioration through carbon sequestration
- local climate regulation - in terms of providing a cooler micro-climate local water and air pollution control – through waste assimilation, water and air filtration
- water regulation, erosion control and water catchment protection –maintaining higher flows in rivers and for longer duration, reducing flood surges and

reducing sedimentation of receiving waters through the stabilisation of riverbanks and steep slopes by vegetation including riparian, emergent habitats

- erosion control of terrestrial habitats (i.e., wind erosion) – controlling ambient fugitive dust emissions though the stabilisation of soil by terrestrial habitats and maintaining edaphic conditions including soil moisture levels
- regulation of ambient noise levels – habitats and vegetation acting as a natural sound barrier buffering noise emissions including those arising from anthropogenic sources (i.e., vehicle movement, people and machinery).

Cultural services include:

- ethical and biodiversity 'non-use' values – in particular, maintaining populations of endangered and endemic species. These values are difficult to ascertain.
- sense of place or way of life – these locations are likely to provide value to local people who use these areas as part of their way of life and who have a special connection with them
- eco-tourism, particularly in protected areas
- aspects of these locations may provide spiritual, sacred or religious values, inspiration for culture and design, and cognitive development.

Habitat and species support include:

- providing refuge, feeding, watering, breeding and nursery areas for a host of animals that spend only part of their life in such areas.

Other supporting services include:

- provision of a range of supporting services such as photosynthesis and water, carbon and nutrient cycling, whose values are typically accounted for in other ecosystem services.

Sensitivity Rankings

From the survey results, the trend in condition and sensitivity to change, the sensitivity of the VECs has been ranked and is shown in Table 6.4-3.

Table 6.4-3 Habitat and Flora Sensitivity Ranking

Ecology VEC	Sensitivity Ranking	Rationale for Ranking
Guineo-Congolian Semi-Evergreen Forest		
Habitat of conservation importance	Very High (5)	Guineo–Congolian semi-evergreen forest is a highly threatened and unique ecosystem and is natural habitat (as defined by IFC Performance Standard 6 and the accompanying Guidance Note).
Flora species of conservation importance	High (4)	Supports *Leplaea cedrata*, an IUCN vulnerable and Ugandan Red List (WCS 2016) endangered species Also supports Ugandan Red List (WCS 2016) vulnerable species: • *Chrysophyllum perpulchrum* • *Chrysophyllum albidum*

Table 6.4-3 Habitat and Flora Sensitivity Ranking

Ecology VEC	Sensitivity Ranking	Rationale for Ranking
		• *Citropsis articulata*
Swamp and riparian forest		
Habitat of conservation importance	Very High (5)	Swamp and riparian forest is a highly threatened and unique ecosystem and is natural habitat (as defined by IFC Performance Standard 6 and the accompanying Guidance Note).
Flora species of conservation importance	High (4)	Supports *Leptonychia mildbraedii*, a range-restricted or endemic (Black Star) species Also supports *Mondia whitei*, a Ugandan Red List vulnerable species
Kasana–Kasambya FR		
Legally protected area	Moderate (3)	Designated as an FR and retains some biodiversity value
Flora species of conservation importance	Low (2)	Gold Star species recorded on reserve border: *Blepharispermum pubescens*
Wambabya FR		
Legally protected area	High (4)	Legally protected site designated as a nature forest reserve
Habitat of conservation importance	Very High (5)	Supports Guineo-Congolian semi-evergreen forest which is a highly threatened and unique ecosystem
Flora species of conservation importance	High (4)	Supports *Leplaea cedrata*, an IUCN vulnerable and Ugandan Red List (WCS 2016) endangered species Also supports Ugandan Red List (WCS 2016) vulnerable species: • *Chrysophyllum perpulchrum* • *Chrysophyllum albidum* • *Citropsis articulata*

Key Considerations

Habitats

Based on the outcomes of the botanical assessment, the following habitats with high bioquality are considered sensitive VECs:

- Guineo–Congolian semi-evergreen forest
- swamp and riparian forest.

Flora

The botanical survey confirmed the presence in the AOI of seven species of vascular plants of conservation importance. Of these, further studies would be

required to verify the presence or absence of *Rytigynia beniensis*, *Nymphaea nouchali* and *Leptonychia mildbraedii* in the RoW. Table 6.4-4 summarises species of conservation importance.

Protected Areas

Based on the baseline assessment, and particularly the known or likely presence of species and habitats of conservation importance, the following protected areas and corridors are identified as sensitive VECs:

- the Wambabya FR
- the Kasana–Kasambya FR.

Table 6.4-4 Key Flora Considerations

Species	Location(s)	Conservation Status	Considerations
Nymphaea nouchali	Secondary *Acacia* sp. woodland, bushland and wooded grassland Over 1 km from the RoW	Uganda Red Listed critically endangered	The IUCN listed vulnerable vascular plant *Leplaea cedrata* is at risk of extinction. Generally, this species has undergone major declines in distribution and abundance from unsustainable harvesting. Restricted-range or endemic (Black Star) species have a highly localised distribution, and niche physical or environmental requirements. These species are particularly vulnerable to the impacts of habitat loss, degradation and fragmentation. Most globally rare and restricted-range or endemic species and Gold Star species in the AOI were recorded in Guineo–Congolian semi-evergreen forest, and swamp and riparian forest habitat types. While these habitats are of low bioquality, they are highly threatened and unique ecosystems. The impact assessment should consider conserving these key habitat types.
Leplaea cedrata	Guineo–Congolian semi-evergreen forest	IUCN vulnerable, Uganda Red Listed endangered	
Chrysophyllum perpulchrum	Guineo–Congolian semi-evergreen forest	Uganda Red Listed vulnerable	
Chrysophyllum albidum	Guineo–Congolian semi-evergreen forest	Uganda Red Listed vulnerable	
Citropsis articulata	Guineo–Congolian semi-evergreen forest	Uganda Red Listed vulnerable	
Mondia whitei	Swamp forest Wetland	Uganda Red Listed vulnerable	
Leptonychia mildbraedii	Swamp and riparian forest Bugoma-Wambabya Corridor	Endemic or restricted range (Black Star)	
Rytigynia beniensis	Swamp and riparian forest	Endemic or restricted range (Black Star)	
Blepharispermum pubescens	Secondary *Acacia* sp. woodland, bushland and	RBS Gold Star	

Table 6.4-4 Key Flora Considerations

Species	Location(s)	Conservation Status	Considerations
	wooded grassland, swamp		
Leucas calostachys	Secondary *Acacia* sp. woodland, bushland and wooded grassland, swamp	RBS Gold Star	

6.4.1.3 Aquatic Biodiversity

This section describes the:

- aquatic biodiversity AOI
- baseline condition of aquatic biodiversity in terms of:
  - aquatic habitats
  - aquatic fauna species (fish and macroinvertebrates)
  - trends affecting the condition of aquatic habitats and fauna species of conservation importance and sensitivity to change
  - ecosystem services provided
  - aquatic biodiversity sensitivity rankings
- key considerations.

For more information, the aquatic biodiversity baseline report is included in Appendix A2.

Area of Influence

The spatial AOI for aquatic biodiversity encompasses 250 m upstream and 750 m downstream of the proposed pipeline crossings of the following rivers:

- Kafu River and tributaries
- Nabakazi River (two crossings)
- Katonga River
- Kibale River.

The 1 km length of AOI was chosen to encompass the immediate area surrounding the potential crossing location that could perceivably be impacted by construction activities. Sediments are unlikely to mobilise beyond these distances based on the rivers' typical flow conditions.

Impacts on these rivers occur only during the construction phase. The temporal AOI will be the duration of pipeline crossing construction plus the time required for the river to recover to pre-construction condition.

Baseline Condition of Aquatic Biodiversity

Aquatic Habitats of Conservation Importance

Kafu River

The Kafu River survey site is close to KP37 of the pipeline AOI. The habitat predominantly comprises a large wetland covered almost entirely by papyrus with no obvious main river channel. There were some small channels and areas of open water between papyrus stands, and local inhabitants advised that these had been created by local fishermen. Although there was no obvious main river channel, there was notable flow out of a perched culvert that was underneath the road. The road and associated culvert represent an obstacle to the movement of fish at this location.

There were also small areas of open water interspersed with wetland plants other than papyrus. These areas were predominantly found along the margins of the road. These areas may provide refuge and foraging areas for some species and life stages of fish as well as various macroinvertebrates. They may also provide hunting opportunities for fish-eating birds and other fauna.

Except for the road passing through the centre of the papyrus wetland and the small channels cut through the wetland by fishermen, the observed habitat appeared to be in an undisturbed state. Although there was clear flow through the wetland, the river channel was indistinct from the rest of the papyrus wetland.

Nabakazi River

The Nabakazi River is crossed by the AOI at two locations, KP114 and KP148.

Water depths at crossing 1 (KP114) within the accessible areas of the main channel at the survey site were in excess of 2 m. The channel substrate was comprised predominantly of clay overlain with sand in patches and some accumulations of organic debris towards the edges of the small area of open water. Ditches of approximately 1 m width and 1.5 m depth have been dug along the sides of the access road providing potential habitat for fish and access for local fishermen.

At crossing 2 (KP148) an old railway line splits a narrow strip of wetland from the main papyrus wetlands, which is well supplied with water through culverts to the south of the Nabakazi River. The strips of wetlands have a diverse flora dominated by sedges or *Typha sp*. Papyrus mats are by far the dominant vegetation cover comprising the bulk of the main wetland. Among the papyrus were several sedge dominated vegetation mats fringed by *Vossia* species. Anthropogenic impacts were also observed, mostly trampling and erosion of the banks at watering points for the large herds of cattle.

Katonga River

Water depths of up to 2.6 m were recorded in the Katonga River, but access was blocked to most of the channel by floating vegetation mats. The banks of the channel consist of *Vassia* sp*,* papyrus and dwarf sedges. Ditches have been dug either side of the road, approximately 2 m wide and 1.5 m deep. While offering potentially good habitat for fish, they were in places packed with thorny branches

and rocks from road construction making surveying difficult. Evidence of hippopotamus was recorded close to the survey site.

Kibale River

The land adjacent to the Kibale River channel on the left[3] bank comprised steeply sloping farmland with banana and plantain plantations, with level ground by the river that appeared to have been cleared less than 6 months previously. Remnants of the cleared papyrus beds could still be found in a thin strip a few metres wide along much of the left bank. The land on the right bank appeared to be undisturbed.

The river channel mostly comprised glide-flow types and a silt substrate, with densely vegetated marginal and riparian zones. Several sections of the river had shallow, marginal slack water areas with aquatic vegetation. Such habitat provides important spawning and refuge areas for juvenile and small fish and macroinvertebrate species. Predatory fish species may also use the vegetation for camouflage to ambush prey.

Flow and substrate diversity throughout the channel was poor but the river channel showed no obvious signs of disturbance. Turbidity levels were high.

Overall, the river habitat at this location is considered to be in a near to natural state. A reasonably good range of different fish and macroinvertebrate species were caught here, indicating that the river and its associated fauna are in good condition.

Ephemeral Rivers

The AOI crosses 10 ephemeral watercourses in Uganda. Local experts advised that these would not be flowing at the time of the surveys in June 2017 and they were therefore not surveyed. It is possible that small isolated pools may have remained with aquatic life seeking refuge in such pools. However, locating these pools would have required a substantial survey effort. Furthermore, such pools are likely to be heavily impacted by people, wildlife and livestock.

Aquatic Fauna Species of Conservation Importance

Overview

The Fishbase (2018) and IUCN (2018) websites identified 72 fish species occurring in Ugandan freshwater habitats that were listed by the IUCN as vulnerable, endangered or critically endangered. Many of these species were also considered endemic or at least range-restricted (i.e., only found in the Lake Victoria or Victoria Nile basins). Many of these species could be present in the AOI but were not recorded during field surveys.

Freshwater macroinvertebrates have been poorly studied in the AOI. Notwithstanding this, 44 threatened dragonfly species are listed in the Uganda Red List (WCS 2016). Of these 44 species, only *Pseudagrion bicoerulans* is listed as vulnerable on the IUCN Red List and this species has only been recorded from montane streams greater than 2000 m above sea level and is therefore not

[3] It is standard practice for aquatic surveys to describe the river banks as being either the left or right of the channel, as observed when facing downstream

expected in the AOI. All other species listed as threatened at a national level are listed globally as not evaluated, data deficient, least concern or near threatened.

Secondary literature indicates that the actual number of fish and macroinvertebrate species within the AOI for the aquatic habitats studied is likely to be larger than the sampling results of the surveys. Field survey data only provide a snapshot in time, so are unlikely to represent the full diversity of species at a site. Therefore, baseline assessments include secondary data as well as data gathered during field surveys.

Kafu River

Three species of fish were caught during the Kafu River fish surveys:

- *Barbus kerstenii* comprised most of the catch at this location. This species undertakes freshwater migrations to breed (IUCN 2018).
- *Astatotilapia* sp.
- *Clarias liocephalus*.

It is likely that other species occur at this site. Local inhabitants informed the survey team that the following species were also encountered regularly at this location:

- *Protopterus aethiopicus*
- *Schilbe intermedius*
- *Labeo* sp.
- small mormyrid spp.

Three types of macroinvertebrate were recorded for the Kafu River. Chironomids (midges or lake flies) dominated the samples with a relative abundance of 98%.

Secondary literature indicates that papyrus wetlands and swamps are known to act as nursery areas for several fish species (Mnaya and Wolanski 2002) and to have abundant macroinvertebrate communities. The actual number of fish and macroinvertebrate species can therefore be assumed to be much larger than the sampling results indicate.

Nabakazi River – Crossing 1

Six fish species were caught during the Nabakazi River crossing fish surveys. *Barbus neumayeri* comprised most of the catch with 11 individuals caught. *Clarius liocephalus, Clarius gariepinus, Protopterus aethiopicus* and unknown species of *Astatotilapia and Aplocheilichts* were also caught. All species are classed by the IUCN as least concern.

It is likely that other species will occur at this site that were not caught during the surveys. The district state of environment report for Mubende (NEMA, 2004) suggest the following species also inhabit the river system:

- *Oreochromis niloticus* – IUCN not assessed
- *Oreochromis zilli* – IUCN not assessed
- *Oreochromis leucostictus* – IUCN least concern
- *Clarias* sp.

Eighteen species of macroinvertebrates were recorded during the June 2018 surveys. Of these, *Biomphalaria sudanica* was the most frequently recorded aside from a relative abundance of Oligochaetes.

The macro-invertebrate taxon recorded here was varied indicating a relatively undisturbed habitat that is free from serious degradation. The survey results show that overall the species diversity is relatively high with no significant dominance of any particular species or taxonomic group.

One species of conservation importance was recorded, *Gabbiella humerosa* spp *alberti* – IUCN endangered. This species has a disjunct distribution in the Great Lakes of central Africa but is sub-divided into six subspecies according to which lake they are found (Van Damme and Lange 2017). The Lake Albert subspecies *Gabiella humerosa* ssp*. Alberti* is classed as endangered by the IUCN on the basis of being an endemic species to Lake Albert and being found in only five known locations (Kyambadde 2010).

Nabakazi River – Crossing 2

Five species of fish were recorded at this river crossing. *Ctenopoma muriei* (IUCN least concern) was the most common. The further four species caught at this survey site were as follows:

- *Clarias liocephalus*
- *Aplocheilichyts* sp. – unknown species
- *Clarias gariepinus*
- *Protopterus aethiopicus*.

It is likely that other species occur at this site that were not caught during surveys. The district state of environment report for Mubende (NEMA, 2004) suggest the following species also inhabit the river system:

- *Oreochromis niloticus*
- *Oreochromis zilli*
- *Oreochromis leucostictus*
- *Clarias* sp.

All species are classed as by the IUCN as least concern.

Fourteen species of macroinvertebrates were recorded during the June 2018 surveys. Of these, *Biomphalaria sudanica* was the most frequently recorded, with an unknown species of the genus *Derallus* the second most frequent.

Katonga River

Only four species of fish were recorded in the Katonga river during the field surveys. These were:

- *Clarias liocephalus*
- *Clarias gariepinus*
- *Protopterus aethiopicus*
- *Ctenopoma muriei*.

All species found during the surveys are listed by the IUCN as least concern.

However, the species *Haplochromis katonga* (IUCN data deficient) is only known from the type locality in the Katonga River (FishBase team RMCA & Geelhand 2016). While little is known about this species, it is assumed to not be very common.

Three species of macroinvertebrate were recorded during the surveys. These could not be identified at species level but were of the genera *Chironomidae*, *Naucoris* and *Appasus*. None of these species are of conservation importance.

Kibale River

Seven fish species were caught in the Kibale River:

- fish from the genus *Astatotilapia* comprised most of the fish catches
- fish from the genus *Barbus* were encountered most frequently after *Astatotilapia*
- *Clarias liocephalus*, *Aplocheilichtys* sp. and *Astatoreochromis* sp. were only recorded in small numbers or as single specimens.

Local inhabitants informed the surveyors that the following species were caught regularly from this section of the Kibale River:

- *Protopterus aethiopicus*
- *Schilbe intermedius*
- *Labeo* spp.
- small mormyrid species.

Nine types of macroinvertebrate were recorded for the Kibale River. Protoneuridae species (a type of damselfly) were the most abundant macroinvertebrates. However, the survey results show that overall the species diversity was relatively high with no major dominance of any particular species or taxonomic group.

Trend in Condition and Sensitivity to Change

Papyrus wetlands are under increasing anthropogenic pressure with large areas cleared for agriculture or the harvesting of papyrus. Clearing of wetland vegetation and the creation of open water can increase evaporation rates leading to a shrinking of the wetland area. Papyrus will readily regenerate if left undisturbed after the initial encroachment. However, land use pressures in the region are likely to restrict opportunities for permanent regeneration. Increasing pressure on this system will affect the flora and fauna.

Rivers are also very sensitive to change, with their associated flora and fauna most sensitive to factors such as water quality, suspended sediment and changes in flow conditions. Changes to land adjacent to the river or the river channel are likely to result, as a minimum, in localised impacts on associated flora and fauna.

Table 6.4-5 provides site-specific trends in condition and sensitivity to change.

Table 6.4-5 Site-Specific Trends in Condition and Sensitivity to Change

Site	Trend in Condition	Sensitivity to Change
Kafu River	Comparatively undisturbed natural habitat, though there is evidence of some clearing of riparian habitats for agriculture and harvesting of papyrus. This trend is likely to continue owing to ongoing land use pressures.	High
Nabakazi River	Comparatively undisturbed natural habitat, though there is evidence of some clearing around the wetland edges for agriculture and harvesting of papyrus. This trend is likely to continue owing to ongoing land use pressures.	High
Katonga River	Comparatively undisturbed natural habitat with some evidence of clearing for agriculture. This trend is likely to continue owing to ongoing land use pressures.	High
Kibale River	In good condition, but there had been vegetation clearing for agriculture on one bank within the 6 months of the June 2017 survey. This trend is likely to continue due to ongoing land use pressures.	High

Ecosystem Services Provided

The Kafu, Nabakazi, Katonga and Kibale Rivers and associated papyrus wetlands provide the following ecosystem services:

Provisioning services include:

- fisheries and a source of other wild food. These provisioning ecosystem services are covered in freshwater livelihoods section of Appendix A11 Socio-economic and Health Baseline Report.

Regulating services include:

- water regulation, whereby the river helps to retain and control the flow of water in times of heavy rainfall and during the wet season. The vegetation and shape of the river are important factors in this role.

Habitat and species support services include:

- habitat and species support services, whereby the river supports various fauna that either use the water for drinking or cooling in the heat, or as a food source (e.g., birds eating the insects that frequent the river). It also provides important connectivity between habitats, particularly during the wet season.

Sensitivity Rankings

Based on the survey, the trend in condition and sensitivity to change, the sensitivity of the VECs has been ranked and is shown in Table 6.4-6.

Table 6.4-6 Aquatic Biodiversity VECs and Sensitivity Ranking

Aquatic Ecological VEC	Sensitivity Ranking	Rationale for Ranking
Kafu River		
Legally protected, internationally or nationally recognised areas	High (4)	The Ugandan National Policy for the Conservation and Management of Wetlands protects the Kafu River wetlands as a biodiversity area and a resource for local communities.
Flora and fauna species of conservation importance	Very High (4)	Endemic, range-restricted and migratory (potamodromous) species are known, or considered likely, to be present.
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	The Kafu River and associated wetlands are considered to be a natural habitat[1]. Apart from a road crossing, there were no obvious signs of anthropogenic habitat modifications. The Kafu River provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes.
Nabakazi River		
Legally protected, internationally or nationally recognised areas	High (4)	The Ugandan National Policy for the Conservation and Management of Wetlands protects the Nabakazi River wetlands as a biodiversity area and a resource for local communities.
Flora and fauna species of conservation importance	High (4)	Endemic, range-restricted and migratory (potamodromous) species are known or considered likely to be present.
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	Secondary sources and information from in-country aquatic ecologists indicate that the river and associated wetlands can be classified as natural habitat[1]. The river and associated wetlands are likely to be important breeding and feeding grounds for aquatic fauna. The Nabakazi River provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes.

Table 6.4-6 Aquatic Biodiversity VECs and Sensitivity Ranking

Aquatic Ecological VEC	Sensitivity Ranking	Rationale for Ranking
Katonga River		
Legally protected, internationally or nationally recognised areas	Very High (5)	The Katonga River and associated wetlands and tributaries are connected with or flow through numerous nationally protected sites. The river also connects with Lake George to the west, which is a Ramsar wetland and fKBA.
Flora and fauna species of conservation importance	High (4)	Endemic, range-restricted species and migratory (potamodromous) species are known to be present.
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	Although the river could not be accessed during surveys, reports from in-country surveyors suggest that the river and associated wetlands can be classed as natural habitat[1]. The river and wetlands are also likely to be important breeding and feeding grounds for a range of fauna. The Katonga River provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes.
Kibale River		
Legally protected, internationally or nationally recognised areas	High (4)	The Kibale River and associated wetlands and watercourses are connected with, or flow through numerous nationally protected sites. The river also connects with the Nabajjuzi wetland to the east, which is a Ramsar site.
Flora and fauna species of conservation importance	High (4)	Endemic, range-restricted and migratory (potamodromous) species are known to be present.
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	There are no obvious signs of anthropogenic disturbance or modification apart from the road crossing, so the site can be classed as natural habitat[1]. The Kibale River provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes.

NOTES: [1] As defined by IFC Performance Standard 6 and the accompanying Guidance Note.

Key Considerations

Based on the outcomes of the aquatic biodiversity study, and particularly the known or likely presence of fish species of conservation importance, the following rivers are identified as sensitive VECs:

- Kafu River
- Nabakazi River
- Katonga River
- Kibale River.

The presence of large intact mats of aquatic or wetland vegetation, in addition to several macroinvertebrate species from the order Ephemeroptera, indicates that these rivers are largely undisturbed.

None of the fish species sampled during the surveys is considered critically endangered, endangered or vulnerable (IUCN Red List), although secondary data indicate that fish, crustacean and macroinvertebrate species of conservation importance are likely to be present in the AOI.

Two of the fish species sampled (*Barbus kerstenii* and *Schilbe intermedius*) undertake in-river migrations. Secondary data also indicate the likely presence of endemic and range-restricted species in the AOI.

6.4.1.4 Avifauna Biodiversity

This section describes the:

- avifauna biodiversity AOI
- baseline condition of avifauna biodiversity in terms of:
  - habitats of importance for avifauna
  - avifauna species of conservation importance
  - trends affecting the condition of avifauna habitats and species of conservation importance and sensitivity to change
  - ecosystem services provided
  - avifauna biodiversity sensitivity rankings
- key considerations.

For more information, the avifauna biodiversity baseline report is included in Appendix A3.

Area of Influence

The AOI for the avifauna study is a 2-km corridor centred on the pipeline RoW as this encompasses the area that has the potential for impacts during construction and operation. This is extended at certain locations where possible pathways exist to sites designated specifically for avifauna (e.g., a watercourse crossing upstream of an IBA).

The temporal AOI for avifauna habitats of conservation importance is defined as the duration of the project construction phase extended by the time required for the

relevant habitat to recover to its pre-project potential (i.e., the habitat is able to support the species' diversity and abundance, and ecological processes of the habitat in its pre-project condition). The temporal AOI for avifauna species of conservation importance is the duration of operation of the AGIs where these have the potential to cause noise or visual disturbance.

Baseline Condition of Avifauna Biodiversity

Avifauna Habitats of Conservation Importance

Wambabya Forest Reserve

Within the Wambabya FR there are a few remaining old trees in the riverine forest alongside the Wambabya River, but generally the avifauna habitat within the reserve is degraded. The 76 species recorded during the field surveys included forest-specialist species such as:

- spotted greenbul, *Ixonotus guttatus* (IUCN least concern)
- toro olive greenbul, *Phyllastrephus hypochloris* (IUCN least concern, Uganda near threatened)
- grey parrot, *Psittacus erithacus* (IUCN endangered, Uganda vulnerable).

Papyrus Swamp

Extensive swamps, largely dominated by papyrus are found throughout the AOI. Surveys at these swamps recorded papyrus endemics, notably papyrus gonolek, *Laniarius mufumbiri* (IUCN near threatened, Uganda vulnerable). Another wetland site of note for avifauna are ponds at a disused airstrip at KP288. Although artificial, these ponds are now well vegetated with native plants and support an interesting variety of birds, including:

- white-backed duck, *Thalassornis leuconotus* (IUCN least concern, Uganda vulnerable, congregatory)
- rufous-bellied heron, *Ardeola rufiventris* (IUCN least concern, Uganda vulnerable, congregatory).

Southern Valleys

The southern valleys are typified by grassland and agricultural land, around KP232. The grey-crowned crane, *Balearica regulorum* (IUCN endangered and Uganda endangered) is the national bird of Uganda and is present in a variety of open habitats including grasslands and cultivated land. During both the wet and dry season surveys, pairs were recorded in about two-thirds of the valleys in the southern sites (sites 1, 5, 8, 9 10, 11, 13 and 24 as shown in Appendix A3). According to the bird atlas of Uganda, this once-widespread species is now confined largely to southwest Uganda and the distribution maps indicate that the species is present in the AOI. While only a sample of valleys were surveyed it is likely to be present in other areas of suitable habitat within the same area.

Avifauna Fauna Species of Conservation Importance

Uganda is a bird-rich country, with about 1040 species recorded, of which about 800 are resident species (Carswell et al. 2005). The AOI avoids protected areas,

but the Lake Albert flats, which are pastoral areas, are known to be species-rich. Uganda's predominantly small-scale farmlands are also species-rich. However, other than species that require native trees for breeding, the species found there are typically not of conservation importance (Douglas et al 2013).

Bird species richness was high in 15 of the 30 sites surveyed, often with 40 or more species recorded. This indicates the importance of birds as contributors to ecosystem function, notably pollination, seed dispersal and pest control. Species were also identified as being of conservation importance, as detailed in Table 6.4-7.

Table 6.4-7 Avifauna of Conservation Importance

Common Name ***Scientific Name*** **(Alternative Name)**	**Global**					**Uganda**					
	CR	**EN**	**VU**	**NT**	**DD**	**CR**	**EN**	**VU**	**NT**	**RR**	**DD**
White-backed duck *Thalassornis leuconotus*								✓			
Grey-crowned crane *Balearica regulorum*		✓					✓				
African woollyneck *Ciconia microscelis*								✓			
Saddlebill *Ephippiorhynchus senegalensis*								✓			
Striated heron *Butorides striata* (green-backed heron)									✓		
Rufous-bellied heron *Ardeola rufiventris*								✓			
Hooded vulture *Necrosyrtes monachus*	✓						✓				
Ovambo sparrowhawk *Accipiter ovampensis*								✓			
Grey parrot *Psittacus erithacus*				✓				✓			
Papyrus gonolek *Laniarius mufumbiri*				✓				✓			

Table 6.4-7 Avifauna of Conservation Importance

Common Name ***Scientific Name*** **(Alternative Name)**	**Global**					**Uganda**					
	CR	**EN**	**VU**	**NT**	**DD**	**CR**	**EN**	**VU**	**NT**	**RR**	**DD**
Toro olive greenbul *Phyllastrephus hypochloris*									✓		
Number of species	1	1	-	2	-	-	2	8	2	-	-

NOTE: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, RR = Regionally Restricted, DD = Data Deficient.

The hooded vulture, *Necrosyrtes monachus* (IUCN critically endangered, Uganda endangered), African woollyneck, *Ciconia microscelis*, (ICUN least concern, Uganda vulnerable), saddlebill, *Ephippiorhynchus senegalensis* (ICUN least concern, Uganda vulnerable) and the Ovambo sparrowhawk, *Accipiter ovampensis*, (ICUN least concern, Uganda vulnerable) were also recorded during field surveys, but are not connected specifically with any of the habitats described here.

Trend in Condition and Sensitivity to Change

Wambabya Forest Reserve

The Wambabya FR could become an important part of an ecological corridor being investigated for restoration and enhancement by Ecotrust, Jane Goodall Institute and Fauna & Flora International within the broader Albertine Rift landscape (Lamprey 2017). Similarly, the Ugandan Wildlife Authority has advised the project of its intention to initiate a revegetation programme in degraded parts of the Wambabya FR. Should these programmes proceed, it is anticipated that the condition of the Wambabya FR would improve.

As the Wambabya FR provides nesting habitat for grey parrot (IUCN endangered) and other forest-specialist avifauna, it is considered to have very high sensitivity to change.

Papyrus Swamp

Papyrus wetlands are under increasing anthropogenic pressure with large areas cleared for agriculture or the harvesting of papyrus. Clearing of wetland vegetation and the creation of open water can increase evaporation rates leading to a shrinking of the wetland area. Papyrus will readily regenerate if left undisturbed after the initial encroachment. However, land use pressures in the region are likely to restrict opportunities for permanent regeneration. Increasing pressure on this system will affect the flora and fauna.

Wetlands and the specialist bird species that depend on them for nesting and foraging habitat have high sensitivity to change.

Southern Valleys

The grasslands are subject to pressures through over-grazing and conversion to agriculture; these pressures on land use are anticipated to continue.

As the southern valleys provide important habitat for grey-crowned crane (IUCN and Uganda endangered), they are considered to have high sensitivity to change.

Ecosystem Services Provided

The habitats described, together with the avifauna species they support, generate a range of ecosystem services as set out below.

Provisioning services include:

- food (bushmeat hunting and egg gathering).

Regulating services include:

- many of the bird species (raptors, vultures and owls) being keystone species that provide pest control and other regulating services.

Cultural services include:

- eco-tourism, particularly in protected areas
- use of feathers, bones and other body parts in ceremonial rituals.

Habitat and species support includes:

- refuge, feeding, watering, breeding and nursery areas for a range of bird species.

Supporting services include:

- pollination and seed dispersal.

Sensitivity Rankings

Based on the survey, the trend in condition and sensitivity to change, the sensitivity of the VECs has been ranked and is shown below in Table 6.4-8.

Table 6.4-8 Avifauna Valued Environmental Components and Sensitivity Ranking

Avifauna VEC	Sensitivity Ranking	Rationale for Ranking
Wambabya FR		
Legally Protected area	High (4)	Legally protected as a FR
Flora and fauna species of conservation importance	Very high (5)	Supports the IUCN endangered (Uganda vulnerable) grey parrot
Habitats of conservation importance (terrestrial and aquatic)	High (4)	Habitats providing important breeding habitat for forest-specialist species, including the IUCN endangered (Uganda vulnerable) grey parrot

Table 6.4-8 Avifauna Valued Environmental Components and Sensitivity Ranking

Avifauna VEC	Sensitivity Ranking	Rationale for Ranking
Papyrus swamp and other wetlands		
Flora and fauna species of conservation importance	Moderate (3)	Supports Uganda vulnerable species: • papyrus gonolek • white-backed duck • rufous-bellied heron
Habitats of conservation importance (terrestrial and aquatic)	High (4)	Natural habitat providing nesting and foraging habitat for wetland-specialist birds
Southern valleys		
Flora and fauna species of conservation importance	Very high (5)	Supports IUCN and Uganda endangered species: • grey-crowned crane
Habitats of conservation importance (terrestrial and aquatic)	High (4)	Natural habitat supporting the national bird of Uganda, the grey-crowned crane
Avifauna species		
Flora and fauna species of conservation importance	Very high (5)	IUCN critically endangered and endangered species: • hooded vulture (critically endangered) • grey-crowned crane (endangered) • grey parrot (endangered) Uganda vulnerable species: • papyrus gonolek • white-backed duck • rufous-bellied heron

Key Considerations

Based on the outcomes of the avifauna biodiversity study, and particularly the known or likely presence of species of conservation importance, the following areas are identified as sensitive VECs:

- Wambabya FR
- papyrus swamp and other wetlands
- southern valleys.

Avifauna species of conservation importance were recorded during the field surveys that are key considerations for the impact assessment. These species are important because they are listed as IUCN or Uganda critically endangered, endangered or

vulnerable; some are congregatory; and some are range-restricted or habitat specialists. Species of conservation importance are listed in Table 6.4-9.

Table 6.4-9 Avifauna Key Considerations

Species	Location(s)	Conservation Status	Considerations for Impact Assessment
Hooded vulture	KP127 close to Kasana-Kasambaya FR	IUCN CR, Uganda EN	Main threats to this species include habitat loss, intentional or unintentional poisoning, bushmeat hunting and small clutch size meaning loss of one parent will lead to loss of offspring.
Grey-crowned crane	Kafu River swamps, KP37, 91, 210, 220, 226, 232, 259 and 289	IUCN EN, Uganda EN	The main threats to this species are loss and degradation of wetland breeding areas, illegal captive trade, hunting and egg capture and human disturbance.
White backed duck	MCPY4 at KP288.5	Uganda VU, congregatory and partially migrant	The species is threatened by the modification of wetlands, deterioration in water quality and pollution.
African woollyneck	Kafu River swamps – KP37 and 232	Uganda VU	Uganda vulnerable due to a declining population and subpopulations being less than 1000 mature individuals.
Saddlebill	Kafu River swamps, KP37	Uganda VU	The species is vulnerable to disturbance and wetland degradation (e.g., pesticide contamination) and conversion to agriculture (del Hoyo et al. 1992).
Rufous-bellied heron	MCPY4 at KP288.5	Uganda VU	Uganda vulnerable due to a declining population and subpopulations being less than 1000 mature individuals.
Ovambo sparrowhawk	KP274	Uganda VU	Loss of woodland habitat due to cutting is a threat (Kemp and Kirwan 2013).
Grey parrot	Wambabya FR	IUCN EN, Uganda VU	Trapping for the wild bird trade is the main threat to the species, with habitat loss also being a notable threat to the species in East Africa (BirdLife International 2017b).
Papyrus gonolek	Kafu River swamps, KP37	IUCN NT, Uganda VU	The highly specialised habitat required by this species makes it vulnerable to threats such as drainage, burning and the over-exploitation of wetlands (BirdLife International 2016f).

Key considerations for avifauna species are:

- loss of habitat
- disturbance to nesting and foraging, both of which occur throughout the year.

6.4.1.5 Fauna Biodiversity

This section describes the:

- fauna biodiversity AOI
- baseline condition of fauna biodiversity in terms of:
  - habitats
  - fauna species (large mammals, small mammals, reptiles, amphibians, and invertebrates)
  - trends affecting the condition of habitats and fauna species of conservation importance and sensitivity to change
  - ecosystem services provided
  - fauna biodiversity sensitivity rankings
- key considerations.

For more information, the fauna biodiversity baseline report is included in Appendix A4.

Area of Influence

For fauna species of conservation importance, the spatial AOI encompasses the direct project footprint and areas within an ecologically relevant distance of the project to account for potential indirect impacts arising from, for example, facilitated access, edge effects, the spread of invasive species and permanent habitat loss and fragmentation. The definition of an ecologically relevant distance relies on the mobility of a species, habitat connectivity between it and the project, and the potential impact pathways between it and the project. On a precautionary basis, the spatial AOI was generally defined by a 10-km-wide corridor centred on the pipeline route and AGIs to account for the mobility of some fauna species.

The temporal AOI is defined as the duration of the project construction phase extended by the time required for the relevant habitat to recover to its pre-project potential (i.e., the habitat can support the species diversity and abundance, and ecological processes of the habitat in its pre-project condition).

Baseline Condition of Fauna Biodiversity

Habitats of Conservation Importance

Wambabya Forest Reserve

The Wambabya FR is a closed, tropical high forest and is designated as an ecological and environmental FR (NEMA 2010). The southern part of the reserve is relatively intact forest. The FR supports the highest population density of chimpanzees, *Pan trogolodytes schweinfurthii*, in the Albertine Rift. The chimpanzee is listed as endangered by the IUCN and critically endangered on the Ugandan Red List. Other species of conservation concern either recorded during field surveys or identified from literature review include the tree pangolin *Phataginus*

tricuspis, long-tailed pangolin *Phataginus tetradactyla* and the African golden cat *Caracal aurata*, all of which are listed as IUCN vulnerable. The African golden cat is listed as endangered on the Uganda Red List, while the two pangolin species are listed as vulnerable.

Remnant fragments of riparian forest link the Wambabya FR to the Bugoma CFR. This network provides important habitat for the IUCN and Uganda endangered chimpanzee.

Taala Forest Reserve

Taala FR was originally designated for ecological purposes and, although heavily degraded and converted to agriculture, it retains biodiversity value. The spot-necked otter *Hydricitis maculicolois* was recorded in a small watercourse at the northern end of the Taala FR, and is listed by the IUCN as near threatened, and as endangered on the Ugandan Red List. Several butterfly species of importance were also recorded here during the project baseline surveys.

Kasana–Kasambya Forest Reserve

The pipeline RoW is within 100 m of the Kasana–Kasambaya FR near KP123, which is exclusively pine tree plantations with field studies suggesting that eucalyptus plantations and maize fields are also widely present. The Sierra Leone mops bat *Mops brachypterus* (Uganda Red List vulnerable) was recorded in project surveys. Pousargue's mongoose *Dologale dybowskii* is listed as data deficient by IUCN. There is uncertainty about its abundance throughout its range and it could be more common than thought. This species was also recorded in baseline surveys. Interviews with local communities suggest that leopard *Panthera pardus* (IUCN and Uganda vulnerable) visit the reserve. Three butterfly species of conservation importance were recorded during the baseline surveys.

Disused Airstrip Borrow Pits

The AOI traverses a disused airstrip at KP288, where there are former borrow pits that have filled with water approximately 200 m to the west of the pipeline RoW. The ponds provide good quality habitat for amphibians, reptiles and invertebrates within an otherwise relatively dry, agricultural landscape. The Bohor reedbuck *Redunca redunca* (IUCN least concern and Uganda endangered) was recorded in baseline surveys. One butterfly species of conservation importance *Uranothauma heritsia* (IUCN not listed and Uganda endangered), one dragonfly species *Acisoma inflatum* (IUCN least concern and Uganda vulnerable) and one damselfly species *Azuragrion vansomereni* (IUCN least concern and Uganda data deficient) were recorded.

Wetland and Aquatic Habitats

Aquatic habitats throughout the AOI, including wetlands, ponds and riparian habitats, support species of interest, particularly amphibians. In addition, wetlands serve as watering holes for wildlife, with access to a reliable water source generally the main range-limiting factor for large carnivores (Abade et al. 2014).

Sitatunga *Tragelaphus spekii* (Uganda Red List vulnerable) was recorded in the baseline surveys in the papyrus swamps associated with the Nabakazi River

around KP106 and KP141, and around KP165 at the Katonga River papyrus swamp. The Bohor reedbuck (IUCN least concern and Uganda endangered) and Temminck's ground pangolin *Smutsia temminckii* (IUCN and Uganda vulnerable) were recorded at KP165 (Katonga River).

Evidence of spot-necked otter (IUCN near threatened and Uganda endangered) was found during surveys at the Nabakazi River crossing at KP147.5.

Interviews with local communities suggest that leopards are present around the Nabakazi swamp and Katonga River wetlands area although no evidence was noted during the field surveys.

Fauna Species of Conservation Importance

Bats

Uganda has 95 documented species of bats. Of these species, none were noted within the project AOI from literature or community consultations. However, three species were observed during the baseline surveys.

Only one species, Sierra Leone mops bat (Uganda vulnerable) is of conservation importance. This species was identified in the Kasana–Kasambaya FR.

Large Mammals

Of the 45 large mammal species reported during the surveys, most were recorded during the wet season in the Katonga River wetland system around KP165. Most species recorded or reported to be present are common and widespread except for the following, which are considered of conservation importance:

- sitatunga (*Tragelaphus spekii*), IUCN least concern, Uganda vulnerable
- Bohor reedbuck (*Redunca redunca*), IUCN least concern, Uganda endangered
- Temminck's ground pangolin (*Smutsia temminckii*), IUCN vulnerable and Uganda vulnerable
- tree pangolin (*Phataginus tricuspis*): IUCN vulnerable, Uganda vulnerable
- long-tailed pangolin (*Phataginus tetradactyla*), IUCN vulnerable, Uganda endangered
- African golden cat (Caracal aurata), IUCN vulnerable, Uganda endangered
- African clawless otter (*Aonyx capensis*), IUCN near threatened and Uganda vulnerable
- hippopotamus (*Hippopotamus amphibious*), IUCN vulnerable, Uganda vulnerable
- spotted-necked otter (*Hydrictis maculicollis*), IUCN near threatened and Uganda endangered
- leopard (*Panthera pardus*), IUCN vulnerable and Uganda vulnerable
- chimpanzee (*Pan troglodytes*), IUCN endangered and Uganda endangered.

Small Mammals

No small mammals of conservation importance were recorded during the baseline surveys.

Reptiles

No reptile species of conservation importance were recorded during the baseline surveys.

Amphibians

The baseline surveys in the AOI observed 26 species of amphibians. The borrow pits at the disused airstrip at KP288 had the most amphibians with 17 species.

One species of conservation importance was recorded during the field studies: golden-throated rocket frog (*Ptychadena chrysogaster*), IUCN least concern and Uganda vulnerable.

Invertebrates

A total of 314 lepidopterans (butterflies and moths) was recorded during the surveys. For butterflies, the highest number of species was recorded in the forests and woodland areas. In a woodland area near KP275, 58 species of butterfly were recorded. However, most species of conservation importance were recorded around the Wambabya FR and larger wetland areas such as the Kafu River wetlands.

Twenty-four butterfly species and nine dragonfly species of conservation importance were recorded during the field surveys. No species were listed by the IUCN, but all were listed on the Uganda Red List. No records were available for the AOI from literature or consultations.

The following butterfly species are of conservation importance:

- *Acada biseriatus,* data deficient – only second known record in Uganda
- *Actinote alciope*, critically endangered
- *Actinote pharsalus*, vulnerable
- *Actinote rahira*, vulnerable
- *Actinote pentapolis*, vulnerable
- *Actinote wigginsi*, data deficient – first known record in Uganda
- *Anthene indefinita*, vulnerable
- *Anthene liodes*, vulnerable
- *Bebearia laetitioides*, vulnerable
- *Bicyclus istaris*, vulnerable
- *Borbo holtzi*, vulnerable
- *Cymothoe egesta*, endangered
- *Euchrysops subpallida*, vulnerable
- *Hewitsonia ugandae*, data deficient
- *Lachnocnema divergens*, data deficient
- *Metisella willemi*, vulnerable
- *Monza alberti*, vulnerable
- *Mylothris rhodope*, data deficient – first known record in Uganda
- *Neptis nicomedes*, vulnerable
- *Pentila inconspicua*, vulnerable

- *Pentila tachyroides*, critically endangered
- *Prosopalpus styla*, vulnerable
- *Uranothauma heritsia*, endangered
- *Zenonia zeno*, vulnerable.

The following dragonfly species are of conservation importance:

- *Acisoma inflatum*, vulnerable
- *Acisoma variegatum*, vulnerable
- *Agriocnemis palaeforma*, endangered
- *Azuragrion vansomereni*, data deficient – few known records in Uganda
- *Chlorocypha victoriae*, vulnerable
- *Neodythemis afra*, critically endangered
- *Pseudagrion* (B) *torridum*, vulnerable
- *Platycypha lacustris*, vulnerable
- *Pseudagrion* (B) *glaucoideum*, critically endangered.

Trend in Condition and Sensitivity to Change

Wambabya Forest Reserve

Trends in condition and sensitivity to change for the Wambabya FR are described in Section 6.4.1.1.

The Wambabya FR and the corridors of remnant riparian forest linking it to the Bugoma CFR provide important habitat for the IUCN and Uganda endangered chimpanzee. This area is therefore of very high sensitivity to change.

Taala Forest Reserve

The Taala FR was originally designated for ecological purposes and now comprises modified habitat that has biodiversity value in places. It is considered to have low sensitivity to change and there is no anticipated change in condition of this forest.

Kasana–Kasambya Forest Reserve

As this FR is a commercial plantation, there is no anticipated change in condition.

Kasana–Kasambya FR comprises modified habitat with some biodiversity value. It is considered to have low sensitivity to change.

Disused Airstrip Borrow Pits

The airstrip borrow pits have developed into important ecological features over the last 40 years. Unaltered, it is anticipated that their condition would continue to be important for the species that use the borrow pits and associated wetland habitat.

The airstrip borrow pits provide important breeding and feeding habitat for reptile, amphibian and invertebrate species, and are therefore considered to have high sensitivity to change with no anticipated change in condition.

Wetland and Aquatic Habitats

As noted in the Aquatic Biodiversity Baseline Report (Appendix A2), Uganda's wetlands are under increasing pressure from agricultural activities, extensive livestock husbandry, agro-chemical and other pollution, reservoir construction, deforestation and mining practices (Dugan 1990).

Papyrus wetlands are under increasing anthropogenic pressure with large areas cleared for agriculture or papyrus harvesting. Clearing of wetland vegetation and the creation of open water can increase evaporation rates leading to a shrinking of the wetland area. Papyrus will readily regenerate if left undisturbed after the initial encroachment. However, land use pressures in the region are likely to restrict opportunities for permanent regeneration. Increasing pressure on this system will affect the flora and fauna.

Wetlands within the project AOI comprise natural habitat that provide important ecological function (including, but not limited to, connectivity) and are therefore considered to have high sensitivity to change.

Ecosystem Services Provided

The fauna generates the range of ecosystem services as set out below. Further information on the general nature and extent of the provisioning ecosystem services listed can be found in the land-based livelihoods Section 6.4.3.8 and in Appendix A11, Socio-economic and Health Baseline Report.

Provisioning services include:

- food (hunting, gathering and foraging). In some areas, these activities are legal whereas in others they are not.
- trapping of wildlife for the live trade market
- other products (e.g., skins)
- collection of medicinal products.

Cultural services include:

- ethical and biodiversity 'non-use' values, particularly in terms of maintaining populations of endangered and endemic species. These values are difficult to determine.
- eco-tourism, particularly in protected areas
- aspects of these species may provide spiritual, sacred or religious values; inspiration for culture and design; and cognitive development.

Sensitivity Rankings

The sensitivity of the VECs has been ranked and is shown in Table 6.4-10.

Table 6.4-10 Fauna Sensitivity Ranking

Fauna VEC	Sensitivity Ranking	Rationale for Ranking
Wambabya FR		
Legally protected areas	High (4)	Designated as an FR, originally for ecological purposes.
Flora and fauna species of conservation importance	Very high (5)	The Wambabya FR and the corridors of remnant riparian forest linking it to the Bugoma CFR provide important habitat for the IUCN and Uganda endangered chimpanzee.
Fauna habitats of conservation importance	Very high (5)	Natural habitat (as defined by IFC Performance Standard 6) and habitat providing important feeding or breeding ground.
Taala FR		
Legally protected areas	High (4)	Designated as an FR, originally for ecological purposes
Flora and fauna species of conservation importance	High (4)	Supports spot-necked otter, a Uganda endangered species (IUCN near threatened).
Fauna habitats of conservation importance	Low (2)	Comprises modified habitat that has biodiversity value in places.
Kasana–Kasambya FR		
Legally protected areas	Moderate (3)	Designated as an FR and retains some biodiversity value.
Flora and fauna species of conservation importance	Low (2)	Supports several species ranked as IUCN least concern.
Fauna habitats of conservation importance	Low (2)	Comprises modified habitat with some biodiversity value.
Nabakazi River		
Legally protected areas	High (4)	The Ugandan National Policy for the Conservation and Management of Wetlands protect the Nabakazi River wetlands as a biodiversity area and as a resource for local communities.
Flora and fauna species of conservation importance	High (4)	Supports spot-necked otter, a Uganda endangered species (IUCN near threatened).
Fauna habitats of conservation importance	High (4)	The river and associated wetlands can be classified as natural habitat[1]. The Nabakazi River provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes.

Table 6.4-10 Fauna Sensitivity Ranking

Fauna VEC	Sensitivity Ranking	Rationale for Ranking
Katonga River		
Legally protected areas	Very High (5)	The Katonga River and associated wetlands and tributaries are connected with or flow through numerous nationally protected sites. The river also connects with Lake George to the west, which is a Ramsar wetland and freshwater Key Biodiversity Area (fKBA).
Flora and fauna species of conservation importance	High (4)	Supports IUCN near threatened, Uganda endangered spot necked otter. Supports IUCN vulnerable and Uganda vulnerable species: • hippopotamus • sitatunga • Temminck's ground pangolin • tree pangolin.
Fauna habitats of conservation importance	High (4)	The Katonga River can be classed as natural habitat[1]. It provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes.
Disused airstrip borrow pits		
Flora and fauna species of conservation importance	High (4)	Supports Bohor reedbuck, a Uganda endangered species.
Fauna habitats of conservation importance	High (4)	Provides important breeding and feeding habitat for reptile, amphibian and invertebrate species.

Key Considerations

Based on the outcomes of the fauna biodiversity study, and particularly the known or likely presence of species of conservation importance, the following areas are identified as sensitive VECs:

- the Wambabya FR and riparian corridors linking the Wambabya FR with the Bugoma CFR to the south owing to the presence of chimpanzee, which is IUCN endangered and Uganda endangered
- the Taala FR owing to the recorded presence of the spot-necked otter, which is Uganda vulnerable
- the disused airstrip borrow pits at KP288 owing to the recorded presence of Bohor reedbuck, which is Uganda endangered

- papyrus wetlands associated with the Nabakazi and Katonga rivers, owing to the recorded presence of Bohor reedbuck and Temminck's ground pangolin, which is IUCN vulnerable and Uganda vulnerable.

Some species identified during the survey (either recorded during field surveys or reported in secondary data) are of conservation importance. These species are important because:

- they are listed as IUCN endangered or vulnerable
- some are endemic to Uganda
- some are included in species action plans or the Uganda Red List, or are listed in the Convention on Migratory Species.

A summary of these species is provided in Table 6.4-11.

Table 6.4-11 Key Fauna Considerations

Species	Location(s)	Conservation Status	Considerations for Impact Assessment
Sitatunga	KP165 (Katonga River), KP141 (Nabakazi swamp) and KP106 in the area of a papyrus swamp	IUCN vulnerable, Uganda vulnerable	The main threat to the species is habitat degradation and hunting (East 1999).
Bohor reedbuck	KP6, KP165, KP187, KP218–231 and KP289	IUCN least concern, Uganda endangered	This species has been eliminated from large parts of its range due to hunting, and loss of habitat to the expansion of settlement and livestock.
Temminck's ground pangolin	KP165 (Katonga River)	IUCN vulnerable, Uganda vulnerable	The main threat to the species is exploitation for cultural uses, traditional medicine and bushmeat, and increased intercontinental trade to Asia (Pietersen et al. 2014).
Tree pangolin	KP165 (Katonga River)	IUCN vulnerable, Uganda vulnerable	The main threat to the species is exploitation for cultural uses, traditional medicine and bushmeat, and increased intercontinental trade to Asia (Pietersen et al. 2014).
Long-tailed pangolin	Wambabya FR	IUCN vulnerable, Uganda endangered	The main threat to the species is exploitation for cultural uses, traditional medicine and bushmeat, and increased intercontinental trade to Asia (Pietersen et al. 2014).

Table 6.4-11 Key Fauna Considerations

Species	Location(s)	Conservation Status	Considerations for Impact Assessment
African golden cat	Wambabya FR	IUCN vulnerable, Uganda endangered	The species main threats are habitat loss and deforestation, informal bushmeat trade reducing its prey base and being a bycatch in informal hunting activities.
African clawless otter	Wambabya FR	IUCN near threatened, Uganda vulnerable	The species main threats are the declining state of freshwater ecosystems and informal hunting for skins and other body parts
Hippopotamus	KP165 (Katonga River)	IUCN vulnerable, Uganda vulnerable	The main threats are habitat loss and degradation, and illegal and unregulated hunting for meat and ivory (Lewison and Pluháček 2017).
Spot-necked otter	KP165 (Katonga River)	IUCN near threatened, Uganda endangered	Alteration and degradation of freshwater habitats and riparian vegetation are a major threat to this species. Other threats include anthropogenic activity leading to disruption of denning activity and alterations to the prey base, water pollution and otters being killed for food and skins.
Leopard	KP165 (Katonga River), KP205	IUCN vulnerable, Uganda vulnerable	Leopards have limited levels of ecological resilience to habitat fragmentation. Other threats include persecution from increasing human populations, illegal wildlife trade (such as the ceremonial use of skins), prey base decline and poorly managed trophy hunting (Stein et al. 2016).
Chimpanzee	Wambabya FR and connecting forests	IUCN endangered, Uganda endangered	Species main threats include poaching (infrequent and mostly opportunistic), conflict killings, habitat loss and degradation and disease.

Table 6.4-11 Key Fauna Considerations

Species	Location(s)	Conservation Status	Considerations for Impact Assessment
Sierra Leone mops bat	Kasana–Kasambaya FR	IUCN least concern, Uganda vulnerable	Vulnerable within Uganda due to threat of habitat loss through deforestation and the conversion of land to agricultural use.
Golden-throated rocket frog	KP187	IUCN least concern, Uganda vulnerable	Vulnerable in Uganda owing to habitat loss and only known in 10 or fewer locations.

6.4.2 Physical Environment

6.4.2.1 Geology and Soil

This section describes the:

- soil AOI
- baseline condition of soil and geology along the route:
  - ecosystem services provided
  - soil sensitivity rankings
- key considerations.

For more information, see Appendix A5: Geology and Soil Baseline Report.

Area of Influence

The geology and soil AOI are based on the project footprint and construction and operation of:

- the 30-m pipeline RoW
- AGI locations
- construction camps and facilities
- access roads.

Aggregates are considered in the project description (see Section 2.4.2).

Baseline Condition of the Soil and Geology

Geology

In Uganda, precambrian crystalline rock, including gneiss and granite, underlies approximately 90% of Uganda's land area. The remaining area is mostly underlain by younger volcanic and sedimentary rocks. The regolith over the crystalline rock is weathered material that varies from rock fragments near the bedrock interface to well-weathered soil and hardened laterite at the surface. This regolith layer varies in thickness, but averages approximately 30 m (British Geological Survey 2001).

Seismicity and Earthquakes

The occurrence of earthquakes in Uganda is associated with the East African Rift system but the proposed EACOP route does not traverse the system. However, the pipeline RoW crosses six major faults. Its tectonic setting makes Uganda prone to earthquakes. Since 1929, the country has had seven earthquakes measuring 5 or more on the Richter scale, some of which killed people, destroyed buildings and triggered landslides.

Landslides and Sinkholes

Review of secondary data did not identify any landslides or sinkholes across the AOI and broader region at the time of writing.

Mining and Quarrying

Review of secondary data indicates that there may be existing mining and quarrying operations inside the AOI and broader region, further information is not available at the time of writing.

Artisanal and small-scale mining is described in the Socio-economic and Health Baseline Report (see Section 6.4.3.7).

Soil

Soil types within the AOI and broader region are shown on the soil type map in Figure A5.4-2 of Appendix A5. Table A5.4-1 of Appendix A5 presents the EACOP baseline survey soil classifications. In addition to a field survey, data from Isabirye et al. (2004) and Kaizzi (2017) have also been used to map soil resources within the AOI. The soil type classifications resulting from the baseline soil survey did not always correspond with the mapped soil type reported in Isabirye et al. (2004) and Kaizzi (2017). Isabirye et al. (2004) and Kaizzi (2017) provides consistent and comparable soil data and information in the AOI and broader region, whereas the field survey provides point data, relevant to the sampling location only. Soil profile data in Isabirye et al. (2004) and Kaizzi (2017) can sometimes be incomplete, which explains why there may be inconsistencies with the field survey classifications. Where inconsistencies exist at individual sample sites, the field survey data has been given preference.

Soil Structure

Soil texture varies along the length of the AOI (see Table A5.4 -1 in Appendix A5), although soil with a high sand content was found to be present along most of the route and identified at more than 60% of the sample locations. Soil containing high proportions of sands is less vulnerable to dust and silt generation. However, soil with a low sand content was also identified at several of the sample locations. Further, the potential for dust generation is also greatly influenced by the moisture content of the soil, and during the dry season it is likely that many sections of the route will be prone to dust generation.

Sandy soil also tends to have a relatively low bulk density, owing to the larger particle size, and will be less sensitive to compaction. Soil comprised primarily of silt and clay (e.g., at KP0, KP80 and KP260) has a higher bulk density and therefore

will be more sensitive to compaction. Silty clay soil also has poor trafficability when wet.

Top soil depth within the study area was found to range from 15–40 cm, although for most of the route the depth was 20–30 cm (see Table A5.4 -1 in Appendix A5). Thin top soils (<5 cm) were not encountered during the field survey, although it is likely that such soils may be present along the route, particularly in areas of steep slopes or where shallow soils are developed on exposed bedrock.

Soil Productivity and Nutrient Content

Most soil types within the AOI are characterised as low to medium in productivity and support grazing, commercial farms and plantations, and subsistence farming (Kaizzi 2017). Soil with higher productivity was found at KP5, KP45 and KP280.

Arenosols, rhodic ferralsols, skeletic leptosols, petroplinthic plinthosols, rhodic nitisols and gleysols were identified along the pipeline route. Most of the profiles were within the slightly acidic to moderately alkaline range and therefore indicate good agricultural production potential. Most topsoil was of low to medium organic matter content and high base status, indicating that soils could be productive if well managed. Most soil had low to very low extractable soil phosphorus, the one exception being the gleysol at SU013.

Phosphorus, potassium, and magnesium are macronutrients required by plants that are necessary for the basic biological functions such as growth, photosynthesis and respiration (Singh and Schulze 2015). Deficiencies can negatively affect vegetative growth and yield and can result in increased mortality rates. Soil erosion risk is categorised in the erosion risk assessment (Appendix G1) and soil sensitivity is categorised in the sensitivity tables. There are no Ugandan standards for soil quality, so no screening for exceedances was undertaken.

Potential Sodic B Horizons

Attachment A5.1 of Appendix A5 presents the results of the soil laboratory tests for parameters potentially indicative of possible sodic B horizons.

A sodic B horizon is a subsoil layer in which sodium occupies greater than 15% of the exchange complex (i.e., the exchangeable sodium content is greater than 15% of the cation exchange capacity; by definition, therefore, the combined exchangeable calcium and magnesium content would be less than 85% of the cation exchange capacity). Soils with a high exchangeable sodium content are associated with adverse physical conditions such as slumping or compaction and deflocculation of clay particles, making them more susceptible to erosion. Sodic B horizons were not observed during the field survey.

Soil Contamination

At the time of writing, potential sources of contamination such as industry, commerce or heavily populated areas do not occur within the AOI and there was with no evidence of existing sources of potentially substantial contamination.

Attachment A5.1 of Appendix A5 presents the results of the soil laboratory tests for parameters potentially indicative of contamination.

The results of the laboratory analysis undertaken on the 14 samples collected (SU006–SU019) during the field survey included :

- copper in six samples at a maximum of 0.195 mg/kg.
- manganese in 11 samples at a maximum of 3.082 mg/kg.
- zinc in 14 samples at a minimum of 0.139 mg/kg and a maximum of 1.353 mg/kg.

The results indicate that there is no soil contamination at the locations sampled and that the levels detected are typical of natural soil concentrations in Uganda. No arsenic, cadmium, hexavalent chromium, lead, mercury, molybdenum, nickel, selenium or total petroleum hydrocarbons were detected in the samples, which indicates no industrial related contamination at sampling locations.

Unexploded ordnance dating back to the five-month Liberation War (1978–1979) has been reported on both sides of the Uganda–Tanzania border. Unexploded ordnance risk is considered low because of the short duration of the conflict and high amounts of agricultural activity in the area. The latter activities include soil being dug over and therefore if unexploded ordnance were present, it is likely that they would already have been found.

Trends Affecting Condition and Sensitivity to Change

The soil types within the AOI are of reasonable agricultural quality but are vulnerable to differing pressures. External physical (e.g., vehicle movement) or chemical (e.g., fertiliser use) pressures may reduce soil quality because of nutrient loss, compaction, erosion and or contamination. Throughout the AOI, there has been long-term drought, as well as flooding and heavy rainfall at different times, with some areas experiencing both drought and flooding during the same year (see climate baseline report, Appendix A14). Drought and flooding may exacerbate weathering, make soil more prone to erosion and cause the loss of nutrients and organic matter.

Current and future agricultural activities and practices are also likely to affect the soil within the AOI. Animals and machinery can diminish protective plant cover and cause structural damage and erosion of soil. Fertiliser is now required to improve soil fertility in many areas. If used incorrectly, fertiliser can cause diffuse and point-source agricultural pollution to surface and groundwater. In addition, there is increasing evidence of severe soil degradation caused by erosion (from mining and deforestation) in Uganda (Lufafa et al. 2003).

Stakeholders engaged as part of the baseline surveys have commented that much of their land is less fertile and productive than it has been in the past. Continued use of the land within the study area for agriculture and grazing is likely to result in continuing deterioration in soil quality.

Ecosystem Services Provided

The soil in the AOI, and their associated micro-organisms, provide a range of ecosystem services as set out below.

Provisioning services include:

- quarrying operations for rock and construction aggregate materials

Regulating services include:

- soil quality regulation, nutrient cycling, carbon storage, and water storage and flow control.

Sensitivity Rankings

Fertility

Table 6.4-12 summarises the sensitivity ranking for soil fertility which is based on the sensitivity table in Appendix D. The fertility sensitivity scores are based on soil descriptions in the World Reference Base for Soil Resources (WRB) (FAO 2014) and the data from Isabirye et al. (2004) and Kaizzi (2017). Location-specific ranking based on the soil classification information collected during the field survey is also provided. This was supported by data gathered by the soil field surveys.

Table 6.4-12 Soil Fertility Sensitivity Ranking

Fertility	Sensitivity Ranking	Rationale for Ranking
13 locations	Very low (1)	No ecosystem or agricultural value
39 locations	Low (2)	Soil with low agricultural productivity
29 locations	Moderate (3)	Soil with moderate agricultural value. May take up to 3 years to fully recover
7 locations	High (4)	Soil with high agricultural productivity. May take 3-6 years to fully recover
None recorded but may occur locally	Very high (5)	Soil with very high agricultural productivity or ecosystem value

NOTE: KP ranges can be found in Appendix A5

Compaction

Table 6.4-13 summarises the sensitivity ranking for soil compaction which is based on the sensitivity table in Appendix D. The compaction sensitivity scores are based on soil descriptions in the World Reference Base for Soil Resources (WRB) (FAO 2014) and the data from Isabirye et al. (2004) and Kaizzi (2017).

Table 6.4-13 Soil Compaction Sensitivity Ranking

Compaction	Sensitivity Ranking	Rationale for Ranking
1 locations	Very low (1)	Not susceptible to erosion or compaction.
18 locations	Low (2)	Soil will respond well to restoration techniques to mitigate compaction.
19 locations	Moderate (3)	Soil will usually respond moderately well to restoration techniques to mitigate compaction. May take up to 3 years to fully recover.

Table 6.4-13 Soil Compaction Sensitivity Ranking

Compaction	Sensitivity Ranking	Rationale for Ranking
None recorded but may occur locally	High (4)	Soil that may need more intensive restoration techniques to mitigate compaction. May take 3–6 years to fully recover.
None recorded but may occur locally	Very high (5)	Soil that may be difficult to restore to its former condition

NOTE: KP ranges can be found in Appendix A5

Erosion

Table 6.4-14 summarises KP ranges for soils with sensitivity rankings of very high risk for erosion. The erosion risk assessment focuses on areas of very high sensitivity rankings only. The erosion sensitivity scores are in the erosion risk assessment (Appendix G1) where the list of KP locations are presented in full.

Table 6.4-14 Soil Erosion Sensitivity Ranking

KP Ranges[1]	Sensitivity Ranking	Rationale for Ranking
43 locations	Very high (5)	Soil at very high risk of erosion, according to soil type and slope.

NOTE: [1]KP ranges can be found in Appendix A5

Soil Contamination

Throughout the length of the AOI, the agricultural and ecosystem value of the soil varies. However, contamination was not identified at any of the locations in the AOI, and due to the predominantly rural nature of the AOI, contamination is unlikely to exist. Therefore, soil is considered to have a moderate sensitivity to contamination.

Unexploded ordnance may exist in certain areas near the Uganda–Tanzania border region, although the risk of unexploded ordnance being encountered is considered low.

Key Considerations

Soil sensitivity rankings range from very low to very high, depending on the soil type; there is considerable variation along the entire length of the AOI.

Soil is recognised as providing both regulating ecosystem services (e.g., erosion and soil quality regulation) and provisioning ecosystems services (e.g., provision of aggregate).

6.4.2.2 Surface Water

This section describes the surface water:

- AOI and study area boundaries
- baseline conditions:
  - trend in condition and sensitivity to change
  - ecosystem services provided
  - sensitivity rankings
- key considerations.

Surface water may occur as permanent or ephemeral watercourses (channels and floodplains), wetlands and waterbodies. The term 'ephemeral' is used to include those watercourses with seasonal flow and those with flow just following rainfall.

For more information, see the surface water baseline report (Appendix A6).

Area of Influence

The AOI for the construction phase includes:

- the project footprint at the location where the pipeline or access road crosses a watercourse or waterbody
- surface waterbodies downstream of AGIs and construction facilities.

The spatial AOI for construction varies from 2–5 km downstream of the pipeline crossing point, access road crossing point, AGI or construction facility, depending on the extant quantity of water and its quality, including sediment concentrations and turbidity, in the watercourse and the quantity and quality of any water discharged.

The AOI also includes surface waterbodies that will be used to supply water to the project. At the time of writing, surface water is considered a potential water resource for hydrotesting.

The temporal AOI for construction is the period that includes abstraction and discharge and a short recovery period of less than one year.

The spatial AOI for operation is 2–5 km downstream of water courses and waterbodies and the temporal AOI for operation is the life of the project, approximately 25 years.

The study area is larger than the AOI as it comprises the upstream catchment areas of the watercourses crossed by the pipeline, access roads or discharge points and downstream to key VECs. This is because land use in catchments upstream of the project influences the flow and water quality regimes at the crossing points and downstream VECs. The pipeline route crosses many minor tributaries. These are characterised by indistinct channels when viewed on satellite imagery and small catchment areas. The route crosses 10 major watercourses, a tributary of the Wambabya River, the Kafu River, two tributaries of the Kafu River, two tributaries of the Nabakazi River, the Nabakazi River, the Katonga River, the Kibale River and the Jemakunya River. These major rivers are the focus of this report (Figure 6.4-7). The rivers ultimately drain into Lake Albert (via the Victoria

Nile in the case of the Kafu River) or Lake Victoria. However, these waterbodies are outside the AOI.

Water accessibility and scarcity for communities was assessed within a 2km corridor along the pipeline, along project roads and near construction facilities and AGIs.

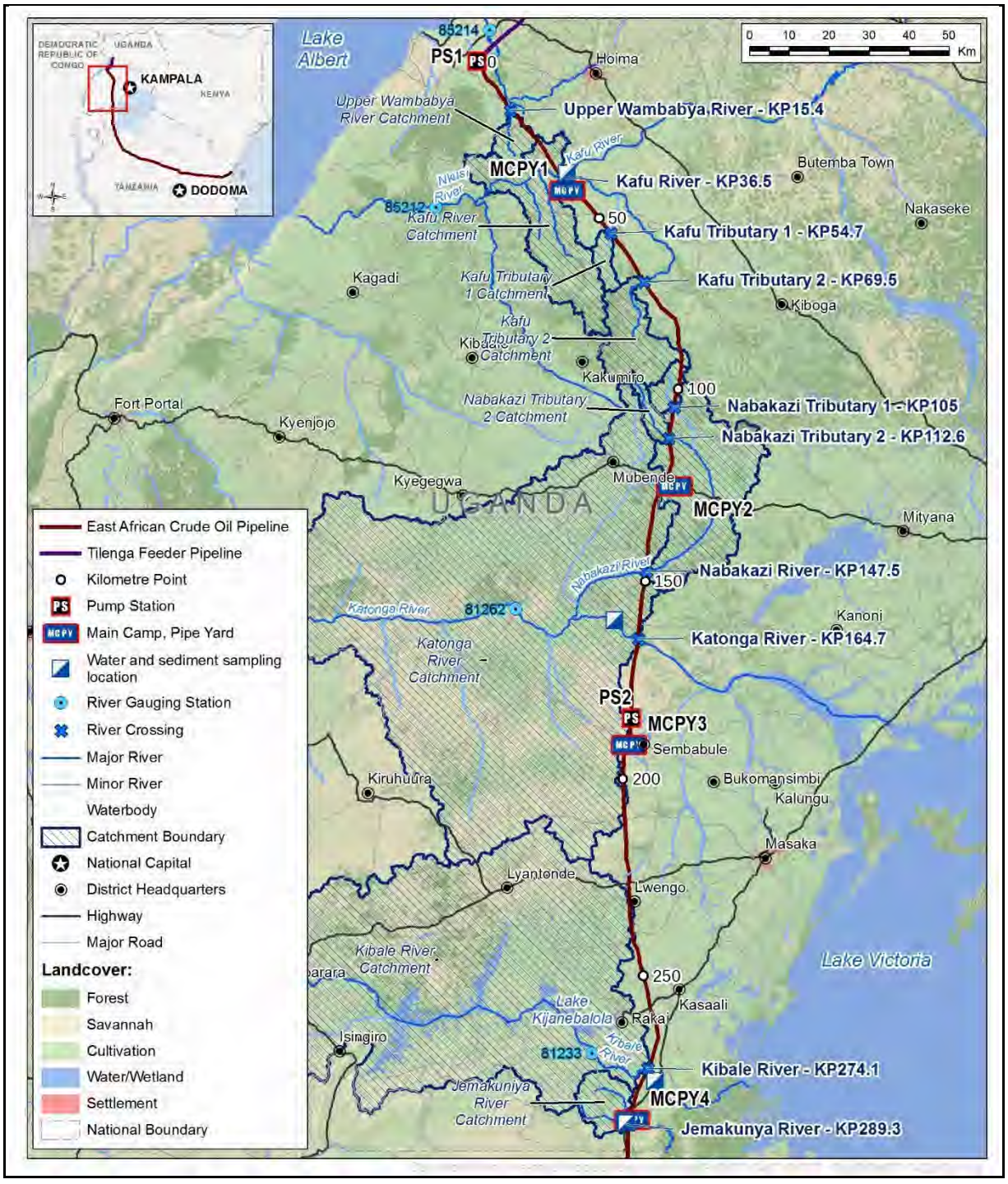


Figure 6.4-7 Main Watercourse Crossings and Catchments

Baseline Condition of Surface Water

Flow and Flood Regimes

Pipeline Crossings

There are ten pipeline crossings of major watercourses as listed in Table 6.4-17. There are no other surface waterbodies within the AOI other than those listed in this table.

A bimodal flow distribution is evident in most rivers, with higher flows in April–May and October–November reflecting rainfall maxima in these periods and dry seasons from December to March and from June to July (Table 6.4-17 and Figure 6.4-8). Flow from Lake Kijanebalola gives the Kibale River a different regime with a single peak flow in May.

The flood study (see Appendix A6) suggests that the bankfull capacity of the Kibale and Jemakunya Rivers is exceeded and these rivers flow across their floodplains during relatively minor but frequent flood events. The frequency of floodplain flow could not be determined for those watercourses dominated by swamp vegetation. Their channels may be silted up and floodplain flow may occur under non-flood conditions.

The Wambabya River is used for hydroelectricity generation at the Kabalega hydroelectric power station in Hoima district about 25 km downstream of the pipeline crossing.

Road Crossings, Construction Facilities and Aboveground Installations

Table 6.4-15 presents a list of road crossings and nearby watercourses. Table 6.4-16 presents a list of construction facilities and AGIs and nearby watercourses. Maps of project roads are presented in Appendix A6.

All the watercourses crossed by project roads and near project facilities are ephemeral and most lack defined channels. Flow and floods at the road crossings may be characterised as surface runoff occurring for short periods, perhaps only for minutes, during and after storm rainfall.

Table 6.4-15 Road Crossings - Stability of Road Drainage Valued Environmental Components

KP	Road ID	Location (Road KP)[1]	Channel Present?	Nature of Road Drainage VEC	Likely Nature of Soil	Evidence of Existing Erosion	Stable or Unstable VEC
0	PAR-PS-1	2.5	Yes	Minor stream channel; cultivated fields on floor of valley with ephemeral flow	Loam soil	None	Stable
		4.8	Yes	Minor stream channel; riparian vegetation on floor of valley with ephemeral flow	Silty-clay soil	None	Stable
125	TAR-MCPY-2	0.42	No	Dry valley with scrub and rainfed cultivation delivers runoff into existing road drain alongside Kampala–Kiwumulo tarmac road	Sandy soil	Sheet erosion of soil	Potentially unstable
		0	Yes	Existing road drain alongside Kampala–Kiwumulo tarmac road	Sandy soil	None	Stable
126	ERU-MCPY-2	1.0	No	Scrub	Sandy soil	Sheet erosion of soil	Potentially unstable
185	ERU-PS-2	0.5	No	Grassland	Silty-clay soil	Sheet erosion of soil	Stable

NOTES: [1]Distance from start of road. The start of road is assumed as the junction with a national or district road. ERU – existing road upgrade. PAR – permanent access road. TAR – temporary access road.

Table 6.4-16 Project Facilities – Stability of Watercourses Nearby Installations

KP	Project Facility	Watercourse type[1]	Distance to Watercourse / VEC from Facility (m)	Land Cover	Likely Nature of Soil	Evidence of Existing Erosion	Stable or Unstable VEC
0	PS1	Ephemeral watercourse	650 (east)	Cultivated land	Loam	None	Stable
		Ephemeral watercourse	200 (south)	Cultivated land	Loam	None	Stable
		Ephemeral watercourse	300 (north west)	Cultivated land	Loam	None	Stable
40	MCPY1	Floodplain, ephemeral flow	70 (east)	Wooded grassland	Silty-clay	Sheet erosion of soil	Stable
125	MCPY2	Ephemeral watercourse	Within site	Cultivated land & wooded scrub	Sandy	Sheet erosion of soil	Potentially unstable
185	PS2	Ephemeral watercourse	70 (south west)	Scrub	Sandy	Sheet erosion of soil	Potentially unstable
191	MPCY3	Ephemeral watercourse	300 (north east)	Scrub	Sandy, silty	Sheet erosion of soil	Potentially unstable
		Ephemeral watercourse	500 (south west)	Scrub	Sandy, silty	Sheet erosion of soil	Potentially unstable
283	MPCY4	Ephemeral floodplain	400 (south east)	Wooded grassland	Silty-clay	None	Stable

NOTES: [1]There are no defined watercourses near some facilities, in such cases the appropriate receptor has been stated

Table 6.4-17 Estimated Median Monthly Flows at Main Watercourse Crossings, m^3/s

KP	River	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
15.4	Wambabya tributary	0.23	0.15	0.19	0.42	0.6	0.31	0.35	0.46	0.59	0.78	0.85	0.4	0.41
36	Kafu	0.35	0.23	0.18	0.88	1.52	1.12	0.73	0.66	2.17	3.81	3.38	1.48	1.00
54	Kafu tributary 1	0.03	0.02	0.02	0.08	0.13	0.10	0.07	0.06	0.19	0.33	0.29	0.13	0.09
69	Kafu tributary 2	0.16	0.11	0.08	0.39	0.67	0.50	0.33	0.29	0.96	1.69	1.50	0.66	0.44
105	Nabakazi tributary 1	0.04	0.02	0.02	0.10	0.16	0.12	0.08	0.07	0.23	0.39	0.35	0.15	0.11
112	Nabakazi tributary 2	0.04	0.02	0.02	0.09	0.16	0.12	0.08	0.07	0.22	0.38	0.34	0.15	0.10
147	Nabakazi	0.50	0.33	0.26	1.27	2.18	1.61	1.05	0.94	3.13	5.49	4.88	2.14	1.44
164	Katonga	1.83	0.74	0.56	1.35	2.91	2.32	1.87	1.77	3.49	5.86	5.48	3.01	2.09
274	Kibale	1.4	1.81	1.735	2.02	2.64	2.24	1.58	1.275	1.225	0.895	0.98	1.27	1.49
289	Jemakunya	0.04	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.04	0.01

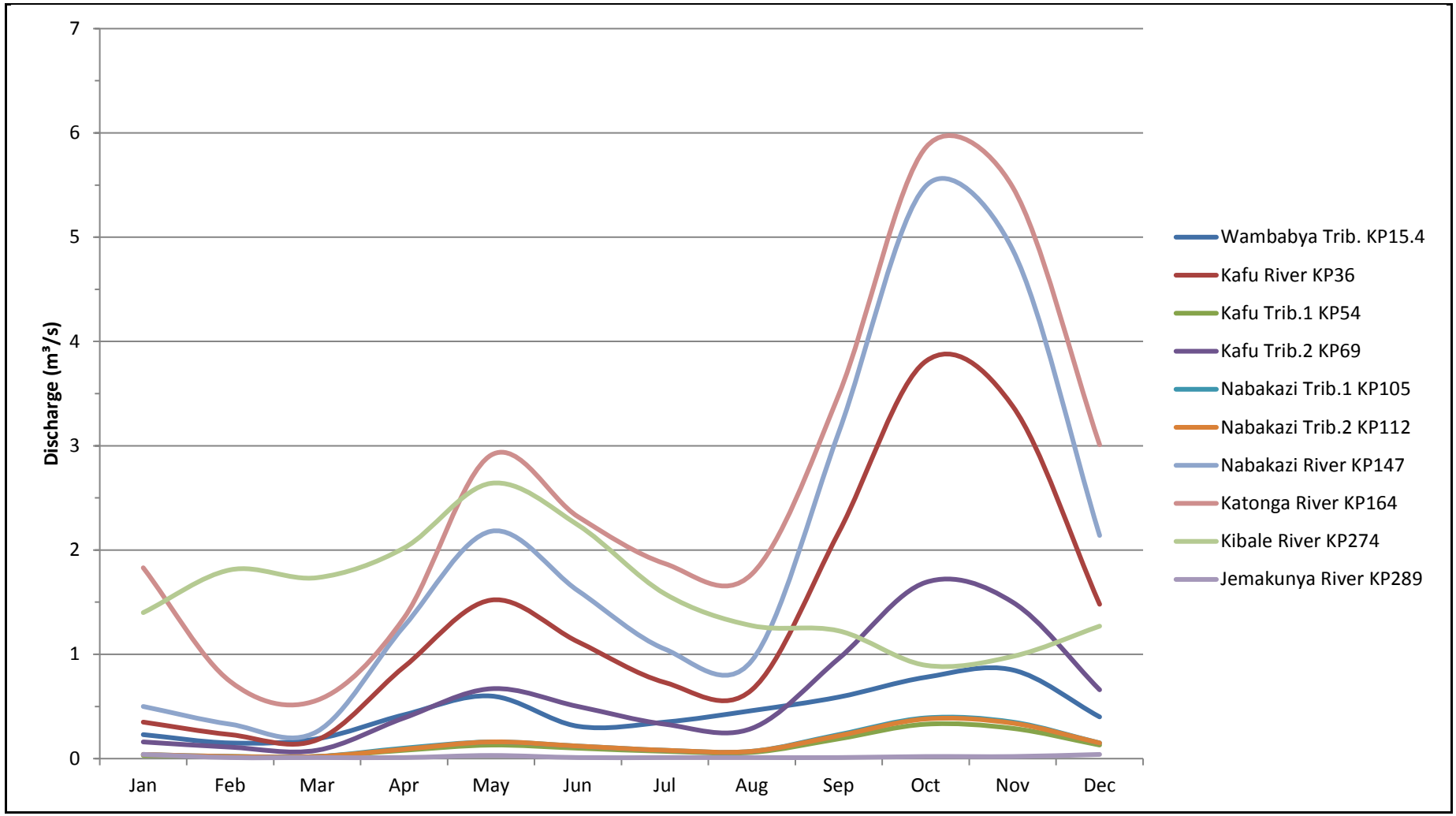


Figure 6.4-8 Streamflow Regime at Watercourse Crossings

River Channel Morphology and Stability

Pipeline Crossings

Table 6.4-18 presents estimates of stream power (a measure of the energy available to cause erosion and sediment transport) and an assessment of stream channel stability based on stream power, channel planform, bed and bank materials and riparian vegetation.

With the exception of the Jemakunya River, most channels are assessed as being stable. The Jemakunya River channel is formed in alluvial and lacustrine sediments. Its meandering planform and limited riparian vegetation relative to the other floodplains, which are dominated by swamp vegetation, suggest that the Jemakunya River channel may be unstable.

Road Crossings, Construction Facilities and AGIs

Table 6.4-15 and Table 6.4-16 present estimates of watercourse stability at road crossings and project facilities respectively. Most VECs are valley floors with poorly defined channels and ephemeral flow. The VECs along the temporary access road at MCPY2 and the existing road to be upgraded from MCPY2 to the RoW are assessed as being potentially prone to erosion.

The potential waterbodies and or watercourses which will receive site drainage at MCPY2, PS2 and MCPY3 are assessed as being potentially prone to enhanced erosion because of the drainage (see Table 6.4-16).

Table 6.4-18 Main Pipeline Crossings - River Channel Morphology and Stability

Watercourse	KP	Stream Power (W/m)[1]	Estimated Floodplain Width (m)	Channel Bankfull Width (m)	Channel Planform[2]	Channel Bed Materials	Channel Bank Materials	Riparian Vegetation	Stable or Unstable Channel
Upper Wambabya	15.4	521	180	ND	Sinuous (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kafu	36.5	85	500	ND	Sinuous (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kafu tributary 1	54.7	7	100	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kafu tributary tributary2	69.5	276	100	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Nabakazi tributary tributary1	105	125	250	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Nabakazi tributary tributary2	112.6	45	100	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Nabakazi	147.5	32	300	ND	Sinuous (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Katonga	164.7	56	200	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kibale	274.1	187	30	15	Sinuous (floodplain)	Silt, clay	Silt, clay	Riparian vegetation	Stable
Jemakunya	289.3	64	400	4	Meandering	Silt, clay	Silt, clay	Riparian vegetation	Potentially unstable

NOTES: [1]Stream power is calculated at the mean annual flood (see Appendix A6, Attachment A6.4). ND – no data

Water Quality, Sediment Quality and Sensitivity to Contamination

Water Quality

Water quality was assessed in relation to the national potable water specification (UNBS 2014). The national potable water specification is incorporated into the EACOP project standards. Onsite and laboratory analytical results showed good water quality in the rivers at the times of sampling with low levels of anthropogenic contamination. Exceedances of national potable water quality standards were observed for:

- iron: one exceedance of the limit for natural and treated waters
- total coliforms and E. coli: exceedances in all samples.

For hydrocarbons, a single sample from the Katonga River downstream of a bridge where vehicles collect water showed the presence of polycyclic aromatic hydrocarbons (PAH). All other analyses of hydrocarbons in the Katonga and other rivers were below detection limits at the times of sampling.

Overall, the water quality results are consistent with rivers in catchments with dispersed rural settlement, frequent use by livestock and people and for domestic purposes, and in which there are high rates of biological activity.

Sediment Quality

The concentrations of hydrocarbons and PAHs were below the detection limit at all the sites sampled. However, some metals were above the detection limit in several samples taken downstream of road bridges, which suggests that road runoff affects sediment quality at these locations.

Sensitivity of Watercourses to Potential Contamination

The sensitivity to potential contamination depends on the degree of existing contamination and was ranked according to the table for water quality sensitivity in Appendix D. Attachment A6.17 of Appendix A6 presents the assessment of the sensitivity of watercourses to potential contamination at pipeline crossings.

Attachment A6.18 of Appendix A6 presents the assessment of the sensitivity of watercourses to potential contamination at road crossings. Attachment A6.19 of Appendix A6 presents the assessment of the sensitivity of watercourses near project construction facilities to potential contamination.

Pipeline Crossings

Attachment A6.17 of Appendix A6 presents the assessment of the sensitivity of watercourses to potential contamination at pipeline crossings. The sensitivity to potential contamination depends on the degree of existing contamination and was ranked according to Table D9 for water quality sensitivity in Appendix D of the ESIA.

Except for the Kibale and Katonga Rivers, all the watercourses are assessed as having a moderate sensitivity to contamination. Their catchment areas support relatively dense, dispersed rural populations engaged in rain-fed, mostly subsistence agriculture with some livestock rearing. The natural vegetation has

been removed and riparian vegetation remains along drainage lines. The main watercourses are wetlands and support swamp vegetation. These rivers are contaminated by livestock and people using them for domestic purposes.

The Katonga and Kibale Rivers are considered to have a high sensitivity to contamination because their catchments have lower rural population densities and the water quality has fewer anthropogenic influences.

Road Crossings, Construction Facilities and AGIs

Attachments A6.18 and A6.19 of Appendix A6 present the assessment of the sensitivity of watercourses to potential contamination at road crossings and project facilities respectively.

All the watercourses crossed by project roads and near project facilities are ephemeral and most lack defined stream channels. Most watercourses are assessed as having a high sensitivity to contamination because their catchment areas are rural and sparsely populated. Water quality at times of flow is likely to be very good.

Some VECs at project facilities are land rather than a watercourse. For land VECs, the assessment is of the sensitivity to potential contamination of ephemeral surface runoff rather than ephemeral flow in a watercourse. The majority of VECs are assessed as having a high sensitivity to contamination. This is because their catchments are rural and sparsely populated. Water quality at times of flow is likely to be very good.

Water Accessibility and Scarcity for Community Use

An assessment of relative water scarcity for communities along the pipeline route, along project roads and near the construction facilities and AGIs is included in the surface water baseline study (see Appendix A6). The assessment of relative water accessibility and scarcity includes groundwater as a source of water supply (please refer to the “Water Scarcity and Accessibility for Community Use” section in Appendix A6 which explains the methodology). A summary is shown in Table A7.4-3 of Appendix A7.

Project Districts

The percentage of the population in districts and subcounties without access to safe water supplies and the percentage of non-functioning water sources have been estimated from the Uganda Water Supply Atlas 2017 (UMWE 2017c). Official statistics on lack of access to safe water supplies and non-functioning sources (i.e., pumps not working) suggest lower non-access rates but higher non-functionality at the northern and southern ends of the pipeline and higher but variable nonaccess rates and lower non-functionality along the central portion of the pipeline, an area dominated by pastoralism which traverses an area known as the cattle corridor (Figure 6.4-9). In all districts and sub-counties, non-functionality of borehole pumps and or handpumps is predominately due to technical breakdown (i.e., non-functioning) (20–60%) and, to a lesser extent, low yield (15–20%). Water quality is a cause of non-functionality in the Hoima, Kyankwanzi and Lwengo Districts.

Some district towns also have access to piped water from surface sources like rivers and swamps. Some parts of Gomba, Lwengo and Sembabule districts in the cattle corridor have limited access to surface water sources with community water points located relatively far from community habitations. Ranches and farms in these districts depend on privately constructed rainwater harvesting dams for their cattle.

Entrepreneurs collect water from rivers using vehicles and pumps to sell to people in urban areas. The water is generally of reasonable quality apart from coliform counts, restricting its potential uses without some form of treatment.

The Wambabya River is used for hydroelectricity generation at the Kabalega hydroelectric power station in Hoima District about 25 km downstream of the pipeline crossing.

Pipeline

Attachment A6.20 of Appendix A6 presents the assessment of water scarcity for communities along the pipeline. Within the 2-km corridor water scarcity study area along the pipeline, water scarcity was assessed as moderate at the northern end of the pipeline, high through the cattle corridor and moderate towards the southern end of the pipeline, mainly owing to the types and numbers of water supply infrastructure and their functionality. However, there is substantial variation within each zone, depending on local circumstances. Through the cattle corridor, from approximately KP80–250, water scarcity was assessed as high. In this zone, there are fewer boreholes. Groundwater is available in shallow wells, which are often unprotected and, therefore, at risk from microbiological contamination. People obtain water from valley dams and floodplains that they share with livestock. These sources are often contaminated and ephemeral, drying up during the dry season and droughts. However, water scarcity can be low locally, depending on the number and nature of water sources.

Road Crossings, Construction Facilities and AGIs

Attachments A6.21 and A6.22 in Appendix A6 present the assessment of water accessibility and scarcity for communities along the pipeline at road crossings and project facilities respectively.

Water accessibility and scarcity along project roads is variable and dependent on water supply infrastructure in villages and in rural areas along the roads. Near the temporary access road at MCPY1, water scarcity is assessed to vary from high to low depending on the water sources available for the villages of Kisenyi (high), Kasambya (moderate) and the boreholes at Our Lady of Fatima and Nyamigamba (low). Water scarcity along roads at MCPY2 (KP125) is moderate to low. Water scarcity along roads at PS2 and MCPY3 is high. There are few boreholes at these locations and people share valley dams with cattle.

Water accessibility and scarcity at facilities is similarly variable to that along project roads, as the roads are associated with facilities. At PS1 (KP0) and at MCPY1 (KP40), water scarcity varies locally from high to low. At MCPY2 (KP125), PS2 (KP185) and MCPY3 (KP191), water accessibility and scarcity is moderate to high due to the absence of functioning boreholes. At the southern end of the pipeline, at

MCPY4 (KP283) water scarcity is moderate to low, mainly owing to the greater functionality of boreholes.

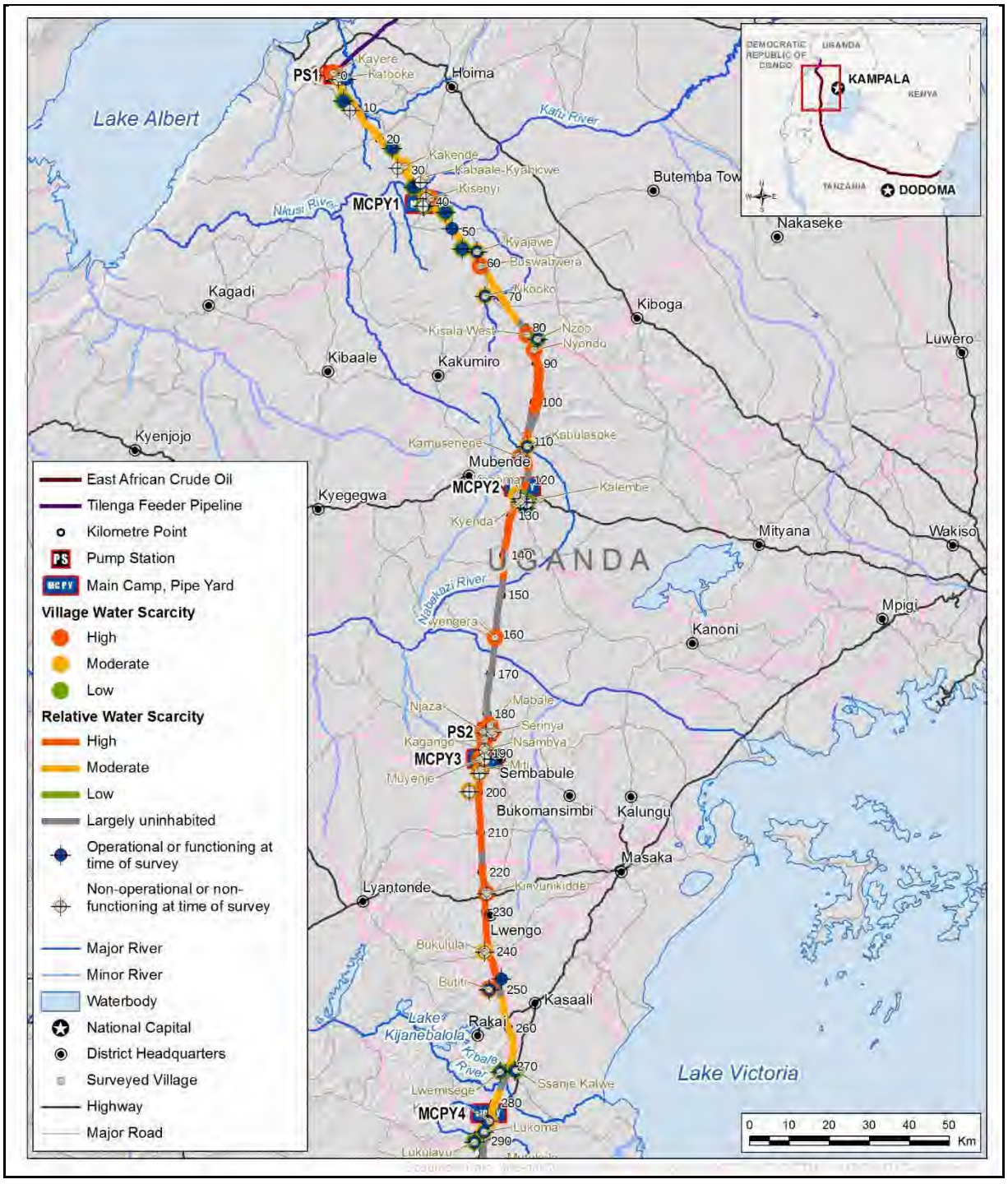


Figure 6.4-9 Water Accessibility and Scarcity Along the Pipeline

Trend in Condition and Sensitivity to Change

Flow and Flood Regimes

Several environmental changes have taken place in Uganda. Land cover has undergone rapid change because of increasing population pressures. Human

activities such as timber cutting, clearing of land for agriculture, settlement and overgrazing have affected the natural vegetation cover, which has resulted in deforestation, encroachment on wetlands (Government of Uganda 2016) and land degradation (MEMD 2013). Soil productivity has declined, and soil erosion is a major cause of river siltation (NEMA 2009). Increased pressure is also evident in the rangelands of the cattle corridor. Increasing livestock numbers have led to overgrazing of the savannah, reduced groundcover and increased soil erosion. Consultation and literature indicate that these processes are likely to intensify.

Water resources along the watercourses traversed by the AOI are relatively undeveloped and used mainly for livestock watering and domestic purposes. Water collection from the rivers is relatively small scale, but, as populations grow, and agriculture intensifies, the pressure to pump water from the rivers for public water supply and agricultural and commercial uses will increase. This is likely to lead to reduced flows downstream. Sensitivity to change therefore depends on current levels of use and likely future development.

As agriculture intensifies and soil degrades, flood volumes and peak flows may increase. Wetlands and swamps in floodplains tend to attenuate floods by slowing water velocities, thus delaying and reducing peak flows. Where there is wetland encroachment and conversion to farmland, increased flooding and flood risk may be expected. At the time of writing, it is unclear whether this is occurring in the rivers traversed by the AOI.

River Channel Morphology and Stability

Floods deliver water and sediment from the land to river channels. The rate of wetland siltation and floodplain swamp formation is likely to increase as soil erosion intensifies. As the floodplains are incised, continuing siltation maintains the stability of the river channels, providing the swamp vegetation cover remains. Over time, continuing siltation may cause water levels during floods to rise, thereby possibly causing increasing inundation of public infrastructure or informal settlements on floodplains.

Water and Sediment Quality and Sensitivity to Contamination

Water and sediment quality are coming under increasing pressure from growing populations and human activities. Increased pesticide and fertiliser use, and urbanisation in the agricultural catchments traversed by the AOI threatens water supplies and ecosystems in the long term. As water quality deteriorates, sensitivity to potential contamination is likely to reduce.

Ecosystem Services Provided

The watercourses and water bodies in the AOI described herein provide the following ecosystem services.

Provisioning services include:

- water for local people in rural communities, their livestock and agricultural activities.
- Water is also collected from rivers by entrepreneurs using vehicles and pumps to sell to people in urban areas.

- hydroelectricity generation at the Kabalega hydroelectric power station on the Wambabya River in Hoima District about 25 km downstream of the pipeline crossing.
- sources of water and food for visiting wild animals and birds.

Regulating services include:

- floodplains regulating floods by slowing water velocities; storing water on their surfaces, and transmitting water relatively slowly downstream and reducing peak flows
- wetlands along watercourses regulating water quality by acting as filters causing reduction of suspended sediment and associated metals, and local water purification through microbial breakdown of organic matter.

Habitat and species support include:

- waterbodies providing habitat and support for aquatic and terrestrial species.

Sensitivity Rankings

Flow Regime

Pipeline Crossings

Based on the trend in condition and the sensitivity to change, the sensitivity ranking of the main watercourses (VECs) at pipeline crossings with respect to their flow regimes and uses is shown in Table 6.4-19. Sensitivity has been ranked according to the table for surface water sensitivity in Appendix D.

Table 6.4-19 Surface Water Flow Sensitivity Rankings – Pipeline Crossings

Watercourse or VEC	KP	Sensitivity Ranking	Rationale for Ranking[1]
Upper Wambabya River	15.4	Moderate (3)	Provides water directly for rural communities and hydropower generation downstream. Water demand will rise.
Kafu River	36.5	Low (2)	Provides water directly for rural communities. Water demand will rise.
Kafu tributary 1	54.7		
Kafu tributary 2	69.5		
Nabakazi tributary 1	105		
Nabakazi tributary 2	112.6		
Nabakazi River	147.5		
Katonga River	164.7		
Kibale River	274.1		
Jemakunya River	289.3		

NOTE: [1]Rationale relates to the situation at the time of writing. Species and habitats of conservation concern have been considered within the biodiversity VEC in Section 8.2

Road Crossings

Table 6.4-20 shows the sensitivity ranking of the watercourses traversed by project roads with respect to their flow regimes.

Table 6.4-20 Surface Water Flow Sensitivity Rankings – Road Crossings

KP	Road ID	VEC Location (Road KP)[1]	Sensitivity Ranking	Rationale for Ranking
0	PAR-PS-1	2.5	Low (2)	Waterbody provides water for rural communities and livestock.
		4.8		
125	TAR-MCPY-2	0.42	Very low (1)	Waterbody does not provide a source of water supply for rural communities and livestock.
		0		
126	ERU-MCPY-2	1.0		
185	ERU-PS-2	0.5	Low (2)	Waterbody provides water for rural communities and livestock.

NOTES: [1]Distance from start of road. The start of road is assumed as the junction with a national or district road. ERU – existing road upgrade. PAR – permanent access road. TAR – temporary access road.

Construction Facilities and Aboveground Installations

Table 6.4-21 presents the sensitivity ranking of the flow regime to changes in watercourses near project facilities.

Table 6.4-21 Surface Water Flow Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse or VEC	Sensitivity Ranking	Rationale for Ranking
0	PS1	Ephemeral watercourse (650 m east)	Low (2)	Watercourses provides water for rural communities and livestock.
		Ephemeral watercourse (200 m south)		
		Ephemeral watercourse (300 m north west)		
40	MCPY1	Ephemeral watercourse (70 m east)		
125	MCPY2	Ephemeral watercourse within site	Very low (1)	Watercourse does not provide water for rural communities and livestock.
185	PS2	Ephemeral watercourse (70 m south west)	Low (2)	Watercourse provides a source of water supply for rural communities and livestock at livestock watering points 70 m and 400 m from PS2.

Table 6.4-21 Surface Water Flow Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse or VEC	Sensitivity Ranking	Rationale for Ranking
191.5	MPCY3	Ephemeral watercourse (300 m north east)	Low (2)	Livestock watering point 800 m from MPCY3 provides water for rural communities and livestock.
		Ephemeral watercourse (500 m south west)	Very low (1)	Does not provide water for rural communities and livestock.
288	MPCY4	Ephemeral floodplain (400 m south east)	Low (2)	Floodplain provides seasonal source of water for rural communities and livestock.

River Channel Morphology and Stability

Pipeline Crossings

Based on the trend in condition and the sensitivity to change, the sensitivity ranking of the morphology and the stability of the main watercourses at pipeline crossings is shown in Table 6.4-22. Sensitivity has been ranked according to the table for surface water sensitivity in Appendix D.

Table 6.4-22 River Channel Morphology and Stability Sensitivity Rankings – Pipeline Crossings

Watercourse or VEC	KP	Sensitivity Ranking	Rationale for Ranking
Upper Wambabya River	15.4	Low (2)	Channel formed in uncohesive materials (sand, silt) with thick continuous floodplain swamp vegetation.
Kafu River	36.5		
Kafu tributary1	54.7		
Kafu tributary 2	69.5		
Nabakazi tributary 1	105.0		
Nabakazi tributary 2	112.6		
Nabakazi River	147.5		
Katonga River	164.7		
Kibale River	274.1	Low (2)	Channel formed in cohesive materials (silt, clay) with thick continuous riparian vegetation.
Jemakunya River	289.3	Moderate (3)	Channel formed in cohesive materials (silt, clay) with a narrow zone of continuous riparian vegetation.

Road Crossings

Table 6.4-23 presents the sensitivity ranking of watercourses crossed by project roads for morphology and stability.

Table 6.4-23 River Channel Morphology and Stability Sensitivity Rankings – Road Crossings

KP	Road ID	VEC Location (Road KP)[1]	Sensitivity Ranking	Rationale for Ranking
0	PAR-PS-1	2.5	Low (2)	Minor channel formed in cohesive materials. Cultivated fields in a valley floor with ephemeral streamflow.
		4.8		
125	TAR-MCPY-2	0.42	Moderate (3)	Ephemeral valley floor with uncohesive soil materials but a cover of scrub vegetation and rainfed cultivation.
		0	Low (2)	Existing road drain alongside Kampala–Kiwumulo tarmac road.
126	ERU-MCPY-2	1.0	High (4)	Ephemeral valley floor with uncohesive soil materials with a cover of scrub vegetation.
185	ERU-PS-2	0.5	High (4)	Valley floor with uncohesive soil materials with a cover of scrub vegetation. Ephemeral flow.

NOTES: [1] Distance from start of road. The start of road is assumed as the junction with a national or district road. ERU – existing road upgrade. PAR – permanent access road. TAR – temporary access road.

Construction Facilities and Aboveground Installations

Table 6.4-24 presents the sensitivity ranking of watercourses (VECs) near project facilities for morphology and stability.

Table 6.4-24 River Channel Morphology and Stability Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse or VEC	Sensitivity Ranking	Rationale for Ranking
0	PS1	Ephemeral watercourse (650 m east)	Low (2)	Watercourse in loam soil, with scrub-vegetation cover and rain fed cultivation.
		Ephemeral watercourse (200 m south)		
		Ephemeral watercourse (300 m northwest)		
40	MCPY1	Ephemeral floodplain (70 m east)		Floodplain in cohesive materials with cover of wooded-grassland.
125	MCPY2	Ephemeral watercourse (within site)	Moderate (3)	Watercourse in uncohesive materials and wooded scrub-vegetation cover.

Table 6.4-24 River Channel Morphology and Stability Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse or VEC	Sensitivity Ranking	Rationale for Ranking
185	PS2	Ephemeral watercourse (70 m southwest)	High (4)	Watercourse in uncohesive materials with cover of scrub-vegetation.
191.5	MPCY3	Ephemeral watercourse (300 m northeast)		Watercourse in uncohesive materials with cover of scrub-vegetation.
		Ephemeral watercourse (500 m southwest)		
288	MPCY4	Ephemeral floodplain (400 m southeast)	Low (2)	Floodplain with cohesive materials, with cover of wooded grassland.

Water and Sediment Quality and Sensitivity to Contamination

Pipeline Crossings

Based on the trend in condition and the sensitivity to change, the sensitivity ranking of the 10 watercourses (VECs) at pipeline crossings with respect to potential contamination is shown in Table 6.4-25. Sensitivity has been ranked according to the table for surface water sensitivity in Appendix D.

Table 6.4-25 Water and Sediment Quality and Sensitivity to Contamination Sensitivity Rankings – Pipeline Crossings

KP	Watercourse/VEC	Sensitivity Ranking	Rationale for Ranking
15.4	Upper Wambabya River	Moderate (3)	Rural catchment, densely settled with rain-fed cultivation, some plantation agriculture with swamp vegetation along floodplain.
36.5	Kafu River	Moderate (3)	Rural catchment, densely settled with rain-fed cultivation with swamp vegetation along floodplain.
54.7	Kafu tributary 1		
69.5	Kafu tributary 2		
105	Nabakazi tributary 1		
112.6	Nabakazi tributary 2		
147.5	Nabakazi River		
164.7	Katonga River	High (4)	Rural catchment, sparsely settled with rain-fed cultivation with swamp vegetation along floodplains. Only minor contamination from vehicles collecting water.

Table 6.4-25 Water and Sediment Quality and Sensitivity to Contamination Sensitivity Rankings – Pipeline Crossings

KP	Watercourse/VEC	Sensitivity Ranking	Rationale for Ranking
274.1	Kibale River	High (4)	Rural catchment, sparsely settled with lakes and swamp vegetation along floodplains.
289.3	Jemakunya River	Moderate (3)	Rural catchment, densely settled river valleys.

Road Crossings

Table 6.4-26 summarises the results of the assessment of the sensitivity of watercourses (VECs) traversed by project roads to potential contamination.

Table 6.4-26 Sensitivity to Contamination Sensitivity Rankings – Road Crossings

KP	Road ID	VEC Location (Road KP)[1]	Sensitivity Ranking	Rationale for Ranking
0	PAR-PS-1	2.5	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow.
		4.8		
125	TAR-MCPY-2	0.42	Low (2)	Runoff with good quality from natural catchment will mix with road drainage water of poor quality.
		0	Very low (1)	Water quality in existing road drain may be poor.
126	ERU-MCPY-2	1.0	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow.
185	ERU-PS-2	0.5	High (4)	Rural catchment, sparsely settled with livestock rearing. Water quality likely to be very good during periods of flow.

NOTES: [1] Distance from start of road. The start of road is assumed the junction with a national or district road. ERU – existing road upgrade. PAR – permanent access road. TAR – temporary access road. Project roads at MCPY3 and MCPY4 do not cross watercourses.

Construction Facilities and Aboveground Installations

Table 6.4-27 presents the sensitivity of watercourses (VECs) near project facilities to potential contamination.

Table 6.4-27 Sensitivity to Contamination Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse/ VEC	Sensitivity Ranking	Rationale for Ranking
0	PS1	Ephemeral watercourse (650 m east)	Moderate (3)	Rural catchment, densely settled with subsistence cultivation and livestock rearing. Water quality likely to be reasonably good during periods of flow.
		Ephemeral watercourse (200 m south)		
		Ephemeral watercourse (300 m northwest)		
40	MCPY1	Ephemeral floodplain (70 m east)	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow.
125	MCPY2	Ephemeral watercourse within site		
185	PS2	Ephemeral watercourse (70 m southwest)		
191	MPCY3	Ephemeral watercourse (300 m northeast)		
		Ephemeral watercourse (500 m southwest)		
283	MPCY4	Ephemeral floodplain (400 m southeast)		

Key Considerations

Key considerations for surface water VECs are summarised below for:

- flow in watercourses
- river channel morphology and stability
- water and sediment quality and sensitivity to contamination.

Flow in Watercourses

Flow in watercourses traversed by the AOI is considered to have a low or very low sensitivity to change. This is because there are relatively few uses of the watercourses other than providing water for a dispersed rural population and livestock. Present and likely future demand, based on the available information, are relatively low. The exception is the Wambabya River, which is used for hydroelectricity generation at the Kabalega hydroelectric power station in Hoima district about 25 km downstream of the pipeline crossing. The Wambabya River is considered to have a moderate sensitivity to change in flow.

The sensitivity to change in flow is also low or very low at road crossings and near project facilities since the watercourses either provide water to a rural population and livestock by means of a livestock watering point or seasonal floodplain or are assessed as not providing water.

River Channel Morphology and Stability

The morphology and stability of the watercourses traversed by the AOI are considered to have a low sensitivity to change. This is because the floodplains contain swamp vegetation that limits flow velocities, inhibits erosion and makes the watercourses very stable. The exception is the Jemakunya River, which is considered to have a moderate sensitivity to change. The Jemakunya River has a relatively narrow zone of riparian vegetation along its channel, which increases the risk of instability.

Of the watercourses traversed by project roads in the AOI, two are considered to have a high sensitivity to change:

- the watercourse at road KP1.0 on the existing road to be upgraded from MCPY2 (KP126) to the pipeline RoW
- the watercourse at road KP0.5 on the access road to PS2 (KP185).

These watercourses are valley floors with uncohesive materials and scrub vegetation; defined channels are absent.

Of the watercourses near project facilities, four are considered to have a high sensitivity to change:

- the watercourse southwest of PS2 (KP185)
- the watercourse to the north east of MCPY3 (KP191)
- the watercourse to the south west of MCPY3 (KP191)
- the ephemeral floodplain at MCPY4 (KP283).

The watercourses at PS2 and at MCPY3 are formed in uncohesive and easily erodible materials and have a cover of scrub vegetation.

Water and Sediment Quality and Sensitivity to Contamination

The following watercourses crossed by the pipeline were considered to have a high sensitivity to contamination:

- Katonga River
- Kibale River.

Their catchments are sparsely settled rural areas and predominantly rangeland. Pollution sources are limited to livestock and people using the rivers.

For the same reasons, the following watercourses traversed by project roads were considered to have a high sensitivity to contamination:

- the watercourse at road KP2.5 on the permanent access road at PS1 (KP0)
- the watercourse at road KP1.0 on the access road to the pipeline RoW from MCPY2 (KP126)
- the watercourse at road KP0.5 on the existing road to be upgraded to PS2 (KP185).

Similarly, the following watercourses adjacent to project facilities were considered to have a high sensitivity to contamination:

- the ephemeral floodplain east of MCPY1 (KP40)
- the ephemeral watercourse south west of PS2 (KP185)
- the ephemeral watercourse north east of MCPY3 (KP191)
- the ephemeral watercourse south west of MCPY3 (KP191)
- the ephemeral floodplain south east of MCPY4 (KP283).

6.4.2.3 Groundwater

This section describes:

- groundwater AOI and broader region
- the baseline condition of groundwater:
  - trends affecting groundwater
  - sensitivity of groundwater to change
  - ecosystem services provided
  - groundwater sensitivity rankings
- key considerations.

For more information, see Appendix A7: Groundwater Baseline Report.

Area of Influence

The groundwater AOI during the project construction and operational phase will encompass aquifers:

- affected by project groundwater abstraction
- that may be affected by planned discharges and spills, and leaks of fuels and chemicals by the project.

During construction, the AOI will include aquifers crossed by the RoW and aquifers from which groundwater will be abstracted for the MCPYs and other construction activities. During the approximate 25-year operational phase, the AOI will include aquifers crossed by the RoW.

Baseline Condition of Groundwater

Aquifer Characteristics

The AOI traverses areas that are characterised by unconsolidated fluvial, sedimentary and basement aquifers. In all the districts that are traversed, groundwater is an important source of public water supply. A review of Ministry of Water and Environment (MWE) published data (2008a, 2008b, 2012a, 2012b and 2012c) indicates that groundwater quality is generally good in all districts.

A summary of aquifer characteristics is presented in Table 6.4-28.

Sampling was undertaken at 11 locations during the field survey. No exceedances of the national water quality standards (The Uganda Standard, US EAS 12: 2014) or the project standards for the parameters tested in the laboratory were identified.

Table 6.4-28 Summary of Aquifer Geology and Characteristics

District, Approximate KP Range and Project Facilities or AGIs	Geological Formations and Aquifer Lithology	Soil Description[1]	Main Water Strike[2] (mbgl) (Average)	Static Water Level (mbgl) (Mean Value)[3]	Vulnerability[4]	Yield (m^3/h) and Recharge[5]
Hoima KP0–40 PS1 near KP0 MCPY1 near KP40	Regolith and fluvial sediments (palaeochannels); Tertiary–Quaternary sediments within the Rift Valley system predominantly sandstones, siltstones, claystones and shales	Clay loams (petric plinthosols)	52	17	High	Yield: 6.3 Recharged by rainfall
	Precambrian basement (weathered and fractured crystalline bedrock): shales, arkoses and quartzites; undifferentiated gneisses and granulite facies rocks		43	19		Yield: 4.1 Recharged by rainfall
Kakumiro/ Kyankwanzi KP40–100	Precambrian basement (weathered and fractured crystalline bedrock): phyllites and schists with basal quartzites and amphibolites; undifferentiated gneisses and granulite facies rocks	Loamy sand; sandy/silty clay loam	38	27	High	Yield: 1.75 Recharged by rainfall

Table 6.4-28 Summary of Aquifer Geology and Characteristics

District, Approximate KP Range and Project Facilities or AGIs	Geological Formations and Aquifer Lithology	Soil Description[1]	Main Water Strike[2] (mbgl) (Average)	Static Water Level (mbgl) (Mean Value)[3]	Vulnerability[4]	Yield (m^3/h) and Recharge[5]
Mubende KP100–160 MCPY2 near KP126	Precambrian basement (weathered and fractured crystalline bedrock): undifferentiated gneisses and in the north granulite facies rocks; Buganda-Toro Series: argillites (phyllites and schists) with basal quartzites and amphibolites	Gravelly sandy loam	47	23	High	Yield: 2.38 Recharged by rainfall Poor yields owing to deep water table causing wells to often break down; DWO is considering installing piped groundwater systems to facilitate access for communities
Sembabule KP180–220 PS2 near KP180 MCPY3 near KP191	Precambrian basement (weathered and fractured crystalline bedrock): undifferentiated acid and basic gneisses; Buganda-Toro system: mica schist, quartz mica schist and undifferentiated schist and acid gneisses	Sandy clay loam	64	36	Low	Yield: 1.78 Recharged by rainfall Poor yields owing to deep water table causing wells to often break down; DWO is considering installing piped groundwater systems to facilitate access for communities

Table 6.4-28 Summary of Aquifer Geology and Characteristics

District, Approximate KP Range and Project Facilities or AGIs	Geological Formations and Aquifer Lithology	Soil Description[1]	Main Water Strike[2] (mbgl) (Average)	Static Water Level (mbgl) (Mean Value)[3]	Vulnerability[4]	Yield (m^3/h) and Recharge[5]
Rakai KP240–290 MCPY4 near KP283	Precambrian basement rocks (weathered and fractured crystalline bedrock): undifferentiated acid and basic gneisses	Sandy clay loam	45	34	Moderate	Yield: 2.1 Recharged by rainfall
	Precambrian Buganda-Toro system: mica schist, quartz mica schist and undifferentiated schist and acid gneisses			24	Moderate	
	Precambrian Karagwe-Ankolean system: quartzites, quartzose sandstones sandstones, conglomerates and some shales and phyllites			18	High	

SOURCE: From district groundwater reports provided by DWRM (2012a, 2012b).

NOTES: KP = kilometre point; AGI = aboveground installation; MCPY = main camp and pipe yard; PS = pumping station; DWO = district water officer

[1]Based on field observations during the baseline survey in November 2017

[2]Main water strike is the level at which groundwater is first encountered during drilling

[3] Static water level refers to the level of water in a well under normal, undisturbed, no-pumping conditions

[4] Recharge data from BGS (2017); qualitative information on yield was obtained during the field survey; average airlift yields from district groundwater reports provided by DWRM (2008a, 2008b; 2012a, 2012b, 2012c)

[5] Sensitivity of a valued environmental and social component (VEC) as a function of the vulnerability based on the ground conditions (permeability) and depth to the water table.

Trend in Condition and Sensitivity to Change

Groundwater will continue to be a primary source of water for the population in all districts with shallow wells and boreholes providing water for over 60% of the population (MWE 2017).

Population growth is likely to increase the reliance of local communities on groundwater for domestic use. Data on past groundwater quality and water levels was not available to undertake an accurate assessment of trends of these aspects. However, the information available was considered sufficient to support this assessment. Groundwater in both the sedimentary and basement aquifers is considered highly sensitive to change.

Ecosystem Services Provided

The groundwater in the AOI provides the range of ecosystem services set out below.

Provisioning services include:

- groundwater supplying freshwater for community use.

Regulating services include:

- groundwater supporting aquatic and riparian habitats and wildlife, both directly (where groundwater feeds wetlands) and indirectly (where groundwater maintains surface water flows).

Sensitivity Rankings

Table 6.4-29 summarises the sensitivity ranking for groundwater.

Table 6.4-29 Groundwater VEC Sensitivity Ranking

District	Groundwater VEC	Sensitivity Ranking	Rationale for Ranking
Hoima	Sedimentary and basement aquifers	High (4)	Quality of the groundwater is good and is the primary source of water for 68% of the population. Boreholes and wells, at the time of writing, are between 500 m and 1 km from the RoW.
Kakumiro–Kyankwanzi	Basement aquifers	Medium (3)	Although quality of the groundwater is good, at the time of writing, the boreholes and wells are more than 1 km from the RoW.
Mubende	Basement aquifers	Medium (3)	Quality of the groundwater is good; boreholes and wells, at the time of writing, are between 500 m and 1 km from the RoW; however, yields are poor due to a deep-water table.
Gomba	Basement aquifers	High (4)	No data on quality is available from DWRM.

Table 6.4-29 Groundwater VEC Sensitivity Ranking

District	Groundwater VEC	Sensitivity Ranking	Rationale for Ranking
Sembabule	Basement aquifers	Very high (5)	Quality of the groundwater is good; boreholes and wells, at the time of writing, are between 500 m and 1 km from the RoW; however, yields are poor due to a deep-water table. Groundwater is the primary source of water for a very high percentage (96%) of the population.
Lwengo	Basement aquifers	High (4)	Quality of the groundwater is good; it is the primary source of water for a very high percentage (87%) of the population.
Rakai	Basement aquifers	High (4)	Quality of the groundwater is good; boreholes and wells, at the time of writing, are between 500 m and 1 km from the RoW.

Key Considerations

The key considerations are summarised below:

- the sensitivity rankings of groundwater VECs are medium to very high, depending on the district in question
- groundwater is an important ecosystem service.

6.4.2.4 Landscape

This landscape section describes the:

- landscape AOI
- baseline condition of the landscape:
  - the landscape character for the AOIs for PS1 and 2
  - trends affecting the condition of the landscape and views, and sensitivity to change
  - ecosystem services provided
  - landscape sensitivity rankings
- key considerations.

For more information, see Appendix A8: Landscape Baseline Report which includes information on views of the AGIs.

Area of Influence

The project components included in the AOI are PS1 and 2. Other project components, such as other AGIs, MCPYs and the RoW, were screened out during scoping, as they are considered unlikely to have major impact on visual receptors. This was confirmed during the landscape field survey.

The PS1 and 2 landscape AOI was set provisionally at a 5-km radius, see Figure 6.4-10 and Figure 6.4-11, based on an initial study using engineering information and satellite images to identify the location of potential receptors.

The field survey confirmed that most PS1 and 2 views will be restricted to within 1–3 km except for a few vantage points from higher hills that extend the AOI in some directions to the 5-km radius.

The PSs are permanent and will remain operational over the lifetime of the project, so the temporal AOI will be approximately 25 years.

Baseline Condition of Landscape

Introduction

The AOI traverses a mixed landscape of gently undulating grasslands and farmland, hills with open plateaus and bare rocky outcrops, forested areas, wetlands and, near the border with Tanzania, a drier, more sparsely vegetated landscape. Most of the AOI is in an area of modified habitat with the exception of a few sections that are within, or adjacent to, FRs that are less modified. Areas of high biodiversity value are often linked to sensitive landscapes, as they can possess valued or rare natural scenic features, such as forests. However, the areas affected by the AOI have been affected by human activity for farming and grazing and are of low landscape sensitivity.

Landscape Character

Pumping Station 1

The PS1 AOI consists of undulating to hilly terrain, which rises from approximately 650 m above sea level (masl) in the west to over 1300 masl in the southeast; see Figure 6.4-10. PS1 is on a slightly elevated area (1083 masl) of an escarpment that includes some pronounced hills.

The landscape is characterised by farmland, comprising grazing (grassland) and mixed cropland dominated by maize and sugar cane, interspersed with clusters of trees and scrubland. Field patterns are typically irregular with field boundaries usually defined by changes in crop type or land use, although simple fencing made of tree branches strung with wire or scrub hedges demarcate some of the plots.

A section of the Wambabya FR is within the AOI, 3 km to the east of PS1, and remains mostly intact, although field observations show some encroachment by farming and logging for charcoal (see Appendix A1 Botany Biodiversity Baseline Report). There is no marked change in landscape character between the wet and dry seasons, although groundcover (e.g., grasses) becomes dry and sparse during the dry season.

There are two quiet, small, mainly agricultural settlements along a sealed main road that traverses the AOI north to south, parallel to Lake Albert. There are small trading centres within the two settlements, where there is a slight increase in activity, although this is restricted to relatively small areas. Another quiet, small agricultural settlement is to the east of PS1. Other areas of habitation are limited to smaller agricultural settlements and isolated farms surrounded by cultivated land,

all accessed by local unsealed roads. Although a predominantly rural, agricultural landscape, the main road and a telecommunication mast are indicators of limited development within the AOI.

Most of the landscape within the AOI has been modified by human activity. Although rural in nature, the landscape has lost most of its natural vegetation, except for the forest remaining in the Wambabya FR. Stakeholders did not perceive the proposed project infrastructure as negative visual intrusions in the landscape and no tourist attractions were identified. The Wambabya FR was identified as having biodiversity value in the biodiversity baseline, Section 6.4.1.1 and Appendix A1 Botany Biodiversity Report. It contains intact forest that increases the landscape sensitivity due to its natural scenic value. However, there are no views of PS1 from the reserve and it is therefore not considered further within the landscape baseline.

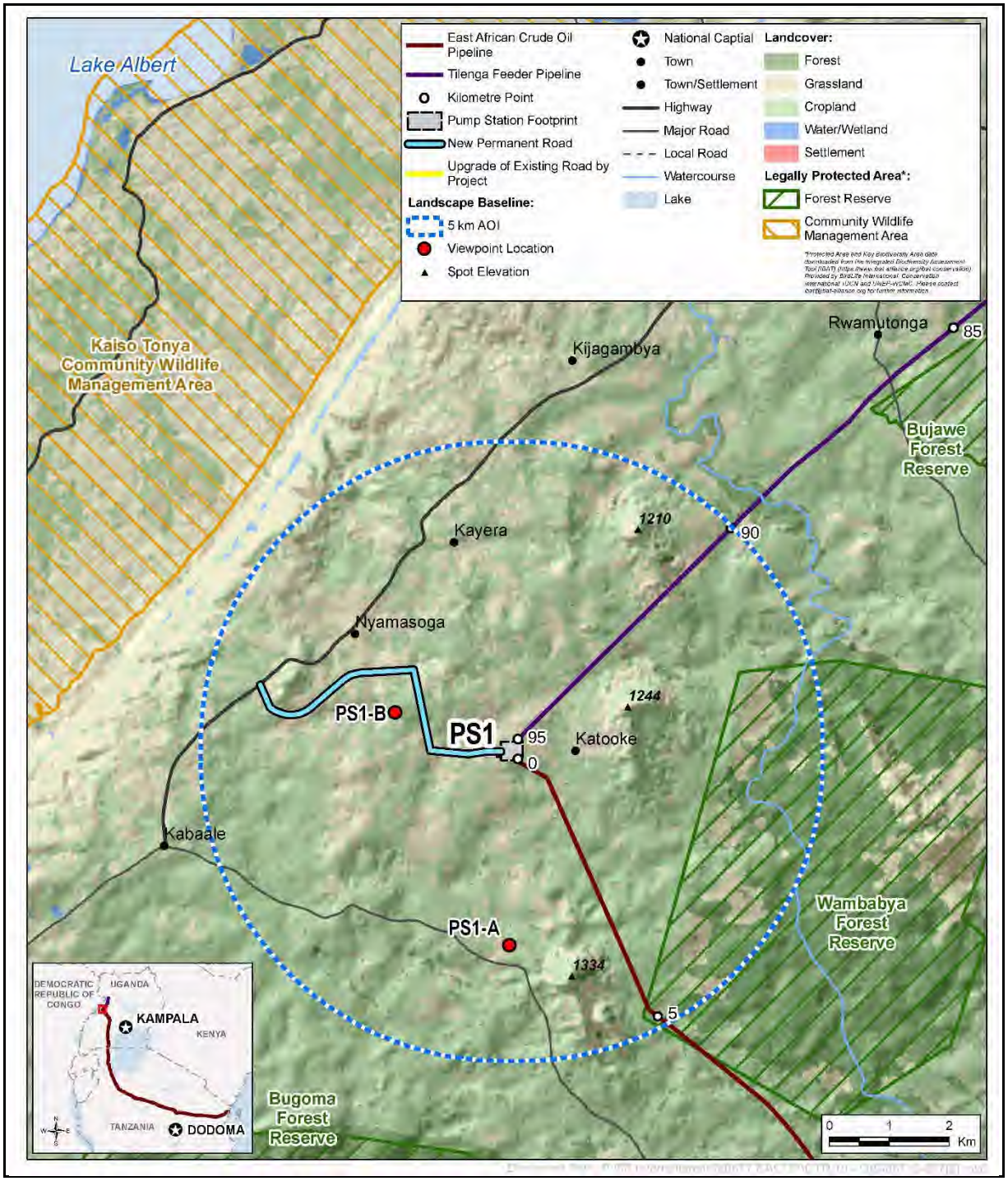


Figure 6.4-10 Area of Influence, and Pumping Station 1 Viewpoint Photograph Locations

Pumping Station 2

The PS2 AOI consists of undulating terrain, with several hills rising to more than 1300 masl, separated by seasonally inundated, low-lying areas; see Figure 6.4-11.

The landscape is characterised by grazing land interspersed by scrub and some trees. There is little evidence of farming, other than small gardens directly adjacent to dwellings. Simple fencing made of tree branches strung with wire or scrub

hedges demarcate grazing plots. Some tree plantations, predominantly pine and eucalyptus, are within the AOI. There is no marked change in landscape character between the wet and dry seasons because of the density of tree and scrub vegetation, although groundcover (e.g., grasses) becomes dry and sparse during the dry season.

The area is remote, with a widely dispersed population. There are four quiet, small agricultural settlements along the unsealed main road that traverses the AOI north–south and four similar settlements distributed along local unsealed roads. There is a small trading centre within one of the settlements, Selinya, where there is a slight increase in activity, although this is restricted to a relatively small area. Other than these settlements, occasional livestock farms with associated *kraal*[4] dot the landscape.

Although remote, this is not a wild or particularly scenic landscape, as human activities have altered it over time. Stakeholders did not perceive the proposed project infrastructure as negative visual intrusions in the landscape and no tourist attractions were identified. There are no areas of biodiversity value within the AOI that would have natural scenic value.

[4] Livestock enclosure

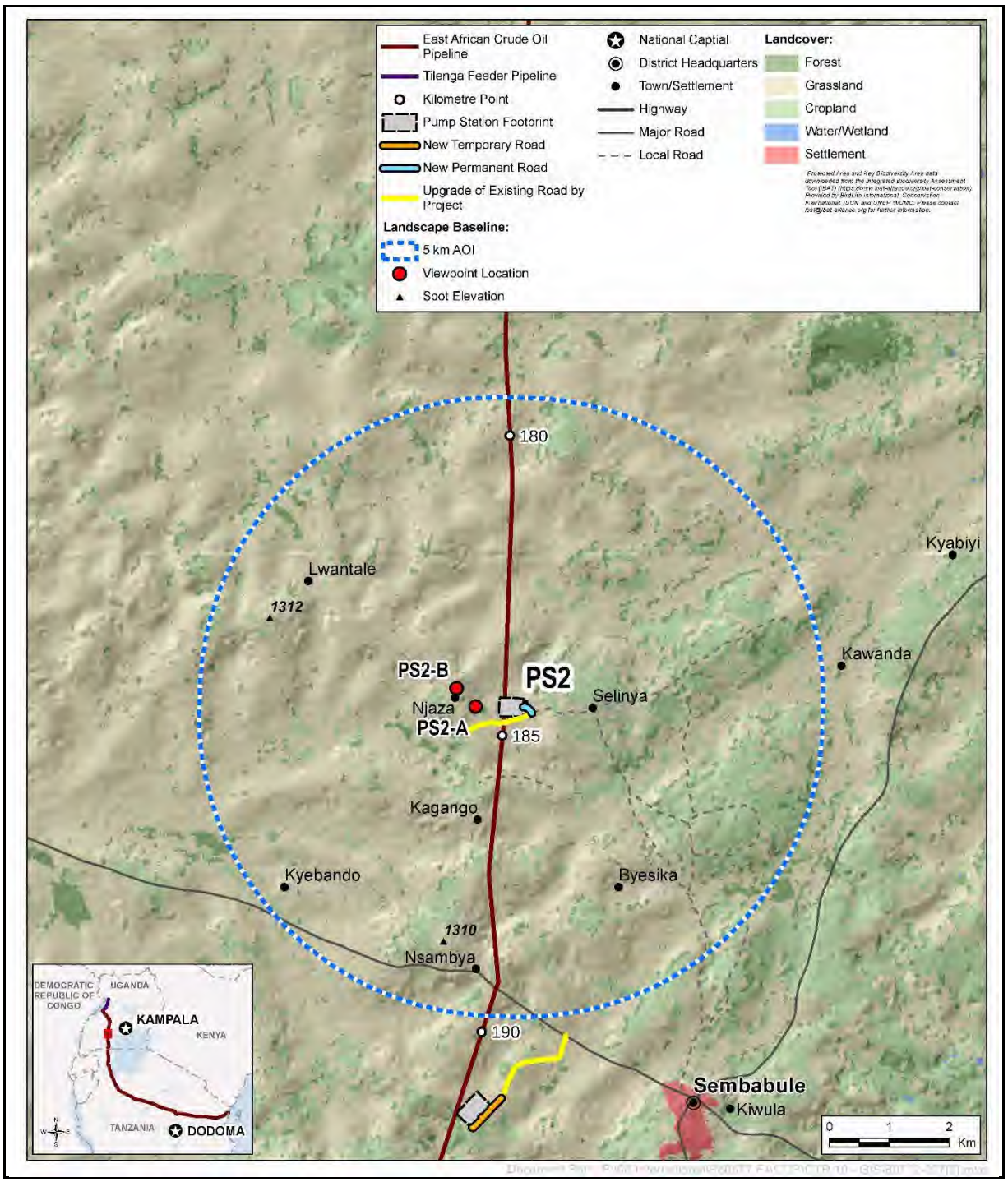


Figure 6.4-11 Area of Influence, and Pumping Station 2 Viewpoint Photograph Locations

Trend in Condition and Sensitivity to Change

Pumping Station 1

PS1 is in an area that, over time, has been converted from a mixture of grassland and scrub to farmland. This trend is predicted to continue, maintaining the rural landscape character of the AOI.

The sealed main road to the west of the AOI has not resulted in increased development, but this may change if oil industry related activities, such as a refinery, are developed. The landscape is expected to be able to tolerate further similar change or modification without change to its present character, so is not regarded as sensitive to change.

Pumping Station 2

PS2 is in an area that has seen gradual conversion from grassland and scrub to predominantly grazing land, which is sparsely settled. This trend appears to be continuing. The landscape is expected to be able to tolerate further similar change or modification without change to its present character, so is not regarded as sensitive to change.

Ecosystem Services Provided

Landscape provides the following ecosystem services:

Cultural services include:

- nonmaterial benefits from the sense of wellbeing and value provided to people by living in an attractive environment.

However, stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape and the two areas do not attract tourists (see Appendix C Stakeholder Engagement and Appendix A11 Socio-economic and Health Baseline Report). Consideration of the ecosystems and local context suggest that landscape values at these two locations are limited. The sites are remote, the local environments comprise highly modified habitat, and there is minimal current or potential tourism in the area.

Sensitivity Rankings

Based on the survey and engagement with stakeholders and trend in condition and sensitivity to change, the sensitivity of the landscape character and visual receptors within the PS1 AOI have been ranked and are shown below in Table 6.4-30.

Table 6.4-30 Pumping Station 1: Landscape Receptor Sensitivity Ranking

Landscape Receptor	Sensitivity Ranking	Rationale for Ranking
Farmland landscape	Low (2)	Agricultural landscape tolerant of further similar change.
Small settlements, farms and users of unsealed roads	Low (2)	Stakeholders did not perceive the proposed project infrastructure as negative visual intrusions in the landscape.

Based on the survey and engagement with stakeholders and the trend in condition and sensitivity to change, the sensitivity of the landscape character and visual receptors within the PS2 AOI have been ranked and are shown below in Table 6.4-31.

Table 6.4-31 Pumping Station 2: Landscape Receptor Sensitivity Ranking

Landscape Receptor	Sensitivity Ranking	Rationale for Ranking
Grazing land, grassland and scrub	Low (2)	Agricultural landscape tolerant of further similar change.
Small settlements, farms and users of unsealed roads	Low (2)	Stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape.

Key Considerations

For the PS1 AOI, most of the landscape has been modified by human activity. Although rural in nature, the landscape has lost most of its natural scenic value and it is of low landscape sensitivity.

Although remote, the landscape sensitivity of the AOI for PS2 is low: it is not a wild or particularly scenic landscape, as human activities have altered it.

Stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape and no tourist attractions were identified.

6.4.2.5 Air Quality

This section describes:

- air quality AOI
- baseline condition of air quality
  - baseline characteristics
  - trends in condition and sensitivity to change
  - ecosystem services
  - sensitivity rankings
- key considerations.

For more information, the air quality baseline report is included in Appendix A9.

Area of Influence

The AOI for air quality depends on the nature and scale of each source of project emissions. The AOI is established by modelling and is the distance to the furthest receptor where the air quality standards are met. Changes in substance concentrations are likely to be measurable within a few kilometres of these facilities. The AOI for emissions from construction activities and project vehicles will be no more than a few hundred metres from each source.

Baseline Condition of Ambient Air Quality

Nitrogen dioxide (NO_2), nitrogen oxides (NO_x), ozone (O_3), sulphur dioxide (SO_2) and volatile organic compound (VOC) concentrations were measured using continuous monitoring using diffusion tubes over three four-week periods between 31 October 2017 and 14 February 2018. Spot measurements of particulate matter

(PM) and carbon monoxide (CO) concentrations were made on five occasions at each location during this period using calibrated instruments.

Table 6.4-32 presents the average substance concentrations recorded at PS1 and PS2

Table 6.4-32 Summary of Average Measured Baseline Substance Concentrations

Substance	Average Concentration in Each Facility AOI (µg/m^3 Unless Otherwise Specified)		Project Environmental Standard (PES) (µg/m^3 unless otherwise specified)
	PS1	PS2	
NO_2	5	4	40 (annual average) 150 (24-hour average) 120 (8-hour average) 200 (1-hour average)
NO_x	6	4	No PES
O_3	81	77	100 (8-hour average, daily maximum)
SO_2	<1	<1	50 (annual average) 20 (24-hour average) 500 (10-minute average)
Benzene	2.5	1.2	No PES
Total VOC	132	97	6,000 (24-hour average)
PM_{10}[1]	56	34	20 (annual average) 50 (24-hour average) 200 (1-hour average)
$PM_{2.5}$	52	29	10 (annual average) 25 (24-hour average)
CO (mg/m$^{3)}$	0	0	10 (8-hour average) 30(1-hour average) 60 (30-minute average) 100 (15-minute average)

The following observations and conclusions can be made from the ambient air quality monitoring results presented in Appendix A9, noting that comparisons with the PES are indicative only as the sampling and PES averaging periods do not match:

- concentrations of NO_2, and NO_x are low at all locations and show a high degree of uniformity between the two PSs. No sample measured greater than 12 µg/m^3
- concentrations of VOC are low at all locations and show a high degree of uniformity between the two PSs. No sample measured greater than 398 µg/m^3
- at all locations and in all the surveys, CO measurements were below the limit of detection of the technique used

- of 23 SO_2 measurements, 20 recorded results below the limit of detection of the technique used
- ground-level O_3 concentrations are moderate and consistent across the locations. This uniformity is expected, as ozone is not a directly emitted substance, but is formed by reactions in the atmosphere and, therefore, changes are normally seen at a regional scale and are not sensitive to local emission sources.
- particulate concentrations are high and, in some cases, exceed the PES included in Appendix F. This is to be expected given the dusty nature of the environment.
- the surveys undertaken for this study focussed on the PSs. However, it is reasonable to assume that the levels of substances found in these areas will be representative of the air quality for most of the project's AOI throughout Uganda.
- a marked increase in the concentrations of NO_2, NO_x, O_3 and SO_2 in the third (final) sample round, relative to the first two rounds, was recorded at all sampling locations. For PM spot monitoring was undertaken on five occasions, and an increase in concentrations was observed in the final two measurements when compared to the earlier three measurements. There is no clear explanation for the increases observed.
- NO_x, VOC and PM concentrations at the measuring location PS1-1, in the small settlement of Kyabalendere, are higher than those measured at the more isolated stations around PS1. This is likely to be a result of the greater traffic and general activity close to the sampling location.
- around PS2, the roadside locations PS2-3 and PS2-4 (see Figure A9.2.2 in Appendix A9) show consistently higher PM concentrations than the non-roadside sites. PS2-3 shows a similarly higher NO_x level, but PS2-4 which lies further from the road does not.
- substance levels recorded within small settlements and at the side of roads were measured to be greater than at other locations.

Trend in Condition and Sensitivity to Change

Air quality is sensitive to change, reacting to emission sources which are almost always associated with human activity. These activities can include vehicles, nonroad machinery for construction, industry or agriculture; and burning for agriculture, waste disposal, cooking or heating.

The substances included in this baseline will be emitted during project activities, change the air quality within a limited distance of the source, and will return to background levels a short time after the activity has ceased.

Sensitivity to change is related to how close the baseline levels are to the standards. The baseline survey has shown the VEC to have a low level of sensitivity to NO_x, VOC, CO or SO_2 emissions, and that sensitivity to changes in PM is greater as the baseline levels are moderate to high. NO_x and VOC are the primary precursors of low-level O_3, which had moderate baseline levels. As such, emissions of NO_x and VOC are important in the control of O_3 formation on a regional scale.

No historical air quality data for identifying trends in development and activity in the AOI have been identified, so air quality trends were not established.

Based on the air quality surveys, engagement with stakeholders, trend in condition and sensitivity to change, the sensitivity of the air quality related receptors within the AOI has been ranked and is shown in Table 6.4-33. The sensitivity is determined by two primary factors:

- the quantity and nature (including likely exposure patterns) of VECs (predominantly people) that are sensitive to air quality
- the baseline levels of substances present, relative to project environmental standards, which determines the environment's capacity to accommodate new emission sources without substance levels becoming potentially harmful.

The sensitivity rankings are shown in Table 6.4-33.

Table 6.4-33 Air Quality VEC Sensitivity Ranking

VEC and Specific Sensitivity	Sensitivity Ranking[1]	Rationale
Sensitivity to dust	Very low (1) to moderate (3)	Dust sensitivities are highly transient and geographically variable, and therefore it is inappropriate to apply rankings at a large scale and impracticable to identify small-scale variations in advance. Most of the AOI for dust will be sparsely occupied by people. Where the AGIs will be constructed the areas are of low ecological value. The AOI will occasionally include buildings, crops and animals of moderate sensitivity.
Sensitivity to gaseous emissions	Moderate (3)	Long term exposure to O_3 must be assumed as the AOI is regional.
Sensitivity to airborne fine PM	Low (2) to very high (5)	Baseline concentrations are moderate to high, with exceedances of standards.[2] The range reflects the variability of public presence.
Sensitivity to hydrocarbon vapour – refuelling sites' AOIs	Very low (1)	Impacts of this activity will be highly localised and members of the public are highly unlikely to be present within the area of impact.

NOTES: [1]The definitions of sensitivity are described in the VEC sensitivity tables included in Appendix D.
[2]All comparisons of baseline concentrations are indicative owing to differences in sampling periods and averaging periods of standards.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Key Considerations

High levels of airborne fine PM, above standard levels, were consistently detected by the baseline survey.

Much of the project's AOI is sparsely populated.

There is capacity in the environment for gaseous emissions without harmful levels being reached. However, ground-level O_3 concentrations were found to be moderately high. As such, control of NO_x and VOC, the primary precursors of ground-level O_3, will be important in limiting regional-scale O_3 levels.

6.4.2.6 Acoustic Environment

This section describes the:

- acoustic AOI
- baseline conditions
  - acoustic character
  - trends in condition and sensitivity to change
  - ecosystem services
  - sensitivity rankings
- key considerations

Baseline acoustic conditions were measured in the AOI.

For more information, the acoustic baseline report is included in Appendix A10.

Area of Influence

AOIs apply to existing, planned new and upgraded construction access roads, PS1 and 2, MCPY1–5 and the RoW.

The AOI was set at a 500-m radius around the PSs, MCPYs, access road and RoW, based on a review of engineering information and satellite images taking into consideration likely noise emission levels and to identify the location of potential receptors.

The PSs are permanent and will remain operational over the lifetime of the project, so the temporal AOIs for PS1 and 2, and the access roads will be approximately 25 years. For the temporary construction access roads and MCPYs, the temporal AOI is the period of construction, approximately three years.

Baseline Condition of the Acoustic Environment

Acoustic Character

Pumping Station 1

The noise environment in the PS1 AOI is consistent with a rural environment with interspersed farming, localised traffic on unsealed roads and small-scale human settlements. The noise environment was observed and considered to be made up of human interactions (traffic and pedestrian movement, domestic and commercial agriculture – crops and livestock) and some wildlife noise (birds and insects).

Quantified noise levels during the day around PS1 were measured at 32–55 dB(A) $L_{90,1hr}$ and 40–56 dB(A) $L_{eq,1hr.}$ At night they were measured at 26–47 dB(A) $L_{90,1hr}$ and 36–53 dB(A) $L_{eq,1hr}$. The PES against which operational impacts are assessed is 35 dB(A) $L_{Aeq,T}$. For large periods of time, the current noise environment is already exceeding the PES.

Watercourse and existing industrial (plant) noise was not observed in the PS1 AOI.

These levels of noise are considered consistent to what would be expected in the given environment.

Pumping Station 2

The noise environment in the PS2 AOI is similar to PS1. The landscape is slightly different to the PS1 AOI with less large-scale farming, and more varied vegetation. However, the proximity to settlements and motorised traffic roads is similar to that of the PS1 AOI.

Quantified noise levels during the day around PS2 were measured at 29–45 dB(A) $L_{90,1hr}$ and 41–53 dB(A) $L_{eq,1hr}$, and 29–43 dB(A) $L_{90,1hr}$ and 35–52 dB(A) $L_{eq,1hr}$ at night. The PES against which operational impacts are assessed is 35 dB(A) $L_{Aeq,T}$. For large periods of time the current noise environment is already exceeding the PES.

Watercourse and existing industrial (plant) noise was not observed in the PS2 AOI.

These levels of noise are considered consistent to what would be expected in the given environment.

Main Camps and Pipe Yards 1–4

The noise environment in the AOI surrounding MCPY 1-4 is similar to those identified at the AOI for the PSs. Although the environment changes (some are more vegetated than others and some have more intensive farming), the noise environment was observed to consist of similar sources, including motor vehicles (particularly motorbikes), localised farming activities (predominantly restricted to hand tool use), bird song and wind through vegetation.

Watercourse and existing industrial (plant) noise was not observed in any of the MCPY AOIs.

As for the PSs, large-scale settlements are outside the acoustic AOI, but smaller groups of dwellings are within the AOI.

Quantified noise levels during the day around the MCPYs are in the range of 33–41 dB(A) $L_{90,1hr}$ and 45–55 dB(A) $L_{eq,1hr}$.

Although the ranges across each AOI for the MCPYs is relatively large (8–10 dB(A)), this is expected from short duration measurements, and varies with specific activities, such as vehicle movements, during each measurement. However, the magnitudes measured are in the order that would be expected in such an environment and is consistent throughout the RoW.

Right-of-Way

The landscape and environmental components of the RoW AOI vary dramatically. However, the noise character is very similar. This is due to the absence of large-scale road networks, industrial and commercial facilities, and other intense noise sources. The main noise sources contributing to baseline conditions throughout the RoW include wind through vegetation, localised and larger scale farming, people interactions (with land, livestock and each other), motorised vehicle movements (dominated by motorbikes) and occasional construction activities.

In the most remote areas of the RoW, there is an absence of human induced noise. However, there is also the absence of human receptors.

The noise associated with terrestrial fauna was not considered to be dominant through any of the monitoring surveys, although the noise environment across the RoW did include some bird, insect and occasional amphibian noise (frogs at night).

Given the similarity of noise sources along the RoW, and the varying contribution of such sources throughout a given time period, the levels measured across the RoW can be considered to be a good representation of the range of levels to which the baseline noise environment is exposed. This is particularly the case given the short-term nature of noise measurements (i.e., 1-hour measurements).

Quantified noise levels during the day through the RoW are in the range of 27–42 dB(A) $L_{90,1hr}$ and 41–59 dB(A) $L_{eq,1hr}$ and 26–47 dB(A) $L_{90,1hr}$ and 35–53 dB(A) $L_{eq,1hr}$ at night. The PES against which operational impacts are assessed is 35 dB(A) $L_{Aeq,T}$.

Construction Access Roads

As for the RoW, the noise environment surrounding proposed new and upgraded construction access roads varies according to time of day, fluctuation in traffic flow and proximity to existing roads. The noise environment around road upgrades is expected to be higher due to the proximity to existing traffic noise. Therefore, levels are more likely to be in the upper region of values experienced in the RoW. The noise environment around new construction access roads will experience lower levels due to the absence of existing road traffic noise.

Trend in Condition and Sensitivity to Change

Pumping Station 1

Although classed as rural, the area has been developed over time and there are settlements and basic infrastructure, including murram roads, clay brick structures and power cables. However, there is no fixed industrial or mechanical plant noise nearby.

The introduction of a sealed main road to the west of the AOI has not increased development, but this may change if oil industry related activities, such as a refinery, are developed.

The noise environment around PS1 ranges from around a maximum of 55 dB(A) $L_{90,1hr}$ daytime to lowest 26 dB(A) $L_{90,T}$ night time and is characterised by natural noises (bird song, wind through trees and weather), manual human interactions and

vehicle noise. The area is exposed to intermittent but regular high noise events resulting from road traffic, and often these can be perceived as more intrusive than a steady noise source. Therefore, the introduction of a steady noise source (assuming the absence of disturbing characters such as impulsive or tonal features) into the area will not necessarily be highly sensitive. For large periods of time, the current noise environment is already above the PES. Therefore, the AOI has the potential to tolerate changes to the existing noise environment.

Pumping Station 2

Although classed as rural, within the eastern African context, the area has been developed over time and there are settlements and basic infrastructure, including murram roads, clay brick structures and some power cables. However, there is no fixed industrial or mechanical equipment noise nearby.

The noise environment around PS2 ranges from a maximum of 45 dB(A) $L_{90,1hr}$ daytime to lowest 29 dB(A) $L_{90,T}$ night time and is characterised by natural noises (bird song, wind through trees and weather), manual human interactions and vehicle noise. Daytime levels were measured to be lower than night levels, but it is expected that night noise levels will be as low as daytime levels, over a longer period of observation. The area is exposed to intermittent but regular high noise events resulting from road traffic, and often these can be perceived as more intrusive than a steady noise source. Therefore, the introduction of a steady noise source (assuming the absence of disturbing characters such as impulsive or tonal features) into the area will not necessarily be highly sensitive. The baseline noise levels are relatively low and therefore the magnitude of noise from the operation of PS2 will be critical to the tolerance the AOI has to change in the noise environment. However, for some periods of time the current noise environment is already above the PES.

Right of Way, Main Camp Pipe Yards and Access Roads

The impacts, and tolerance to change, across the AOI for the RoW, MCPYs and construction access roads will be from temporary activities such as construction and operation of camps.

The noise environment throughout the AOI, particularly around human habitations and settlements, has been exposed to road construction using heavy machinery and although vehicle movements have the potential to increase, the character of the noise source is not new to most of the areas. Sensitivity will be greater where new access roads are created than where existing roads will be used to facilitate project access.

Therefore, given the temporary nature of the noise emissions associated with the wider acoustic AOI, and the experience of similar noise emissions, the tolerance to change is considered relatively high. This will depend on actual magnitude of emissions.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Rankings

Based on the survey, engagement with stakeholders and trend in condition and sensitivity to change, the sensitivity of the acoustic environment for AGIs, construction facilities, RoW and access roads across the AOI has been ranked (Table 6.4-34). The sensitivity ranking is reasonably generic across the AOI.

Table 6.4-34 Acoustic Receptor Sensitivity Ranking – Presence in Area of Influence

Project Component	Receptor				
	Very Low	Low	Moderate	High	Very High
PS1	-	X	X	X	-
PS2	-	X	X	X	-
MCPY1	-	X	X	X	-
MCPY2	-	X	X	X	-
MCPY3	-	X	X	X	-
MCPY4	-	X	X	X	-
RoW	X	X	X	X	-
Construction access roads	X	X	X	X	-

NOTES: Very low – No human receptors other than project workforce and visitors to the project. Area is not considered frequented or used by fauna.
Low – Locations used for recreation and industrial activities, such as industrial units and workshops. Workers outside the project site or not engaged in project work (i.e., not part of the project workforce). Fauna have the potential to pass through the area but this is not a common occurrence. Area not known to be used for breeding, feeding, habitation or migration of fauna
Moderate – Locations used for work requiring concentration, such as offices. Area known to be used regularly by local fauna for regular movement.
High – Locations used for rest and sleep such as residential properties. Educational establishments and places of worship. Area known to be used for regular feeding or migration of local fauna.
Very High – Locations used by vulnerable people such as hospitals and homes for the elderly. Area used to be known for fauna habitation or breeding.

Key Considerations

The acoustic baseline study did not identify sensitive receptors classed as very high anywhere in the acoustic AOI, although very low to high sensitivity receptors were identified across the RoW, MCPYs and PS AOIs.

The noise environment across most of the AOIs, particularly around AGIs, is dominated by human induced sources such as road traffic, farming and general human interactions. Therefore, the addition of temporary noise sources during construction and operation of MCPYs is unlikely to be of concern. As there is an absence of industrial and commercial noise throughout the RoW AOI, and due to the character of this noise not being heard at sensitive receptors in the AOI, there is a higher likelihood that the noise from PSs will be noticeable in the existing

environment. This does not necessarily mean it will dominate, as this will depend on the magnitude of emissions.

6.4.3 Socio-economic and Health Environment

This section describes the:

- socio-economic and health AOI
- baseline conditions of socio-economic and health along the route:
  - trend in condition and sensitivity to change
  - ecosystem services provided
  - sensitivity ranking
- key considerations.

Baseline conditions are described for the following VECs:

- economy
- local economy (nonland-based livelihoods)
- land-based livelihoods
- river- and lake-based livelihoods
- land and property
- workers' health, safety and welfare
- social infrastructure and services
- community health
- community safety, security and welfare.

The section also includes an overview of governance, demography and education.

For more information see Appendix A11, Socio-economic and Health Baseline Report.

6.4.3.1 Area of Influence

The spatial AOI for the construction, operation and decommissioning phases of the project is identified at three levels:

- national and regional
- district (including the subdivisions of districts: county, subcounty and parish) through which the pipeline passes, in which project facilities are located or which could be associated with other project activities such as transportation
- potentially affected communities (PACs). PACs include hamlets, villages, trading centres and towns within a geographical boundary defined by project land take requirements, construction and operation activities. Based on the adopted methodology of purposive sampling (see Section A11.3 and Section A11.3.2.2 in Appendix A11) the geographical boundary was determined as approximately 4 km either side of the pipeline and 4 km around construction facilities and AGIs where PACs were identified to potentially experience a range of direct and indirect impacts, such as air and noise pollution, land take and project induced in-migration (PIIM).

There are nine districts, 41 parishes, 22 subcounties, four town councils (TCs) and an estimated 172 villages and hamlets traversed and passed by the project.

6.4.3.2 Methods

Three teams performed the study: a social team, a health team and a human rights team, who collaborated to develop the socio-economic and health baseline.

The screening report and scoping stakeholder engagement was conducted by the social and health teams between 19 April and 1 June 2017 at national, district and PAC levels. It provided primary and secondary data on the main socio-economic and health characteristics relevant to the project and enabled the identification and initial description of the VECs (see scoping report for details on the stakeholder engagement). During the scoping phase, 82 meetings were held, and 1,848 people were reached.

Subsequent secondary and primary data were collected at national and district levels through Small Groups Interviews (SGI) and Key Informant Interviews (KII) which enabled further descriptions of the VEC.

The health team conducted eight SGIs with health service providers (including the district health management teams) across the districts traversed by the AOI. The aim was to obtain quantitative and qualitative data on the main health concerns in the district, and to assess the capacity of district health facilities. The guide used for the interviews was based on the health management and information system (HMIS) and ensured that the environmental health areas (EHA) framework required by the IFC performance standards was followed. In addition, 13 district health services were assessed using the service availability and readiness assessment (SARA) tool.

Based on this data PACs were identified. To develop a sample of PACs for inclusion in the social study, the following process was undertaken.

Sites (areas) within a 4 km distance of construction facilities, the pipeline route, AGIs and access roads were identified using a purposive sampling strategy. The following criteria were used to identify the sites:

- in each district and subcounty traversed by the AOI, at least one site was identified
- sites within 4 km of planned EACOP facilities and activities were included
- sites representing all the characteristics listed below:
    - different levels of urbanisation: urban (town), rural (village, hamlet, trading centre)
    - different levels of isolation (remote and well-connected)
    - different density of agricultural land parcels (dense and dispersed parcels)
    - presence of grazing land
    - presence of tourism facilities
    - presence of mining activities
    - presence of fishing activities (lake and river)
    - natural habitats (protected and designated areas)
    - vicinity of access roads.

Thirteen sites were identified, which formed the sample sites for the data collection. In each of those sites, the PACs were identified. Figure 6.4-12 and Figure 6.4-13

show the sample sites and sample PACs for the social, health and human rights baseline studies.

The PAC data provided qualitative and quantitative elaborations on the district data. In-depth data collected at PAC level were embedded in the district and national context to ensure both depth and breadth.

This methodology was adopted because a statistical random sampling approach was not appropriate due to the initial lack of reliable data on the number and location of PACs in the AOI and the linear nature of the project (296 km). In addition, statistical sampling could have led to a sample of PACs that did not necessarily include all socio-economic characteristics.

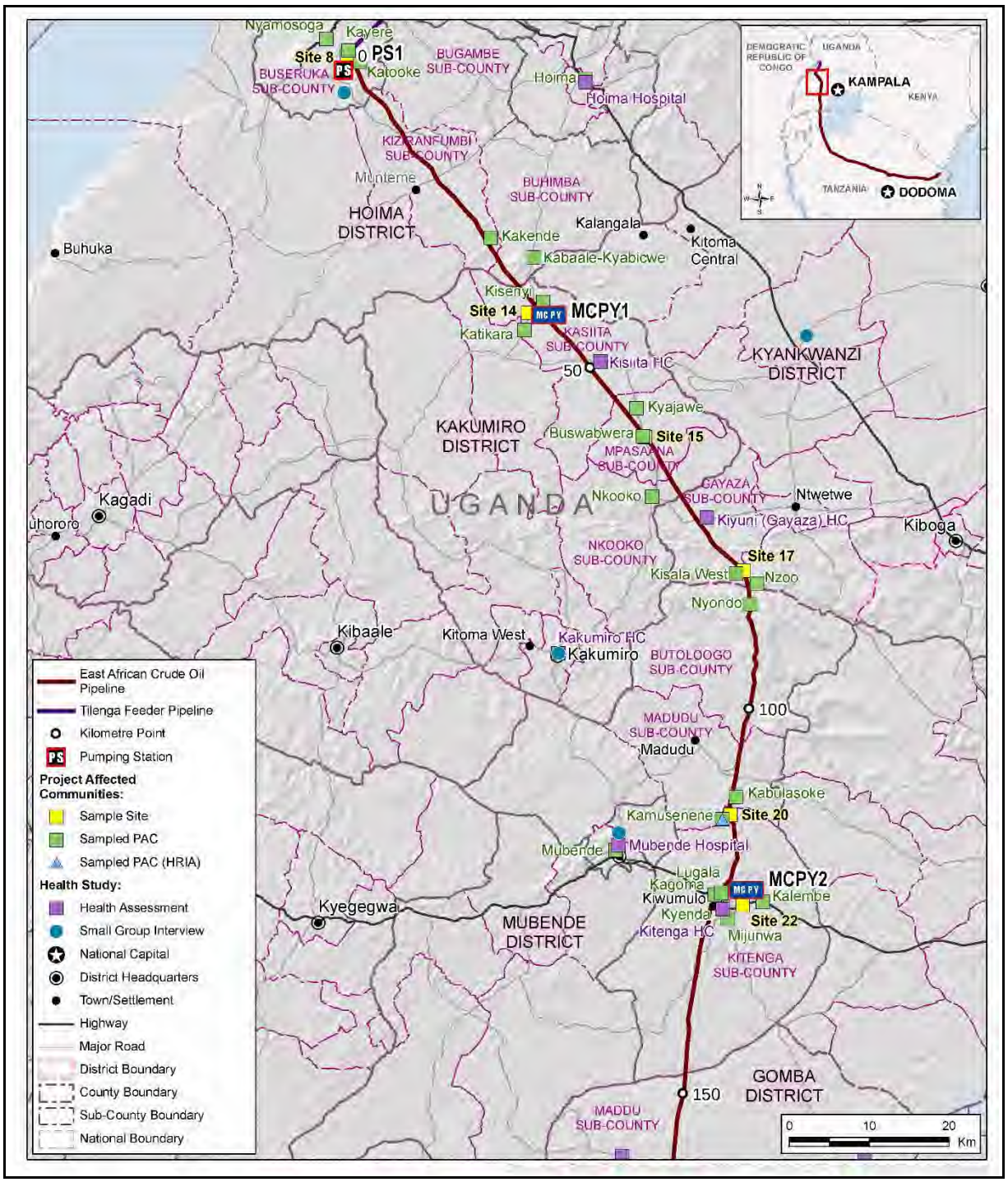


Figure 6.4-12 Sample Sites and Potentially Affected Communities – North

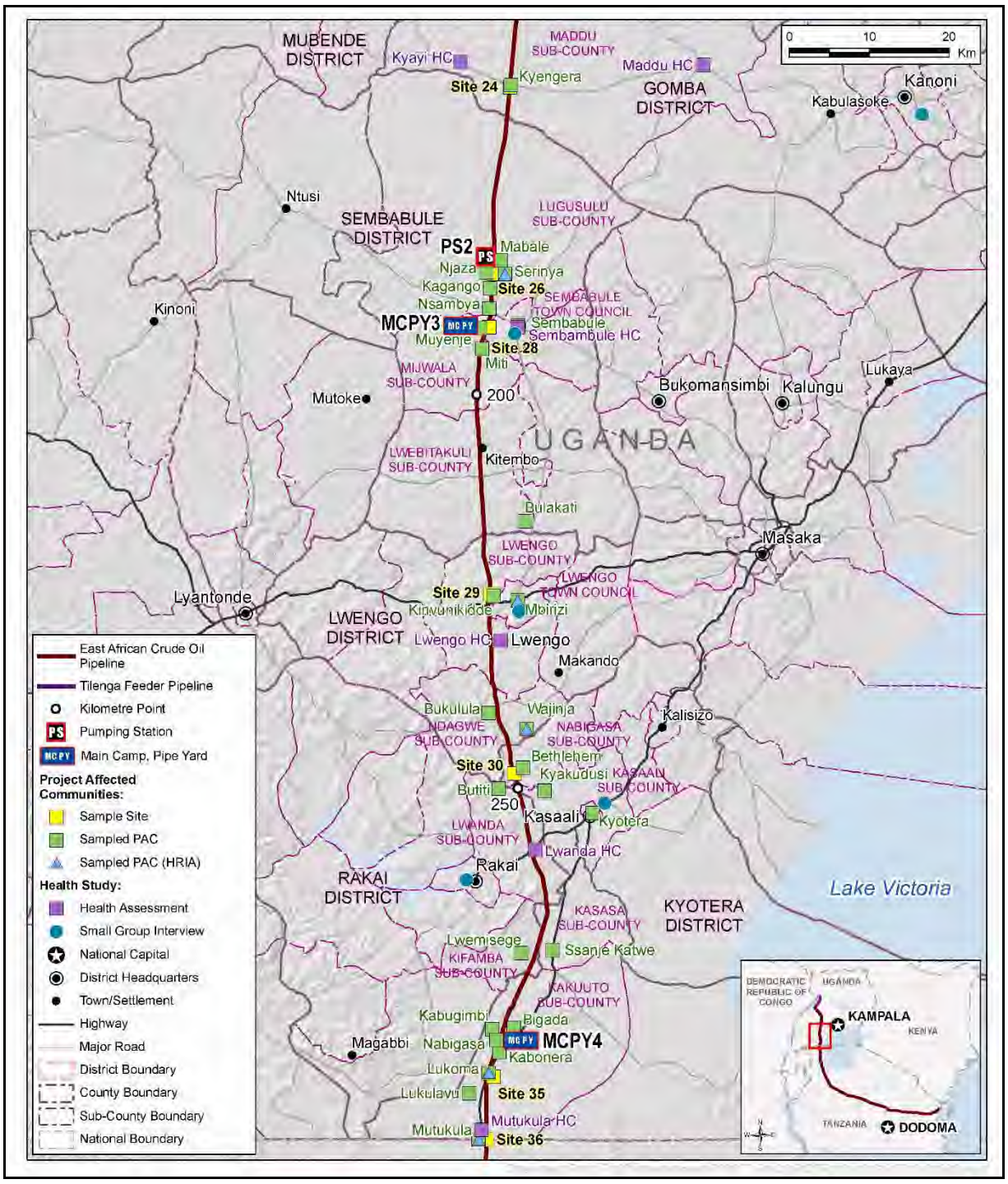


Figure 6.4-13 Sample Sites and Potentially Affected Communities – South

Primary data collection at sample site and sample PAC levels included various steps, outlined below.

Step 1: Compilation of Factsheets

Based on satellite imagery, a 'factsheet' was created for each sample site, which provided initial information of the site. It shows the project components relevant to the sample site, the administrative entities in which it is located, the main socio-

economic features of the project footprint, the PAC in the sample site, initial secondary data available for the sample site and a preliminary indication of the data collection tools to be used for baseline data collection.

Step 2: Reconnaissance Site Visits

Reconnaissance site visits were conducted to the sample sites and PACs during the period 26 October to 21 November 2017 that included:

- a meeting with the village leaders, parish leaders and villagers to inform them about the ESIA and social baseline study. Posters and background information documents (BIDs) were used to explain the project and the ESIA study. Concerns and questions of stakeholders were recorded and, where possible, responses were provided. This is reported in Section 7 (Stakeholder Engagement) of the ESIA.
- verifying and enhancing the data from the factsheet and developing a better understanding of the site and the PACs
- conducting a transect walk on the project footprint (AGI and construction facility) to document land-use features
- compiling a community socio-economic resources inventory through discussion with village leaders and field observation
- arranging the focus group discussions (FGDs), SGIs, KIIs and household interviews (HHIs) to be conducted during the social baseline survey.

The information obtained was used to update the factsheets.

Step 3: Main Baseline Survey

The main survey, which was conducted between 2 November and 7 December 2017, included:

- FGDs, which were open discussions based on discussion guides with village community leaders, women and youth to obtain group knowledge, perceptions and attitudes about village livelihoods and to identify vulnerable groups in the community. The women's groups included widows, single mothers and women engaged in business activities. Based on the discussions, PAC profiles were developed (see Attachment A11.2 in Appendix A11). Two FGDs were organised in each sample PAC: one with women and one with community leaders (which also included some women)
- participatory mapping with the village community leaders and women's focus group participants, which involved drawing a map of infrastructure and land use in and around their village. The mapping facilitated discussion of village activities, local decision making and local community concerns.
- drawing a historical timeline of the important events in the village and discussing the changes these have been brought about in the village over the years. The timelines are included in the PAC profiles
- KIIs, which included interviews with informants with an expertise or knowledge. These included: business people, traders, commerce, shopkeeper, commercial farmers, fishermen, health workers, local leaders, local women, natural resource users, religious leaders, subsistence farmers, teachers and traditional healersSGIs to understand different livelihood strategies with: crop farmers, fishermen, natural resource users, pastoralists

- a community observation walk along a predetermined route, accompanied by community leaders, to gather information on community life, community infrastructure, land use types and patterns and natural resource use.
- HHIs to provide information on household-level socio-economic features. A purposive sampling strategy was used to ensure inclusion of households with different livelihood strategies and vulnerable households, including pastoralists, the very poor, widows, elderly and people with disabilities. A total of 176 HHIs were held across the different PACs. No statistical validity was attempted, as a full household survey will be conducted by the RAP team. The HHIs served to enhance understanding of particular concerns related to vulnerable households and particular livelihoods.

Figure 6.4-14 Focus Group Discussion and Participatory Mapping with Women in Miti, Sembabule District (KP194)

Figure 6.4-15 shows the number of different data collection tools used in the PACs and the districts by the three teams.

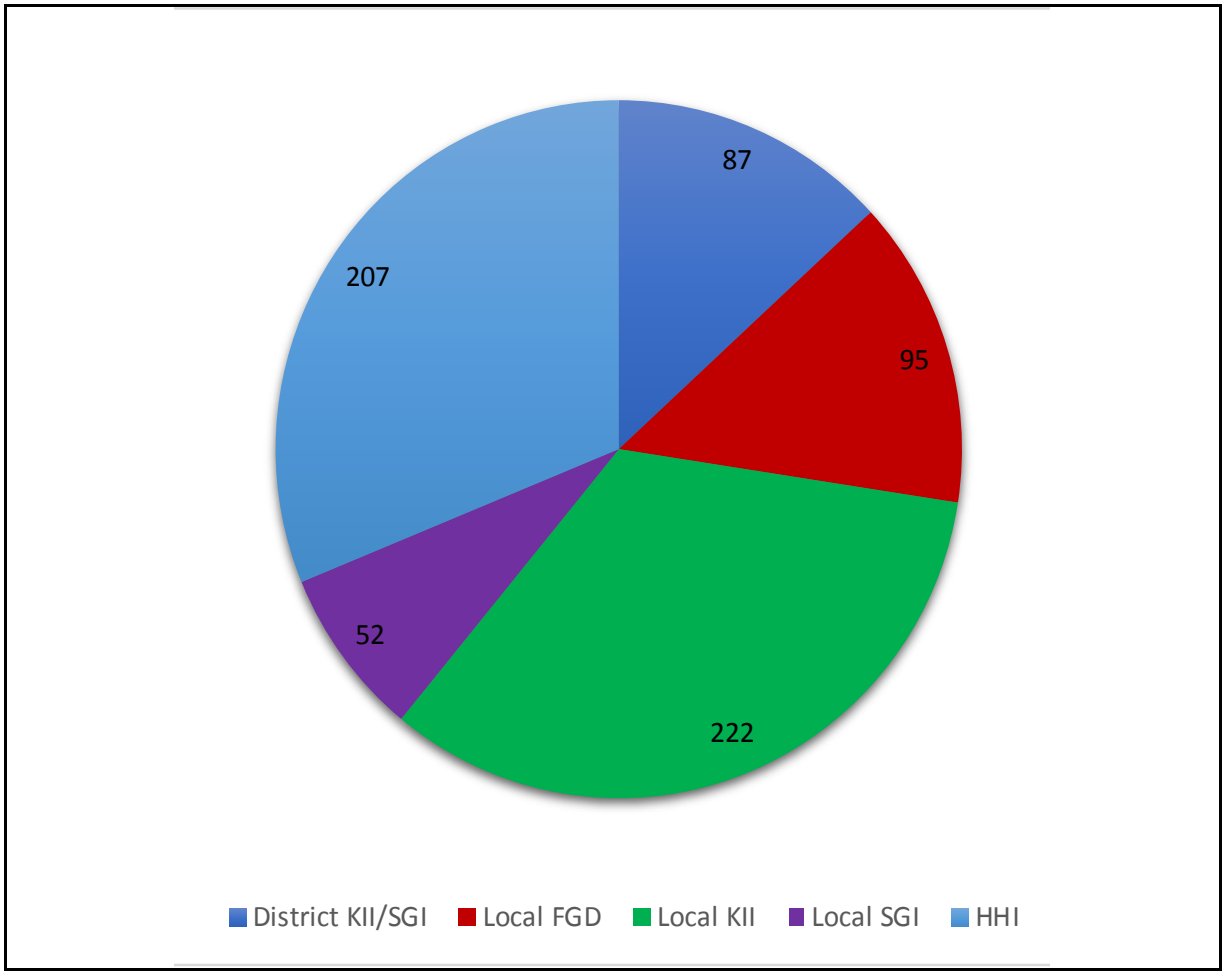


Figure 6.4-15 Data Collection at District and Potentially Affected Community Level

Data Analysis

The following data analysis was conducted:

- data collected through KIIs, FGDs and SGIs were collated, tabulated, compared and triangulated for each VEC
- quantitative secondary and primary data were submitted to descriptive statistical analysis including averages and percentages
- historical data, and data at the time of writing, were compared with future projections to identify trends.

Main VECs were identified and their sensitivity ranked in accordance with the sensitivity tables for the socio-economic VECs in Appendix D.

The following were prepared:

- sample site profiles and sample PAC profiles (see Attachment A11.2)
- maps showing locations of the VECs which are described in the text.

6.4.3.3 Governance and Administration

National Government

The President of the Republic of Uganda is both Head of State and Head of Government. The Government of Uganda has three branches:

- the Executive, comprising the President, Vice President, Prime Minister and Cabinet. The President is responsible for implementing and enforcing the laws written by Parliament and appoints the Cabinet.
- the legislative, comprising Parliament that passes laws and reviews government policy and administration
- the judiciary, comprising the Magistrates' Courts, High Court, Court of Appeals (Constitutional Court) and the Supreme Court. The role of the judiciary is to administer justice by resolving disputes between citizens and between the State and citizens, contribute to the enforcement of law and order and protect the human rights of individuals and groups.
- The government structure of Uganda consists of six levels (see Figure 6.4-16). Through this structure, power and decision-making at the national level is decentralised.

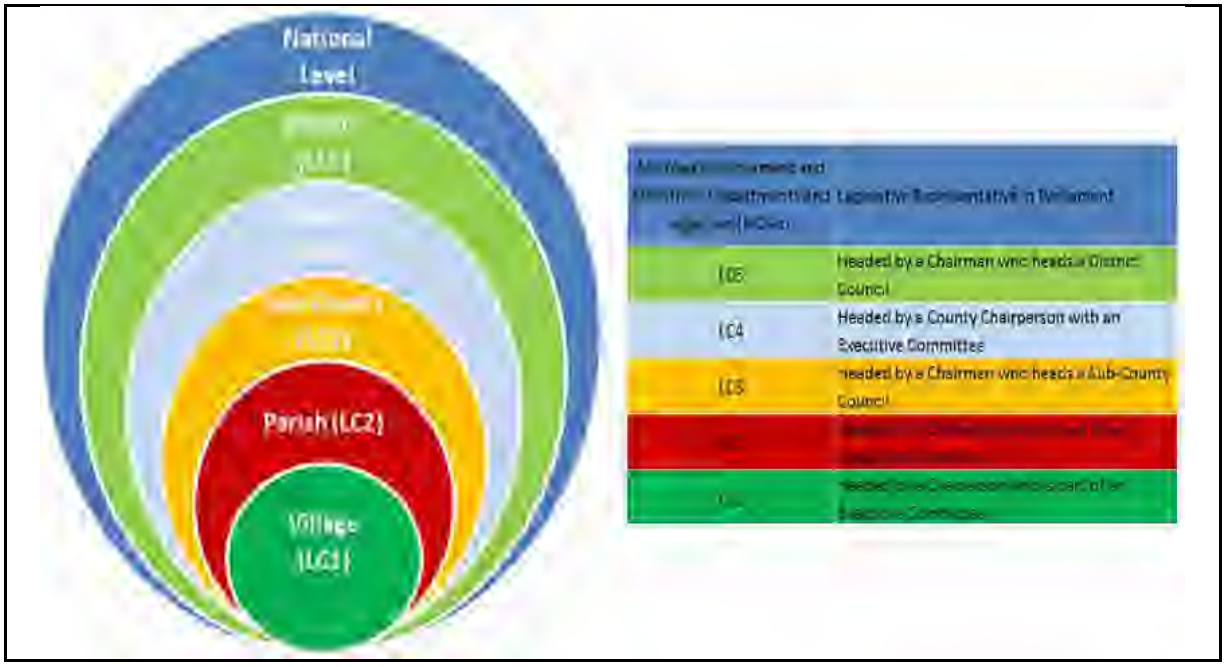


Figure 6.4-16 Government Structure of Uganda

SOURCE: Modified from the TEPU Stakeholder Strategy, June 2013-June 2014

Local Government

The structure of local government differs between urban and rural settings. In urban settings, there are cities, municipal divisions or towns, wards and cell councils (CLGF 2016). In rural settings, there are district councils (Local Council (LC5), which are subdivided into counties, subcounty councils, parish councils and village councils (MOLG 2017). The role of the local government agencies is to implement and monitor government programmes and resolve disputes at the respective levels (UBOS 2016a).

Every district has an elected chairperson, who is supported by a District Council consisting of technical personnel and subcounty representatives. In every district council, at least one of the secretaries and one third of all councillors must be female (CLGF 2016). The District Council is the planning authority of the district that prepares a comprehensive and integrated development plan, incorporating plans of lower level local governments, for submission to the national planning authority (GOU 1997).

A district technical planning committee chaired by the Chief Administrative Officer includes heads of departments of that district.

There are 1403 subcounties (LC3) in Uganda (Electoral Commission 2016, Internet site). Subcounty governments are led by subcounty councils (headed by elected chairmen) and are responsible for service delivery and local economic development within their areas. Similar to the district administration, a team of technical personnel coordinates the activities and functions of the subcounty.

Each subcounty is comprised of parishes, which are further divided into villages. Parish councils have elected executive committees.

At the village level, all village citizens aged 18 years and above are members of the council.

Ancient traditional kingdoms, also known as cultural institutions, are a key feature of Ugandan society. Within the project area, there are three cultural institutions:

- the Buganda Kingdom
- the Bunyoro–Kitara Kingdom
- the Kooki Chiefdom.

Cultural institutions are not mandated to engage directly in the administrative roles of the local or central governments, but can be instrumental in ensuring that government programmes succeed at the local level (John Paul II Justice and Peace Centre 2013). Representatives of cultural institutions play an active role in local communities by:

- assisting with the development of community infrastructure
- generating business opportunities (KIIs with kingdom representatives)
- undertaking community sensitisation and awareness campaigns (KIIs with kingdom representatives)
- preserving history (crafts, sites), cultural norms and identity.

The village council (LC1) which consists of the village chairperson, the vice chairperson, secretary and other prominent leaders such as village elders and elected leaders representing youth, women and religious leaders are pivotal in decision-making at community level. Village councils are headed by an elected chairperson and vice-chairperson. The responsibilities of chairperson and vice-chairperson are to:

- represent the village at the subcounty level
- organise and chair village meetings
- make decisions on behalf of the community
- ensure village security and safety of residents

- resolve disputes between village members; disputes that cannot be resolved by village chairmen are referred to higher levels of government (i.e., the subcounty and district).

6.4.3.4 Demographics

Baseline Condition of Demographics

National Level

The population of Uganda grew by 3% annually between 2002 and 2014, reaching 34.6 million in 2014 (UBOS 2016a). The population size projection for 2018 is approximately 38.8 million (UBOS 2016b). Females and males represent 51% (17.7 million) and 49% (16.9 million) of the population, respectively.

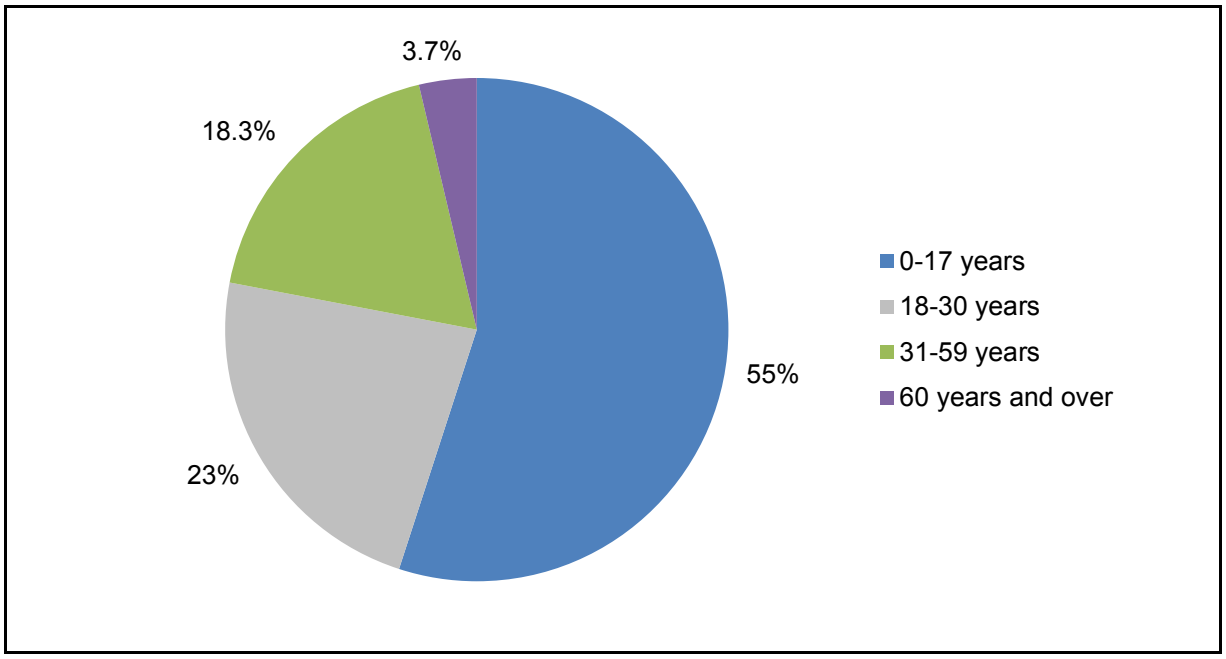


Figure 6.4-17 Age Profile
SOURCE: UBOS (2016a)

As shown in the figure, Uganda's population is predominantly young, with 0–17 year olds constituting more than half of the total population.

Uganda's population is predominantly rural, representing 79% of the overall population (MOLG 2017). However, the urban population has increased by 23% since the 2010 Census (UBOS 2016a). This trend has been driven largely by rural-urban migration (World Bank 2015a, Internet site).

Uganda consists of more than 40 different ethnic groups and languages, each with their own cultural identity and customs. The largest ethnic group are the Buganda, which consist of 16.9% of the population followed by Banyankole (9.5%), Basoga (8.4%); Bakiga (6.9%); Iteso (6.4%); Langi (6.1%); Acholi (4.7%); Bagisu (4.6%) and Lugbara (4.2%). Those identified as others account for 32.3% (World Atlas 2018, Internet site).

There is great ethnic and linguistic diversity, intermarriage, rural-urban migration and other migratory movements, including trans-border migration, and this has meant that the different ethnicities, along with their cultural traditions, have intermingled to create a mixed multicultural nation.

There are at least 40 native languages in Uganda, grouped into three main language families: Bantu, Central Sudanic and Nilotic. In addition, English was adopted during colonisation as the common language and remains an official language. Swahili, which has regional significance, is also an official language and Luganda is a commonly spoken language of a large proportion of the Ugandan population, particularly in the central region.

International Migration

Uganda experiences both in- and out-migration. Migration to Uganda has been driven by civil war and political instability in the Democratic Republic of Congo (DRC), Rwanda and South Sudan (Danish Refugee Council 2016). At the time of writing, more than 800,000 refugees and asylum seekers are accommodated in the country's northern, southern and southwestern regions (Refuge & Hope International 2017, Internet site). Since the beginning of 2018, roughly 34,000 Congolese refugees have crossed Lake Albert to Uganda, driven by renewed violence in the DRC (UNHCR 2018, Internet site). Most refugees have entered Uganda through Kaiso and Sebagoro landing sites on the shores of Lake Albert in Hoima district (ReliefWeb 2018, Internet site).

Internal Migration

Internal migration has occurred throughout Uganda's history and is driven mainly by employment. Internal movements are mostly towards urban centres or regions of high economic activity, such as plantation areas (IOM 2015) or locations where transient employment opportunities are available, such as infrastructure developments. Evidence of migration for family and marital reasons has also been found in some regions and is more common among females (Nakiganda 2013).

District and PAC Level

Table 6.4-35 Demographic Data, 2014

District	Population Size			Population Density (/km^2)	Growth Rate Per Annum (2002-2014)	Average Household Size
	Total	Male (%)	Female (%)			
Hoima	573,903	49.9	50.1	158.9	4.3	4.5
Kakumiro	293,108	50.2	49.8	184	3	4.7
Kyankwanzi	213,267	51.7	48.3	91.6	4.7	4.4
Mubende	688,819	50.3	49.7	148	4.1	4.5
Gomba	160,075	50.9	49.1	180	2.9	4.5
Sembabule	252,994	49.6	50.4	79	2.8	4.5

Table 6.4-35 Demographic Data, 2014

District	Population Size			Population Density (/km^2)	Growth Rate Per Annum (2002-2014)	Average Household Size
	Total	Male (%)	Female (%)			
Lwengo	275,450	48	52	192	3.1	5
Rakai/ Kyotera	518,002	48.9	51.1	159.4	2.1	4.4

The population in the districts traversed by the AOI is predominantly rural. Over 95% of people in Kakumiro, Kyankwanzi and Lwengo live in rural areas (DDPs 2015). However, consistent with national trends, the districts experience urbanisation.

Ethnicity and Religion

The main ethnic groups found in the districts in the southern part of the AOI are the Baganda and Banyankole. In the northern part of the AOI, the main ethnic group is the Banyoro.

The populations of the subcounties traversed by the AOI are diverse. The settlements near the start of the pipeline route at KP0 in Hoima district are sparsely populated and poorly connected. The population gradually increases as the AOI traverse's southwards through the districts of Kakumiro and Kyankwanzi.

Continuing southwards through the districts of Gomba and Sembabule, population levels are lower owing to the expansive rangeland of the cattle corridor except for urbanised settlements such as Kyotera town.

The main languages spoken amongst the PACs are:

- Alur
- Runyoro (Western districts)
- Luganda (Central districts)
- Runyankore-Rukiga (Central districts)
- Kinyarwanda (Central districts).

Religion is important in the sample PACs. HHIs and KIIs with religious leaders indicated that:

- Christianity is the predominant religion in the study area, followed by Islam
- traditional beliefs are also practiced, often in combination with Christianity and Islam.

Indigenous Peoples

According to IFC Performance Standard 7 (IFC 2012), the term 'indigenous peoples' refers to a distinct social and cultural group with the following characteristics in varying degrees:

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others
- collective attachment, i.e., whose identity, as a group or community, is linked to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories
- customary cultural, economic, social or political institutions that are separate from those of the dominant society or culture
- an indigenous language, often different from the official language of the country or region in which they reside.

In Uganda groups that may fulfil international definitions for indigenous peoples include the traditional hunter-gatherer Batwa and Benet communities, the Basongora and Banyabindi and pastoralist groups such as the Ik and Karamojong. These ethnic groups are not within the AOI. The project does not traverse lands traditionally owned by, or under the customary use of, any of these ethnic groups. Furthermore, the government does not officially recognise these groups as indigenous (ILO 2009). The Uganda Constitution refers to indigenous groups as vulnerable and marginalised, adopting the term “Vulnerable and Marginalised Groups” in place of “Indigenous Peoples” (GOU 2015).

PAC Level

The ratio of males to females in the PACs is unequal. In some PACs, 40% of the population were reported to be male compared to 60% female. In other PACs, the proportion of males is said to be much greater.

Trend in Condition and Sensitivity to Change

Demographic trends are important as a context for understanding trends in the VECs. Demographic trends are as follows:

- Uganda’s population is growing rapidly and is projected to reach 130 million by 2050 (World Watch Institute 2018, Internet site). Population growth rates in the districts traversed by the AOI are between 2 and 5% per year, above the 1.2% world average (DDPs 2015).
- Uganda’s population is predominantly rural, but the prevailing trend is urbanisation. Growth in urban areas may accelerate in line with the national vision to transform Uganda from a peasant to modern and prosperous society within 30 years (GOU 2013a). Under this vision, planned improvements in urban infrastructure and public service facilities may strengthen the appeal of towns and cities (GOU 2013a). Job opportunities in urban areas may also increase as industry and services become more prominent economic sectors.
- Uganda remains an important host country for refugees from neighbouring countries. Conflict and instability, if unresolved, may sustain the in-migration of large numbers into the country. The 2006 Refugee Act, one of the most progressive and generous in the world (World Bank 2016a, Internet site), supports the entry of refugees into Uganda.

Key Considerations

Key considerations are:

- there is a large young labour pool
- PIIM may cause added stress to infrastructure and social services
- migrants often stay in locations they have moved to for work opportunities in the hope of further work opportunities, rather than returning to an agricultural income.

6.4.3.5 Education

Baseline Condition of Education

National Level

Education is a right enshrined in the constitution of the Republic of Uganda and is compulsory for 6–13 year olds (NUFFIC 2016). The education system comprises three years of nursery school, seven years of primary school, six years of secondary school and at least three years of higher education.

Figure 6.4-18 shows the national literacy rates.

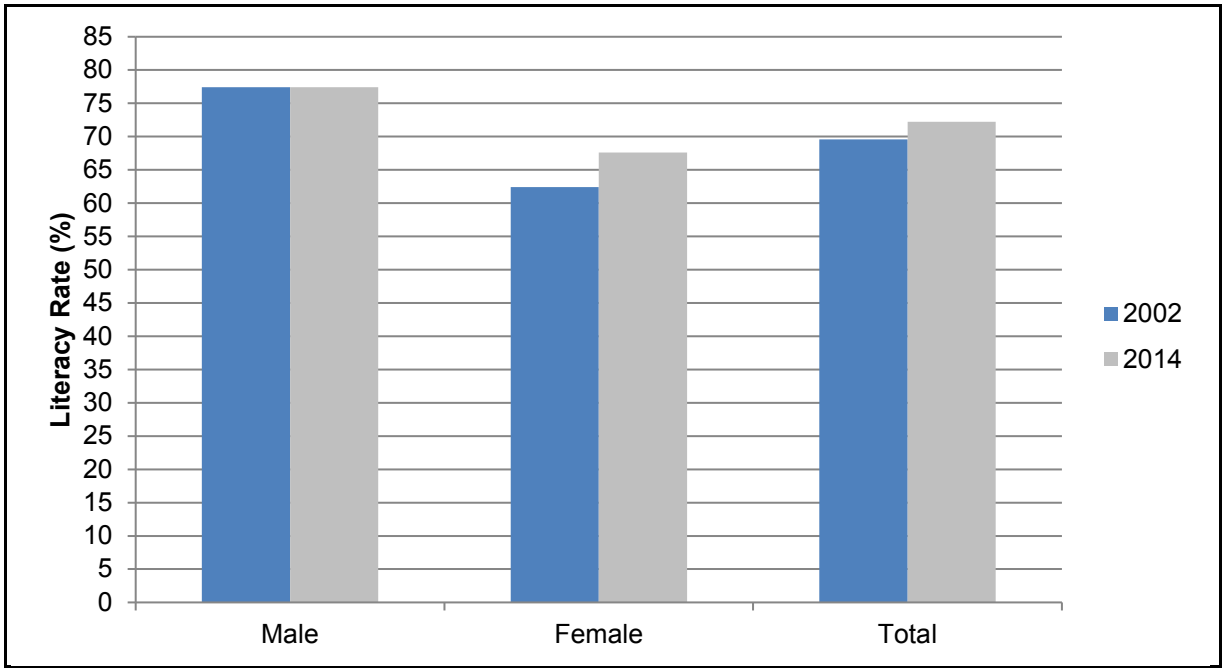


Figure 6.4-18 Literacy Rates for Persons Aged 10 Years and Above, 2002–2014

SOURCE: UBOS (2016a)

National school attendance at primary and secondary level is 81% and 17% respectively (DHS 2011). The disparity in school attendance between males and females at the primary level is minimal in most of the regions.

There is a shortage of appropriately skilled and qualified workers in Uganda, particularly in sectors such as construction (Ministry of Education and Sports 2013).

The mismatch between existing graduate qualifications and the skills required by industry results in high graduate unemployment and high levels of staff turnover and retraining costs for companies.

District and PAC Level

Key points with regards to school attendance rates in the districts traversed by the AOI are the following:

- primary school attendance ranges between 79.4% and 85.5%
- secondary school attendance rates range from 24.7% to 33.1%
- boys have slightly higher attendance rates compared to girls at primary school level
- girls have slightly higher attendance rates compared to boys at secondary school level in some districts.

Consistent with the national level, there are substantial skills gaps present in the districts traversed by the AOI. Recognising the importance of human capital development, the District Development Plans (DDPs) place emphasis on increasing the skill level and productivity of the workforce through vocational training programmes (DDPs 2015).

The DDPs highlight numerous challenges for district education departments including:

- personnel shortages
- inadequate infrastructure
- high drop-out rates amongst girls due to early marriages, teenage pregnancies and domestic chores (Kakumiro, Gomba and Lwengo DDPs 2015).

There are a small number of Technical Institutes (TIs) in the districts traversed by the AOI.

The literacy rate of the population in the PACs varies considerably. Interviews with PAC teachers reported literacy rate estimates ranging from 30-40% in sample PACs such as Kabulasoke village (KP111) to 70-80% in others (Muyenje village, KP192). Female literacy rates were mostly estimated to be below 40% (FGDs with women in all PACs).

The percentage of children estimated to be attending primary school ranges from 40 to 96%. These findings differ from national and district level secondary data, which reports average primary school attendance rates of 79% and 86%.

Teachers reported domestic chores, long travel distances from home to school and the low value attributed to education by children and parents as reasons for low attendance rates.

The majority of teachers in the PACs interviewed reported that their classrooms were not adequately equipped, lacking desks, science kits and textbooks. Other reported concerns include low wages for teachers relative to the cost of living, lack of accommodation for teachers and lack of food for teachers and students during the school day.

Trend in Condition and Sensitivity to Change

Future trends with regards to education in Uganda are as follows:

- education remains a key development priority in Uganda, and the districts traversed by the AOI make provisions for investment in education infrastructure and resources in the DDPs. However, the extent of improvements at the district level will be influenced by the financial and human resources available.
- high graduate unemployment and complaints from the private sector have increased the attention paid to Uganda's skills gap. At national level, the Business Technical Vocational Education Training Strategic Plan 2011–2020 seeks to create employable skills and competencies relevant to the job market. At the district level, some DDPs aim to increase enrolment in TIs and offer vocational training programmes to citizens (Gomba and Hoima DDPs 2015).

Sensitivity Ranking

The social baseline study identified sensitive VECs for education, see Table 6.4-36.

Table 6.4-36 Education Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Unemployed graduates	Positive	Unemployed graduates may benefit from the training opportunities and work experience with the project
Children of primary and secondary school age	Moderate (3)	Attendance rates of children may fall due to jobs or opportunities indirectly created by the project

Key Considerations

Key considerations are:

- Uganda lacks skills in particular sectors (i.e., construction) and enrolment in science and technology programmes. Labour recruited for pipeline construction is likely to require considerable training and capacity building.
- TIs in the districts traversed by the AOI may be a potential source of construction labour for pipeline construction
- opportunities such as temporary work on construction sites and informal service industry (roadside shops and kiosks) may reduce school attendance by both girls and boys, affecting their human right to education.

6.4.3.6 Economy

Baseline Condition of the Economy

East Africa is the fastest growing economic region in Africa with recorded regional growth estimated at 6–7% for 2016 and 2017.

As a member of the East African Community (EAC) since 2010, Uganda shares a common market with Kenya, Tanzania, Burundi and Rwanda. Uganda's GDP is approximately 60% of Kenya's GDP (the largest economy in the EAC), placing it behind Tanzania and just ahead of Rwanda (AfDB et al. 2016). The EAC is

economically more diverse than other regional African communities because it is less dependent extractive industries.

National Level

Gross Domestic Product (GDP)

Uganda's economy collapsed during the 1970s and 1980s due to political uncertainty and ongoing civil war (Byrnes 1990). Since then, the government has acted to rehabilitate the economy, and economic reforms have ushered in a period of solid economic growth and lower inflation. Nevertheless, overall productivity remains hampered by supply-side constraints, including underinvestment and high production costs in the agricultural sector (CIA 2017, Internet site).

The Ugandan economy is characterised by formal and informal economic activity with the informal sector accounting for approximately 45% of all economic activity (UBOS 2016a). The informal economy refers to a diverse set of economic activities, enterprises, jobs and workers that are not regulated or protected by the state.

The service industry typically contributes most to the formal economy, and comprises 54.5% of GDP in 2016 (CIA 2017, Internet site), up from 38% in the early 1990s (Wiegratz 2009).

Community services, wholesale and retail trade (predominantly at micro-scale) were the most important service subsectors, followed by transport and communication (Wiegratz 2009). Services sector growth in Uganda is dominated by telecommunications, tourism and financial services (UN 2011).

Tourism is one of the fastest growing service sectors in the Ugandan economy and is the largest foreign exchange earner. Tourism contributes approximately 9% to GDP and employs around 8% of the national workforce (Deloitte 2016).

Agriculture has traditionally been a major economic activity comprising 24.5% of GDP in 2016 (CIA 2017, Internet site), down from 48.6% in the early 1990s (Wiegratz 2009)[5]. The decreased contribution to GDP is primarily as a result of growth in other sectors such as manufacturing. Major crops include coffee, tea, cotton, tobacco, cassava, potatoes, maize, millet and pulses (CIA 2017, Internet site).

The industrial sector is relatively small but has recorded high growth rates over the past three decades. It accounted for 21% of GDP in 2016 (CIA 2017, Internet site), up from 13.4% in the early 1990s (Wiegratz 2009). The sector is dominated by manufacturing and construction, while electricity production and supply, water supply and mining also contribute to GDP (Wiegratz 2009). However, the industrial sector is dependent on imported equipment and energy (oil) and is constrained by poor infrastructure, high energy costs and low levels of private investment.

Oil and Gas Sector

Uganda's first major oil discoveries were confirmed in 2006.

[5] NOTE: Deloitte (2016) notes that the agricultural sector contributes 5.5% to the formal and 47% to the informal economy.

At the time of writing, Uganda estimates overall crude reserves discovered in the Albertine Graben at 6.5 billion barrels, while recoverable reserves are estimated at between 1.4 and 1.7 billion barrels (IMF 2017b, Internet site).

In 2014, the Government of Uganda identified three major commercialisation processes, formalised in a Memorandum of Understanding (MoU) with licensed upstream oil companies in Uganda (Tullow Oil, TEPU and CNOOC) (MEMD 2017a, Internet site), namely:

- production of crude oil and gas for power generation in the short- to medium-term
- establishment of 60,000-bbl/d refinery
- export of crude oil through a pipeline or any other viable option.

In 2015, the Petroleum Regulatory Authority was established to oversee the oil sector.

Inflation

Uganda experienced generally low and stable inflationary rates since the late 1990s, despite several shocks such as an inflation spike from 4% in 2010 to 18.7% in 2011 (Mawejje and Lwanga 2015). Inflation has remained in single digits, averaging 6.7% in the fiscal period 2015–2016.

Food price inflation has increased from 5% in September 2016 to 23.1% in May 2017 due to a drought in the Horn of Africa, while core inflation[6] increased to 7.2%. However, food price inflation dropped to 11.8% by August 2017 (Bank of Uganda 2017).

Government Finances

Total government revenue in 2015–2016, including taxes and grants, was projected at USD 3.75 billion (UGX 14 trillion)[7] (15.2% of GDP), with projected expenditure of USD 5.41 billion (UGX 20.3 trillion) (20.1% of GDP) (CIA 2017, Internet site, IMF 2017a, Internet site).

Public and publicly guaranteed (PPG) debt in Uganda has increased from 26.1% of GDP in 2012 to 35.7% of GDP in 2015 (IMF 2017a, Internet site) due to national fronting of large infrastructure projects meant to be financed by external sources (UNDP 2016, Internet site). Approximately 61% of debt is external, with the remainder domestic debt (IMF 2017a, Internet site).

Debt

Public debt is considered sustainable and the risk of debt distress is considered as low, provided planned investments in energy and transport infrastructure raise growth and revenue (UNDP 2016, Internet site, IMF 2017a, Internet site).

[6] Core inflation (underlying inflation) measures total inflation within an economy, excluding commodities such as food and energy prices, which tend to be much more volatile and prone to inflationary spikes.

[7] Conversions based on exchange rate on 24/08/2018. Source: https://www.xe.come/currencyconverter/.

Trade

Agriculture accounts for the majority of Ugandan exports; substantial exports in 2014 include coffee (14.9%), sesame seeds (6.3%) and cement (5.5%) (AfDB et al. 2016, IMF 2017a, Internet site).

Uganda's export base is relatively diversified, and the top five export destinations accounted for less than half of exports in 2015 (CIA 2017, Internet site):

- Rwanda (11%)
- United Arab Emirates (UAE) (10%)
- DRC (10%)
- Kenya (10%)
- Italy (6%).

Uganda's main imports are vehicles, petroleum, medical supplies and cereals (CIA 2017, Internet site). Oil accounts for 14% of import value, down from 20% in 2012 and 2013, as a result of lower oil prices.

Uganda's top import partners in 2015 were Kenya (16% of import value), UAE (16%), India (13%) and China (13%) (CIA 2017, Internet site).

Employment

The following bullet points characterise the state of employment in Uganda from available information sources:

- the labour force participation rate in 2016 was 70.1% (ILO 2017, Internet site)
- the size of the labour force in 2016 was estimated to be 19 million (CIA 2017, Internet site)
- the unemployment rate in 2013 was 9.4% (CIA 2017, Internet site)
- youth unemployment in 2014 was estimated at 13.3% (Byamugisha et al. 2014)
- in 2016, 93.5% of the workforce is in the informal sector (World Bank 2017a, Internet site)
- employment in both the formal and informal labour markets is increasing (CIA 2017, Internet site; World Bank 2017a, Internet site). This is largely attributed to urbanisation (World Bank 2017a, Internet site).
- growth in the informal labour market seems to be more rapid than growth in the formal labour market as a result of:
    - rapid growth in construction jobs spurred by urbanisation (Spence et al. 2009: 26-27 cited in AfDB et al. 2016)
    - weak performance of the manufacturing and service sectors, generating fewer wage-paying jobs (Spence et al. 2009: 26-27 cited in AfDB et al. 2016).

The agricultural sector generally absorbs lower-skilled workers, while services, particularly in business, tourism and construction, provide opportunities for semi-skilled workers. The public sector, such as government administration, education and health, generally provides most opportunities for highly skilled workers (Mendez-Parra 2015).

Poverty

Uganda has achieved the second-fastest reduction in poverty in SSA, and met the Millennium Development Goals (MDGs) Target 1a of halving poverty by 2015. The proportion of people living below the international poverty line (USD 1.90 per day) (UGX 7200 per day) has reduced by 2.7% per year since 2003 (World Bank 2017b, Internet site).

However, even after two decades of progress, poverty is still widespread. Approximately 35% of the population (about 11 million people) were below the international poverty line in 2013, down from 62% in 2002 and 2003 and 68% in 1993. Agricultural households account for up to 79% of poverty reduction during this period. This is attributed to good farming conditions and favourable prices for agricultural products in regional and international markets, which helped to increased income from crops.

Trend in Condition and Sensitivity to Change

Economic Outlook

Uganda's economic outlook is considered favourable. Economic growth may exceed 5% in 2017–2018, provided weather conditions remain stable despite the view that global warming is likely to make seasons more unpredictable, foreign direct investment (FDI) flows accelerate, the banking system stabilises and budgeted capital spending is executed without delays. FDI in the oil sector could also help support the recovery of growth, following the issuance of exploration permits (World Bank 2017a, Internet site).

Factors that continue to impact economic growth negatively are low business confidence, the ongoing conflict in South Sudan (affecting exports) and high credit costs that continue to hamper domestic private investment.

Uganda is in the process of implementing the second National Development Plan (NDPII), the objective of which is to propel the country towards middle-income status by 2020. The NDPs are implemented through sector investment plans (SIPs), local government development plans (LGDPs), annual work plans, and budgets of ministries, departments and agencies (MDAs). The NDPII also seeks to leverage the international and regional frameworks such as Africa Agenda 2063 and the Post 2015 Development Agenda to exploit growth opportunities (UBOS 2016A).

Ecosystem Services Provided

The Ugandan economy is heavily dependent upon agriculture, fishing, mining and tourism (all provisioning services). These ecosystem services are described in Section 6.4.3.8, Land-based Livelihoods and 6.4.3.9, River and Lake-based livelihoods.

Sensitivity Ranking

Sensitivity ranking is included in sections describing livelihood activities including crop farming, livestock rearing and mining (Section 6.4.3.7) and Local Economy (nonland-based livelihoods) (Section 6.4.3.6).

Key Considerations

Key considerations are:

- major projects create employment opportunities
- international projects may provide training and capacity building of the Ugandan workforce and local companies to satisfy Uganda's local content policy.

6.4.3.7 Local Economy (Nonland-Based Livelihoods)

Baseline Condition of Local Economy (Nonland-Based Livelihoods)

District Level

Although primary agriculture is the most important livelihood in the districts traversed by the AOI, the following economic activities are also important (DDPs 2015):

- small-scale processing of agricultural products
- small-scale trade in retail merchandise and agricultural produce
- provision of services including tourism and transport.

Local economic activities are predominantly small-scale and informal, they are neither taxed nor regulated by the state, and offer little security to workers (WIEGO 2018, Internet site).

Small-scale cottage industries, largely based on the processing of agricultural products, are based in urban areas. The development of cottage industries in rural areas is limited due to lack of rural electrification and lack of access to appropriate technology and markets (Mubende DDP 2015).

Small-scale trade occurs in all the districts traversed by the AOI. The sale of retail goods and agricultural produce by micro-enterprises predominantly occurs on roadsides in trading centres, towns and cities due to ease of access to customers and good transportation links.

The types of retail merchandise sold range from medicines and hygiene products to fuel wood, mobile airtime and agricultural produce. Women more often engage in small business enterprises than men.

Trade in retail merchandise and agricultural produce is important to the districts. Constraints to the growth of micro-enterprises are:

- lack of skills, which undermines the competitiveness and productivity of enterprises (Kakumiro DDP 2015)
- limited physical access to markets due to poor road conditions (Gomba DDP 2015)
- limited access to micro-credit and borrowing facilities.

Tourism-based livelihoods are important in Hoima district given the abundance of wildlife and geographical features.

Hoima district is a hub for tourists travelling from Murchison Falls to Queen Elizabeth National Park. Hoima has hotels and guesthouses which have invested in facility upgrades to meet increasing tourist and oil industry requirements.

Plans are underway for the construction of the Kabaale International Airport in Hoima district, which is intended to serve as a regional airport to cater for travel to the DRC, South Sudan, Rwanda and Burundi, as well as serving regional tourist sites in Uganda.

KIIs with kingdom representatives indicate that kingdoms promote tourism and tourism-based livelihoods in the districts traversed by the AOI.

Potentially Affected Communities Level

Trade in retail merchandise and agricultural products and the provision of services are livelihood strategies present in the sample PACs, particularly among women. Shops selling retail merchandise and agricultural products are present in virtually all the sample PACs (PAC profiles).

A variety of local services is available in the sample PACs:

- entertainment, including video halls
- construction, including metal welding, brick-laying and carpentry
- hospitality, including restaurants, bars, guesthouses and hotels
- utilities, including plumbers and electricians
- beauty, including hairdressers and barbers.

Mutukula Town (KP295.5,) a large and densely populated settlement within the AOI, serves as an economic hub for surrounding agricultural communities. Located at the international border between Uganda and Tanzania, the town is a prominent trading centre with a diverse provision of goods and services. Economic activity in Mutukula is reportedly increasing, driven predominantly by the in-migration of economic migrants. This has benefited local business owners and traders, but has exacerbated pressure on public services (especially health centres) and infrastructure (power, sanitation and roads).

Programmes such as the Uganda Women Entrepreneurship Programme (UWEP) and the Youth Livelihood Programme (YLP) aim to facilitate the start-up of businesses for women and youth by providing them with zero- to low-interest government loans (KII with community development officers (CDOs).

KIIs and focus group discussions (FGDs) with sample PAC members whose livelihoods are based on trade in goods and services revealed the following challenges:

- poor road network rendering transport of goods difficult
- lack of sufficient access to credit to buy bulk supplies and start up enterprises
- customers buying on credit and not paying when due
- fluctuating market prices for agricultural produce
- lack of affordability of electricity and piped water.

Focus groups with women found that sex work takes place in several of the sample PACs.

Trend in Condition and Sensitivity to Change

Trends with regards to the local economy (nonland-based livelihoods) are as follows:

- livelihoods based on small-scale agro-processing may benefit from the national calls for more foreign investment in this area (Export Gov 2017a, Internet site). Foreign investment, if attracted, may enable people to participate in more sophisticated post-harvest activities (i.e., packaging), thereby increasing the value they capture from the overall product.
- infrastructure development is a priority at national and district levels (DDPs 2015 and State House of Uganda 2018, Internet site). Investment in Uganda's road network could lead to lower transportation costs, thereby improving market access for livelihoods based on the trade of retail goods and agricultural products.
- women and youth engagement in business may intensify as the UWEP and YLP continue to be administered at district and local levels. With support, women and young people may be more empowered to start businesses.
- district governments view tourism as an important growth opportunity and have designated potential sites for future development (DDPs 2015). The development of tourism sites in the districts traversed by the AOI may contribute to the growth of tourism at the district level, increasing the number of job opportunities and income generated. However, funding shortages are a challenge often reported by district governments.
- sex work in urban areas has increased with women travelling from other districts in Uganda to urban hubs such as Hoima Municipality (KP22) and most especially Mutukula Town (KP295.5) in Kyotera at the Uganda-Tanzania border.

Sensitivity Ranking

the social baseline study identified several local economy (nonland-based livelihoods) sensitive VECs. These are presented in Table 6.4-37.

Table 6.4-37 Local Economy (Nonland-Based Livelihoods) Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Small business owners	Potentially positive	Potential increase in number of businesses and business activity.
Employees in informal businesses	Potentially positive	Potential increase in number of businesses and business activity.
Sex workers	High (4)	Vulnerable to physical abuse and communicable diseases. Sex workers are increasingly active in the districts traversed by the AOI.

Ecosystem Services Provided

Local economy (nonland-based livelihoods) does not provide ecosystem services. It however relies on ecosystem services which are described in Section 6.4.3.8 (land-based livelihoods).

Key Considerations

Key considerations are as follows:

- for small local companies to benefit from major projects they need to meet standards which are often absent. This may lead to business and trade opportunities being usurped by outsiders.
- women and young people seem to have fewer paid work opportunities and so the lack of start-up capital for the small business entrepreneur is more keenly felt by women and young people
- good road connections between communities and urban centres are crucial for business owners to source supplies and market their goods.

6.4.3.8 Land-Based Livelihoods

Land-based livelihoods include:

- crop farming
- livestock rearing
- mining
- natural resources use.

Baseline Condition of Crop Farming

National Level

Uganda is an agriculture-based economy. About 72% of the working population is engaged in agricultural activities (World Bank 2017a, Internet site).

Households engaged in agriculture tend to undertake mixed farming activities to prevent shocks, such as drought or pest infestations, affecting household income. According to UBOS (2016a), 75% of agricultural households are engaged in crop growing, 58% in livestock farming and 69% are involved in both crop farming and livestock rearing.

The main cash crops grown are coffee, cotton, tea, tobacco and sugar cane. Crops are mainly rain fed. Maize, beans, plantain, cassava and sweet potato are grown by most of the agricultural households. Of these crops, maize has the highest uptake with 1.5 million households growing the crop (UBOS 2010b).

Agricultural production is predominantly at household level with household members, including children, assisting after school and during weekends. A World Bank study (2015b) found that male-managed plots were 60% larger than those managed by females and were more likely to be planted with cash crops. The UCA of 2008–2009 found that female farm labourers earned lower wages compared to their male counterparts for the same type of employment.

Commercial tree planting is increasingly important partially due to increasing construction industry, charcoal and firewood demand.

Commercialisation of agricultural produce is limited primarily due to remote farms lacking access to local and regional markets (UBOS 2011b).

Figure 6.4-19 Local Market in Katikara Trading Centre, Kakumiro District (KP41)

The MAAIF Agricultural Sector Strategic Plan (2016) recognises the importance of agro processing and adding value to agricultural produce, and has highlighted several processing options for Uganda's strategic commodities (MAAIF 2016).

Farmer groups are the main organisations through which the government supports household agricultural production and marketing services. However, Uganda Cooperative Alliance 2008–2009 found that only 16% of the 3.95 million respondents were members of a farmers group.

District and PAC Level

Crop farming is the primary and most important livelihood strategy adopted by nearly all households in the sample PACs, with the exception of some households in trading centres or towns.

Both commercial and subsistence farming takes place. Only Kakumiro district has an equal number of commercial and subsistence farmers, which is possibly due to extensive maize production as a cash crop, which is marketed in Kampala. Most agricultural activities are classified as subsistence or small-scale farming. Interviews with district agricultural experts revealed the following reasons for the large number of subsistence farmers:

- small land holdings due to division of inherited farmland into smaller parcels
- lack of access to the capital required to develop commercial farming
- costs associated with agricultural inputs (seeds and fertilisers), machinery and storage
- lack of knowledge to transform from small- to commercial-scale farming.

The main cash crops in the districts traversed by the AOI include coffee, cocoa, sugar cane, tea, soya beans, sorghum and tobacco, and on a smaller scale cotton and upland rice. Sugar and tea tend to be grown in the less arid areas of Hoima and Kakumiro districts. Coffee is traditionally grown towards the south of the AOI in the districts of Rakai, Kyotera and Mubende, and to a lesser extent in Kyankwanzi, Kakumiro and Hoima.

Subsistence crops in the districts traversed by the AOI are beans, maize, bananas (matoke), groundnut, sweet potato, potato, cow peas, sesame, passion fruit, cassava, rice, cabbage and pumpkin. Beans are the most commonly grown crop, followed by maize. In all districts, trees such as mango, oranges, pawpaw, pine and eucalyptus are interspersed with arable crops. Crops grown to a lesser extent are ground nut, potatoes, sweet potatoes, millet, sesame, tomatoes, yam and vanilla.

Commercial forestry exists in the area crossed by the AOI, but to a lesser degree than crop farming or livestock rearing.

Farming Inputs

District agricultural officers have disclosed that agricultural activities remain dependent on rudimentary hand tools. With increasing numbers of pests, pesticides have reportedly become a necessity. Yet costs associated with pesticides prevent the majority of farmers in the PACs from using them. Soil fertility of agricultural plots was reported to be declining. However, application of chemical fertilisers is not common among PACs due to their cost.

Storage of agricultural goods is critical for sample PACs, and it was reported that produce often spoils or has to be sold in a hurry at reduced prices because of lack of storage facilities within the household.

Labour

Farming in PACs is predominantly household-based, with household members, including children, executing the agricultural tasks such as tilling, planting, weeding and harvesting. Women and men are involved in all aspects of agricultural activities, such as tilling, sowing and harvesting.

Households who have small plots or no land holdings provide labour (paid or in-kind payments) to other farmers. Where labour is not affordable, traditional collective labour, whereby households work on each other's plots on a rotational basis, or community members, are hired as labourers and are served a meal as payment.

Role of Women in Crop Farming

The Hoima DDP (2015) recognises that in rural agricultural households, women's workloads exceed those of men by several hours a day. It states that women are involved in crop production and are often responsible for post-harvest processing

and storage, marketing of produce, processing staples such as maize and rice for consumption, as well as being responsible for household tasks. However, women have limited access to land and productive assets, and there is a discrepancy between women's contribution to crop production and their control over crop marketing and decisions on the use of household funds.

Marketing

Across the districts, value chain linkages between production, processing and marketing are weak, which results in the majority of agricultural produce being sold unprocessed at the farm gate. Nevertheless, maize milling, coffee processing and fruit processing facilities were found in the larger towns such as Hoima Municipality.

Marketing of produce is cited by sample PACs as being a major challenge to agricultural livelihoods. The main challenges specified by KIIs at district level are:

- inadequate road infrastructure
- high transportation costs which negatively affects produce price
- lack of market price information from surrounding districts, preventing farmers from negotiating prices
- market gluts.

Many sample PAC farmers are supported by either the NAADS, a registered farmers' group or an informal farmers' group.

Trend in Condition and Sensitivity to Change

Crop farming trends are as follows:

- the Government of Uganda has a five-year Development Strategy and Investment Plan to steer public actions and investments in the agriculture sector. The four key programmes of the plan are enhancing production and productivity; improving access to markets and value addition; creating an enabling environment; and institutional strengthening of the sector
- crop farmers, in particular tobacco and sugar farmers, are becoming more commercially orientated and are increasingly renting land to enlarge their plot size. These farmers tend to receive assistance from commodity buyers and processors.
- crop farming is rain fed, low input and low output, therefore harvests are vulnerable to the effects of pests, diseases and climate variability. It is common for a crop to be spoilt, thereby threatening household food security and ability to pay for school fees and health services.
- available labour for farming activities is in decline because young people are migrating to urban areas.

Ecosystem Services Provided

The land-based livelihoods (crop farming) described herein provide the following ecosystem services:

Provisioning services include:

- food for basic survival of the population

- income from selling surplus crops to pay for education, clothes and health-related items, as well as other basic needs
- jobs for farm labourers
- products for agro-processing activities.

Crop farming is undertaken throughout the AOI PACs, sometimes being their only source of food. In the sample PACs, the majority of the farming is subsistence and the agricultural produce is consumed within the family with a small portion being sold at the local market.

Sensitivity Ranking

Table 6.4-38 presents the sensitive VECs with regards to crop farming identified during the social baseline study.

Table 6.4-38 Crop Farming VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Agro pastoralists	Moderate (3)	Agro pastoralists have diversified income streams across crop faming and livestock rearing, therefore are more resilient to external shocks such as pest infestations, animal diseases and climate change.
Commercial farmers (large scale, coffee and tea)	Moderate (3)	Impacts to commercial farming could indirectly affect the livelihoods of the farm workers. However, commercial farmers would be more resilient to adverse conditions than subsistence farmers as a result of greater access to farming inputs, credit and land.
Intermediaries buying goods at farm gates	Moderate (3)	Road access is critical for movement of goods to markets before they spoil. Roads are often in bad condition.
Crop buyers and agro processing	Moderate (3)	Crop buyers, including intermediaries and agro processors, are dependent on the supply of crops, vegetables and fruits to process and sell on. Without the supply of produce, processing will stop. Buyers are dependent on one income, but they are likely to have access to credit facilities based on their business.
Crop farming households engaged in subsistence and commercial crop farming activities	Very High (5)	Crop farming activities are mostly conducted without inputs and are rain fed. Subsistence farmers have limited access to alternative sources of income due their rural location and lack of education, skills and experience. There is low resilience to external shocks such as crop failure. This can impact on food and nutritional status, as well as cash for cost of education and health care.

Table 6.4-38 Crop Farming VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Landless farm labourers on subsistence farms	Very High (5)	Landless farm labourers are particularly vulnerable. Without income, potential impacts will be felt on household food and nutritional status, as well as income for living, education and health care.
Crop farming female headed households	Very High (5)	Women have limited access to improved farming inputs, have access to smaller sized plots to grow crops and are more likely to receive lower wages as farm labourers than men due to cultural norms. They are mainly confined to subsistence farming. Impacts on their crop farming will be felt in their food and nutritional status, as well as on their budget for education and health care.

Key Considerations

Key considerations are:

- crop farming in the sample PACs is mostly undertaken on household land holdings. The impacts of failed crops or loss of land can last for several years as seedlings and seeds are produced each season for the subsequent season
- crop farming in the sample PACs is generally rain fed, low input and low output, and therefore harvests are vulnerable to pests, diseases and climate variability. It is not uncommon for entire crops to be spoilt, thus making households vulnerable in terms of food security and the ability to pay for school fees and health services
- farmer groups have relatively low participation, but are the government's preferred means of contact
- labour shortages may affect household agricultural capability; children are required to complete farm work and miss school when labour is required. This situation may be exacerbated if household members are drawn away to temporary construction jobs
- access to markets is a major challenge for crop farmers in rural areas. With poor road conditions and limited market information, farmers are dependent on selling goods in a timely manner locally or to middlemen buying at the farm gate. Any interruptions in the supply chain will affect their ability to market goods and receive a cash income
- women are notably disadvantaged in crop farming with limited access to land holdings, capital to improve farming activities and constraints with household duties. With limited education and no other prospects of livelihood opportunities, they are reliant on crops farming as a main stay livelihood
- human rights to adequate food and standard of living are sustained.

Baseline Condition of Livestock Rearing

National Level

Livestock rearing is an important economic activity at household level. However, it does not feature prominently in the macro economics of the country (Artelia 2015a).

Domestic consumption of livestock products (meat and milk) is low compared to the country's neighbours, with an average of 11 kg of meat and 23 litres of milk per capita per year for all Ugandans, compared to 41 kg meat and 26 litres of milk in Sudan and 15 kg of meat and 198 litres of milk per person in Kenya (ICPALD 2013). Figure A11.4-30 in Appendix A11 presents a national livestock inventory for 2009.

Livestock are reared for both cultural and economic reasons including:

- prestige to illustrate family wealth
- investment and a means of savings
- cultural for payments of dowries
- income to pay for school fees and health services
- source of food (eggs, milk and meat)
- source of hide
- source of manure for crops.

Livestock rearing takes place under four types of livestock production systems: agro-pastoral, semi intensive, commercial ranching and pastoral (FAO, 2018). Breeds of livestock remain principally indigenous.

Agro-pastoralists undertake livestock rearing alongside crop farming. A small number of animals are kept. Pasture lands, either in 'paddocked' areas with informal hedging or fencing on privately owned land or on communal village land are used to graze livestock.

Semi-intensive production systems, whereby livestock including fowl are kept in confined spaces, are provided fodder, feeds and crop residues. These farming entities are mainly in the central and southwestern subregions and in peri-urban areas.

Commercial ranching production systems consist of large herds of animals, particularly cattle, which are grazed on expansive areas of fenced private lands and are provided with supplementary feed inputs. Commercial ranching accounts for 10% of the national herd, and this system is mainly found in the central and southwestern regions within the cattle corridor. Production is for beef and milk. Herd sizes can be as large as 10,000 heads of cattle, and in the case of goats over 600. Within the system of commercial ranching, large herds of cattle, goats and sheep are tended by a herder, sometimes a family member, or herders are sought from pastoralist tribes such as the Karamojong from the northeast of Uganda or the Banyarwanda from the Southwest of Uganda or Rwanda.

The fourth system, nomadic pastoral production, which is less common and remains mainly in the North East of Uganda, is a system where livestock are moved from one place to another in search of pastures and water on communal lands.

Nomadic pastoralist practices have largely disappeared in Uganda due to factors including:

- government policies which prioritise modern livestock development
- climate change resulting in prolonged droughts
- land tenure matters.

'Localised nomadism' is still practiced (Rakai DDP 2015). This involves movements of livestock herds (usually cattle) between villages within district borders and occasionally between districts during the dry seasons.

Localised nomadism, which enables pastoralists (agro-pastoralists and commercial ranching) to survive the increasingly unpredictable seasons, is carried out in an organised manner with host pastures being rented. Herders (often family members) move the animals by road or by trucks to the pastures and remain with their herd for the duration of their stay in the host pasture. Livestock movements are however prohibited during disease quarantines.

Trading of livestock is undertaken at regional and district markets or farm gate sales with intermediaries buying live animals for onward sale to abattoirs or to private buyers.

District and PAC Level

The main livestock types in the districts traversed by the AOI are cattle, goats, pigs, donkeys, poultry and sheep. The most common livestock production system is agro-pastoralism performed on a subsistence basis. To a lesser extent, but growing in popularity, is the semi intensive production system of chicken and pigs.

Cattle rearing, as a commercial system, is most common in Hoima, Gomba, Sembabule, Lwengo, Kyotera and Rakai districts, with large cattle ranches concentrated in Gomba, Sembabule and Lwengo. Cattle ranches commonly cover tens of square kilometres of paddocked private land with herd sizes of reportedly up to 10,000 heads of cattle.

The PAC household survey showed that the majority of households keep livestock for both subsistence and sale (54%). Cattle, goats, pigs, sheep and poultry (chicken, duck and turkey) are kept.

Labour

Within the agro pastoralist system at the PAC level, all household members share the task of caring for livestock, although females are more likely to care for smaller livestock such as chickens and goats. In the case of large herds of cattle, men dominate. The care, slaughter and sale of livestock are locally perceived as the primary activity of men, but in practice it is shared between sexes.

Localised nomadism of cattle is common in the sample PACs and essential for the larger herds of cattle. Figure 6.4-20 shows the localised nomadic movements.

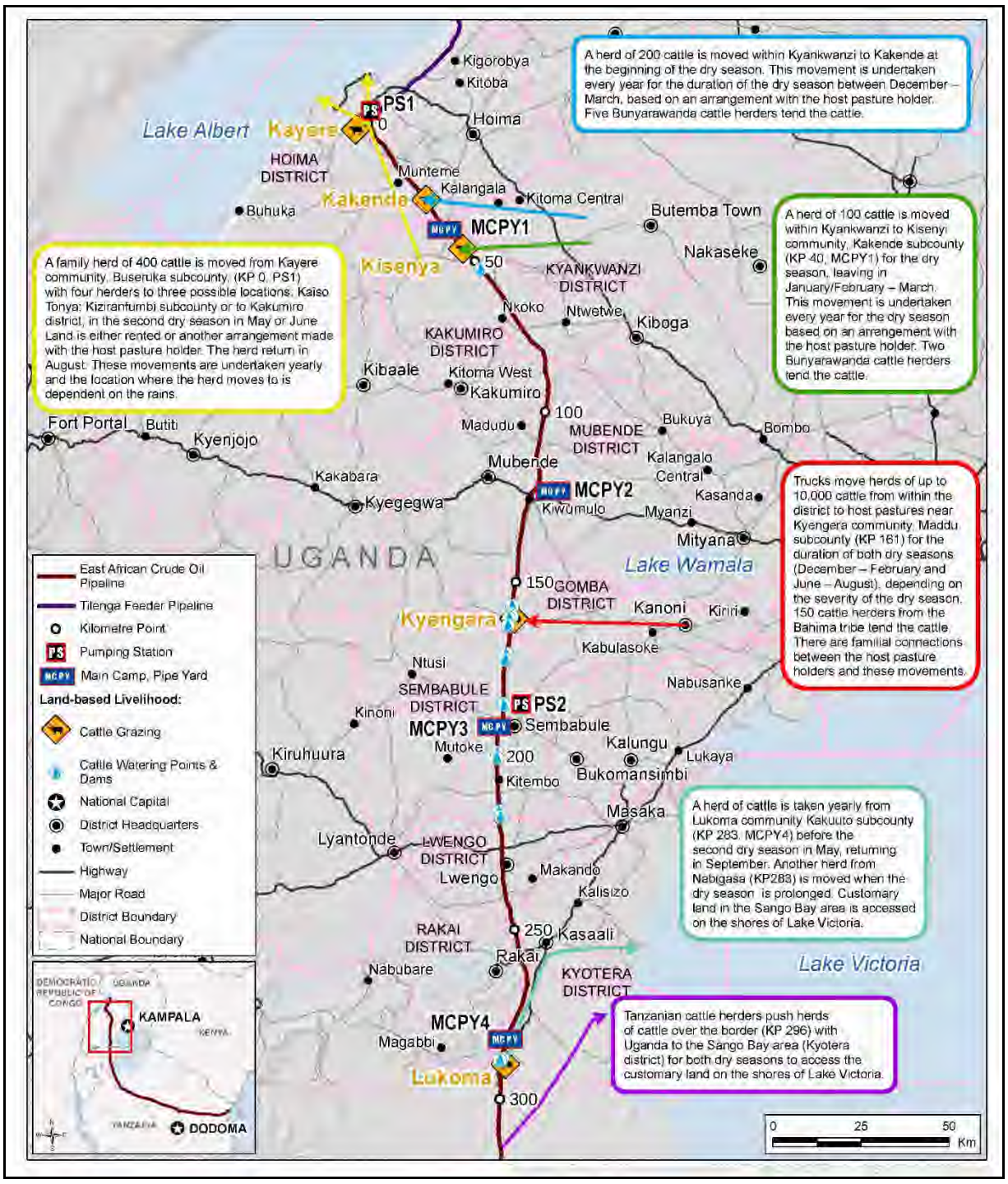


Figure 6.4-20 Localised Nomadic Movements

Marketing

Marketing of livestock takes place at mixed markets. Agro pastoralists commonly walk livestock to markets, however the commercial ranches use trucks.

Livestock products are sold at the farm gate, in markets and to local milk collectors. Milk coolers were reported in Hoima, Sembabule, Gomba, Kyotera and Mudende districts, in addition commercial cattle ranches invest in coolers due to scale of operations.

Products are transported to markets primarily on foot or, less commonly, by motorcycle (Figure 6.4-21) and vehicle. Women sell dairy products such as ghee, cheese, and yoghurt and men market meat and hides. No intermediaries are engaged in the selling of livestock products.

Figure 6.4-21 Milk being Transported to the Dairy by Motorcycle in Hoima, Hoima District (KP74.5)

Key Challenges

The following key challenges to livestock rearing were cited across sample PACs:

- prevalence of diseases. Veterinary services were reported as unaffordable by livestock owners interviewed
- quarantines enforced by the MAAIF have resulted in the closure of livestock markets which has left livestock owners unable to market their animals, leaving them without access to cash
- climate variability has resulted in sustained lengthening of the dry seasons, making access to water sources and pastures difficult
- livestock theft, especially cattle. This is cited as a major challenge and on the increase. Cattle breeders reported theft to be particularly high in the border areas with Tanzania (KP296). Cattle are branded to identify livestock, but this does not act as a deterrent with many thefts never being reported or recovered
- absence of government support for livestock owners
- lack of available land to make livestock rearing commercially viable
- threats from animals, such as snakes and baboons, were cited by 28% of livestock owners interviewed. Baboons were said to be a problem in Buseruka, Lugusulu, Madudu and Butoloogo subcounties
- increasing livestock injuries, including falling into excavations related to informal ASM, when moving animals to pastures and water sources

- prices of livestock and their products fluctuate as a result of the sellers' need for cash and condition of the animals
- conflict because of damage to crops when herds stray into farmland
- competition for resources such as water and land between pastoralists and host communities.

Trend in Condition and Sensitivity to Change

Several trends were reported by livestock keepers, pastoralists and village leaders. These are outlined below:

- long distance movements in search of water and pasture are no longer undertaken. Localised pastoralism is common with organised movements of livestock to host pastures
- livestock owners with large herds of cattle are increasingly reliant on pasture rental agreements and, in the dry season, there are scarce water sources
- government initiatives promote the introduction of exotic livestock breeds. However, livestock owners are slow to engage, and the new breeds are less disease resistant
- despite an increased prevalence of livestock diseases, livestock owners lack access to veterinary services. At the time of the survey, foot and mouth disease quarantine prevented any livestock movements
- rural households invest in livestock as a means of saving for dowries, school fees and health treatment
- access to grazing land and watering points is decreasing as a result of increased use of land by activities including crop farming, and building or improving roads and dwellings
- ongoing conflicts between farmers and livestock owners over access to land is likely to worsen due to the growing population and changing weather patterns
- settlements that are better connected to markets have seen an increase in income from sale of milk and animals.

Ecosystem Services Provided

The land-based livelihoods (livestock rearing) described herein provide the following ecosystem services:

Provisioning services include:

- rural income from selling livestock
- food security for families and future generations (if managed in a sustainable manner)
- financial security (livestock rearing is part of a diversification strategy to ensure some cash will be available when other means of income fail).

Cultural services:

- preservation of cultural heritage and traditional knowledge where livestock rearing is inter-generational.

Key points to note are that within the districts traversed by the AOI, livestock and livestock products are used both for subsistence and for sale. Livestock rearing in the sample PACs is predominantly sedentary with grazing on owned or rented land,

while a form of localised nomadism takes place due to increasingly unpredictable rains, particularly in the Kyankwanzi, Buseruka and the Sango Bay areas.

Land provides a provisioning service as a resource for livestock keeping. It provides grazing resources, water sources, ground for movement and habitation of livestock herds and trees for shelter and medicinal herbs.

Sensitivity Ranking

Table 6.4-39 presents the sensitive VECs in relation to livestock rearing identified during the social baseline study.

Table 6.4-39 Livestock Rearing Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Commercial ranch owners	Moderate (3)	Commercial ranch owners own large tracts of land and rear livestock commercially with assistance of production inputs. As operations are large-scale, they are more resilient to external shocks with the exception of disease, climatic change and a shortage of labour (e.g., herdsmen and other farm workers).
Livestock keepers and their families including women, children and elderly, undertaking crop farming (agro pastoralism incorporating small-scale livestock production)	Moderate (3)	Livestock keepers, who are also crop growers, are vulnerable to loss of livestock, but are less vulnerable than those who rely solely on livestock rearing.
Livestock owners and their families including women, children and elderly with herds, not undertaking crop farming in conjunction with livestock rearing	Very high (5)	Without free movements of large herds (cattle), animals may not have sufficient pasture and water sources. Herd owners are less resilient to external shocks as their main dependency is on their herd.
Hired herdsmen (often of Karamojong, Bunyarawanda ethnicity or non-Uganda nationals)	Very high (5)	Herdsmen employed by cattle owners have low or no education and some are without identity cards. They have no alternative livelihood means and are more vulnerable to external shocks.

Key Considerations

Key considerations are:

- owners of large herds do not have diversified income streams
- livestock rearing activities are under pressure due to shortage of land and water resources

- localised nomadic pastoralism within and between villages is undertaken in the sample PACs during the dry seasons
- livestock diseases are common and increased movements of vehicles and people could increase the spread of diseases
- human rights of access to food and a decent standard of living are maintained.

Baseline Condition of Artisanal and Small-Scale Mining

National Level

Deposits of gold, tin, tungsten, niobium, coloured gemstones, limestone, marble, kaolin, clay and granites are present in Uganda. In addition, construction materials such as sand, clay, murram, limestone, marble, kaolin and stone aggregates are quarried.

To date, Uganda's mining sector is characterised by a combination of officially registered local and international mining companies.

The Mining Act (2003) provides legislation for prospecting, exploration and mining (Alchetron 2017, Internet site). Two aspects of the Act applicable to ASM are listed below:

- Prospecting Licence: a one-year, non-exclusive licence is granted to the holder to prospect for minerals around the country
- Exclusive Prospecting Licence: the licence is mineral specific and is limited to an area of 20.48 km^2 (7.91 square miles).

ASM provides livelihoods for almost 200,000 women and men, and over a million Ugandans indirectly benefit (EARF 2018). It is estimated that ASM has grown by 40% since 2008 (Spiegel 2012).

However, ASM is associated with illicit activities, environmental degradation, exposure to occupational hazards and other serious health and safety concerns for miners and their communities, displacement of people and in-migration of prospectors. At 6% growth per annum, the construction sector is strong, and the current market demand is the main driver especially with the large number of current and imminent infrastructure projects in the country.

District and PAC Level

Full-scale geological studies have not been carried out to determine the presence of minerals across the districts traversed by the AOI, and the mineral status of these districts is largely unknown. Known deposits are largely unexploited.

Construction materials such as sand, stone for aggregates, laterite soils for brick making and gold are the main targets for mining and quarrying in the districts.

Sand mining occurs in all the districts traversed by the AOI, in particular in wetlands. For the majority of existing sand pits, permission is sought from land owners and a fee paid. Sand sources were said to be decreasing due to an increasing number of people seeking to make a living from this resource.

ASM of gold takes place in Kakumiro, Kyankwanzi and Mubende districts. ASM involves the collaboration of various teams: land owners who own the pits, miners

or ‘diggers’ extract the ore, ‘grinders’ pulverise the ore and washers or ‘panners’ clean the ore.

Gold buyers from Kampala buy from miners, the pit owners or local dealers. The buyers then sell the gold to brokers, generally Indian traders, in Kampala. The gold is reportedly exported to China and Dubai.

Mubende district has become a hub for gold mining with finds in 2016, which caused an in-migration of thousands of miners, including experienced miners from the DRC, Rwanda and Tanzania.

Extraction of clay (lateritic soils) from wetlands for brick making is undertaken in all districts traversed by the AOI (DDPs and KIIs with natural resource officers). It is undertaken for household use and sale.

Crushing stone for aggregate was undertaken to a lesser extent.

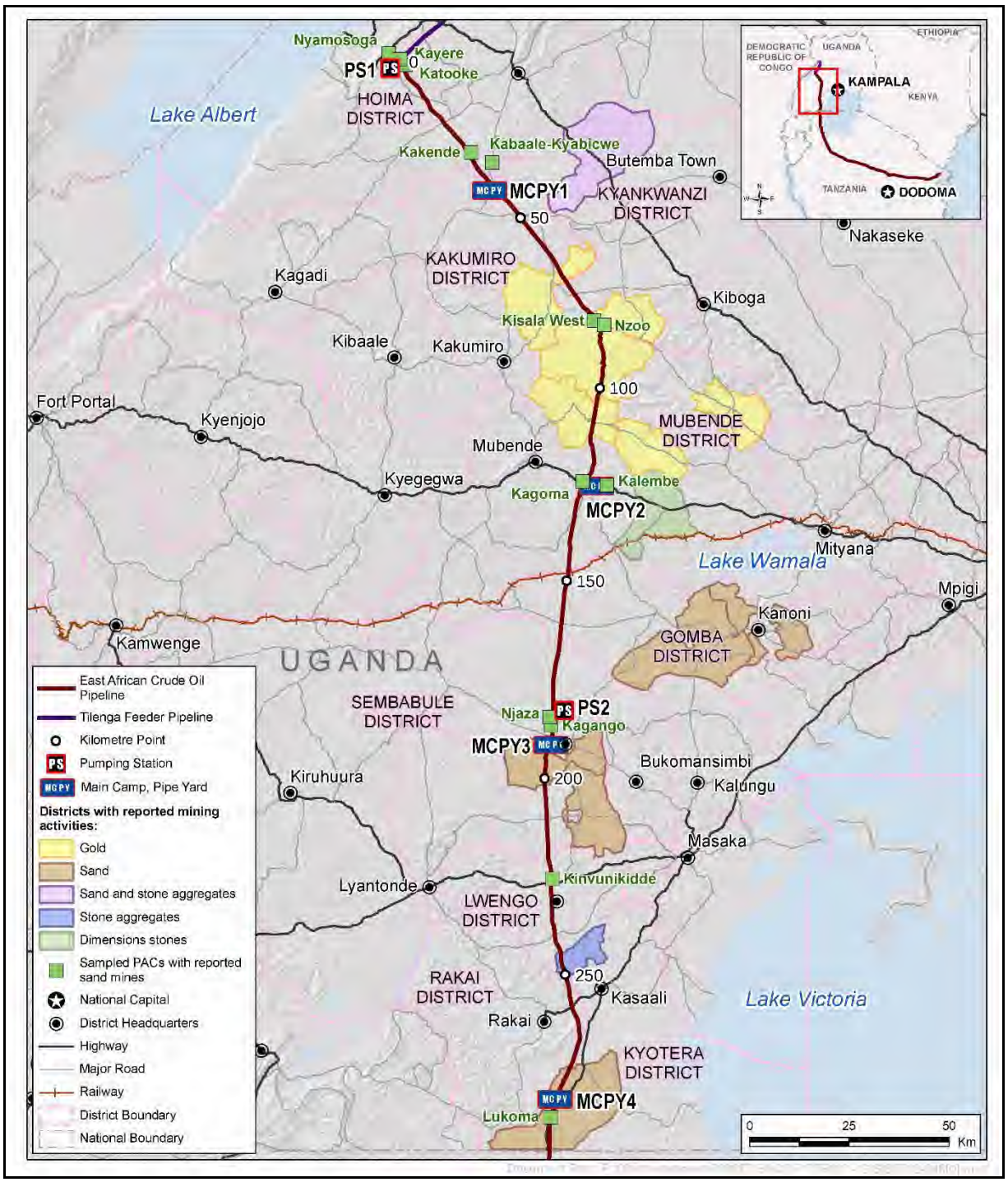


Figure 6.4-22 Artisanal Mining in the Sample Potentially Affected Communities

Problems associated with ASM, as reported by district natural resource officers, were as follows:

- ASM is undertaken in an uncontrolled manner, without a licence, and often without the knowledge of the authorities.

- environmental degradation can occur. Open pits and uprooted trees can create drainage problems and stagnant water provides breeding grounds for mosquitoes. Open holes are dangerous for humans and animals.
- the aesthetic value of abandoned and active mine sites is low
- mining is undertaken without protective equipment, exposing miners to health and safety matters. Unsupported tunnels in hard rock associated with gold mining were reported in Kyankwanzi district
- women working in ASM obtain fewer benefits than men
- child labour is prominent, especially in extremely poor households in rural communities
- gaining access to the deposits cam create conflicts and boundary disputes
- in-migration of people, including experienced ASM miners from Tanzania, Rwanda and the DRC, is common (reported in Kakumiro, Gomba, Kyankwanzi and Mubende districts)
- demand for sand, clay and aggregate fluctuates
- customers do not always pay miners
- miners in Mubende district are using mercury and cyanide to process gold. These chemicals drain into waterbodies (Akumu and Kelly 2016).

Trend in Condition and Sensitivity to Change

ASM trends include:

- the government is increasingly acknowledging the importance of ASM and moving towards formalisation of the sector
- extraction of construction materials, such as sand, clay for bricks and stone for aggregate, is on the increase due to an expanding construction industry in Uganda
- ASM activities provide increasingly major benefits to households and create multiplier effects in local communities
- ASM activities slow down urbanisation and create downstream employment
- rush scenarios (large and sudden in-migration of people) for gold ASM have been encountered in subcounties neighbouring those traversed by the AOI, in Mubende district.

Ecosystem Services Provided

The land-based livelihood (ASM) described herein provide the following ecosystem services:

Provisioning services include:

- income from sale of minerals and construction materials (e.g., sand, clay and gravel)
- materials for dwellings and shelter
- salt for livestock and domestic consumption.

ASM is an abiotic provisioning ecosystem service carried out throughout the AOI by sample PACs, primarily in the dry season. Information about the nature and extent of this ecosystem service is included in the text above.

Sensitivity Ranking

Table 6.4-40 presents the sensitive VECs with regards to ASM identified during the social baseline study.

Table 6.4-40 Mining Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Pit owners on ASM sites dependent on mining for their income	Moderate (3)	These VECs are moderately vulnerable to loss of income but are likely to be more resilient if relocated owing to the relatively cash rich nature of pit ownership.
Non-Ugandan nationals undertaking ASM activities informally	Very high (5)	This category of people will be highly vulnerable as they hold no identity papers and have no legal standing in Uganda.
Artisanal and small-scale miners engaged as casual labour on an informal basis, pursuing mining as a sole occupation	Very high (5)	These VECs do not have access to land for farming or livestock as an alternative livelihood and have therefore very high vulnerability.
Child artisanal miners engaged as casual labour on an informal basis, pursuing mining as a part-time occupation	Very high (5)	Children encounter high safety risks and lack access to education as a result of their mining activities.
Women in ASM	Very high (5)	These VECs are highly vulnerable as they have less access to productive capital than men and may be relying on ASM activities as a sole livelihood.

Key Considerations

Key considerations are:

- large construction projects may require substantial quantities of construction materials. This would increase the pressure on existing sources of supply with the following potential results:
  - price increases for construction material with indirect effects felt through the construction industry and possibly making housing less affordable
  - opening of new (licensed and unlicensed) borrow pits to meet increased demand
  - a surplus of borrow material, fall in prices and fall in employment after the demand is closed once construction is completed
- due to the informal and hence often covert nature of ASM activities, it is difficult to assess the precise location of ASM sites at any particular time
- PACs' human rights to a decent livelihood, safety and security.

Baseline Condition of Natural Resources Use

National Level

Products such as biomass fuel (firewood and charcoal), wild foods (honey, insects, mushrooms and bush meat), timber, medicinal plants and grasses play a vital part in the subsistence of rural communities in terms of energy for cooking, food security, construction materials for shelter, medicine and income.

Hunting occurs throughout rural areas in Uganda and requires a permit from the UWA under the Uganda Wildlife Act 1996. However, hunting often takes place without a permit. Apiculture is a fast-growing industry.

District and PAC Level

Forest, rangeland and wetland habitats characterise the districts traversed by the AOI. Local communities harvest natural resources in these habitats for subsistence or for cash income.

Figure 6.4-23 presents the natural resources use in the sample PACs.

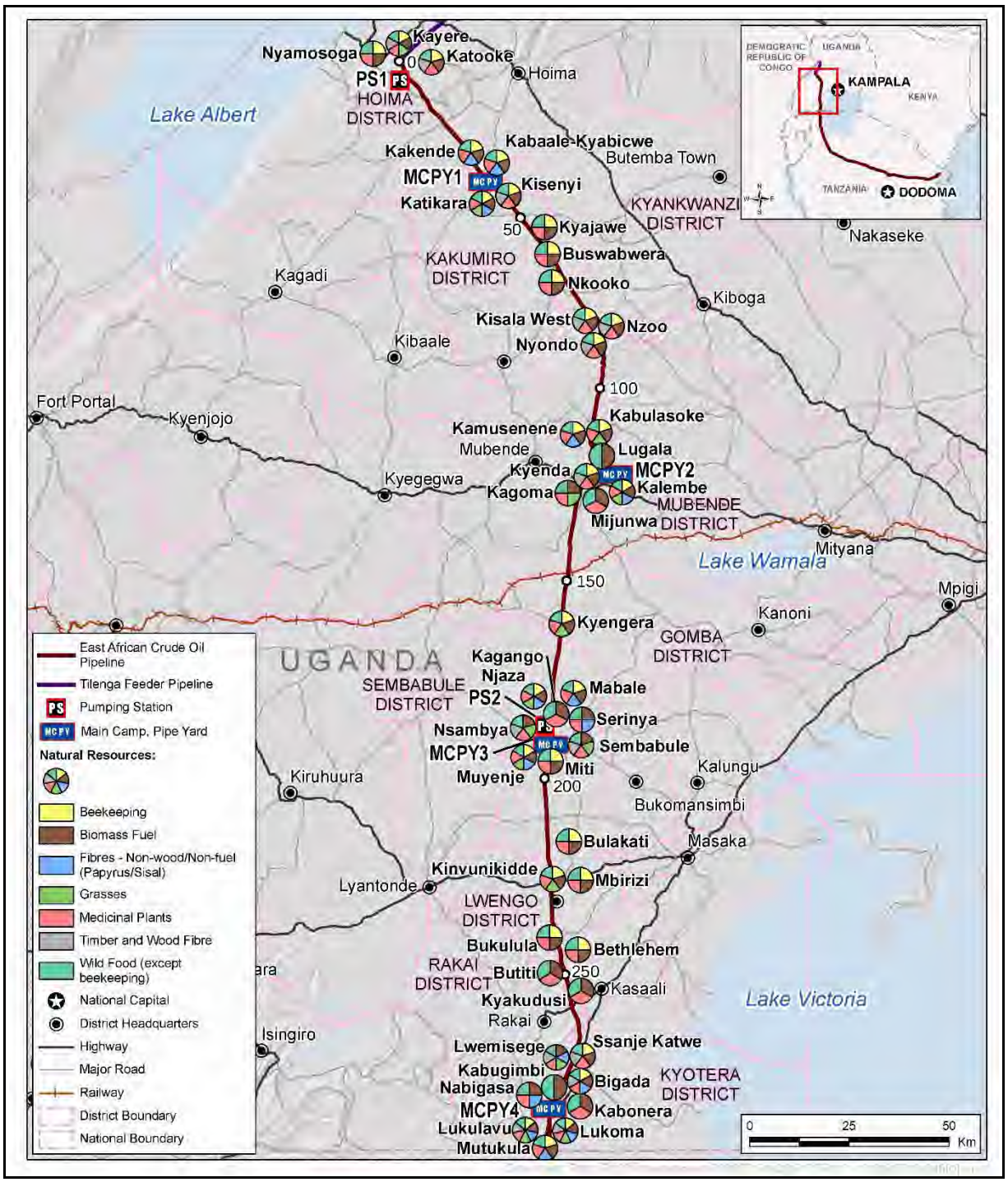


Figure 6.4-23 Natural Resources Harvested in the Sample Potentially Affected Communities

The various natural resources used at PAC level are outlined below.

Trees, mainly eucalyptus and pine, are used for construction (poles for scaffolding or joists and uprights in houses and planks for walls; Figure 6.4-24), household furniture, kitchen utensils, poultry cages and shelters. Wood is sourced from private land in areas adjacent to communities with permission sought from the landowner.

Figure 6.4-24 Wood Cut for Firing a Brick Kiln in Katikara Trading Centre, Kakumiro District (KP41)

Fibre from the inner bark of the Mutuba tree *Ficus natalensis* is used to make the traditional bark cloth (olubuggo), which is used as mats and decorations.

Firewood, an important source of cooking fuel, is collected in communal land by communities in all districts traversed by the AOI. Responsibility for collecting firewood falls largely on women and children. Distances travelled to find firewood have reportedly increased due to diminishing sources. In some instances, permission from private land is sought to access firewood and an annual fee is paid.

Charcoal use is popular in all districts traversed by the AOI. Charcoal processing, predominantly for sale, with small amounts used for the household, is found in a small number of sample PACs.

Papyrus *Cyperus papyrus* grows in abundance in wetland areas of the districts traversed by the AOI and the shore of Lake Albert to the west of the pipeline route. The papyrus is cut, dried and used to make sleeping mats, flooring and screens, baskets and fish traps.

Grasses, which are harvested by both women and men predominantly on village land have several uses. These include:

- thatching of roofs. Grass for thatch is harvested on a regular basis during the rainy season in a small number of sample PACs in Hoima district.
- animal fodder, which is gaining importance due to ongoing depletion of communal grazing areas and the shortage of pasture land during the dry season. Grass for animal fodder is mainly collected in the central and southern sample PACs within the traditional cattle corridor.
- making brooms is a seasonal activity and are generally sold at local markets.

There is a substantial reliance on locally sourced medicinal plants for common illnesses. People use both medicinal plants and modern medicine to treat illnesses. However, use of local medicinal plants is more prevalent in the remote rural areas.

Wild fruit and vegetables are harvested by all sample PACs throughout the year, and serve to supplement the diet. Surplus is occasionally sold in local markets or within the community. Edible wild plants are collected throughout the year from the peripheries of cleared land where crop farming is undertaken and tree covered areas, and are used to supplement the diet. Wild foods are mainly collected by women and children. Mushrooms are harvested between March and May and August and October from scrubland, forest and groves near communities.

Grasshoppers are harvested, mainly in open areas, by men, women and children to supplement the diet. Ants are collected between February and April and between March and June.

Hunting of wild animals was reported to occur in all sample PACs on an infrequent basis. Animals hunted include duiker, impala, bush buck; baboons, bush pig, rabbits; squirrels, hippopotamus, Ugandan cob, rats and warthog. Hunting is undertaken by men in crop growing areas and in uncultivated communal lands.

Apiculture is a livelihood activity practiced in all districts traversed by the AOI. Gomba, Mubende, Sembabule, Lwengo and Kyotera have high densities of beekeepers. Most sample PACs typically have one or two beekeepers.

Challenges for Natural Resources Use Across the Districts

Challenges facing natural resources include:

- a growing population has put pressure on the natural resources due to encroachment on wetlands and forest areas for dwellings, farming and grazing
- many timber and charcoal dealers are unlicensed, which makes regulation by the districts difficult
- the high cost of alternative sources of energy for cooking and lighting (gas, solar and electricity) forces people to use wood and charcoal
- the rate of tree cutting is much higher than the rate of reforestation
- the honey production is inefficient. Traditional beehives and rudimentary equipment can lead to contamination of the processed honey. Fermentation of honey is common due to lack of appropriate equipment and storage facilities. Potentially valuable by-products such as wax and propolis are discarded. To increase production, beekeepers need more support in terms of equipment and on-going practical training
- there is a loss of bee habitat due to clearing of vegetation and climate change.

Trend in Condition and Sensitivity to Change

Key trends affecting natural resources use include:

- natural forest and scrubland is diminishing so women have to travel increasing distances to collect wood. With few affordable alternatives to firewood and charcoal, long-term sustainability of existing sources of biomass fuel is uncertain
- medicinal plants are widely used for human and animal illnesses, especially in remote rural areas due to the inaccessibility of medical facilities. However, increased clearance for farming and infrastructure may threaten availability
- although hunting is only permitted with a licence, illegal hunting is practiced on a small scale. Hunting has diminished because there is a decrease in game populations due to overhunting, clearing of forest and scrubland areas for agriculture, and increased livestock grazing.

Ecosystem Services Provided

The land-based livelihoods (natural resources use) described herein provide the following ecosystem services:

Provisioning service include:

- energy for cooking and food security
- construction materials for shelter
- income from selling natural resources
- traditional medicine.

The natural resources included in this section are obtained from a variety of ecosystems within or near the PACs including forests, wetlands and pasture rangelands. As such, these natural resources play a vital role in subsistence of rural communities. With an increasing population and a high demand and reliance on natural resources, continued protection of and access to these resources is essential.

Sensitivity Ranking

Table 6.4-41 presents the sensitive natural resources use VECs identified during the social baseline study.

Table 6.4-41 Natural Resources Use and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Beekeepers	Low (1)	Beekeepers are more resilient to external shocks because beekeeping activities supplement farming activities.
Fibres and grass collectors	Low (1)	Fibres and grass are widespread, and their availability will not be substantially impacted.
Hunters	Low (1)	Hunters are generally not reliant on the bush animals they catch for food or as a main income.

Table 6.4-41 Natural Resources Use and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Medicinal plant users	Moderate (3)	Without access to medicinal plants there may be limited means to treat illnesses in an affordable manner.
Wild food users	High (4)	Plants supplement diets and are used in months when households may not have sufficient access to food.
Firewood collectors (women)	High (4)	With limited access to firewood, household meals cannot be cooked, affecting the health of family members. Access to firewood is already diminishing, and women must walk long distances.

Key Considerations

Key considerations are:

- communities, especially poorer households, are dependent on natural resources for the provision of wild food, traditional medicine and firewood for cooking
- a growing population and urban demand for firewood and charcoal has reduced their availability in the AOI
- there is a decline in bee populations due to habitat destruction in favour of crop farming and animal grazing. Additional removal of land cover may affect the bee population further.
- PACs' human rights to a decent livelihood and food security.

6.4.3.9 River- and Lake-Based Livelihoods

Baseline Condition of River and Lake-Livelihoods

National Level

The fisheries sector provides a livelihood to fishermen and those engaged in the supply chain, which includes small-scale and industrial fish processing, fish trading, boat-building, net making, trading in fishing equipment and extension activities provided by the government. The current annual production from fisheries is about 461,000 tonnes and from aquaculture 111,000 tonnes (ACME 2017, Internet site)

Fisheries activities are mainly carried out in major and minor lakes, rivers and wetlands. A major challenge facing lake fisheries is illegal fishing with use of indiscriminate fishing gear such as fine-mesh-gill and seine nets. This is particularly problematic in Lakes Albert and Victoria.

The Government is supporting the emergence of pond- and dam-based aquaculture.

District and PAC Level

River, Stream, and Wetland Fishing

The AOI crosses the Kafu River (KP39 MCPY1), Nabikazi River (crossing at KP114 and KP148-149), Katonga River (KP165) and Kibale River.

FGDs found that freshwater fishing was undertaken in all sample PACs. Fishing is likely to be encountered at all river, stream and wetland crossings and in particular the major rivers (see Figure 6.4-25). The rivers contain *Protopterus aethiopicus*, *Schilbe intermedius*, *Labeo* species, small Mormyrids and macroinvertebrates such as Chironomids (see Appendix A2, Aquatic Biodiversity Baseline Report). Fish caught in rivers and wetlands are mainly consumed by the household.

Figure 6.4-25 Fishermen Using Nets to Catch Fish in Bethlehem, Kyotera District (KP247.5)

Lake Fishing

Fishing is practiced on Lake Albert (Buseruka subcounty, Hoima district), Lake Wamala (Gomba district) and Lake Victoria, and minor lakes such as Kijjanebarola (Rakai district) and Kacheera (Kyotera district).

Fishing communities are centred on landing sites, where boats and nets are shored, fish processing is undertaken, food stalls and traders operate and Beach Management Units are active. These sites also serve as gathering points for

recreation and have been linked with social ills and elevated HIV rates (see Section 6.4.3.12 on community health).

Fishing communities have expanded substantially in recent years and attracted unemployed youth and, in the case of Hoima district, youth from the DRC (Artelia 2015b). Males dominate the fishing activity (Hoima DDP 2015). However, women are involved in the processing and marketing fish part of the supply chain. Fishermen are of diverse ethnic backgrounds. In Hoima, fishing is undertaken by the Baganda, Bakobya, Bagungus and Banyoro. The Alur make up a large proportion of the fishermen on the shores of Lake Albert in Hoima district.

Lake fishing is predominantly a full-time occupation and fishing households are therefore solely dependent on this source of income. A small percentage of fishermen also engage in crop farming, livestock rearing or trading.

Lake fishing is undertaken from the shore or from vessels. Boats are usually paddled, with only a minority having outboard engines.

The main fish caught in lakes in the districts traversed by the AOI are Nile Perch, Tilapia, Mudfish and Clarias species.

Marketing and Processing of Lake Fish

Average fish prices are high due to the high demand and short supply. High market prices encourage fishermen to sell rather than consume or share their catches in the local fishing community. FGDs found that fish is sold:

- fresh or processed in local markets such as Hoima Municipality, Masindi Town and Kyotera Town
- fresh or processed at regional markets or in the DRC in the case of fish caught in Hoima district.

Where physical access is possible, refrigerator lorries collect the fresh fish from the landing sites for transport to the factories. Where such access is not possible, fishermen transport their catch by motorbike (Rakai DDP 2015).

Fish is also processed locally before being marketed. Processing is undertaken mainly by women by sundrying fish on makeshift papyrus racks or smoking the fish in firewood-fuelled mud ovens. Salting, which is a male activity, is also undertaken to preserve and sell the fish (Artelia 2015b).

Aquaculture

Aquaculture is a growing economic sector in the districts traversed by the AOI, and all districts are investing in aquaculture initiatives as evidenced in DDPs. However, it is still predominantly a subsistence activity, undertaken in manufactured or dammed ponds up to approximately 500 m^2 in size.

FGDs and KIIs with district production officers and fishermen identified the following challenges associated with aquaculture:

- aquaculture is constrained by low inputs and the low quality of fish fry and feeds, resulting in poor productivity
- major diseases including fungal infection and stunted growth are experienced as a result of poor feeds

- predators such as monitor lizards, snakes and herons further reduce yields (UBOS 2009b).

Trend in Condition and Sensitivity to Change

The following trends were identified for river- and lake-based livelihoods:

- lake fish stocks are decreasing due to overfishing and decreasing fish stocks encourage the use of illegal fishing gear (fine-meshed nets)
- population growth is increasing pressure on natural resource use, including river fishing. Additionally, this is causing more wetlands to be drained for agriculture and other land use, and therefore further constraining fish availability.

Ecosystem Services Provided

The river and lake-based livelihoods described herein provide the following ecosystem services:

Provisioning services include:

- income from selling catch and fishing equipment
- food to supplement diets
- products for fish processing activities.

Cultural services include:

- Fishing has been an important activity for generations and is a major part of the PACs' way of life, in particular for the lake fisherfolk.

Sensitivity Ranking

The social baseline identified sensitive VECs for river and lake-based livelihoods. These are presented in Table 6.4-42.

Table 6.4-42 River- and Lake-Based Livelihoods Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Lake fisherfolk who fish part time	Moderate (3)	This category of fisherfolk undertakes fishing activities alongside crop farming or informal trading activities therefore they are less vulnerable to a reduction of one of their income streams.
Women who process and market fish (river) as part of a multiple livelihood strategy	Moderate (3)	Women have limited income-earning opportunities. Fish processing and marketing is undertaken alongside crop farming. Women have generally more than one income stream and will therefore not be dependent on fish processing and marketing as the sole means of making a livelihood for the household.
Lake fisherfolk who fish full time	Very high (5)	This category of fisherfolk is dependent on fishing as a sole livelihood and subsistence activity. There are few other income-generating opportunities available and without land holdings they are particularly vulnerable.

Table 6.4-42 River- and Lake-Based Livelihoods Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Women who are dependent on lakeshore fishing	Very high (5)	Women fishing from lakeshores are considered highly vulnerable with low resilience to external shocks as they have no alternative means of livelihood and are dependent on shore fishing for food security and income generation
Landless who fish on rivers	Very high (5)	The landless are more reliant on deriving an income from natural resources. With no or limited alternative income generating opportunities other than fresh water fishing, this category is considered highly vulnerable.
Employed workers of aquaculture enterprises	Very high (5)	Often landless and exclusively dependent on their job.

Key Considerations

Key considerations are:

- lake fishing and aquaculture are small-scale subsistence activities
- those whose livelihoods are dependent on fishing are poor and do not have access to credit, and so their resilience is low
- there is pressure on the fisheries sector due to increasing crop failures caused by drought or floods forcing crop farmers to look for alternative means of generating an income
- young people are becoming more attracted to fishing activities as the size of farming plots for the younger generations is diminishing, rendering crop farming less profitable
- the human right to access to food and an adequate standard of living for communities.

6.4.3.10 Land and Property

Baseline Condition of Land and Property

National Level

The Land Act (1998; 2010) identifies four forms of land tenure: customary, leasehold, freehold and mailo (MLHUD 2013). Most citizens hold their land under customary tenure, which applies to specific land areas that are governed by customary laws. Land under this tenure system is communally, jointly or individually owned, often without land titles and often presided over by elders, clan leaders or figureheads within communities). In the laws of Uganda, customary tenure is defined as “a system of land tenure regulated by customary rules which are limited in their operation to a particular description or class of persons”.

Over 60% of land is held under a customary tenure system, most of which is found in the northern, western and southern parts of the country and in Hoima, Kakumiro

and Kyankwanzi. Key problems associated with this tenure include lack of security for landowners and disadvantages for women (MLHUD 2013).

The Land Act (1998; 2010) provides for two mechanisms in which rights held under customary tenure can be formally recognised:

- acquiring a Certificate of Customary Ownership (CCO). Any person, family or community holding land under customary tenure on former public land may acquire a certificate of customary ownership. A CCO can be acquired through a tiered application process. Applications are reviewed by the Area Land Committee and certificates are eventually issued by the district land board.
- forming a Communal Land Association (CLA) by any group of persons under the Land Act for any purpose connected with the communal ownership and management of land, whether under customary law or otherwise (GOU 2013b).

Under the mailo tenure system, land is registered under the Registration of Titles Act, which grants the holder a land title and absolute ownership in perpetuity. This tenure system recognises occupancy by tenants (known as *Bibanja* holders), whose relationship with the landlords is governed and guided by the provisions of the Land Act (1998; 2010). Land held under mailo tenure (approximately 23,300 km^2) is confined to Buganda (central Uganda) and Bunyoro (western Uganda). At present there are over 250,000 mailo land title holders in Uganda (MLHUD 2013).

The third land tenure system (freehold) is similarly governed by the Registration of Titles Act. Under this system, a registration of title in perpetuity and conferment of full powers of ownership is provided to the land holder, who may use the land for any legal purposes. Only national citizens are legally entitled to own land under the freehold system and there is little land held under freehold tenure.

Land conflicts form the highest percentage of disputes reported both in formal and informal dispute resolution systems in Uganda. Common concerns reported are landlord-tenant relations on mailo land, land tenure insecurity in post-conflict northern Uganda, disputes over land expropriation by the Government and the implications of oil exploration and mining for local land tenure systems and rights (MLHUD 2013).

Foreigners cannot own freehold land. However, they may obtain leases for 49 or 99 years. Foreign individual or corporate investors cannot acquire land for crop or animal production. Foreigners can either rent or lease land from citizens or the Government (Global Property Guide 2016, Internet site).

The Land Act seeks to protect equitable ownership of land for women and vulnerable persons through three dispositions:

- women and vulnerable persons cannot be excluded from customary ownership (all customs that exclude them are regarded as null by the law)
- land committees have to protect interests of women, children and disabled persons
- women have to be represented in land committees, CLAs and tribunals.

District and PAC Level

At the district level, land is administrated by the district land office, district land board and district tribunal (not functional). The district land management officer

(DLO) provides technical services to the district administration and the district land board (DLB). The DLB is responsible for holding and allocating land in the district, facilitating the registration and transfer of interests in land and compiling and maintaining rates of compensation payable (i.e., crops and non-permanent buildings).

At the subcounty level, land is administrated by an area land committee and a recorder. In 2016, an online cadastre (register of land ownership) was launched for the mining sector, which aims to reduce conflicts between different land owners who are involved in mining activities.

Large tracts of land are also owned by institutions like the Church and the Kingdoms who lease out to individuals on a lease-hold basis.

Land management challenges are shown in Table 6.4-43.

Table 6.4-43 Land Management Challenges

Challenge	Description of Challenge
Land titling	Few land holdings are titled. This can be attributed to factors including the protracted process required to register land officially and the associated cost.
Speculation	Speculation is a common consequence of publicly disclosed land acquisition. Speculative behaviour is often initiated and may be funded by resourceful individuals with access to information on potential development areas (information which otherwise is not publicly available). Acting on such information, speculators extort land from desperate landowners (usually parcels held under customary tenure), often at below-market prices and without consent from family or clan members who have interest in the same land. In addition, due to the large number of unregistered land parcels in the area, land is often transferred and registered without consent or due process by individuals who do not share interests in the targeted land, and who have access to the land administrative system. Legitimate landowners (with customary tenure rights) are thus deprived of their land rights, often without their knowledge.
Contested land ownership	Weaknesses in the land administrative system give rise to land ownership disputes, not least as a result of incomplete transactional processes, including title registrations.
Recognising and formalising rights under customary tenure	Customary tenure does not give clan leaders any land ownership rights. However, these institutions have the power to establish rules for people claiming their rights and interests on specific parcels of land. Increasingly, land is being parcelled into individual plots, even in clan-held areas, and there is evidence of a move towards individual ownership. CCO linked to membership of a given clan may not be relied on as stable instruments since social migration and community dynamics change family and community composition.

SOURCE: Adapted from CNOOC et al. (2016)

Land and Gender

Despite policy and legal safeguards, the head of the household (predominantly male) is usually perceived as the rightful owner and custodian of the land. In Uganda, women formally own between 16–26% of the land, and informal (customary) ownership is reported to be approximately 15% and conjugal ownership is reported to be 3% (LANDac 2016). As the value of land is increasing, the male dominance over land–related decisions is increasing.

Women and young men are dependent on the head of the household for their access to land. Teenage sons can participate in land management as heirs and are entitled to decide what to do with their inheritance. Women and girls do not typically participate in land-related decisions.

Land Holdings

National data relating to average land holding size is scarce. However, UCA states that the national holding size is 1.1 ha (UBOS 2011b). According to the DDPs (2015), agricultural landholdings are fragmented and small.

Land Conflicts

Land conflicts are the most common source of dispute, and are mainly due to:

- inheritance of land and land partitioning among the heirs
- non-consented land sales within the family
- exclusion of women from land ownership
- fraud over land purchase or illegal land sales
- disputes over land boundaries
- expansion of settled and ranching farming, national parks, towns and settlements encroaching on village land
- land use plans that deny local communities access to land and natural resources needed for livelihoods
- village boundaries not being properly set
- land being acquired by the government for public purposes, but subsequently being used for other purposes, causing dissatisfaction with the original landowners.

The Land Act (1998; 2010) created a dedicated judiciary system to solve land conflicts through district land tribunals, although this resulted in numerous problems and the approach was abandoned in 2006. Land cases are handled by the judiciary system through civil magistrate courts.

Settlements

In rural areas, most of the dwellings concentrate along national and secondary roads. Hamlets and villages often have a central trading place in which the main business and social activities take place.

Traditional house structures common throughout the PACs are constructed using wood joists and uprights, with thatched roofing and adobe walls. Other structures are improved houses with brick walls, and zinc or fired clay tiled roofs.

Trend in Condition and Sensitivity to Change

The following trends and sensitivities were identified:

- an increase in population and in-migration in certain areas with accompanying purchase of land by migrants is causing an increasing scarcity of land. The overall number of disputes involving land-related cases is increasing.
- long-standing discrimination that excludes women from owning, inheriting and controlling land is causing a high level of inequality. Furthermore, as the value of land increases, the male dominance over land-related decisions is likely to increase.
- recognition of land value and the enactment of land legislation have increased the quantity of land being registered, sold and purchased. As a consequence, there is less land being inherited and more land being sold.
- land is often bought by outsiders of the village with higher purchasing power. During these transactions, there is an increasing number of fraud cases. The sale of land for private use is reducing the availability of communal village land, which was in the past used for grazing.

Ecosystem Services Provided

The ecosystem services provided by land have been considered in Section 6.4.3.8, Land-Based Livelihoods.

Sensitivity Ranking

Table 6.4-44 lists the sensitive VECs for land and property.

Table 6.4-44 Land and Property Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Livestock rearers practicing localised nomadism	Moderate (3)	Without access to land or water, livestock quality and quantity will be adversely affected; localised nomadism has become increasingly important as a consequence of recent droughts and climate variability.
Landholders without title deeds	High (4)	Without title deeds land holders will be more vulnerable in terms of rights to compensation for loss of land.
Youth	High (4)	Youth have limited access to land outside their customary rights as a member of a clan or family and inheritance protocols mean that parcels of land are becoming smaller and less viable.
Female headed households	Very high (5)	Without land ownership rights and long-standing discrimination that excludes women from owning, inheriting and controlling land, causing a high level of inequality and without access to productive capital, women are particularly vulnerable.

Table 6.4-44 Land and Property Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Previously displaced/resettled HH/individuals	Very high (5)	Households or individuals who have undergone resettlement or compensation within the AOI will be particularly vulnerable to further change and will have low resilience to additional shocks.

Key Considerations

Key considerations are:

- the increasing scarcity of land which may impact on the ability to provide alternative land to PAPs requiring resettlement
    - the vulnerability of most landowners due to lack of formal title deeds, potentially making them vulnerable in terms of rights to compensation for loss of land
- women being disadvantaged in terms of access to land. Compensation for loss of land will mostly be paid to the head of household (men) without spousal consent, leaving women vulnerable in terms of access to that compensation.
- the existence of numerous land conflicts exacerbated by shortage of land
- the lack of land management plans which impact on the distribution of land
- the existence of vulnerable groups in terms of land take, such as illegal users of the land, including hunters and natural resource collectors (see land-based livelihoods, Section 6.4.3.8)
- an increase in 'land-grabbing' schemes used to obtain land unlawfully or under false pretexts, high amounts of land speculation and reports of speculators extorting land from people creates fear and insecurity.

6.4.3.11 Workers' Health, Safety and Welfare

Baseline Condition of Workers' Health, Safety and Welfare

The majority of the International Labour Organisation (ILO) conventions have been incorporated into national legislation.

Ministry of Gender, Labour and Social Development (MGLSD) through the district administration provide oversight to workplace conditions and worker employer relations. Every employer is required to provide their employees with a written contract of employment from their first working day. However, in practice workers are not always provided with adequate information on their terms of employment and their labour rights (DTCIDC 2016).

Informal workers lack written employment contracts and most are paid daily after the work is completed. Workers' entitlements to job security, sick pay, support in case of work injury, paid holidays, access to grievance mechanisms and regular working hours are largely absent. Basic rights, such as the right to paid leave,

maternity leave (with 60 days leave at full wages) and safe working conditions – are frequently violated (ISER 2017).

A culture of unionisation in the project area is largely non-existent. Some employers reportedly ignore legal requirements to enter collective bargaining agreements with registered unions. Workers have limited power to negotiate with their employers. This is exacerbated by poor awareness of labour rights amongst workers. High levels of illiteracy and the complexity of laws governing labour in Uganda make it difficult for people to understand their rights, rendering them vulnerable (ISER 2017).

Women face numerous challenges in the workplace, including sexual harassment, abuse and exploitation. Such challenges limit women's prospects and opportunities for advancement in the workplace (UHCHR 2016). Women's limited access to education and early marriage restrict them from obtaining equal pay within the formal and informal sectors of the economy.

In addition to women, other groups, including those living with HIV and or AIDS, casual or temporary workers and child-headed households, also experience workplace discrimination.

Social security schemes consist of contributory and or compulsory social insurance for formal workers. These are known as the National Social Security Fund (NSSF) and the Public Service Pension Schemes (PSPS) that cover all public servants and exclude people active in the informal sector (ILO 2018). The government is planning to introduce a nationwide Social Health Insurance scheme (SHI), which would also cover workers from the informal economy. The proportion of the population covered by government or private social protection is estimated at 3.5%, which is lower than the 4.3% average across SSA.

The MGLSD, through the Department of Occupational Safety and Health (DOSH), is responsible for administration and enforcement of the Occupational Safety and Health (OSH) Act 2006. Despite government efforts to improve the safety and health of all workers in the country, limited change has occurred due to lack of regulators enforcing the Act. The management of OSH risks within the workplace is not recognised as a priority by business owners and staff supervisors, and Uganda's labour productivity is the lowest in East Africa due to poor working conditions. The Danish Institute for Human Rights reports that in 2011, Uganda had the highest rate of construction incidents in the world, with 4,200 major injuries taking place each year purportedly as a consequence of inadequate poor construction materials and high numbers of workers on sites (2016). The reality being, employers or employees do not consistently report workplace incidents, and workers do not commonly use legal processes to claim their entitlement for injury.

While there is no detailed information available at a local level associated with worker safety and welfare, anecdotal information collected from KIIs indicates small business do not provide adequate welfare or OHS controls to the workforce in the sample PACs.

A national survey on child labour completed between 2011 and 2012 (ILO 2013) indicated that 39% of children were involved in an economic activity (93% in the agricultural sector), and this is higher than the SSA average of 28%. Over the last

ten years, the prevalence of child labour has decreased substantially and has been linked to higher school attendance at a national level. However, child labour in areas such as ASM and family work (i.e., crop farming, livestock rearing) is still prevalent. Many families have unstable livelihoods and need every family member to be earning an income.

While there is no documented information available at a local level associated with worker safety and welfare, anecdotal information collected from KIIs indicates small business do not provide adequate welfare or OHS controls to the workforce in the sample PACs.

Trend in Condition and Sensitivity to Change

The following trends could be identified:

- the recent, and ongoing, expansion of the informal mining sector across the country is resulting in greater OHS risks, as this sector is largely unregulated and the awareness of OHS amongst the workforce and employers is low
- there is no culture of unionisation in Uganda; workers often do not have the power to negotiate with their employer
- people work in unsafe and unhealthy conditions and often do not have access to personal protective equipment (PPE). Employers do not offer insurance or medical care in case of work-related injury or disease. There is no grievance mechanism for employees who have this type of claim.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

Table 6.4-45 provides the sensitivity ranking for the local workforce.

Table 6.4-45 Workers' Health, Safety and Welfare Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Local workforce health and safety and welfare	Very High (5)	The local workforce has a low occupational health and safety awareness.

Key Considerations

Key considerations are:

- unscrupulous recruitment agencies exist in Uganda and potential workers may be asked to pay fees to 'register' their interest in being part of a workforce
- low level of awareness of health and safety and worker rights in the existing PACs
- low levels of understanding of a non-discriminatory work culture such as with a mixed gender workforce in the PACs
- the human rights of workers with regards to health and safety.

6.4.3.12 Social Infrastructure and Services

Baseline Condition of Social Infrastructure and Services

National Level

Electricity

The liberalisation of Uganda's power sector in the late 1990s resulted in the unbundling of the state-owned Uganda Electricity Board into three state companies: the Uganda Electricity Generation Company Limited (UEGCL), the Uganda Electricity Transmission Company Limited (UETCL) and the Uganda Electricity Distribution Company Limited (UEDCL) (Norton Rose Fulbright 2015, Internet site).

A large proportion of Uganda's rural population remains without access to electricity. To address the lack of electrical power provided to rural areas, a 10-year Rural Electrification Strategy and Plan (RESP-2) was approved by the Government of Uganda in 2013.

The Rural Electrification Agency (REA) was established at this time to facilitate the government's goal of achieving universal access to electricity by 2035 (REA 2018, Internet site). The country generates its own electricity supply, predominantly from hydroelectric power stations (GOU 2018, Internet site).

In the absence of electricity, wood and charcoal provide almost all the energy required to meet the basic energy needs for cooking in rural areas and many urban households (UNDP 2014).

Telecommunications

Uganda's communications sector is growing fast, driven by the rapid expansion of mobile telephony (ITU 2009, Internet site). There are more than 19 million mobile phone subscribers, equivalent to 50% of the population.

The number of people with mobile internet subscriptions is far greater than fixed internet subscriptions.

Mobile money services were first introduced in Uganda in March 2009 and have grown substantially since then (Bank of Uganda 2016). A survey conducted in 2015 found that 43% of Ugandan adults have access to, and 26% actively use, mobile money accounts (CGAP 2015, Internet site).

The benefits of mobile money include:

- increased accessibility to financial services
- agricultural commercialisation, rural development and poverty reduction (Baganzi and Lau 2017).

Media

There are 24 daily and weekly newspapers in Uganda (Freedom House 2015, Internet site). There has been a general decline in newspaper circulation in Uganda, partly resulting from the growing popularity of social media (e.g., Facebook, Twitter and YouTube) as a means of disseminating news and information.

Radio broadcasting, which began in 1952, is the most widely accessed news medium in Uganda (Freedom House 2015, Internet site). There has been tremendous growth in Uganda's radio industry since the liberalisation of broadcasting in the 1990s and over 180 private radio stations are now in operation (UNESCO 2015, Internet site). Community radio stations have played an important role in disseminating information for development purposes with a focus on health, education and sports (UNESCO 2015, Internet site).

There has been substantial growth in Uganda's television industry since the 1990s. In urban areas, roughly 80% of the participants reported watching television at home.

Waste Management

The provision of waste management services under the Local Government Act 1997 is the responsibility of local government authorities (Komakech 2014). Rapid population growth and higher levels of economic activity in urban areas has led to a substantial increase in waste generated.

Inadequate waste collection and disposal in Uganda's major towns and cities has exacerbated many of the environmental hazards associated with urban areas and generated public health risks. Field observations found considerable amounts of waste dumped in open areas, streams and drainage canals, burnt near to homesteads or buried. Domestic liquid waste in Uganda is mainly disposed of via pit latrines.

District and PAC Level

Electricity

Less than 20% of households have access to electricity in the districts traversed by the AOI. However, access to electricity may improve following the completion of energy generation projects in the districts.

In the absence of electricity, people rely on alternative energy sources for lighting, principally fuel lamps and solar powered torches, and candles to a lesser degree.

Telecommunications

Up to 100% of households in the PACs own mobile phones which are used to call family members in urban areas, transfer money and negotiate market prices with buyers and intermediaries. Charge-up cards are bought in the local shops, which tend to have electricity and serve as mobile phones charging points.

Internet penetration in the districts remains low; on average, 4.4% of persons aged 10 years and above use the internet, despite reported growth in internet subscriptions at the national level. More males use the internet than females in the districts; the most major difference is in Hoima district where 4.5% more males use the internet than females.

Media

Leading national newspapers such as the *New Vision*, the *Daily Monitor* and the *Bukedde* are widely available in the districts traversed by the AOI.

The popularity of radios in the districts may be a reflection of low literacy levels and limited disposable incomes, and these factors may limit access to newspaper and television.

Waste Management

Waste management in the districts traversed by the AOI is poor (DDPs 2015). Lack of effective waste management systems, designated dumping sites and low levels of waste collection is widely reported, particularly in town councils and trading centres.

During KIIs, it was found that the main waste management strategies undertaken in the sample PACs is the burning of waste in open air or burial of waste in private pits. These activities are undertaken near homesteads.

Trends in Condition and Sensitivity to Change

Trends for social infrastructure and services include:

- under the efforts of the RESP-2, rural access to electricity may continue to improve. Uganda's overall electricity generation capacity will also likely improve once the construction of new HPPs in Kiryandongo district and Jinja district are complete.
- renewables may play an increasingly important role in Uganda's energy sector as the national government continues to support renewable project developers. The share of the sector is projected to grow considerably as 157 MW of feed-in-tariff supported projects are expected to be commissioned by the end of 2018 (Climate Scope 2017, Internet site).
- Uganda's telecommunications infrastructure is rapidly expanding in line with growing demand for mobile and internet services nationwide. Mobile operators have installed 4G networks around Kampala and there are plans to make 4G available in other cities and urban settlements going forward (Export Gov 2017b, Internet site). Mobile phone and internet subscriptions are expected to reach 28.7 million and 11.9 million in 2021 respectively (Business Sweden 2017).
- the mobile money market in Uganda may grow with the rising number of internet subscriptions. Mobile money operators may also provide customers with new and diverse opportunities. Ugandans can now also pay for petrol, TV subscriptions, purchase airline tickets and play the lotto using mobile money.
- the use of social media in Uganda has proliferated in recent years in urban areas and among the youth. Internet use and penetration is still very low in rural areas. Popular platforms such as Facebook and Twitter are commonly used to access the latest news and communicate with others (Freedom House 2015, Internet site). The proliferation of social media is likely to be an ongoing trend, particularly if the number of mobile internet subscriptions continues to rise (Uganda Business News 2017, Internet site).

Ecosystem Services Provided

The social infrastructure and services described herein provide the following ecosystem services:

Provisioning services include:

- electricity from hydro, fossil fuels and solar energy
- cooking fuel from biomass and firewood (see Section 6.4.3.8, land-based livelihoods – natural resources use).

Sensitivity Ranking

Table 6.4-46 provides the sensitivity ranking for infrastructure and social services.

Table 6.4-46 Social Infrastructure and Social Services Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
PACs – media (radio, television, newspapers)	Low (1)	All households in the PACs have access to one or more media information sources.
PACs – electricity	Moderate (3)	Most PACs do not have access to grid electricity and rely on other means for cooking and lighting. Lack of grid electricity limits the economic development of PACs. Population growth and in-migration increase competition for the few available connections.
Households without mobile phone and internet	Moderate (3)	These households may become increasingly vulnerable as information is increasingly shared using those media.

Key Considerations

Key considerations are:

- PACs rely on radio as a main means of receiving information
- mobile phone and internet is becoming increasingly important for exchanging information
- rural electrification is low, limiting general development.

6.4.3.13 Community Health

The community health baseline section is based on the format presented in the IFC good practice note for health impact assessment (HIA). In accordance with this note, several EHAs are described:

- health system
- communicable diseases linked to the living environment (termed respiratory and housing issues under the EHAs)
- vector-related diseases
- soil, water and waste-related diseases
- sexually transmitted infections (STIs), including HIV and AIDS
- food and nutrition related concerns
- noncommunicable diseases
- accidents and injuries

- veterinary medicine and zoonotic diseases
- social determinants of health
- social cultural health practices.

Exposure to potentially hazardous materials, noise and offensive odours has not been considered in the baseline but are considered in the impact assessment.

Baseline Condition of Health System

National Level

Health care in Uganda is delivered by both public sector (government) and private entities, which include private-not-for-profit (PNFP) and private-for-profit (PFP) organisations and complementary health service providers such as traditional healers. The government (MOH 2014) owns the majority of the health facilities in the country. The national target for access to services is that everyone should have a health facility within 5 km of their residence. Access measured against this indicator stood at 72% nationally in 2015 (MOH 2016).

A target of having a hospital or a level IV (see Table 6.4-47) primary care facility per 100,000 people was met in 2014, with a national census of health facilities recording 147 hospitals and 188 level IV primary care facilities (MOH 2014).

Provision of public health care has been decentralised with districts and subcounties having a key role in the planning, delivery and management of health services in their respective areas. The health service delivery structure is organised in tiers starting from the community level up to the national level, including the role of the Ministry of Health (MOH) as described below in Table 6.4-47.

Table 6.4-47 Health System Delivery Structure

Structure	Level	Description of Role Function in Structure
Village health teams (VHTs) or health centre (HC) I	Village target population of 1000 people	VHTs are the first level of health care delivery and mainly consist of volunteers in villages facilitating health promotion, service delivery, community participation and empowerment.
HCs II, III and IV	Village target population of 5000 people	This is the second level of service delivery and includes: HC IIs provide a first level of interaction between the formal health sector and communities. They only provide health prevention and promotion services, community outreach services and links with VHTs. Curative services include outpatient care, emergency care and emergency deliveries.
	Village target population of 20,000 people	HC IIIs provide basic preventive, health promotion and curative services, and support and supervision to lower level units. There are provisions for limited inpatient services, laboratory services for diagnosis, maternity care and first referral cover for the subcounty.

Table 6.4-47 Health System Delivery Structure

Structure	Level	Description of Role Function in Structure
	Health subcounty	HC IVs provide the same broad level of care as HC III, with the addition of more advanced inpatient care, blood transfusion, laboratory, emergency and other services. HC IVs were introduced in some areas as a strategy to address poor access to health care services.
General hospitals (GHs)	Target population of 500,000 people	This includes all services offered at HC IV and other general services including surgery, imaging services and inpatient care. In-service training, consultation and research to community-based health care programmes also occur at this level. They are generally managed by the district government.
Regional referral hospitals (RRHs)	Target population of 2,000,000 people	This level consists of more specialised clinical services in addition to services offered at GHs. Specialist services may include paediatrics, psychiatry, ophthalmology, dentistry, intensive care, radiology, pathology, and higher level surgical and medical services. These institutions are also generally involved in teaching and research. While RRHs are managed by the MOH, they manage and develop their own operating budgets. Each district has a designated RRH that provides services not available at the GH level.
National referral hospitals (NRHs)	Target population of 35,000.000 people	This is the highest level and provides the most comprehensive and specialised level of care level. They provide advanced tertiary services in addition to all the other clinical services, as well as providing teaching and research. These facilities are fully autonomous.
Health subcounty	Subcounty	Health subcounty are mandated with planning, organisation, budgeting and management of the HC III, II and I services and private providers.
District health systems	District	District health systems are responsible for the delivery of health services and the management of human resources, the development and passing of health-related bylaws and monitoring of sector performance. Local district governments manage public GHs and HCs and provide supervision and monitoring of all health activities (including those in the private sector) in their respective areas. Health service delivery is decentralised at the district level, with the DHMT, led by a district heath officer, mandated to implement programmes and policy.

Table 6.4-47 Health System Delivery Structure

Structure	Level	Description of Role Function in Structure
Ministry of Health	National	The MOH is responsible for: • policy analysis, formulation and dialogue • strategic planning and resource mobilisation • setting standards and quality assurance • advising other government departments and agencies on health concerns • capacity development, technical support and supervision • provision of nationally coordinated services and coordination of research • monitoring and evaluation of the overall health sector performance.

The country has an estimated 1.55 health workers per 1,000 persons, which is below the WHO ratio of 2.28 per 1,000 persons. Below this point, a country is considered to have a critical shortage of personnel. According to 2015 statistics, nurses and midwives are staffed to 83% and 76% respectively. Other staffing levels are also suboptimal, notably pharmacists (8%), anaesthetic staff (30%), health administrators (33%) and cold chain technicians (40%). Overall, staffing levels are skewed in favour of specialised health institutions and larger health facilities: RRH (81%), GH (69%), HC IV (85%), HC III (75%) and HC II (49%) (MOH 2014).

District and PAC Level

The distribution and types of health facilities available in the project districts are included in Figure 6.4-26.

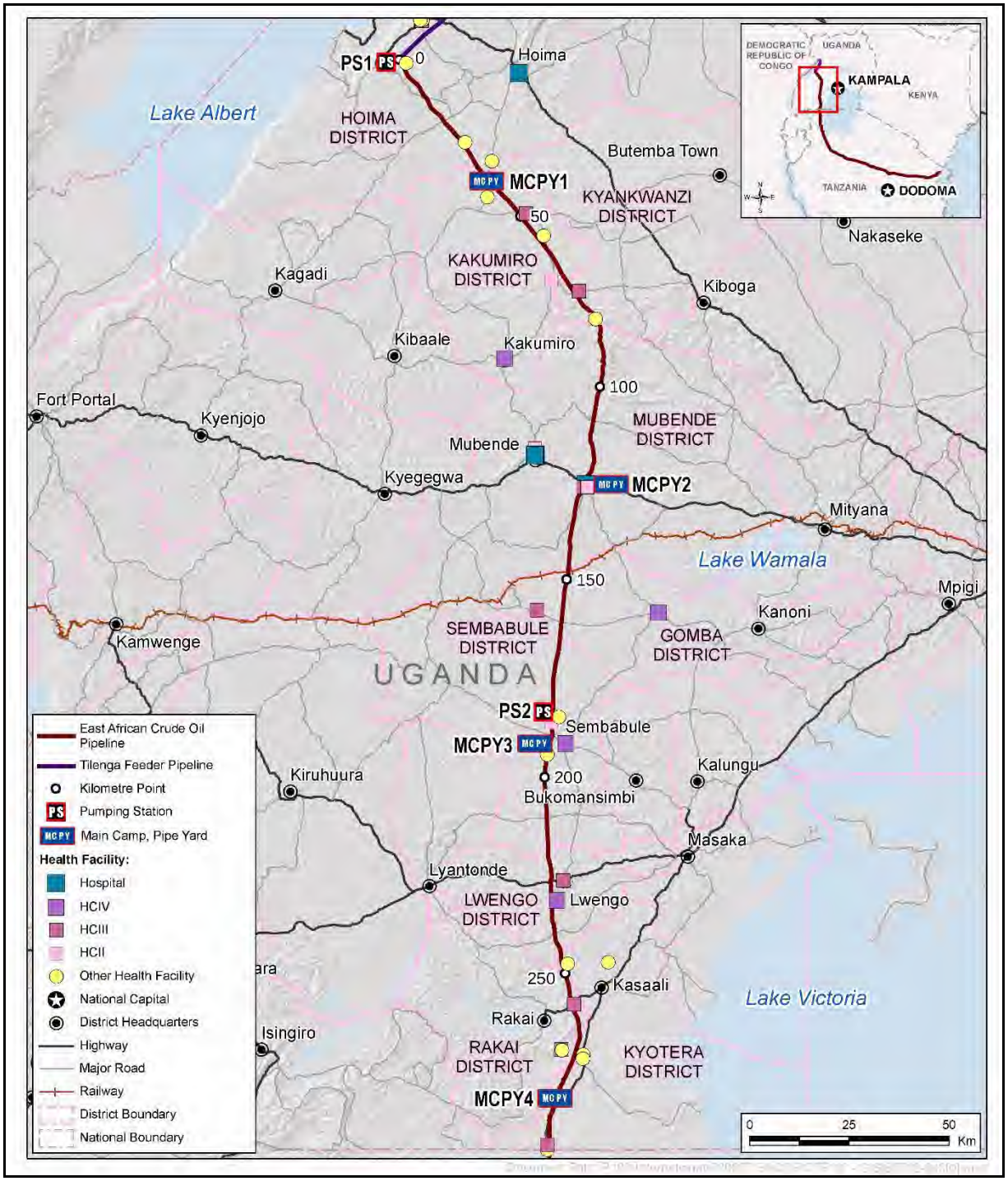


Figure 6.4-26 Health Facilities by District

Health System Challenges

The baseline assessment identified the following health system challenges in the districts traversed by the AOI:

- shortage of skilled health personnel
- inadequate financial resources
- high burden of communicable and infectious diseases

- increasing burden of noncommunicable diseases
- inadequate and inequitable distribution of health facilities
- inadequate solid waste management facilities
- inadequate water and sanitation facilities
- shortage of medical supplies and equipment
- delay in seeking medical care
- inadequate emergency care services.

These challenges were common throughout the project districts.

Trend in Condition and Sensitivity to Change

Despite the improvement in some parameters, the sensitivity to change of the health systems in the project districts is considered to be high. The majority of the DHMT respondents noted that the existing structures and systems only managed to partially manage existing challenges and did not have the required capacity to meet any additional requirements brought about by project-associated changes. This includes short-term changes (e.g., infective outbreaks), as well as longer-term impacts associated with chronic conditions.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

Table 6.4-48 presents the sensitive health systems VECs.

Table 6.4-48 Community Health Valued Environmental Component and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
PACs in the districts of Kakumiro, Kyankwanzi, Lwengo, Gomba and Sembabule	High (4)	Difficult access to appropriate health care and services

Key Considerations

A key consideration is:

- population growth (natural and because of in-migration) may lead to local health care facilities being over-stretched.

Baseline Condition of Communicable Diseases Linked to the Living Environment

Acute Respiratory Infections

Acute Respiratory Infections (ARI) were identified as the leading cause of disease burden in the districts traversed by the AOI and the country in general. Reports indicated an ARI prevalence of 9–12% in the central region and 17% in the western region (UBOS 2012b). Lower respiratory infections are the second leading cause of

disease burden in Uganda (after HIV and AIDS) and are responsible for nearly 10% of all deaths (WHO 2015a).

Data obtained from the district level HMIS show that ARI contributed to at least 20% of the outpatient load in the project districts, with the highest burden recorded in the districts of Kyankwanzi (37%) and Gomba (35%).

Tuberculosis

TB remains a major public health challenge in Uganda, with an incidence rate of around 200 new cases per 100,000 (2015 estimate) (WHO 2016a). Like most countries in SSA, Uganda is battling with the dual epidemic of TB, and HIV and AIDS. It is estimated that approximately 42% of TB patients in the country are co-infected with HIV and AIDS (WHO 2015b, WHO 2016a). Multidrug resistant TB (MDR-TB) is also an emerging challenge at a prevalence of 1.6% for new cases and 12% of retreatment cases (WHO 2015).

Baseline findings show that TB is endemic in all the districts traversed by the AOI. District level HMIS data from 2016 shows that Hoima district recorded the highest number of TB cases. The number of TB cases reported at PAC level were low with only a small concentration of reports in Kagango (KP186.5).

Trend in Condition and Sensitivity to Change

The national trend in the annual incidence of TB has shown a progressive decline over the past 10 years.

The sensitivity to diseases related to living conditions in the districts traversed by the AOI varies from moderate to very high. These are based on the existing burden of disease (BOD) in the districts, the available health services, trends in disease, stakeholder concerns and in-migration into high burden areas.

The district of Rakai is considered to have a moderate sensitivity based on the available data, which illustrated no concerns regarding housing and overcrowding, and the lowest prevalence of diseases associated with living conditions. However, the data indicates that the other districts traversed by the AOI were deemed to have either a high or very high sensitivity to change.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

Table 6.4-49 presents the sensitive VECs identified for communicable diseases due to living conditions.

Table 6.4-49 Communicable Disease Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Households close to roads	Moderate (3)	Increased exposure to diesel particulate matter and other pollutants that have a detrimental effect on the respiratory system.
Elderly	High (4)	Lower immune response and greater risk for contracting communicable diseases.
Children (especially under five years old)	High (4)	Immature immune systems and low herd immunity.
Households using biomass fuel for indoor cooking and lighting	High (4)	Poor indoor air quality associated with higher risk of ARIs.
Individuals living in overcrowded areas associated with poor housing and low socio-economic standards	High (4)	Higher likelihood of disease spread and inadequate ventilation.
Immuno-compromised individuals	Very high (5)	Poor immune response and clear link between TB and HIV.

Key Considerations

Key considerations are:

- interaction between PACs and an expatriate labour force may increase the risk of transmission of communicable diseases
- given the high incidence of communicable diseases and the poor health facilities, potential in-migration into the PACs will likely increase the prevalence of communicable diseases.

Baseline Condition of Vector-Related Diseases

Malaria

Malaria remains the leading cause of disease burden in Uganda and poses a substantial challenge to socio-economic development. The entire population is at risk of infection, though children under five years and pregnant women are particularly vulnerable (MOH 2014a, Internet site).

Malaria accounts for between 20–50% of outpatient cases in the districts traversed by the AOI. HMIS data from 2017 indicate that the malaria case load (confirmed by rapid diagnostic test) was highest in Hoima, Mubende and Kyotera, and lowest in Gomba.

Findings from FGDs and household surveys show that malaria is among the most common ailments experienced by sample PACs.

All the districts traversed by the AOI received periodic mass distribution of insect treated nets (ITNs). They also received targeted distribution of ITNs to pregnant mothers and children under-five years and malaria prophylaxis in pregnancy.

Malaria case management with rapid diagnostic test and artemisinin in combined therapy is routinely available in all health facilities.

Dengue

Dengue is endemic in Uganda.

Yellow Fever

Most recently in March to April of 2016, an outbreak of yellow fever was confirmed in Masaka district and spread to seven other districts including Rakai (WHO 2018, Internet site).

Human African Trypanosomiasis

Human African Trypanosomiasis (HAT), commonly known as sleeping sickness, is endemic in parts of Uganda. Two forms of the parasite occur – *Trypanosoma brucei. gambiense* is dominant in northwest and *T. b. rhodesiense* in the southeastern region (Simarro et al. 2012). The rural populations whose livelihoods depend on agriculture, fishing, animal husbandry or hunting are at the highest of risk of exposure to the tsetse fly bites that transmit the parasite. Approximately 7% of the country (over two million people) is at risk of HAT. The districts traversed by the AOI are within a low risk area for sleeping sickness transmission.

HAT was reported in PACs near protected areas in Hoima, in the communities of Kayere (KP0), Katooke (KP1.5) and Nyamasoga (KP0), and in Lukoma (KP287.5) near the Tanzanian border.

Onchocerciasis

Onchocerciasis, commonly known as river blindness, is caused by the parasitic worm, *Onchocerca volvulus*. It is transmitted to humans through exposure to repeated bites by infected blackflies of the genus Simulium. It is most common in Hoima where 398 cases were recorded in 2016 and 245 cases in 2017. The district implements an onchocerciasis elimination strategy, which includes biannual mass treatment with ivermectin and vector elimination measures, and results indicate that transmission of the disease has been interrupted.

Trend in Condition and Sensitivity to Change

Confirmed malaria cases increased in all project districts from 2015 to 2016. The number of cases remained high in 2017, with minimal changes across all project districts. Other vector-related diseases generally show a decreasing trend.

The sensitivity of the districts traversed by the AOI with regards to vector-related diseases varies from moderate to high. Due to a high BOD, in conjunction with an increase in disease trends, the districts of Hoima, Mubende, Rakai and Kyotera are all considered highly sensitive to change with a lower resilience than the other project districts.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The sensitive VECs for vector-related diseases are presented in Table 6.4-50.

Table 6.4-50 Vector-Related Diseases and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Children (especially under five years of age)	High (4)	Immature immune systems.
Pregnant women	High (4)	Potential of disease affecting unborn child.
Individuals living in overcrowded areas associated with poor housing and poor sanitary conditions	High (4)	Higher likelihood of disease spread and increased mosquito densities.
Rural populations	High (4)	Poorer access to medication and health facilities.

Key Considerations

Key considerations are:

- construction activities can lead to changes such as an increase in bodies of standing water that provide breeding habitat for mosquitoes, and therefore an increase in malaria
- vector management treatments, if not performed in alignment with national strategies, result in an increase in vector resistance and negatively affect local preventative interventions that are implemented by local authorities
- PIIM may cause changes that promote vector breeding, disease transmission, changes in the distribution of vector-borne diseases and an increased burden on health systems
- environmental sanitation, health care services and prophylaxis, vector control programmes and PIIM management are key for controlling malaria.

Baseline Condition of Soil-, Water- and Waste-Related Diseases

Access to Drinking Water and Sanitation

The prevalence of soil-, water- and waste-related diseases is highly dependent on sanitation facilities and access to safe drinking water.

The districts of Gomba, Lwengo and Kyotera recorded the best access to safe drinking water at 87%, 72% and 63%, respectively, while Mubende, Kakumiro, Sembabule and Rakai ranked in the bottom five with coverage below 50% (MWE 2017).

Information from 39 PAC profiles indicate that 51% of communities have access to boreholes, however many of these are noted as being non-functional. Moreover, 36% of the PACs state that they have access to unprotected community wells, suggesting that access to safe drinking water is limited. Others rely on surface water from lakes, rivers and reservoirs for their domestic needs, often sharing these water sources with livestock.

The majority of the population in the districts traversed by the AOI have access to some form of sanitation facility, with the highest coverage recorded in Hoima (91%), followed by Mubende (84%) and Rakai (84%) (MWE 2017).

Pit latrines are the commonest type of sanitation facility. Access to hand-washing facilities is still a challenge with coverage noted to be between 17% and 65% (MWE 2017).

Diarrhoeal Disease

Baseline findings show that diarrhoea is a common cause of morbidity in the districts traversed by the AOI. According to HMIS data, approximately 3% of all outpatient cases are present with diarrhoea. Cases were reported in the majority of PACs traversed by the AOI, ranging from Katooke (KP1.5) and Nzoo (KP84) in the north to Kabonera (KP284.5), and Mutukula Town (KP295.5) towards the south.

Cholera

Cholera remains a major risk in all of the districts traversed by the AOI with a variable level of vulnerability identified across districts.

The key underlying factors leading to higher vulnerability are:

- limited access to safe drinking water
- inadequate sanitation
- poor hygienic practices.

Typhoid Fever

Typhoid fever continues to be a public health concern in many developing countries, including Uganda. Typhoid is commonly over-reported due to the lack of required diagnostic facilities. HMIS data show that the districts traversed by the AOI record several cases annually. FGD participants in PACs consistently listed typhoid among common ailments in their community.

Intestinal Worms and Schistosomiasis

Intestinal worms were reported throughout the districts traversed by the AOI, with more cases noted towards the south in Miti (KP194), Muyenje (KP192) and Kinvunikidde (KP225). Mass de-worming of young children is implemented across the county to control the infection.

Schistosomiasis, also known as bilharzia, is prevalent in tropical and sub-tropical areas, especially in poor communities without potable water and adequate sanitation. Therefore, the prevalence of schistosomiasis is a good indicator of the level of sanitation in a potentially endemic area.

The Lake Albert area shows a community prevalence of up to 80% (Tukahebwa et al. 2013). Schistosomiasis is a high risk in Hoima district and generally low risk in the rest of the project districts.

Trend in Condition and Sensitivity to Change

Trends with regards to soil, water and waste-related disease management include:

- access to safe drinking water and basic sanitation facilities is improving

- most districts traversed by the AOI reported a decrease in the burden of diarrhoeal diseases. This was partly attributed to improvements in hygiene behaviour. In addition, WASH programmes are coordinated and implemented by the Uganda Sanitation Fund. Most programmes are focused on behaviour change communication (BCC) programmes that target open defecation. Programmes target approximately 5.6 million people in over 9,000 villages, to live in open defecation free (ODF) environments, and to adopt good hygienic practices. A particularly effective initiative is Community Led Total Sanitation (CLTS).
- potential for cholera and typhoid outbreaks remain high in all the project districts as a result of underlying challenges in environmental health conditions.

Ecosystem Services Provided

Soil-, water-- and waste-related diseases are linked to safe water, which provides the following ecosystem services:

Provisioning services include:

- general health
- form of livelihood (see Section 6.4.3.9 on river- and lake-based livelihoods).

Sensitivity Ranking

Several sensitive VECs were identified in relation to soil, water and waste-related diseases (see Table 6.4-51).

Table 6.4-51 Soil-, Water- and Waste-Related Disease Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Children	High (4)	Undeveloped immune response and greater risk for contracting diseases.
Elderly	High (4)	Compromised immune response.
Immuno-compromised individuals	High (4)	Poor immune response.
Communities with existing poor access to safe water and adequate sanitation	High (4)	High likelihood of infection.

Key Considerations

A key consideration is:

- in-migration to PACs may reduce the availability of water, exacerbate unsanitary conditions and increase disease spread and BOD.

Baseline Condition for Sexually Transmitted Infections

HIV and AIDS

The HIV epidemic in Uganda continues to be generalised and stable, without a substantial change of pattern over the last decade. Uganda achieved impressive success in the control of HIV during the 1990s, bringing down the prevalence

among adults 15–49 years from a high of 18.5% in 1992 to 6.4% in 2005 (MOH 2017b).

However, recent findings show an increase in HIV prevalence. In 2016, an estimated 52,000 new HIV infections were recorded and 28,000 people were estimated to have died from AIDS-related illnesses. While there have been increased efforts to scale up treatment initiatives, there are still many people living with HIV who are not treated (possibly high-risk groups such as commercial sex workers). Punitive laws and stigmatising attitudes towards sex workers, people who inject drugs and gay men has meant that these people, who are most vulnerable to infection, are far less likely to engage with HIV services (AVERT 2017, Internet site). HMIS data show that the HIV positivity rate was highest in Rakai (12%) and Sembabule (8.5%), and lowest in Kakumiro (4.4%) and Kyotera (5.6%). These rates are derived from programme data and weighted HIV prevalence among pregnant women who attend antenatal clinics, and therefore do not necessarily reflect the true prevalence in the general population.

Hotspots for HIV infection were identified along major transport corridors, and in trading centres and fishing communities, the common underlying factor being availability of disposable income that drives commercial sex activity. The following determinants for HIV infection were identified by informants in the AOI:

- high population mobility
- location along major transport routes with rest stops for truck drivers
- fishing communities
- trade hubs
- existence of most-at-risk populations (most urban centres)
- cultural practices such as wife inheritance
- road construction that has increased in-migration to the area
- high-risk sexual behaviour.

HIV care and treatment services were generally available and freely accessible. There were reports of shortages of first line drugs in some districts linked to supply chain inefficiencies.

Women FGDs revealed that most women had acquired their knowledge about HIV-AIDS via various public health messages broadcast on the radio or at health clinics. They understood preventative measures to include using condoms, abstinence, being faithful and male circumcision. When asked if people followed measures for preventing HIV, 84% of the women replied no. The FGDs revealed that those living with HIV and or AIDS were not stigmatised in communities, with only seven PACs (16% of the sample) stating there was stigmatisation.

Sexually Transmitted Infections

Sexually transmitted infections (STIs) such as gonorrhoea, syphilis and chlamydia are prevalent in Uganda.

Baseline findings shows that sexually transmitted infections (STIs) are common in the districts traversed by the AOI. The districts of Mubende, Hoima and Rakai recorded the highest number of cases in 2017. The incidence of STIs is prevalent in

the districts traversed by the AOI, with cases of syphilis recorded in 14 PACs, including Katooke (KP1.5) and Buswabwera (KP61) in the north and Butiti (KP249.5) and Kyakudusi (KP251) towards the south. STIs were also reported in Kyenda (KP125.5) and Mbirizi (KP225).

Unsafe sexual practices, especially among the youth, were seen as the key underlying factor despite widespread availability of condoms. STI services were generally available in most public health facilities.

Trend in Condition and Sensitivity to Change

The following trends were identified:

- the national trend in HIV prevalence showed a decrease over the previous two decades, from a high of >18% in the 1990s to a record low of 6.4% in 2005. The current picture however shows stagnation and pockets of increasing prevalence.
- more than half of the districts traversed by the AOI reported a decrease in HIV prevalence (based on data captured at antenatal clinics) over the past three years. This was attributed to an upscale of interventions, including health education, free condom distribution, increased availability and use of HIV care and treatment, and reduction of HIV-related stigma. The AIDS epidemic in Uganda in the 1990s, more than any other place, substantially impacted the districts of Kyotera and Rakai. Many young men and women died from AIDS related infections, leaving many households headed by the elderly. Recent government and international interventions have substantially reversed this trend.
- HMIS data shows that Kyankwanzi, Kyotera and Sembabule reported an increase in new HIV infections. The increase in Sembabule was attributed to ongoing major road construction that has caused a sudden in-migration of job seekers and traders. The increase in Kyankwanzi was linked to the in-migration of workers displaced from closed gold mines in Mubende. The location of Kyotera at the Tanzanian border, with high population mobility, was seen as the key determinant for increasing HIV infections in that district.
- all the districts are considered highly sensitive to change with regards to HIV and AIDS, and other STIs, with the district of Sembabule rated as highly sensitive based on a high BOD and an increase in disease trend
- none of the VECs is considered resilient to change as increases in disease prevalence related to construction projects and other extractive operations have been noted by stakeholders in some of the districts
- any project-related change may result in a substantial deviation from the baseline status, while the duration and associated challenges brought about by these changes are typically considered to be longer term. As with other EHA's, any substantial change has the potential to overwhelm the existing capacity of district health services and may result in a permanent negative change.
- as the potential project-related changes to incidences of HIV and STIs are typically observed in communities near project infrastructure, in larger trading centres and along project access roads, specific types of communities have been identified and, where possible, referenced to KPs.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The sensitive VECs for sexually transmitted diseases are presented in Table 6.4-52.

Table 6.4-52 Sexually Transmitted Disease Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Women and young girls	High (4)	High risk group for disease spread due to high level of GBV and rape.
PACs along transport routes and access roads	High (4)	Truck driver stops linked to transactional sex.
PACs close to artisanal mining activities	High (4)	Artisanal miners linked to transactional sex.
Commercial sex workers	High (5)	High risk group for disease spread due to unsafe sex.

Key Considerations

A key consideration is:

- districts with a high prevalence of STDs, PIIM and a growing population are likely to have increased STI prevalence.

Baseline Condition of Food and Nutrition Related Considerations

Uganda produces more food than it consumes. Yet, poverty still limits people's access to nutritious food, especially in the north and east of the country. Rapid population growth and the presence of a large refugee population pose further challenges to the country's food security. Inadequate diets are a root cause of persistent nutritional problems which undermine the health, growth and development of Ugandan children (WFP 2017, Internet site).

Food security is not a major concern in the districts traversed by the AOI with most of the districts reporting sufficient food availability throughout the year.

Malnutrition and Anaemia

Acute malnutrition is generally not regarded as a major public health concern in the districts traversed by the AOI, with hospital data showing that 0.2–1.2% of children less than five years of age are affected.

More than half of project district households (at 58%) reported that they experience periods of hunger, but these are generally short-lived. FGDs reported that malnutrition commonly occurs within PACs in Hoima, Kakumiro and Kyotera districts.

Trend in Condition and Sensitivity to Change

Available data shows that chronic malnutrition rates have decreased, while acute malnutrition rates have generally remained low and stable at the district level. The 2016 UDHS shows that stunting prevalence has declined to 29% from 33% in 2011 and 46% in 1995. The proportion of underweight children has also declined to 11%,

from 14% in 2011 and 21% in 1995. Acute malnutrition rates (wasting) have remained low at around 4–6%. There were concerns for future food insecurity related to weather patterns, especially drought, and rapid population growth in urban centres. Data on the trend of anaemia was inconclusive.

Ecosystem Services Provided

Ecosystem services related to food and nutrition are included in land and river and lake-based livelihoods, Sections 6.4.3.8 and 6.4.3.9.

Sensitivity Ranking

The sensitive VECs for food and nutrition are presented in Table 6.4-53.

Table 6.4-53 Food and Nutrition Related Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
PAC households	Moderate (3)	Vulnerable to price inflation.
Landless households	Moderate (3)	May have less access to subsistence crops and wild foods.
Elderly	High (4)	Elevated level of vulnerability to food price inflation.
Women-headed households and children	High (4)	Elevated level of vulnerability related to income insecurity, land tenure and food price inflation.
Hunter gatherers	High (4)	May have less access to wild foods due to reduced access to hunting and gathering areas.

Key Considerations

Key considerations are:

- most farmers in the AOI are subsistence farmers and an increase in external demand will need to be managed
- in-migration into the AOI may increase food prices and, as a result, affect food security of vulnerable groups.

Baseline Condition of Non-Communicable Diseases

The BOD attributable to non-communicable diseases (NCDs) is on the increase worldwide, with cardiovascular diseases (CVD), diabetes, cancer and chronic respiratory conditions responsible for most deaths. In SSA, it is predicted that NCDs and injuries may cause up to 60% of morbidity and 65% of mortality by 2020 (WHO and AFRO 2011). It is estimated that NCDs account for 27% of all deaths in the country, of which CVD contributes 9%.

Hypertension and Diabetes

Baseline findings show that heart disease and hypertension are common in the districts traversed by the AOI. HMIS data show that Hoima, Lwengo and Kyotera recorded the highest number of hypertension cases in 2017.

All districts traversing the AOI have recorded an increase in diabetes cases. HMIS data (2017) show high numbers of diabetes cases in the districts of Hoima, Mubende, Kyotera and Lwengo. Diabetes care and treatment services were generally available at hospitals, but very limited at lower level facilities.

Cancer

The burden of cancers in the districts traversed by the AOI is not well understood. HMIS data show that several cases of cancers are recorded in the districts every year, especially cervical cancer in women and prostate cancer in men, with most suspected cancer cases referred to higher level facilities.

Asthma

HMIS data show that asthma is common in the districts traversed by the AOI, while very few cases of chronic obstructive pulmonary disease (COPD) are recorded.

Trend in Condition and Sensitivity to Change

NCDs, particularly heart disease, hypertension and diabetes, are showing an upward trend nationally and in the districts traversed by the AOI. This increase is largely attributed to urbanisation and changes in lifestyle.

While NCDs are considered to be an important risk factor with regards to community health in general, the sensitivity to change in all project districts is rated as moderate with little variation between districts.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The social baseline did not identify any sensitive NCD VECs.

Key Considerations

- Unless there is a sustainable growth of the districts' economies an increase in NCD is unlikely.

Baseline Condition of Accidents and injuries

Physical Assault and Domestic Violence

Domestic violence is widely acknowledged to be of great concern in Uganda, from human rights, economic and health perspectives. Baseline findings show that gender-based violence (GBV), including physical and sexual assault, is a common cause of injuries in the project districts. Substance (alcohol) abuse, social and economic challenges were identified as contributing factors. The incidence of domestic violence and GBV was reported in 38 PACs traversed by the AOI. FGDs indicate that women generally do not have support networks for victims of domestic violence.

Trend in Condition and Sensitivity to Change

Trends in traffic accidents are described in the traffic baseline report (see Appendix A12). Trends in workers' health are described in Section 6.4.3.10 (workers' health, safety and welfare) and in the socioeconomic and health baseline report (Appendix A11).

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

Sensitivity for traffic-related injuries are ranked in the traffic baseline report (see Appendix A12). Women, particularly sex workers, are considered highly vulnerable (4) in terms of GBV.

Baseline Condition of Veterinary Medicine and Zoonotic Diseases

The most common zoonotic diseases in the AOI are viral haemorrhagic fever and rabies.

Viral Haemorrhagic Fever

Viral haemorrhagic fevers (VHFs), particularly Ebola and Marburg, pose a substantial risk in all the districts traversed by the AOI. In 2017, four project districts recorded suspected cases of VHFs as follows:

- Hoima (13 cases)
- Sembabule (11 cases)
- Mubende (1 case)
- Kakumiro (1 case).

Rabies

Rabies is a public health problem in many developing countries, although it is often under-reported due to limited awareness, public veterinary health services and diagnostic ability. Many cases of dog bites are recorded in the local health facilities and these are often promptly managed with post-exposure prophylaxis to prevent progression to full-blown rabies.

Brucellosis is common among pastoral communities in Uganda. Each of the districts traversed by the AOI recorded at least 100 cases of brucellosis in 2017.

Trend in Condition and Sensitivity to Change

Rabid dog bites have increased in the districts traversed by the AOI, leading to an increase in demand for post-exposure prophylaxis for rabies, with the vaccine often out of stock. The risk from VHFs remains high given their occurrence in the country and potential for spontaneous outbreaks.

Although the conditions are prevalent throughout the AOI, the estimated burden of disease (BOD) is low.

However, potential for outbreaks is a substantial challenge that imparts a measure of risk in the AOI. Due to the low-grade reoccurrence of potential VHF cases in

Hoima, Kakumiro, Mubende and Sembabule, these districts are considered to have a high sensitivity to change.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The social baseline identified that all PACs are equally sensitive VECs with regards to veterinary and zoonotic diseases.

Key Considerations

A key consideration is:

- VHFs and the associated outbreak potential remains a risk to PACs, in particular those that are impacted by in-migration.

Baseline Condition of Social Determinants to Health

Uganda has recognised mental health as a serious public health concern and has recently implemented reforms aimed at strengthening the country's mental health system.

Mental Illness

Although mental illness is recognised as a public health burden in all of the project districts, reliable data are scarce. Baseline findings show that epilepsy, bipolar disorder and major depression are the most common mental disorders in the districts traversed by the AOI.

Only one PAC, Mbrizi (KP225), reported that a member of the community had a mental illness.

Substance Abuse and Social Ills

FGDs in PACs show that alcoholism, ‘smoking drugs’, prostitution, and theft and gambling are among the social challenges in the project districts. Commercial sex work (CSW) was particularly reported in the towns of Hoima, Kyotera, Mubende, Lwengo and Mutukula.

Gender-Based Violence

Baseline findings show that GBV is common in the study area. The highest number of cases was recorded in the districts of Mubende, Hoima and Kyotera. In addition, all sex workers interviewed reported that they had been subjected to GBV at some point. FGDs indicate that women in this setting are also marginalised in education, employment opportunities, decision-making and many other aspects.

Teenage Pregnancy and Early Marriages

A recent national survey shows that 24% of 15–19 year old girls in Uganda have given birth or are pregnant with their first child (UBOS 2017b). Baseline findings show that teenage pregnancies and early marriages are a concern in all the project districts, and are increasing.

Lack of formal education, cultural norms (acceptance in society, religious beliefs) and poverty (dowry and failure to pay for education) are some of the drivers of increase in teenage pregnancy. This has been identified by the government as a key challenge to Uganda's development. Several campaigns by government and other donor agencies towards prevention of teenage pregnancy, abuse and education of the girl child are ongoing in most public and private media outlets.

Trend in Condition and Sensitivity to Change

Data on the trend of mental disorders were not conclusive, but the perception of health officials is that cases are increasing. Psychosocial stressors (economic strife, poverty and other social challenges), and alcohol and drug abuse were identified as contributing factors. In FGDs with health staff, 74% felt that social problems have increased, in particularly alcoholism and prostitution.

Based on the available data, the VECs' sensitivity to change as it relates to social ills, is considered moderate across all districts traversed by the AOI. However, four districts with a higher burden of GBV and CSW - Hoima, Mubende, Lwengo and Kyotera - have been identified as highly sensitive.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The sensitive VECs for the social determinants to health are presented in Table 6.4-54.

Table 6.4-54 Socially Determined Diseases Related Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
PACs whose members are employed by the project	High (4)	Disposable income increases alcohol, drug use and commercial sex work.
PACs where PIIM is expected	High (4)	Decrease in social structure and social cohesion.

Key Considerations

A key consideration is:

- PAC households that experience a sudden increase in disposable income may be affected by a loss of cohesion through increased use of substances such as alcohol and drugs, and sex workers.

Baseline Condition of Social Cultural Health Practices

Culture and spirituality may influence health-seeking behaviour, as well as the type and perceived severity of an illness.

Baseline findings show that the majority of the population in the districts traversed by the AOI make use of formal health care services. However, self-medication and

the use of traditional medicine is also used and can negatively affect treatment outcomes by delaying treatment.

FGDs show that traditional medicine is most often used in the treatment of pregnancy complications, infertility, epilepsy, ulcers, fever, skin diseases, cough, diarrhoea, stomach ache, malaria and head ache, and those who have been 'bewitched'. Traditional beliefs and practices, poor awareness of health concerns and challenges in the health care system (e.g., accessibility, affordability and availability of services) were reported as key contributing factors.

Trend in Condition and Sensitivity to Change

The following trends were identified:

- health-seeking behaviour has improved and the majority of the population in the districts traversed by the AOI now use the formal health care system, as well as traditional medicine. This was attributed to health education and system strengthening, including provision of outreach services.
- there is an increasing demand for services and high utilisation rates for maternal and child health services
- use of traditional medicine has generally decreased as people embrace modern health care.

Ecosystem Services Provided

Social cultural health practices are linked to the use of wild plants, which provides the following ecosystem services:

Provisioning services include:

- ingredients for treatment of common illnesses (traditional medicine).

Sensitivity Rankings

The sensitive VECs for social cultural health practices are presented in Table 6.4-55.

Table 6.4-55 Social Cultural Health Practice Related Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
PACs where PIIM is anticipated	Moderate (3)	Higher burden on health systems may lead to adverse health-seeking behaviour.

Key Considerations

A key consideration is:

- in-migration may lead to inadequate health care services.

6.4.3.14 Community Safety, Security and Welfare

Baseline Condition of Community Safety, Security and Welfare

Safety and Security

The Uganda Police Force (UPF), established under Article 212 of the 1995 Constitution of the Republic of Uganda, is headed by the Inspector General of Police, who provides oversight to regional and district commanders.

At community level, the rule of law is enforced by community leaders and by police officers at police stations or police posts (smallest unit). However, not all rural communities boast a police station. There is a major police station at Hoima Municipality (KP22).

In addition, the national approach to community policing includes the establishment of community 'crime preventers', whom are individuals proposed by local communities and their leaders, to be trained in policing and to assist the police force in maintaining law and order in the community.

Recognising the importance of the oil and gas industry in Uganda, the Oil and Gas Police Protection Directorate was established and charged to maintain security of the routes, wells and any oil related installations in the Albertine Graben area to bolster security (UPF 2017, Internet site; Oil in Uganda 2013, Internet Site).

Community Wellbeing

To understand a PAC's sense of wellbeing and sensitivity to change, it is important to understand how they perceive key events in their communal history. In FGDs, PACs identified the following important historical events:

- new infrastructure and services are regarded as substantial positive events. PACs recalled the dates of construction of HCs, dams, tarmac roads, boreholes and vaccination campaigns.
- health epidemics were remembered as key negative events. These included measles outbreaks, and the onset of HIV and AIDS and animal diseases such as foot and mouth disease.
- major natural disasters, earthquakes and droughts also form a substantial part of communal history.

Community Aspirations

FGDs with PAC leaders and women's groups shared that most aspirations were related to infrastructure and service improvement (e.g., schools, health facilities, roads and electricity). This is in line with the data obtained for the historical events.

Community Cohesion and Social Support

Field survey data indicated a strong social fabric for all PACs with well-developed social networks and a sense of place.

In PAC households, bonds and commitment to support one another are strong. Households generally work as a unit on agricultural plots, and ties to ancestral land are strong and traditional inheritance protocols for land allocation to family

members maintain their connection. Unspoken kinship allegiances extend to patrilineal clans and to tribal affiliations.

Maintaining the traditional relationship with land is becoming increasingly difficult as plots are becoming too small to remain viable, forcing younger generations to migrate to urban areas. In addition, over recent years, mutual support in PACs appears to be decreasing, possibly as a result of migrations, emerging use of technology and intermarriage.

Familial ties with ancestral lands are particularly deemed important in terms of burial ceremonies and rituals, which are deeply rooted in a diversity of numerous cultural beliefs, traditions and religions. With few public cemeteries, families of the deceased bury their dead in locations available to the household. This commonly is within the curtilage of the family's land holdings. Deemed sacred, graves are often marked with rocks or simply go unmarked. Often generations are buried at grave sites.

Little outside assistance from Government initiatives or NGOs was observed in the sample PACs. However, NGOs such as World Vision, the Rakai Health Sciences Programme, Hoima Catholic Development Organisation, Action AID and the World Bank were mentioned during KIIs with CDOs and FGDs in PACs. The Rakai DDP (2015) acknowledges that NGOs are working within the district on natural resource management projects.

Community based organisations (CBOs) were prominent in all PACs. Savings and credit cooperative organisations, commonly referred to as 'savings circles', are the most prevalent CBOs. The existence and functioning of the savings and credit cooperative organisations in PACs demonstrates the social capital of communities, trust and mutual reciprocity.

Crime

The Uganda Annual Crime Report (2014) indicated that serious crime rates have increased by 13% since 2013. The most common serious crime was reported to be defilement, accounting for more than half of all serious crimes in 2014 (GOU 2014). The total number of cases that were investigated in 2014 represented an increase of 25.8%, while reported cases of rape increased by 5.4% since 2013.

The Overseas Security Advisory Council **(**OSAC) (2017) reports that organised crime syndicates operate on a small scale, carrying out robberies or roadside assaults, stealing valuables and attacking individuals. Gang crime is on the increase with groups, such as the Kifeesi gang, operating in Kampala and in other urban towns and trading centres. Gangs are popular amongst disengaged youth, and the number of the members is increasing, despite Government arrests and crack downs on leaders and members.

While there is relative stability and prosperity in the country, Uganda still has some underlying conditions that could result in internal conflict, such as grievances over land and oil, and ethnic divisions (USAID 2018, Internet site).

Conflict

Over the past 30 years, the Government of Uganda has introduced a decentralised governance structure. This has assisted in reducing national-level conflict. However, it has incited local-level conflict through highly competitive races for district leadership positions and altering relations between local ethnic groups (Green 2015).

Even though communities are generally peaceful, conflicts were reported in KIIs and FGDs. Conflicts or disputes mentioned are related to:

- land concerns (trespassing, destruction of crops by livestock, land grabbing and boundary disputes)
- criminal acts (theft, defilement, rape and GBV)
- rumour mongering
- access to water resources
- unsettled debts.

The most often mentioned disputes related to theft and land. The latter is described in Section 6.4.3.10. Land conflicts are generally resolved with the assistance of the community leaders (see Section 6.4.3.3 on governance and administration). In the case of theft, defilement and rape, the police would occasionally be called. However, PAC members said that community leaders would initially endeavour to resolve any dispute or conflict.

Household domestic quarrels were mentioned often and reportedly resolved through family meetings supported by clan members. If the matter cannot be resolved, the village chairperson or another village leader relevant to the matter will get involved. Where resolution could not be reached at this level, the subcounty community development officer may be called upon to mediate, but this was not a frequent occurrence.

Gender

FGDs with women and village leaders in the sample PACs revealed the task and role divisions between men and women. Only cooking and cleaning within the household are the sole responsibility of women. All other tasks are shared by women and men. Women have the largest responsibility for child upbringing, collecting water, wood, wild plants and fruit, cultivating land, household budgeting, buying goods and sale of produce. Men mostly undertake tasks related to house construction, hunting and fishing. Males mostly inherit and own land. Women are mostly regarded as the protectors of the household. The above demonstrates that women are important members of the household and wider community. They are highly entrepreneurial and their substantial contribution to the informal economy through labour (much of it unpaid) cannot be underestimated.

However, women are considered vulnerable in many ways:

- GBV against women is common in the districts traversed by the AOI. Substance abuse, especially alcohol, was seen as a major contributing factor.
- women are also vulnerable in marriage. This vulnerability relates to the non-contractual nature of some types of marriage and the resulting inability to claim spousal rights in the event of mistreatment, divorce or abandonment.

- the low quality and accessibility of policing, health and education facilities in very poor areas exacerbate women's situation. The lack of resources of the police service acts as a constraint on women trying to extricate themselves from abusive situations.

Other Vulnerable Groups

PAC members identified the following potential vulnerable groups.

Widow-Headed Households

Elderly widows were said to be subject to theft of property and land from relatives, and often found it difficult to obtain sufficient food because they could not tend to crops.

Children

Children are the single largest group (59%) of Ugandans living in absolute poverty. Children were deemed vulnerable, in particular those from poor households. Poor children were reported to be less likely to attend school. AIDS orphans kept by guardians were regarded as particularly vulnerable, as they have limited opportunity to attend school or access health care and may be discriminated compared to the guardians' own children. Children were also vulnerable to child labour, in particular in livestock rearing households, where they were it was traditionally seen as a child's role to tend to livestock.

Elderly

The elderly were deemed vulnerable as they are unable to work the land and are depended on remittances sent by family members.

Youth

Youth were reported to be vulnerable, as they had limited access to productive assets (such as land or capital) and many lacked vocational skills.

People Living with Disabilities

People living with disabilities, including those living with mental, hearing and sight impairment, were said to be vulnerable. This was attributed to the lack of ability to work the land effectively and reliance on other people for financial and food security.

People Living with Illnesses

People with illnesses such as epilepsy, TB, and HIV and AIDS were classified as vulnerable as they were unable to work their land and relied on other people for financial and food security.

Land Users Who Have No Land Title

Land users who have no land title, no customary status or who have not yet acquired an 'interest in the land' were deemed vulnerable.

Ethnicities

The main ethnic groups in the AOI are discussed in Section 6.4.3.3. During baseline data collection it was found that, whilst some villages featured predominantly one ethnic group, many were composed of a diverse mix of ethnicities. This was reported to be as a result of mixed marriages across different ethnicities, and a relatively mobile population. It was repeatedly stressed during FGDs and KIIs that ethnicity is not a defining feature of vulnerability, but that other factors, such as being landless (see Section 6.4.3.9), are more likely to make a household more vulnerable.

Trend in Condition and Sensitivity to Change

- Communities consisting of mixed ethnicities and religions generally live in harmony. However, increasing migration and arrival of outsiders in PACs threatens this equilibrium. With improvements in infrastructure and increasing migration, communities will diversify.
- Traditions are gradually deceasing in prevalence. The Government is promoting traditions through the reestablishment of Kingdoms, encouraging people's valuation of cultural heritage.
- Savings circles are popular in rural PACs in the absence of banks and borrowing facilities. With improved infrastructure, micro-credit borrowing may be more accessible, thus the number savings circles, that also foster social cohesion and thus wellbeing, may reduce.
- Despite government policies and actions, gender inequality prevails in all aspects of life for women and girls, which continues to affect the females in society.
- Despite government efforts to combat women's discrimination, women still have a precarious legal status, lack political power and still suffer from 'overburden' of unpaid tasks and chores and high levels of sexual violence.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Rating

The sensitive VECs for community safety, security and welfare are listed in Table 6.4-56.

Table 6.4-56 Community Safety, Security and Welfare Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Widow headed households	Very high (5)	Widows are challenged to meet basic needs of the household in terms of food security, shelter, welfare and the ability to pay for schooling and health care. Their situation is compounded by the gender aspect. Elderly widows reported as being subject to theft of property and land.

Table 6.4-56 Community Safety, Security and Welfare Valued Environmental Components and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Children (particularly in poor households, AIDS orphans and boys from cattle keeping and plantation agriculture communities)	Very high (5)	As minors in society, children are particularly vulnerable. Those children from poor households will be less likely to attend school. They are more likely to be relied on to perform household tasks and generate income, exposing them to child labour which prevents them from accessing school.
Elderly (men and women)	Very high (5)	The elderly find it difficult to meet basic needs and afford health care. Unable to work the land, they depend on family to provide support and remittances, and exchange what little they own for food.
Youth	Very high (5)	Young people are particularly sensitive to change, as they have limited access to productive assets (such as land or capital), they lack education and vocational skills and their situation is compounded by a lack of employment opportunities.
Women	Very high (5)	Cultural attitudes towards women and their role within the household hinder many females in PACs. Disadvantaged through a lack of education and with limited access to land, and support mechanisms such as access to credit facilities and agricultural inputs, women are deemed particularly sensitive to change.
Disabled	Very high (5)	Disabled people find it difficult to meet basic needs and afford health care. Unable to work their land, they depend on family to provide support and remittances, and exchange what little they own for food.
People living with illnesses	Very high (5)	People with illnesses (e.g., epilepsy, TB, HIV and AIDS) are unable to work their land and rely on other people for financial and food security.
Land users without land titles	Very high (5)	Land users who have no land title as, without formal acknowledgement of land ownership, they will not be eligible for compensation, only for crops grown.

Key Considerations

Key considerations are:

- there are effective established mechanisms for conflict resolution and support groups at village level; however, lack of land and migrations, emerging use of technology and intermarriage are reducing their effectiveness
- although PACs are generally peaceful, conflicts arise as a result of changing demographics and decentralisation, underlining the requirement for effective stakeholder engagement
- there are vulnerable groups which will need special considerations.

6.4.3.15 Traffic

This section describes the:

- traffic AOI
- methods
- baseline condition of the transport network, including
  - ports, airports, the road network, public transport, walking and cycling
  - trends affecting traffic conditions and sensitivity to change
  - traffic sensitivity rankings
- key considerations.

For more information, the traffic baseline report is included in Appendix A12.

Area of Influence

The potential traffic impacts in an AOI are those that connect to key population centres, ports and airports to the AGIs, construction facilities and pipeline RoW.

The traffic AOI includes the trunk road network across Uganda and Tanzania closest to the pipeline, other roads that connect to the construction facilities and AGIs, and roads that connect to major centres and ports, such as Kampala and Dar es Salaam.

AGIs will remain operational over the project lifetime, so the AOI at these locations is considered over approximately 25-years. At other locations, the AOI extends is the construction period.

Methods

A desktop review of the transport network using maps, satellite images, input from the project engineers was used to identify the road network likely to be used for the project, the main settlements on the road network and the location of field surveys to collect traffic data.

A review of types of road use was undertaken using information from UNRA, the World Health Organisation and data gathered through the social field surveys to identify the conditions experienced by users. Walking, cycling, public transport and the typical forms of private transport used were considered.

A field survey collected data on traffic volumes and flow characteristics at 16 selected locations within the project area, five in the Uganda EACOP AOI.

Baseline Condition of Traffic

The baseline traffic conditions relate to four VECs; social infrastructure and services, community safety, security and welfare, workers' health, safety and welfare, and community health. These VECs are associated with the transport network, including ports, airports, road network, public transport, walking and cycling, road safety and traffic flows.

Ports

Uganda is a land-locked country and therefore relies on goods being transported through neighbouring countries. Ugandan ports handle a negligible amount of cargo, with 95% of total cargo being transported by road. However, the following shipping routes offer the potential for cargo arriving by road to travel across Lake Victoria or Lake Albert with onward travel via road and rail:

- Lake Victoria offers shipping cargo routes to Kenya and Tanzania, including a ferry that transports train wagons from Kampala to each of these countries
- ferries operate across Lake Victoria for standard cargo
- commercial boats are used to transport goods on Lake Albert between Uganda and Congo
- an UNRA ferry operates from Wanseko in Buliisa district to Panyimur in Nebbi district.

Airports

Airports are an entry point into land-locked Uganda for people and nonbulk goods, including specialist components.

Uganda's capital, Kampala, is served by Entebbe International Airport, approximately 40 km southwest of the city. At the time of writing, the airport is being upgraded and expanded to modernise and improve the passenger and cargo facilities. It provides connections to countries across Africa, the Middle East and Europe, and offers opportunities for freight and specialist workers to be transported to Uganda with onward transport by road.

Kabaale International Airport in the Hoima District of Uganda is being developed to serve the region's oil industry, including the planned oil refinery in Kabaale. The airport will handle large passenger and cargo aircraft for the transport of equipment and workers to the construction site and nearby oilfields.

There are also airstrips across the country that can accommodate smaller passenger and cargo aircraft. These can be used to reach more remote parts of Uganda, including the Tilenga development area, which is served by existing airstrips at Bugungu and Pakuba in Murchison Falls National Park.

Road Network

The project will use a variety of road types across Uganda. In Uganda, the road classification system has five levels A–E with A representing international trunk roads and E representing minor roads. In this baseline report, roads have been described in relation to the function they perform and the environment through which they pass as being:

- trunk roads
- urban roads
- rural roads.

At the time of writing, many of Uganda's unsealed trunk roads are being upgraded to become roads with sealed surfaces. In addition, road networks are being upgraded by UNRA to support oil and gas infrastructure development. This will include an upgrade to 11 roads and several bridges to become sealed roads.

Uganda has a wide range of urban roads, some sealed and some unsealed. They vary in condition and are often poorly maintained.

Nontrunk rural roads are typically unsealed and can often be a single lane track or footpath of varying condition. Off-road vehicles or motorcycles are usually the only vehicles that can use these roads, particularly in the wet season, when they can become partially flooded.

Public Transport

Due to the low population density, and therefore in lower demand, the road condition is poor and there is very little public transport in Uganda outside of major urban areas. Therefore, many people in rural areas walk long distances to use public transport.

The social baseline survey showed that boda boda (motorcycle taxis) and bajaj (three-wheeled motorcycle taxis) are the most common form of transport, being used by the average Ugandan household for 75% of all journeys. The survey also showed that a further 11% of household transport was by private motorcycle.

There is no formal bus rapid transit (BRT) system in place in Uganda. However, Kampala is preparing to introduce a BRT service which should improve travel times within the city (*National Transport Master Plan 2008-2023*). For inter-city journeys, most towns have a form of taxi-park, with longer-haul minibuses departing to various destinations. Larger buses also make inter-city journeys.

There are no railways close to EACOP that are available for freight or passenger use. The Kampala service is a passenger network covering the Kampala urban area.

Walking and Cycling

Cyclists and pedestrians are the most vulnerable road users, having no physical protection against motor vehicles. Many urban roads in Uganda have little or no infrastructure for pedestrians and cyclists, creating safety risks for these road users.

In rural areas, walking and cycling are extremely important for people's livelihoods. Often, rural people travel along footpaths before they can access roads. These paths range in use and significance but can link whole communities with the road network. The condition of footpaths and roads, as well as the traffic density, can therefore have an important effect on rural livelihoods. The condition of Uganda's rural footpaths is highly variable and may change depending on the season.

Road Safety

Uganda has experienced significant growth in recorded road crash fatalities over the last decade with 24 people killed per 100 road crashes, although recent trends appear to show stabilisation in the most recent five-year period. On average, Uganda loses 10 people per day in road traffic crashes, which is the highest level in East Africa.

Careless and dangerous driving are the principal causes of road accidents in Uganda.

Traffic Flows

The data collected by the traffic surveys was analysed to determine:

- existing traffic with peak hour and directional distribution
- traffic composition
- percentage of truck traffic at peak hours and its proportion of the total traffic volume.

Daily two-way traffic flows ranged between 2,000 and almost 11,000 vehicles during the 10-hour survey period. On average, the proportion of trucks was around 5%. Motorcycles represented a significant proportion of traffic, usually approximately 50% and at some locations in excess of 75% of all traffic.

Trend in Condition and Sensitivity to Change

Road Condition

The Ugandan government is currently upgrading trunk road sections that are currently unsealed. The upgrades are focused on the trunk road network and those roads that will be used for oil industry activities.

Sealed roads are less likely than unsealed roads to degrade as traffic levels increase. Those parts of the network not being upgraded have the potential for higher rates of deterioration and are considered most sensitive to a change in traffic flows.

Road Safety

Various initiatives have been implemented over recent years to promote road safety in Uganda. These have included advertising campaigns on radio and television, and road safety literature. The number of people killed or seriously injured fell between 2011 and 2013 but has, at the time of writing, risen to levels similar to 2011. This is likely to reflect the increase in motorcycles for private or boda boda use, which have a poor safety record.

Accident rates on upgraded roads have the potential to fall due to improved road surfaces, although it is acknowledged that this can introduce other factors which affect accident risk, such as increased speed. Accident rates on roads that are not upgraded are likely to be most sensitive to increased traffic flows, with a likely detrimental impact on road safety.

Traffic Congestion

The key areas for congestion in Uganda are in Kampala and on the approach to border crossings. Severe congestion can be experienced on a daily basis within Kampala due to the:

- volume of private traffic
- lack of public transport
- volume of boda boda and bajaj, which has increased as they offer a low-cost and effective means of travel.

Congestion has increased over recent years owing to an increasing number of people working in the centre of Kampala.

In other areas of the country, congestion only occurs when vehicles are travelling along routes with high volumes of pedestrians walking in the road as the volume of vehicles is relatively low.

The roads most sensitive to change will be those already congested as small increases in traffic may increase journey times. Other roads across Uganda are less sensitive to change as they have spare capacity.

Sensitivity Rankings

Based on the traffic surveys, engagement with stakeholders, trend in condition and sensitivity to change, the sensitivity of the traffic-related receptors within the AOI has been ranked and is shown in Table 6.4-57.

Table 6.4-57 Traffic-Related Valued Environmental Components Sensitivity Ranking

Traffic-Related VEC	Sensitivity Ranking	Rationale for Ranking
Road condition: National roads (upgraded or planned upgrade)	Medium (3)	The national road network is generally in moderate condition with some sealed roads experiencing deteriorating conditions.
Road condition: Access roads	Very high (5)	The access road network is generally in poor condition with the majority of nontrunk roads being unsealed.
Road safety: National roads (upgraded or planned upgrade)	High (4)	Sealed roads have a lower accident risk. Poor road conditions are a major cause of accidents in Uganda. However, settlements are alongside the road with vulnerable road users (pedestrians and cyclists) being particularly sensitive to increases in the number of heavy goods vehicles.
Road safety: Access roads	Very high (5)	Accident rates are very high in Uganda. Vulnerable road users (pedestrians and cyclists) are particularly sensitive to increases in the number of heavy goods vehicles.

Table 6.4-57 Traffic-Related Valued Environmental Components Sensitivity Ranking

Traffic-Related VEC	Sensitivity Ranking	Rationale for Ranking
Traffic congestion: Kampala, Hoima and other large towns, and Uganda–Tanzania border	Very high (5)	Where congestion is already experienced, a small increase can extend journey times, compared to roads with spare capacity.
Traffic congestion: Other roads	Medium (3)	Localised congestion can occur through areas of settlement where stalls, dwellings and pedestrians can reduce the road width. Moderate increases in traffic volumes could extend journey times in these areas.

Key Considerations

Within the AOI, the condition of many sections of the road network will be upgraded by the government as part of its ongoing improvements or by the project for construction purposes.

Accident rates in Uganda are high, with pedestrians and cyclists considered particularly vulnerable. Traffic levels are low, so congestion is rare, except at the border with Uganda and in Kampala, Hoima and other large towns.

6.4.3.16 Tangible and Intangible Cultural Heritage

This section describes the intangible and tangible cultural heritage:

- AOI and study area
- baseline condition
  - trends in condition and sensitivity to change
  - ecosystem services
  - sensitivity rankings
- key considerations.

For more information the baseline report is included in Appendix A13.

Tangible cultural heritage (TCH) is defined as moveable or immovable objects, sites, structures, or groups of structures having archaeological, palaeontological, historical, cultural, artistic, and religious values (IFC 2012a).

Intangible cultural heritage (ICH) is defined as cultural resources, knowledge, innovations and practices of local communities embodying traditional lifestyles (IFC 2012b).

Cultural heritage provides continuity between tangible and intangible forms and between the past, present and future. People identify with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. Cultural heritage, in its many manifestations, is important as a source of valuable scientific and historical information, as an economic and social asset for

development, and as an integral part of people's cultural identity and practice (World Bank 2017).

Area of Influence

The TCH AOI for the construction phase includes all construction areas:

- the RoW
- AGIs
- MCPYs
- access roads
- temporary work spaces (at crossings).

The area affected visually or by noise, dust, vibration or restriction of access beyond the physical footprint is also included in the AOI. This distance extends to 100 m from the project footprint. It is unlikely that there will be discernible effects from noise, vibration, dust or restriction of access beyond this distance. This will be checked as part of the proposed programme of cultural heritage construction planning survey and assessment, based on the findings of the impact assessment for noise and air emissions and additional engineering studies for noise and air emissions.

During the operational phase, the TCH AOI includes:

- the RoW
- AGIs.

Visual and noise impact on TCH beyond the physical footprint is also included in the operational phase AOI, which extends to 100 m beyond the pipeline and AGIs. It is unlikely that there will be discernible effects from noise beyond this distance. This will be checked as part of the proposed programme of cultural heritage construction planning survey and assessment, based on the findings of the impact assessment for noise emissions and additional engineering studies for noise emissions.

The AOI for ICH is more difficult to define. For example, a sacred site may have no clear boundaries, worshippers may come from various areas and it may not be clear whether the RoW or other project components will affect access. The construction and operation AOI for TCH has been used as a basis but has been extended in cases where, based on professional judgement, sites may be affected.

The study area is 2 km wide, 1 km either side of the pipeline.

Baseline Condition of Tangible and Intangible Cultural Heritage

Three categories of cultural heritage were defined based on the features identified by the studies:

- Category 1 – tangible cultural heritage:
  - archaeological sites
  - areas of high archaeological potential
- Category 2 – tangible cultural heritage with strong intangible elements:
  - cemeteries and graves, including kingdom burial sites and regalia

    - religious places where worship associated with the main established religions is practised (such as churches or mosques)
- Category 3 – intangible cultural heritage with a less well defined tangible component:
    - sites with an intangible component and traditional value, the importance of which is not always a factor of geography, but of belief and ritual. Such sites may be used for music making, dance, storytelling and other rituals. This category may also include rituals that are not linked to any particular site, but to a particular group of people.

Religious and other intangible cultural heritage VECs are more difficult to define, as these may have no fixed or easily mapped location, boundary or physical entity, and when they do (e.g., a sacred tree), the importance may be shared by people over a wider area. All the Category 3 features were identified during the social baseline field survey.

Within the 2-km-wide study boundary (see Appendix A13), 66 features were located through secondary data reviews and by the field surveys:

- three within the project footprint (inside)
- five within 100 m of the 30 m RoW and project components and may be susceptible to some form of impact (close)
- 58 within the 2-km study area but beyond 100 m of the RoW, and project components, i.e., beyond the area expected to be affected (outside[8]).

Potential sites identified from an examination of light detection and ranging (LIDAR) are excluded from the totals above, as the surveys showed a large proportion of the identified features were likely to be the result of natural processes or recent agricultural activity. However, the LIDAR sites not visited during the field survey will be included in cultural heritage construction planning survey and assessment.

Based on the baseline data collected, the following examples of cultural heritage features were identified for Categories 1, 2 and 3, see summary below, the figures in Attachment 13.1 and tables in Attachments 13.2 to 13.4 of Appendix A13.

Category 1:

- sites with pottery remnants: no known sites are in the study area, although there are many known sites outside the study area. The pottery recorded indicates that a range of associated settlement sites may be present dating from the Stone Age through the early Iron Age up to recent times.
- ironworking sites: eleven ironworking sites are known within the study area from KP251 to KP261. They comprise signs of slag, associated with furnaces, and potential ore mining sites. This ironworking material could date from the early Iron Age up to the relatively recent past.

[8] The location of each site in the study area was categorised:

- **inside** the project footprint (within the pipeline RoW and within project components; AGIs, MCPYs, access roads and temporary work spaces)
- **close**, within 100 m of the 30 m RoW and project components
- **outside**, over 100 m from the 30 m RoW and project components and not expected to be affected.

- rock art sites: one site with rock art has been identified within the study area (Kalyango cultural rock, near KP86) and there are other known sites outside the study area.

Category 2:

- churches and mosques: 47 churches and mosques have been identified within the study area
- graves and cemeteries: five cemeteries have been recorded within the study area. Two cemeteries have been identified within the project footprint (inside), with a third within 100 m (close).

Category 3:

- sacred natural sites and trees: identified in the communities of Nkooko at Nkooko Hill, Nyondo, Kakuuto and Bigada. In some communities, specific places were mentioned but the character of the place was not explained, such as Nyondo, and Kamusenene (both Mubende district) and at Buseruka (Hoima).
- traditional dances: implied by the description of rituals in Kakende (Hoima district) for exorcising evil spirits. At Katikara traditional dances also involve wearing specific clothing of white cloth.
- rituals to interact with ancestors to ensure good health and prosperity: Mentioned in the PACs of Nyondo, Miti, Bulakati, Buswabera and Nkooko
- traditional healing: widely practised, for example, at Bulakati (Sembabule), Kakende (Hoima), Nzoo (Kyankwazi), Mutukula (Kyotera) and Nyondo (Mubende). Traditional healing is also covered in the socio-economic and health baseline report (see Appendix A11).
- syncretism: the amalgamation of established religions (Islam and Christianity) and traditional African belief systems was mentioned explicitly in many PACs, including, for example, the village of Katooke in Hoima District and at Nzoo
- sacred meeting places still used for important meetings were mentioned at Katooke
- rivers and ceremonial ways: mentioned in Kayere, in association with sacred trees, but not elsewhere
- twins: the birth of twins is commonly surrounded by a degree of spiritual ambivalence and this was mentioned at Rwamutonga and Nyondo.

Trend in Condition and Sensitivity to Change

Limited information exists on trends in condition of cultural heritage sites in the regions traversed by the project. Agriculture, expanding and new settlements, infrastructure, mining and other developments affect the cultural heritage baseline. Based on professional experience and opinion, and a precautionary principle that acknowledges that archaeological sites may be unique, even if superficially similar to others, the definition adopted is that tangible cultural heritage is a finite resource and loss is considered non-replicable by the project, but not under IFC definitions. IFC Performance Standard 8 (2012) defines replicable heritage as “tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may be

considered replicable where the particular eras and cultural values they represent are well represented by other sites and or structures."

Nonreplicable cultural heritage is defined by IFC such that it "may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site".

Based on professional experience, no sites within the AOI meet IFC criteria as nonreplicable. However, this does not diminish the potential archaeological interest of sites and, using a precautionary principle that acknowledges that archaeological sites may be unique, the approach adopted is that tangible archaeological heritage is a finite resource.

Intangible cultural heritage is closely linked to individual and group identity and to all parts of a culture. ICH practices are not static, as change is ongoing and further change is inevitable. ICH assets of value to the PACs are sensitive to change. This may be due to the movement of people in or out of the area, so that the resource loses value as the belief systems that gave the asset value are replaced. Intangible cultural heritage assets may have little resilience and can be lost entirely to a new generation.

The older established religions, like Islam and Christianity, presently have an ambivalent relationship with traditional African beliefs in ancestral spirits, which may be further eroded.

Ecosystem Services Provided

Cultural heritage generates a range of ecosystem services as set out below.

Cultural services include:

- providing a sense of self and the role of communities and individuals in the world. A sense of place or way of life is central to the effective functioning of many social systems in terms of agricultural production, craft production and trade, land ownership and inheritance and are based on and maintained by intangible heritage practices.
- providing spiritual, sacred or religious values, inspiration for culture and design, and cognitive development
- supporting the effective functioning of other social activities in terms of agricultural production, craft production and trade, land ownership and inheritance
- building resilience in terms of the ability to adapt to continuous social changes without the loss of basic social functions.

Sensitivity Rankings

Sensitivity rankings for Category 1 and 2 sites are provided in Attachment 13.2 of Appendix A13.

Key Considerations

Key considerations are:

- the tangible and intangible cultural heritage identified is considered a representative sample. The sample represents the full range of features for categories 1, 2 and 3 that are likely to be encountered, but there is less certainty for Category 3.
- religious structures are the most common in Category 2 sites
- no known nationally or internationally designated sites or critical cultural heritage have been identified within the study area
- three high sensitivity Category 2 features (cemeteries) are within the AOI of which two are within the RoW
- the remaining Category 1 and 2 features within the RoW or the AOI are moderate sensitivity
- Category 3 is closely linked to individual and group identity, and is therefore sensitive to cultural change
- many more features for each category are likely to be identified in the AOI
- identification of further Category 3 features requires active participation of local key informants based on establishing a sufficient degree of trust.

The Convention for the Protection of the World Cultural and Natural Heritage, 1972 and the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage refer to international human rights in respect of tangible and intangible cultural heritage and the importance of:

- the tangible and intangible cultural heritage as mainsprings of cultural identity and diversity
- maintaining access to and right to practice traditional cultural heritage and beliefs.

6.4.4 Climate

This section describes the climate:

- AOI
- baseline conditions:
  - air temperature, precipitation, air humidity, solar radiation, wind and greenhouse gas (GHG) emissions
  - trends in the climate and GHG emissions
  - ecosystem services provided
- key considerations.

For more information, the climate baseline report is included in Appendix A14.

Area of Influence

The spatial AOI climate change boundary is global. However, for the purposes of assessing the project contributions to national emissions, Uganda's borders are considered the spatial AOI.

The temporal AOI will extend throughout the life of the project, from construction to decommissioning, as all these phases will generate GHG emissions.

Baseline Condition of Climate

The tropical climate in Uganda is determined by large-scale monsoons and the Intertropical Convergence Zone systems as they move north and south following the sun. In addition, the medium-scale systems influenced by the extensive physical features in the East African region, like the Lake Victoria Basin, mountain ranges and the associated rift valleys, and the Congo Basin forest to the west has an important role in the temporal and spatial distribution and the intensity of the weather systems in Uganda.

Air Temperature

Air temperature in Uganda is moderate throughout the year, with a mean daily temperature of 28°C (MWE 2014).

Between 1951–1980 and 1981–2010, there has been an increase in average annual minimum temperature of 0.5–1.2°C and 0.6–0.9°C for average maximum temperature (USAID 2013).

Average maximum air temperature within the pipeline route peaks at approximately 35°C in February–March and September–October. The average minimum temperature varies little throughout the year, ranging between approximately 9°C (June–July) and 11°C (March) (Actimar 2016a).

Precipitation

Rainfall in Uganda ranges from 400–2200 mm/a (MWE 2014). The southern regions of the country receive 600–2200 mm/a, while the north receives 400–1600 mm/a. Nationwide, Uganda receives an average of 1180 mm/a of rainfall.

Precipitation in Uganda is seasonal and it's timing, intensity and duration vary considerably across the country. In general, Uganda experiences two modes of rain seasons. This includes one long rainy season from late March to mid-October in the north, and a bimodal season, from March to May, and then from September to November, in the western, central and eastern regions. Droughts sometimes occur in the dry season, affecting water availability for agriculture and the population.

Uganda also experiences the El Niño–Southern Oscillation (ENSO)[9], which is the principal driving force of annual to interannual rainfall variability in the tropics. The effects of ENSO are most pronounced in Uganda between September and December. El Niño is often associated with floods, whereas La Niña is associated with droughts (MWE 2014).

The timing of rainfall can vary considerably from year to year. The onset of rainy seasons can be 15 to 30 days earlier or later, while the duration of the rainy season can change by 20 to 40 days (USAID 2013).

The area that the pipeline route traverses experiences two rainy seasons per year from March to May and from August to November. During these two seasons, the

[9] El Niño and La Niña are terms for climatic events originating in the tropical Pacific that recur every few years as part of a naturally-occurring cycle. The name 'El Niño' is used specifically for the anomalous sustained warming of sea surface temperature that occurs every few years, typically concentrated in the central-east equatorial Pacific. 'La Niña' is the term adopted for episodes of cooler-than-normal sea surface temperature in the equatorial Pacific. (Met Office 2017, internet site)

monthly mean precipitation exceeds 100 mm/month and the maximum can exceed 250 mm/month. Rainfall occurs on 17 days/month on average (Actimar 2016a).

Humidity

Uganda's climate is equatorial, with moderate humid and hot climatic conditions throughout the year. Maximum relative humidity reaches 100% almost everywhere throughout the year except between July and October in the south-west of Lake Victoria, where it remains above 85%.

Solar Radiation

Local conditions play an important role in the variability of daily solar radiation. The maximum daily peak of solar radiation occurs during the equinox periods from September to October and from March to April (the latter period has a slightly lower maximum daily peak due to a rainy season). The maximum daily peak of solar radiation along the pipeline route ranges between 800 W/m² in June to 950 W/m² in October.

Wind

Wind speeds in the region of the pipeline are low, with maximum 1-hour mean wind speeds along the pipeline route being 3–8 m/s, and not varying considerably throughout the year (Actimar 2016a).

Greenhouse Gas Emissions

Uganda has one of the lowest levels GHG emissions per capita in the world, estimated at 1.6 tCO_2e per capita for 2014, totalling absolute emissions of 59.9 $MtCO_2e$ which is approximately 0.12% of the world total (Climate Watch 2018, Internet site).

The same data show that land use change and forestry (LUCF) was the leading source of GHG emissions, accounting for 43%, with agriculture close behind at 40%.

Approximately 93% of Uganda's energy needs are met by biomass, with 6% met by oil and 1% by electricity. Agriculture sector emissions are primarily driven by livestock production, inefficient animal waste management systems and the cultivation of organic soils (MWE 2014). Forested land has been shown to be decreasing, with forest degradation highest outside protected areas and in areas where agriculture expanded (MWE 2015).

Trend in Condition and Sensitivity to Change

Since 1960, mean annual temperatures have risen by 1.3°C and annual and seasonal rainfall has decreased considerably across Uganda. Rainfall has also become more unpredictable and unevenly distributed over the year. Extreme events such as droughts, floods and landslides are increasing in frequency and intensity (MWE 2015).

From 1970 to 2000, minimum and maximum temperatures have increased, with minimum temperature having risen faster than the maximum temperatures.

Climate change is affecting a wide variety of sectors, particularly agriculture, water, health and human settlements. In the 2007–2008 fiscal year, climate change damages were equivalent to 4.4% of the national budget, exceeding the budget allocation for the Environment and Natural Resource Sector (MWE 2015).

Climate variability and change in Uganda affect seasonal to interannual rainfall. This is reflected in variations or shifts in the timing and duration of seasonal rainfall and intraseasonal dry spells, and the intensity of rainfall, thunderstorms, lightning and hailstones. This can lead to floods, droughts and famine.

Climate projections developed for the country using the models used in the IPCC Fifth Assessment Report indicate an increase in near-surface temperature for the country. These predict increases of +2°C in the next 50 years and +2.5°C in the next 80 years under representative concentration pathway (RCP) 4.5 (intermediate level of GHG emissions). Under RCP 8.5 (very high GHG emissions), it is predicted to increase by +2.5°C in the next 50 years and +4.5°C in the next 80 years. The models also predict a slight decrease in total annual rainfall in most of the country, with slightly wetter conditions over the west and northwest under both RCP 4.5 and RCP 8.5. Rainfall totals might drop considerably (–20% from present levels) over Lake Victoria (MWE 2015).

Floods can lead to secondary impacts, including landslides, soil erosion, silting of dams and drainage channels, bursting of dams and river banks, water logging in low lying valleys and wetlands, outbreaks of epidemics in animals, crop diseases and pests. Droughts lead to secondary impacts, including degraded grazing and agricultural lands, which can lead to desertification.

Anthropogenic GHG emissions, together with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming since the mid-20th century. In recent decades, changes in climate have affected natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to a changing climate (IPCC 2014).

Between 1990 and 2014 Uganda's GHG emissions increased by 71% (Climate Watch 2014, internet site).

Uganda's Intended Nationally Determined Contribution (INDC) report (MWE 2015), sets out long-term goals and adaptation strategies in relation to climate change mitigation. It prioritises specific measures in energy supply, forestry and wetlands to provide GHG emission reductions and adaptation measures. The cumulative impact of the emission reduction measures is predicted to be a 22% reduction of overall national emissions in 2030 when compared to the business-as-usual (BAU) projection. The BAU emissions baseline for Uganda is 77.3 $MtCO_2e$ per year in 2030, and a 22% reduction would result in emissions of approximately 60.3 $MtCO_2e$ – close to the 2014 level.

Continued GHG emissions will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in GHG emissions which, with adaptation, can limit climate change risks (IPCC, 2014).

Ecosystem Services Provided

Although this VEC does not provide ecosystem services directly, climate influences VECs that do provide services.

Key Considerations

The key considerations related to the climate baseline are:

- the global climate has undergone unprecedented change10 and continuing change is predicted by climate scientists. Uganda's climate has changed and further change is predicted.
- Uganda is vulnerable to increased climate variability and climate change. For example, the severity and frequency of extreme events such as droughts and floods are projected to increase.
- global anthropogenic GHG emissions, together with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming of the global climate since the mid-20th century
- the Ugandan government has put in place measures to reduce the risks of the changing climate. These include mitigation measures (reductions in GHG emissions relative to a BAU scenario) and adaptation measures (reduction of the vulnerability of social and biological systems).

6.5 Ecosystem Services

6.5.1 Ecosystem Service Coverage

The above descriptions of VEC baselines have included ecosystem services with each reference summarised in Table 6.5-1.

Table 6.5-1 Ecosystem Service References

Ecosystem Service*	Reference
Provisioning services	
Crops	6.4.3.8 Land-Based Livelihoods
Livestock	6.4.3.8 Land-Based Livelihoods
Capture fisheries	6.4.1.3 Aquatic Biodiversity, 6.4.3.9 River- and Lake-Based Livelihoods
Aquaculture	6.4.3.9 River- and Lake-Based Livelihoods
Wild foods	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.3 Aquatic Biodiversity, 6.4.1.4 Avifauna Biodiversity, 6.4.1.5 Fauna Biodiversity, 6.4.3.8 Land-Based Livelihoods
Live trade in wildlife	6.4.1.1 Protected Areas, 6.4.1.5 Fauna Biodiversity
Timber and wood products	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.3.8 Land-Based Livelihoods
Fibres and non-wood products	6.4.1.2 Botany Biodiversity, 6.4.1.4 Avifauna Biodiversity, 6.4.1.5 Fauna Biodiversity, 6.4.3.8 Land-Based Livelihoods

[10] "Since the 1950s, many of the observed changes are unprecedented over decades to millennia" (IPCC 2014).

Ecosystem Service*	Reference
Aggregates and minerals	6.4.3.8 Land-Based Livelihoods
Biomass fuel	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.3.8 Land-Based Livelihoods, 6.4.3.12 Social Infrastructure and Services
Ornaments and other products	6.4.1.4 Avifauna Biodiversity, 6.4.1.5 Fauna Biodiversity
Freshwater	6.4.2.2 Surface Water, 6.4.2.3 Groundwater
Medicinal plants	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.5 Fauna Biodiversity, 6.4.3.8 Land-Based Livelihoods
Regulating services	
Local air quality regulation	6.4.1.2 Botany Biodiversity
Global climate regulation	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.4 Avifauna Biodiversity, 6.4.1.5 Fauna Biodiversity, 6.4.2.1 Geology and Soil
Local climate regulation	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.5 Fauna Biodiversity
Water regulation	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.3 Aquatic Biodiversity, 6.4.2.1 Geology and Soil, 6.4.2.2 Surface Water
Erosion regulation	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity
Waste assimilation	6.4.1.2 Botany Biodiversity, 6.4.1.5 Fauna Biodiversity, 6.4.2.2 Surface Water
Pest control	6.4.1.4 Avifauna Biodiversity
Soil quality regulation	6.4.1.2 Botany Biodiversity, 6.4.2.1 Geology and Soil
Cultural services	
Recreation and ecotourism	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.4 Avifauna Biodiversity, 6.4.1.5 Fauna Biodiversity
Aesthetics, landscapes	6.4.2.4 Landscape
Sense of place / self	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity6.4.3.8 Land-Based Livelihoods, 6.4.3.9 River- and Lake-Based Livelihoods, 6.4.3.16 Tangible and Intangible Culture
Spiritual, sacred and religious values	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.5 Fauna Biodiversity, 6.4.3.16 Tangible and Intangible Culture
Ethical and biodiversity non-use values	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.5 Fauna Biodiversity
Supporting services	
Habitats and species support	6.4.1.1 Protected Areas, 6.4.1.2 Botany Biodiversity, 6.4.1.3 Aquatic Biodiversity, 6.4.1.4 Avifauna Biodiversity, 6.4.2.2 Surface Water, 6.4.2.3 Groundwater

NOTE: *The order of ecosystem services is based on a standard list of ecosystem services in WRI (2012) Corporate Ecosystem Services Review Version 2.0.

7 STAKEHOLDER ENGAGEMENT

7.1 Introduction

The term “stakeholder engagement” describes a broad, inclusive, and continuous process between a company and those potentially impacted that encompasses a range of activities and approaches and spans the entire life of a project (International Finance Corporation (IFC) 2007).

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have either interest in a project or the ability to influence its outcome, either positively or negatively.

Stakeholder engagement has been an integral part of the project to date. Stakeholder engagement activities have been undertaken by the project team, including community liaison officers (CLO), and consultants including the:

- resettlement teams
- human rights impact assessment teams
- geophysical and geotechnical survey CLO teams
- environmental and social impact assessment (ESIA) teams as part of their specific activities and aimed to provide stakeholders with information and to receive their inputs.

This section focuses on stakeholder engagement during the ESIA process and explains how it fits in with the project team engagement. Stakeholder engagement is an integral component of the ESIA process and the foundation for developing and maintaining the project’s social licence to construct and operate.

Stakeholder engagement during the ESIA preparation has been undertaken in accordance with the requirements of Ugandan legislation, international requirements as set out in the Equator Principles III and the IFC (2012) and project policies for stakeholder engagement.

Appendix C3 includes a stakeholder concerns table addressing:

- concerns and questions raised by stakeholders
- responses given to stakeholders in answer to their concerns and questions
- stakeholders who raised the concerns
- reference to where the concern is addressed in the ESIA

7.2 Stakeholder Engagement Principles and Protocols

The following principles are the basis for the ESIA stakeholder engagement:

- Open and Transparent: Information relevant to project activities will be as accessible and transparent as possible, providing stakeholders with a comprehensive understanding of project activities and how they are or may be affected by them (unless legitimate reasons for commercial confidentiality or the protection of stakeholders require that it be kept confidential).

- Based on Listening and Dialogue: Stakeholders will be listened to, their concerns taken seriously, and responses provided in a timely way to address their concerns.
- Participative: Stakeholders will be invited and encouraged to actively engage with the project. The project will be inclusive in this process, considering factors such as gender and cultural considerations and ensuring stakeholders feel they have an opportunity to share their perspectives.
- Proactive: The engagement process will provide information in advance of consultation activities and decision-making points. Potential risks and impacts will be communicated proactively with stakeholders.
- Impact-focused: During the impact assessment process, engagement with communities potentially affected by the project will be, whenever possible, focused around the potential and actual negative project impacts that may concern them in order to jointly identify appropriate avoidance, mitigation and compensation measures. Other stakeholders indirectly affected by the project's impacts may also be consulted.
- Safe: Steps will be taken by the project towards ensuring stakeholder engagement is free from manipulation, interference, coercion or intimidation. Any stakeholder that participates in any form of engagement can do so in a safe and protected way without risk or fear for retaliation (for example, through the use of trusted third parties, individual meetings or group meetings).
- Effective: Information and forms of engagement will be acceptable to, and effective for, the individuals for whose use they were intended and will be accessible, legitimate, transparent and human rights compatible.
- Appropriate: Different forms of engagement may be required for different kinds of stakeholders and for different purposes. Information provided to stakeholders will be provided in formats appropriate to the stakeholder in question, considering the potential need to help with the interpretation of technically complex information.
- Empowering and responsive: Engagement should empower stakeholders to make their voices heard. This will include informing stakeholders of what they can expect in terms of feedback and responses to their inputs.
- Equal and human rights respectful: Everyone, without discrimination, will be afforded the right to participate on equal terms. The project will ensure a gender sensitive approach to engagement and identify the need for any special measures to ensure that vulnerable individuals and groups are inclusively engaged.

In addition to the above principles, project guidelines and protocols have been used to support respectful interactions during the stakeholder meetings, ensure consistency across stakeholder engagement teams in managing sensitivities, expectations and concerns, and avoid mixed messages. These include:

- protocol for photographing stakeholders and permission for use
- cultural dos and don'ts in meetings
- procedure for recording cost reimbursements to stakeholders.

7.3 Environmental and Social Impact Assessment Stakeholder Engagement Objectives

The objectives of stakeholder engagement during the ESIA process were to:

- obtain an understanding of the number and types of stakeholders in the socioeconomic study area
- inform stakeholders about the project and the ESIA
- inform stakeholders about the engagement process and grievance management
- inform stakeholders about the ESIA baseline studies in the areas traversed by the project and associated infrastructure
- obtain stakeholder input into the scope of the ESIA, including the development of valued environmental (and social) components (VEC), impact identification, mitigation measures and potential sources of cumulative impact and impact mitigation
- listen to questions and concerns from stakeholders and ensure these are addressed in the ESIA
- conduct pre-submission meetings to consult a sample of potentially impacted local stakeholders before the submission to the National Environment Management Authority (NEMA) to acquire their feedback on ESIA findings (impacts and mitigation measures), cumulative impact assessment and mitigation measures
- provide a mechanism for ongoing stakeholder engagement and ways in which the stakeholders can continue to participate in the stakeholder engagement process
- ensure regulatory requirements and project standards are met.

7.4 Environmental and Social Impact Assessment Stakeholder Engagement Planning

A stakeholder engagement plan (SEP) to support effective engagement throughout the ESIA process was developed. The ESIA SEP provides direction for the ESIA engagement approach, stakeholder identification, specific engagement plans for the different ESIA phases and the key deliverables from engagement activities.

The SEP focuses on:

- the ESIA stakeholder engagement activities in each phase (see Section 7.5)
- a stakeholder identification and analysis process (see Section 7.5.1.1)
- methods, materials and protocols for stakeholder engagement including information disclosure, consultation, and reporting to stakeholders (see Section 7.5.1.3)
- a data management system for all stakeholder data and minutes of meetings for analysis and follow up
- a project grievance mechanism, which also serves as the ESIA grievance mechanism (see Section 7.7).

7.5 Environmental and Social Impact Assessment Stakeholder Engagement Activities

7.5.1 Stakeholder Engagement During the Scoping Phase

7.5.1.1 Stakeholder Identification

A key element of the ESIA scoping phase was to identify stakeholders and determine their potential interest in, influence over or link to the project area of influence (AOI) through a systematic analysis. The identification process is crucial to ensure that a representative range of stakeholders, particularly those most vulnerable and directly affected, are incorporated within the ESIA engagement strategy.

When identifying and prioritising stakeholders, the following aspects were considered:

- who could be adversely affected by environmental and social impacts in the AOI?
- who are the most vulnerable among the potentially impacted, and are special engagement efforts necessary?
- which stakeholders can best assist with the early scoping of concerns and impacts?
- who strongly supports or opposes the changes that the project will bring and why?
- who is it critical to engage with first, and why? (IFC 2007)

Stakeholders were then identified through:

- inputs from project personnel and the ESIA team's local expert knowledge and experience
- previous ESIAs and other studies conducted in the area
- geographic information system analysis of the AOI to identify the location of communities
- site visits undertaken by the ESIA stakeholder engagement team comprising project personnel and the local expert consultants employed by the project
- stakeholder meetings.

Particular attention was paid to the identification of vulnerable people and groups which could be directly affected by the project. The IFC defines disadvantaged or vulnerable groups as follows:

> "Individuals or groups within the project area of influence who could experience adverse impacts from the proposed project more severely than others based on their vulnerable or disadvantaged status. This status may stem from an individual's or group's race, colour, sex, language, religion, political, or other opinion, national or social origin, property, birth or other status. In addition, other factors should be considered such as gender, ethnicity, culture, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural resources".

Identification of vulnerable groups was undertaken during discussions at district and ward level and with potentially affected communities (PAC).

The stakeholder categories and subcategories identified are presented in Table 7.5-1. The specific organisations consulted are listed in Appendix C1.

Table 7.5-1 Stakeholder Categories and Subcategories

Authorities	Directly Affected Groups Including Vulnerable People	Civil Society	Others
National government Local government (district/county and subcounty) Regulatory institutions Policy makers District technical experts Village elected officials Health and educational institutions Police	Landowners Local residents Farmers (nonland owning) Shopkeepers Traders Business owners Pastoralists (cattle herders) Fisherfolk Women (including women in the workplace Minorities Youth (including unmarried) Elderly Sex workers Children (including orphans) Widows and female headed households People with mental and physical disabilities Chronically ill (i.e., those with HIV and AIDS) Refugees and migrants	Community groups and community-based organisations Media Nongovernmental organisations (NGOs) Religious leaders Traditional leaders and organisations Traditional leaders	Business sector Professional organisations Research institutions Academia Tourism service providers Emergency services

A workshop was held in March 2017 between the project and the ESIA consultants to analyse stakeholders in terms of their interest in the project, potential influence over the project or the potential impact of the project on them.

7.5.1.2 Scoping Stakeholder Engagement Objectives

The objective of scoping stakeholder engagement was to capture the main stakeholder considerations for the development of the terms of reference (ToR) for the EIS.

The specific objectives of the scoping phase engagement were to:

- identify stakeholders
- provide stakeholders with an overview of the proposed project activities, the potential impacts and opportunities and an understanding of the ESIA process

- document stakeholder views, concerns and expectations to inform the development of the scope of the EIS, including the development of the VECs
- acquire stakeholder input during the development of the ToR for the EIS.

7.5.1.3 Scoping Engagement Approach

To deliver the scoping phase objectives, meetings with key stakeholders were held:

- at national level
- in all districts crossed by the project
- in all subcounties with proposed AGIs or temporary construction facilities.

In addition, 13 PACs were consulted (see Figure 7.5-1). The PACs were selected taking into consideration:

- land uses (crop growing, grazing, natural resource use)
- locations of social and environmental sensitivity, including important biodiversity areas
- locations of VECs
- locations of the proposed AGIs and construction facilities.

Meetings

The scoping stakeholder meetings were held between 19 May and 2 June 2017. A total of 1182 people participated in 67 meetings. Meetings were held with:

- 12 national government agencies in Kampala
- a Buganda Kingdom representative
- district health authorities in eight districts
- district authorities in eight districts
- subcounty authorities in 22 subcounties
- two town councils
- 13 villages
- one umbrella organisation of NGOs (Civil Society for Oil). Thirteen NGOs were represented at the meeting.

Appendix C1 contains the list of all stakeholders consulted during the scoping phase.

Stakeholders who were consulted with specific reference to potential sources of cumulative impacts are included in Appendix C1 in a separate section. This included engagements with:

- 10 national government agencies
- government authorities in eight districts
- six town councils
- government authorities in 14 subcounties.

Figure 7.5-1 shows the districts, subcounties and villages engaged with during the scoping phase.

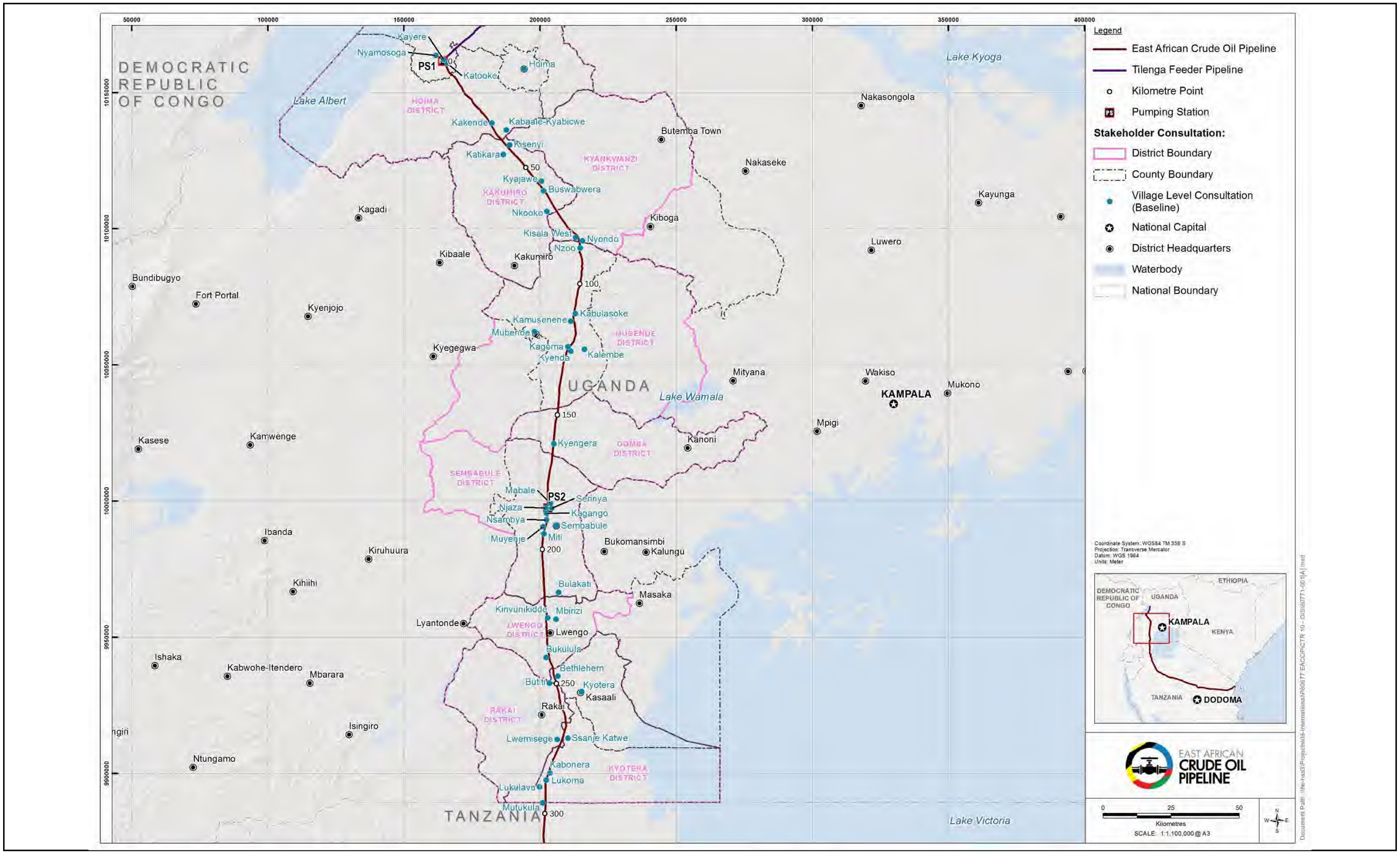


Figure 7.5-1 Districts, Subcounties and Villages Consulted During the Scoping Phase

NOTE: The scoping phase was undertaken before the formation of Kyotera district in June 2018.

Arranging the Engagement Activities

For meetings with district, subcounty and national government stakeholders, invitation letters were hand delivered to the stakeholders one week before the proposed meetings. The invitations were accompanied by project information and ESIA information brochures.

A confirmation phone call was made to the contact person for each stakeholder meeting to confirm the event, the time and place a few days before the meeting.

For village meetings, the following procedure was followed:

- Radio announcements on local stations in English and local languages (Rugungu, Runyoro-Rutooro, Luganda, Runyanko, or Rukiga, Alur) were made at least ten days before the start of the stakeholder engagements in all project affected areas. These announcements aimed to inform the public about the project and to mobilise the relevant communities to attend the planned meetings. Further to this, the following steps were taken.
- Selected villages and their subcounty and district government officials were visited two weeks before the planned meetings to announce the forthcoming community meetings and to obtain commitment from the village and government officials to mobilise the local people to attend.
- A phone call was made to the local council chairmen a week before the proposed village meetings confirming dates and venues.
- Local council chairpersons were contacted a day before each meeting to confirm their assistance with the mobilisation for the meeting.

Engagement Protocol

The protocol adopted for the meetings is outlined below.

- Meetings were held by the ESIA stakeholder engagement team and representatives of the project.
- Meetings were held in relevant local languages or English if appropriate.
- Two background information documents (BID), one outlining the project and one outlining the ESIA, in English and in relevant local languages (Lungu, Alur, Luganda, Runyakore- Rukiga, Runyoro- Rutooro), were distributed to the participants (see Appendix C2 for English version).
- For community meetings, the importance of women's participation was emphasised at the start of the meeting (although separate women's meetings were also held).
- The community meetings started with a prayer and opening remarks by the stakeholder appointed chairperson (each meeting appointed its own chairperson) and introductions. Meetings at subcounty, district and national levels started with introductions.
- All stakeholder meetings included a presentation on the project and the ESIA using a presentation at national level and posters (Appendix C2) at district, subcounty and village level. The project representatives introduced the project grievance procedure.
- After the presentation, a question and answer session was held for stakeholders to question and discuss the project, the project impacts and mitigations.

- During all meetings, the type and status of vulnerable peoples and groups potentially affected by the project was discussed. This served as preparation for further meetings with vulnerable groups during the baseline and impact assessment phase.
- Attendance registers were completed, and all questions and responses were recorded and entered in a database. Appendix C4 presents full records of all formal stakeholder meetings.

The results of the scoping phase consultations aided with the development of the list of priority VECs described in Section 6.

Figure 7.5-2 and Figure 7.5-3 show scoping phase stakeholder meetings.

Figure 7.5-2 Stakeholder Meeting at Kamuli Village

Figure 7.5-3 Stakeholder Meeting with Rakai District Local Government

7.5.2 Stakeholder Engagement During the Baseline and Impact Assessment Phase

7.5.2.1 Baseline and Impact Assessment Stakeholder Engagement Objectives

The objectives of the baseline and impact assessment phase engagement were to:

- introduce the project and ESIA process to stakeholders identified during the scoping phase engagements and who had not been met
    - identify and gain access to baseline data (collect, verify and close data gaps) from stakeholders
    - gather stakeholder feedback on the identification of impacts and development of management and mitigation measures for potential impacts, particularly where stakeholders have a potential role in developing and implementing these measures.

7.5.2.2 Baseline and Impact Assessment Engagement Approach

Building on stakeholder engagement conducted during the scoping phase, stakeholder identification continued during the baseline and impact assessment phase. ESIA subject matter experts (social, biodiversity, hydrology and cultural heritage) engaged with national, regional and local level stakeholders in their baseline studies. The subject matter experts gathered subject specific data, provided stakeholders with information about the project and the ESIA and potential impacts and recorded their concerns, suggestions and aspirations.

The engagement approach adopted by the teams included the following:

- *International and national level:*

  Key informant interviews (KII) were the predominant engagement tool with national government agencies and officials, businesses, NGOs and academic institutions.

- *District and subcounty level:*

  KIIs and small group interviews (SGI) were used at this level targeting civil society organisations (CSO), district and subcounty government agencies and service providers (e.g., health) and individual experts (e.g. land, livestock, fisheries).

- *PAC level:*

  A sample of PACs with a diversity of socio-economic characteristics were included. The identification of sample PACs was based on the social baseline sampling methodology (see Appendix A11).

  PACs were engaged through community meetings, focus group discussions (FGD), SGIs (to understand different livelihood strategies), KIIs (including business representatives, leaders, natural resource users, religious leaders, teachers and traditional healers) and household interviews (HHI). Focus group guides, which were the mechanism used for recording stakeholder responses in that forum, included questions on aspirations and concerns with regards to the project

All engagement activities included an element of identifying vulnerable groups and exploring knowledge, perceptions and attitudes towards vulnerable groups. Women-only group sessions and interviews were also included to explore gender matters with particular reference to women's perceptions and concerns.

The different methodologies were strategically employed and aimed to identify impacts on vulnerable stakeholders (e.g., SGI with pastoralists, fishermen, artisanal miners and HHI with the very poor, widows, elderly and people with disabilities).

Meetings

The baseline and impact assessment phase engagement meetings were held between 26 October and 18 December 2017. A total of 1401 people participated in 606 meetings. The following meetings were held:

At international and national level:

- seven KIIs and SGIs with national government agencies
- one meeting with an International NGO (World Vision)
- three meetings with traditional leaders (Buganda Kingdom, the Bunyoro-Kitara Kingdom and the Kooki Chiefdom).

At district level:

- 82 KIIs and SGIs with district authorities.

At local level:

- 34 community assembly meetings
- 32 FGDs with community leaders (including parish leaders)
- 39 FGDs with women groups

- 232 KIIs and SGIs with community members including local business owners, religious leaders, teachers, traditional healers, fisherfolk, crop farmers, pastoralists, artisanal miners, natural resource users and health workers
- 176 HHIs (including vulnerable people).

Appendix C1 lists stakeholders met during the baseline and impact assessment phase.

Figure 7.5-4 shows the districts and villages engaged with during the baseline and impact assessment phase.

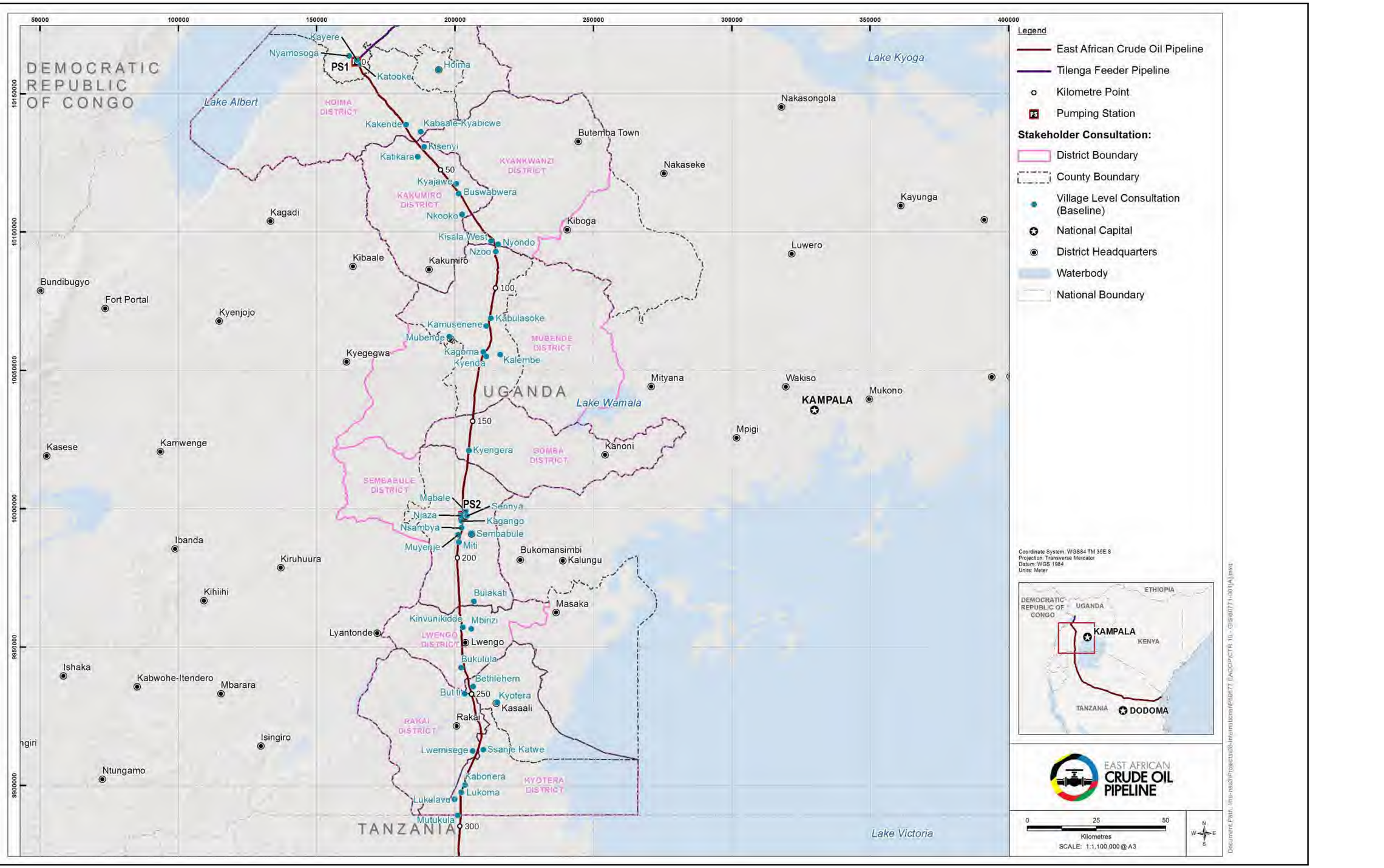


Figure 7.5-4 Districts, Subcounties and Villages Consulted During the Baseline and Impact Assessment Phase

Arranging the Engagement Activities

For meetings with district, subcounty and national government stakeholders, a process similar to the one applied during scoping was used:

- a letter providing an update on the ESIA and stakeholder engagement process was sent by email one week before the proposed meeting. The letters were accompanied by electronic versions of the BID and ESIA information brochures
- the DED of each district directed the DEMO as the liaison person for the ESIA team
- regular phone contact was maintained with the DEMOs to arrange the district, and community meetings in terms of time and location of the meetings, and mobilisation of participants.

For meetings at PAC level, the following process was followed:

- Subcounty leaders were contacted by phone and requested to inform community leaders about the proposed meeting.
- The stakeholder engagement team met with the subcounty and PAC leaders and members. The objectives of these meetings were:
  - to explain the project, the ESIA and potential project impacts, to provide BIDs and to arrange for subsequent meetings with different community groups.
  - to provide a letter introducing the baseline studies (social and environmental)
- The village leaders were requested to mobilise community groupings for follow-up meetings (SGIs, FGDs, KIIs).
- A phone call was made to the village leader at least a day in advance to confirm dates, times and venues for the interviews and group discussions.

Engagement Protocol

Community assembly meetings and national meetings followed the same protocol as during the scoping meetings. BIDs and posters were used and distributed during the meetings.

Other stakeholder engagements (FGDs, SGIs, KIIs and HHIs) were executed in a less formal manner and combined with data collection. These engagements generally started with a short presentation on the project and the ESIA, followed by a discussion on topics relevant to the livelihood, experience or expertise of the stakeholder, followed by opinions, concerns and suggestions with regards to the project. Appendix C4 presents full records of all formal stakeholder meetings during the baseline and impact assessment phase.

Figure 7.5-5 and Figure 7.5-6 show stakeholder engagement during the baseline and impact assessment phase.

Figure 7.5-5 Stakeholder Meeting at Katikara Village, Kakumiro District

Figure 7.5-6 Stakeholder Meeting at Kabonera Village, Kyotera District

7.5.3 Human Rights Stakeholder Engagement

In addition to the meetings held by the ESIA team, the human rights team conducted meetings with the following stakeholders.

- At national level, meetings were held with:
  - Advocates for Natural Resources and Development (Anarde)
  - African Center for Energy and Mineral Policy (ACEMP)
  - Advocates Coalition on Development and Environment (ACODE)
  - National Association of Women Organisations in Uganda
  - National Association of professional environmentalists (NAPE)
  - Action Aid
  - Advocates Coalition on Development and Environment (ACODE).
- At village/town level, meetings were held with:
  - separate men and women groups in Mutukula, Lukoma, Mbrizi, Sembabule, Serinya, Bugula, Bucuya, Kyenda and Kamusenene
  - cultural leaders at Wajinja Cultural Site
  - Bucuya artisanal and small-scale miners' association
  - Mubende farmers association.

These informal meetings provided opportunities for stakeholders to discuss the project and its potential impacts. Details of stakeholders met are provided in Appendix C1.

7.5.4 Environmental and Social Impact Assessment Pre-Submission Stakeholder Engagement

7.5.4.1 Environmental and Social Impact Assessment Pre-Submission Engagement Objectives

As part of the project's commitment to meaningful engagement with stakeholders in general, and impacted communities in particular, the project stakeholder engagement process includes pre-submission stakeholder engagement before finalisation of the ESIA report. The objective of the ESIA pre-submission stakeholder engagement was to consult with all categories of potentially impacted stakeholders on the draft ESIA findings, specifically, the potential impacts and mitigation measures.

Pre-submission engagement served to:

- inform stakeholders of the preliminary results of the impact assessment and mitigation measures to be applied.
- inform stakeholders of how their concerns had been considered in the draft ESIA.
- receive concerns, comments and recommendations on the impacts and proposed mitigation measures for consideration and incorporation into the final ESIA report for submission to the regulators.

7.5.4.2 ESIA Pre-Submission Engagement Approach

To achieve the pre-submission stakeholder engagement objectives, engagement with key stakeholders was undertaken at:

- *District level*

  Targeting technical and political leaders
- *Subcounty level (including town council)*

  Targeting technical leaders
- *PAC level*

  Where targeted efforts were made to extend invitations to women, elderly, youth and people with disabilities or their representatives to participate in the PAC meetings.

The process used to arrange meetings in the scoping phase was again followed.

Meetings

The pre-submission stakeholder meetings involved project representatives and the ESIA contractor. They were conducted on 6 and 18 June 2018. A total of 355 people participated in 35 meetings. The following meetings were held:

- at district level:
  - nine meetings with district authorities
- at subcounty level
  - 19 meetings with subcounty authorities
- at PAC level
  - 17 community assembly meetings.

Appendix C1 lists stakeholders met during the pre-submission meetings.

Figure 7.5-7 shows the districts, subcounties and villages engaged during the pre-submission meetings.

Figure 7.5-7 Districts, Subcounties and Villages Consulted in the Pre-Submission Meetings

Arranging the Engagement Activities

For meetings with district, subcounty and PACs, the following process was followed:

- Letters requesting a meeting were sent to districts.
- Phone calls were made to local council chairpersons before the village meetings to confirm the meeting dates, times and venues and to request them to mobilise the village residents.

Engagement Protocol

Community meetings followed a similar protocol to the scoping meetings. Posters and BIDs were used and distributed during the meetings. The project was presented with the most up-to-date information, and impacts and mitigation measures were discussed. This was followed by a question and answer session. Appendix C4 presents full records of all formal stakeholder meetings. Stakeholder comments were considered in the ESIA reporting.

Figure 7.5-8 and Figure 7.5-9 show pre-submission stakeholder meetings.

Figure 7.5-8 District Meeting with Hoima District Technical Planning Committee and Political Leaders

Figure 7.5-9 Community Meeting in Kijjaguzo Village, Mubende District

7.6 Stakeholder Engagement Results

This section presents the main concerns and questions raised by stakeholders during the scoping phase, the baseline and impact assessment phase and the pre-submission meetings and indicates where these concerns are addressed in the ESIA.

Appendix C3 includes a more comprehensive list of the stakeholder concerns and project responses disaggregated for the scoping phase, baseline and impact assessment phase and pre-submission meetings and disaggregated per stakeholder engagement group.

Appendix C4 presents full records of all formal stakeholder meetings held in the scoping phase, the baseline and impact assessment phase and the pre-submission meetings. This does not include the stakeholder comments from the KIIs, FGDs, HHIs and SGIs, as these engagements were more informal and are included in the social field data records.

Figure 7.6-1 provides the percentage of comments from stakeholders (all stakeholder groups combined) across the different categories of concern. The figure indicates that during the scoping phase, the majority (38%) of the project concerns are about socio-economic and health matters. This was also the case during the baseline and impact assessment phase, with 43% of concerns related to

socio-economic and health matters. Similarly, during the pre-submission meetings, most concerns were about socio-economic and health matters (70%). Concerns about the ESIA, project information and stakeholder engagement were also prevalent during both the scoping and baseline and impact assessment phases.

Figure 7.6-2 shows the results from the FGDs with women and with community leaders at PAC level during the baseline and impact assessment phase. The data is disaggregated into concerns and aspirations. From the figure, it can be seen that:

- both community leaders and women have high aspirations with regards to community infrastructure (e.g., building of schools and clinics) and employment
- concerns about loss of land and property are important among community leaders
- concerns about health are important for both community leaders and women.
- comments regarding education were raised by community leaders and women, with aspirations consisting of better access to education services and improved standards of teaching for both children and adults. Concerns raised were focussed on school dropouts.
- in both FGDs, concerns and aspirations were voiced with regards to health. The main areas of concern were the spread of disease (both communicable and non-communicable), teenage pregnancies, accidents (mainly traffic related) and poor sanitation. All aspirations with regards to health consist of better health services and access to improved medicines.
- job opportunities were a major aspiration in FGDs with both community leaders and women.

Sections 7.6.1 to 7.6.4 provide additional information on the concerns, comments and aspirations of the stakeholders and the responses of the project.

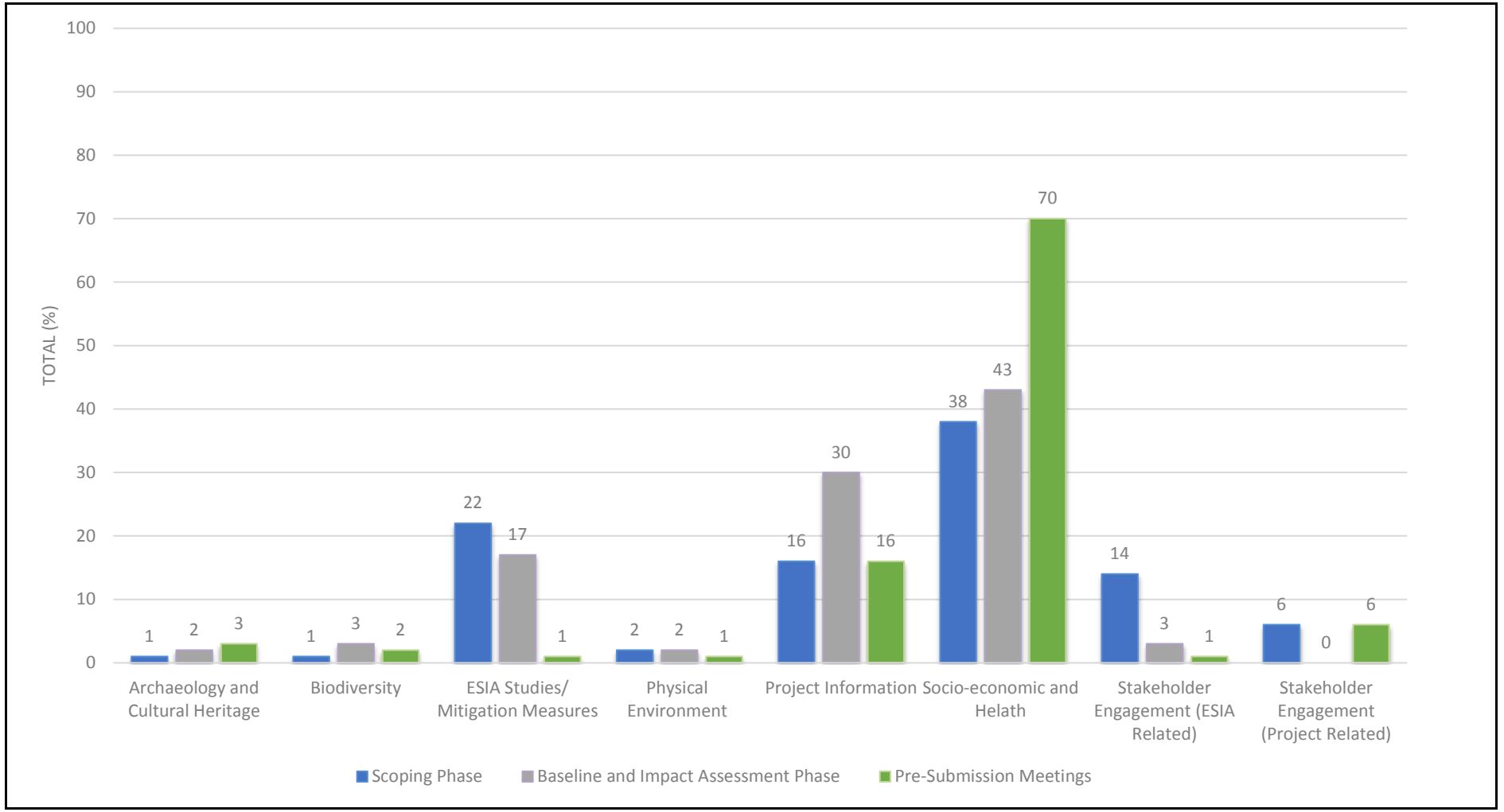


Figure 7.6-1 Grouping of Concerns and Comments by Environmental and Social Impact Assessment Phase

NOTE: The numbers indicate the percentage of concerns raised in that category during the scoping and baseline and impact assessment phases.

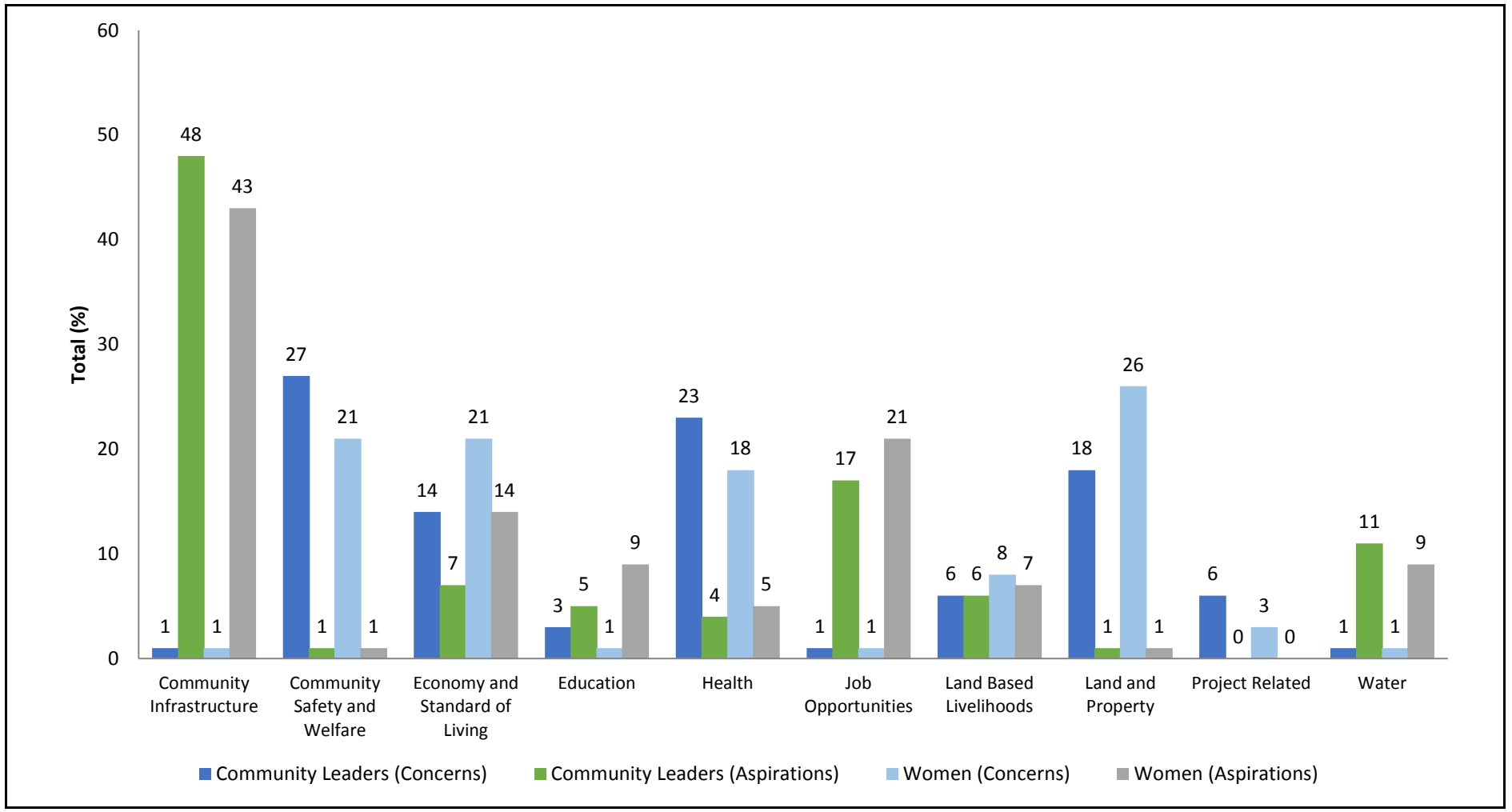


Figure 7.6-2 Grouping of Concerns and Aspirations from Focus Group Discussions during the Baseline and Impact Assessment Phase

7.6.1 Socio-economic and Health

7.6.1.1 Land and Property

Scoping Phase

Concerns Raised

A recurrent concern throughout the engagement for all stakeholder categories was compensation for loss of land, livelihoods and properties.

Stakeholders emphasised the shortage of land in project-affected districts and the difficulty of finding replacement land. Stakeholders indicated that most land for the proposed pipeline route is already under scrutiny of land speculators because of the project, rendering the present occupants of the land more vulnerable. The need to ensure that compensation is provided in a timely manner and project-affected people receive adequate compensation to enable them to rebuild their lives was a constant theme throughout the consultations.

Another key concern was the potential conflict between owners and tenants over project-acquired land. Scoping consultation found that most tenants do not have rental or tenancy agreements with owners, and many owners do not have access to their own title deeds resulting in concerns around security of tenure and rights attached to land use.

The importance of including vulnerable groups, particularly women and children, in all compensation and resettlement-related discussions was emphasised.

Local stakeholders expressed confusion about the project right-of-way (RoW) and sought clarity on whether this would be associated with permanent or temporary land take across the width of the RoW.

Responses Provided

Stakeholders were informed that the project will manage land acquisition by developing a resettlement action plan (RAP) and a livelihood restoration plan (LRP), which will be informed by various socio-economic baseline studies (see Section 6.4.3 and Appendix A9). A resettlement policy strategy has been developed to ensure fair compensation while the livelihood restoration programme will ensure that impacts on livelihoods will be mitigated consistent with national law and international standards (IFC Performance Standard 5, 2012). During the ESIA and land acquisition planning phases, there will be ongoing engagement with project affected stakeholders, including vulnerable groups, to update them on the plans and receive their questions and grievances

Baseline and Impact Assessment Phase

Concerns Raised

As during scoping, all stakeholder categories raised concerns over land acquisition and compensation for loss of land, livelihoods and properties. Clarifications regarding the RoW were sought. The difficulty of identifying replacement land in light of the already existing pressure on land, timing of compensation and

compensation needs for landowners and tenants were also raised. There were also concerns about forced resettlement, choice of host area and livelihood restoration.

Concerns were raised in terms of potential grievances and how these would be handled.

Stakeholders shared negative experiences with regards to resettlement on previous projects. Government projects such as road upgrades have resulted in legacy issues (project-affected people being paid below market rates for land and property, not being paid or being paid after the land or property had been acquired)

Responses Provided

Stakeholder were informed that a resettlement action plan will be developed and agreed with the relevant Ministry. An entitlement framework will be developed to ensure fair compensation while a livelihood restoration plan will be developed to ensure that impacts on livelihoods of tenants and landowners will be mitigated. There will be no forced acquisition of land.

It was further explained that compensation will be provided before construction and appropriate compensation rates will be identified. It was explained that a temporary 30-m RoW would be required during construction and there would be a permanent 10-m RoW for operations.

Pre-Submission Meetings

Concerns Raised

While the presentation at the meeting addressed stakeholder concerns and how these had been addressed and mitigated in the ESIA, stakeholders again raised concerns about the compensation process and emphasised the importance of timely and fair compensation. It was suggested that some affected districts lack approved compensation rates, and that, where rates exist, they are lower than prevailing market prices.

Another concern regarding the handling of vulnerable groups during the compensation process, particularly women and children was raised. The implementation of a mechanism for handling land-related conflicts that may arise due to project activities was recommended.

Clarification was sought on how orphaned land will be handled.

Responses Provided

Stakeholders were advised that concerns related to land acquisition and resettlement will be addressed through the RAP process as described in the ESIA (Section 8.15.1.1 and Appendix L). Stakeholders were further informed that the EACOP project will provide compensation based on rates validated by the chief government valuer and in compliance with national regulations and International Finance Corporation (IFC) performance standards. They were advised that any concerns about district compensation rates will be forwarded to the Ministry of Lands, Housing and Urban Development.

The development of a project grievance redress mechanism (GRM), to ensure that potential land-related conflicts are addressed in a timely manner, was discussed.

Stakeholders were notified that the land acquisition team will determine the handling of orphaned land.

7.6.1.2 In-Migration and Foreign Workforce

Scoping Phase

Concerns Raised

Concerns were raised at the national and regional level meetings on in-migration and influx management in areas close to project construction and operational sites. A common perception was that women and girls could be victimised by construction workers.

Fears regarding construction camps were widespread with the expectation that these may lead to an increase in HIV and AIDS rates, reduce water and electricity availability for the local population, overburden healthcare resources and contribute to family breakdowns.

Responses Provided

Stakeholders were informed that the potential for project-induced in-migration and the associated negative impacts will be addressed in the socio-economic part of the ESIA which includes a health impact assessment and mitigation measures developed.

Baseline and Impact Assessment Phase

Concerns Raised

Stakeholders voiced concerns about in-migration and project-induced in-migration-related impacts, echoing many of the fears expressed during the scoping phase. As for the scoping phase, stakeholders were fearful that women and girls would be lured by construction workers and susceptible to sexual harassment, rape, pregnancy and defilement. Many of the fears were based on experiences with previous projects in the area. Foreign construction workers were perceived to be the main culprits.

Responses Provided

Stakeholders were informed that social management plans (such as camp management and journey management plans) will be put in place to minimise interactions between migrant workers and local communities.

Pre-Submission Meetings

Concerns Raised

On being presented with proposed impacts and mitigations related to in-migration and foreign workforce, stakeholders raised further concerns about PIIM and associated impacts on health facilities and other public services. Questions were asked about potential plans to upgrade the health facilities in PACs to help cope with population increase during the construction period.

Responses Provided

Stakeholders were informed that the impacts and mitigation section of the ESIA (Section 8.18) and a PIIM management plan will be developed to minimise impacts associated with PIIM. The project team will liaise closely with local authorities on issues related to PIIM management. It was explained that the upgrade of health facilities is the responsibility of the Government of Uganda.

7.6.1.3 Community Health and Safety

Scoping Phase

Concerns Raised

All stakeholder categories raised community health and safety concerns. A main concern related to the impact of the heated pipeline on people, animals, soils and crops.

Concerns were raised about road safety. It was indicated that Uganda has one of the highest rates of traffic-related fatalities per vehicle in the world, and a major concern was the effect that increased traffic would have on both people (mainly children) and animals. Stakeholders cited speed as being the main cause of fatalities and were worried about construction vehicles sharing roads with local road users.

Responses Provided

Stakeholders were informed that a community health impact study will be undertaken and a community health management plan developed that will address the concerns raised.

Meeting Note: The pipeline is insulated and will be buried more than 1.5 m underground so there would be no impacts arising from heating the pipeline.

The project will also prepare a traffic impact assessment as part of the ESIA, and a more in-depth traffic impact assessment will be prepared as part of detailed engineering studies that will include location specific mitigation measures.

Baseline and Impact Assessment Phase

Concerns Raised

Stakeholders asked about potential health impacts of the project. Stakeholders at community level were concerned about potential impacts of the project on water quality.

PACs asked about the measures that would be put in place to prevent the spreading of communicable diseases. They were also concerned about the safety of women.

Similar to the scoping phase, stakeholders also asked questions about the heated nature of the pipeline and whether this will impact upon people, animals and crops, among others.

Responses Provided

Stakeholders were advised that water quality will be monitored regularly and alternative community water sources will be provided where access to water sources would be restricted by construction. A camp management plan and journey management plan will minimise interaction between construction workers and communities and health impacts will be monitored. Any criminal offence will be handled according to Ugandan law and a grievance mechanism will be put in place involving community liaison officers and local leaders to address issues such as misconduct of project workers.

Pre-Submission Meetings

Concerns Raised

While stakeholders were presented with project information that showed how impacts related to physical VECs had been addressed in the ESIA, further concerns were raised about the generation of dust during pipeline construction and potential impacts on community health was a key concern among stakeholders. It was suggested that project construction workers should be provided with sanitary facilities to prevent spread of diseases due to unhygienic conditions.

Stakeholders raised questions about security measures to prevent damages to pipeline infrastructure and asked about the risk of pipeline failures causing harm to people, crops and property.

PACs raised concerns about increased crime levels and sought clarification on how the project will deal with this.

Responses Provided

The implementation of a suite of measures within the ESIA impact assessment sections (Sections 8.9 and 8.10) and the pollution prevention plan will minimise impacts such as air and noise pollution. Stakeholders were informed that dust suppression measures will include the use of water to regularly irrigate construction sites.

It was emphasised that project workers will be provided with mobile toilets, in addition to the sanitary facilities that will be established at the camps.

To prevent damages to pipeline infrastructure, an extensive pipeline monitoring and control system will be implemented to detect abnormal situations. Stakeholders were advised that the use of state of the art instrumentation and fibre optic technology along the pipeline route will allow detection of movements along the pipeline. The PPT will liaise closely with security agencies in the country to secure the pipeline corridor of any threats.

Concerns about crime levels were noted and stakeholders were informed that the project will work closely with local leaders and security agencies to ensure safety and security in the PACs.

7.6.1.4 Economy and Standard of Living

Scoping Phase

Concerns Raised

All stakeholder categories were interested in the potential benefits of the project for Uganda as well as for local communities near the project. Local benefits were viewed in terms of employment and training opportunities and the procurement of goods and services. Emphasis was placed on the importance of project compliance with national content requirements to ensure that local skills and labour are used wherever possible. Community stakeholders, however, were concerned that it would be difficult to benefit from employment because of the lack of pipeline and facilities construction and operation skills in the local workforce

Responses Provided

The stakeholder engagement team stated that a national content plan will be developed by the project, compliant with Ugandan requirements, which will include commitments to local procurement, capacity building and employment.

Baseline and Impact Assessment Phase

Concerns Raised

Similar to the scoping phase, stakeholders at community level were concerned about employment opportunities and other benefits, particularly for women and youths.

Responses Provided

Stakeholders were informed that job opportunities will range from casual, unskilled, semi-skilled to skilled. Local people, including the youth and women, will be prioritised for non-skilled jobs.

Besides direct job opportunities, there will be indirect benefits such as road upgrades.

Pre-Submission Meetings

Concerns Raised

Stakeholders were presented with mitigation measures on how impacts related to community and standard of living would be addressed. During the discussions, stakeholders at village level raised showed interest in potential project benefits, particularly in terms of improvement in living standards. Stakeholders asked questions about how local people could benefit from the project, and whether materials such as aggregates will be sourced from the local area.

Stakeholders emphasised that local communities should be prioritised for employment, particularly for non-technical jobs, and for local purchasing of goods and services. Clarification was sought on what training programmes will be put in place to enable local people to gain skills and benefit from the project.

Stakeholders also asked how the rights of the labour force would be protected.

Responses Provided

The development and implementation of a transparent recruitment strategy was emphasised to stakeholders. Stakeholders were informed that the project, as part of the ESIA impacts mitigation process and the procurement and supply chain management plan (ESIA Sections 8.11–8.15), is committed to reinforcing the use of local workers and suppliers. Stakeholders were advised that project benefits will include employment opportunities for skilled and semi-skilled workers, upgrades of some roads, potential growth of small, training programmes and capacity building for local people.

Stakeholders were informed that small businesses and farmers can become part of the supply chain by submitting tenders to supply to the EACOP project. It was explained that aggregates will be sourced from local areas and along the pipeline route during pipeline construction.

Stakeholders were advised that all employment opportunities available during the construction period will be communicated in such a way as to make these employment opportunities available to as many people as possible. The recruitment of workers for non-technical jobs will prioritise local communities.

7.6.2 Physical Environment

Scoping Phase

Concerns Raised

Concerns were raised about potential effects on community water sources. It was feared that the project would need water from community water sources rendering these insufficient to meet local requirements.

There were concerns that the heat from the pipeline would affect the soils and decrease soil fertility or affect crops planted in the 10-m RoW.

Concerns were raised with regards to potential project impacts on air quality and climate change during the construction and operational phases.

Responses Provided

The stakeholder engagement team informed stakeholders that water assessments will be undertaken to ensure that project requirements can be met without affecting local water requirements.

The stakeholder engagement team explained that the engineering team will collaborate with the ESIA team to assess project impacts on air and climate change and identify mitigation measures that may be required; and project engineering team will ensure compliance with applicable emission standards.

Baseline and Impact Assessment Phase

Concerns Raised

No further concerns were raised by stakeholders during the baseline and impact assessment phase.

Pre-Submission Meetings

Concerns Raised

At the district level, stakeholders explained that some PACs depend on unprotected water sources for domestic purposes. They emphasised that the study should consider impacts on unprotected water sources.

Stakeholders also reported that communities are worried about the potentially negative impacts of pipeline activities on soil productivity.

Responses Provided

Stakeholders were advised that the potential impacts on surface water and soil productivity have been assessed and mitigation measures proposed in two sections of the ESIA report. The implementation of a suite of measures within the ESIA impact assessment sections (Section 8.6) and the pollution prevention plan will minimise impacts on surface water sources.

Landscape

Stakeholders were shown illustrations of typical project infrastructure and their responses recorded. The responses suggest that stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape.

7.6.3 Biodiversity

Scoping Phase

Concerns Raised

Stakeholders raised concerns about the impact of the project on Lake Albert fisheries and animal and plant biodiversity in the project area.

Impact on ecosystem habitats during construction of the pipeline was raised mostly in national consultations.

Impacts, particularly during the construction phase, on sensitive ecosystems such as forests, wetlands and wildlife reserve, which are habitats for several animal species was a concern.

Concerns were also raised regarding connectivity to protected areas and potential impacts on endemic species.

Responses Provided

Stakeholders were informed that biodiversity studies and an ecosystem services study will be undertaken to assess project impacts on aquatic and terrestrial animals and plants, the extent to which humans depend on these resources and that mitigation measures will be developed where impacts are identified.

Baseline and Impact Assessment Phase

Concerns Raised

As during the scoping phase, concern was raised about impact on interconnectivity for migratory species.

Responses Provided

Stakeholders were informed that the selection of the pipeline route included consideration to avoid environmental and social sensitivities and that the pipeline will be constructed along existing infrastructure corridors where feasible.

Pre-Submission Meetings

Concerns Raised

Stakeholders where presented with information from the ESIA that showed how potential project. At the district level, stakeholders asked questions about what measures will be put in place to ensure that loss of biomass (especially tree cover) is addressed. Stakeholders explained that their district tree planting project could help to address the issue of loss of biomass.

There was concern among district level stakeholders about potential impacts on forest resources; it was suggested that the EACOP project team should liaise with the district natural resource department to assess the number of trees destroyed so they can be replanted at another location.

Stakeholders emphasised the need for the study team to conduct a biodiversity risk assessment to quantify biodiversity loss and determine how the loss can be compensated.

Stakeholders sought clarification on the size of the construction corridor in ecologically sensitive areas.

Responses Provided

Stakeholders were informed that mitigation measures relating to loss of biodiversity are outlined in the ESIA report (Sections 8.2–8.4). Stakeholders were assured that a biodiversity risk assessment has also been included in the ESIA and a biodiversity management plan developed to address issues related to loss of biomass. It was emphasised that the project aims for no net loss for biodiversity.

Stakeholders were advised that, in ecologically sensitive areas, the project footprint will be reduced to a 20-m corridor to minimise impacts.

7.6.4 Project and Environmental and Social Impact Assessment Related Matters (Including Environmental and Social Impact Assessment Stakeholder Engagement)

Scoping Phase

Concerns Raised

Stakeholders raised questions about the grievance procedure, project community liaison officers (CLOs) and the process for providing feedback after the completion of field surveys and the ESIA. Recommendations were made on communication channels with local communities, new stakeholders to include in the next round of consultations, and the protocol for meetings, particularly about per diem payments for meeting attendance.

Responses Provided

The stakeholder engagement team provided project background information documentation, which includes information on stakeholder communication. They indicated that stakeholder engagement planning for the next phases will be revised to integrate recommendations received.

Baseline and Impact Assessment Phase

Concerns Raised

Questions were asked about the ESIA schedule, the approval process for the scoping report, a definition of the area of influence and the grievance mechanism.

Stakeholders also requested information about project design and pipeline routing. Recommendations were made by stakeholders with regards to disaster preparedness.

Suggestions were made to involve the Chief of Defence, the Office of Prime Minister and the Chamber of Mines. Recommended were also made to run radio programmes to sensitise communities.

Responses Provided

Responses from the stakeholder engagement team included information on the envisaged ESIA submission, the process regarding approval of the scoping report, women participating in the ESIA process and audits to be undertaken on the efficacy of the grievance mechanism. Feedback was also provided on project design such as pipeline routing, pipeline insulation and markers, oil spill contingency and emergency response planning as well as security planning and the grievance mechanism. The recommendations by stakeholders were noted for consideration.

Pre-Submission Meetings

Concerns Raised

Stakeholders raised concerns about the grievance procedure, explaining that vulnerable persons may not have their grievances properly addressed. It was recommended that the grievance procedure should include a procedure of capturing photos of the aggrieved persons, and that the aggrieved party should be provided with an acknowledgement to indicate that a grievance has been recorded.

Stakeholders at the district level asked how local governments can ensure that the proposed mitigation measures are enforced. Clarification was sought on why studies target a wide range of people, rather than only those directly affected by the project.

Stakeholders recommended that GPS coordinates of the pipeline route should be shared with the subcounty authorities so that local leaders can protect local people from land speculation and land grabbers.

Stakeholders asked if unplanned events and cumulative impacts will be addressed in the ESIA.

Responses Provided

Stakeholders were advised that there are various levels of handling grievances within the grievance procedure. It was explained that a database will be developed for

recording grievances, which will include details about the aggrieved person/entity. Stakeholders were informed that the aggrieved party will be provided with an acknowledgement form to indicate that a grievance has been received and recorded.

Stakeholders were informed that district environmental officers are mandated to conduct regular inspections and monitoring to ensure that mitigation measures are implemented. The importance of maintaining a relatively large area, when assessing environmental and social impacts, was discussed with regards to the need to establish an understanding of the baseline conditions.

It was emphasised that the districts, subcounties and villages through which the pipeline will pass have been identified, but that the exact route will only be finalised once studies have been completed (ESIA and G&G). The affected districts will be informed of the exact route during the RAP process and pre-construction surveys.

It was confirmed that unplanned events and cumulative impacts will be addressed in the ESIA.

7.7 Grievance Procedure

In April 2017, the EACOP PPT established a nonjudicial project grievance procedure to ensure any complaint raised by a stakeholder will be registered and handled properly to guarantee its resolution. The grievance procedure is compliant with the United Nations Guiding Principles on Business and Human Rights effectiveness criteria for project level grievance mechanisms.

The grievance procedure describes the process available to stakeholders for lodging a grievance during pre-construction, construction and project operations.

The grievance procedure is readily accessible to all stakeholders at no cost and without retribution. The mechanism does not impede access to judicial or administrative remedies.

The project's grievance procedure has been presented to stakeholders during each consultation phase and is managed by EACOP staff (CLO and grievance administrator).

The grievance management process requires the following steps by EACOP:

- receive
- register
- investigate
- response.

Figure 7.7-1 outlines the grievance procedure.

Stakeholders are provided with several methods of communication to report a grievance to ensure that the grievance mechanism is inclusive and culturally appropriate: verbally, in an e-mail or via post. In any case, a grievance form shall be filled with the help of CLOs and signed by the complainant and his witness.

Any grievance is registered in the grievance database, reviewed and responded to. The grievance administrator will follow up and ensure the different timings for the different steps of resolution are respected.

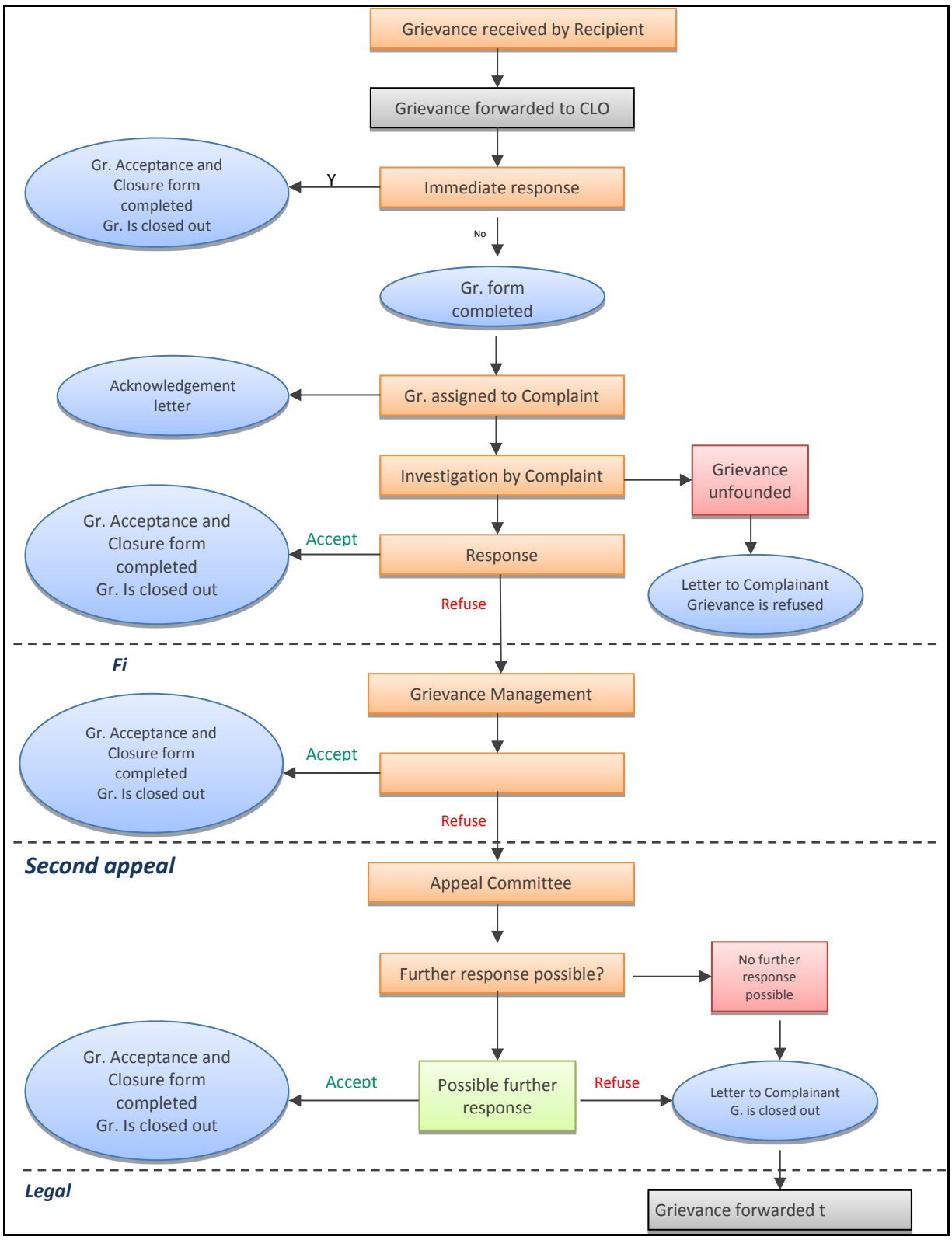


Figure 7.7-1 Project Grievance Procedure

7.8 Government Environmental Impact Statement Disclosure

The developer will submit the environmental impact statement (EIS) to the Executive Director of NEMA in accordance with Regulation 17 of the National Environment EIA Regulations, 1998.

As part of the review process, the Executive Director will transmit the EIS to a lead agency for comments on the EIS within 30 working days.

Within ten days of receiving the comments from the lead agency, the Executive Director will invite the general public to make written comments on the EIS, including comments from persons specifically affected by the project.

Thereafter, the Executive Director will consider the EIS and all the comments received and determine whether a public hearing be held in accordance with Regulation 22 of the Environment Impact Assessment Regulation, 1998 under section 107 of the National Environmental Act Cap 153.

The public hearing will be presided over by a suitably qualified person known as a presiding officer appointed by the lead agency in consultation with the Executive Director. The date and venue of the public hearing will be advertised through the mass media to bring it to the attention of persons most likely to be affected by the project.

Any interested party who has requested to make formal presentations can make presentations following the initial presentation by the developer in accordance with the EIA Public Hearings Guidelines 1999. The developer will also have a chance to respond to the questions raised in the hearing.

On the conclusion of the public hearing, the presiding officer will make a report of the views presented at the public hearing and make factual findings to the lead agency and the Executive Director within thirty days from the day on which the public hearing was concluded.

Thereafter, the Executive Director makes a decision about the project taking into account the whole review process. The Director may:

(a) approve the project or part thereof

(b) require that the project be re-designed including directing that different technology or an alternative site be chosen

(c) refer back the project or part thereof to the developer where there is insufficient information for further study or submission of additional information as may be required to enable the Executive Director to make a decision, or

(d) reject the project.

A decision of the Executive Director under this regulation shall be communicated to the developer within fourteen days of the decision.

7.9 Ongoing Stakeholder Engagement

7.9.1 Post-Environmental and Social Impact Assessment Submission Stakeholder Engagement

The project will conduct ongoing stakeholder engagement after submission of the ESIA report.

The objective of these engagements will be to:

- further discuss the results of the impact assessment, including the cumulative impact assessment and mitigation measures
- discuss how stakeholder concerns have been considered in the ESIA.

To accomplish the objectives, key stakeholders identified in the scoping, baseline and impact assessment phase and pre-submission meetings will be targeted. This will include key national government authorities and NGOs and government stakeholders in all the districts and all the subcounties crossed by the project. Community leaders (women and men) of a sample of PACs will be gathered at subcounty and village level for engagement.

The engagement strategy will also include targeted engagement with identified vulnerable stakeholders (such as pastoralists, fishing communities and communities with a significant presence of landless community members) or their representatives (such as mothers, health workers or school teachers to represent the perspectives of children as appropriate).

Meetings will be arranged as per the agreed protocol during the previous phases. Information materials on the ESIA outcomes in English and local languages where appropriate (such as information brochures, nontechnical summaries of the ESIA, posters and PowerPoint presentations) will be used for the meetings.

As described in some of the cumulative impact assessment parts of Section 8, liaison will be undertaken with the developers of third-party projects where there could be a significant cumulative impact.

The results of these engagements will be documented in a stakeholder engagement report.

Engagement activities will be adjusted to reflect evolving project activities, stakeholder preferences and concerns over the life of the project. The project will also seek to build partnerships with NGOs, CSOs and communities to support the development and implementation of practical impact management strategies ranging from benefit sharing to monitoring.

The grievance procedure will continue to provide opportunities for stakeholders and project-affected communities to express grievances about project activities.

A stakeholder engagement monitoring and evaluation programme will be developed to ensure efficient and effective stakeholder engagement.

7.9.2 Community Engagement

Before the construction phase of the EACOP project begins, local community offices will be established at appropriate locations along the pipeline route to allow stakeholders direct access to CLOs.

Regular meetings with PAC representatives will be held before and when construction is active in their area to:

- communicate construction schedules and activities to those affected
- manage expectations and reduce conflicts
- receive and manage grievances
- define matters of land take, user rights and access
- ensure participation in project implementation, as needed
- communicate on project's health, safety, and security procedures and requirements concerning the communities.

Additional meetings will be held when the need arises (e.g., discontent, conflicts, incidents).

Regular meetings will be held with the district council technical teams, including health management teams to discuss potential health and other issues related to the development of the project and to proactively plan and coordinate the development and implementation of community programmes.

The project will reinforce its engagement with vulnerable groups. The objective is to ensure inclusive engagement reaches all vulnerable groups and to adapt engagement techniques to facilitate that objective, such as through using small group meetings, focus groups, women field team members, providing additional translation and selecting accessible locations for engagement activities.

A community liaison log (meeting minutes) will be maintained detailing the content of all meetings with PACs.

7.9.3 Community Awareness Programmes

Community awareness programmes will be developed and implemented to raise awareness of PACs to matters including but not limited to:

- employment and training opportunities. The project will develop a campaign focused on providing realistic community expectations with regards to livelihood restoration options and employment opportunities. This is to avoid that people make livelihood decisions based on incorrect information.
- risks associated with construction activities and construction camps and measures to protect health, safety and security
- financial literacy
- gender-based violence and alcohol abuse
- road safety awareness
- importance of staying at school (in schools)
- children's rights
- HIV and sexually transmitted diseases (for communities and project drivers).

8 IMPACT IDENTIFICATION AND EVALUATION – NORMAL CONSTRUCTION AND OPERATIONS

8.1 Introduction

8.1.1 Scope

This section describes and assesses the potential changes to the baseline biological, physical, socio-economic and health conditions of each valued environmental and social component (VEC) that are considered likely to be caused by the EACOP project planned activities described in Section 2.1 to 2.5.

The methodology used to identify and evaluate potential project impacts is described in Section 5; specifically, Section 5.5 describes the process used to identify potential impacts and, Section 5.6.2.5 describes the methodology used to determine significance of each potential impact in terms of magnitude, duration, extent and the sensitivity of the VEC. Project effects that were considered likely to result in adverse or beneficial impacts have been evaluated; this process was informed by professional, industry specific experience and the characteristics of the AOI.

Where appropriate, such as for air quality and acoustic environment VECs, PES have been used to inform the evaluation of impacts; PES is fully described in Appendix F in terms of Ugandan, East African and international standards.

This section also addresses potential impacts of minor unplanned events; e.g., spills from refuelling vehicles and leaks from hydraulic hoses. Potential impacts associated with abnormal and unplanned events (e.g., traffic accidents, leaks) during construction and operations are described in Section 9.

This section includes:

- VEC-specific assessments of project and cumulative impacts and mitigations (Section 8.2 to 8.20)
- a summary of ecosystem services impacts (Section 8.21)
- a climate impact assessment (Section 8.22)
- decommissioning of the pipeline (Section 8.23)
- a summary of the key impacts of the associated facilities (Section 8.24).

The methodology for defining project-related impacts, determining their significance before and after mitigation and assessing cumulative impacts is provided in Section 5. The approach used for describing impacts in this section is provided in Section 8.1.2. This section is best reviewed side by side with Section 5.6.2.5 for definitions of duration and extent, and Appendix D for magnitude and sensitivity grading for each VEC.

8.1.2 Approach

The approach to most VEC and other assessments, climate, decommissioning and associated facilities is described in this section including:

- key baseline condition sensitivities and considerations
- potential project impacts
- mitigation measures
- residual impacts and significance summary
- transboundary impacts
- cumulative impacts
- transboundary cumulative impacts
- ecosystem services.

Key Baseline Condition Sensitivities and Considerations

The key baseline conditions sensitivities and considerations section summarises the baseline condition, key sensitive VECs and receptors and ecosystem services provided by the VEC.

Potential Project Impacts

Potential generic and location-specific impacts (see Section 5.5.2.1) on VECs are identified and described by aspect and project phase (construction or operation).

The impact type is identified (see Section 5.5.2.2), as are impacts affecting human rights and ecosystem services provided, where applicable, by the VEC. Impacts associated with a high level of stakeholder concern are also identified.

The impacts are designated either not significant or significant based the methodology described in Section 5.5.2.5. At this stage impact significance is determined before the proposed application of mitigation.

Project aspects are listed in Appendix E1 and the aspects, impacts and significance determination before mitigation are summarised in Appendix E2 for generic impacts and E3 for location-specific impacts.

Mitigation Measures

Impact mitigation methodology is described in Section 5.5.2.4. Mitigation measures to reduce impacts on a VEC are summarised by project phase (construction or operation) and referenced to the relevant management plan that will be developed to manage implementation.

The mitigation measures are listed in Appendix E2 and E3 and the master commitments register (Appendix E4) and are summarised in the ESMP (see Section 10 and Appendix J).

Impact significance is determined again, summarised and described after the proposed mitigation is applied.

Residual Impacts and Significance Summary

This section summarises the residual impacts and includes the residual impact significance scoring presented in tables. The tables summarise the generic impacts table in Appendix E2 and the location-specific impacts in Appendix E3 for the VEC. Associated impacts on ecosystem services are also summarised.

Transboundary Project Impacts

Transboundary project impacts that extend or occur across a national boundary are identified, assessed and described as part of the project's impact assessment process described above.

Cumulative Impacts

This section describes the potential cumulative impacts on VECs from the EACOP project, associated facilities and third-party developments that have been screened-in to the CIA.

The screening of associated facilities and third party developments and identifying where cumulative impacts may occur is described in Section 5.5.2.3. Associated facilities and screened-in third party developments are listed in Section 2.5. A description of the screened-in associated facilities and third party developments, maps and the interactions between EACOP VECs and the screened-in developments are provided in Appendix H, Sections H1, H2 and H3, respectively.

Where a high risk of a cumulative impact between screened-in developments and EACOP is identified in Appendix H3 (Category 1 and 2[1]), the potential impacts on the VEC are summarised and described in the CIA section based on the information available. When information is limited, professional judgement is used to predict the likely impacts of the screened-in development.

The criterion for qualitatively determining cumulative impact significance is either the preferred condition of the VEC, a threshold or the limit of acceptable change as recommended in IFC (2013), see Section 5.5.2.3. Additional mitigation measures are proposed to avoid or reduce significant cumulative impacts, see Section 5.5.2.4.

Transboundary Cumulative Impacts

Cumulative impacts may also be transboundary. Transboundary impacts are identified and assessed as an integral part of the VEC-specific cumulative impact assessments described above.

8.1.2.1 Ecosystem Services

Consideration of ecosystem services is provided on a VEC-specific basis, so are fully integrated into each VEC impact assessment. Section 8.21:

- guides the reader to the sections of the VEC impact assessments that describe impacts on ecosystem services

[1] Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC.

Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.

- includes a high-level assessment of significant ecosystem services dependencies, i.e., where the project is dependent on an ecosystem service and summarises project resource use efficiency measures.

8.1.2.2 Climate

Section 8.22 considers the greenhouse gas (GHG) emissions associated with the project and includes:

- quantification of the project's main direct GHG emissions (direct emissions are those that occur from sources owned or controlled by the project)
- comparison of project emissions against national total emissions and associated reduction commitments, as described in Section 6.4.3.17
- description of the key mitigation measures used to reduce GHG emissions.

The impact of GHGs are placed in context rather than as a determination of significance because:

- No specific impact location or magnitude can be attributed to a particular GHG emission. Climate scientists have developed models that predict macro-scale effects based on particular global emission scenarios, but it is not advised to attempt to allocate impacts to a specific emission.
- GHG emissions are a source of the same cumulative, transboundary impact (climate change) on the same VEC (the global climate).

The section also describes the potential impacts of climate change on the EACOP project and how these have been considered in project design and implementation.

8.1.2.3 Pipeline and AGI Decommissioning

Section 8.23 provides an overview of the impacts and mitigation measures when the pipeline is decommissioned as described in Section 2.4.6.2 and 2.4.6.3.

8.1.2.4 Associated Facilities

Section 8.24 summarises the significant impacts of the upstream AFs.

8.2 Biodiversity: Habitats of Conservation Importance

This section describes potential impacts on habitats of conservation importance during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.2.1 Key Sensitivities and Considerations

The habitats of conservation importance baseline conditions are described in Section 6.3.1, as well as:

- their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the habitats of conservation importance.

The sensitivity ranking of habitats of conservation importance ranges from low to very high.

The key aquatic habitats are the four permanent rivers (Kafu River, Nabakazi River, Katonga River and Kibale River) and their associated wetlands crossed by the pipeline. The permanent rivers and associated wetlands have high sensitivity rankings. All potential impacts on aquatic habitats are considered generic because of the nature of the impacts (in terms of magnitude, duration and extent) and the corresponding mitigation measures are all the same.

The following habitats and vegetation types are of conservation importance, either because of the flora and fauna species they support or the status of the habitat itself and are considered sensitive VECs:

- Guineo–Congolian semi-evergreen forest within and adjacent to Wambabya Forest Reserve (FR) (KP0–11)
- wetland forests: riverine (KP12.3) and swamp forests (KP106.0)
- ponds developed from borrow pits on a disused airstrip at KP289 valleys throughout the southern portion of the area of influence (AOI).

Ecosystem Services

Ecosystem services associated with habitats of conservation importance are listed here and potential impacts to ecosystem services are described in Section 8.2.2.

Provisioning services include:

- collecting wood, including for fuel and charcoal manufacture
- hunting, gathering and foraging for food
- collection of medicinal products
- trapping of wildlife for the live trade market.

Regulating services include:

- climate change amelioration through carbon sequestration
- local climate regulation in terms of micro-climate
- local water and air purification – through waste assimilation, and water and air filtration
- water regulation and erosion control (i.e., water catchment protection) – vegetation helping to maintain higher flows in rivers for longer, reduce flood surges, and reduce erosion of steep slopes and river banks and sedimentation

Cultural services include:

- ethical and biodiversity ‘non-use ‘ values, particularly through maintaining populations of endangered and endemic species and the appreciation of these species
- sense of place and way of life. These locations are likely to provide value to local people who live close to and use the areas in terms of their way of life and special connection with such areas
- ecotourism, particularly in protected areas
- aspects of these locations which may provide spiritual, sacred or religious values, inspiration for culture and design, and cognitive development.

Habitat and species support includes:

- habitat that provide important refuge, feeding, watering, breeding and nursery areas

Other supporting services include:

- habitats and species that provide photosynthesis, seed propagation, pollinating services and water, carbon and nutrient cycling, which are values typically accounted for in other ecosystem services.

8.2.2 Potential Project Impacts

8.2.2.1 Introduction

The assessment of potential impacts from the aboveground installations (AGI) has been included in the description of generic impacts because these facilities are in modified habitats of low sensitivity. The nature of impacts (in terms of magnitude, duration and extent) will be the same for each of these facilities and, therefore, the proposed mitigation measures will also be the same. A similar approach has been taken for the construction facilities.

Where the pipeline traverses agricultural land, this will be converted to natural grassland on completion of construction. This represents a considerable biodiversity enhancement of approximately 225 ha.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operational impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on biodiversity, habitats of conservation importance, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

Potential impacts to ecosystem services have been addressed throughout this section where relevant. Ecosystem services impacts have not been scored in the same way as other impacts, but an indication of the likely significance of the ecosystem service impact has been provided in each case.

8.2.2.2 Construction Phase

Generic Impacts

Soil Compaction

Impact: Impaired re-establishment of vegetation after construction

Soil compaction from inappropriate soil storage and management can restrict the root penetration required for vegetation reinstatement. Soil types that are likely to be more susceptible to compaction (i.e., high silt and clay content) were identified along the right of way (RoW), including at KP0, KP80 and KP260. However, the pre-mitigation impact of soil compaction during construction was found to be not

significant (see Section 8.5.2); as the habitats found at the construction sites are typically easy to reinstate, the potential impact of soil compaction on vegetation re-establishment is also considered not significant.

Soil Erosion

Impact: Loss of topsoil through erosion by wind or water causing impaired reinstatement

Soil storage will be managed based on the best construction practices to ensure soil will not be eroded by wind or water causing diminished topsoil quality and quantity. The loss of topsoil could impair vegetation growth after reinstatement. This impact is considered not significant as, in the unlikely event of erosion, the effects will be limited to the work site and the magnitude will be medium.

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, and degradation of spawning habitat

Soil compaction and erosion can produce indirect impacts through increased run-off and siltation of aquatic habitats. The latter has potential to reduce the structural complexity of habitats (see Walker et al. 2013). Soil erosion may impair re-establishment of vegetation and the recovery of aquatic habitats. It can also have direct impacts on turbidity which can cause smothering and degradation of habitats. This may indirectly impact primary productivity rates and degrade aquatic habitats (e.g., alter biochemistry), including functional habitats such as fish spawning and foraging habitats. As the rivers along the pipeline route generally show high turbidity and the duration would be transient, this impact is considered not significant.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Poor re-colonisation due to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds

Prolonged storage of topsoil (longer than six months) can cause loss of soil fertility, as nutrients may be leached out by rain or anaerobic conditions may be created by a lack of air circulation. Prolonged storage may also cause loss in viability of the seed bank in the stored topsoil. This can lead to poor vegetation re-colonisation during reinstatement. As soil storage is likely to be for a short duration, this impact is considered not significant.

Impeded Flow of River or Channel and Abstraction of Water

Impact: Loss of aquatic and water-margin habitats or barrier effects

Impeded river flow (including reduced flow owing to river water abstraction) reduces flow volumes, which can lead to direct habitat loss in aquatic and marginal habitats. It can also lead to indirect loss by reducing access to habitats through creation of barriers within the river channel (e.g., insufficient depths to allow fish passage). Reduced water volumes and velocities could also indirectly affect the biochemical conditions of a habitat (e.g., reducing dissolved oxygen levels owing to higher ambient water temperatures) which could have sublethal and lethal impacts on species. In some instances, the habitat structure may be modified rather than the aquatic or marginal habitats being lost altogether. As water levels within these rivers tend to fluctuate between seasons, this impact is considered not significant.

Loss of Habitat

Impact: Permanent loss of habitat from (AGIs and operational RoW)

The need to clear vegetation for the construction of AGIs will cause permanent direct habitat loss. Table 8.2-1 summarises the habitat loss at each AGI and the type of habitat affected. These facilities are not within protected areas or other areas highlighted through baseline studies as habitats of conservation importance and the habitat loss will be limited in extent. The impact is therefore considered not significant.

There will also be some permanent habitat loss along the RoW where woodland and forest habitats will be removed and not reinstated due to the requirement to have no deep-rooted species over the pipeline. As indicated in Table 8.2-1, this mostly affects modified habitats and this direct impact is considered not significant.

This habitat loss has indirect impacts on the species supported by the habitats as described in Section 8.3.

Table 8.2-1 Permanent Habitat Loss (Aboveground Installations and Operational Right-of-Way[2]) (ha)

	PS1	PS2	Operational RoW	Total	% of AOI[3]
Natural[4]	9.6	2.5	47.1	59.2	0.50
Forest	-	-	0.1	0.1	0.09
Woodland	-	-	3.2	3.2	0.51
Bushland	-	0.2	13.8	14.0	0.42
Wetland Forest	-	-	1.2	1.2	0.41
Wooded Grassland	9.6	2.3	28.8	40.8	0.55
Modified	2.1	10.1	236.7	248.9	0.66
Cultivation	2.1	10.1	224.7	236.9	0.70
Plantation	-	-	10.5	10.5	0.35
Settlement	-	-	0.02	0.02	0.01
Shrubland	-	-	1.5	1.5	0.48
Total	11.7	12.6	283.8	308.1	0.63

Impact: Temporary loss of habitat from construction activities (RoW and other temporary worksites, main camp and pipe yards (MCPYs))

[2] The Operational RoW is a 10-m exclusion zone centred on the pipeline centreline where no deep-rooted species will be allowed to grow, to ensure the integrity of the pipeline

[3] Percentage of each habitat type found within the AOI

[4] The classification of habitat types is described in Appendix A1 Table A1.3 2 Physiognomic Habitat Classes in the Study Area

Most of the construction causing temporary habitat loss is within modified habitat. Any habitat loss in areas of high bioquality[5] is described in the location-specific impacts section. The temporary loss of vegetation along the RoW will cause a short-term direct impact on habitats (permanent loss of deep rooted species is described under permanent loss of habitat). Agricultural areas will be reinstated as grassland and all other habitats will be returned to their original condition. As these impacts are temporary and affect mostly modified habitat (592.2 ha of modified compared to 157.7 ha of natural habitat), this impact is considered not significant.

Table 8.2-2 summarises the type and extent of temporary habitat loss for the RoW and the construction facilities.

Table 8.2-2 Temporary Habitat Loss (Right-of-Way and Construction Facilities) (ha)

	MCPY1	MCPY2	MCPY3	MCPY4	PS1	PS2	ROW	Total	% of AOI[6]
Natural	0.3	0.0	2.2	0.0	1.9	0.9	152.4	157.7	1.11
Forest	-	-	-	-	-	-	0.2	0.2	0.19
Woodland	0.0	-	-	-	-	-	7.5	7.5	1.19
Bushland	-	-	0.6	-	-	-	32.2	32.8	0.99
Wetland	0.0	0.0	0.0	0.0	0.0	0.0	42.4	42.4	1.72
Wetland forest	-	-	-	-	-	-	4.2	4.2	1.45
Wooded grassland	0.3	-	1.5	-	1.9	0.9	65.9	70.5	0.95
Modified	17.2	0.0	15.3	3.6	0.5	1.4	554.3	592.2	1.58
Cultivation	17.2	0.0	11.9	3.6	0.5	1.4	525.7	560.3	1.65
Plantation	-	-	-	-	-	-	24.2	24.2	0.80
Settlement	-	-	-	-	-	-	0.1	0.1	0.07
Shrubland	-	-	3.3	-	-	-	4.3	7.6	2.43
Total	17.5	0.0	17.4	3.6	2.3	2.3	706.7	749.9	1.45

Impact: Modified habitat structure following reinstatement after construction

Habitats may not fully establish or return to their pre-project condition following reinstatement and some may take longer than others to establish, for example grassland will be quicker than forest. This may cause a different habitat structure which may, in turn, affect the species using the habitat. As most of the habitats to be reinstated are modified and widespread, this direct impact is considered not significant.

Habitats of high bioquality (such as riparian forest) which are highly unlikely to regenerate naturally, are described in the location-specific section.

[5] Bioquality is defined as an aspect of a plant community's conservation value, derived from the concentration of restricted-range species occurring in the community - see Baseline Section 6.3.1

[6] Percentage of each habitat type found within the AOI

Impact: Loss of wetland and riparian habitat through open cut crossing during construction of the RoW

Open-cut crossing of rivers and wetlands during the pipeline construction will cause a direct loss of wetland and riparian habitat. Although this direct impact could affect habitat and species of very high sensitivity, and is of large magnitude, it is temporary and as such is considered not significant.

Impacts from Introduction of Alien Invasive Species or Plant and Animal Diseases

Impact: Poor re-colonisation by local flora through flora through competition by alien invasive species (AIS) following reinstatement

The introduction of competitive species or plant and animal diseases, including AIS, can modify the physical structure of aquatic and terrestrial habitats (e.g., changing flow patterns and choking channels in the case of some plant species). The accidental introduction of non-native species has the potential to hamper habitat reinstatement as these non-native species tend to be vigorous in growth and out-compete native species for resources.

Some diseases or animal species can also target and ultimately remove structural and functional habitat features (e.g., submerged tree roots and aquatic and riparian plants).

As the magnitude of this potential impact is large and, once established, it is very difficult to eradicate non-native species; this is a potentially significant indirect impact.

Impacts from Disturbance or Harm to Wildlife

Impact: Increased interaction between construction workers and habitats of conservation importance, especially relating to food and fuel

Construction workers living at the camps have the potential to use natural resources from adjacent habitats for fuel and food, causing local deforestation. This potential impact is not considered significant because meals will be provided and the camps will be closed.

Impact: PIIM to areas around camps causing increased pressure on natural resources (farming and deforestation for fuel)

Construction camps will be a source of revenue and may encourage people to move to the area and set up temporary accommodation on land around the camps. These people may clear land for cultivation and food which will cause very long duration impacts of local extent and on habitats of moderate sensitivity, causing not significant impacts.

Ecosystem Services

The following generic aspects may have impacts on ecosystem services that the habitats support:

- impeded flow of river or channel
- abstraction of water
- habitat loss.

Impacts from these aspects will have indirect effects on the ecosystem services that the habitats support.

Impacts from impeded flow of river or channel and abstraction of water could cause the loss of aquatic and water-margin habitats that have the potential to affect the following ecosystem services:

- provisioning services, including hunting, gathering and foraging food and collection of medicinal products
- cultural services, such as ethical and biodiversity 'non-use ' values and a sense of place and way of life.

Impacts from impeded flow and abstraction are considered to be not significant and therefore the indirect impacts on ecosystem services are similarly likely to be not significant.

Impacts from habitat loss are wide ranging as the habitat types are varied and multi-functional. Loss of habitat, whether permanent or temporary, will affect the following ecosystem services:

- provisioning services, including wood and wood fuel; hunting, gathering and foraging food; collection of medicinal products; and trapping of wildlife for the live trade market
- regulating services, including carbon sequestration, local climate regulation, local water and air purification, water regulation and erosion control
- cultural services, including ethical and biodiversity 'non-use' values; sense of place and way of life; ecotourism; spiritual, sacred or religious values; inspiration for culture and design; and cognitive development
- habitat and species support, including the habitats which provide important refuge, feeding, watering, breeding and nursery areas.

Impacts from habitat loss are considered not significant as most habitats affected are modified and the impacts are localised, therefore associated impacts on ecosystem services are also likely to be not significant.

Location-Specific Impacts

Location: Guineo–Congolian Semi-Evergreen Forest (KP0–11)

Loss of Habitat

Impact: Loss of the natural habitat, Guineo–Congolian semi-evergreen forest

Guineo–Congolian semi-evergreen forest is a natural habitat and is of conservation importance. Guineo–Congolian semi-evergreen forest has a very high sensitivity to change. Construction of the pipeline will cause the loss of 0.24 ha of fragments of this habitat type adjacent to the Wambabya FR between KP0 and 11. Habitat mapping from aerial photography has estimated approximately 105 ha of this type of forest in the AOI, of which only 26 ha was mapped outside the Wambabya FR, predominantly distributed in discontinuous patches along tributaries and drainage lines of the Wambabya River. Although the loss of 0.24 ha of this habitat type is a small proportion of the overall resource, it may decrease connectivity between the remaining patches and increases the overall area of exposed patch to edge effects. These fragments are unlikely to regenerate passively once construction activities

are complete. This direct impact is of small magnitude and local extent, and is therefore considered not significant.

Location: Wetland Forests (Riverine and Swamp Forests) Throughout the Extent of the Pipeline Route

Loss of Habitat

Impact: Loss of wetland forests (swamp and riverine forest)

Construction of the pipeline will cause the loss of 5.04 ha of wetland forests within the RoW and additional temporary working areas. Swamp and riverine forests has a very high sensitivity to change. These habitat types are unlikely to regenerate passively once construction activities are complete. Table 8.2-3 provides a summary of where these wetland forest areas have been identified.

Table 8.2-3 Permanent Wetland Forest Loss

Approximate Location of Wetland Forest (KP)	Loss of Wetland Forest Operational RoW (ha)	Name of Adjoining Rivers
6	0.04	Unnamed tributary of Wambabya River
13	0.17	Unnamed tributary of Wambabya River
15	0.13	Upper Wambabya River
19–21	0.33	Unnamed tributary of Wambabya River
25	0.22	Unnamed tributary of Kafu River
32–33	0.62	Kanywabarogo River (tributary of Kafu River)
36	1.48	Kafu River
38	0.15	Lwebikere River (tributary of Kafu River)
55	0.12	Mabengere River (tributary of Kafu River)
65	0.24	Unnamed tributary of Kafu River
72	0.24	Unnamed tributary of Kafu River
79	0.12	Unnamed tributary of Lugolima River
88.5	0.57	Unnamed tributary of Lugolima River
98.4	0.20	Unnamed tributary of Nabakazi River
105.1	0.41	Nabakazi River
Total	5.04	

There is 290 ha of this habitat type within the AOI and therefore the loss of 5ha is only a small proportion of the total resource. However, the removal of this habitat type will increase the fragmentation of this habitat type. Although this direct impact could affect natural habitat of very high sensitivity, the small magnitude and site extent means that the impact is not significant.

Location: Taala Forest Reserve (KP78.3–82.5)

Loss of Habitat

Impact: Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR

The pipeline traverses the Taala FR and is adjacent to a village. Existing land use within the reserve is primarily agricultural, with some eucalyptus plantations to the north. Isolated patches of natural habitat remain in wet valleys. As indicated in Table 8.2-4, construction of the pipeline will cause the permanent loss of 4.2 ha from the 10-m wide operational corridor in Taala FR, of which 3.1 ha is extensively modified, the remainder being bushland and wetland supporting both being of low bioquality. This equates to a loss of 0.6% of natural habitat in Taala Forest, which is a small magnitude, local extent but very long duration. This direct impact is considered not significant.

Table 8.2-4 Permanent Habitat Loss in Taala Forest

	Operational RoW (ha)	**Habitat Type in the Protected Area in the AOI[7] (%)**
Natural	**1.1**	**1.3**
Bushland	0.8	1.0
Wetland	0.3	0.3
Wetland Forest	–	–
Modified	**3.1**	**3.2**
Bare	–	–
Cultivation	9.7	2.2
Pasture	0.2	0.4
Plantation	0.7	0.6
Total	**4.2**	**4.5**

Impact: Temporary loss of habitat within Taala FR during pipeline construction

Table 8.2-5 summarises the temporary loss of habitat in Taala FR from the pipeline construction (for the 20 m of the RoW width outside the operational corridor and over which deep-rooted species are permitted to grow). As the proportion of natural habitat (bushland and wetland) to be removed is small compared to the overall resource in the AOI within the FR, the magnitude is small, and all the habitats will be reinstated, the duration is moderate, extent local and impacts are considered not significant.

[7] The protected area extends beyond the AOI so the figures represent the habitat in the AOI, not the whole protected area.

Table 8.2-5 Temporary Habitat Loss in Taala FR

	RoW (Including Additional Workspace[8]) (ha)	Habitat Type in Protected Area in AOI (%)
Natural	**3**	**1.7**
Bushland	2.0	2.4
Wetland	1.0	1.1
Wetland Forest	–	–
Modified	**0.5**	**0.8**
Bare	–	–
Pasture	0.5	0.8
Total	**3.5**	**2.5**

Ecosystem Services

The following location-specific impacts may have an impact on ecosystem services:

- permanent and temporary loss of habitat within Taala FR during pipeline construction (not significant)
- temporary loss of Guineo–Congolian semi-evergreen forest (not significant)
- permanent and temporary loss of wetland forests (not significant).

These impacts have the potential to cause impacts on the following ecosystem services:

- provisioning services, including wood and wood fuel, hunting, gathering and foraging food, collection of medicinal products, and trapping of wildlife for the live trade market
- regulating services, including carbon sequestration, carbon sinks, microclimate regulation, local water and air purification, water regulation, erosion control and regulation of ambient noise levels
- cultural services, including ethical and biodiversity 'non-use' values; sense of place and way of life; ecotourism; spiritual, sacred or religious values; inspiration for culture and design; and cognitive development
- habitat and species support, including the habitats which provide important refuge, feeding, watering, breeding and nursery areas for many animals that spend only part of their life in such areas.

However, the location-specific impacts from habitat loss are considered not significant and therefore, associated impacts on ecosystem services are also considered likely to be not significant.

[8] The standard RoW is 30 m wide but in some areas such as steep side slopes or road, rail and river crossings, additional workspace may be required to safely construct the pipeline.

8.2.2.3 Operation

Generic Impacts

There are no generic impacts on habitats of conservation importance.

Location-Specific Impacts

There are no location-specific impacts on habitats of conservation importance.

Ecosystem Services

There are no potential impacts on ecosystem services during the operation phase as impacts during this phase are limited to minor maintenance activities which will only affect small areas for very short periods of time.

8.2.3 Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect biodiversity impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section and the associated management plan and other measures that are included in Appendix E4 have been collectively used to assess residual impacts, and to determine their significance.

8.2.3.1 Design

Generic Mitigation Measures

Soil Erosion and Compaction

Geological and geophysical surveys were undertaken to evaluate soil conditions and to assess potential geohazards (e.g., faulting) on the pipeline route. Geotechnical surveys established the physical properties of subsurface soils. These surveys require drilling of boreholes to sample and test the subsurface.

Good soil management practices that reduce the potential for erosion and compaction have been built into the project description and are covered in Section 8.5.3.

Crossing of perennial wetlands (those with standing water or saturated soil for most of the year) will be undertaken using open-cut methods with a wider trench to reduce erosion. Seasonal wetlands (those with no standing water or saturated soil for part of the year) will also be open-cut, but with a narrower trench since the potential for erosion is not as great.

Impeded Flow of River or Channel and Abstraction of Water

A study to identify and evaluate potential water sources to support construction, commissioning and operations was undertaken to identify potential water sources with enough supply to meet project requirements without adversely affecting other water users and biodiversity.

Loss of Habitat

Route selection has been an iterative process of refinement based on a set of technical, environmental and social criteria. These criteria were applied with a view to delivering the final proposed route, worksite and facilities' locations that strike the optimum balance between socio-economic, environmental and technical factors. Environmental factors used in the selection process included potential impacts on rivers and wetlands, forests, and sensitive and protected areas.

Construction methods were considered at the design stage to reduce impacts on a variety of VECs. Where the pipeline crosses watercourses, special construction methods will be employed to reduce the effects on biodiversity. Where required, method statements will be drafted for river crossings. At many locations the watercourse is likely to be low or dry while at others there will be a wet open-cut crossing.

Introduction of Alien Invasive Species or Plant and Animal Diseases

The project description describes the reinstatement methods that will be used, including reinstating natural vegetation that occurs in non-agricultural areas from the soil seedbank to avoid introducing invasive species.

Disturbance or Harm to Wildlife

There are no specific design phase mitigation measures to address impacts of workers within construction camps and potential PIIM.

Location-Specific Mitigation Measures

Location: Guineo–Congolian Semi-Evergreen Forest (KP0–11)

Loss of Habitat

Impact: Temporary loss of Guineo–Congolian semi-evergreen forest

Route selection helped to reduce the impacts on the loss of Guineo–Congolian semi-evergreen forest within the Wambabya FR through avoidance of the protected area. There are no design-phase mitigation measures to reduce impacts on the loss of Guineo–Congolian semi-evergreen forests outside the reserve.

Location: Wetland Forests (Riverine Forest and Swamp Forests) Across the Extent of the Pipeline

Loss of Habitat

Impact: Temporary loss of wetland forests (swamp and riverine forests)

Route selection helped to reduce the impacts on habitat loss in protected areas through avoidance. The pipeline RoW mainly crosses already modified habitat.

Location: Taala FR (KP78–82.5)

Loss of Habitat

Impact: Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR

and

Impact: Temporary loss of habitat within Taala FR during pipeline construction

Route selection helped to reduce the impacts on habitat loss in protected areas through avoidance. The pipeline RoW mainly crosses already modified habitat.

8.2.3.2 Construction

Generic Mitigation Measures

Soil Compaction

Impact: Impaired re-establishment of vegetation after construction

The soil management plan, reinstatement plan and the community health, safety and security plan will include measures that contribute to the control of impacts from soil erosion and compaction.

During construction, local communities will be discouraged from using the RoW as an access track. Ground protection such as bogmats and geotextile fabric will be used to support heavy loads where ground is soft. Stockpiled topsoil will be monitored for compaction and corrective action implemented if required. The reinstatement plan will include ways to achieve an increasing trend in vegetation regrowth and diversity of desired species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact will be reduced from small to negligible.

Soil Erosion

Impact: Loss of topsoil through erosion by wind or water causing impaired reinstatement

The soil management plan and reinstatement plan will include procedures to reduce and control erosion.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large too small.

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat

The soil management plan and reinstatement plan will include measures to manage erosion and reduce siltation above background levels. Locations for discharging excavated pipeline trench water will be identified in the pollution prevention plan. Appropriate sediment control measures consistent with recognised industry best practices will be implemented.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Poor re-colonisation due to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds

The soil management plan will include measures for managing topsoil that will contribute to maintaining adequate soil condition.

Topsoil stacks will be monitored for compaction and corrective action implemented if required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impeded Flow of River or Channel and Abstraction of Water

Impact: Loss of aquatic and water-margin habitats or barrier effects

The soil management plan, reinstatement plan and natural resource management plan will include mitigation that will contribute to the management of impeded flow and water abstraction from surface waters.

Riverbed and bank material will be stored separately and away from active water channels during river crossings and, where conditions require, river crossing method statements will be developed. Water flow at surface water abstraction points will be monitored and corrective measures implemented if required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Loss of Habitat

Impact: Permanent loss of habitat from AGIs and operational RoW

The biodiversity management plan will include measures that will contribute to the control of impacts associated with loss of habitat.

A vegetation removal method statement will be implemented to control activities such as tree felling and ensure vegetation outside the RoW is not impacted. Where habitats of conservation have been identified, pre-construction surveys will inform location-specific biodiversity management plans that will consider micro routing to avoid impacts or conservation measures to achieve no net loss to biodiversity. A schedule for all the surveys will be developed in the early stages of construction planning to allow surveys to be undertaken at an appropriate time.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: Temporary loss of habitat from construction activities (RoW and other temporary worksites, main camps and pipe yards (MCPYs).

The biodiversity management plan will include measures that collectively manage habitat loss.

A vegetation removal method statement will be developed to control activities such as tree felling and ensure vegetation with the RoW is not affected. Where required pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large to medium.

Impact: Modified habitat structure following reinstatement after construction

The biodiversity management plan will include measures that manage modification of habitat.

Location-specific biodiversity management plans will be developed and implemented where applicable allowing for progressive, active habitat restoration (including seeding with seed collected from similar habitats, propagation of seedlings off-site for supplementary planting if required). Ways will be explored to achieve an increasing trend in vegetation regrowth and diversity of desired species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small while duration remains medium and extent remains local.

Impact: Loss of wetland and riparian habitat through open cut crossing during construction

The biodiversity management plan will include measures that manage loss of wetland and riparian habitat.

River crossing method statements will be developed that will set out measures to address impacts including construction during the dry period, pump-arounds to keep water flow and protection of riparian vegetation.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large to medium.

Introduction of Alien Invasive Species (AIS) or Plant and Animal Diseases

Impact: Poor re-colonisation by local flora through competition by AIS following reinstatement

The biodiversity management plan will include measures that manage poor recolonisation of local flora.

Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive such as wheel washing.

The application of the described mitigation will reduce the magnitude of impact from medium to small and hence the residual impact will be not significant; the duration remains very long term.

Disturbance or Harm to Wildlife

Impact: Increased interaction between construction workers and habitats of conservation importance, especially relating to food and fuel

The biodiversity management plan, project induced in-migration plan, community health, safety and security plan and the occupational health, safety and security plan will include measures that collectively manage interaction between workers and habitats.

Construction camps will be designated as having “closed” status and food and fuel will be provided to prevent interactions between the workforce and surrounding habitats reducing the likelihood of fuel and food gathering activities.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: PIIM to areas around camps causing increased pressure on natural resources (farming, deforestation for fuel)

The project will develop and implement a project induced in-migration plan that will aim to reduce the number of people that arrive into potentially affected communities.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location-Specific Mitigation Measures

Location: Guineo–Congolian Semi-Evergreen Forest (KP0 to 11)

Loss of Habitat

Impact: Temporary loss of the natural habitat, Guineo–Congolian semi-evergreen forest

In addition to the generic mitigation addressing habitat loss described in Section 8.2.3.2, the biodiversity management plan and reinstatement plan will include the following measures that will manage the temporary loss of Guineo-Congolian semi-evergreen forest.

The project will complete pre-construction biodiversity surveys that will inform site specific biodiversity management plans to reduce impacts on biodiversity during construction (exploring options to avoid, reduce, mitigate or compensate for loss). Pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored as well as possible enhancements to achieve no net loss of biodiversity.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the duration of the residual impact is reduced from long term to medium term.

Location: Wetland Forests (Riverine and Swamp Forests) along the Entire Pipeline Route

Loss of Habitat

Impact: Permanent loss of wetland forests (swamp and riverine forest)

In addition to the generic mitigation addressing habitat loss described in Section 8.2.3.2, the biodiversity management plan and reinstatement plan will include the following measures that will manage the permanent loss of wetland forest.

The project will complete pre-construction biodiversity surveys that will inform site specific biodiversity management plans to reduce impacts on biodiversity during construction (exploring options to avoid, reduce, mitigate or compensate for loss). Pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored as well as possible enhancements to achieve no net loss of biodiversity.

River crossing method statements will be developed that will set out options to protect the integrity of riparian vegetation where possible in additional to the most suitable approach for the removal and reinternment of riparian vegetation.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

Location: Taala Forest Reserve (KP78.3–82.5)

Loss of Habitat

Impact: Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR

Impact: Temporary loss of habitat within Taala FR during pipeline construction

In addition to the generic mitigation addressing habitat loss described in Section 8.2.3.2, the biodiversity management plan and reinstatement plan will include the following measures that will manage the permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR.

Where a section of the ROW is through habitats with high biodiversity value, the area will be reviewed to determine if the working width can be reduced to limit impacts as much as possible.

The project will complete pre-construction biodiversity surveys that will inform site specific biodiversity management plans to reduce impacts on biodiversity during construction (exploring options to avoid, reduce, mitigate or compensate for loss). Pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored as well as possible enhancements to achieve no net loss of biodiversity.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

Ecosystem Services

Mitigation described to control location-specific impacts on habitats of conservation importance will control impacts to ecosystem services where applicable.

8.2.3.3 Operations

There are no location-specific impacts on habitats of conservation importance during the operation phase and hence no mitigation measures are required

8.2.4 Residual Impacts and Significance Summary

This section summarises the potential residual impacts on biodiversity after mitigation has been implemented, following the order in Table 8.2-6 and focusing on those impacts that are considered significant.

8.2.4.1 Generic and Location-Specific Impacts

Table 8.2-6 summarises the potential generic biodiversity impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.2-7 summarises the location-specific impacts.

Considering the generic and location-specific mitigation described there are no residual impacts on habitats of conservation importance.

Table 8.2-6 Habitats of Conservation Importance – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Soil compaction	Impaired re-establishment of vegetation after construction	C	–	Soil Management Plan Reinstatement Plan Community Health, Safety and Security Plan	2	2	1	3	8
Soil erosion	Loss of topsoil through erosion by wind or water causing impaired reinstatement	C	–	Soil Management Plan Reinstatement Plan	4	3	1	4	12
	Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	C	–	Soil Management Plan Reinstatement Plan	4	2	2	3	11
Loss of soil structure, fertility and seed bank	Poor re-colonisation owing to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds	C	–	Soil Management Plan	4	2	1	3	10
Impeded flow of river or channel	Loss of aquatic and water-margin habitats or barrier effects	C	–	Natural Resource Management Plan	4	2	4	3	13
Loss of habitat	Permanent loss of habitat from AGIs and operational RoW	C	–	Biodiversity Management Plan	4	5	2	3	14
	Temporary loss of habitat from construction activities (RoW and other temporary worksites main camps and pipe yards)	C	–	Biodiversity Management Plan	6	3	2	4	15
	Modified habitat structure following habitat reinstatement after construction	C	–	Biodiversity Management Plan	4	3	2	4	13
	Loss of wetland and riparian habitat through open-cut crossing during construction of the RoW	C	–	Biodiversity Management Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.2-6 Habitats of Conservation Importance – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Introduction of competitive species or plant/animal diseases	Poor re-colonisation by local flora through competition by non-natives following reinstatement	C and O	–	Biodiversity Management Plan	4	5	2	5	16
Disturbance or harm to wildlife	Interaction between humans at camps and habitats conservation importance, especially relating to food and fuel	C	–	Biodiversity Management Plan Project Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan	4	2	3	5	14
	PIIM to areas around camps causing increased pressure on natural resources (farming, deforestation for fuel)	C	–	Project Induced In-Migration Management Plan	4	5	2	3	14

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.2-7 Habitats of Conservation Importance – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP0–11 Guineo–Congolian semi-evergreen forest	Loss of habitat	Loss of, Guineo–Congolian semi-evergreen forest	C	–	Biodiversity Management Plan Reinstatement Plan	2	5	1	5	13
Wetland forests (riverine forest and swamp forests) throughout the extent of the pipeline route	Loss of habitat	Loss of wetland forest (swamp and riverine forest)	C	–	Biodiversity Management Plan Reinstatement Plan	2	5	1	5	13
KP78–82 Taala FR	Loss of habitat	Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR	C	–	Biodiversity Management Plan Reinstatement Plan	2	5	1	4	12
KP78–82 Taala FR	Loss of habitat	Temporary loss of habitat from Taala FR	C	–	Biodiversity Management Plan Reinstatement Plan	2	3	1	4	10

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.2.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.2.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the habitats of conservation importance VEC is negligible and no further mitigation measures other than those described in Section 8.2.3 are considered necessary.

8.2.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts affecting habitats of conservation importance.

8.3 Biodiversity: Flora and Fauna Species of Conservation Importance

This section describes potential impacts on biodiversity during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.3.1 Key Sensitivities and Considerations

The flora and fauna species of conservation importance baseline is described in Section 6.3.1, as well as:

- their sensitivity ranking based on the relevant tables in Appendix D
- key considerations.

The sensitivity ranking of flora and fauna VECs ranges from low to very high.

Key considerations include the presence of 11 species of vascular plants of conservation importance. These species are important because they are listed as globally or nationally rare, threatened, endemic or range-restricted. The majority of these species were recorded in wetland forests (swamp and riverine forests), degraded swamps and Guineo–Congolian semi-evergreen forest (see Section 8.2).

Leplaea cedrata is International Union for Conservation of Nature (IUCN) vulnerable. This species has undergone major declines in distribution and abundance across its range in tropical Africa owing to habitat loss, degradation and fragmentation, and unsustainable harvesting.

The following species are of conservation importance in accordance with the National Red List for Uganda (WCS 2016) and were only recorded in Wambabya FR during the baseline botanical surveys:

- *Leplaea cedrata* – Uganda endangered
- Chrysophyllum perpulchrum – Uganda vulnerable
- Chrysophyllum albidum – Uganda vulnerable
- Citropsis articulate – Uganda vulnerable
- *Mondia whitei* – Uganda vulnerable.

The range-restricted or endemic species, *Leptonychia mildbraedii* and *Rytigynia beniensi,* have a highly localised distribution. These species are particularly vulnerable to the impacts of habitat loss, degradation and fragmentation. *Leptonychia mildbraedii* was recorded in riverine forest of low bioquality at a tributary of the Wambabya River (KP12.3) approximately 970 m from the pipeline centre-line and therefore will not be directly impacted by the project.

Fauna species of conservation importance include (where these species were identified is included in the baseline reports in Appendix A4):

- sitatunga (*Tragelaphus spekii*) – IUCN vulnerable, Uganda vulnerable
- Bohor reedbuck (*Redunca redunca*) – IUCN least concern, Uganda endangered
- Temminck's ground pangolin (*Smutsia temminckii*) – IUCN vulnerable, Uganda vulnerable
- tree pangolin (*Phataginus tricuspis*) – IUCN vulnerable, Uganda vulnerable
- long-tailed pangolin (*Phataginus tetradactyla*) – IUCN vulnerable, Uganda endangered
- African golden cat (*Caracal aurata*) – IUCN vulnerable, Uganda endangered
- African clawless otter (*Aonyx capensis*) – IUCN near threatened, Uganda vulnerable
- hippopotamus (*Hippopotamus amphibius*) – IUCN vulnerable, Uganda vulnerable
- spot necked otter (*Hydrictis maculicollis*) – IUCN near threatened, Uganda endangered
- leopard (*Panthera pardus*) – IUCN vulnerable, Uganda vulnerable
- chimpanzee (*Pan troglodytes schweinfurthii*) – IUCN endangered, Uganda endangered
- Sierra Leone mops bat (*Mops brachypterus*) – IUCN least concern, Uganda vulnerable
- golden-throated rocket frog (*Ptychadena chrysogaster*) – IUCN least concern, Uganda vulnerable.

Avifauna species of conservation importance include (where these species were identified is included in the baseline report in Appendix A3):

- hooded vulture (*Necrosyrtes monachus*) – IUCN critically endangered, Uganda endangered
- grey crowned crane (*Balearica regulorum*) – IUCN endangered, Uganda endangered
- white backed duck (*Thalassornis leuconotus)* – IUCN not listed, Uganda vulnerable
- African woollyneck (*Ciconia microscelis*) – IUCN not listed, Uganda vulnerable
- saddle billed stork *(Ephippiorhynchus senegalensis*) – IUCN not listed, Uganda vulnerable
- rufous bellied heron (*Ardeola rufiventris*) – IUCN not listed, Uganda vulnerable
- ovambo sparrowhawk (*Accipiter ovampensis*) – IUCN not listed, Uganda vulnerable
- grey parrot (*Psittacus erithacus*) – IUCN near threatened, Uganda vulnerable

- papyrus gonolek (*Laniarius mufumbiri*) – IUCN near threatened, Uganda vulnerable.

None of the fish or invertebrate species sampled during the surveys is critically endangered, endangered or vulnerable (IUCN Red List), although secondary data indicates that fish, crustacean and macroinvertebrate species of conservation importance are likely to be present in the AOI.

Two of the fish species sampled (*Barbus kerstenii* and *Schilbe intermedius*) undertake in-river migrations. Secondary data also indicates the likely presence of endemic and range-restricted species in the AOI.

Ecosystem Services

Ecosystem services associated with species of conservation importance are listed below. Potential impacts to ecosystem services are addressed in Section 8.3.3.

Provisioning services include:

- collection of wood (including for fuel and charcoal manufacture)
- hunting, gathering and foraging food
- collection of medicinal products
- trapping of wildlife for the live trade market.

Cultural services include:

- ethical and biodiversity 'non-use' values – in particular in terms of maintaining populations of endangered and endemic species
- ecotourism, particularly in protected areas.

8.3.2 Potential Project Impacts

The assessment of potential impacts from AGIs has been included in the description of generic impacts because these facilities are in areas that do not tend to support species that have high or very high sensitivity. The nature of these impacts (in terms of magnitude, duration and extent) will be the same for each of these facilities and, consequently, the proposed mitigation measures will also be the same. A similar approach has been taken for the construction facilities.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on biodiversity, flora and fauna of conservation importance, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

Potential impacts to ecosystem services have been addressed throughout this section where relevant. Ecosystem services impacts have not been scored in the

same way as other impacts but an indication of the likely significance of the ecosystem service impact has been provided in each case.

8.3.2.1 Construction

General

Impacts from the construction phase, including the development of construction facilities; construction and commissioning of the pipeline and aboveground installations (AGI) and; the decommissioning of construction facilities are described together in this section as the impacts are similar for all of the activities.

Generic Impacts

Treatment and Disposal of Known and Unknown Contamination; Disposal of Solid and Liquid Waste and; Accidental Release of Oil and Chemicals

Impact: Injury or mortality of flora and fauna due to mobilisation of soil contaminants

Impact: Mortality of flora and fauna through contamination of food and water supply

Impact: Stress or mortality of flora and fauna due to disposal of solid and liquid waste

Accidental disposal of waste material and chemicals have the potential to pollute watercourses and cause mortality of macrophytes, which species of conservation importance may use. Accidental spills of waste material and chemicals are unlikely and not planned events and therefore this direct impact is considered not significant.

Impact: Increase in vermin around any established waste dumps and consequent increase in prey availability for carnivorous birds and mammals

There is the potential that the inappropriate disposal of waste may encourage vermin into the camps which could alter the predator–prey balance for species close to the camps causing an indirect impact on species. This may encourage some native raptors to the site but is more likely to increase vermin such as rats and invasive species such as Indian house crow (*Corvus splendens*). The duration of such incidences is likely to be short, localised at site level and hence be small in magnitude; consequently, this direct impact is considered not significant.

Disposal of Surplus Water from Working Areas and Hydrotest Water

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, and degradation of spawning habitat

As described in the habitats section, soil erosion can directly impact turbidity, which can cause smothering and degradation of aquatic habitats. This may indirectly impact primary productivity rates and degrade aquatic habitats (e.g., alter biochemistry), including functional habitats such fish spawning and foraging habitats. As the rivers along the pipeline route generally have high turbidity and the duration of any event resulting from construction activities is likely to be short, this impact is considered not significant.

Impeded Flow of River or Channel

Impact: Restriction of fish (ranging from non-migratory fish species to potamodromous fish species) movement and reduced reproductive success, impaired movement of other aquatic organisms and reduced habitat suitability

Impeding a river's flow or channel may impair movement and reduce reproductive success for all fish but is a key consideration for potamodromous fish; those fish that migrate within or between rivers, wetlands or lakes to access key functional habitats used for refuge, foraging or spawning at different life stages. Nonmigratory fish are less sensitive to this impact and therefore sensitivity is lower. Impaired movement has the potential to affect the reproductive success of fish species. River crossings during construction are typically of short duration therefore these impacts are considered not significant.

Abstraction of Water from River or Channel

Impact: Decreased water level from water abstraction for project use leading to loss of aquatic and water-margin habitats, causing reduced spawning activity

Impact: Mortality to aquatic organisms from the river through direct abstraction

Entrainment and removal of aquatic species during abstraction activities is likely to cause stress, injury and or mortality. If no screens or inappropriate screens are used, there is also a risk that species may become trapped in or on the screens, which would cause stress, injury and or mortality. An indirect impact linked to abstraction is a loss or reduction of aquatic and marginal habitat availability for aquatic flora and fauna caused by reduced water levels. As water levels generally rise and fall during the wet and dry seasons, these indirect impacts are considered not significant.

Management of Black and Grey water

Impact: Injury or mortality of flora and fauna from surface water contamination

Inappropriate disposal of black and grey water could contaminate surface water which may cause stress, injury or mortality to aquatic species. Accidental release of oil or chemicals into aquatic habitats can also cause stress, injury or mortality of aquatic species, and terrestrial species using surface water habitats. Although the impacts resulting from surface water contamination can be widespread and chronic, accidental discharge of untreated grey or black water is unlikely and is not a planned event and therefore this indirect impact has a small magnitude and therefore is considered not significant.

Abstraction of Groundwater

Impact: Decreased water level from water abstraction for project use leading to loss of habitat for stygofauna

As described in Section 8.7.4, there are no significant residual impacts anticipated on groundwater levels from abstraction for project use during construction. Based on available secondary data relating to stygofauna in East Africa, the species of stygofauna (groundwater-dwelling animals) likely to be impacted are not of conservation importance, and habitat loss for stygofauna is predicted to be temporary; hence the indirect impact on stygofauna is considered not significant.

Loss of Habitat to Species of Conservation Importance

Impact: Permanent loss of breeding and foraging habitat for fauna through site clearance for construction

Vegetation removal and site clearance required when construction begins will remove habitat which can be used by species for breeding and foraging. Table 8.2-1 in Section 8.2.2.2 quantify the amount of permanent habitat loss. This direct impact will disturb or remove breeding sites such as dens, earths and nests that may be present in the project footprint, and reduce forage availability, which could influence a species' distribution or ability to reproduce, causing a decline in the local population. Although most of the permanent habitat loss in the RoW and AGIs is farmland or other modified habitat, species are opportunistic and may still use modified habitats for parts of their life cycle. Birds may forage on crop land and large mammals may roam through cultivated land. Species of conservation importance must therefore be assumed to be present in most habitat types if they are present in the landscape. Although the extent of habitat loss is local, the sensitivity of potentially affected species is high and the magnitude is large as loss of breeding sites could cause a failure of that species to breed, duration is long because the loss is permanent, but the extent is local. As such, this potential direct impact on species is significant.

Impact: Temporary loss of breeding and foraging habitat for fauna through site clearance for construction

As described above for permanent habitat loss, the temporary loss of habitat will also have impacts on a variety of species using the landscape. Table 8.2-1 in Section 8.2.2.2 quantify the amount of temporary habitat loss. However, as these temporary land takes will be reinstated, the duration is short and the magnitude medium, and therefore temporary habitat loss is not significant.

Impact: Habitat fragmentation causing disrupted species movement during construction of RoW

During construction, vegetation will be removed from a 30-m wide strip along the length of the RoW. Tree-dwelling species and those that prefer cover to facilitate movement will not be able to move through their usual territories or will become more susceptible to predation and unable to move between habitat patches. Species of very high sensitivity that are susceptible to fragmentation are described in the location-specific impacts section. Typically the duration when passage is blocked by either open trench or a pipeline string is short however, the species of conservation importance are of high sensitivity and the magnitude is large as fragmentation could cause abandonment of breeding sites or reduced forage range, extent is regional as species can move through large areas and duration is medium (due to the time it takes for various habitats to re-establish, grassland will be much quicker than forest); hence this impact is considered significant.

Introduction of AIS, or Plant or Animal Diseases

Impact: Modified habitats from alien invasive species establishment leading to increased competition and loss of habitat for breeding and foraging

Non-native species can hinder the establishment of native species which has an indirect impact on species that use these habitats for breeding and foraging. Some invasive species can outcompete native species for ecological resources such as food and refuge or predate them in a way that they have not adapted to avoid. Some diseases and parasites can target native species, weakening them or removing them from habitats all together.

Once established, invasive species can be hard to eradicate causing a very long duration of medium magnitude for this potential indirect impact on very highly sensitive species of conservation importance, but at a local level only; hence this indirect impact is considered not significant.

Disturbance or Harm to Wildlife

Impact: Increased predation owing to removal of habitat used to shelter and forage

Site clearance will create a 30-m wide strip of un-vegetated areas of land that could cause increased predation on species due to the loss of cover and shelter. This indirect impact is considered of moderate duration due to the time taken for vegetation to re-establish but only of medium magnitude, and hence it is not significant.

Impact: Mortality of fauna species of conservation importance from movement of vehicles and presence of construction plant and structures

The use of vehicles and construction equipment may directly impact less mobile species such as reptiles and amphibians by death or injury. However, as most species can move away from vehicles and will avoid the construction area and hence traffic movement, the magnitude of potential impact is medium and the duration will be short; hence this direct impact is considered not significant.

Impact: Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps facilitated by improved access along new or upgraded project access roads and along the RoW during construction and reinstatement.

The PIIM of people seeking employment at and around the camps or using the newly created access roads has the potential to cause indirect impacts on species using habitats surrounding the camps and accessed by roads. The clearance of land along the RoW can cause PIMM of people using the RoW as an unofficial access route. Most roads and camps are in areas surrounded by modified habitat types. Where roads are in areas of high conservation importance, they are described in the location-specific section. When people move to an area, some will clear trees for charcoal and cultivate land leading to loss of habitat on which species of conservation importance depend. There may also be increased hunting of bushmeat and fishing which will have direct impacts on species of conservation importance. The duration is very long as people outside the project cannot be directly controlled and access roads will be permanent, the sensitivity of the species of conservation importance is high (as species are opportunistic and can be found in modified and natural habitats), and the magnitude is medium as the loss of breeding habitat could affect a portion of a population and may bring about a change in abundance and/or distribution over more than one generation; hence this potential indirect impact is considered significant.

Impact: Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and or behaviour of animals

Construction activities create noise and visual disturbance from vehicle and human movement. This activity can cause species to move away from forage and breeding areas and can restrict breeding for some sensitive species. Those species considered to be very sensitive to disturbance are more likely to be found in natural habitats within the protected areas. As the pipeline mostly passes through modified habitat with settlements and human activity, this impact is considered of medium magnitude and short duration and therefore not significant.

Open Excavations

Impact: Injury or fatality of fauna from falling into excavations if they cannot escape and where they are at increased risk of predation

Trenching will create a long, linear trench of typically around 1.5 m width in which species could get trapped, particularly smaller, less mobile species. Once in the trench they are potentially subject to predation or are unable to access food and water which could cause mortality. Impacts are of short duration and medium magnitude on species including those of very high sensitivity; as such, they are considered not significant.

Ecosystem Services

All the aspects described in the generic impacts section have the potential to affect ecosystem services. Any aspect which affects animals or plants that are used by local people for food, fuel or medicine will affect the provisioning ecosystem services delivered by these species. However, the significance of the impact on ecosystem services is difficult to be quantified as it depends on how reliant each community is on the particular ecosystem service and whether there are any alternatives available.

Impacts on rivers through abstraction, sedimentation or contamination could affect fish used for the following provisioning service:

- capture fisheries and food (fishing, gathering and foraging).

Impacts from smothering of species from soil disposal, waste spills and introduction of competitive species could affect plants and animals used for these provisioning services:

- wood (including collection for fuel and charcoal manufacture)
- food (hunting, gathering and foraging)
- collection of medicinal products.

Impacts from disturbance or harm to wildlife, habitat loss and impeded movement could affect plants and animals used for these provisioning services:

- wood (including collection for fuel and charcoal manufacture)
- food (hunting, gathering and foraging)
- collection of medicinal products.

Location-Specific Impacts

Location: KP6, 165, 187, 218–231 and 289

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and disturbance to Bohor reedbuck

The Bohor reedbuck is IUCN least concern and Ugandan endangered. Bohor reedbuck tend to use wooded grassland or wetland habitats. Site clearance will cause the loss of breeding and forage habitat of approximately 7.5 ha over the five sites where this species has been observed and may cause short term displacement. This species has a large range, and habitat removal will be temporary (transient duration) and of site extent. Therefore the direct impact is considered not significant.

Location: Wambabya–Bugoma Corridor (KP0–20)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of chimpanzee habitat

Chimpanzees are classified as Uganda and IUCN endangered and therefore have very high sensitivity to change.

High rates of deforestation in Uganda are increasing pressure on chimpanzee habitat and resource availability (Twongyirwe et al. 2015). This is confirmed by studies highlighting that remnant corridors of riparian forest (forest adjacent to a body of water [e.g., stream]) and remaining forest fragments in the landscape between Budongo FR in the north and Bugoma FR in the south provide commuting and foraging habitats for chimpanzees (WCS and eCountability 2016). Within this landscape the pipeline RoW crosses the remnant riparian corridors that link Wambabya FR and Bugoma FR (Figure 8.3-1).

Between Wambabya and Bugoma the forest corridors are mainly provided by two streams, the Kasoma and Kanywabarogo. These two corridors are therefore likely to facilitate the movement of chimpanzees. In an ongoing study chimpanzee faecal DNA is collected in the Wambabya and Bugoma forest reserves to determine the presence of gene flow, augmented by chimpanzee nest surveys to understand the corridors' use in time and space. The information collected at the time of writing suggests that chimpanzees do not move regularly between the Wambabya and Bugoma FRs, but completion of the study is required to confirm their use.

While chimpanzee home-range[9], (including access to water sources) and community dynamics in this area are unknown and information regarding habitat use is limited, the ongoing study suggests that there is movement of chimpanzees out of the two FRs, particularly during the dry season. Habitat degradation within Wambabya FR, resulting in less food availability during the dry season, is known to prompt small 'raiding parties' of chimpanzees that take jackfruit, mango and sugar cane from communities between the two FRs (Ganas-Swaray and Koojo 2017). The analysis of chimpanzee faecal DNA will assist to determine whether the

[9] An area in which an animal lives and moves on a periodic basis

riparian corridors also play an important role in maintaining the viability of the chimpanzee groups in the two forest blocks.

However, until completion of this study a precautionary approach has been taken that assumes the riparian corridors provide an opportunity for the chimpanzees to move between the two forest blocks and allow geneflow, thus supporting their important role in maintaining this population. The precautionary approach is further supported by the results from previous studies for the general area that indicate the chimpanzee population is already under pressure as a result of a growing human population.

Site clearance required for the 30 m pipeline construction RoW will result in the temporary removal of vegetation used by chimpanzees for moving, nesting and foraging, with permanent loss of trees within the 10 m operational RoW (where deep-rooted trees are not allowed, but herbaceous vegetation and shrubs are permitted). During construction the RoW will hinder movement, and this may potentially limit access to foraging and nesting habitat and may impact on behavioural patterns. After construction has been completed the areas outside the permanent 10 m RoW will be reinstated but within the permanent RoW, the removal of trees causes partial habitat loss. The long-term effect of this partial habitat loss on chimpanzee habitat usage, movement and community structure is currently unknown.

The magnitude is large as the initial loss of nest and forage trees and the hindrance to movement by the 30 m construction RoW may fundamentally affect the character and composition of chimpanzee groups and may cause a decline in abundance and/or change in distribution. The duration is medium as revegetation within the RoW may take 5-10 years and the establishment of trees of a suitable height for nesting[10] (outside the permanent 10 m RoW) up to 15 years[11]. The extent is evaluated as national (owing to a national and international status as endangered) and the sensitivity ranking is considered to be very high. Based on present knowledge the impact is significant (significance score 20) but will be re-assessed upon completion of the presently ongoing study.

Disturbance or Harm to Wildlife

Impact: Disturbance to chimpanzees

Pipeline construction activities will disturb chimpanzees through noise, vibration and the movement of construction vehicles. This may cause the displacement of chimpanzees from habitat near these sources, resulting in increased pressure on resources in remaining habitat.

Disturbance from noise and vibration may cause stress with the level of impact depending on noise intensity, vibration and human activity and the proximity of chimpanzee habitat to the sources. Chimpanzees hear one octave higher than humans and are therefore likely to be impacted more by high pitched noises than humans. As the distribution of chimpanzee habitat in the area is not fully

[10] studies of nesting chimpanzees in the human-dominated landscape between Budongo and Bugoma forests found a mean nest height of 10.9 m (McArthy 2016).

[11] Based on estimates of growth rates of typical nest trees listed in McArthy 2016 and Kew gardens database

understood, the effects of this disturbance may cause temporary displacement from sections of their home range.

Chimpanzee group displacement may result in a larger number of chimpanzees having to depend on fewer resources as a result of habitat reduction. This may lead to inter- and intracommunity conflict that can even result in mortality (Arcus Foundation, 2018).

If conditions do not allow chimpanzee groups with a home range that overlaps the RoW to move away from noise, stress may decrease the biological fitness of individuals (Arcus Foundation, 2018) and increase interactions with humans because of attempts to avoid areas of disturbance. Such interactions with communities could potentially further exacerbate the human - wildlife conflict observed in the region (McLennan 2008.)

There is potential for chimpanzees to habituate to constant and consistent levels of noise over time, provided that they do not perceive it as a threat, but the duration of activities will be too short for habituation.

This impact is of medium to long-term duration and national extent (owing to a national and international status as endangered) and chimpanzees are ranked as being of very high sensitivity. The overall impact is of medium magnitude owing to the potential effect that disturbance may have on feeding and nesting behaviour. Based on present knowledge the impact is significant (significance score 18-19) but will be re-assessed upon completion of the presently ongoing study

Location: Wambabya FR

Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to species of conservation importance using the adjacent reserve

In addition to chimpanzees, the Wambabya FR supports the following species of conservation importance:

- African golden cat (*Caracal aurata*) – IUCN vulnerable, Uganda endangered
- African clawless otter (*Aonyx capensis*) – IUCN near threatened, Uganda vulnerable
- long-tailed pangolin (*Phataginus tetradactyla*) – IUCN vulnerable, Uganda endangered.

Several butterfly species of conservation interest (Ugandan vulnerable to critically endangered) and two dragonflies, *Chlorocypha victoriae* (IUCN least concern and Uganda vulnerable) and *Neodythemis afra* (IUCN least concern and Uganda critically endangered), were recorded in Wambabya FR and the surrounding area.

There will be no direct impacts on the reserve during construction. However, as the RoW passes about 40 m from the reserve, there may be indirect disturbance of species using the reserve from noise and activity from people and machinery. The mammals described above are most vulnerable to this indirect impact. As the indirect impact is of transient duration and low magnitude, it is not significant.

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat, and noise and visual disturbance during construction for grey parrot.

The grey parrot typically inhabits dense forest, but it is commonly observed in other habitats such as forest edges, clearings, wooded savannah, cultivated areas and even gardens. Grey parrots are of very high sensitivity (IUCN endangered and Uganda vulnerable). This species was observed in the Wambabya FR during baseline surveys, but they may be present in supporting habitat around the reserve as they use a wide variety of habitats. Nests are formed in tree cavities and any tree felling in this area has the potential to cause a loss of breeding and forage habitat for this species. Where direct habitat is avoided, there are indirect impacts on species in surrounding habitats through noise and disturbance during site clearance and construction. The grey parrot, although of very high sensitivity, is versatile and the potential magnitude of the impact is small. The impact extent is national (owing to the importance of the local population at a national level) and the duration is short as habitats along the RoW will be reinstated. As such, the potential direct impact is not significant.

Location: Kafu Crossing (KP36–37), Nabakazi River (KP141–148) and Associated Habitats

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance

The proposed open cut crossing of the Kafu and Nabakazi Rivers will cause direct short-term habitat loss for endemic birds reliant on papyrus swamp. A species of high sensitivity using this habitat type is a bird, the papyrus gonolek (*Laniarius mufumbiri)* which is IUCN near threatened and Uganda vulnerable. Intact papyrus swamp at KP113 and swamp habitat around the Nabakazi River are likely to support a range of amphibians and sitatunga (*Tragelaphus spekii*; Uganda vulnerable) were recorded at this location during the baseline surveys. In addition, the construction activities will cause indirect noise and disturbance that may restrict the activity of birds near construction.

Habitat loss is the primary threat to sitatunga, with the increasing loss of wetlands and suitable habitat throughout their range cutting off former dispersal routes and many populations becoming increasingly isolated. Papyrus swamp can regenerate easily and rapidly and therefore the impacts are of short duration and small magnitude. The species are of high sensitivity and the extent of the impact local. As such, the direct and indirect potential impact is considered to be not significant.

Location: Wetland on Northern Edge of Taala FR (79–80)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting species of conservation importance and noise and visual disturbance during construction

The RoW passes through about 4.3 km of the Taala FR from KP78–82.5 which mostly comprises degraded habitats with eucalyptus plantations, maize fields and a large village. However, there is a small patch (1 ha) of papyrus swamp 1.3 ha of which would be affected at KP79–80. Baseline surveys in this area identified species of conservation importance: two butterflies (*Prosopalpus styla* (Uganda vulnerable), and *Actinote pentapolis* (Uganda vulnerable)), a dragonfly *Acisoma inflatum* (Uganda vulnerable) and the spot-necked otter (*Hydrictis maculicollis*); IUCN near threatened, Uganda endangered). Site clearance will cause the short term loss of the papyrus swamp used by these species for breeding and foraging. However, as papyrus regenerates easily and rapidly, this direct impact will be short term and is therefore not significant.

Locations: Secondary Acacia sp. Woodland, Bushland and Wooded Grassland (KP99.5, 276.5, 201.5, 217.5, 191.2 and 178.8) and Swampy Grassland with Occasional Woody Species (KP122.7, 164.9 and 201.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic evergreen scrambling shrub *Blepharispermum pubescens.*

Clearance of secondary *Acacia* sp. woodland, bushland and wooded grassland of low bioquality and, swampy grassland with occasional woody species of low bioquality will cause the loss of individual endemic evergreen scrambling shrubs *(Blepharispermum pubescens*). This direct impact is of medium magnitude and long duration on a species of low sensitivity to change, and is therefore not significant.

Locations: Swampy Grassland with Occasional Woody Species (KP93.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic *Leucas calostachys*

Clearance of swampy grassland with occasional woody species of low bioquality for pipeline construction will cause the loss of individuals of the endemic shrub *Leucas calostachys.* This direct impact is of medium magnitude and long duration on a species of low sensitivity to change, and is therefore not significant.

Location: Swamp Forest (KP106.0) and Papyrus Swamp (KP 112.6)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the vascular plant *Mondia whitei* (Uganda vulnerable)

Swamp forest at KP106 and papyrus swamp (KP 112.6) of low bioquality will be cleared for pipeline construction causing the loss of individuals of the Uganda vulnerable vascular plant *Mondia whitei* (WCS 2016).The local abundance of this

perennial woody climber is uncertain. There is potential for this species to inhabit other areas of wetland forests in the RoW. The direct impact is of medium magnitude and long duration on a species of moderate sensitivity, and is therefore not significant.

Location: Katonga River (KP165)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting high-sensitivity species, and noise and visual disturbance during construction

The Katonga River and its riparian habitat support several species of conservation interest:

- spot-necked otter (*Hydrictis maculicollis*) - IUCN near threatened
- hippopotamus (*Hippopotamus amphibius*) - IUCN vulnerable and Uganda vulnerable
- leopard (*Panthera pardus*) - IUCN vulnerable and Uganda vulnerable
- tree pangolin (*Phataginus tricuspis)* - IUCN vulnerable and Uganda vulnerable
- Temminck's ground pangolin (*Smutsia temminckii)* - IUCN vulnerable and Uganda vulnerable
- sitatunga (*Tragelaphus spekii)* - IUCN least concern, Uganda vulnerable.

The open-cut crossing of the river will cause short term loss of riparian habitat and swamp that may be used by these species for feeding and breeding. In addition, construction could present a physical barriers which inhibits the movement of species using the watercourse with further disturbance caused by noise and activity by people and machinery.

Species like the sitatunga that are sensitive to human activity and tree pangolins that have low reproductive rates are more likely to be affected by the temporary loss of habitat and disturbance. However, as the construction will be temporary and habitats reinstated once complete, this direct and indirect impact is considered not significant.

Location: Wetland and Ponds Supporting Golden-Throated Rocket Frog (KP187)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and direct mortality to Golden-throated rocket frog

Any construction activities directly affecting ponds or wetlands at KP187, where the golden-throated rocket frog (*Ptychadena chrysogaster*) was identified, has the potential to cause mortality or injury to this species which is IUCN least concern and Uganda vulnerable. The species is of high sensitivity, but the impact duration is short, as habitat loss will be temporary, the magnitude of the impact is considered to be moderate because mortality of species could affect their long-term success, and the extent local. As such, this direct impact is considered to be not significant.

Location: Valleys in Southern Uganda (KP203–270)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes

Grey crowned crane inhabit wetland habitats and are associated with valleys in southern Uganda. They are of very high sensitivity owing to their IUCN and Ugandan endangered status. Vegetation clearance in suitable habitat will cause direct loss of breeding and foraging habitat. As pressure on wetland habitats through human activities is already large, any additional habitat loss and disturbance could cause population loss.

These potential direct and indirect impacts on species of very high sensitivity are of short duration; national extent (owing to their national importance) and medium magnitude (as it affects a portion of a population and may bring about a change in abundance and/or distribution over more than one generation, but does not threaten the integrity of that population). As such, the impact is considered to be significant.

Location: MCPY4 at KP283

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit (*Poelagus marjorita)* from MCPY4

The Ugandan vulnerable species Bunyoro rabbit was identified at the site of the proposed MCPY4. Although the land use here is mainly agricultural it is being used by this species for foraging and breeding. The clearance of land for the camp will cause a loss of breeding and forage habitat for this species. In addition the noise and visual disturbance from the increased activity of people, vehicles and machinery in the area is likely to cause this high sensitivity species to be temporarily displaced from the area.

These potential direct impacts on species of high sensitivity are of short duration, local extent and medium magnitude, and are therefore considered not significant.

Location: Disused Airstrip and Associated Borrow Pits (KP288–289)

Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to bird and fauna species using the adjacent borrow pits causing a restriction in species' distributions

The RoW passes approximately 500m from a disused airstrip at KP288 in the Sango Bay area (an Important Bird Area (IBA), covering 54,000ha). Next to the airstrip are flooded abandoned borrow pits which are used by a variety of avifauna and fauna species, including:

- white-backed duck *Thalassornis leuconotus* (Uganda vulnerable)
- rufous-bellied heron *Ardeola rufiventris* (IUCN least concern, Uganda vulnerable and congregatory)

- Bohor reedbuck *Redunca redunca* (IUCN least concern, Uganda endangered)

The construction of the RoW has the potential to cause adverse impacts on species of conservation interest using the borrow pits through increased noise and visual disturbance. This may cause short term abandonment of nest and forage sites by birds. This indirect impact is of medium magnitude, short duration will affect species of high sensitivity; and is considered not significant.

Ecosystem Services

As described in Section 8.3.2.1, the impacts on species of conservation importance will have indirect impacts on ecosystem services should those species be used for provisioning services. Of the species of conservation interest described in the location-specific section, the following plants and animals are considered to provide specific ecosystem services:

- Temmick's ground pangolin and tree pangolin – collection of medicinal products, as it is used in traditional medicine
- leopard – trophy hunting and for illegal international trade
- birds, game and some plants – food (hunting, gathering and foraging)
- woody plant species (including collection for fuel and charcoal manufacture).

8.3.2.2 Operation

Generic Impacts

Disturbance or Harm to Wildlife

Impact: Maintenance activities causing minor habitat loss and alteration

The only generic impact that may affect species of conservation importance during project operations is the maintenance activities to manage scrub and tree establishment along the RoW through clearance by hand. These activities may cause injury or mortality to fauna species using these habitats. Maintenance activities will affect only very small areas and therefore this impact is considered not significant.

Location-Specific Impacts

There are no location-specific impacts on flora and fauna species of conservation interest.

Ecosystem Services

There are no potential impacts on ecosystem services during the operation phase as impacts during this phase are limited to minor maintenance activities which will only affect small areas for very short periods of time.

8.3.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect biodiversity impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key

mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4 have been collectively used to assess residual impacts, and to determine their significance.

8.3.3.1 Design

Generic Mitigation Measures

Treatment and Disposal of Known and Unknown Contamination; Disposal of Solid and Liquid Waste; and Accidental Release of Oil and Chemicals

The construction waste management plan will be based on the following elements:

- avoidance – establishing contracts to allow return of excess product and packaging
- reduction – construction processes to reduce waste generation (e.g., accurate calculation of concrete mixes) and waste reduction techniques (e.g., reduce volume of waste materials)
- reuse and recycling – all categories of waste will be segregated to facilitate recycling and reuse. Waste materials which cannot be recycled locally or shipped to recycling facilities (e.g., plastics) will be treated at site.

Disposal of Surplus Water from Working Areas and Hydrotest Water

Each pipeline section will be dewatered after completion of the tests. The water will be reused to test the next section via a temporary connection. Upon completion of the hydrostatic testing, the water will be release as described in the project description and meeting water quality discharge standards.

Impeded Flow of River or Channel

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Abstraction of Water from River or Channel

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Abstraction of Groundwater

The primary source of water for pipeline hydrostatic testing will be surface water. If enough surface water is not available to make up losses incurred during testing, groundwater may be used. An application for a drilling and ground water use permit which would include mitigation measures would be submitted to local water management authorities.

Management of Black and Grey Water

As outlined in the project description (Section 2), there will be a sewage treatment plant at each MCPY for the treatment of black and grey water with discharge of effluent to discharge quality standards and periodic removal of sewage sludge for treatment at an approved waste management facility. An alternative is the use of septic tanks and tanker transfer of sewage/effluent to a project facility for processing.

Loss of Habitat to Species of Conservation Importance

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Introduction of AIS, or Plant or Animal Diseases

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Disturbance or Harm to Wildlife

Route selection and methods for construction through wetlands and rivers, as described in the habitats section (8.2.3) have helped to reduce potential impacts on wildlife.

Impeded Movement of Animals and People

Route selection and methods for construction through wetlands and rivers as described in the habitats section (8.2.3) have helped reduce potential impacts on wildlife.

Open Excavations

There are no design phase mitigation measures specific to this impact.

Location-Specific Mitigation Measures

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

8.3.3.2 Construction

Generic Mitigation Measures

Treatment and Disposal of Known and Unknown Contamination; Disposal of Solid and Liquid Waste and; Accidental Release of Oil and Chemicals

Impact: Injury or mortality of flora and fauna due to mobilisation of soil contaminants

Impact: Mortality of flora and fauna through contamination of food and water supply

Impact: Stress or mortality of flora and fauna due to spills of hazardous materials into watercourses

The pollution prevention plan and waste management plan will include measures to manage contamination, waste and accidental oil and chemical releases.

The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have an impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training will be included as part of the pollution prevention plan.

Areas of contamination identified before construction within the project footprint will be remediated before or during construction. Contaminated material will be temporarily stored in impermeable bunds and covered to prevent contaminated runoff and airborne losses. In the event of accidental spills, a trained rapid response

team will be mobilised to contain, clean and remediate polluted locations; spill response equipment will be available at all work site locations.

Although the pre-mitigation impacts are considered not significant, the application of the above measures will further reduce impact; the residual impacts will still have a medium duration but the magnitudes are reduced from medium to small or negligible.

Impact: Stress or mortality of flora and fauna due to disposal of solid and liquid waste

The pollution prevention plan and waste management plan will include measures to manage floral or faunal stress from waste spills.

The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. In the event of accidental spills, a trained rapid response team will be mobilised to contain, clean and remediate polluted locations; spill response equipment will be available at all work site locations.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Impact: Increase in vermin around any established waste dumps and consequent increase in prey availability for carnivorous birds and mammals

The occupational health, safety and security plan and the waste management plan will include measures that manage vermin.

Worker food requirements will be planned with a focus to reduce food waste; waste will be managed as per the waste management plan that will detail waste collection, segregation, treatment, storage, transfer and final disposal.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Disposal of Surplus Water from Working Areas and Hydrotest Water

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, and degradation of spawning habitat.

The pollution prevention plan and waste management plan will include measures that manage effects on surface water and aquatic ecology.

An environmental evaluation will be completed for potential treated wastewater discharge locations; the results will inform the development of location-specific mitigation.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impeded Flow of River or Channel

Impact: Restriction of fish (ranging from non-migratory to potamodromous fish species) movement and reduced reproductive success, impaired movement of other aquatic organisms and reduced habitat suitability

The biodiversity management plan, natural resource management plan and the pollution prevention plan will include measures that manage effects on fish and aquatic habitat.

During open-cut watercourse crossing activities, bank and bed material will not be placed where flow or drainage will be obstructed. If dams and pumps are used to maintain water flow then fish screens will be used on the end of the pump inlet hose; fish caught within dammed areas either side of the crossing will be transferred up or downstream as appropriate by suitably experienced personnel.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Abstraction of Water from River or Channel

Impact: Decreased water level from water abstraction for project use leading to loss of aquatic and water-margin habitats, causing reduced spawning activity

Impact: Mortality to aquatic organisms from the river through direct abstraction

The biodiversity management plan and natural resource management plan will include measures that manage habitat loss, effects on spawning and mortality of aquatic organisms.

Flow, water level or water volume in the waterbody will be assessed before abstraction and monitored during abstraction to evaluate compliance with permit conditions; suitably sized fish screens will be fitted to water inlet hoses.

Although the pre-mitigation impacts are considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impacts are reduced from medium to small and small to negligible respectively.

Management of Black and Grey Water

Impact: Injury or mortality of flora and fauna from surface water contamination

The waste management plan and natural resource management plan will include measures that manage black and grey water.

Grey water will be separated from black water, treated to meet legislation and project discharge standards and permit conditions. Treated wastewater will be reused where possible.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to negligible, duration is reduced from long term to short term and extent reduces from regional to local.

Abstraction of Groundwater

Impact: Decreased water level from water abstraction for project use leading to loss of habitat for stygofauna

The natural resource management plan will include measures that manage effects on stygofauna.

Hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points; if significant adverse impacts are predicted then alternative borehole locations will be considered.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Loss of Habitat for Species of Conservation Importance

Impact: Permanent loss of breeding and foraging habitat for fauna through site clearance for construction

The biodiversity management plan will include measures that manage permanent habitat loss.

Pre-construction surveys within the RoW are planned to identify whether action is required to protect species during construction in the RoW; and, a vegetation removal method statement will be developed to control activities such as tree felling and ensure vegetation outside the RoW is not impacted. These surveys will inform location-specific biodiversity management plans that will consider micro routing to avoid impacts or additional conservation measures to achieve no net loss to biodiversity.

The pre-mitigation impact is significant, however, application of mitigation described above will reduce magnitude of impact from large to small and hence the residual impact is not significant.

Impact: Temporary loss of breeding and foraging habitat for fauna through site clearance for construction

The biodiversity management plan will include measures manage temporary habitat loss.

Pre-construction surveys within the RoW are planned to identify whether action is required to protect species during construction in the RoW; and, a vegetation removal method statement will be developed to control activities such as tree felling and ensure species outside the RoW are not impacted. These surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: Temporary habitat fragmentation causing disrupted species movement during construction of RoW

The biodiversity management plan will include measures that manage temporary habitat fragmentation.

The total duration of construction disturbance will be minimised and location-specific biodiversity management plans produced that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored.

The pre-mitigation impact is considered significant, however, application of mitigation described above will reduce magnitude of impact from large to medium and duration from medium to small; hence the residual impact is not significant.

Introduction of AIS, or Plant or Animal Diseases

Impact: Modified habitats from alien invasive species establishment leading to increased competition and loss of habitat for breeding and foraging

The biodiversity management plan will include measures that manage alien invasive species and plant or animal diseases.

Biosecurity measures will be developed and implemented measures to prevent the introduction or spread of alien invasive, and for weed and pest control.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Disturbance or Harm to Wildlife

Impact: Mortality of fauna species of conservation importance from movement of vehicles and presence of construction plant and structures

The biodiversity management plan, community health, safety and security plan and the transport and road safety management plan will include measures that contribute to the management of faunal mortality.

Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Pre-construction surveys will be completed to inform site-specific biodiversity management plans that will address species related seasonal constraints. Welded pipe sections will be capped to prevent fauna entering; fauna ladders will be placed in open excavations and morning trench inspection will be conducted.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small and the duration from medium to short term.

Impact: Increased predation owing to removal of habitat used to shelter and forage

The biodiversity management plan will include measures that contribute to management of increased predation rates.

Pre- construction surveys within the RoW are planned to identify whether action is required to protect species during construction in the RoW; a vegetation removal method statement will be developed to ensure vegetation outside the RoW is not impacted; in areas of high biodiversity value the area will be reviewed to determine if the working width can be reduced and a strategy for tree removal and replanting, minimising habitat loss, will be developed.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps facilitated by improved access along new or upgraded project access roads and along the RoW during construction and reinstatement.

The biodiversity management plan, labour management plan, community health, safety and security plan and the stakeholder engagement plan will include measures that contribute to the control of impacts associated with this aspect.

Construction camps will be “closed” to reduce interaction between workers and the environment. Employment opportunities will be communicated to communities to reduce the numbers of people collecting around camps in the hope of employment and the project induced in-migration management plan will aim to reduce in-migration. Additionally, local communities will be discouraged from using the right-of-way as an access road and, hunting, fishing, unauthorised gathering of products and deliberate disturbance or harassment of fauna will be prohibited for project personnel.

The pre-mitigation impact is considered significant, however, application of mitigation described above will reduce magnitude of impact from large to medium hence the residual impact is not significant.

Impact: Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and or behaviour of animals

The pollution prevention plan will include measures to control and manage project emissions; this, with measures described in the biodiversity management plan, the community health, safety and security plan, the occupational health, safety and security plan, the project induced in-migration plan and the transport and road traffic management plan will manage faunal disturbance.

Project noise emissions will not exceed project emission limits and noise and vibration impacts will be assessed where piling is to be undertaken. The total duration of construction disturbance will be minimised. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Construction camps will be “closed” status to reduce interaction between workers and the environment.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Open Excavations

Impact: Injury or fatality of fauna from falling into excavations if they cannot escape or where they are at increased risk of predation

The biodiversity management plan will include measures that manage the risk of injury or fatality of fauna from construction activity.

Fauna ladders will be placed at suitable intervals in all open excavations and trapped animals will be safely removed and released into suitable habitat away from working areas; the maximum length of open trench at any one time (per spread) will be managed depending on the sensitivity of the habitat and species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Ecosystem Services

All aspects described in the generic impacts section have the potential to affect ecosystem services. Any aspect which affects animals or plants that are used by local people for food, fuel or medicine will cause an effect on provisioning ecosystem services delivered by these species. However, the significance of the impact on ecosystem services is difficult to be quantified as it depends on how reliant each community is on the particular ecosystem service and whether there are any alternatives available. However, as impacts to species of conservation importance are considered to be not significant it is determined that associated impacts on ecosystem services are also likely to be not significant.

Location-Specific Mitigation Measures

Location: KP6, 165, 187, 218–231 and 289

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and disturbance to Bohor reedbuck

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measure to manage the effects on Bohor reedbuck.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage and refuge for species of conservation importance will be explored. In addition, seasonal constraints will be evaluated to limit disturbance on sensitive species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Wambabya–Bugoma Corridor (KP0–20)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of chimpanzee habitat

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will contribute to the management of loss of chimpanzee habitat.

A biodiversity survey strategy will address timings and methods for pre-construction surveys, the establishment of a reduced working width in sensitive habitats, identification of seasonal constraints and measures to keep construction duration to a minimum. Pre-construction surveys will also aim at retaining as many trees as possible, in particular food species and nesting trees. Site-specific reinstatement measures will be developed and implemented to promote a reinstatement programme that aims to achieve a species composition that provides refuge, forage, and nesting for species of conservation importance.

In addition the following mitigations will specifically address chimpanzees:

- The ongoing chimpanzee faecal DNA and movement study will extend cover an annual cycle before construction begins. The results of the study will be used to reassess impacts and inform additional enhancement and conservation measures, particularly regarding the maintenance of chimpanzee movement corridors.
- The project will partner with forest conservation initiatives within the Albertine Graben which will also be of benefit for chimpanzees. The selected initiatives would address the development and implementation of forest management and restoration plans with the involvement of communities to improve:
    - sustainable management of forest areas to maintain natural resource availability and the supply of ecosystem services for local communities
    - connectivity between forest blocks
    - improve management of forested protected areas, such as Budongo, Wambabya and Bugoma Forest Reserves within the wider landscape.

Chimpanzee groups will be monitored pre and post construction with adaptive management in response to findings.

Although the pre-mitigation impact is considered significant, the application of mitigation described above should reduce magnitude of impact from large to medium; the residual impact is not significant (significance score of 18).

Disturbance or Harm to Wildlife

Impact: Disturbance to chimpanzees

In addition to the generic mitigation addressing habitat loss described above, the biodiversity management plan will include the following measures to manage the effect of disturbance on chimpanzees.

Construction will be avoided during sensitive periods and the surveys will confirm the seasonality of habitat use, with the total duration of construction disturbance also being kept to a minimum. Chimpanzee groups will be monitored pre and post construction with adaptive management in response to findings.

The application of the above measures should reduce the magnitude of the residual impact from medium to small; the residual impact (significance score of 15-16) is not significant.

Location: Wambabya FR

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to species of conservation importance using the adjacent reserve

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will contribute to managing effects on flora and fauna of conservation concern using the adjacent reserve.

Seasonal constraints will be evaluated to limit disturbance on sensitive species and a vegetation removal method statement developed and implemented to reduce impacts on biodiversity in adjacent protected areas. Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Impact: Loss of habitat, and noise and visual disturbance during construction for grey parrot.

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will manage the effects on grey parrot.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for species of conservation importance will be explored. In addition, seasonal constraints will be evaluated to limit disturbance on sensitive species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Location: Kafu Crossing (KP36–37), Nabakazi River (KP141–148) and Associated Habitats

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will manage the effects on papyrus specialists, endemics and other species of conservation importance.

Total duration of construction disturbance will be minimised and a river crossing plan will be developed and implemented which may include population monitoring

pre and post construction with adaptive management if required in response to findings.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Location: Wetland on Northern Edge of Taala FR (79–80)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting species of conservation importance and noise and visual disturbance during construction

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will manage the effects on species of conservation importance.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for species of conservation importance will be explored. Total duration of construction disturbance will be kept to a minimum.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Locations: Secondary Acacia Species Woodland, Bushland and Wooded Grassland (KP99.5, 276.5, 201.5, 217.5, 191.2 and 178.8) and Swampy Grassland with Occasional Woody Species (KP122.7, 164.9 and 201.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic evergreen scrambling shrub *Blepharispermum pubescens*

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will manage effects on *Blepharispermum pubescens*.

A biodiversity survey strategy will be developed for flora. Where a section of the RoW is through habitats which support species of conservation importance , the area will be reviewed to determine if the working width can be reduced to limit impacts.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact from medium to small.

Locations: Swampy Grassland with Occasional Woody Species (KP93.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic *Leucas calostachys*

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will manage the effects on *Leucas calostachys*.

A biodiversity survey strategy will be developed for flora. Where a section of the RoW is through habitats which support species of conservation importance (i.e., *Leucas calostachys)*, the area will be reviewed to determine if the working width can be reduced to limit impacts.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Swamp Forest (KP106.0) and Papyrus Swamp (KP112.6)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the vascular plant *Mondia whitei* (Ugandan Red Listed vulnerable (WCS 2016)).

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will manage effects on *Mondia whitei*.

A biodiversity survey strategy will be developed for flora. Where a section of the right-of-way is through habitats which support species of conservation importance, the area will be reviewed to determine if the working width can be reduced to limit impacts.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Katonga River (KP165)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting high-sensitivity species and noise and visual disturbance during construction

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will contribute to the management of habitat loss and disturbance.

Total duration of construction disturbance will be minimised and species population will be monitored pre and post construction with adaptive management if required in response to findings.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large to medium.

Location: Wetland and Ponds Supporting Golden-Throated Rocket Frog (KP187)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and direct mortality to golden-throated rocket frog

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measure to manage the effects on Golden-throated rocket frog.

Pre-construction surveys within the RoW are planned and any discovered individuals will be translocated to ponds outside the RoW.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Valleys in Southern Uganda (KP203-270)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes.

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measures to manage loss of breeding and foraging habitat and disturbance to grey crowned cranes.

A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken. An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for grey crowned cranes will be explored. In addition, seasonal constraints will be evaluated to limit disturbance on sensitive species.

The pre-mitigation impact is considered significant, however, application of mitigation described above will reduce the magnitude of the impact from medium to small; hence, the residual impact is not significant.

Location: MCPY4 at KP283

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit from MCPY4

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the

following measures to manage loss of breeding and foraging habitat and disturbance to.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for Bunyoro rabbit will be explored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Location: Disused Airstrip and Associated Borrow Pits (KP288–289)

Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to bird and fauna species using the adjacent borrow pits causing a restriction in species' distributions

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measure that will manage the effects on bird and fauna species using the adjacent borrow pits.

Seasonal constraints will be evaluated to limit disturbance on sensitive species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

8.3.3.3 Operations

Generic Mitigation Measures

Disturbance or Harm to Wildlife

Impact: Maintenance activities causing minor habitat loss and alteration

The biodiversity management plan will include measures to manage habitat loss and alteration.

The project will develop and implement a maintenance plan for the control of vegetation around AGIs and along the RoW; this will include information on the relevant habitat and species of conservation importance with recommended action to reduce impacts on these habitats and species such as nesting checks and avoidance of work during sensitive periods.

This will reduce the impact from small to negligible; the residual impact is not significant.

Location-Specific Mitigation Measures

There are no location-specific impacts on species of conservation importance during the operation phase and therefore no mitigation measures are required.

8.3.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on biodiversity after mitigation has been implemented, following the order in Table 8.3-1 and focusing on those impacts that are significant.

8.3.4.1 Generic and Location-Specific Impacts

Table 8.3-1 summarises the potential generic biodiversity impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.3-2 summarises location-specific impacts.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Treatment and disposal of known/unknown contamination	Injury or mortality of flora and fauna through to mobilisation of soil contaminants	C	–	Pollution Prevention Plan	4	3	2	5	14
Disposal of solid and liquid waste and accidental release of oil and chemicals	Mortality of flora and fauna through contamination of food and water supply	C	–	Pollution Prevention Plan Waste Management Plan	2	2	1	5	10
	Stress or mortality to flora and fauna from spills of waste	C	–	Pollution Prevention Plan Waste Management Plan	2	2	1	5	10
	Increase in vermin around temporary waste storage and consequent increase in prey availability for carnivorous birds and mammals	C	–	Occupational Health, Safety and Security Plan Pollution Prevention Plan Waste Management Plan	2	2	1	5	10
Disposal of surplus water from working areas and hydrotest water	Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	C	–	Waste Management Plan Pollution Prevention Plan	4	2	3	5	14
Impeded flow of river or channel	Restriction of fish (ranging from general fish species (nonmigratory) to potanodromous fish) movement and reduced reproductive success, impaired movement and reduced habitat suitability of other aquatic organisms -	C	–	Biodiversity Management Plan Natural Resource Management Plan	4	2	4	3–5	13–15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Abstraction of water from river or channel	Decreased water level from water abstraction for project use leading to loss of aquatic and water-margin habitats causing reduced spawning activity	C	–	Biodiversity Management Plan Natural Resource Management Plan	4	2	4	3	13
	Mortality to aquatic organisms from the river through direct abstraction	C	–	Natural Resource Management Plan	2	2	2	4	10
Management of black and grey water	Injury or mortality of flora and fauna through surface water contamination	C&O	–	Natural Resource Management Plan Waste Management Plan	2	2	2	4	10
Abstraction of groundwater	Decreased water level owing to water abstraction for project use leading to loss of habitat for stygofauna	C	–	Natural Resource Management Plan	2	2	2	2	8
Loss of habitat for species of conservation importance	Permanent loss of breeding and foraging habitat for fauna through site clearance before construction	C	–	Biodiversity Management Plan	4	5	2	4	15
	Temporary loss of breeding and foraging habitat for fauna through site clearance before construction	C	-	Biodiversity Management Plan	4	2	2	4	12
	Temporary habitat fragmentation causing disrupted species movement during pipeline construction along the RoW	C	–	Biodiversity Management Plan	6	2	4	4	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Introduction of competitive species or plant and animal diseases	Modified habitats caused by non-native species establishment leading to increased competition and loss of habitat for breeding and foraging	C&O	–	Biodiversity Management Plan	4	5	3	4	16
Disturbance or harm to wildlife	Mortality of fauna species of conservation importance from movement of vehicles and presence of construction plant and structures	C	–	Community Health, Safety and Security Plan Biodiversity Management Plan	4	3	2	5	14
	Increased predation from predator species from removal of habitat used to shelter and forage	C	–	Biodiversity Management Plan Labour management plan Community Health, Safety and Security Plan Stakeholder Engagement plan	4	3	2	5	14
	Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps, from improved access along new or upgraded project access roads and access provided by RoW during construction and reinstatement.	C	–	Project Induced In-Migration Management Plan	6	5	2	4	17

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Disturbance or harm to wildlife	Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and behaviour of animals	C	–	Pollution Prevention Plan Biodiversity Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Project Induced In-Migration Management Plan Road Traffic Management Plan	4	2	2	5	13
Disturbance or harm to wildlife	Maintenance activities causing minor habitat loss and alteration	O	-	Biodiversity Management Plan	2	1	1	5	9
Open excavations	Injury or fatality of fauna from falling into excavations if they cannot escape or where they are at increased risk of predation	C	–	Biodiversity Management Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP6, 165, 187, 218–231 and 289	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance to Bohor reedbuck	C		Biodiversity Management Plan	4	2	2	4	12
KP0–20 Wambabya–Bugoma corridor	Loss of Habitat to Species of Conservation Importance	Loss of chimpanzee habitat	C	-	Biodiversity Management Plan Reinstatement Plan	6	3	4	5	18
KP0–20 Wambabya–Bugoma corridor	Disturbance or Harm to Wildlife	Disturbance to chimpanzee	C	-	Biodiversity Management Plan Reinstatement Plan	4	3 - 4	4	5	16 - 17
KP4.5–8 Wambabya	Disturbance or Harm to Wildlife	Noise and visual disturbance to species of conservation importance using the adjacent reserve	C	-	Biodiversity Management Plan Reinstatement Plan	2	1	2	4	9
KP4.5–8 Wambabya	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat, and noise and visual disturbance during construction for grey parrot.	C	-	Biodiversity Management Plan Reinstatement Plan	2	3	3	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP36–37 Kafu Crossing	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance	C	-	Biodiversity Management Plan Reinstatement Plan	2	2	2	4	10
KP79–80 Wetland on northern edge of Taala FR	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat supporting species of conservation importance and noise and visual disturbance during construction	C	-	Biodiversity Management Plan	4	2	3	4	13
Secondary Acacia sp. woodland, bushland and wooded grassland (KP99.5, 276.5, 201.5, 217.5, 191.2 and 178.8)	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*	C	-	Biodiversity Management Plan	4	4	4	2	14
Swampy grassland with occasional woody species (KP93.1 and 1001.1)	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the endemic *Leucas calostachys*	C	-	Biodiversity Management Plan	4	4	4	2	14

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Swamp forest (KP106.0) and Papyrus swamp (KP 112.6)	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the vascular plant, *Mondia whitei*	C	-	Biodiversity Management Plan	4	4	4	3	15
KP147–148 River Crossing (Nabakazi River)	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance	C	-	Biodiversity Management Plan Reinstatement Plan	2	2	2	4	10
KP164–165 Katonga River	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat supporting species of conservation interest, and noise and visual disturbance during construction	C	-	Biodiversity Management Plan Reinstatement Plan	6	2	3	3	14
KP187–187 Wetland	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and direct mortality for golden throated rocket frog	C	-	Biodiversity Management Plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP203–270 approx. Valleys in southern Uganda	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes	C	-	Biodiversity Management Plan Reinstatement Plan	4	2	4	5	15
KP283 MCPY4	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit from MCPY4	C	-	Biodiversity Management Plan Reinstatement Plan	4	3	3	4	14
KP288–289 Disused airstrip and associated borrow pits	Disturbance or Harm to Wildlife	Noise and visual disturbance to bird and fauna species causing a restriction in species' distributions	C	-	Biodiversity Management Plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.3.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.3.6 Cumulative Impacts

8.3.6.1 Context

The baseline condition of flora and fauna species of conservation importance in the EACOP project's AOI, the trends and sensitivity to change are described in Section 6.3.1. Residual project impacts are summarised in Table 8.3-1and Table 8.3-2.

Associated facilities and third party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. The developments are:

- associated facilities:
  - Tilenga project (AF01)
  - Kingfisher oil project (AF02)
- third-party developments:
  - Lot 4 road upgrade – R4 (Kabaale -Kiziranfumbi) and R5 (Kaseeta-Lwera via Bugoma Forest) (UG19)
  - the Hoima–Buloba Pipeline (UG08)
  - the refinery (UG07)
  - Kabaale International Airport (UG04)
  - the transmission line to Kabaale Airport (UG05).

The preferred condition is that the number of species remains stable or increases, relative to the background changes in population levels. The limit of acceptable change is a short-term decrease followed by recovery to pre-construction numbers.

8.3.6.2 Cumulative Impacts

Wambabya–Bugoma Corridor

The area between the Wambabya and Bugoma FRs is important for chimpanzees in the adjacent FRs. Riparian corridors allow for movement, provide nesting trees as well as foraging habitat.

As described in Section 8.3.2.1, the construction phase could cause significant impacts on chimpanzees caused by temporary loss of habitat and disturbance.

Figure 8.3-1 Wambabya Forest Reserve and the Corridors of Remnant Riparian Forest Linking it to Bugoma Central Forest Reserve

The overhead transmission line (OHTL) to the airport, the Hoima–Buloba pipeline and Lot 4 – R4 (Kabaale -Kiziranfumbi) and R5 (Kaseeta-Lwera via Bugoma Forest) road upgrade all pass through the same area. It is assumed that there would be no habitat loss for the road upgrades as construction should be limited to road surface and shoulder only. The other two projects have varying potential to cause chimpanzee habitat loss. For the OHTL, vegetation clearance along a 40-m-wide RoW is assumed with a 5-m easement kept permanently clear of trees. The Hoima-Buloba pipeline is assumed to be similar to EACOP with a construction RoW of approximately 30 m and an operational RoW of 10 m, which will also be kept permanently clear of trees.

The cumulative impact of these projects operational RoWs within the area between Wambabya and Bugoma will cause permanent loss of chimpanzee habitat.

During the project's operational phase, permanent habitat loss may hinder movement and, potentially, restrict access to food and water sources as well as interfere with behavioural patterns. Although it is predicted in Section 8.3.3.2 that the residual impact of permanent loss of chimpanzee habitat is not significant, the activities of these projects have the potential to increase the cumulative impact significance.

The disturbance on chimpanzees' movement and foraging during construction of the road upgrade, OHTL and Hoima-Buloba pipeline in the area between the two FRs will be similar to those caused by the EACOP project construction. The road and OHTL are more or less parallel to each other and the project RoW at an approximate distance of 2 km. The Hoima-Buloba pipeline is parallel in between the EACOP pipeline and Wambabya FR (see Figure 8.3-2). If concurrent construction is assumed for all three projects, a larger area will be affected by noise and visual disturbance. In the case of EACOP and the Hoima-Buloba pipeline, the proximity of the two projects would cause a combined elevated noise level and higher degree of visual disturbance. Sequential construction would extend the period of disturbance, but the area affected would be smaller. Although it is predicted in Section 8.3.4 that disturbance to chimpanzees residual impacts from the project are not significant, the cumulative activities of these projects have the potential to increase the cumulative impact to significant.

Figure 8.3-2 Cumulative Impacts: Wambabya - Bugoma Corridor

At the time of writing not enough information for the third-party projects is available to confirm categorically the potential effects on chimpanzees. In addition, there are still gaps in the understanding of chimpanzee ecology and behaviour in the area between the Wambabya and Bugoma FRs making it difficult to assess cumulative impacts. The project will therefore implement the following mitigation measures in addition to the ongoing chimpanzee faecal DNA and movement study while

continuing to monitor project development as well as chimpanzee dynamics in the area.

The project will partner with forest conservation initiatives within the Albertine Graben which will also be of benefit for chimpanzees. The selected initiatives would address the development and implementation of forest management and restoration plans with the involvement of communities to improve:

- sustainable management of forest areas to maintain natural resource availability and the supply of ecosystem services for local communities
- connectivity between forest blocks
- improve management of forested protected areas, such as Budongo, Wambabya and Bugoma Forest Reserves within the wider landscape.

The conclusion of this study will lead to collaboration and support of a chosen forest conservation initiative as part of the project's mitigation strategy and contribution to cumulative impact management.

With the implementation of the EACOP project mitigation measures as well as the regional environmental management initiatives the cumulative impact magnitude and duration will be reduced; hence the cumulative residual impact is considered not significant.

8.3.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on species of conservation importance.

8.4 Biodiversity: Legally Protected, Internationally or Nationally Recognised Areas

This section describes potential impacts on legally protected, internationally or nationally recognised areas during construction, commissioning and operation of the EACOP project and associated mitigation measure to be adopted.

8.4.1 Key Sensitivities and Considerations

The legally protected, internationally or nationally recognised areas baseline conditions are described in Section 6.3.1 as well as:

- their sensitivity ranking based on the relevant table in Appendix D
- key considerations for legally protected, internationally or nationally recognised areas.

The sensitivity ranking of legally protected, internationally or nationally recognised areas ranges from moderate to high.

Key legally protected, internationally or nationally recognised areas for consideration include:

- Wambabya Forest Reserve
- Taala Forest Reserve.

Ecosystem Services

A summary of the ecosystem services provided by the habitats found within these protected areas is described in habitats Section 6.3.1.

8.4.2 Potential Project Impacts

8.4.2.1 Construction

Generic Impacts

There are no generic impacts for the legally protected, internationally or nationally recognised areas VEC.

Location-Specific Impacts

Location: Wambabya FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

Though the project has the potential to affect species of conservation importance in the reserve through noise and visual disturbance this will not affect its integrity and the impact is of small magnitude, therefore not significant.

Location: Taala FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

Although pipeline construction along the RoW will cause a permanent loss of 11.6 ha of habitat within the reserve, only 1.1 ha is natural habitat (0.8 ha of bushland and 0.3 ha of wetland) and species of conservation importance were only found within the remnant wetland which will largely be unaffected. As the project is not considered to cause a loss of integrity of the reserve the magnitude is small and the impacts are not significant.

Ecosystem Services

Potential impacts on ecosystem services are described in Sections 8.2 and 8.3. There are no ecosystem services that relate to protected areas exclusively that are not already described in the habitats of conservation importance and species of conservation importance sections. However, given the protected areas status, potential non-use values can be considered to be higher for habitats with protected areas.

8.4.2.2 Operation

Generic Impacts

There are no generic impacts from the pipeline, AGI and MST operation on legally protected, internationally or nationally recognised areas.

Location-Specific Impacts

There are no specific impacts from the pipeline and AGI operation on legally protected, internationally or nationally recognised areas.

Ecosystem Services

Potential impacts on ecosystem services are described in Sections 8.2 and 8.3. There are no ecosystem services that relate to protected areas exclusively that are not already described in the habitats of conservation importance and species of conservation importance sections. However, given the protected areas status, potential non-use values can be considered to be higher for habitats with protected areas.

8.4.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects that could affect biodiversity impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4 have been collectively used to assess residual impacts, and to determine their significance.

8.4.3.1 Design

Generic Mitigation Measures

The design mitigation measures relating to route selection described under Section 8.2.3.1 are of relevance.

Location-Specific Mitigation Measures

There are no specific design mitigation measures of relevance to protected areas.

8.4.3.2 Construction

Generic Mitigation Measures

The mitigation measures described for habitats of conservation importance and species of conservation importance will be used to mitigate for impacts on these VECs and will, in turn, mitigate for impacts on protected areas.

Location-Specific Mitigation Measures

The mitigation measures described for habitats of conservation importance and species of conservation importance will be used to mitigate for impacts on these VECs and will, in turn, mitigate for impacts on protected areas.

Location: Wambabya FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

The biodiversity management plan will include measures that collectively contribute to the control of impacts described for habitats and species associated with the reserve.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

Location: Taala FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

The biodiversity management plan will include measures that collectively contribute to the control of impacts described for habitats and species associated with the reserve.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

8.4.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on biodiversity after mitigation has been implemented, following the order in Table 8.4-1 and focusing on those impacts that are significant.

The implementation of mitigation measures for habitats of conservation importance and species of conservation importance will reduce impacts on those VECs and although there are some residual impacts on those VECs, none will be enough to cause an overall loss of integrity of the protected areas. It is therefore considered that there are no residual impacts on protected areas.

In concordance with IFC PS6 guidance, a biodiversity action plan incorporating further enhancement and conservation measures will be developed and implemented to achieve no net loss of biodiversity where feasible.

Table 8.4-1 Legally Protected, Internationally or Nationally Recognised Onshore Areas – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plans	Residual Impact				
						M	D	E	S	SS
KP4.5–8 Wambabya FR	Loss of Habitat and Disturbance or Harm to Wildlife	Loss of ecological function and integrity of protected site through impacts on species and habitats	C&O		Biodiversity management plan	2	5	3	3	13
KP78–82 Taala FR	Loss of Habitat and Disturbance or Harm to Wildlife	Loss of ecological function and integrity of protected site through impacts on species and habitats	C&O		Biodiversity management plan	2	5	3	3	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.4.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.4.6 Cumulative Impacts

Potential cumulative impacts on habitats and species of conservation importance within protected areas are described in Sections 8.2.6 and 8.3.6. There are no cumulative impacts identified that are likely to affect the integrity or ecological function of a protected area.

8.4.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts affecting legally protected, nationally and internationally recognised areas.

8.5 Soils

This section describes potential impacts on soil during construction, commissioning and operation of the EACOP project in Uganda and the associated planned mitigation measures to be adopted.

As mentioned in Section 6.4.2.1, while geology for this ESIA, is not considered a VEC, and is not assessed, the potential impact on aggregate extraction has been assessed and described in this section. Information on seismic risk areas traversed by the pipeline has been included in the project description (see Section 2).

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on soil, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.5.1 Key Sensitivities and Considerations

The soil baseline conditions are described in Section 6.4.2.1, as well as:

- soil key valued environmental components (VEC) and their sensitivity ranking based on the relevant table in Appendix D
- key considerations for the soil impact assessment.

Sensitivity in the soil area of influence (AOI) ranges from very low to very high, depending on the soil type, and varies considerably throughout the pipeline route.

Key considerations include:

- The texture of the soil at several of the survey sample locations, for example, at KP40 and KP180, on the pipeline route was found to be very fine. It was

primarily fine silt and clay, which are considered more prone to compaction, to have poor trafficability when wet and to be prone to dust generation during dry conditions.

- Several areas of the proposed pipeline route are noted as having particularly high erosion potential, for example, KP68.5 and KP206.
- The topsoil depth is generally deep (20–30 cm) along the route and at construction facilities, although there are likely to be sections where the topsoil is thin (<5 cm).
- The proposed pipeline route is predominantly through agricultural land with mostly low to moderate productivity and high productivity at several locations.
- Contamination from industrial or agricultural activities was not identified at any of the locations along the proposed route, due to the predominantly rural nature of the AOI.
- Unexploded ordnance (UXO) may exist in certain areas within the AOI, particularly near the Uganda–Tanzania border.

The project impacts are assessed cumulatively, incorporating qualitatively, the baseline conditions.

Section 6.4.2.1 identifies ecosystem services associated with soil in the AOI. The following ecosystem services have been considered:

- aggregates and topsoil
- soil quality
- water storage
- water flow control.

Soil also provides the following ecosystem services that are considered in other sections:

- agriculture (land-based livelihoods VEC, Section 8.13)
- biodiversity (biodiversity VECs, Section 8.2 to Section 8.4).

8.5.2 Potential Project Impacts

8.5.2.1 Construction

Generic Impacts

Use of Raw Materials and Natural Resources

Impact: Depletion of natural resources, for example, aggregate

Aggregate will be needed for aboveground installation (AGI) construction, for use as padding material for the pipeline and for concrete for constructing AGI components, construction of main line block valves, and construction of the main camp and pipe yards (MCPY) and access roads. The extraction and use of aggregate constitutes the use of non-renewable natural resources, which is a direct impact that is expected to be minimal because of the quantities required and their sourcing being distributed over a long distance (296 km).

Construction will require the stripping of topsoil from within the soil AOI, which will be stored for later use, including pipeline reinstatement. If poorly managed, topsoil could be lost as a resource in several ways:

- reducing soil quality, for example by mixing topsoil with subsoil
- wasting soil by mixing it with construction waste or contaminated materials, which then must be treated before reuse or even disposed as a last resort.

The extraction of aggregate may also have indirect impacts on surface water and water resources, biodiversity, cultural heritage, land users and communities that will be considered when an environmental and social appraisal is undertaken of sites, see Section 10.10

The pre-mitigation impact for use of raw materials and natural resources during construction is considered not significant, because of the small magnitude, site-based extent and short duration.

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity

Compaction of soil during construction may occur and compaction-prone soil was identified at several locations during the field survey, for example, KP0, KP80 and KP260. Compaction of soil during construction will occur where and when the soil bearing strength is exceeded by the load of construction activities, for example, vehicle movements and pipe storage. This causes soil particles to be compressed together, which reduces the soil's porosity and increases its bulk density. Wet and clay-dominated soil is more sensitive to compaction due to the relatively small particle size and high bulk density.

Topsoil and subsoil will be stripped from all working areas before construction, so the impact will be limited to sites that are due to be reinstated, i.e., the RoW.

The indirect impacts of soil compaction are the alteration of drainage characteristics, which may cause surface runoff and localised flooding, and reduced dissolved oxygen levels in receiving waters, which could cause anaerobic conditions to develop. Compaction can also have indirect impacts on ecology by restricting root zone growth, as it can affect vegetation re-establishment (see habitats of conservation importance VEC, Section 8.2) and on agricultural productivity and associated livelihoods (see land-based livelihoods VEC, Section 8.13).

The pre-mitigation impact for use of soil compaction during construction is considered not significant. Although the magnitude is potentially large, the impact is not significant because of the site-based extent and short duration.

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

Preparation of the RoW and construction of the MCPYs and access roads, including removing vegetation, topsoil stripping and benching, will affect soil

structure and stability. This may increase the risk of erosion, particularly where the soil has poor cohesion or there are steep slopes. The erosion risk is expected to be highest during wet weather, when runnels may develop, and it will be exacerbated by vehicle movements.

Topsoil removed from the RoW will be stored at the edge of the working area pending replacement during reinstatement. Topsoil stockpiles can be poorly consolidated, so prone to erosion and soil loss via wind erosion or washout by rainfall.

Soil stability at areas that exhibit active erosion could be made worse by AGI and pipeline construction activities, or erosion could be triggered in areas with erosion potential.

A RoW soil erosion classification study was conducted and is described in Appendix C2. Highly erodible soil was identified at several locations along the pipeline route, for example, KP68.5, KP104.5 and KP221.5.

Treated hydrotesting water will be discharged to either land or a watercourse. Erosion could occur at the point of discharge to land. This discharge could indirectly cause scour and increased sediment loading if to a watercourse (see surface water VEC, Section 8.6).

Where access roads to the right of way (RoW) are widened, construction will include the removal of topsoil and subsoil, which can leave soil more exposed and more prone to erosion. Soil erosion may cause indirect impacts on aquatic fauna (from sediment release into watercourses) and could affect vegetation re-establishment (loss of soil). These potential impacts are described in the habitats of conservation importance VEC (Section 8.2). Soil erosion could also affect agricultural productivity, see land-based livelihoods VEC (Section 8.13) for a description of the potential impacts.

The pre-mitigation impact for soil erosion during construction is considered not significant, because of the site-based extent and short duration, although the magnitude is potentially large.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Development of anaerobic conditions in stored soil and mixing of different soil or soil with foreign materials leading to loss of drainage and fertility

In areas with thin topsoil coverage, stripping of topsoil and segregation of topsoil and subsoil may be more difficult. A pre-construction survey will confirm location-specific topsoil depths.

Soil structure can be damaged by soil stripping and the nutrient content can be decreased due to leaching, which can affect vegetation re-establishment. Alterations to structure and nutrient content can also occur if topsoil and subsoil layers are mixed during construction and/or storage, or if surplus subsoil is disposed by spreading over topsoil or vegetation.

Prolonged storage of topsoil (longer than six months) can cause loss of soil fertility, as nutrients may be leached out by rain or by anaerobic conditions may be created by a lack of air circulation. Prolonged storage may also cause loss in viability of the seed bank in the stored topsoil. Soil fertility was identified as a key stakeholder

concern; highly productive soil was identified in several areas within the AOI. Most of the AOI is considered to have low to medium fertility.

Indirect impacts include ecological effects due to loss of seed bank diversity, effects on vegetation re-establishment (see habitats of conservation importance VEC, Section 8.2).

The pre-mitigation impact on soil structure, fertility and seed bank during construction is considered not significant because of the small magnitude, short duration and site-based extent of the potential impact.

Disturbance, Treatment and Management of Contaminated Soil

Impact: Mobilisation of soil contaminants

There is a risk that unidentified contaminated soil may be encountered during construction. Two potential impacts are associated with encountering contaminated soil during construction:

- direct risks to the health and safety of construction personnel (see workers' health, safety and welfare VEC, Section 8.16)
- indirect risks from mobilising contaminants into the wider environment, thereby contaminating previously clean soil with consequent potential indirect impacts on community water sources, agricultural land, flora and fauna.

In addition to the risk of encountering contaminated soil, the border of Uganda and Tanzania has been identified as a potential UXO area. At the time of writing, the Ugandan and Tanzania authorities are undertaking a survey to assess the UXO risk in the project area. Depending on the findings of the survey, a programme will be implemented to clear the area of UXOs.

The pre-mitigation impact of disturbance, treatment and disposal of contaminated soil during construction is considered not significant because of the small magnitude, short duration, and site-based extent of the potential impact.

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

Construction activities have the potential to produce soil contamination. The principal potential contaminants associated with the construction activities are:

- fuels and lubricating oils
- hazardous wastes
- welding wastes
- field coating materials
- paints and solvents.

Potential indirect impacts from contamination of soil include:

- impacts on the viability of terrestrial flora and fauna (see flora and fauna species of conservation concern VEC, Section 8.3)
- damage to the viability of aquatic vegetation and fish through contaminants leaching into watercourses (see flora and fauna species of conservation concern VEC, Section 8.3)

The pre-mitigation impact for solid and liquid waste disposal and accidental release of oil or chemicals during construction is considered not significant because of the small magnitude, short duration and site-based extent of the potential impact.

Management of Surplus Subsoil and Aggregate

Impact: Loss of soil structure, drainage, fertility and seed bank

If subsoil and aggregate are stored in areas where the topsoil has not been stripped before storage and the surplus subsoil and aggregate is not removed after construction, there could be adverse impacts on soil structure, fertility and the seed bank with consequent effects impacts on vegetation re-establishment and agricultural productivity. Offsite disposal at approved borrow and spoil pits of aggregate and surplus subsoil and aggregate and within project areas to be reinstated has the potential to cause impacts on the soil structure, fertility and seed bank of the receiving site.

The pre-mitigation impact for surplus subsoil and aggregate disposal during construction is considered not significant because of the small magnitude, transient duration and site-based extent of the potential impact.

Location-Specific Impacts

Location: Areas Sensitive to Soil Compaction

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity

Compaction of soil during construction will occur where and when the soil bearing strength is exceeded by the load of construction activities, for example, vehicle movements and pipe storage. The potential impacts associated with soil compaction described in the generic impacts section above apply.

Compaction-prone soil was identified at several locations along the RoW, for example, KP40 and KP260, and it is likely that additional areas will be identified before construction. Sand-dominated soil was identified at the sample locations closest to the MCPYs for example, KP40 (MCPY1), KP126 (MCPY2), KP200 (MCPY3) and KP288 (MCPY4), which suggests that these sites will be less prone to compaction. Clay soil is still likely to exist in certain areas at the MCPY and access road locations. When this soil is wet (i.e., during the wet season), it will be prone to compaction regardless of texture. Topsoil and subsoil will be stripped from all working areas before construction, so the impact will be limited to sites that are due to be reinstated.

The pre-mitigation impact for soil compaction during construction at the above locations is considered not significant because of the short duration and site-based extent, although the magnitude is potentially large.

Location: Area Sensitive to Soil Erosion

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

Construction, including removing vegetation, topsoil stripping and benching, will disturb soil structure and stability. The potential impacts associated with soil erosion described in the generic impacts section above apply.

A soil erosion classification study was conducted and described in Section 8.5.2.2. Highly erodible soil was identified at several locations along the RoW, for example, KP68.5, KP104.5 and KP221.5. No highly erodible soil types were identified at any of the locations close to the MCPYs. However, it is possible that additional areas of highly erodible soil exist at other locations.

The pre-mitigation impact for soil erosion during construction at the above locations is considered not significant because of the short duration and site-based extent, although the magnitude is potentially large.

As described in Section 2.3.6 and 2.4.6.1, the land required for facilities will be leased from the government. When the construction phase has been completed and after decommissioning, the leases will be surrendered and some of the facilities, such as the MCPYs and CF may be transferred to the government with some structures left in place.

Project-related construction phase location-specific impacts will be managed by the generic mitigation described in Section 8.5.3; there will not be any project-related location-specific impacts to soil once project-related construction activities are concluded, irrespective of whether the MCPYs and CF are retained by the government or reinstated.

8.5.2.2 Project Operation

Generic Impacts

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

As soil will be replaced during trench backfilling and reinstatement of the RoW and natural regeneration of vegetation allowed to occur, no potential impacts on soil are expected during project operation.

Following construction reinstatement, restoration of any soil cover to its original state will partially depend on the risk of erosion. Vegetation will eventually re-establish naturally, though it will take longer in areas with thin or erodible topsoil.

Soil stability at areas that exhibit active erosion could be exacerbated following AGI and pipeline construction activities or erosion could be triggered in areas with erosion potential. This may lead to erosion of the RoW and pipe trench following reinstatement, which would potentially cause displacement of the pipeline, thereby risking its integrity. Further information regarding management of pipeline integrity is provided in the project description (see Section 2.4.5).

During project operation, the only activity permitted on the RoW in agricultural areas will be grazing.

When the pipeline is operating, unmanned aerial vehicles will undertake regular patrols of the pipeline RoW. Driving along the RoW will be kept to a minimum and only allowed for maintenance and urgent security matters.

The pre-mitigation impact of soil erosion during project operation during project operation is considered not significant because of the site-based extent, although the magnitude is potentially large and the duration potentially long.

Location-Specific Impacts

Location: PS1 and PS2

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

Security personnel will be accommodated at PS1 and PS2. At these locations there will be the need to dispose of small quantities of treated sewage, waste water and domestic waste, and very small quantities of chemicals and fuel for maintenance activities that could contaminate soil if spilled.

There will also be some surface water runoff from concreted areas on the sites that has the potential to contaminate soil through accidental release of oil and chemicals and to potentially cause localised flooding (see Section 8.5.2.1). Potential indirect impacts could occur on surface water (see Section 8.6.2) and groundwater (see Section 8.7.2).

The pre-mitigation impact of solid and liquid waste disposal and accidental release of oil or chemicals during project operation is considered not significant because of the small magnitude and site-based extent of the potential impact although the duration is potentially long.

8.5.3 Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect soil.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plans and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.5.3.1 Design

Design, routing and siting measures to avoid or minimise project impacts on soil are described in Section 2.2, Section 2.3 and Section 3.

8.5.3.2 Construction

Generic Impacts

Use of Raw Materials and Natural Resources

Impact: Depletion of natural resources, for example, aggregate

The waste management plan and the natural resource management plan will include measures that contribute to the management of natural resource use.

Excavated materials will be screened and reused where possible and new aggregate extraction sites will undergo environmental and social evaluation before development.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent and long duration, although the magnitude is reduced to negligible.

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity

The soil management plan and the community health, safety and security plan will include measures that contribute to the management of compaction.

During construction, local communities will be discouraged from using the RoW for transportation. Ground protection such as bogmats and geotextile fabric will be used to support heavy loads where ground is soft. The soil management plan and reinstatement plan will include procedures to reduce and control compaction. Stockpiled topsoil will be monitored for compaction and corrective action implemented if required; stockpiled topsoil areas will be free draining and include gaps to allow passage of floodwater.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

The soil management plan and the community health, safety and security plan will include measures that contribute to the management of erosion.

During construction, local communities will be discouraged from using the RoW as an access track. Ground protection such as bogmats and geotextile fabric will be used to support heavy loads where ground is soft. The soil management plan and reinstatement plan will include procedures to reduce and control erosion. Stockpiled topsoil will be monitored for weeds and compaction and corrective action implemented if required; stockpiled topsoil areas will be free draining and include gaps to allow passage of floodwater.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Development of anaerobic conditions in stored soil and mixing of different soil or soil with foreign materials leading to loss of drainage and fertility

The soil management plan will include measures that contribute to the management of loss of soil productivity.

Stockpiled topsoil will be monitored for weeds and compaction and corrective action implemented if required. Stockpiled topsoil and subsoil areas will be free draining and include gaps to allow passage of floodwater.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and a site-based extent, although the magnitude is reduced to negligible.

Disturbance, Treatment and Management of Contaminated Soil

Impact: Mobilisation of soil contaminants

The pollution prevention plan and the reinstatement plan will include measures that contribute to the management of soil contamination.

Areas of surface contamination identified before construction within the project footprint will be remediated before or during project construction. Contaminated material will be temporarily stored in impermeable bunds and covered to prevent runoff and airborne losses.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and a site-based extent, although the magnitude is reduced to negligible.

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

The pollution prevention plan and the waste management plan will include measures that contribute to the management of impacts from waste management and accidental substance releases.

In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and site-based extent, although the magnitude is reduced to negligible.

Surplus Subsoil and Aggregate

Impact: Loss of soil structure, drainage, fertility and seed bank

The waste management plan will include measures that contribute to the surplus soil materials.

Disposal of surplus subsoil and aggregate will be subject to environmental and social evaluations to identify suitable offsite disposal sites to avoid impacts on soil structure, drainage, fertility and seed bank at potentially affected sites.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and site-based extent, although the magnitude is reduced to negligible.

Location-Specific Impacts

Location: Areas Sensitive to Soil Compaction

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity.

The generic mitigation for soil compaction described in Section 8.5.3.2 will contribute to the management of compaction; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Location: Areas Sensitive to Soil Erosion

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

The generic mitigation for soil erosion described in Section 8.5.3.2 will contribute to the control of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

8.5.3.3 Operation

Generic Impacts

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

The reinstatement plan and biodiversity management plan will include measures to reduce and control erosion during operation and explore ways to achieve an increasing trend in vegetation regrowth and diversity of desired species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Location-Specific Impacts

Location: PS1 and PS2

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

The pollution prevention plan and the waste management plan will include measures that contribute to the management of impacts from waste management and accidental substance releases, including spill response procedures, management of hazardous materials and a requirement for wastewater discharges to comply with permit conditions and project environmental standards.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a long duration and site-based extent, although the magnitude is reduced to negligible.

8.5.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on soil after mitigation measures have been implemented.

Table 8.5-1 summarises the potential generic soil impacts, the proposed mitigation measures and the significance of the residual impacts after implementation of the mitigation measures. Table 8.5-2 summarises the location-specific impacts.

8.5.4.1 Generic Impacts

The residual impacts of the following are considered not significant after mitigation measures are assumed to be implemented:

- use of raw materials and natural resources
- soil compaction
- soil erosion
- loss of soil structure, fertility and seed bank

- disturbance, treatment and disposal of contaminated soil
- management of solid and liquid waste and accidental release of oil or chemicals
- disposal of surplus subsoil and aggregate
- flooding
- disruption of irrigation or drainage infrastructure.

8.5.4.2 Location-Specific Impacts

With the implementation of the planned mitigation measures, no significant residual location-specific impacts to soil are predicted.

8.5.4.3 Ecosystem Services

Section 6.4.2.1 identifies ecosystem services associated with soil in the AOI. The following ecosystem services have been assessed in Sections 8.5.2 and 8.5.3:

- aggregates and topsoil
- soil quality
- water storage
- water flow control.

With the implementation of the planned mitigation measures, there are no predicted significant residual impacts on the above services.

Table 8.5-1 Soil – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S*	SS
Use of raw materials and natural resources	Depletion of natural resources, for example, aggregate	C	–	Waste Management Plan Natural Resource Management Plan	2	2	1	1–3	6–8
Soil compaction	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity	C	–	Soil Management Plan Community Health, Safety and Security Plan	6	1	1	1–3	9–11
Soil erosion	Loss of topsoil causing soil erosion and impaired reinstatement	C	–	Soil management plan Community health, safety and security plan	6	4	1	1–3	12–14
		O		Reinstatement plan Biodiversity management plan					
Loss of soil structure, fertility and seed bank	Development of anaerobic conditions in stored soil Mixing of different soil types or soil containing foreign materials leading to loss of drainage and fertility	C	Y	Soil Management Plan	2	2	1	1–4	6-9

NOTES: *Soil sensitivity varies considerably throughout the AOI (see Section 6.4.2.1); the amount of variation means it is not practicable to separate out all the locations based on sensitivity, so the full range (very low to very high) has been included.
C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.5-1 Soil – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S*	SS
Disturbance, treatment and management of contamination	Mobilisation of soil contaminants	C	–	Pollution Prevention Plan Reinstatement Plan	2	1	1	3	7
Management of waste and accidental release of oil or chemicals	Soil contamination	C	–	Pollution Prevention Plan	2	1	1	3	7
		O	–	Waste Management Plan	2	2	1	3	8
Management of surplus subsoil and aggregate	Loss of soil structure, drainage, fertility and seed bank	C	–	Waste Management Plan	2	1	1	1–3	5–7

NOTES: *Soil sensitivity varies considerably throughout the AOI (see Section 6.4.2.1); the amount of variation means it is not practicable to separate out all the locations based on sensitivity, so the full range (very low to very high) has been included.
C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.5-2 Soil – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S[1]	SS
All locations sensitive to soil compaction	Soil compaction	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity	C	–	Biodiversity Management Plan Community Health, Safety and Security Plan Transport and Road Safety Management Plan	6	1	1	4–5	12–13
All locations sensitive to soil erosion	Soil erosion	Loss of topsoil causing reduced fertility and impaired reinstatement	C	–	Soil Management plan Reinstatement Plan	6	4	1	5	16

NOTES: *Soil sensitivity varies considerably throughout the AOI (see Section 6.4.2.1); the amount of variation means it is not practicable to separate out all the locations based on sensitivity, so the full range (very low to very high) has been included.
C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.5.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.5.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the soil VEC is negligible and no further mitigation measures other than those described in Section 8.5.3 are considered necessary.

8.5.6.1 Transboundary Cummulative Impacts

There are no transboundary cumulative impacts affecting soils.

8.6 Surface Water

This section describes potential impacts on surface water during construction, commissioning and operation of the Uganda EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on surface water, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.6.1 Key Sensitivities and Considerations

The surface water baseline conditions are described in Section 6.4.2.2 as well as:

- surface water key valued environmental and social components (VEC) and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the surface water impact assessment.

Sensitivity rankings for surface water range from very low to high. High sensitivities include:

- change in the Wambabya River flow regime, as hydroelectricity is generated at the Kabalega hydropower plant about 25 km downstream of the pipeline crossing (KP15.4)
- change of the Jemakunya River channel about 0.1 km downstream of the pipeline at KP289, as a relatively narrow zone of riparian vegetation protects the riverbanks from erosion and instability
- change in the watercourse that may receive drainage from the access roads to main camp and pipe yard (MCPY) 2 and pumping station (PS) 2, and in the watercourses that may receive drainage from facilities PS2 and MCPY3 since these undefined channels in uncohesive materials are protected only by scrub vegetation, and so are at risk from erosion.

- change in water quality in the Katonga (KP164.7) and Kibale Rivers (KP274.1), with swamp channel vegetation, as water quality is considered and confirmed to be very good (i.e., occasionally within national potable water specification standards for natural water) in these relatively sparsely settled catchments
- change in water quality in ephemeral watercourses crossed by the project roads to PS1, MCPY2 and PS2, as water quality is considered and confirmed to be very good (i.e., occasionally within national potable water specification standards for natural water) in these relatively sparsely settled catchments
- change of water quality in ephemeral watercourses that may receive drainage from project facilities MCPY1, PS2, MCPY3 and MCPY4, as the water quality is considered very good (i.e., occasionally within national potable water specification standards for natural water) in these relatively sparsely settled catchments.

Key considerations include:

- flow in watercourses
- river channel morphology and stability
- water and sediment quality and sensitivity to contamination.

Section 6.4.2.2 identifies ecosystem services associated with surface water in the EACOP area of influence (AOI). The regulation of flood flows and water quality ecosystem service is considered in this section.

Surface water also provides the following ecosystem services that are considered in other sections:

- provision of water for people, livestock and agriculture (see Section 8.13)
- supporting biodiversity (see Section 8.2).

8.6.2 Potential Project Impacts

8.6.2.1 Construction

Generic Impacts

Erosion

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

Direct impacts from erosion-causing and sediment-generating activities may occur during construction, including from vegetation removal, topsoil stripping and benching (see soil VEC, Section 8.5.2).

When bare soil is exposed to rain splash, fine particles may seal the surface, reducing the infiltration rate below the rainfall rate, causing sheet overland flow and sheet soil erosion. Where sheet flow is concentrated, rills and gullies may be eroded. Where runoff from a site reaches a watercourse, the flow rate may increase above baseline conditions and sustained higher flow rates may increase channel bed and bank erosion, channel instability and suspended sediment.

Sediment suspended in runoff from construction areas may be transported to downstream VECs. It may also be released to watercourses during soil handling,

using vehicles in watercourses and during the excavation of trenches for foundations and services (e.g., for water supply pipes).

Sediment reduces light levels within the water column and can therefore have an indirect impact on aquatic biodiversity (see biodiversity VEC, Section 8.2). High suspended sediment concentrations can also make watercourses unsuitable as drinking water sources. However, at watercourses where vegetation is present this will act as a sediment filter, reducing suspended sediment concentrations.

Activities with similar direct impacts, include the excavation of the pipeline trench, wet and dry open-cut watercourse crossings, and the excavation of trenches for building foundations and services.

Open-cut crossings may affect the stability of the bed and banks of watercourses formed in uncohesive alluvial material. Natural processes of channel erosion and deposition may be exacerbated, resulting in an indirect impact on agricultural land (see land-based livelihoods VEC, Section 8.13).

Many watercourses in the AOI are protected from erosion by riparian vegetation.

The pre-mitigation impact for erosion and increased suspended sediment in watercourses during construction is considered not significant because of the small magnitude, short duration and local extent of the potential impact, even though surface water sensitivity is moderate to high.

The potential for increased erosion and suspended sediment to affect highly sensitive watercourses is identified in the location-specific section.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

There is the potential for direct impacts on surface water quality in receiving watercourses from the following sources:

- the management of solid and liquid waste generated during the construction process and MCPY operation
- the management of surplus water (trench water) from working areas
- the accidental release of oil or chemicals during construction.

The principal potential contaminants associated with the construction activities are:

- fuel and lubricating oils
- hazardous waste
- paints and solvents
- high pH runoff from concrete batching areas.

Surface water contamination may increase downstream substance concentrations with indirect impacts on water supplies for drinking and domestic use (see social VECs, Section 8.11), aquatic biodiversity (see biodiversity VECs, Section 8.2) and agricultural land (see land-based livelihoods VEC, Section 8.13).

Most rivers considered in this study have good water quality and therefore have moderate or high sensitive to contamination depending on the density of settlement in their catchments. Most rivers are used as sources of water for washing, bathing, and watering of livestock.

The pre-mitigation impact for the management of liquid waste and surplus water, and the accidental release of oil or chemicals in watercourses during construction is considered not significant because of the small magnitude, transient duration and local extent of the potential impact.

The potential for contamination of highly sensitive watercourses is identified in the location-specific section.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

During the construction of watercourse crossings, the contractor may need to temporarily impede flow. There is potential for direct impact on water quality, mainly as a result of downstream scour, which can increase turbidity and suspended-sediment concentrations with indirect impacts on water supplies for drinking and domestic use (see social VECs, Section 8.11), aquatic biodiversity (see biodiversity VECs, Section 8.2), channel morphology (see above) and possibly agricultural land (see land-based livelihoods VEC, Section 8.13).

Specific locations where flow may need to be impeded will be identified at the time of construction.

The pre-mitigation impact for water-quality deterioration at sites of impeded flow during construction is considered not significant because of the negligible magnitude, transient duration and local extent of the potential impact.

Altered Drainage Pattern

Impact: Trench can act as conduit for groundwater, draining higher areas and flooding lower areas

Surface flooding may occur in new areas if the drainage pattern is altered. This may occur where stockpiled soil redirects floodwaters from the normal flow direction. On sloping ground, the pipeline trench may intercept groundwater and alter drainage patterns.

Specific locations where the drainage pattern may be altered are not known.

The pre-mitigation impact for flooding from an altered drainage pattern during construction is considered not significant because of the negligible magnitude, short duration and local extent of the potential impact, and low sensitivity of the VEC.

Location-Specific Impacts

Erosion and Increased Suspended Sediment in Watercourses

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

Locations-specific impacts from erosion-causing and sediment-generating activities may occur during construction, with the direct impacts described in the generic impact section above.

The baseline study identified the following watercourses as being particularly sensitive to erosion:

- the ephemeral watercourse crossed by the existing road upgrade (ERU) connecting MCPY2 (KP126) to the RoW (ERU-MCPY2) at road KP1
- the watercourse crossed by the ERU to PS2 (ERU-PS2) at road KP0.5
- the ephemeral watercourse at PS2 (KP185)
- the watercourse to the southwest of PS2 and watercourses to the northeast and southwest of MCPY3 (KP191)
- the Jemakunya River crossing at KP289.3.

Open-cut crossings on these rivers may increase their lateral mobility (change in channel position through bed and bank erosion, and sediment deposition). This could increase the rate of cultivated-land loss (potentially impacting livelihoods of affected farmers).

The pre-mitigation impact for erosion and increased suspended sediment at the above locations during construction is considered not significant because of the medium magnitude, short duration and local extent of the potential impact.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

There is potential for direct impacts on surface water quality during construction, as a result of waste management and accidental release of oil or chemicals with the direct impacts described in the generic impact section above.

This risk exists mainly at construction facilities due to the longer duration of construction activity at these locations than on the ROW. The baseline study identified the following watercourses crossed by the pipeline as being particularly sensitive to contamination:

- the ephemeral floodplain east of MCPY1 (KP40)
- the ephemeral watercourse northeast of MCPY3 (KP191)
- the ephemeral watercourse southwest of MCPY3 (KP191)
- the ephemeral floodplain southeast of MCPY4 (KP283).

The baseline study identified the following watercourses crossed by roads as being highly sensitive to contamination owing to the sparsely settled nature of their catchments and likely good water quality, those on roads:

- PS1 (KP0) at road KP2.5
- the RoW from MCPY2 (KP126) at road KP1.0
- PS2 (KP185) at road KP0.5.

The baseline study also identified the ephemeral watercourse at PS2 (KP185) as being particularly sensitive to contamination, as the rural and sparsely settled catchment has very good water quality (i.e., occasionally within national potable water specification standards for natural water).

The pre-mitigation impact from the management of liquid waste and the accidental release of oil or chemicals in the above watercourses during construction is considered not significant because of the small magnitude, transient duration and local extent of the potential impact, even though surface water has a moderate to high sensitivity to contamination.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

Direct impacts on surface water quality may occur where flow is impeded by the construction of access roads across watercourses. This can cause downstream scour, which can increase turbidity and suspended-sediment concentrations with indirect impacts on water supplies for drinking and domestic use (see social VECs, Section 8.11), aquatic biodiversity (see biodiversity VECs, Section 8.2), channel morphology (see above) and possibly agricultural land (see land-based livelihoods VEC, Section 8.13).

Flow will only be impeded where the minor ephemeral streams are crossed by access roads during times of flow.

The pre-mitigation impact for water quality deterioration at sites of impeded flow during construction is considered not significant because of the negligible magnitude, transient duration and site-based extent of the potential impact, even though surface water has a moderate to high sensitivity to contamination of the VEC.

Surface Water Use

Impact: Decreased water level due to abstraction for project use

During pre-commissioning, the pipeline will be hydrotested as described in Sections 2.4.4.2 and 2.4.4.3. Surface water abstraction could cause a reduction in water level, flow or volume, depending on the waterbody from which water is abstracted.

The plan will be to abstract water from a source large enough such that the withdrawal volumes requirements will be negligible, relative to the volume of water in the waterbody, such as Lake Albert or Lake Victoria. Even though the impact is expected to have a negligible magnitude, transient duration, and very localised extent, in the absence of a defined water source, the significance of the impact of abstraction is indeterminable.

Hydrotest Water Disposal

Impact: Deterioration of water quality

Disposal of the hydrotest water may impact the quality of the receiving water, depending on the waterbody receiving the discharge.

Potential receiving surface locations or waterbodies will be identified in the above-noted hydrotest management plan. Even though the impact is expected to have a transient duration and localised extent, in the absence of a defined receiving waterbody, the significance of the impact of abstraction is indeterminable.

8.6.2.2 Operation

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

There is potential for direct impact on surface-water quality from the following sources:

- the management of solid and liquid waste generated during operations
- the management of black water (e.g., sewage) and grey water
- the accidental release of oil or chemicals during refilling of storage tanks and maintenance.

All the watercourses have good water quality and are therefore sensitive to contamination. Most rivers are used as sources of water for a predominantly rural population and their livestock.

Surface water contamination may increase downstream pollutant concentrations with indirect impacts on aquatic biodiversity (see social VECs, Section 8.14), aquatic biodiversity (see biodiversity VEC, Section 8.3) and agricultural land (see land-based livelihoods VEC, Section 8.13).

The pre-mitigation impact from the management of liquid waste and the accidental release of oil or chemicals during operation is considered not significant because of the small magnitude, short duration and local extent of the potential impact.

Location-Specific Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The baseline study identified the ephemeral watercourse southwest of PS2 (KP185) as having a high sensitivity to contamination owing to the sparsely settled nature of the catchment and likely good water quality.

The pre-mitigation impact for the management of liquid waste and the accidental release of oil or chemicals during operation is considered not significant because of the small magnitude, short duration and local extent of the potential impact.

8.6.3 Mitigation Measures

This section describes avoidance and mitigation measures that will be applied to the aspects and activities that could affect surface water.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.6.3.1 Design

Design, routing and siting measures to avoid or reduce impacts of the project on surface water are described in Sections 2.2, 2.3 and 2.4.

8.6.3.2 Construction

Generic Impacts

Erosion

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

The soil management plan and reinstatement plan will include procedures to reduce and control erosion and compaction through measures developed for soil handling and management, topsoil stripping and storage, sediment interception, a strategy for tree removal and replanting and progressive, active, habitat restoration where required. Additionally, location-specific method statements for open-cut watercourse crossings will be prepared where necessary; requirements such as segregation of bed and bank material; retention of as much riparian vegetation as possible and maintaining environmental base flows downstream of water crossings will be included.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a local extent and short duration, although the magnitude is reduced to negligible.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The soil management plan, reinstatement plan and the waste management plan will include measures that contribute to the management of impacts from waste management and accidental releases.

An environmental and social evaluation of treated effluent discharge locations will be undertaken; treated effluent which is not reused will be preferentially discharged to land. Grey water will be separated from black water, treated in accordance with the project environment standards, treated wastewater will be reused where possible or discharged as per permit conditions. Kitchen facilities will be fitted with industry standard grease traps. In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a local extent and transient duration, although the magnitude is reduced to negligible.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

The biodiversity management plan, soil management plan and the pollution prevention plan will include measures that collectively contribute to the management of water quality deterioration.

Vehicles and equipment will cross watercourses after installation of appropriately sized temporary culverts and bridging structures. During open-cut river crossings, bed and bank material will be stored away from active water channels and, where necessary, river crossing method statements will be developed. Bathing or washing clothes, vehicles and equipment by project employees will be prohibited in watercourses.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a negligible magnitude and transient duration, although the extent is reduced to site based.

Altered Drainage Pattern

Impact: Trench can act as conduit for groundwater, draining higher areas and flooding lower areas

The reinstatement plan will describe where trench breakers will be installed in the pipeline trench.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a negligible magnitude and local extent, although the duration is reduced to transient.

Location-Specific Impacts

Erosion and Increased Suspended Sediment in Watercourses

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

The generic mitigation addressing erosion described in Section 8.6.3.2 will contribute to the management of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and local extent, although the magnitude is reduced to small.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The generic mitigation addressing surface water contamination described in Section 8.6.3.2 will contribute to the management of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and local extent, although the magnitude is reduced to negligible.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

The generic mitigation addressing deterioration of water quality described in Section 8.6.3.2 will contribute to the management of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude is reduced to medium.

Surface Water Use

Impact: Decreased water level due to abstraction for project use

The generic mitigation for decreased water level described in Section 8.6.3.2 will manage water level; no additional mitigation is required.

Water sources will be confirmed in the hydrotest management plan, a subplan of the water management plan which will be produced in later project phases. Mitigation measures for potential abstraction impacts will be developed and included in the hydrotest management plan. The mitigation measures will be submitted as part of the surface water abstraction permit application to the relevant water authority with jurisdiction over the planned water abstractions.

Even though the pre-mitigation impact is expected to have a negligible magnitude, transient duration, and very localised extent, as water sources are yet to be defined, with the mitigation measures in the hydrotest management plan the residual impact is expected to be not significant.

Hydrotest Water Disposal

Impact: Deterioration of water quality

The natural resource management plan, pollution prevention plan and hydrotest management plan will include procedures to manage hydrotest water disposal during construction.

Mitigation measures for potential impacts on water quality of receiving waters will be developed and included in the hydrotest management plan. Mitigation measures will be included in the application for discharge approval.

Even though the pre-mitigation impact is expected to have a negligible magnitude, transient duration, and very localised extent, as receiving water bodies are yet to be defined, with the mitigation measures in the hydrotest management plan the residual impact is expected to be not significant.

8.6.3.3 Operation

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The pollution prevention plan, waste management plan and the emergency preparedness and response plan will include procedures to manage impacts from waste management and accidental release of oil or chemicals during operation.

In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and local extent, although the magnitude is reduced to negligible.

Location-Specific Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The generic mitigation addressing contamination of surface water described in Section 8.6.3.2 will contribute to the management of accidental releases; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and local extent, although the magnitude is reduced to negligible.

8.6.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on surface water after mitigation measures have been implemented, focusing on those impacts that are significant.

Table 8.6-1 summarises the potential generic surface water impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.6-2 summarises location-specific impacts.

8.6.4.1 Generic Impacts

The residual impacts of the following are considered not significant after mitigation measures are implemented:

- erosion of river or channel banks, scour and surface water sediment contamination
- surface water contamination from waste management and the accidental release of oil or chemicals;

- water-quality deterioration owing to impeded flow in channels
- flooding due to altered drainage patterns.

8.6.4.2 Location-Specific Impacts

The residual impacts of the following are considered not significant after relevant mitigation measures are implemented:

Construction

Erosion and increased suspended-sediment concentrations in:

- the ephemeral watercourse crossed by the existing road upgrade (ERU) connecting MCPY2 (KP126) to the RoW (ERU-MCPY2) at road KP1
- the ephemeral watercourse crossed by the ERU to PS2 (ERU-PS2, KP185) at road KP0.5
- the ephemeral watercourse to the northeast of MCPY3 (KP191)
- the ephemeral watercourse to the southwest of MCPY3 (KP191)
- the ephemeral floodplain southeast of MCPY4 (KP283)
- the Jemakuriya River, which crosses the pipeline at KP289.3
- the ephemeral watercourse crossed by the existing road upgrade (ERU) connecting MCPY2 (KP126) to the RoW (ERU-MCPY2) at road KP1
- the watercourse crossed by the ERU to PS2 (ERU-PS2) at road KP0.5
- the hill-slopes draining to the east and north of MCPY3 (KP191.5)
- the wetland at MCPY4 (KP288).

Surface water contamination as a result of the disposal of waste and the accidental release of oil or chemicals at:

- road KP2.5, PAR-PS1 (KP0)
- road KP1.0, the RoW from MCPY2 (KP126)
- road KP0.5, ERU-PS2 (KP185)
- ephemeral floodplain east of MCPY1 (KP40)
- ephemeral watercourse northeast of MCPY3 (KP191)
- ephemeral watercourse southwest of MCPY3 (KP191)
- ephemeral floodplain southeast of MCPY4 (KP283)
- ephemeral floodplain 70 m from MCPY1 (KP40)
- the hill-slopes east and north of MCPY3 (KP191.5)
- the wetland 70 m south of MCPY4 (KP288).

Derogation of the water resource for other users by abstraction of surface water for hydrotesting from:

- Lake Albert and Lake Victoria.

Contamination of unidentified watercourses through:

- the disposal of hydrotest water.

Operations

Contamination of surface water as a result of the disposal of waste and the accidental release of oil or chemicals at:

- the ephemeral watercourse at PS2 (KP185).

Table 8.6-1 Surface Water – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Erosion	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters	C&O	-	Soil management plan Reinstatement plan	2	2	2	3–4	9–10
Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water	C	Y	Soil management plan Reinstatement plan Waste management plan	2	1–2	2	3–4	8–10
			O	Y	Pollution prevention plan Waste management plan Emergency preparedness and response plan	2	2–4	1–2	3–4	9–10
Impeded flow of river or channel	Surface water	Deterioration of water quality	C	Y	Biodiversity management plan Soil management plan Pollution prevention plan	2	1	1	3–4	7–8
Altered drainage pattern	Surface water	Trench can act as conduit for groundwater, draining higher areas and flooding lower areas	C&O	Y	Reinstatement plan	2	2	1	2	7

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.6-2 Surface Water – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
							M	D	E	S	SS
KP0 PAR-PS1, road KP2.5 KP40 MCPY1 KP126 ERU-MCPY2 at road KP1.0 KP185 ERU-PS2 at road KP0.5 KP191 MCPY3 KP283 MCPY4	Management of waste and accidental release of oil or chemicals during development of construction facilities	Surface water	Contamination of surface water	C	Y	Soil Management Plan Reinstatement Plan Waste Management Plan	2	1	2	3	8
KP126. ERU-MCPY2 at road KP1.0. KP185 ERU-PS2 at road KP0.5 KP191 MCPY3 KP283 MCPY4 KP289.3 Pipeline crossing	Erosion and increased suspended sediment in watercourses	Surface Water	Erosion of river or channel banks, scour and sediment contamination of surface waters	C	-	Reinstatement Plan Soil Management Plan	2	1	1	3	7

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.6.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.6.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the surface water VEC is negligible and no further mitigation measures other than those described in Section 8.6.3 are considered necessary.

8.6.6.1 Transboundary Cummulative Impacts

There are no transboundary cumulative impacts surface water.

8.7 Groundwater

This section includes potential impacts on groundwater during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on groundwater, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.7.1 Key Sensitivities and Considerations

The groundwater baseline conditions are described in Section 6.4.2.3, as well as:

- groundwater key valued environmental components (VEC) and their sensitivity ranking based on Table D11in Appendix D
- key considerations for the groundwater impact assessment.

Sensitivity in the groundwater area of influence (AOI) ranges from moderate to very high.

Key considerations include:

- In all districts, groundwater is the most important source of public water supply. Shallow wells and boreholes are the primary source of water for over 60% of the population in all districts.
- Groundwater will continue to be a principal source of water for the population in all districts.

Section 6.4.2.3 identifies ecosystem services associated with groundwater in the EACOP AOI including:

- provision of freshwater for community use (see community health VEC, Section 8.18)
- supporting aquatic and riparian habitats and wildlife, both directly (where groundwater feeds wetlands) and indirectly (where groundwater maintains surface water flows) (see biodiversity VECs, Section 8.2).

8.7.2 Potential Project Impacts

8.7.2.1 Construction

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

Potential direct impacts on groundwater quality may occur due to the storage, transportation, treatment and disposal of solid and liquid waste, chemicals and fuel. These impacts on groundwater quality may lead to indirect impacts associated with the need to use alternative water sources or restricted access to existing sources such as increased costs with consequent impacts on livelihoods (see socio-economic and health VECs, Section 8.14).

The pre-mitigation impact of waste management and accidental release of oil or chemicals during construction is considered not significant because the magnitude is negligible, the duration is transient and the extent is site based.

Location-Specific Impacts

Location: All MCPYs, PS1 and PS2

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

Potential direct impacts on groundwater quality may occur due to the storage, transportation, treatment and disposal of solid and liquid waste, chemicals and fuel.

These impacts on groundwater quality may lead to indirect impacts associated with the need to use alternative water sources or restricted access to existing sources such as increased costs with consequent impacts on livelihoods (see socio-economic and health VECs, Section 8.14).

The sensitivity of groundwater is ranked as very high at PS2 and MCPY3, high at PS1 and MCPY1 and MCPY4 and moderate at MCPY2.

The pre-mitigation impact for the management of waste and accidental release of oil or chemicals during construction is considered not significant because the magnitude of the impact is ranked as small, the duration is transient and the extent is the site.

Location: All MCPYs, PS1 and PS2

Management of Black and Grey Water

Impact: Contamination of groundwater

Black water is waste water from bathrooms and toilets that contains faecal matter and urine. Also called sewage or brown water, it can carry disease-causing bacteria that are harmful to humans. Grey water is waste water that comes from sinks, washing machines, bathtubs and other site activities.

Black water from camp facilities used during the development of the MCPYs and grey water from vehicle washdown areas, roads and hardstanding will be produced and will be treated and disposed of as outlined in the project description (see Section 2). Potential direct impacts on groundwater quality may occur through inappropriate disposal practices such as the use of pit latrines. This may lead to indirect impacts on other groundwater users, including the need to use alternative water sources or restricted access to existing sources with consequent increased costs and impacts on livelihoods (see socio-economic and health VECs, Section 8.18).

The pre-mitigation impact for the management of black and grey water during development of construction facilities is considered not significant because the magnitude is ranked as small, the duration is transient and the extent is local.

Location: All MCPYs, PS1 and PS2

Abstraction of Groundwater

Impact: Decreased water level due to abstraction for project use

The abstraction of groundwater to supply MCPYs may have a direct impact on the water table near the well through drawdown, which may have an indirect impact on the yield of nearby boreholes and wells. In all the districts that the pipeline traverses, groundwater is the most important source of public water supply, so abstraction in districts where MCPYs are located may indirectly affect communities (see socio-economic and health VECs, Section 8.18) and ecosystems (see biodiversity VECs, Section 8.2).

The pre-mitigation impact for the abstraction of groundwater during construction, based on currently available information on the planned abstraction is ranked as not significant because for all MCPYs the magnitude is ranked as small the duration is transient and the extent is local.

As described in Section 2.3.6 and 2.4.6.1, the land required for facilities will be leased from the government. When the construction phase has been completed and after decommissioning, the leases will be surrendered and some of the facilities, such as the MCPYs may be transferred to the government with some structures left in place. Project-related construction phase location-specific impacts will be controlled by the generic mitigation described in Section 8.6.3. It is expected pumps and power supply will be removed and the wells decommissioned; there will not be any project-related location-specific impacts to groundwater once project related construction activities are concluded irrespective of whether the MCPYs are retained by the government or reinstated.

8.7.2.2 Operation

Generic Impacts

It is considered that there are no potential generic impacts from normal operation. The impacts from abnormal operations and unplanned events are described in Section 9.

Location-Specific Impacts

Location: PS1 and PS2

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

Direct impacts on groundwater quality may occur from the management of solid and liquid waste and accidental releases during the operation of the AGIs.

The pre-mitigation impact of waste management and accidental release of oil or chemicals during pipeline and AGI operation is considered not significant. This is because the magnitude is negligible and the extent is site based.

Location: PS1 and PS2

Abstraction of Groundwater

Impact: Decreased water level due to abstraction for project use

Direct impacts on groundwater availability may occur from abstracting groundwater at the AGIs.

The pre-mitigation impact of groundwater abstraction during pipeline and AGI operation is considered not significant. This is because the magnitude is small, the extent is local and the duration long.

8.7.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect groundwater.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance

8.7.3.1 Design

Design, routing and siting measures to avoid or reduce project impacts on groundwater are described in Sections 2.2, 2.3 and 2.4.

8.7.3.2 Construction

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Potential for groundwater contamination if disposal is uncontrolled

The waste management plan, pollution prevention plan and natural resource management plan will include measures that collectively contribute to the management of impact from the management of solid and liquid waste and accidental releases.

Grey water will be separated from black water, treated in accordance with the project environment standards, treated wastewater will be reused where possible or discharged as per permit conditions. Kitchen facilities will be fitted with industry standard grease traps. The waste management plan will identify requirements for waste collection, storage, transfer and disposal. An environmental and social evaluation of treated effluent discharge locations will be undertaken; treated effluent which is not reused will be discharged to land.

In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, transient duration and negligible magnitude.

Location-Specific Impacts

Location: All MCPYs, PS1 and PS2

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

The pollution prevention plan, waste management plan and the emergency preparedness and response plan will include measures to manage solid and liquid waste and accidental releases during construction; relevant measures are outlined above.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude will be reduced to negligible.

Location: All MCPYs, PS1 and PS2

Management of Black and Grey Water

Impact: Contamination of groundwater

The waste management plan and the pollution prevention plan will include measures that collectively contribute to the management of impact from management of black and grey water.

Grey water will be separated from black water, treated in accordance with the project environment standards, treated wastewater will be reused where possible or discharged as per permit conditions. Kitchen facilities will be fitted with industry standard grease traps. Contingency will be provided for wastewater treatment plant maintenance.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude will be reduced to negligible.

Location: All MCPYs, PS1 and PS2

Abstraction of Groundwater

Impact: Decreased water level due to abstraction for project use

The natural resource management plan and hydrotest management plan will describe measures that will be undertaken to evaluate the potential impact on local groundwater abstraction points, such as the undertaking of hydrogeological evaluations; if significant adverse impacts are predicted by these evaluations then alternative borehole locations will be considered; the water quality and sustainability of water abstracted from either new or existing boreholes will be monitored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude will be reduced to negligible.

Project Operation

Location-Specific impacts

Location: PS1 and PS2

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Potential for groundwater contamination

The natural resource management plan will describe the stormwater drainage to be provided at aboveground installations. The pollution prevention plan and waste management plan will include measures to manage solid and liquid waste and accidental release of oil and chemicals. The waste management plan will identify requirements for waste collection, storage, transfer and disposal.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a

transient duration and site-based extent, although the magnitude will be reduced to negligible.

Location: PS1 and PS2

Abstraction of Groundwater

Impact: Decreased water level due to abstraction for project use

The generic mitigation for decreased water level described in Section 8.7.3.2 will contribute to the management of abstraction of groundwater; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the potential impact will still have a long duration and local extent, although the magnitude will be reduced to negligible.

8.7.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on groundwater after mitigation measures have been implemented and focuses on those impacts that are significant (scoring 19 or more).

Table 8.7-1 summarises the potential generic groundwater impacts, proposed mitigation measures and the significance of the residual impacts after implementation of the mitigation measures. Table 8.7-2 summarises the location-specific impacts.

The residual impact of the following is considered not significant:

- management of solid and liquid waste
- management of black and grey water
- abstraction of groundwater
- accidental release of oil or chemicals.

Table 8.7-1 Groundwater – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
						M	D	E	S	SS
Management of waste and accidental release of oil or chemicals	Groundwater	Potential for groundwater contamination	C&O	–	Waste Management Plan Pollution Prevention Plan Natural Resource Management Plan Emergency Preparedness and Response plan	2	1	1–2	5	9–10

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.7-2 Groundwater – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
							M	D	E	S	SS
PS1, PS2 MCPY1, MCPY2, MCPY3, MCPY4	Management of waste and accidental release of oil or chemicals	Groundwater	Potential for groundwater contamination	C	Y	Pollution Prevention Plan Waste Management Plan	2	1	1	4	8
PS1, PS2 MCPY1, MCPY2, MCPY3, MCPY4	Management of black and grey water	Groundwater	Contamination of groundwater	C	Y	Pollution Prevention Plan Waste Management Plan	4	1	2	4	11
PS1, PS2 MCPY1, MCPY2, MCPY3, MCPY4	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use	C	Y	Natural Resource Management Plan	2	1	1	4	8

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.7.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.7.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the groundwater VEC is negligible and no further mitigation measures other than those described in Section 8.7.3 are considered necessary.

8.7.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on groundwater.

8.8 Landscape

This section includes potential impacts on landscape and views during construction, commissioning and operation of the EACOP project, and the associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on landscape, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.8.1 Key Sensitivities and Considerations

The landscape baseline conditions are described in Section 6.4.2.4, as well as:

- landscape and visual sensitivity ranking based on Table D15, Appendix D
- key considerations for the landscape and visual impact assessment.

Landscape sensitivity has been ranked according to the key characteristics and value placed on them. Areas of biodiversity value were considered, as these areas may be associated with features of higher landscape sensitivity, such as having a greater degree of naturalness and absence of modern infrastructure.

Visual sensitivity is associated with receptors that have a particular interest in their surroundings, such as tourists, or views that are associated with features of aesthetic, cultural or religious importance.

Key considerations are:

- Most of the EACOP route is in an area of low biodiversity significance with the exception of a few sections that are in or adjacent to forest reserves. Areas of high biodiversity value are often linked to sensitive landscapes, as they can possess valued or rare natural scenic features. However, the areas traversed

by EACOP have been affected by farming and grazing and are of low landscape sensitivity.

- PS1 AOI: the landscape has been modified by human activity; although rural in nature, the landscape has lost most of its natural scenic value and it is of low landscape sensitivity.
- PS2 AOI: although remote the landscape sensitivity is low; it is not a wild or particularly scenic landscape, as human activities have altered it.
- No visual receptors of high sensitivity have been identified: visual receptors at PS1 and PS2 are limited to users of unsealed roads, farm workers and people living in small settlements.

Landscape is recognised for having the potential to provide cultural ecosystem services, including nonmaterial benefits from the sense of wellbeing and value provided to people by living in an attractive environment. However, stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape (see Section 7.6.2) and the AOIs of the pumping stations areas do not attract tourists.

8.8.2 Potential Project Impacts

8.8.2.1 Construction

Generic Impacts

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

During construction, the RoW and construction facilities (including MCPYs) will be cleared of vegetation, stripped of topsoil and construction plant and machinery will be visible, which will have a direct impact on the landscape and visual receptors. Tree removal will be confined to small sections of tree lines and small areas; no large-scale tree removal is required. No blasting of surface rock is required.

When construction is complete, agricultural areas will be reinstated as grassland and non-agricultural areas will be reinstated using natural revegetation to avoid the introduction of invasive species (see Section 2.3.7.1 and 2.4.3.4). Landscape and visual impacts will therefore be short term during construction and for the period afterwards required to re-establish vegetation cover. The magnitude will be medium, the extent local and of short-term duration. The landscape and visual impacts will be not significant.

Disposal of Surplus Subsoil and Aggregate

Impact: Permanent change of views because of disposal of surplus subsoil and aggregate

There may be a direct permanent impact (medium magnitude, permanent, local, not significant) from the disposal of excess subsoil created by trench excavation, if imported fill is needed to pad the pipe. However, this can normally be spread without creating any visual impact within the RoW before the topsoil is replaced. Any excess will be disposed as waste off-site.

There may be a direct impact (small magnitude, permanent, local, not significant pre-mitigation) from the disposal of surplus aggregate during the decommissioning of construction facilities.

Location-Specific Impacts

Location: Side Slope Areas with Permanent Benching

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to permanent benching of RoW in side slope areas

Impact: Change of views in areas of permanent benching of RoW in side slope areas affecting views from small settlements, farms and unsealed roads

The RoW will need to be benched on side slopes to create a safe working area for construction. The impacts will mostly be short term, as most of the RoW will be reinstated to original profiles and natural vegetation. However, on some steep slopes it may not be possible to completely reinstate the RoW to pre-existing profiles and there will be a permanent landscape impact.

Precise locations and reinstatement plans will be defined in subsequent development phases. Landscape or visual impacts experienced because of permanent benching, owing to the medium magnitude and local nature of the impacts, are considered not significant pre-mitigation.

Location: Pumping Stations

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to construction and commissioning of the AGIs

Impact: Change of views due to construction and commissioning of the AGIs

PS1 and 2 have been located to avoid impacts on sensitive landscapes. No naturally scenic landscapes of high landscape sensitivity have been identified that are visible from the pumping stations. No significant landscape impacts on these farmland landscapes will be experienced during construction due to the short-term and local nature of the construction phase.

Stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape (see Section 7.6.2) and did not identify any tourist attractions. All visual receptors are therefore assessed as being of low sensitivity. Owing to the short-term duration and local extent, the pre-mitigation visual impacts are considered not significant.

Other AGIs (electric substations and block valves) were screened out of the impact assessment due to their small size and insignificant landscape and visual effects.

8.8.2.2 Operation

Generic Impacts

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

There will be a permanent change of land-use on the RoW from crop-land to grassland in agricultural areas during the operational phase of the project (see Section 2.4.3.4). This will have a direct biodiversity benefit and a not significant landscape or visual impact, owing to the low sensitivity of receptors, small magnitude and local extent of the impact.

Location-Specific Impacts

Location: Pumping Stations

Visual intrusion of Project Components into Landscape

Impact: Change of landscape character due to operation of the AGIs

Impact: Change of views due to operation of the AGIs

Views and landscape character will be modified at PS1 and 2 for the project life span (approximately 25 years). The sites will comprise low-level equipment, single storey buildings and a communications tower that may be approximately 100 m high, see Section 2.3.3.2. The landscapes are assessed as low sensitivity. Owing to the local extent, the pre-mitigation permanent landscape impacts for both sites is considered not significant.

Visual receptors at the PS1 and PS2 are mainly farms, small villages and road users, which are all low sensitivity. Visibility of the proposed AGIs is summarised as follows:

- 0–1-km radius – some views of the AGI, but often screened by hills and vegetation
- 1–3-km radius – views limited to the taller elements of the AGI, such as the communications antenna
- 3–5-km radius – views limited to the taller elements of the AGI from hilltops.

Figure 8.8-1 and Figure 8.8-2 show typical views toward PS1 (the location of the viewpoints is shown in Figure 6.4-8 in Section 6.4.2.4). The landscape is typical of this AOI.

Figure 8.8-3 and Figure 8.8-4 show the view toward the PS2 location from viewpoints PS2-A and PS2-B (the location of the viewpoints is shown in Figure 6.4-8 in Section 6.4.2.4). The landscape shown is typical of this AOI.

Permanent visual impacts at both PSs will be small in magnitude. Owing to the low sensitivity of the receptors and the local extent of the impact, the pre-mitigation visual impact is considered not significant.

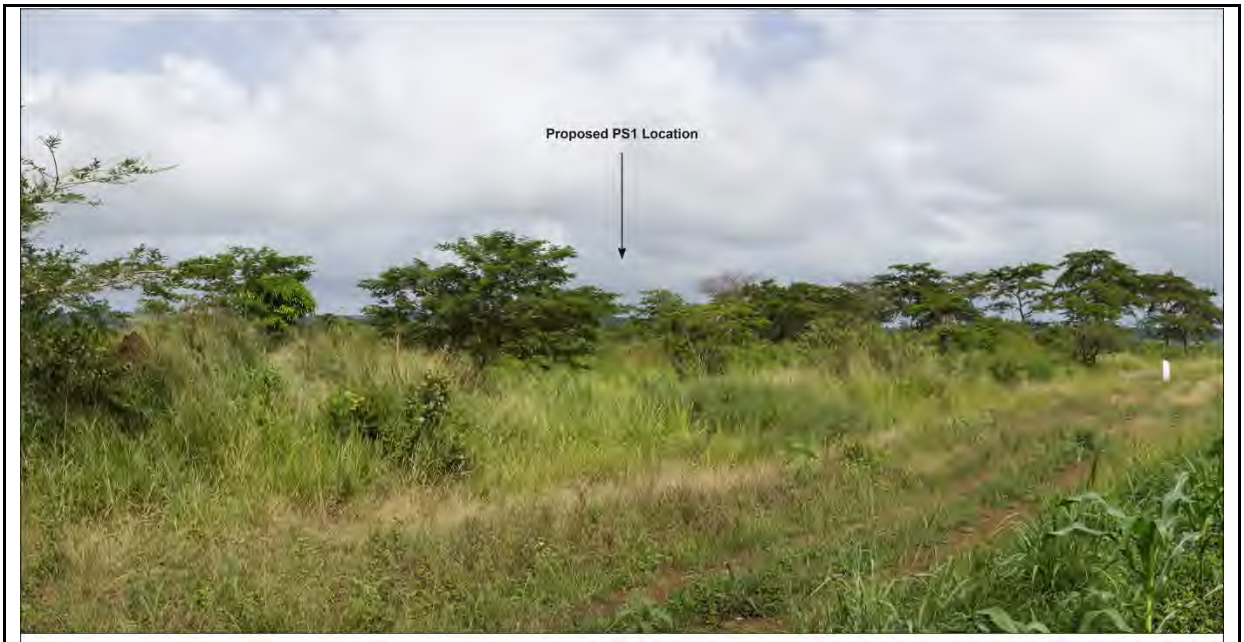


Figure 8.8-1 PS1 Viewpoint PS1-A Photograph

Figure 8.8-2 PS1 Viewpoint PS1-B Photograph

Figure 8.8-3 PS2 Viewpoint PS2-A Photograph

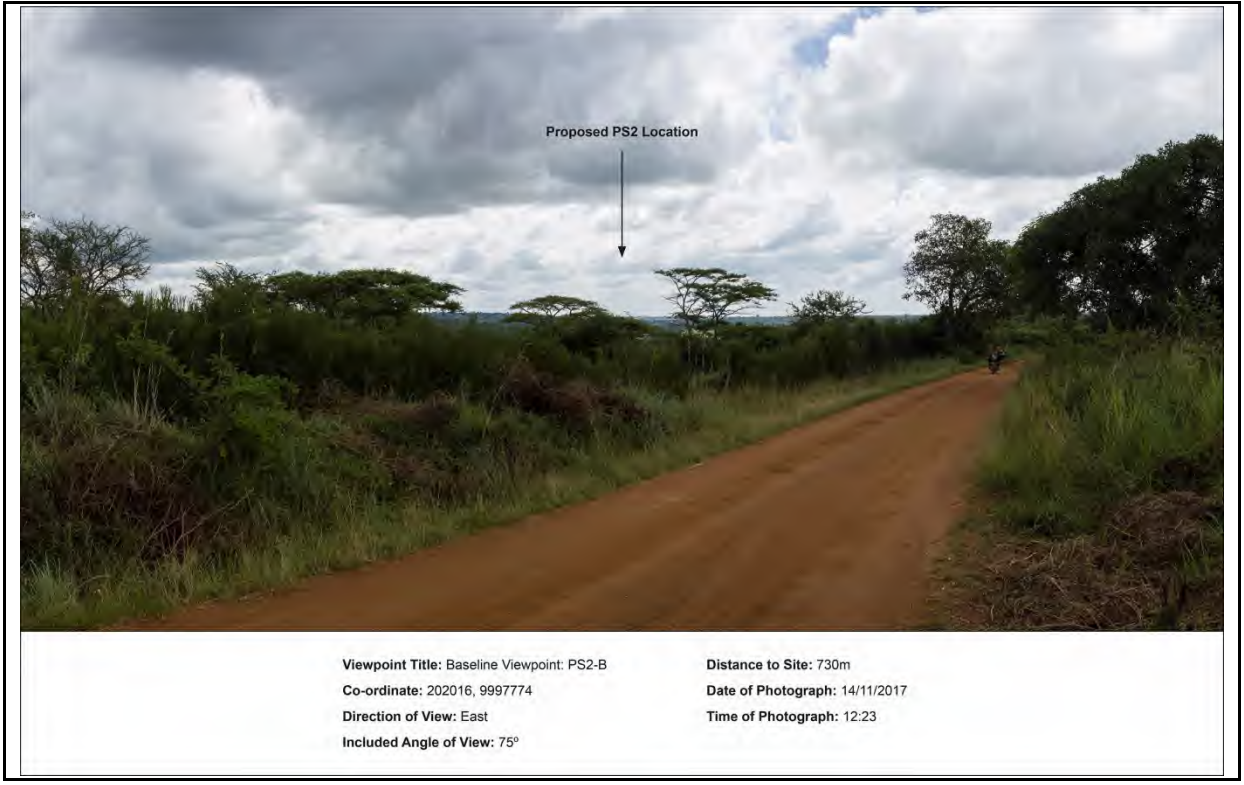


Figure 8.8-4 PS2 Viewpoint PS2-B Photograph

8.8.3 Mitigation Measures

This section evaluates impacts in terms of the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect landscape and visual impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.8.3.1 Design

Generic Mitigation Measures

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

Route selection has been an iterative process of gradual route refinement based on a set of technical, environmental and social criteria. The final proposed route and AGIs have been located to strike the optimum balance between the relevant socio-economic, environmental and technical factors. The route has been designed to have a minimum negative impact on:

- areas of high biodiversity value
- sites of cultural heritage and religious value.

Consequently, the route will avoid the majority of:

- sensitive landscape receptors, which are often associated with natural scenic landscapes
- sensitive visual receptors, which are often associated with natural, cultural or religious value.

The pipeline will also be buried and will not be visible along its entire length.

Location-Specific Mitigation Measures

Location: Side Slope Areas with Permanent Benching

Visual Intrusion of Project Components into Landscape

Impact: Change of views and landscape character due to permanent benching of RoW in side-slope areas

Route optimisation has been undertaken to limit traversing steep side slopes, see Section 3.4.3.2.

8.8.3.2 Construction

Generic Mitigation Measures

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

The soil management plan, reinstatement plan and biodiversity management plan will include measures that contribute to the management of the change of landscape character.

Soil handling, soil reinstatement and revegetation measures are key to mitigation of landscape and visual impacts. These are described in Section 2.4.3 and the soil and biodiversity VEC impact assessments (Sections 8.2, 8.3, 8.4 and 8.5). The measures include erosion control, replacement of excavated soil following construction, natural revegetation, implementation of a tree replanting strategy and monitoring of the re-establishment of vegetation.

Although the pre-mitigation impact on both landscape and views is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and local in extent but the magnitude is reduced from medium to small.

Disposal of Surplus Subsoil and Aggregate

Impact: Permanent change of views as a result of disposal of surplus subsoil and aggregate

The soil management plan, reinstatement plan, waste management plan and biodiversity management plan will include measures that contribute to the management of permanent change of views.

The impact of disposal of excess spoil from the trench will be eliminated by treating surplus spoil that cannot be spread on the RoW as waste. Environmental and social evaluations, including landscape and visual, will be undertaken to identify suitable offsite disposal sites for waste soil and rock and appropriate management measures implemented. All temporary soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented.

Although the pre-mitigation impact on views is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain very long term and local in extent, but the magnitude is reduced from medium to small.

Location-Specific Mitigation Measures

Location: Side Slope Areas with Permanent Benching

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to permanent benching of RoW in side slope areas

Impact: Change of views in areas of permanent benching of RoW in side slope areas affecting views from small settlements, farms and unsealed roads

The soil management plan, reinstatement plan, waste management plan and biodiversity management plan will include measures that contribute to the change of views and landscape character.

Areas where benching is required will be re-contoured to original profiles. Side casting in areas of steep terrain will be prohibited and mitigation such as installation of fences or geotextile fabric on steep slopes will reduce the risk of soil slippage.

In areas of permanent benching, recontouring will be sympathetic and in keeping with pre-construction profiles where this does not cause risk to pipeline. The waste management plan will identify reuse and disposal options for surplus rock.

Although the pre-mitigation impacts on both landscape and views are considered not significant, the application of the above measures will further reduce impacts; the residual impacts on both landscape and views will be very long term and local in extent but the magnitude is reduced from medium to small.

Location: Pumping Stations

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to construction and commissioning of the AGIs

Impact: Change of views due to construction and commissioning of the AGIs

The soil management plan, reinstatement plan and the biodiversity management plan will include measures that will contribute to the control of impacts associated with loss of habitat.

The pre-mitigation impacts on both landscape and views are considered not significant. The application of the above measures will not further reduce these medium or small magnitude and local extent impacts.

8.8.3.3 Operation

Generic Mitigation Measures

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

The reinstatement plan and the biodiversity management plan will include measures that will contribute to the control of impacts associated with loss of habitat.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and local in extent, but the magnitude is reduced from medium to small.

Location-Specific Mitigation Measures

Location: Pumping Stations

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to operation of the AGIs

Impact: Change of views due to operation of the AGIs

No specific landscape and visual mitigation measures for the PSs are proposed as the pre-mitigation impact is not significant. The residual landscape and visual impact will remain the same.

8.8.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on landscape after mitigation measures have been implemented.

8.8.4.1 Generic and Location-Specific Impacts

Table 8.8-1 summarises the potential generic landscape impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.8-2 summarises specific impacts.

No significant impacts were predicted pre-mitigation due to careful route and site selection. The implementation of the mitigation measures described in Section 8.8.3 will further reduce impacts. No significant residual landscape and visual impacts are predicted.

8.8.4.2 Ecosystem Services

Section 6.4.2.4 identifies ecosystem services associated with landscape. Landscape has the potential to provide cultural ecosystem services, including nonmaterial benefits from the sense of wellbeing and value provided to people by living in an attractive environment. However, stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape (see Section 7.6.3) and the PS AOIs do not attract tourists.

Table 8.8-1 Landscape – Generic Impacts

Aspect	Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Visual intrusion of project components into landscape	Change of landscape character and views caused by project components	C&O	-	Biodiversity Management Plan Reinstatement Plan Soil Management Plan	4	2	2	2	10
Disposal of surplus subsoil and aggregate	Permanent change of views as a result of disposal of surplus subsoil and aggregate	C	-	Soil Management Plan Reinstatement Plan Waste Management Plan Biodiversity Management Plan	4	5	2	2	13

* NOTES: C= construction; O= operation; C&O= construction and operation; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity (which may be a range); SS= significance score: Y = stakeholder concern; Yes; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.8-2 Landscape – Location-Specific Impacts

Location	Aspect	Potential Impact	Impact Detail	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
Side slope areas with permanent benching	Visual intrusion of project components into landscape	Change of landscape character	Permanent benching of RoW in side slope areas	C	-	Reinstatement Plan Soil Management Plan	4	5	2	2	13-
		Change of views	In areas of permanent benching of RoW in side slope areas affecting views from small settlements, farms and unsealed roads	C	-	Reinstatement Plan Soil Management Plan	4	5	2	2	13
PS1 and PS2	Visual intrusion of project components into landscape	Change of landscape character	Construction and commissioning of the AGIs	C	-	Reinstatement Plan	6	2	2	2	12
			Operation of the AGIs	O	-	Reinstatement Plan Pollution Prevention Plan	6	4	2	2	14
		Change of views	Construction and commissioning of the AGIs	C	-	Reinstatement Plan	4	2	2	2	10
			Operation of the AGIs	O	-	Reinstatement Plan Pollution Prevention Plan	4	4	2	2	12

* NOTES: C= construction; O= operation; C&O= construction and operation; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity (which may be a range); SS= significance score: Y = stakeholder concern; Yes; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.8.5 Transboundary Project Impacts

There are no transboundary project impacts.

8.8.6 Cumulative Impacts

8.8.6.1 Context

The baseline condition of landscapes which the EACOP project traverses, the trends and sensitivity to change are described in Section 6.4.2.4; project residual impacts are summarised in Section 8.8.4.

The landscape and visual receptors are characterised as having low sensitivity. This is a result of the degradation of the natural scenic value of much of the landscape by human activity.

The direct pre-mitigation and residual EACOP project impacts on landscape and visual receptors are not significant, although the duration of impacts from the pumping stations are long term.

The criterion for assessing whether the cumulative impacts are significant is that the limit of acceptable change is not exceeded. The limit of acceptable change is for AOIs to maintain their characteristic rural landscape quality.

Developments in the project landscape AOI are confined to PS1. They are described and mapped in Appendix H:

- associated facilities:
  - Tilenga Project - feeder pipeline (AF01)
  - Kingfisher Oil Project - feeder pipeline (AF02)
- third-party developments:
  - Kabaale International Airport (UG04)
  - transmission line to Kabaale Airport (UG05)
  - Kabaale refinery (UG07)
  - Hoima–Buloba pipeline (UG08)
  - Lot 4 R4 (Kabaale – Kiziranfumbi) road upgrade (UG19).

8.8.6.2 Cumulative Impacts

Landscape and Visual Receptors of PS1

The landscape around PS1 AOI has been modified by human activity and although rural in nature, the landscape has lost most of its natural scenic value. It has been ranked as being of low sensitivity.

Associated Facilities

Potential cumulative impacts are predicted on landscape character and visual receptors where PS1 and the Tilenga Project and Kingfisher Oil Project feeder pipelines AOIs overlap around KP0.

The Tilenga Project and Kingfisher Oil Project pipelines will have similar impacts to those described in Section 8.8.2. For the EACOP project, PS1 will be partly

screened by landform and existing vegetation. Intervisibility with the EACOP project will therefore be limited and the overall industrialising nature small in magnitude and within the limit of acceptable change.

Third-Party Developments

Potential cumulative impacts are predicted on landscape character and visual receptors where the third-party developments listed above and PS1 share an AOI. It is predicted that the Hoima–Buloba pipeline (UG08) will have similar impacts to those described in Section 8.8.2, the Kabaale-Kiziranfumbi road (UG19) is an upgrade to an existing road, and the proposed airport and refinery in the Kabaale Industrial Park (UG04, UG05, UG07) will be major developments in the area. There will be intervisibility with PS1 from small settlements, farms and unsealed roads from where the developments will be experienced as industrialising features. The overall industrialising nature will be large in magnitude, but the contribution of EACOP and the associated facilities is small.

The cumulative impact will change the characteristic rural quality of the landscape and receptors, outside the limit of acceptable change, so the cumulative residual impact will be significant. The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants.

8.8.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on landscape.

8.9 Air Quality

This section includes potential impacts on ambient air quality during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts associated with air quality, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.9.1 Key Sensitivities and Considerations

The air quality baseline conditions are described in Section 6.4.2.5 as well as:

- air quality key valued environmental components (VEC) and their sensitivity ranking based on the relevant tables in Appendix D

- key considerations for the air quality impact assessment.

The sensitivity ranking of air quality VECs ranges from very low to very high dependent on the level of each type of substance relative to PES, and the potential for exposure.

Key considerations include:

- much of the project traverses sparsely populated and infrequently occupied areas
- there is capacity in the atmospheric environment for gaseous emissions without risking harmful levels being reached
- moderate to high levels of airborne fine PM were consistently detected by the baseline survey, and in some cases background levels of PM exceed Project Environmental Standards (PES) and draft national standards.

8.9.2 Potential Project Impacts

8.9.2.1 Construction

The impacts to air quality from all project construction activities are from similar activities and often use similar equipment. Consequently, the impacts and generic mitigation measures are similar.

Generic Impacts

The nature and quantity of atmospheric emissions from construction activities depend on the type of activity, the prevailing weather conditions and the effectiveness of management measures.

Three sources of emissions have the potential for environmental effects:

- release of gases, exhausts and vapours to atmosphere from combustion of fuel in construction equipment and vehicles
- release of gases, exhausts and vapours to atmosphere during refuelling
- dust emissions from site activities.

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Reduced air quality from combustion of fuel in construction equipment and vehicles

The operation of equipment and vehicles powered by internal combustion engines results in the emission of exhaust gases containing the substances nitrogen oxides (NO_x), sulphur dioxide (SO_2), volatile organic compounds (VOC), particulate matter less than 10 and 2.5 µm in diameter (PM_{10} and $PM_{2.5}$) and carbon monoxide (CO). The quantities emitted depend on factors such as engine type, service history, usage pattern and fuel composition.

Movements of vehicles (carrying pipe, equipment, materials and people) and nonroad mobile machinery such as excavators, dozers and graders will cause exhaust emissions. These emissions are considered not significant, as vehicle and machinery movements will be short term, localised and intermittent.

Emissions will be generated from the operation of construction equipment including compressors and generators.

Exhaust emissions before mitigation are considered not significant owing to the short-term nature and medium magnitude of impact associated with these emission sources.

Impact: Hydrocarbon vapour emissions from refuelling operations causing reduced air quality

Minor releases of hydrocarbon vapour emissions will occur from the refuelling of vehicles at filling stations in the construction camps and mobile bowsers on the pipeline spreads, and the refilling of the tanks and bowsers from fuel tanker trucks. Most vehicles and machinery will be diesel powered. Diesel storage and handling causes far less vapour generation than the equivalent operations with gasoline, as diesel is much less volatile. The use of diesel fuel will therefore mostly remove evaporative losses of hydrocarbons. Before mitigation, the impacts associated with these emissions are considered small and short term. They are considered not significant.

Dust

Impact: Nuisance from dust emissions from construction site activities

Dust emissions from construction activities will be variable in nature and depend on the type and extent of the activity, the soil type and its moisture content, road surface conditions and weather conditions. Dry weather and higher wind speeds will generate more dust.

Activities with the greatest potential to cause dust emission are expected to occur during earthworks and include:

- excavating (including ripping and blasting)
- haulage
- tipping and stockpiling
- levelling and landscaping
- other vehicle movements.

Stockpiling and movement of construction materials can also potentially cause dust emissions.

Once airborne, dust will travel downwind before settling. The distance travelled depends primarily on wind speed and particle size. Smaller particles and stronger winds cause greater dilution effects but create deposition over a larger area. Dust impacts typically occur within a few hundred metres of the dust emission.

Dust generated from construction activities is mainly of a particle size greater than the PM_{10} fraction that is of most concern in terms of human health impacts.

Project dust emissions will be transient and localised. The impacts will be short term and, before mitigation, will be of medium magnitude. They are therefore considered not significant.

The potential effects of dust include nuisance for affected local residents, the impairment of the biological function of plants and animals through smothering or

other means, and effects on human health from particles that are small enough to enter the lungs.

Whether dust deposition becomes a nuisance is subjective. It depends on a variety of factors including the sensitivity of nearby locations, the frequency of any deposit occurring and the nature of the dust. Owing to this subjectivity, there are no statutory limits or widely used standards for dust deposition.

Location-Specific Impacts

Location: All MCPYs and Hydrotest Sections

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Emissions of gaseous substances from operation of generators causing reduced air quality from operation of generators

Impact: Emissions of fine particulate matter causing reduced air quality from operation of generators

Air emissions at each main camp and pipe yard (MCPY) will be generated primarily from the operation of diesel-powered generators to produce electricity for the camp and from the use of vehicles at and near the camp.

Mobile, diesel-powered compressors will provide power to produce compressed air used to dry the interior surface of each pipeline section after hydrotesting; each drying period will last two to three days.

The impact to air quality from the above emissions is considered not significant owing to the small magnitude and short duration.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles

The movement of vehicles to, from and around the MCPYs will generate dust. Vehicle-related dust generation will be similar to that described in the generic impact section.

The impact to air quality from the above emissions is considered not significant owing to the small magnitude and short duration.

8.9.2.2 Operation

Generic Impacts

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Exhaust emissions from vehicles causing reduced air quality during operation

The generic impacts during operation will be from vehicle use to move people, materials and equipment for operations and maintenance works.

Vehicle movements will occur for short periods at each location and be widely dispersed and hence of small magnitude; therefore, the generic operational impacts on air quality are considered not significant.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles.

The movement of vehicles to, from and around the AGIs will cause dust generation. Vehicle-related dust generation will be similar to that during construction, although it will be limited to designated access roads and site roads.

Vehicle movements will occur for short periods at each location and be widely dispersed and hence of small magnitude; therefore, the generic operational impacts on air quality are considered not significant.

Location-Specific Impacts

Location: PS1 and PS2

Release of Gases, Exhausts and Vapours to Atmosphere

Location-specific air quality impacts during operation will occur later in the life of the project when the use of oil heaters at the pumping stations will contribute to project-related emissions to atmosphere. The fuel for these stationary combustion emission sources will be crude oil from the pipeline. The expected magnitudes of emissions were not considered sufficient to warrant quantitative assessment, e.g., by dispersion modelling[12].

Impact: Increased NO_2 concentrations at ground level from operation of bulk heaters (long and short term).

Owing to the relatively small quantities of emissions of NO_2 from the bulk heaters at PS1 and PS2, the impact is considered a medium magnitude before mitigation, and the effects of NO_2 emissions from PS1 and PS2 during operation from bulk heaters are considered not significant.

Impact: Increased PM_{10} and $PM_{2.5}$ concentrations at ground level from operation of bulk heaters (long and short term)

Owing to the relatively small quantities of emissions of particulate matter from the bulk heaters at PS1 and PS2, the impact is considered a medium magnitude before mitigation, and the effects particulate matter emissions from PS1 and PS2 during operation from bulk heaters are considered not significant.

8.9.3 Mitigation Measures

This section describes impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect air quality.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management

[12] This is a deviation from the scoping report. When the scoping was undertaken, power generation was included at PS1 and PS2. Power generation results in higher emissions, requiring quantitative assessment. Optimisation of the project design eliminated the need for power generation at PS1 and PS2, reducing the emissions from these AGIs.

plans and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.9.3.1 Design

The project will design the operations combustion equipment to comply with national regulations and project emission standards.

8.9.3.2 Construction

Generic Impacts

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Reduced air quality from combustion of fuel in construction equipment and vehicles

The pollution prevention plan will include measures that contribute to the management of this impact.

Project vehicles, plant and equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude will be reduced from medium to small while duration will remain short term.

Impact: Hydrocarbon vapour emissions from refuelling operations causing reduced air quality

The pollution prevention plan will include measures that contribute to the management of this impact.

A refuelling procedure will be developed and implemented which will include measures to limit loss of fuel or vapours to the environment.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude will be reduced from small to negligible while duration will remain short term.

Dust

Impact: Nuisance from dust emissions from construction site activities

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

Dust will be managed where necessary by means such as covering fine materials and wetting roads where appropriate. Project speed driving limits will be enforced, and awareness training will be provided to project personnel.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude will be reduced from medium to small while duration will remain short term.

Location-Specific Impacts

Location: All MCPYs and Hydrotest Sections

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Emissions of gaseous substances causing reduced air quality from operation of generators

Impact: Emissions of fine particulate matter causing reduced air quality from operation of generators

The pollution prevention plan will include measures that contribute to the management of these impacts.

Combustion equipment will be designed to meet national regulations and project standards regarding air quality and emission limits and will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impacts are considered not significant, application of the above mitigation measures will further reduce impact; the magnitude will be reduced from medium to small while duration remains short term.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

Dust will be managed where necessary by means such as covering fine materials and wetting roads where appropriate. Project speed driving limits will be enforced, and awareness training will be provided to project personnel.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce the impact; the magnitude will be reduced from small to negligible while duration remains short term.

8.9.3.3 Project Operation

Generic Impacts

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Exhaust emissions from vehicles causing reduced air quality during operation

The pollution prevention plan will include measures that contribute to the management of this impact.

Project vehicles, plant and equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude will be reduced from small to negligible.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles.

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

Dust will be managed where necessary by means such as covering fine materials and wetting roads where appropriate. Project speed driving limits will be enforced, and awareness training will be provided to project personnel.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude will be reduced from small to negligible.

Location-Specific Impacts

Location: PS1 and PS2

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Increased NO_2 concentrations at ground level from operation of generators and bulk heaters (long and short term)

The pollution prevention plan will include measures that contribute to the management of this impact.

Equipment will be in good condition, regularly maintained and appropriate for the task being undertaken

The project will design combustion plant to comply with national regulations and project emission standards. Equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude of impact will reduce from medium to small.

Impact: Increased PM_{10} and $PM_{2.5}$ concentrations at ground level from operation of generators and bulk heaters (long and short term)

The pollution prevention plan will include measures that contribute to the management of this impact.

The project will design combustion plant to comply with national regulations and project emission standards. Equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude will be reduced from medium to small.

8.9.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on air quality after mitigation measures have been implemented.

Table 8.9-1 summarises the potential generic air quality impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.9-2 summarises location-specific impacts.

No significant residual air quality impacts are predicted.

Table 8.9-1 Air Quality – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Release of gases, exhausts and vapours to atmosphere	Air Quality	Reduced air quality from combustion of fuel in construction equipment and vehicles	C	–	Pollution Prevention Plan	4	2	2	2–4	10–12
Release of gases, exhausts and vapours to atmosphere	Air Quality	Hydrocarbon vapour emissions from refuelling operations causing reduced air quality	C	–	Pollution Prevention Plan	2	2	2	1	7
Release of gases, exhausts and vapours to atmosphere	Air Quality	Exhaust emissions from vehicles causing reduced air quality during operation	O	–	Pollution Prevention Plan	2	4	2	2–5	10–13
Dust	Air Quality	Nuisance from dust emissions from construction site activities	C	–	Pollution Prevention Plan Traffic and Road Safety Management Plan	4	2	2	1–3	9–11
Dust	Air Quality	Nuisance from mobilisation of dust by project vehicles	O	–	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	4	2	1–3	9–11

NOTES: C = construction; O = operation; C&O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity (which may be a range as described in Section 6.4.2.5); SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.9-2 Air Quality – Location-Specific Impacts

Location	Aspect	Potential Impact	Impact Detail	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
All MCPYs and hydrotest sections	Release of gases, exhausts and vapours to atmosphere	Emissions of gaseous substances causing reduced air quality from operation of generators		C	–	Pollution Prevention Plan	4	1-2	2	1–3	8–11
All MCPYs and hydrotest sections	Release of gases, exhausts and vapours to atmosphere	Emissions of fine particulate matter causing reduced air quality from operation of generators		C	–	Pollution Prevention Plan	4	1-2	2	2–5	9–13
All MCPYs and hydrotest sections	Dust	Nuisance from mobilisation of dust by project vehicles		C	–	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	4	2	1–5	9–13
PS1, PS2	Release of gases, exhausts and vapours to atmosphere	Increased NO_2 concentrations at ground level from operation of bulk heaters (long and short term)		O	–	Pollution Prevention Plan	4	4	2	1	9

NOTES: [1] Only the part of the mitigation measure relating to the location of machinery and activity away from receptors is relevant in these cases.

C = construction; O = operation; C&O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity (which may be a range as described in Section 6.4.2.5); SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.9-2 Air Quality – Location-Specific Impacts

Location	Aspect	Potential Impact	Impact Detail	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
PS1, PS2	Release of gases, exhausts and vapours to atmosphere	Increased $PM_{2.5}$ and PM_{10} concentrations at ground level from operation of bulk heaters (long and short term)		O	–	Pollution Prevention Plan	4	4	2	3	11

NOTES: C = construction; O = operation; C&O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity (which may be a range as described in Section 6.4.2.5); SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

8.9.5 Transboundary Project Impacts

None of the impacts described above are transboundary, except for the limited occurrence of construction work immediately adjacent to the Uganda–Tanzania border, where low levels of emissions will cross the border. Based on prior experience and professional judgement, effects will not occur beyond around 300 m from the source activities.

No construction facilities or operational phase AGIs are close enough to national borders for their emissions to have a discernible transboundary impact.

8.9.6 Cumulative Impacts

8.9.6.1 Context

The baseline condition of air quality in the EACOP project's AOI, the trends and sensitivity to change are described in Section 6.4.2.5. Residual project impacts are summarised in Table 8.9-1 and Table 8.9-2.

Air quality is characterised as having moderate sensitivity to NO_x, VOC, CO and SO_2 emissions, and low to very high sensitivity to changes in PM for which measured baseline levels are moderate to high, and in some cases exceed the PES.

The primary, construction-related project impacts are reductions in air quality from dust emissions from construction activities, exhaust emissions from equipment and vehicles and emissions from refuelling operations. These are predicted to be transient and limited in extent to the immediate vicinity and residual impacts are therefore considered not significant. The primary project operation impacts are reductions in air quality from the operation of generators and bulk heaters at the pumping stations.

The criterion for assessing whether the cumulative impacts are significant is that the limit of acceptable change is not exceeded. The limit of acceptable change is that no PES is exceeded because of the combined effects of the project and other developments.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H.

8.9.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are possible on air quality where the EACOP project AOI overlaps the AF AOI. This occurs around KP0 where the EACOP PS1 and pipeline route are close to the Tilenga and Kingfisher feeder pipelines.

Construction timeframes for the Tilenga feeder and Kingfisher pipelines are not confirmed but likely to occur in a similar timeframe to EACOP. If the construction activities are conducted concurrently generating emissions to air, this could lead to

potential direct cumulative impacts on the ambient air quality and indirect impacts on communities within 300 m of the right-of-way at KP0.

The EACOP project and the associated facilities construction activities will be transient. Therefore, the overlap with of construction schedules would be for a short period.

Information from the Kingfisher and Tilenga projects indicate that similar mitigation measures to those proposed in Section 8.9.3 will be implemented. To manage the construction-phase cumulative impact, the project will ensure that the proponents of the associated facilities are made aware of the construction schedule to reduce disruption.

With the mitigation measures, it is predicted that the residual cumulative impacts will be within the limit of acceptable change, and therefore not significant.

Third-Party Developments

Potential cumulative impacts are possible on air quality where the EACOP project and the third party developments construction AOIs overlap, see Table 8.9-3.

Table 8.9-3 Air Quality –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG05	Transmission line to Kabaale airport	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG08	Hoima-Buloba pipeline	Is parallel to EACOP KP0–5	Affecting the same communities as EACOP at KP0–5
UG19	Lot 4 Kabaale – Kiziranfumbi (R4) road upgrade	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG20	Buhimba-Kakumiro road upgrade	KP39.5	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG22	Bulima-Kabwoya road upgrade	KP19	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG34	Transmission line extension	KP133	Up to 15 communities within the overlapping AOI identified by satellite imagery

Table 8.9-3 Air Quality –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG41	Kyotera – Rakai road upgrade	KP258	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG44	ICT infrastructure	KP223 and 269.5	Up to 15 communities within the overlapping AOI identified by satellite imagery

Construction timeframes for the third-party developments are not known at the time of writing. Although unlikely, a worst-case scenario has therefore been assumed that if the construction activities are conducted concurrently generating emissions to air, this could lead to potential direct cumulative impacts on the ambient air quality and indirect impacts on communities. The EACOP project and the third-party development construction activities will be transient therefore the overlap with third-party projects in construction schedules would be for a short period of time.

If during the course of project construction timeframes for third party developments become known, the project will engage with the third party developers and planning authorities to schedule activities to avoid overlap.

With the mitigation measure implemented, it is predicted that the residual cumulative impacts will be within the limit of acceptable change, and therefore not significant.

There are no residual cumulative impacts from operation of the AGIs or underground pipeline.

8.9.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on air quality.

8.10 Acoustic Environment

This section describes potential impacts on the terrestrial acoustic environment during commissioning, construction and operation of the EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts from noise and vibration, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If before the aggregation a construction facility or pipeline and AGIs impact was greater than the other, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in

the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.10.1 Key Sensitivities and Considerations

The acoustics baseline conditions are described in Section 6.4.2.6, as well as:

- acoustics key valued environmental components (VEC) and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the acoustics impact assessment.

The acoustic baseline study identified very low to high sensitivity VECs with none ranked as very high.

The noise environment across the majority of the AOIs, particularly around AGIs is dominated by human induced sources such as road traffic, farming and general human interactions.

For the acoustic VEC, regardless of magnitude, unless there is a current or proposed receptor (i.e., an existing or proposed dwelling) there is no impact.

Further information about receptors is presented in Section G2.2.3 of Appendix G2.

8.10.1.1 Approach to Quantifying Impacts

Section G2.2 of Appendix G2 provides information and methodology on the quantitative modelling undertaken to support this acoustic impact assessment.

Noise

Construction and operational noise have been predicted using internationally recognised computer modelling software (SoundPlan V7.4). This software can account for environmental parameters including meteorological conditions, ground absorption, terrain, structures (dwellings and barriers). Tables G2.2-10 and G2.2-11 in Appendix G2 describe how each of these parameters has been defined in the model.

Operational noise from aboveground installations (AGI) and main camp pipe yards (MCPY) has been predicted across the AOI using engineering layouts and equipment information. Given the large number of potential receptors, operational noise levels are predicted across the area rather than at specific receptors, although the number of receptors within specific operational-noise bands is identified (see Figures G2.1–G2.8 in Appendix G2).

Construction noise is transient for the pipeline right-of-way (RoW). The model predicts the construction noise for each construction activity across the AOI based on all equipment being in the worst-case position (i.e., tracking along the RoW and within AGI boundaries with the highest possible noise level).

Traffic noise has been predicted using internationally accepted algorithms and is quantified and reported as change in noise rather than predictions of absolute levels (see Section G2.2.6.5 of Appendix G2 for assumptions).

Vibration

Vibration calculation methods are presented in Section G2.2.7 of Appendix G2. They evaluate construction generated vibration (including rock breaking and traffic movements; no blasting is required in Uganda). Predictions are based on empirical formula using construction activity specifications (i.e., rock hammer weight) and specified distances between the source and prediction points. Assumptions are made, including the ground conditions and other environmental parameters (see Table G2.2-12 of Appendix G2).

8.10.2 Potential Project Impacts

8.10.2.1 Construction

Where similar construction equipment and activities are used in different parts of the project, the noise impacts and generic mitigation measures are similar and therefore assessed in the same way.

Construction activities are expected to change the noise environment close to the works. The level to which the existing noise environment is affected depends on the project noise source levels and distances between the source and receptors. Construction noise can also change or add a new noise character to the existing noise environment. Therefore, regardless of the level of change, the change in character is likely to make the construction noise noticeable by local receivers.

A change in the noise environment will have a primary impact on people within the AOI. The impacts include sleep and rest disturbance, lack of concentration and, according to the World Health Organization (WHO), may cause cardiovascular and psychophysiological effects, reduce performance and provoke annoyance responses and changes in social behaviour'. Although less research is available, the same effects can apply to the wildlife that frequents (for food, security, water and reproduction) or inhabits the area.

Secondary impacts on humans, which can include longer-term health or social effects associated with elevated noise levels in an inhabited environment, are considered in Section 8.18 and secondary impacts on wildlife are considered in Section 8.3.

Quantification of construction noise impacts is presented in Section G2.3.1.3 (development of MCPYs), Section G2.3.1.5 (access roads) and Section G2.3-1 (pipeline construction) of Appendix G2. The results show that construction noise will be audible, but short in duration.

Generic Impacts

Noise

Impact: Disturbance or nuisance from noise from construction on the RoW

The construction activities associated with development of the RoW are expected to use standard construction methods. The noise sources include trenchers, excavators, dozers, dump trucks and graders.

Noise levels are predicted to range between 50 dB(A) and 70 dB(A) $L_{Aeq,T}$. When compared with the baseline noise environment, levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible because of the different character to the existing environment and increase over the baseline $L_{A90.}$ No exceedances of the PES are predicted.

Noise levels are predicted to be of a very large magnitude and are likely to be perceptible. Owing to the transient and intermittent nature of RoW construction, the impacts on the acoustic environment before mitigation are considered not significant.

Impact: Disturbance or nuisance from noise from traffic movement

Many vehicles are required for the construction of all project components. These vehicles will use existing roads and new permanent or temporary access roads.

The movement of vehicles may generate noise levels above the existing noise environment. This is particularly the case for new roads where a new source will be introduced into the area with the potential to change the noise character. The level of impact is determined by the magnitude of exposure, which relates to variables including vehicle numbers, speed, type and load; road condition (including surface); and the distance between the noise receptors and the noise source (the road). For traffic-related noise, it is noted that a 3-dB change is typically required to be perceivable by humans, and for this to occur a 100% increase in traffic would be required. Similarly, a 1 dB increase in traffic noise represents a 25% increase in traffic, whereas a 20% reduction represents a 1 dB reduction.

Primary road-traffic impacts will be similar to those for fixed-source noise. However, due to the intermittent nature of vehicle movements, the fluctuation in noise levels can be greater than for fixed-noise emissions. The constant change in noise level from traffic movements has potentially more impact on human and wildlife health and sleep disturbance than a steady-state, high-noise environment.

Quantification of access-road use (to facilitate construction) is presented in Section G2.3.1.5 of Appendix G2. The movement of construction traffic will have the potential to increase the baseline noise environment by up to 10 dB for new access roads, and up to 5 dB for existing. No exceedances of PES are predicted.

Owing to the transient and intermittent nature of construction traffic at any one location, the impacts on the acoustic environment before mitigation are not significant.

Impact: Disturbance or nuisance from noise during commissioning of the pipeline

Commissioning, hydrostatic-testing, pigging and pipeline-drying facilities will require the operation of pumps, compressors and blowers. Use of this equipment will introduce new, high-magnitude noise sources into the environment which will operate continuously for 24–48 hours.

The locations at which these activities will occur are not yet known. However, a generic quantitative assessment, undertaken to determine the impact, is presented in Section G2.3.2 of Appendix G2. This assessment predicts a level of 68 dB(A) 10 m from the noise source (assuming local acoustic screening is included in the site layout). No exceedances of PES are predicted.

The modelling predicts the magnitude of the impact could be very large. However, owing to the transient and intermittent nature of commissioning noise, the impacts on the acoustic environment before mitigation are not significant.

Vibration

Impact: Disturbance, nuisance or cosmetic/structural damage from vibration

Standard excavation and trenching techniques will be unsuitable for some relatively short sections of the RoW because of local ground conditions or buried obstructions. At these locations, rock breakers may be required. The locations at which other rock-breaking techniques may be required will be identified as the project progresses.

The primary impacts associated with the use of rock-breaking equipment will be the exposure to low-level vibration. The vibration may be felt by people less than 20 m from the rock-breaking equipment. However, the equipment typically used will not startle people or cause damage to structures. There is a potential secondary social impact associated with these new experiences considered in Section 8.15.

Quantification of rock-breaking vibration is presented in Section G2.4.1.1 of Appendix G2.

Owing to the transient and intermittent nature of rock breaking at any one location, the impacts from vibration are considered not significant.

Location-Specific Impacts

Location: All MCPYs

Noise

Impact: Disturbance or nuisance from noise generation during development of construction facilities

The construction activities associated with development of the MCPYs and access roads are expected to use standard construction methods. The noise sources include excavators, dozers, dump trucks and graders.

Noise levels at the fenceline of the MCPYs and access roads are predicted to range between 40 dB(A) and 65 dB(A) $L_{Aeq,T}$. When compared with the baseline noise environment, levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible because of the different character to the existing environment and increase over the baseline $L_{A90.}$

During the construction of MCPY1-3, the noise levels from some activities have the potential to exceed the ‘very large’ magnitude ranking at up 22 receptors at any one MCPY, where receptors are classed as ‘high sensitivity’. At MCPY4, no receptors have been identified within 100m, and the magnitude of impact at this location is predicted to be negligible.

Noise levels are likely to be perceptible and of a very large magnitude. However, owing to the transient and intermittent nature of construction impacts, the impacts on the acoustic environment before mitigation are considered not significant. No exceedances of the PES are predicted.

Vibration

Impact: Disturbance or damage due to vibration generation during development of construction facilities

The expected construction methods at the MCPYs and coating facility are not expected to introduce sources of vibration with the potential to be perceptible within the AOI. The magnitude of any impact will be small, and the impact is considered not significant.

Location: All MCPYs

Impact: Disturbance or nuisance from operation of the MCPYs

Construction facility operation will add to the noise environment in the immediate vicinity. However, the level to which it affects the existing noise levels depends on noise source magnitude and distances of receptors from the source. In addition to affecting the baseline magnitude, construction noise can change or add a new noise character to the existing environment.

Although these facilities are required for the construction phase, they have an operational character to them, with fixed noise sources (e.g., generators and water treatment plants).

The impacts of a change in the noise environment will have a primary effect on the users of the area exposed to the change (as described in Section 8.10.2.1). Although less research is available, the same effects can apply to wildlife that frequents (for food, security, water and reproduction) or inhabits the area.

Secondary impacts can include the longer-term health or social effects associated with elevated noise levels in human- and wildlife-inhabited environments. These impacts are described in Sections 8.15 and 8.18 for human environments and 8.3 for wildlife environments.

Quantification of likely noise generated through construction facility operation is presented in Section G2.3.1.3 of Appendix G2. During the operation of the MCPYs noise levels are predicted to range between 40 dB(A) and 65 dB(A) $L_{Aeq,T}$. When compared with the baseline, noise environment levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible because of the different character to the existing environment and increase over the baseline $L_{A90.}$

At MCPY1-3 the magnitude of impacts has the potential to be very large. However, owing to their short-term operation, the impacts of MCPY1-3 operation on the acoustic environment before mitigation are considered not significant. At MCPY4, no receptors have been identified within 100m, and the magnitude of impact at this location is predicted to be negligible.

No exceedances of PES are identified at MCPY locations.

Vibration

Impact: Disturbance or damage due to vibration generation during development of construction facilities

The expected construction methods at the MCPYs and coating facility are not expected to introduce sources of vibration with the potential to be perceptible within the AOI. The magnitude of any impact will be small, and the impact is considered not significant.

Location: All MCPYs

When construction has been completed and after decommissioning, the leases will be surrendered and the MCPYs may be transferred to the government with some structures left in place or removed. Noise impacts will occur only if structures are removed and then the impacts described below apply.

Noise

Impact: Disturbance or damage due to noise generation during decommissioning of construction facilities

Where structures are to be removed at the end of their use by the project, the machines and equipment used and nature of operations are expected to be similar to those used for construction. The impacts on the acoustic environment from decommissioning are therefore expected to be similar to those for disturbance from noise from traffic movement, and disturbance or nuisance from noise generation during development of construction facilities described above. Identification and assessment of acoustic impacts will be included in the decommissioning plan.

Location: All MCPYs

Vibration

Impact: Disturbance or damage due to vibration generation during decommissioning of construction facilities

Where structures are to be removed at the end of their use by the project, the machines and equipment used and nature of operations are expected to be similar to those used for construction. The impacts of vibration from decommissioning are therefore expected to be similar to those for disturbance from vibration from traffic movement, and disturbance or nuisance from vibration during construction of construction facilities. Identification and assessment of vibration impacts will be included in the decommissioning plan.

8.10.2.2 Operation

Generic Impacts

Noise

Impact: Disturbance or nuisance from noise from traffic movement

The generic impacts during operation will be restricted to operational vehicle movements. These operations will be widely dispersed, at a low intensity and

transient at each location. Therefore, generic operational impacts on the acoustic environment are expected to be not significant.

Location-Specific Impacts

Location-specific acoustic impacts during operation have been identified. These relate to the operation of bulk oil heaters at PS1 and PS2. These stationary noise sources will affect the areas surrounding the AGIs.

The level of impact depends on the noise source level and distances between the receivers and the source. In addition to affecting the baseline noise levels, operational machines noise can change or add a new noise character to the existing environment.

The existing noise environment across the AOI was found not to be influenced by industrial noise. Therefore, noise from the operation of the pumping stations is likely to add a new noise character to the existing baseline environment.

Quantification of likely noise generated through operation of the pumping stations is presented in Section G2.3.3. of Appendix G2. The levels and impacts reported below are taken from Appendix G2 and represent the range of operational noise predictions across each AOI, before the application of specific mitigation measures.

Before mitigation, pumping-station operation is predicted to have a significant impact on the existing baseline environment and, in some circumstances, the noise levels are predicted to exceed PES.

Location: PS1 and PS2

Noise

Impact: Increase in existing baseline noise environment causing disturbance and nuisance

PS1 and PS2: quantitative assessment in Section G2.3.3.1 of Appendix G2 predicts pre-mitigation noise levels of 40–55 dB(A) LAeq,T in the 1 km study area around PS1 and PS2. Night-time impacts from noise are predicted to be of large magnitude with noise levels predicted to exceed the night-time PES for receptors.

Predicted noise levels in the AGI AOI are mostly higher than baseline ambient noise levels and, being of different character to baseline noise, are likely to be perceptible. The greater the distance from the AGIs the less perceptible the noise will be; receptors typically habituate to noise over time.

At PS1, due to the potential exceedance of the PES during both daytime and night-time periods, impacts are considered significant before mitigation is applied.

At PS2, due to the potential exceedance of the PES during night-time periods only, impacts are considered significant before mitigation is applied.

8.10.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect the acoustic environment.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plans and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.10.3.1 Design

Generic Mitigation Measures

To limit the impacts of noise generated by project activities, the design process will continue to minimise the impact of noise emissions through appropriate design. This includes giving preference to the selection of low noise and vibration emitting equipment and construction techniques, specifying equipment mitigation devices as standard where these are available (for example, exhaust muffler), and laying out sites to maximise distance and acoustic screening between noisy equipment and sensitive receptors.

Location-Specific Mitigation Measures

Modelling results predict that before mitigation PES at receptor locations will be exceeded in the AOI of PS1 and PS2 during the operational phase, which is a function of project design. Further design mitigation is being progressed during detailed engineering to ensure that meeting PES will be the project target for noise emissions at any receptor.

8.10.3.2 Construction

Generic Mitigation Measures

Noise

Impact: Disturbance or nuisance from noise from construction on the RoW

The pollution prevention plan will include measures that contribute to the management of noise impacts.

Noise emissions will be reduced by giving preference to low noise emitting equipment, acoustic screening and, where necessary, undertaking additional assessment to identify other mitigation that may be required. Equipment will be serviced and maintained on schedule.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Impact: Disturbance or nuisance from noise from traffic movement

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to manage noise emissions from traffic movement.

To limit the impacts of noise generated by traffic movements, measures to ensure project vehicles are in good condition, regularly maintained and appropriate for the task will be implemented. Where possible, new access roads will be constructed a minimum of 100 m from sensitive receptors, such as schools. Speed limits will be enforced, night-time driving will be by exception and vehicle movements will be restricted to defined access routes. There is a potential secondary social impact associated with these new experiences considered in Sections 8.15 and 8.18.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to large.

Impact: Disturbance or nuisance from noise during commissioning of the pipeline

The pollution prevention plan will include measures that contribute to the management of commissioning noise impacts.

Noise emissions will be reduced by giving preference to low noise emitting equipment, acoustic screening and, where necessary, undertaking additional assessment to identify other mitigation that may be required. Equipment will be serviced and maintained on schedule.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Vibration

Impact: Disturbance, nuisance or cosmetic/structural damage from vibration

The pollution prevention plan and the stakeholder engagement plan will include measures that will manage vibration impacts.

To minimise the impact of vibration the project will give preference to the selection of low vibration emitting equipment and require additional assessments to be undertaken where activities generating high levels of vibration are near sensitive receptors. Where damage to property from project activities has been identified, the project will complete repairs or compensate as appropriate; repairs will be on a like-for-like or better basis. The compensation framework will be included in the RAP.

Communities will have access to the project grievance procedure to register concerns regarding disturbance or damage from vibration.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Location-Specific Mitigation

Location: All MCPYs

Noise

Impact: Disturbance or nuisance from noise generation during development of construction facilities

The pollution prevention plan will include measures that contribute to the management of noise impacts.

Noise emissions will be reduced by giving preference to low noise emitting equipment, acoustic screening and, where necessary, undertaking additional assessment to identify other mitigation that may be required. Equipment will be serviced and maintained on schedule.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude at MCPY1-3 will reduce from very large to small. Magnitude at MCPY4 will remain negligible.

Vibration

Impact: Disturbance or damage due to noise or vibration generation during development of construction facilities

The pollution prevention plan and the stakeholder engagement plan will include measures that contribute to the management of vibration impacts.

Vibration will be reduced by preferentially selecting low vibration generating equipment undertaking additional assessments where activities generating high levels of vibration are near sensitive receptors. Where damage to property from project activities has been identified, the project will complete repairs or compensate as appropriate; repairs will be on a like-for-like or better basis.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Location: All MCPYs

Noise

Impact: Disturbance or nuisance from operation of the MCPYs

The pollution prevention plan will include measures that manage MCPY noise impacts.

During operation of the MCPYs preference will be given to the selection of low noise emitting equipment. Power plants and equipment will be kept in good condition, regularly maintained and appropriate for the task being undertaken.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short

term and intermittent while magnitude at MCPY1-3 will reduce from very large to small. Magnitude at MCPY4 will remain negligible.

Location: All MCPYs

Noise

Impact: Disturbance or damage due to noise generation during decommissioning of construction facilities

The pollution prevention plan will include measures that contribute to the management of this impact.

The impacts to the acoustic environment during decommissioning are expected to be similar to those during construction. The mitigation measures within the pollution prevention plan, particularly those described under generic impacts in Section 8.10.2.2 will apply.

The pre-mitigation impact for the development of construction facilities is considered not significant. Similarly, the pre-mitigation impact for decommissioning construction facilities is considered not significant and the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Vibration

Impact: Disturbance or damage due to noise or vibration generation during development of construction facilities

The pollution prevention plan and the stakeholder engagement plan will include measures that contribute to the management of vibration impacts.

Vibration will be reduced by preferentially selecting low vibration generating equipment undertaking additional assessments where activities generating high levels of vibration are near sensitive receptors. Where damage to property from project activities has been identified, the project developer will complete repairs and/or compensate as appropriate; repairs will be on a like-for-like or better basis.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Impact: Disturbance or damage due to vibration generation during decommissioning of construction facilities

The pollution prevention plan and the stakeholder engagement plan will include measures that contribute to the management of this impact.

The impacts to the acoustic environment during decommissioning are expected to be similar to those during construction. The mitigation measures within the pollution prevention plan, particularly those described under generic impacts in section 8.10.3.2 will apply.

Although the pre-mitigation impact for the development of construction facilities is considered not significant, and similarly, the pre-mitigation impact for decommissioning construction facilities is considered not significant, the application

of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

8.10.3.3 Project Operation

Generic Mitigation

Noise

Impact: Disturbance or nuisance from noise from traffic movement

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

The generic impacts during operation will be restricted to operational vehicle movements. Speed limits will be enforced, night time driving will be by exception and vehicle movements will be restricted to defined access routes. Additionally, project vehicles will be in good condition, regularly maintained and work appropriate.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to large.

Location-Specific Mitigation

Location: PS1 and PS2

Noise

Impact: Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations

The pollution prevention plan will include measures that contribute to the management of noise emissions from the PSs.

During operation of these AGIs, preference will be given to the selection of low noise emitting equipment. Power plants and equipment will be kept in good condition, regularly maintained and appropriate for the task being undertaken.

Meeting PES will be the project target for noise emissions.

The implementation of the mitigation measures will reduce the magnitude of impact from large to small; the residual impact will be not significant.

8.10.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on the acoustic environment after mitigation has been implemented.

Table 8.10-1 summarises the potential generic acoustic impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.10-2 summarises location-specific impacts after mitigation.

No significant residual acoustic environment impacts are predicted.

Table 8.10-1 Acoustic Environment – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Noise	Acoustic Environment	Disturbance or nuisance from noise from construction on the RoW	C	-	Pollution Prevention Plan	4	1	2	4	11
Noise	Acoustic Environment	Disturbance or nuisance from noise from traffic movement	C&O	–	Pollution Prevention Plan Transport and Road Safety Management Plan	8	1	2	5	16
Vibration	Acoustic Environment	Disturbance, nuisance or cosmetic / structural damage from vibration	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11

NOTES: C = construction; O = operation; C/O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity; SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.10-2 Acoustic Environment – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
MCPY1-3	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during development of construction facilities	C	–	Pollution Prevention Plan	4	1	2	4	11
MCPY4	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during development of construction facilities	C	–	Pollution Prevention Plan	2	1	2	4	9
MCPY1-3	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during development of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
MCPY4	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during development of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	2	1	2	4	9
MCPY1-3	Noise	Acoustic Environment	Disturbance or nuisance from operation of MCPY1–3	C	–	Pollution Prevention Plan	4	2	2	4	12
MCPY4	Noise	Acoustic Environment	Disturbance or nuisance from operation of MCPY4	C	–	Pollution Prevention Plan	2	2	2	4	10
MCPY1-3	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan	4	1	2	4	11

NOTES: C = construction; O = operation; C/O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity; SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.10-2 Acoustic Environment – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
MCPY4	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan	2	1	2	4	9
MCPY1-3	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
MCPY4	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	2	1	2	4	9
Pumping Stations (PS1-PS2)	Noise	Acoustic Environment	Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations and MST.	O	–	Pollution Prevention Plan	4	4	2	4	14

NOTES: C = construction; O = operation; C/O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity; SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

8.10.4.1 Further Emissions Management Design

Preliminary acoustic modelling results for operations at PS1 and PS2 predict significant impacts at receptors within the AOI before mitigation, significant being more than PES.

As a result, further design mitigation is being assessed to reduce the impacts to not significant levels and the pollution prevention plan includes a commitment that meeting PES will be the project target for noise emissions. The regulator will be updated on the progression of mitigation results following detailed design assessment.

8.10.5 Transboundary Project Impacts

At the time of writing, there are no transboundary project impacts.

8.10.6 Cumulative Impacts

8.10.6.1 Context

The baseline condition of acoustic environment in the EACOP project's AOI, the trends and sensitivity to change are described in Section 6.4.2.6. Residual impacts are summarised in Table 8.10-1 and Table 8.10-2.

Although the landscape and environment changes throughout the acoustics AOI, the baseline noise sources are similar due to the scarcity of fixed structures or substantial transport network; the main sources of noise are:

- wind through vegetation
- insects, birds and amphibians
- traffic (with a high proportion of small-engine motorbikes, some cars and more trucks when close to sealed roads)
- human interactions
- farming (mostly hand tools, some livestock movements).

As such, the noise environment across the acoustics AOI does not vary considerably and is consistent with the levels expected in a rural environment away from major road networks, towns and industry. Based on the acoustic survey, engagement with stakeholders and the trend in condition and sensitivity to change, the sensitivity of the acoustic environment for AGIs, construction facilities, the RoW and access roads across the AOI has been ranked from low to high.

The criterion for assessing whether cumulative impacts are significant is that the limit of acceptable change is not exceeded. The limit of acceptable change is that no PES is exceeded because of the combined effects of the project and other developments.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H.

8.10.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are possible on the acoustic environment where the EACOP project AOI overlaps the AF AOI. This occurs around KP0 where the EACOP PS1 and pipeline route converge with the Tilenga Project and Kingfisher Oil Project feeder pipelines. Construction timeframes for the Tilenga Project and Kingfisher Oil Project feeder pipelines are not confirmed but are likely to occur in a similar timeframe to the EACOP project.

The EACOP project and the associated facilities construction activities will be transient therefore the overlap of construction schedules would be for a short period.

To manage the cumulative impact, the project will ensure that the proponents of the associated facilities are made aware of the construction schedule to reduce disruption. With the additional mitigation measure implemented, noise is not likely to exceed the PES and the residual cumulative impact will be within the limit of acceptable change, and therefore not significant.

Third-Party Developments

Potential cumulative impacts are possible on the acoustic environment where the EACOP project and the third-party development AOIs overlap, see Table 8.10-3.

Table 8.10-3 Acoustic Environment –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG05	Transmission line to Kabaale airport	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG08	Hoima-Buloba pipeline	Is parallel to EACOP KP0–5	Affecting the same communities as EACOP at KP0–5
UG19	Lot 4 Kabaale – Kiziranfumbi (R4) road upgrade	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG20	Buhimba-Kakumiro road upgrade	KP39.5	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG22	Bulima-Kabwoya road upgrade	KP19	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG34	Transmission line extension	KP133	Up to 15 communities within the overlapping AOI identified by satellite imagery
UG41	Kyotera – Rakai road upgrade	KP258	Up to 20 communities within the overlapping AOI identified by satellite imagery

Table 8.10-3 Acoustic Environment –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG44	ICT infrastructure	KP223 and 269.5	Up to 15 communities within the overlapping AOI identified by satellite imagery

Construction timeframes for the third-party developments are not known at the time of writing. In the unlikely worst-case scenario where noise-generating construction activities are conducted concurrently, there could be cumulative impacts on communities.

The EACOP project and the third-party development construction activities will be transient therefore the overlap with third party projects in construction schedules would be for a short period of time.

If during the course of project construction timeframes for third-party developments become known, the project will engage with the third-party developers and planning authorities to schedule noise-generating activities to avoid overlap.

With these mitigation measures implemented, noise is not likely to exceed the PES and the cumulative impact will be within the limit of acceptable change and therefore not significant.

Cumulative impacts will not occur for vibration and blasting because the impacts are based on a single event rather than a combination of events.

There are no residual cumulative impacts from operation of the AGIs and the underground pipeline.

8.10.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on the acoustic environment.

8.11 Economy

This section describes potential impacts on the Ugandan economy, subsequently referred to as benefits, during construction, commissioning and operation of the EACOP project and associated enhancement measures to be adopted. This assessment has focused on:

- employment
- provision of goods and services
- contribution to the economy.

8.11.1 Key Sensitivities and Considerations

The economic baseline conditions are described in Section 6.4.3.6, as well as:

- economic key valued and environmental components (VECs) and their sensitivity ranked based on the relevant tables in Appendix D

- key considerations for the economy impact assessment.

Sensitivity in the economy area of influence (AOI) is included in the various livelihood activities discussed in Sections 8.12 and 8.13.

Key considerations include:

- major projects create employment opportunities
- international projects may provide training and capacity building of the Ugandan workforce and local companies to satisfy Uganda's local content policy.

8.11.2 Project Benefits

8.11.2.1 Construction

Employment

The project is expected to create three categories of employment[13]:

- direct employment - employees and principal contractors
- indirect employment - subcontractors and suppliers
- induced employment - employment generated by increased spending by businesses and households earning an income from the project.

Benefit: The generation of national employment opportunities leading to an increase in household income and an improvement in living standards.

This may lead to direct and indirect impacts.

It is estimated that, on average, some 2000 direct construction jobs may be generated in Uganda over three-year construction phase, of which 1800 may be skilled and semi-skilled and 200 unskilled. It is estimated that 1200 workers will be nationals.

Information on the anticipated wage bill is not available. Assuming that all national workers earn the Ugandan average annual wage estimated at USD 2000 (UGX 7.56 million) (above the Ugandan average wage of USD 1600 due to the nature of jobs: industrial services mainly semi-skilled), employment of 1,200 national workers during construction will generate an annual income of USD 2.4 million (UGX 9.06 billion) (USD 7.2 million of the whole construction period) (UGX 27.2 billion).

[13] The ICMM (2011) defines the various employment categories as follows in the Mining: Partnership for Development Toolkit

- Direct employment by the operation includes those staff that are on the payroll and contractors permanently based on site;
- Indirect employment comprises contractor employees working remotely for the operation (i.e., those staff on the contractors' payrolls who are employed to fulfil contracts at the operation), employees working at the operation's suppliers and at any contractor's suppliers or subcontractors whose employment is attributable to business generated by the operation, and employment generated in the region by (community) social investment activities, including local business development, in which the pipeline operation is a participant; and
- Induced or "multiplier" employment in local communities generated by the spending of direct and indirect employees, such as employment in local businesses and services (e.g., shops, transport and public services).

In addition to direct jobs, the project will create indirect and induced employment in other sectors such as logistics and supply chains, catering and security. Opportunities will increase as local businesses develop the capacity to supply goods and services during the construction and operation phases (local content) (IMF 2014).

Induced employment generation may be relatively restrained for this project for several reasons:

- The EACOP project is very capital (rather than labour) intensive, implying that for every USD in capital expenditure (Capex), a smaller proportion than predicted by multipliers accrues to labour remuneration.
- The project has a relatively high "leakage", as some goods and services that are not available locally at the required standard must be sourced internationally (e.g., pipe manufactured to international standards, highly skilled pipeline construction supervisors).

MacGillivray et al. (2017) calculated that the average employment multiplier in developing countries is 7.8 (i.e., each direct worker is associated with (generates) more than seven indirect and induced jobs). Based on this multiplier, direct Uganda-based employment by the project may generate:

- approximately 9500 indirect and induced short-term employment opportunities in Uganda during construction
- at an average annual Ugandan wage of USD 1600 (UGX 6.04 million) (which overestimates income in the informal sector), indirect and induced employment generates an annual income of approximately USD 15 million (UGX 56.7 billion) during construction (USD 45 million for the whole period) (UGX 170 billion)
- during construction, the EACOP project may generate jobs (through direct, indirect and induced employment) for a total of approximately 10,700 Ugandans, 11% of whom will be directly employed
- the project may, therefore, generate total annual household income of USD 17.4 million (UGX 65.7 billion) (direct construction income of USD 2.4 million (UGX 9.06 billion) plus indirect and induced income of USD 15 million (UGX 56.7 billion) (USD 52 million (UGX 197 billion) for the three year period)
- people who benefit directly or indirectly from the project also support several dependants. Based on the average household size of 4.7 persons in Uganda (UBOS 2014a) and assuming one income earner per household, each income earner supports, on average, 3.7 dependants. Income from direct, indirect and induced employment (or reduced underemployment) for 10,700 nationals during construction could therefore benefit 39,590 dependants.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses

This may lead to direct and indirect impacts.

Uganda's Oil and Gas Local Content Regulations prescribes that goods and services must be preferentially procured from local providers. Local content requirements will be fully integrated into EACOP's contracting and procurement strategy. The project is developing a local content plan to guide the implementation process.

- It is assumed that 40% of Capex, approximately USD 95 million (UGX 358.9 billion) annually, will be spent on goods and services procured nationally over the three-year construction period.
- Project activities comprise fairly standard civil works (e.g., construction camps and access road upgrades). It is expected that suitably qualified businesses in Uganda will participate in the execution of these project components. Capacity of national companies may be a challenge if the project is implemented simultaneously with other major infrastructure projects envisaged by the government.
- Regional changes in the demand for consumer goods have the potential to increase inflation; however, this is not expected to occur at a national scale and is assessed in Section 8.12.

Based on the multipliers stated in the next section, the estimated annual indirect and induced output is approximately USD 130 million (UGX 491 billion).

Contribution to Economy

Benefit: Contribution to national economy from investment

This may lead to direct and indirect impacts.

It is assumed that:

- the total Capex for the construction of the 1143 km EACOP is USD 3.5[14] billion (UGX 13.2 trillion); nearly USD 700 million (UGX 2.64 trillion) (20% of the total) will be expended on the 296 km of pipeline in Uganda
- assuming that 40% of Capex is spent on nationally procured goods and services, direct annual in-country spending will amount to approximately USD 95 million per year (UGX 358.9 billion) (USD 285 million (UGX 1.07 trillion) for the three year construction period)
- the Bank of Uganda (2016) calculated output multipliers for different sectors of the Ugandan economy, to analyse the national income generated from a unit of investment in different sectors. Sectors that will directly benefit from the EACOP project have relatively high multipliers; these include industry (2.5) and services (2.25). This implies that for each USD 1 (UGX 3777.75) invested in these sectors, a further USD 1.5 (UGX 5666.6) and USD 1.25 (UGX 4722.2) of indirect and induced output will be generated in the economy by the multiplier effect[15]. Applying an averaged multiplier of 2.37 for the above two sectors, direct EACOP Capex expended in Uganda generates and contributes an additional annual indirect and induced amount of USD 130 million (UGX 491 billion) (USD 390 million (UGX 1.47 trillion) for the three-year construction period).

[14] All EACOP related values are in 2016 terms

[15] For comparison, a World Bank (2006) study on developing countries estimated a broad rural output multiplier of 2.5 and an urban output multiplier of 2, given the higher import content (leakage) of urban output that reduces the multiplier effect.

The total direct, indirect and induced economic impact of EACOP's Capex on the Ugandan economy amounts to an estimated USD 225 million (UGX 850 billion) per annum for the three-year construction period (USD 675 million) (UGX 2.6 trillion), equivalent to 2.5% of 2015 Gross Domestic Product (GDP).

These estimates apply primarily to the formal (measured) economy. Due to the importance of the informal economy in Uganda, the project will also increase demand (and therefore production) in the informal economy. The benefits of economic growth include increased income (including in the local informal economy), lower unemployment and underemployment and increased tax base and revenues.

Multipliers are typically derived through an evaluation of backward and forward linkages of economic sectors with other sectors (e.g., procurement, household expenditure). However, the indirect and induced economic stimulus of the EACOP project is likely to exceed the value provided by multipliers, as the EACOP project more generally results in:

- improved infrastructure, notably upgraded and new access roads
- exposure of a large workforce and associated businesses to technical training and work opportunities to international standards.

The World Bank (2017) specifically concluded that FDI in the oil sector could help support the recovery of growth. Other aspects deemed critical to drive growth are strong performance in the industrial sector and investment in large infrastructure projects that will also boost manufacturing and services, notably tourism (AfDB et al. 2016). The EACOP project has the potential to contribute toward several these critical aspects.

Benefit: Changes to the fiscal balance

This may lead to direct and indirect impacts.

During construction, the EACOP project is not expected to generate substantial government revenue and income. The Government of Uganda and Tanzania have agreed to offer several fiscal incentives to the project. It is expected that the contractors will contribute to the fiscal balance in the order of magnitude of several tens of USD millions over the construction period.

The wage bill and income distribution are not known, but Ugandan wages from direct EACOP employment are estimated at USD 2.4 million (UGX 9.06 billion) annually during construction. If all incomes are taxed at the maximum tax rate of 30% (URA 2018), this will yield government revenue of USD 800,000 (UGX 3.02 billion) per annum during the three-year construction phase (USD 2.4 million (UGX 9.06 billion) for the three year construction period). Additional income will be derived from indirect and induced wages; many may, however, lie below tax thresholds.

Government expenditure might increase during this phase to finance the national equity share and any supporting infrastructure.

Although it is too preliminary to estimate corporate or income tax on local businesses that will provide goods and services to EACOP, due to numerous factors involved in the determination of these figures, this is contribution to the

national economy and benefit to government by increasing the fiscal balance. The same applies to companies down the value chain (or through the multiplier effect) that will be required to pay Value Added Tax (VAT).

8.11.2.2 Operation

The following benefits, described for construction, are also applicable to operation:

Employment

Pipeline operation will require a workforce of 16 people, of whom approximately 11 workers (approximately 70% of the workforce) may be nationals in the first ten years, increasing to at least 14 workers (approximately 85% of the workforce) after 10 years. The percentage of skilled professionals is expected to increase during operations.

Assuming all workers earn a Ugandan average annual wage of USD 2000 (UGX 7,56 million) employment of 14 national workers generates an annual income of approximately USD 28,000 (UGX 105.8 million) during the operational life of the pipeline.

Indirect and induced employment opportunities from the project may generate approximately 110 long-term employment opportunities during operation. At an average annual Ugandan wage of USD 1600 (6.04 million), indirect and induced employment generates an annual income of USD 176,000 (UGX 664.8 million) during operation (USD 204,000 (UGX 771 billion) for direct, indirect and induced).

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses

This may lead to direct and indirect impacts.

During operation, in Uganda EACOP procurement will be associated with maintenance activities for a total operating expenses (Opex) of approximately USD 25 million (UGX 94.4 billion) of which approximately 70% would be resourced locally (USD 17 million (UGX 64.2 billion). The local content of operation phase procurement is expected to be higher, and to increase over time as national suppliers acquire the required tools and skills.

Based on the previously stated multipliers (2.37) the estimated indirect and induced output is USD 24 million (UGX 90.67 billion).

Contribution to Economy

Benefit: Contribution to national economy from investment

This may lead to direct and indirect impacts.

The total direct, indirect and induced economic effect of EACOP Opex on the Ugandan economy amounts to an estimated USD 41 million (UGX 154.9 billion) per annum for the duration of pipeline operation.

In addition, if the pipeline can in future be utilised by other regional oil producers, as envisaged in the original announcements by the Ugandan and Tanzanian governments (The Observer 2017), EACOP could be of wider regional economic importance.

Benefit: Changes to the fiscal balance

This may lead to direct and indirect impacts.

The application of taxes on profits and other taxes will be reviewed by the Governments of Uganda and Tanzania as and when the pipeline company structure is finalised. This government income stream from taxes has not been quantified in the assessment. As an equity partner, the government will derive income from its equity share of the tariff and profits from pipeline operation (or incur losses if the pipeline is not profitable). The income cannot be estimated based on the currently available information.

In addition, it is expected that certain taxes waived during the construction period (such as VAT, corporate income tax and import duties) will become effective and generate additional income for the government during the operational life of the pipeline.

The wage bill and income distribution are not known, but Ugandan wages from direct EACOP employment are estimated at USD 200,000 (UGX 755.6 million) annually during operation. If all incomes are taxed at the maximum tax rate of 30% (URA 2018), this will yield government revenue of approximately USD 60,000 (UGX 226.7 million) per annum during operation.

Although revenue from the pipeline will not grow to be a substantial contribution to the budget, it will likely be large and countervail a possible longer-term decline in government grants and concessional loans. Given the exhaustibility of oil reserves, the boost to the national economy will be finite, but likely long-term, assuming Ugandan oil production is sustained in the foreseeable future (IMF 2014).

Summary of Benefits

Table 8.11-1 summarises the project annual economic benefits:

Table 8.11-1 Project Annual Economic Benefits

Benefit	Construction	Operation
Employment	9,500 direct, indirect or induced jobs USD 15.2 million (UGX 57.1 billion)	
Provision of goods and services	USD 38 million (UGX 142.3 billion) (direct)	USD 23 million (UGX 86.5 billion)
Revenue		
Contribution to the national economy	USD 95 million (UGX 357.3 billion) 0.9% of 2015 GDP	USD 54 million (UGX 203 billion) 0.2% of 2015 GDP
Changes to fiscal balance	USD 570,000 (UGX 2.1 billion)	positive (taxes)

8.11.3 Enhancement Measures

This section describes the enhancement measures, listed in Table 8.11-2 that will be applied to enhance benefits to the economy.

8.11.3.1 Design

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to land and property such as minimising impacts on businesses and infrastructure. The selected Kabaale, Uganda to Tanga, Tanzania pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

8.11.3.2 Construction

Generic Enhancement Measures

Employment

Benefit: The generation of national employment opportunities leading to an increase in household income and an improvement in living standards

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses

The procurement and supply chain management plan, local content plan and the labour management plan will include measures that collectively contribute to the support of project opportunities for national businesses.

The procurement and supply chain management plan will be developed to maximise the purchase of goods and services from within Uganda and include, as appropriate, enterprise and capacity development.

8.11.3.3 Operation

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses.

The procurement and supply chain management plan, local content plan and the labour management plan will include measures that collectively contribute to the support of project opportunities for national businesses.

The procurement and supply chain management plan will be developed to maximise the purchase of goods and services from within Uganda and include, as appropriate, enterprise and capacity development.

Table 8.11-2 Economy – Generic Enhancements

Aspect	Potential Impact	Phase	High Stakeholder Concern	Enhancement and Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Employment	The generation of national employment opportunities leading to an increase in household income and an improvement in living standards.	C	Y	Local Content Plan	B				
Provision of goods and services	Project procurement providing opportunities for national businesses.	C/O	Y	Local Content Plan	B				
Contribution to economy	Contribution to national economy from investment.	C/O	Y		B				
Contribution to economy	Changes to the fiscal balance	C/O	-		B				

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.11.4 Transboundary Project Impacts

Section 8.12.5.2 describes the local economic impacts from transboundary, mainly informal, trade.

8.11.5 Cumulative Impacts

Cumulative impacts are not considered for the economic VEC, as it is not feasible to acquire residual economic impact information on the myriad of projects that are being developed in Uganda much less predict their contribution to employment, provision of goods and services and contribution to the economy.

8.12 Local Economy (Nonland-Based Livelihoods)

This section describes potential impacts on the local economy (nonland-based livelihoods) during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.12.1 Key Sensitivities and Considerations

The local economy (nonland-based livelihoods) baseline conditions are described in Section 6.4.3.7, as well as:

- local economy (nonland-based livelihoods) key valued environmental components (VECs) and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the local economy (nonland-based livelihoods) impact assessment.

Sensitivity in the local economy (nonland-based livelihoods) AOI is ranked as potentially positive for VECs such as small business owners, who may benefit from an increase in business activities caused by a growing population, new developments and associated increase in construction activities. Employees in informal businesses are ranked as potentially positive VECs due to the potential increase in opportunities to start or expand a business. Sex workers are ranked as highly sensitive due to their vulnerability to physical abuse and communicable diseases. The impacts on sex workers are discussed in Section 8.18 and Section 8.19.

Key considerations are:

- for small local companies to benefit from major projects they need to meet standards which are often absent. This may lead to business and trade opportunities being usurped by outsiders
- women and young people seem to have fewer paid work opportunities and so the lack of start-up capital for the small business entrepreneur is more keenly felt by women and young people
- good road conditions between rural communities and urban centres are crucial for business owners to source supplies and market their goods.

Section A11.4.5 in Appendix A11 identifies that the local economy (nonland-based livelihoods) does not provide ecosystem services. It does, however, rely on

ecosystem services which are described in land-based livelihoods (see Section 8.13).

The key human rights considerations relevant to the local economy (nonland-based livelihoods) relate to a variety of workers' rights, including the right to non-discrimination, freedom from child labour, freedom from forced labour, freedom of association, right to just and favourable working conditions, and the right to work in a healthy and safe environment. Other human rights that are relevant to local economy (nonland-based livelihoods) are the right to an adequate standard of living and women's rights. International standards for responsible business require that labour standards are respected by companies and that they use their leverage to ensure that contractors and suppliers also respect labour rights (see Section 4).

8.12.2 Potential Project Impacts

8.12.2.1 General

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operational impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on the local economy (nonland-based livelihoods) the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.12.2.2 Construction

Generic Benefits

Employment

Benefit: The generation of project local employment opportunities

During construction, approximately 2,000 workers, out of which 10% are unskilled, will be required per spread (refer to Section 2). The pipeline will be constructed near population centres (listed in Table 2.4-2, Section 2) where the inhabitants will have the opportunity to obtain project employment. PACs near the MCPYs will be particularly well placed to benefit from employment.

Increased income may enhance a household's standard of living, their capacity to pay school and healthcare fees and invest in existing or future livelihood activities (i.e., small-scale trade and agro-processing). This may improve the long-term prospects of children, household food security and nutrition.

Benefit: The provision of training and skill development opportunities within employment

A key constraint to growth in Uganda is the availability of requisite industrial skills. The project will recruit unskilled labour from PACs where possible. Training will equip local workers with transferable skills that are in demand by the Ugandan

economy (see Section A11.4.3.1 in Appendix A11), thereby enhancing their future employment prospects and ultimately leading to a larger skilled workforce. Equipping local workers with construction skills such as site clearance and operating plant machinery will be particularly beneficial given national labour shortages in this sector.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for local businesses

A variety of materials will be sourced locally during pipeline construction including gravel, sand, cement, murram and fencing. In addition, the main camps and pipe yards (MCPYs), designed to accommodate up to 1000 people, will require supplies (e.g., food, fuel, medication). Providing goods and services to the project would enable local businesses to boost their income earnings and profit margins during the construction period, resulting in multiplier effects and overall benefits to the local economy. Increased incomes of local workers may also lead to increased spending in the PACs, benefiting local enterprises.

The informal, unregulated and small-scale nature of local businesses, lack of business expertise, market access and power supply may, however, hamper local businesses in meeting project standards and requirements.

In addition, women and young people seem to have fewer paid work opportunities and so the lack of start-up capital for the small business entrepreneur may be more keenly felt by these groups.

It should be noted that increased incomes may not necessarily be used for the benefit of workers' households. Increased access to cash by men in the PACs could lead to an increase in the incidence of social ills such as substance abuse and a rise in GBV with regards to spouses and children (see Section 8.19).

There may be an impact on human rights if the project does not exercise due diligence as it provides these opportunities for local businesses to minimise the risks of adverse impacts on workers' rights (through contractual requirements about minimum working conditions, screening, auditing of local businesses and so forth) and to use its leverage to train and encourage local businesses to respect the appropriate working conditions.

There may be another impact on workers' rights, for instance due to excessive working hours because of time pressures, or due to late payment of workers because of long payment terms for contractors.

The impacts are considered beneficial, while acknowledging the importance of mitigation measures to be put in place to protect workers' rights.

Benefit: Improvements in road conditions for business owners and public transport

The pipeline has been routed, as much as possible, near existing infrastructure, thereby minimising the need for the development of new roads. To accommodate increased volumes of traffic generated by the project, access roads will be upgraded and widened to ensure two-way traffic can pass. It is expected that PACs will benefit from road upgrades and widening. The creation of a smaller number of new access roads may benefit some PACs by improving their access to markets, social services and neighbouring communities.

Poor road conditions are a significant challenge for business owners and public transport providers in the PACs; they increase travel time and costs considerably (see Section 8.17). Improvements in road conditions would allow business owners and public transport providers to travel faster and transport passengers and goods at lower costs.

The impacts are considered beneficial. The assessment of this impact assumes that the government will maintain the roads.

Generic Impacts

Employment

Potentially affected communities (PACs) are characterised by poverty, high unemployment and limited formal employment opportunities. Education levels and technical skills in particular sectors (i.e., formal training in construction) are low. Households have limited income streams and financial security and are therefore, sensitive to external shocks. Business owners and civil servants (i.e., teachers) reported fluctuating incomes and low salaries. PACs have high expectations from the project in terms of job and training opportunities.

The baseline context with respect to specific human rights context related to just and favourable working conditions includes:

- lack of awareness of labour rights. There is a low level of awareness of worker rights in PACs. Furthermore, there are low levels of understanding of a non-discriminatory work culture, such as with a mixed gender workforce
- no contracts and unregulated working conditions. The majority (90%) of the labour force is not covered by legislation as they operate in the informal economy where workplace activities are largely unregulated (DTCIDC 2016). Basic rights and protections against child labour, forced labour, right to paid leave, maternity leave, economic exploitation and rights to work in safe and healthy working conditions among others therefore remain predominantly unenforced, according to a 2016 report of the Uganda Consortium on Corporate Accountability
- use of middlemen. In particular, middlemen are used to find workers for projects and those middlemen withhold entire salaries from workers for months of work
- unionisation and collective bargaining. Workers in PACs stated that they have limited power to negotiate with their employers, which prevents them from working in fair conditions. There is no culture of unionisation or collective bargaining. Trade union density is estimated to be around 3% of the total workforce. Many workers are illiterate and the laws governing the labour sectors are difficult for them to understand or manage, which makes them vulnerable. There are concerns in PACs that the work for the project will be difficult and poorly paid. Based on previous negative work experiences, workers fear they will not have any negotiating power
- child labour. It is estimated that approximately 2 million children were engaged in child labour; of the 2 million child labourers, it was reported that 507,000 were exposed to hazardous work. The most dangerous forms of forced labour include commercial sexual exploitation, commercial agriculture, mining, construction and armed conflicts. Children reportedly face abuse, sexual exploitation, sexually transmitted diseases (STDs), early pregnancy, exposure to chemicals, carrying heavy loads, unpaid work and long hours. Child labour

has been linked to high school dropout rates, particularly in the context of artisanal and small-scale mining (ASM). Children who may be particularly vulnerable to child labour include those who come from low-income families, live in mining areas or orphans

Impact: Loss of employment after project construction phase

This may lead to direct and indirect impacts.

Employment with the project may cause lack of attention to, or possible abandonment of, existing subsistence livelihood activities during the period of employment of household members, in particular crop growing and livestock rearing. Achieving the level of agricultural productivity established before project employment may require time, during which, household food security and nutrition may be compromised if replacement income sources are not available.

This may cause an economic shock at household level and a drop in the standard of living, which could potentially increase social ills such as alcohol abuse and gender-based violence (GBV). This could affect the right to health of women.

There may also be an impact on the following human rights: the human right to work if the notice process for retrenchment is inadequate; the human right to an adequate standard of living due to loss of income and benefits; and the right to social security if employers have not provided the necessary social security benefits or contributed to private unemployment insurance schemes.

Generally low levels of financial literacy may prevent construction workers in the PACs from preparing financially for the termination of their employment contracts. The income generated by project employment may be used for immediate gratification or to buy items on credit, rather than saving for or investing in the future, or to bridge the post-project unemployment period, during which replacement livelihoods will need to be developed. Retrenched employees may also be faced with a lack of funds to honour credit repayments. However, not all retrenched workers will necessarily experience the impacts described above.

The impacts will be short-term and will affect some households within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities

This may lead to direct and indirect impacts.

The stakeholder engagement processes identified that, across all stakeholder categories, there are unrealistically high expectations of the project's capacity to provide employment opportunities. This was particularly accentuated at PAC level where there are few or no formal employment opportunities. Unmet expectations at PAC level could be further compounded by the potential Project Induced In-Migration (PIIM) of workers and other opportunistic job seekers, who will increase competition for employment opportunities (described below).

There may be an impact on the human right to non-discrimination because of real or perceived unfairness in how employment opportunities are allocated. While the rights of migrant workers and their families should be considered in the allocation of

employment opportunities, this must be balanced by commitments to local hiring and national immigration and employment requirements.

Experience with large-scale projects globally indicates that unmet expectations could cause tensions at the local level, which, if not addressed satisfactorily, could potentially lead to some blockages or protests. If disregarded, relations could deteriorate further over time and culminate in clashes between PACs and migrants seeking access to work or other project benefits, or, in an extreme case, between PACs and project security personnel or local security forces. Dissatisfied communities may voice their grievances on local radio or social media platforms. While local radios remain the main source of information in PACs, sites such as YouTube and Twitter are growing in popularity in Uganda (see Section A11.4.10.1 in Appendix A11) and could be used by disgruntled PAC members to express grievances and garner support, spreading the dissatisfaction to a wider audience. As such, a localised upset could quickly escalate and reverberate over the AOI.

The impacts will be short-term and will affect districts. Due to their short-term nature, before mitigation the impacts are considered not significant.

Impact: Competition over employment opportunities

This may lead to direct and indirect impacts.

High unemployment rates may lead to competition over project employment opportunities in the PACs. Uganda has a young and mobile population with movements of people to other subcounties, districts and regions as well as people entering from neighbouring countries in search of employment (see Section A11.4.2.1 in Appendix A11). Migration to PACs by non-residents and non-nationals seeking project employment may heighten competition for job opportunities and raise tensions between the groups. It is quite possible that migrant job seekers could have gained skills in other large-scale projects, which will be an advantage in seeking project positions. As such, they could potentially out-compete local job seekers. The recruitment of foreign nationals may also lead to jealousy among locals who perceive that foreign workers are taking ‘their’ jobs. This may also result in conflicts between different groups.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs

This may lead to direct and indirect impacts. The risk that children will be diverted from schooling to backfill in subsistence agriculture is discussed in Section 8.13, or to find employment in the supply chain is described below as the next impact.

Low salaries and fluctuating income earnings may motivate public sector workers and business owners in PACs to seek project employment, particularly if the wages offered are more favourable. Pupil to teacher ratios reported in schools in the PACs are already high (see Section A11.4.3.1 in Appendix A11) and, as such, there may be negative outcomes for the quality of education received by children if teachers find employment with the project and are not replaced. There may therefore be an

impact on children's human right to education. Considering that local health facilities are already understaffed (see Section A11.4.11.1 in Appendix A11), project employment of local health personnel may negatively impact local health services. There may therefore be an impact on the right to health.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: School drop outs seeking employment in the project supply chain

This may lead to direct and indirect impacts.

Baseline data shows that low school attendance rates are common among both boys and girls. Boys are generally attracted by potential income earning activities, while girls are engaged in household chores. The project may entice children, particularly boys, to loiter near project works. In plantation agriculture and pastoralist communities, and areas where artisanal and small-scale mining (ASM)[16] activities have been identified, the risk of child labour may be higher given the presence of an already existing labour pool of children who have left school and have entered the workforce.

There may be an impact on the human right that prevents child labour as well as the right to education.

The impacts will be long-term and will affect PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Provision of Goods and Services

Commercial activity in the PACs consists predominantly of informal, small-scale enterprises that trade in agricultural produce, daily necessity goods and basic services.

Impact: Inflation and effects on supply owing to project procurement

This may lead to direct and indirect impacts.

Project procurement of goods locally to worksites may cause price inflation and lead to a shortage in supplies.

The impacts will be short-term and will affect districts. Due to their short-term nature, before mitigation the impacts are considered not significant.

Impact: Restriction of access to small businesses, street vendors and local markets during construction

This may lead to direct and indirect impacts.

Markets and enterprises are on roadsides and at intersections in PACs. During construction, customer access may be temporarily obstructed by construction activities, causing loss of income to vendors.

[16] Artisanal and small-scale mining (ASM) refers to mining practised by individuals, groups or communities often informally (illegally). Extractive activities are often undertaken without mechanisation but when affordable simple technologies are used. Health and safety provisions are often overlooked in informal ASM and environmental degradation is consequential to the activities. Child labour is commonly engaged in informal ASM activities.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

From a human rights perspective there may be an impact, on a very temporary basis, on the right to work and on the right to an adequate standard of living of the small business owners and street vendors.

Temporary Road Closure

Business owners rely on the road network between PACs and urban centres to source supplies and market goods.

Impact: Increased transportation costs and travel time with economic consequences

This may lead to direct and indirect impacts.

The pipeline has been routed as much as possible near the existing road network, thereby minimising the need for the development of new roads. This means some existing roads which serve local communities will be upgraded. There are also 23 main road crossings by the pipeline in Uganda, which may also create some form of temporary obstruction.

Upgrading of the existing roads and other construction activities may temporarily interfere with business owners who purchase supplies in urban centres, farmers selling their produce at district markets and public transport providers, particularly motorbike taxis. Alternative routes (if available) to urban centres may increase the cost and time needed to source supplies. This may have negative outcomes for business operating hours and product prices, potentially reducing business competitiveness and customer bases.

From a human rights perspective, there may be an impact on the right to health and education through temporary reduced access to healthcare and education facilities.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

Location-Specific Benefits

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic benefits are also applicable to the eight PACs near the two pumping stations. However, the benefit of improvements in road conditions for business owners and public transport (related to provision of goods and services), may be more pronounced in the following PACs:

- Kayere (KP0, approximately 0.6 km away from PS1)
- Katooke (KP1.5, approximately 1.7 km away from PS1).

These PACs are characterised by poor and sometimes impassable roads. Given the poor road conditions, these PACs may particularly benefit from the development of new access roads or upgrades to roads by the project.

The impacts are considered beneficial.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. However, the impact of competition over employment opportunities may be more pronounced in the following PACs:

- Katikara Trading Centre (KP41, the nearest urban area to MCPY1, approximately 1.8 km away)
- Kyenda (KP125.5, the nearest urban area to MCPY2, approximately 2.5 km away)
- Sembabule Market Zone (KP190, the nearest urban area to MCPY3, approximately 4 km away).

These PACs are densely populated and growing in size (see Appendix A11 Attachment A11.2) and demand for jobs is high. Many local businesses are already present. These PACs are more likely to experience PIIM than neighbouring PACs near the project, which are considerably smaller and offer fewer goods and services.

The impacts will be short-term and will affect the entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: Right-of-Way (RoW): PACs Close to Pipeline Crossings of Major Roads

The potential generic impacts are also applicable to the 46 PACs close to pipeline crossings of major roads. However, the impact of temporary road closure, leading to increased transportation costs and travel time with economic consequences, may be more pronounced in the following PACs:

- Buswabwera (KP61, on the Nkooko – Nalweyo road, approximately 0.3 km from major pipeline road crossing)
- Kabulasoke (KP111, on the Kyenda – Debeza road, approximately 1.15 km from major pipeline road crossing)
- Kagoma (KP124.5, on the Mityana – Mubende road, approximately 0.27 km from pipeline highway crossing)
- Kyenda (KP125.5, on the Mityana – Mubende road, approximately 1.6 km from major pipeline road crossing)
- Kyengera (KP160.5, on the Maddu – Makole road, approximately 0.12 km from major pipeline road crossing)
- Nsambya (KP189, on the Sembabule – Lwendale road, approximately 0.5 km from major pipeline road crossing)
- Bukulula (KP240, on the Lwamagwa – Makonndo road, approximately 1.22 km from major pipeline road crossing)

- Lukoma (KP287.5, on the Masaka – Mutukula road, approximately 1 km from major pipeline road crossing).

These PACs are on main roads and close to points where they will be intersected by the pipeline. The pipeline crossing of these roads during construction may disrupt traffic flows and obstruct routes used by business owners, public transport providers and other PAC members.

The impacts will be short-term and will affect the entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

Mutukula town, at the border between Uganda and Tanzania, has experienced rapid population growth in recent years, driven predominantly by the in-migration of economic migrants from other parts of Uganda and neighbouring countries, including Tanzania, Burundi and Rwanda. Mutukula is more likely to incur PIIM during pipeline construction than neighbouring PACs, which are considerably smaller and offer fewer goods and services.

The demand for jobs in Mutukula is already high. Consultation undertaken for the project indicated that local stakeholders have higher expectations from the project than other PACs in terms of generation of employment and business opportunities and broader socio-economic development. Baseline studies revealed that restaurants, hotels and petrol stations have already been established in anticipation of the project. With higher expectations, residents of Mutukula may feel greater dissatisfaction than stakeholders in other PACs if expectations are not met.

The potential generic impacts are also applicable to the border town of Mutukula. However, the following impacts may be more pronounced in this PAC:

Employment

Impact: Dissatisfaction arising from unmet expectations

and

Impact: Competition over employment opportunities

The impacts will be short-term and will affect the entire PAC. Due their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.12.2.3 Operation

Personnel during operations will be employed in accordance with national and project requirements. In addition, a set of management measures will apply (described in Section 8.12.3).

Generic Benefits

The following potential generic benefit, described for construction, is also applicable during pipeline and AGI operation:

Provision of Goods and Services

Benefit: Improvements in road conditions for business owners and public transport

It is expected that road upgrades during the construction period will continue to benefit the PACs during pipeline operation.

The impacts are considered beneficial. The assessment of this impact assumes that the government will maintain the roads.

Generic Impacts

The following potential generic impact, described for construction, is also applicable during pipeline and AGI operation:

Employment

Impact: School drop outs seeking employment in the project supply chain

This may lead to direct and indirect impacts.

The project may continue to entice children, particularly boys, for maintenance of the RoW. In plantation agriculture and pastoralist communities, and areas where ASM activities have been identified, the risk of child labour may be higher given the presence of an already existing labour pool of children who have left school and engaged in such activities.

There may be an impact on the human right that prevents child labour as well as the right to education.

The impacts will be long-term and will affect some individuals in the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.12.3 Enhancement and Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect the local economy (nonland-based livelihoods).

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.12.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to the local economy (nonland-based livelihoods) such as minimising impacts on local businesses and infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific design mitigation measures for the construction facilities, pipeline and AGIs.

8.12.3.2 Construction

Generic Enhancement Measures

Employment

Benefit: The generation of project local employment opportunities

The procurement and supply chain management plan, labour management plan and the stakeholder engagement plan will include measures that collectively support local employment opportunities.

As part of the tendering process (sub) contractors will be required to include initiatives in their proposal aimed at increasing local employment. There will be a recruitment procedure approved by the project that is open to all, transparent, non-discriminatory and promotes local content by preferentially employing local people.

Benefit: The provision of training and skill development opportunities within employment

The procurement and supply chain management plan and the labour management plan will include measures that collectively support skills development within the workforce through compliance with project human resources policies and procedures. On-the-job training will be provided to enable local workers to gain new or improved skills while working on the project. Risk-based worksite training and daily toolbox meetings addressing health and safety concerns will provide additional on-the-job training.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for local businesses

The procurement and supply chain management plan and the labour management plan will include measures that collectively contribute to the support of project opportunities for local businesses.

The procurement and supply chain management plan will be developed to maximise the purchase of goods and services from within Uganda and include, as appropriate, enterprise and capacity development.

Generic Mitigation Measures

Employment

Impact: Loss of employment after project construction phase

The procurement and supply chain management plan, labour management plan and the stakeholder engagement plan will include measures that will contribute to the management of loss of employment after project construction phase.

A campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities and financial management workshops for workers to raise levels of financial literacy will be implemented. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should try to maintain their existing livelihoods and prepare for the termination of their employment.

A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent and long duration, although the magnitude is reduced to negligible.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact will be not significant.

Impact: Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities

and

Impact: Competition over employment opportunities

The labour management plan and stakeholder engagement plan will include measures that will contribute to the control of these impacts.

The project will set targets for local recruitment and establish employment offices in the districts traversed by the project.

A public awareness programme communicating employment and training opportunities and a PIIM management plan aiming to reduce the number of people that arrive into PACs will be developed.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Impact: Diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs

The procurement and supply chain management plan, labour management plan and stakeholder engagement plan will include measures that will contribute to the control of diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs.

Before construction, a benchmarking exercise gathering data on average incomes in the private and public sector will be undertaken. This data will be used to identify salary levels for the construction workforce that avoid disparities with local businesses/public sector salaries.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Impact: School drop outs seeking employment in the project supply chain

The procurement and supply chain management plan, monitoring and reporting plan, labour management plan and stakeholder engagement plan will include measures that contribute to the control of this impact.

The stakeholder engagement plan will include provisions to address school drops outs seeking employment in the project supply chain through an awareness campaign targeting schools in PACs, particularly in areas where ASM activities have been identified.

The following management measures will be included in the procurement and supply chain management plan, labour management plan and the stakeholder engagement plan:

- a transparent recruitment procedure
- regular meetings with supply chain workers to address human and labour rights
- no employees will be hired, directly or indirectly, under the age of 18 years
- stakeholders concerned about child labour will be encouraged to use the grievance mechanism
- evaluations of (sub) contractors' human rights record related to labour and working conditions will be conducted.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Provision of Goods and Services

Impact: Inflation and effects on supply owing to project procurement

The procurement and supply chain management plan will include measures that contribute to the control of this impact.

Before construction, a benchmarking exercise of local prices for goods will be undertaken and used to identify and monitor appropriate prices so that large price disparities between project-procured and local goods prices are avoided. Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact will be not significant.

Impact: Restriction of access to small businesses, street vendors and local markets during construction

The resettlement action plan, monitoring and reporting plan and stakeholder engagement plan will include measures that contribute to the control of this impact.

A resettlement strategy outlining procedures related to loss of assets and livelihood restoration has been developed. Based on the resettlement strategy, the resettlement action plan or livelihood restoration plan will identify PAPs and the

procedures related to compensation for loss of assets as well as livelihood restoration.

The stakeholder engagement plan keeps stakeholders informed about project activities and evaluates and responds to concerns.

Application of these mitigation measures will reduce the magnitude of impact from medium to negligible and the residual impact will be not significant.

Temporary Road Closure

Impact: Increased transportation costs and travel time with economic consequences

The infrastructure and utilities management plan and the stakeholder engagement plan will include measures that contribute to the control of this impact.

All construction activities that can interfere with local transportation will be communicated to local authorities and affected communities at least 72 hours beforehand.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact will be not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic enhancement and mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional specific mitigation measure is recommended for Katikara Trading Centre (KP41), Kyenda (KP125.5) and Sembabule Market Zone (KP190):

Employment

Impact: Competition over employment opportunities

The stakeholder engagement plan and the PIIM management plan will contribute to the control of competition over employment opportunities for Katikara Trading Centre (KP41), Kyenda (KP125.5) and Sembabule Market Zone (KP190).

The project will conduct ongoing monitoring of Katikara Trading Centre (Kakumiro district), Kyenda (Mubende district) and Sembabule Market Zone (Sembabule district) and liaise with authorities to review social changes in the towns, enhance existing interventions or develop additional interventions if required.

Application of these mitigation measures will reduce the magnitude of impact from very large to medium and the residual impacts will be not significant.

Locations: RoW: PACs Close to Pipeline Crossings of Major Roads

The generic enhancement and mitigation measures are also applicable to the 46 PACs close to pipeline crossings of major roads.

Locations: RoW: Mutukula Town, Kyotera District, KP295.5

The generic enhancement and mitigation measures are also applicable to the border town of Mutukula. The additional specific mitigation measures required for Mutukula are:

Employment

Impact: Dissatisfaction arising from unmet expectations

and

Impact: Competition over employment opportunities

The following location-specific mitigation will be included in the stakeholder engagement plan and the PIIM management plan to contribute to the control of competition over employment opportunities and dissatisfaction arising from unmet expectations for Mutukula.

Ongoing monitoring and liaising with authorities to review social changes in Mutukula (Kyotera district) where additional interventions aimed at competition over employment and dissatisfaction resulting from unmet expectations will be developed to support existing interventions.

Application of these mitigation measures will reduce the magnitude of impact from very large to medium and the residual impact will be not significant.

Locations: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic enhancement and mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.12.3.3 Operation

Generic Mitigation Measures

Employment

Impact: School drop outs seeking employment in the project supply chain

The procurement and supply chain management plan, monitoring and reporting plan, labour management plan and stakeholder engagement plan will include measures that contribute to the control of this impact.

The stakeholder engagement plan will include provisions to address school drop outs seeking employment in the project supply chain through an awareness campaign targeting schools in PACs, particularly in areas where ASM activities have been identified.

The following management measures will be included in the procurement and supply chain management plan, labour management plan and the stakeholder engagement plan:

- a transparent recruitment procedure
- regular meetings with supply chain workers to address human and labour rights
- no employees will be hired, directly or indirectly, under the age of 18 years

- stakeholders concerned about child labour will be encouraged to use the grievance mechanism
- evaluations of (sub) contractors' human rights record related to labour and working conditions will be conducted

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.12.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on the local economy (nonland-based livelihoods) after mitigation measures have been implemented.

Table 8.12-1 summarises the potential generic local economy (nonland-based livelihoods) impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.12-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on the local economy (nonland-based livelihoods) will be not significant.

8.12.4.1 Ecosystem Services

Section A11.4.5 in Appendix A11 identifies that the local economy (nonland-based livelihoods) does not provide ecosystem services. No ecosystem services have therefore been considered. The ecosystem services that the local economy (nonland-based livelihoods) relies upon are described in land-based livelihoods (Section 8.13).

Table 8.12-1 Local Economy (Nonland-Based Livelihoods) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Employment	The generation of project local employment opportunities	C	Y	Procurement and Supply Chain Management Plan Labour Management Plan Stakeholder Engagement Plan	B				
Employment	The provision of training and skill development opportunities within employment	C	Y	Procurement and Supply Chain Management Plan Labour Management Plan	B				
Provision of Goods and Services	Project procurement providing opportunities for local businesses	C	Y	Procurement and Supply Chain Management Plan Labour Management Plan	B				
Provision of Goods and Services	Improvements in road conditions for business owners and public transport	C & O	Y		B				
Employment	Loss of employment after project construction phase	C	N	Procurement and Supply Chain Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	1	5	12
Employment	Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities	C	Y	Project-Induced In-Migration Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	3	5	14

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-1 Local Economy (Nonland-Based Livelihoods) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	2	5	13
Employment	Diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs	C	N	Procurement and Supply Chain Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	2	4	12
Employment	School drops outs seeking employment in the project supply chain	C & O	Y	Procurement and Supply Chain Management Plan Monitoring and Reporting Plan Labour Management Plan Stakeholder Engagement Plan	4	4	1	4	13
Provision of Goods and Services	Inflation and effects on supply owing to project procurement	C	-	Procurement and Supply Chain Management Plan	4	2	3	3	12
Provision of Goods and Services	Restriction of access to small businesses, street vendors and local markets during construction	C	-	Resettlement Action Plan Monitoring and Reporting Plan Stakeholder Engagement Plan	2	1	2	3	8
Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	4	1	2	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-2 Local Economy (Nonland-Based Livelihoods) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Kayere (KP0)	Provision of Goods and Services	Improvements in road conditions for business owners and public transport	C	Y		B				
Katooke (KP1.5)	Provision of Goods and Services	Improvements in road conditions for business owners and public transport	C	Y		B				
Katikara Trading Centre (KP41)	Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kyenda (KP125.5)	Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Sembabule Market Zone (KP190)	Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Buswabwera (KP61)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-2 Local Economy (Nonland-Based Livelihoods) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Kabulasoke (KP111)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kagoma (KP124.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kyenda (KP125.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kyengera (KP160.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Nsambya (KP189)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Bukulula (KP240)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-2 Local Economy (Nonland-Based Livelihoods) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Lukoma (KP287.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Mutukula town (KP295.5)	Employment	Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities	C	Y	Stakeholder Engagement Plan Project-Induced In-Migration Management Plan	6	2	2	5	15
Mutukula town (KP295.5)	Employment	Competition over employment opportunities	C	Y	Stakeholder Engagement Plan Project-Induced In-Migration Management Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.12.5 Transboundary Project Impacts

8.12.5.1 Generic Transboundary Project Impacts

No generic transboundary project impacts have been identified in relation to the local economy (nonland-based livelihoods).

8.12.5.2 Location-Specific Transboundary Project Benefits

Location: RoW: Mutukula Town, Kyotera District, Uganda (KP295.5), Mutukula Town, Missenyi District, Tanzania (KP296)

The following location-specific transboundary project benefits have been identified in Mutukula town (Uganda and Tanzania) during construction.

Employment

Benefit: The generation of project local employment opportunities

The international border between Uganda and Tanzania at Mutukula is extremely porous; people migrate daily and weekly between the two countries to trade in basic goods and services. These movements are largely unregulated with customs being predominantly concerned with monitoring truck movements. The migration of agricultural labour to and from the areas surrounding Mutukula on a seasonal basis is also known to occur.

Tanzanian nationals living close to the border with Uganda may benefit from the generation of local employment opportunities by the project. Nationals from other neighbouring countries (i.e., Rwanda, Burundi) may also benefit as they have also been known to migrate to the area for economic reasons. The history of cross border migration in Mutukula and the surrounding area has led to the development of social ties and family connections; these may facilitate the movement of people from Tanzania and other countries to work on the project in Uganda.

Benefit: The provision of training and skill development opportunities within employment

Nationals from Tanzania (and other neighbouring countries), who successfully gain employment on the project in Uganda, may also benefit from the training and skill development opportunities it will bring.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for local businesses

Traders in Mutukula, which straddles the Uganda – Tanzania border, may also benefit from opportunities to provide goods and services to the project or additional spending by the construction workforce in the town; this may enhance their business activities and income earnings as a result.

The potential for generation of project local employment opportunities, provision of training and skill development opportunities within employment and project procurement opportunities will be enhanced through the measures described in Section 8.12.3.

8.12.5.3 Location-Specific Transboundary Project Impacts

No location-specific transboundary project impacts have been identified in relation to the local economy (nonland-based livelihoods).

8.12.6 Cumulative Impacts

8.12.6.1 Context

Section 6.4.3.7 describes the baseline condition of the local economy (nonland-based livelihoods), the trends and sensitivity to change. Table 8.12-1 and Table 8.12-2 summarise project residual impacts.

Although agriculture is the most important livelihood for the population in the districts traversed by the AOI of the EACOP project, trade in retail merchandise and agricultural produce and the provision of goods and services, including transport, are also important (DDPs 2015). There are presently few formal employment opportunities in the PACs and most PACs lack skilled and semiskilled workers.

The residual project impacts that may contribute to cumulative impacts are:

- provision of employment (mainly unskilled)
- skills development
- opportunities for business development from project procurement
- diversion of local people from existing local business and public-sector jobs
- retrenchment after the completion of construction
- children dropping out of school to seek employment in the project supply chain
- inflation due to project procurement of goods and services.

The cumulative impacts may be experienced in the districts, counties and subcounties within the shared AOI of the EACOP project, the associated facilities and third-party developments. The associated facilities and third-party developments are shown in the cumulative impacts matrix, described and mapped in Appendix H. These are:

- associated facilities:
  - Tilenga Project (AF01)
  - Kingfisher Oil Project (AF02)
- third-party developments:
  - transmission line from the Tilenga Project Central Processing Facility (CPF) to Kabaale (UG0A)
  - Kabaale International Airport (UG04)
  - transmission lines to Kabaale Airport (UG05)
  - refinery (UG07)
  - Hoima-Buloba pipeline (UG08)
  - Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
  - Buhimba to Kakumiro road upgrade (UG20)
  - construction camp for Bulima–Kabwoya road (UG21)
  - transmission line extension (UG34)
  - ICT infrastructure installation (UG44).

No threshold is required for the beneficial impacts of employment, training and local purchasing.

The preferred condition for the other potential impacts is that PACs maintain an adequate standard of living by returning to their pre-employment livelihoods or through alternative employment opportunities following retrenchment, that children stay in school, and that project induced inflation is curbed.

The predicted cumulative impacts should be interpreted with caution as data on construction schedules, labour and purchasing needs for third party developments are not confirmed at the time of writing.

8.12.6.2 Cumulative Impacts

Associated Facilities

The cumulative impacts for this VEC have been assessed for the construction phase only because the operational phase workforce is minimal for the EACOP project, Tilenga Project feeder pipeline and Kingfisher Oil Project feeder pipeline.

Potential cumulative impacts are predicted based on the premise that the EACOP project and the Tilenga Project feeder pipeline and Kingfisher Oil Project feeder pipeline have concurrent or consecutive construction phase timelines. The pipelines converge at PS1 around KP0 in Buseruka subcounty, Hoima district. For the local economy VEC, cumulative impacts are predicted with the Tilenga Project and Kingfisher Oil Project.

Potentially, Hoima district and Hoima municipality will experience cumulative impacts on several VECs from the EACOP, Tilenga, Kingfisher projects and several third-party developments in the area. Hoima municipality is the largest urban centre within the projects' shared AOI and will therefore play an important role in the provision of goods and labour.

Local Economic Boost

Hoima municipality is likely to benefit from a general economic boost due to the cumulative impacts from employment, training and purchasing associated with the Tilenga, Kingfisher and the EACOP projects.

If the projects were implemented consecutively the economic boost may be less intense but would occur over a longer duration.

The PACs which may experience a major economic boost (including development of new enterprises and services and increase in material standard of living of a significant number of households) as a result of the cumulative impact of employment, training and purchasing are: Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5), see Figure 8.12-1.

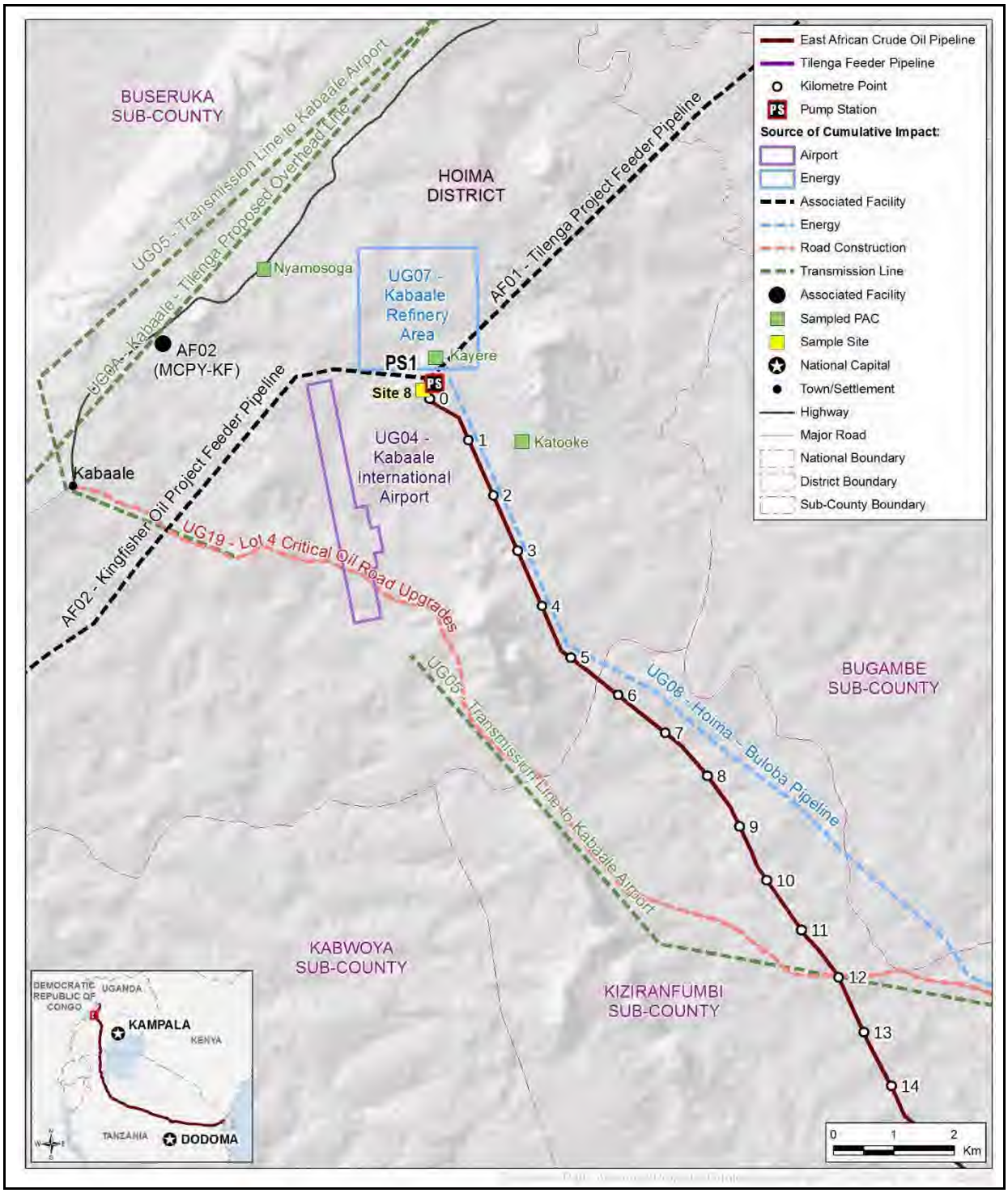


Figure 8.12-1 Cumulative Impacts: Hoima District

The projects may lead to PIIM, which in turn will lead to increased indirect employment opportunities and additional spending, resulting in additional cumulative local economic benefits.

The economic boost in Hoima municipality and affected PACs (indicated above) may also lead to an overestimation of 'financial opportunity' among school going youth, causing them to leave school in search of employment or informal business

opportunities. The potentially increased pool of jobs may also entice public sector employees away from their employment in search of higher salaries with the Tilenga, Kingfisher and the EACOP projects. The presence of all three projects would cause an impact greater than the impact caused by the EACOP project alone.

The associated facilities will implement measures similar to those described in Section 8.12.3, therefore with the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Inflation

Purchasing by the Tilenga, Kingfisher and the EACOP projects combined may cause inflation in the Hoima district of a larger magnitude than inflation caused by the EACOP project alone. This impact would be felt during the construction period but could continue into operations.

The project will undertake a benchmarking assessment on the inflation of goods within PACs if construction phases with the AFs coincide. The results of benchmarking will be shared with the proponents of the Tilenga Project and Kingfisher Oil Project.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Economic Decline After Construction

The PACs in Hoima district that may experience an economic boom as a result of cumulative impacts on employment, purchasing and training, as well as PIIM generally linked to a boom, may experience a ‘bust’ after completion of the construction period of the EACOP, Tilenga, and Kingfisher projects. However, both the Tilenga Project and Kingfisher Oil Project will employ operational workforces large enough to retain a proportion of the local workforce.

It is not yet known if the EACOP, Tilenga and Kingfisher, projects will be constructed consecutively or concurrently. The cumulative impact will be more pronounced and involve a larger number of households if the construction schedules of the projects are concurrent. If the projects were implemented consecutively, the economic ‘bust’ would be less intense as the downturn would be spread over a longer period and a proportion of local workers could be absorbed by the operational workforces.

The project will ensure that the proponents of the associated facilities are made aware of the construction schedule in Hoima district so that construction activities can be strategically planned to manage the cumulative impacts.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Retrenchment and Re-employment

Construction schedules are not confirmed but if the construction schedules of the EACOP project and associated facilities partially overlap or are consecutive, work

experience and potentially enhanced skills may provide retrenched EACOP project employees with enhanced opportunities for employment with the associated facilities. The EACOP project may also provide opportunities for retrenched workers from the associated facilities if its construction period ends before or during the construction phase of the associated facilities.

The project will engage associated facility proponents and appropriate government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration to optimise opportunities for re-employment of retrenched employees.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts on the local economy are predicted where the EACOP project and third-party developments have concurrent or consecutive construction timelines and require significant labour forces, construction materials and supplies. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that the construction phases will have similar timeframes. The EACOP project in Uganda will include 2000 workers including 200 locally recruited unskilled workers. For the third-party developments, where the workforce is known these figures have been used; where they are not known, the workforce has been estimated.

The cumulative impact of the third-party developments are similar to those of the associated facilities and are summarised below:

- local economic boost
- inflation
- economic decline post construction
- retrenchment.

The third-party developments and the subcounties that may be impacted are shown in Table 8.12-3.

Table 8.12-3 Cumulative Impacts: Local Economy (Non Land-based Livelihoods)

ID	Project	Nearest KP	MCPY/AGI	PAC/Subcounty Potentially Impacted	Labour Force Notes
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district	No data available, but it is estimated that the workforce will be smaller than for EACOP
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district	Up to 4000 workers and therefore greater than EACOP

Table 8.12-3 Cumulative Impacts: Local Economy (Non Land-based Livelihoods)

ID	Project	Nearest KP	MCPY/AGI	PAC/Subcounty Potentially Impacted	Labour Force Notes
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district	20 workers and therefore smaller than EACOP
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district	No data available but it is estimated that the workforce will be greater than for EACOP
UG08	Hoima-Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 is parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka and Kiziramfumbi subcounties, Hoima district	No data available but assumed to be similar to the EACOP spread
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19	PS1, approximately 3.2 km from UG 19	Buseruka subcounty, Hoima district	No data available but it is estimated that the workforce will be similar to that of EACOP.
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita and Nalweyo subcounties, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district	250 workers and therefore similar to EACOP
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district	30 workers and therefore smaller than for EACOP
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty and Mubende town council, Mubende district	30 workers and therefore smaller than for EACOP

Table 8.12-3 Cumulative Impacts: Local Economy (Non Land-based Livelihoods)

ID	Project	Nearest KP	MCPY/AGI	PAC/Subcounty Potentially Impacted	Labour Force Notes
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district	No data available but it is estimated that the workforce will be smaller than for the EACOP spread

Hoima municipality may experience an economic boost, inflation and potential downturn as a result of third party developments.

The following PACs within the overlapping project AOIs may experience a substantial economic boost (including development of new enterprises and services and increase in material standard of living of a substantial number of households) caused by the cumulative impact of employment, training and purchasing:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the refinery, the transmission line from Tilenga Project CPF to Kabaale, Kabaale international airport, the transmission lines to Kabaale airport, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade. It is estimated that EACOP will be a smaller contributor to the benefits accruing from the economic boost of the developments, compared to the other projects.
- Kabaale-Kyabicwe (KP35), Kisenyi (KP40), Kakende (KP29.5) and Katikara (KP41) caused by the EACOP project and the Hoima-Buloba pipeline, and the Buhimba to Kakumiro road upgrade. It is estimated that the beneficial impacts of the projects will be similar.
- Kalembe (KP122), Kyenda (125.5), Lugala (KP124), Mijunwa (KP127.5) Kagoma (KP124.5) and Mubende town caused by the EACOP project and the transmission line extension. It is estimated that EACOP will be the major contributor to the benefits accruing from the economic boost of the two developments.
- Nabigasa (KP283), Kabugimbi (KP282), Bigada (KP281.5), Kabonera (KP284.5) and Lukoma (KP287.5) caused by the EACOP project and the ICT infrastructure installation. It is estimated that EACOP will be the major contributor to the benefits accruing from the economic boost of the two developments

These PACs may also experience inflation and economic downturn post construction and have potential opportunities for re-employment with the different developments, if construction timelines are sequential.

The project will engage proponents of third party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include development and implementation of awareness campaigns in schools and communities to ensure:

- that the short-term nature of employment opportunities is communicated effectively
- collaboration to optimise opportunities for re-employment of retrenched employees
- liaising on the construction schedules to reduce disruption.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.12.6.3 Cumulative Transboundary Impacts

There are no cumulative transboundary impacts on local economy (non-landbased livelihoods).

8.13 Land-Based Livelihoods

This section describes potential impacts on land-based livelihoods during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.13.1 Key Sensitivities and Considerations

The land-based livelihoods baseline conditions are described in Section 6.4.3.8, as well as:

- land-based livelihoods key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the land-based livelihoods impact assessment.

Sensitivity in the land-based livelihoods AOI is ranked as follows:

- crop farming households engaged in subsistence and commercial crop farming are deemed very highly sensitive, owing to their limited access to alternative sources of income caused by remote location, lack of education, skills and experience. Female headed households are even more sensitive due to their particularly pronounced lack of access to alternative income sources. Also ranked very highly sensitive are landless farm labourers on subsistence farms; without their wages, potential impacts will be felt on household food and nutritional status as well as cash for living, education and health care.
- commercial farmers farming large-scale crops (e.g., coffee, tea) are deemed moderately sensitive as they generally have access to cash reserves and alternatives. Agro pastoralists are ranked as moderately sensitive as they have diversified income streams across crop farming and livestock rearing. Crop buyers and agro processors are ranked as moderately sensitive; they are dependent on one income stream but are likely to have access to credit facilities based on the business. Intermediaries who purchase goods at farm gates are also ranked as moderately sensitive; road access is critical for movement of goods to market in a timely manner.
- livestock owners (and their families) not undertaking crop farming in conjunction with livestock keeping are ranked very highly sensitive because a reduction in free movements of large herds may cause reduced access to pasture and water sources. Also ranked very highly sensitive VECs are hired herdsmen, who have little or no education and no alternative livelihood means.

- livestock owners (and their families) who undertake crop farming in conjunction with livestock rearing are considered moderately sensitive; they are less vulnerable to loss of livestock than those who rely solely on livestock rearing. Also ranked moderately sensitive are commercial ranch owners; as their operations are large-scale, they are more resilient to external shocks with the exception of disease, climatic change and a shortage of labour.
- women involved in ASM are considered very highly sensitive as they have less access to productive capital than men and may be relying on ASM as a sole livelihood. Miners who are engaged as casual labour and pursue ASM as a sole occupation are deemed very highly sensitive; these VECs do not have access to land for farming or livestock as an alternative livelihood and are therefore highly vulnerable. Children involved in ASM are very highly sensitive since they are exposed to safety risks and may lack access to education as a result of mining activities. Non Ugandan nationals engaged in ASM are very highly sensitive; these people hold no identity papers and have no legal standing in Uganda.
- pit owners are considered moderately sensitive; they may be moderately vulnerable to a loss of income but are likely to be more resilient if relocated owing to the relatively cash-rich nature of pit ownership.
- female firewood collectors are deemed highly sensitive VECs due to their dependency on natural resources; biomass reserves are already decreasing and women have to walk long distances to collect firewood. Wild food users are also deemed highly sensitive VECs as plants supplement diets and are used during hungry months when households may not have sufficient access to food.
- medicinal plant users are moderately sensitive as, without access to plants, there may be limited means to treat illnesses in an affordable manner.
- sensitivity for hunters is considered to be low; they are generally not reliant on the animals they hunt for food or as a source of income. Sensitivity for beekeepers is also considered to be low; beekeeping activities predominantly supplement farming activities, rather than representing sole livelihood strategies. Sensitivity for fibres and grass collectors is further considered to be low; fibres and grass are widespread and their availability will not be significantly impacted by the project.

Key considerations are:

- crop farming:
  - in the sample PACs crop farming is mostly undertaken on household land holdings. The impacts of failed crops or loss of land can last for several years as seedlings and seeds are produced each season for the subsequent season
  - crop farming in the sample PACs is generally rain fed, low input and low output; therefore, harvests are vulnerable to pests, diseases and climatic variability
  - farmer groups have relatively low participation but are the government's preferred means of contact
  - labour shortages may affect household agricultural capability; children miss school when they are required to complete farm work, which may be exacerbated if household members are drawn away to temporary construction jobs
  - access to markets is a major challenge for crop farmers in rural areas. With poor road conditions and limited market information, farmers are dependent

on selling goods in a timely manner locally or to middlemen buying at the farm gate. Any interruptions in the supply chain will affect their ability to market goods and receive a cash income
    - women are notably disadvantaged in crop farming with limited education, access to land holdings, capital to improve farming activities, constraints with household duties and no alternative livelihood opportunities
    - human rights to adequate food and standard of living are sustained.
- livestock rearing:
    - livestock rearing activities in the sample PACs are under pressure due to shortage of land and water resources
    - localised nomadic pastoralism within and between villages is undertaken in the sample PACs during the dry seasons
    - livestock diseases are common and increased movements of vehicles and people could increase the spread of diseases
    - owners of large herds in the sample PACs often do not have diversified income
    - human rights of access to food and a decent standard of living are maintained.
- ASM:
    - large construction projects may require substantial quantities of construction materials, which would increase the pressure on existing sources of supply with the potential for increased cost of construction materials, opening of new (licensed and unlicensed) borrow pits and surplus of borrow material
    - due to the informal and hence often covert nature of ASM activities, it is difficult to assess the precise location of ASM sites at any particular time
    - PACs' human rights to a decent livelihood, safety and security.
- natural resources use:
    - communities, especially poorer households, are dependent on natural resources for the provision of wild food, traditional medicine and firewood for cooking
    - a growing population and urban demand for firewood and charcoal has reduced their availability in the AOI
    - there is a decline in the bee population due to habitat destruction in favour of crop farming and animal grazing. Additional removal of land cover may affect the bee population further
    - PACs' human rights to a decent livelihood and food security.

Sections A11.4.6.1, A11.4.6.2, A11.4.6.3 and A11.4.6.4 in Appendix A11 identify ecosystem services associated with land-based livelihoods in the AOI. The following ecosystem services have been considered:

Crop farming provisioning services:

- food for basic survival of the population
- income from selling surplus crops to pay for education, clothes and health-related items as well as other basic needs
- jobs for farm labourers
- products for agro-processing activities.

Crop farming is undertaken throughout the AOI in PACs, sometimes being their only source of food.

In the sample PACs, most of the farming is subsistence and the agricultural produce is consumed within the family with a small portion being sold at the local market.

Livestock rearing provisioning services:

- rural income from selling livestock
- food security for families and future generations (if managed in a sustainable manner)
- financial security (livestock rearing is part of a diversification strategy to ensure some cash will be available when other means of income fail).

Livestock rearing cultural services:

- preservation of cultural heritage and traditional knowledge where livestock rearing is inter-generational.

Key points to note are that within the districts traversed by the AOI, livestock are used both for subsistence and sale. Livestock rearing in the sample PACs is predominantly sedentary with grazing on owned or rented land, while a form of localised nomadism takes place due to increasingly unpredictable rains, particularly in the Kyankwanzi, Buseruka and the Sango Bay areas.

Land provides a provisioning service as a resource for livestock keeping. It provides grazing resources, water sources, ground for movement and habitation of livestock herds and trees for shelter and medicinal herbs.

ASM provisioning services:

- income from sale of minerals and construction materials (e.g., sand, clay, gravel)
- materials for dwellings and shelter
- salt for livestock and domestic consumption.

ASM is an abiotic provisioning ecosystem service undertaken throughout the AOI by sample PACs primarily in the dry season.

Natural resources use provisioning services:

- energy for cooking and food security
- construction materials for shelter
- income from selling natural resources
- traditional medicine.

Natural resources are obtained from a variety of ecosystems within or near the PACs including forests, wetlands and pasture rangelands. As such, these natural resources play a vital role in subsistence of rural communities. With an increasing population and a high demand and reliance on natural resources, continued protection of and access to these resources is essential.

The main human rights that are relevant to land-based livelihoods are the right to an adequate standard of living, women’s rights and children’s rights as vulnerable groups. International standards for responsible business also provide that

individuals should receive adequate compensation when deprived of their means of livelihood. Adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods (see Section 4).

8.13.2 Potential Project Impacts

8.13.2.1 Construction

Generic Benefits

Use of Road Network

Within PACs, surplus agricultural produce and livestock is marketed either at farm gates (to bulk buyers) or at weekly or daily local and district markets. Temporary disruption of access to markets are discussed in Section 8.12. Farm gate sales are particularly advantageous to livestock owners as they can avoid the administrative legalities enforced at livestock markets. Baseline data indicates that marketing of produce and livestock is a major challenge, especially in rural areas, due to inadequate road infrastructure. Roads often become impassable during the two rainy seasons. Consequently, produce spoils because it cannot reach markets in time and costs of transportation are inflated, reducing farmers' profits.

Benefit: Improved ability to sell agricultural produce to nearby markets for farmers and traders

The project will improve the conditions of some murram roads and construct new roads for project access to the pipeline RoW and AGI facilities, which will be advantageous to rural communities. With improved road conditions, marketing of agricultural produce may increase and may lead to increased revenue for producers in the AOI.

Generic Impacts

Impeded Movement of Animals

Livestock are intrinsic to the livelihoods of rural PAC households. Livestock rearing of cattle, goat and sheep is a largely sedentary activity. Pasture lands used are either in fenced areas on privately owned land or on communal village land. Nomadic pastoralist practices have largely disappeared but localised movement of livestock is still practiced in some parts of the AOI (see Section A11.4.6.2 in Appendix A11).

Impact: Due to access restrictions, livestock cause damage to crops

This may lead to direct and indirect impacts.

Trenching and the creation of new access roads could temporarily limit or restrict access routes to grazing areas and watering points. This will force livestock herders to seek alternative routes or sites, potentially entering farming areas when doing so. This may cause crop damage, increase the number of conflicts or exacerbate existing conflicts between livestock owners and crop farmers. Access restrictions

may also force livestock herders to enter areas protected for their biodiversity values when seeking alternative routes or sites.

The impacts will be short-term and will affect some individuals within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Accidents Due to Open Excavations

Livestock in PACs often roam free.

Impact: Livestock falling into excavations

This may lead to direct and indirect impacts

Livestock could fall into excavations, such as the pipeline trench, causing injury or death. PACs do not have easy access to veterinary services for injured livestock. Loss of livestock may impact on a household's food security, collateral for loans and cash income.

The impacts will be medium-term and will affect some households within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Loss/Severance of Land and Disruption to Land-Based Livelihoods

PAC households are reliant on agricultural land for crop farming, forests and scrubland for natural resources, grassland for livestock rearing and areas suitable for ASM.

Impact: Permanent loss of land used for crop farming

This may lead to direct and indirect impacts.

Permanent land acquisition of approximately 300 ha will cause loss or severance of agricultural land. Baseline data indicates that there is substantial dependency on land used for commercial and subsistence crop farming, the latter of which is undertaken in nearly every PAC. Mixed farming activities consist of growing variations of perennial and annual cash crops, trees (fruit and tree plantations) and/or subsistence crops. Women are particularly engaged in crop farming and use the income generated to reinforce household food security and pay for their children's education and health care. Without access to land, a household's livelihood, food security and well-being could be severely affected.

From a human rights perspective there may be an impact on the rights related to land.

Baseline data further indicates that there is increasing scarcity of land and replacement land for economically displaced individuals may not be as productive as previous land holdings.

The impacts will be very long-term and will affect some households within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Temporary loss of grazing land

This may lead to direct and indirect impacts.

Livestock rearing in the PACs is predominantly sedentary with grazing on owned, rented or customary land. There are few alternative areas available to graze cattle without entering protected areas or causing disruptions to other land holders or users. Livestock farming is reliant on grazing land to feed animals, with few or no supplements provided.

Acquisition of land used for grazing within the RoW will result in reduced access to grazing land for livestock during construction.

From a human rights perspective there may be an impact on the rights related to land.

The impacts will be short-term and will affect some households within the PACs who depend on livestock rearing. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: Increased traffic leading to spread of animal diseases

This may lead to direct and indirect impacts.

Livestock diseases are prevalent in the districts traversed by the AOI, partially due to a lack of veterinary services and some livestock owners lacking the means to afford veterinary services. Project vehicles and people will be moving across districts, potentially spreading disease (such as foot and mouth disease) on car tyres and shoes. An increase in livestock disease may negatively impact on the food security and cash income of households depending on livestock rearing for a major proportion of their livelihoods.

The impacts will be medium-term, will affect districts and may have transboundary implications (discussed in Section 8.13.5.1). Due to their medium-term nature and medium extent, before mitigation the impacts are considered not significant.

Impact: Permanent loss of access to artisanal mining sites

This may lead to direct and indirect impacts.

ASM of construction materials (e.g., sand, stone and clay) occurs throughout the AOI. Gold ASM is undertaken in the districts of Kakumiro, Kyankwanzi and Mubende. Operations are usually non-mechanised, though simple technologies may be applied with minimal economic outlay. ASM engages many people to perform manual labour, including women and children. Participation of experienced miners from neighbouring countries (e.g., Tanzania, Rwanda and the DRC) is also common. ASM is undertaken in a largely uncontrolled manner, without a licence and often without the knowledge of the authorities.

With few alternative employment opportunities, ASM is poverty-driven and provides an important livelihood strategy for several households in the PACs. With permanent loss of access to ASM sites through permanent land acquisition for the project, households may experience a decrease in cash income and food security.

Furthermore, as it may be difficult to keep individuals involved in ASM away from known mineral deposits (particularly gold), there could be impacts related to interactions between PACs and project security personnel (see Section 8.19).

The impacts will be long-term and will affect some individuals within the PACs who depend on ASM. Young artisanal miners and women, who often turn to mining

activities because they do not have access to land for farming or livestock rearing and lack alternative livelihood opportunities, are deemed very highly sensitive VECs. Due to their very large magnitude and high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of natural resources

This may lead to direct and indirect impacts.

All households in PACs rely on natural resources including biomass fuel such as firewood or charcoal (for cooking), wood (for house construction), grasses (for thatched roofing and fodder for livestock), wild plants (to supplement food and human and animal medicine), non-wood fibres such as papyrus (for mats and screens) and insects and animals (for food and honey).

Baseline studies found varying degrees of reliance on natural resources for food security, medicine, shelter and income generation. However, the poorest members of PACs are most reliant on natural resources, often due to a lack of access to land to grow crops. There is a pronounced reliance on biomass fuels (firewood and charcoal) for cooking as there are no affordable alternatives. Medicinal plants are particularly relied on in remote rural areas where access to health care is limited.

Population growth and overexploitation is leading to a decrease in available natural resources, particularly biomass fuel.

Permanent loss of access to natural resources, caused by project land acquisition, could affect those relying on natural resources.

The impacts will be long-term and will affect entire PACs. Poorer households (e.g., landless, widowed, single female and elderly headed households) who are particularly dependent on natural resources may be more vulnerable. Owing to their small extent, before mitigation the impacts are considered not significant.

Impact: Reduction in honey production due to loss of habitat

This may lead to direct and indirect impacts.

Most PACs have at least one household involved in apiculture, which is undertaken alongside crop farming and livestock rearing activities. Apiculture is widespread in the project AOI but is particularly prevalent in Gomba, Mubende, Sembabule, Lwengo and Kyotera districts. However, baseline studies indicate a decline in the bee population, which is partially due to loss of habitat.

From a human rights perspective there may be an impact on the right to an adequate standard of living.

Further habitat degradation could be compounded by dust created along the RoW, access roads or rural roads used by construction vehicles, particularly during the two dry seasons when traffic is more likely to create dust. Vibrations, generated by construction activities, may also affect bee populations (described in Section 8.10). A decline in honey production will result in loss of income for households involved in apiculture.

The impacts will be medium-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Disruption to Surface Water Catchments

Crop cultivation in the PACs is mainly rain fed as few farmers have irrigation infrastructure. However, crop farmers are also reliant on other water sources such as rivers, dams and wells, which are drainage fed. During dry periods, water is collected from these sources and (mostly) manually transported to agricultural plots with containers to drip irrigate seedlings.

Livestock owners are reliant on catchment areas for their animals. These sources of water are not always reliable throughout the year and alternative sources often have to be accessed with permission from land holders.

These water sources are also used in some PACs by household members for washing clothes and, to a lesser extent, for drinking water.

Impact: Temporary disruption to surface water

This may lead to direct and indirect impacts.

Disruption of surface water catchment areas could affect irrigation, livestock water points and sources of water used by households. Disruptions could lead to both lack of water and flooding, resulting in direct impacts on crop cultivation and livestock rearing and indirect impacts on food security and income generation.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

From a human rights perspective there may be an impact on the right to water and an adequate standard of living in relation to farmers and irrigation.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs, except for impacts related to temporary loss of grazing land. The land acquired for the MCPYs will be acquired permanently by the government and leased to the project. It has been assumed that the land will not be returned to agricultural use when the lease ends. Therefore, the following specific impact is applicable to the 20 PACs near the four MCPYs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of grazing land

This may lead to direct and indirect impacts.

Land acquisition of approximately 70 ha for the MCPYs will cause permanent loss or severance of grazing land.

Livestock farming in the PACs is reliant on grazing land to feed animals, with few or no supplements provided to the animals. Permanent acquisition of grazing land for the MCPYs could result in insufficient grazing land for livestock and could affect the

livelihoods, food security and wellbeing of PAC households engaged in livestock rearing.

The impacts will be very long-term and will affect some households within the PACs. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

The following generic impacts may be more pronounced in the 20 PACs near the four MCPYs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land used for crop farming

This may lead to direct and indirect impacts.

Owing to the land acquisition of approximately 70 ha for the MCPYs, permanent loss of crop farming land will be greater at these locations than in PACs near to the RoW. The potential PIIM of economic migrants to the area due to employment opportunities may increase existing pressure on remaining crop land during the construction period.

The impacts will be very long-term and will affect some households within the PACs. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of natural resources

This may lead to direct and indirect impacts.

Land acquisition of approximately 70 ha for the MCPYs will cause greater permanent loss of natural resources at these locations than in PACs near to the RoW. The potential PIIM of economic migrants to the area due to employment opportunities will increase pressure on natural resources.

The impacts will be long-term and will affect entire PACs. Owing to their moderate sensitivity and small extent, before mitigation the impacts are considered not significant.

The following specific impact is also applicable to the 20 PACs near the four MCPYs:

Employment

Owing to the dearth of formal employment opportunities in PACs, households in rural areas are reliant on crop farming and livestock rearing for food security and cash income. These activities rely primarily on household members for labour.

Impact: Household members seeking employment with the project will no longer be available for land-based livelihood activities

This may lead to indirect impacts.

Household members, who may gain employment with the project, will not be available for household land-based livelihood activities (e.g., crop farming, mining). This may increase the contribution of the remaining spouse (usually the wife) and children to land-based livelihoods. Increased child labour requirements may jeopardise school attendance. Girls are more likely to be withdrawn from school

than boys due to cultural norms. If the woman is employed by the project, girls will more likely be withdrawn from school to fulfil household tasks.

Furthermore, it is possible that households may not return to their previous livelihood activities following the termination of their employment contracts. With new skills and experience on the project, households may pursue alternative work in more urbanised areas instead. Households who can secure work in such areas may benefit from increased income earning opportunities. However, households who are unable to find alternative employment may experience greater insecurity and impoverishment owing to the abandonment of existing subsistence livelihoods during the period of their employment with the project.

Households may leave land untended or under-utilised, causing agricultural production to decline. Any decline in land quality and productivity may necessitate considerable effort and financial investment to recover its previous potential.

Project employment opportunities may also reduce the availability of farm workers and hired herdsmen on cattle ranches and farms. Baseline studies indicate that commercial crop farms, plantations and cattle ranches rely on hired labour, sometimes non-Ugandan, to undertake agricultural and livestock activities that support their commercial operations. In the absence of mechanisation, manual labour is relied upon for productivity of land-based livelihoods.

The impacts will be medium-term and will affect some households within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Location: RoW: Areas of High Value Crop Cultivation

The potential generic impacts are also applicable to PACs located in areas of high value crop production. The following specific impact is also applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land cultivated with high value cash crops

This may lead to direct and indirect impacts.

Cash crops such as tobacco, tea, sugar, maize and high value perennial crops such as coffee are grown in:

- Hoima district (KP0 to KP30)
- Kakumiro district (KP36.6 to KP69)
- Lwengo district (KP225 to KP240).

Project-related land acquisition may cause the permanent loss of agricultural land used to grow high value cash crops within the RoW. This could directly impact upon the livelihoods of households who are engaged in high value crop cultivation.

The impacts will be very long-term and will affect some households within PACs. Hired agricultural labourers, who are fully dependent on the cultivation of cash crops for their livelihoods, will be particularly vulnerable. Due to their very large magnitude and high sensitivity, before mitigation the impacts are considered significant.

Location: RoW: Artisanal and Small-Scale Mining Concentrations

The potential generic impacts are also applicable to PACs where there is a concentration of gold ASM activities. The following specific impact is also applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of access to artisanal gold mining sites

This may lead to direct and indirect impacts.

Gold ASM[17] provides an alternative livelihood to subsistence farming. The practice is prevalent in:

- the subcounties of Butoloogo and Madudu, Mubende district (KP84 to KP112, bordering Bukuya subcounty)
- Nkooko subcounty, Kakumiro district (KP69 and KP82)
- Ntwetwe subcounty, Kyankwanzi district (KP82).

Project-related land acquisition may cause the permanent loss of access to gold artisanal mining sites within the RoW. This could directly impact upon the livelihoods of households with members engaged in gold ASM.

The impacts will be long-term and will affect some individuals within PACs. The potentially most affected include women and youth involved in mining activities, who have less access to productive capital than men, and casual artisanal miners without access to land. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location RoW: PACs Close to Livestock Watering Points Identified Within the RoW

The potential generic impacts are also applicable to PACs close to livestock watering points identified within the RoW. The following specific impact is also applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Temporary loss of access to livestock watering points.

This may lead to direct and indirect impacts.

During G&G environmental permitting surveys, numerous dams and potential watering points for livestock were identified along the RoW including:

- one dam in Kakumiro district (KP53)
- four dams (KP157, KP160, KP160.5 and KP162.5) and one potential animal watering point (KP159) in Gomba district
- five dams (two at KP170.5, KP172, KP185 and KP199) and three potential animal watering points (KP184.5, KP200.5, KP215.5) in Sembabule district
- one potential animal watering point (KP217) in Lwengo district

[17] ASM is undertaken in an uncontrolled and informal manner and prospecting and extraction is itinerant in nature, therefore extraction site locations are disparate and usually only known to the miners.

- one dam (KP288.5) and one potential animal watering point (KP289) in Kyotera district.

During the construction period, access restrictions along the RoW may cause temporary loss of access to these dams and watering points. This could directly impact upon the livelihoods of households engaged in livestock rearing. Households solely reliant on livestock rearing, with no alternative means of income, will be most vulnerable.

The impacts will be short-term and will affect some households within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations except for impacts related to temporary loss of grazing land. Land acquisition for the pumping stations will be permanent. Therefore, the following specific impact is applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of grazing land

This may lead to direct and indirect impacts.

Permanent land acquisition of approximately 30 ha for the pumping stations will cause permanent loss or severance of grazing land.

Livestock farming in the PACs is reliant on grazing land to feed animals, with few or no supplements provided to the animals. Permanent acquisition of grazing land for the pumping stations could cause insufficient grazing land for livestock and could affect the livelihoods, food security and well-being of PAC households engaged in livestock rearing.

The impacts will be very long-term and will affect some households within the PACs. Households that solely rely on livestock but lack private grazing land, and herders employed by livestock owners (who are often landless), will be most affected. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impacts related to permanent loss of access to artisanal mining sites are also not applicable; no evidence of ASM was found near the pumping stations during the baseline studies.

8.13.2.2 Operation

The land acquired for the MCPYs will be acquired permanently by the government and leased to the project. When construction has been completed, land leased to the project for these construction facilities will be returned to the government. The government will determine how this land will be used in the future. No additional land will be required during the operation phase.

Generic Impacts

There are no generic impacts during pipeline and AGI operation.

Location-Specific Impacts

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The following specific impact is applicable to the eight PACs near the two pumping stations during operation:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Accidental damage to crops during maintenance activities

This may lead to direct and indirect impacts

During project maintenance activities, accidental damage to crops could occur.

The impacts will be transient and will affect some individuals within the PACs. Due to their transient nature and localised extent, before mitigation the impacts are considered not significant.

8.13.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect land-based livelihoods.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.13.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects such as land use. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available. However, it may therefore have had a potentially greater impact on land-based livelihoods.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.13.3.2 Construction

Generic Mitigation Measures

Impeded Movement of Animals

Impact: Due to access restrictions, livestock cause damage to crops

The community health, safety and security plan, stakeholder engagement plan and the monitoring and reporting plan include measures that will manage impeded movement of animals.

Crossing points will be provided across trenches at locations identified to be most appropriate by local people who will be informed of access restrictions. Incidents in conflicts between crop farmers and herders will be monitored, support will be provided to local authorities where required and all stakeholders will have access to the grievance procedure.

Meetings will be held with PAC representatives, when construction is active in their area, to provides updates on construction progress and to receive comments or queries. Leaflets and posters with additional information will be produced consistent with project stakeholder engagement plan guidelines.

Where access restrictions affect land-based livelihoods because of interruption to agricultural production, appropriate compensation will be provided.

Application of these mitigation measures will reduce the magnitude from very large to medium and the residual impact is not significant.

Accidents Due to Open Excavations

Impact: Livestock falling into excavations

The community health, safety and security plan, stakeholder engagement plan and monitoring and reporting plan will include measures that will manage accidents related to open excavations.

A risk assessment will be conducted for excavations and the maximum length of open trench will be defined based on community safety and livestock management patterns. Community awareness programmes will be implemented to ensure community and livestock safety during construction. Inspections of construction activity will include checks for compliance with measures to protect livestock.

Application of these mitigation measures will reduce the magnitude from medium to negligible and the duration from medium-term to short-term. Residual impacts will be not significant.

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land used for crop farming

Impact: Temporary loss of grazing land

Impact: Permanent loss of access to artisanal mining sites

Impact: Permanent loss of natural resources

Impact: Reduction in honey production due to loss of habitat

The pollution prevention plan, resettlement action plan and monitoring and reporting plan will include measures that contribute to manage land and livelihood related impacts.

A resettlement action plan will describe the procedures related to compensation for loss of assets and livelihood restoration strategies to ensure livelihoods are restored to pre-project levels as a minimum.

Where construction generated dust may affect honey production, dust suppression, adherence to RoW speed limits and sheeting of fine materials being transported or stored on-site will be considered.

For the impact permanent loss of land used for crop farming, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from very long-term to short-term. The residual impact is not significant.

For the impact temporary loss of grazing land, application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact will be not significant.

For the impact permanent loss of access to artisanal mining sites, application of these mitigation measures will reduce the magnitude of impact from very large to small and the duration of impact from long-term to short-term. The residual impact will be not significant.

For the impact permanent loss of natural resources, application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact will be not significant.

For the impact reduction in honey production due to loss of habitat, application of these mitigation measures will reduce the magnitude of impact from small to negligible and the duration from medium-term to short-term.

The residual impact will be not significant.

Impact: Increased traffic leading to spread of animal diseases

The transport and road safety management plan, community health, safety and security plan and the biodiversity management plan will include measures to manage spread of animal diseases.

Measures will include inspections, cleaning and the restriction of movement to defined access roads and demarcated working areas (unless in the event of an emergency).

Application of these mitigation measures will reduce the magnitude from large to small and the residual impact will be not significant.

Disruption to Surface Water Catchments

Impact: Temporary disruption to surface water

The infrastructure and utilities management plan and resettlement action plan will include measures that will contribute to the control of this impact.

Potentially affected landowners, land users and communities will be consulted if there is likely to be any disruption to the existing infrastructure and utility services and their feedback will inform planning of the works. If project activities affect land-based livelihoods because of interruption to irrigation or drainage required for agricultural production, compensation will be provided.

A pre-construction entry survey will be undertaken to document the condition of immovable assets and crops to provide baseline evidence in the event of a claim for damage and agree on temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing).

Application of these mitigation measures will reduce the magnitude from medium to small and the residual impact will not be significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional specific mitigation measures recommended for these PACs are:

Employment

Impact: Household members seeking employment with the project will no longer be available for land-based livelihood activities

The stakeholder engagement plan and labour management plan will include measures that will contribute to managing employment impacts.

This will include a campaign focused on providing realistic community expectations about livelihood options and employment opportunities and financial management workshops for workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should try to maintain their existing livelihoods and prepare for the termination of their employment.

Application of these mitigation measures will reduce the magnitude from large to small and the residual impact will be not significant.

Children's Rights

An awareness campaign targeting schools at sensitive locations within the project AOI will be developed. This will focus on topics specifically important to children:

- importance of staying in school
- risks of relationships with transient workers, transactional and commercial sex

Right to an adequate standard of living

The project will develop a campaign focused on providing realistic community expectations about livelihood options and employment opportunities.

All stakeholders will be informed on their rights and the project grievance mechanism and their right to use it.

Location: RoW: Areas of High Value Crop Cultivation

The generic mitigation measures are also applicable to PACs in areas of high value crop cultivation. The additional mitigation measures recommended for these PACs are:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land cultivated with high value cash crops

The resettlement action plan and stakeholder engagement plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all stakeholders allowing for the resolution of potential grievances.

Location: RoW: Artisanal and Small-Scale Mining Concentrations

The generic mitigation measures are also applicable to PACs where there is a concentration of gold ASM activities. The additional mitigation measure recommended for these PACs is:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of access to artisanal gold mining sites

The resettlement action plan and stakeholder engagement plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all stakeholders allowing for the resolution of potential grievances.

Location: RoW: PACs Close to Livestock Watering Points Identified Within the RoW

The generic mitigation measures are also applicable to PACs close to livestock watering points identified within the RoW. The additional mitigation measure recommended for these PACs is:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Temporary loss of access to livestock watering points.

The resettlement action plan and stakeholder engagement plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all stakeholders allowing for the resolution of potential grievances.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations, except for measures related to permanent loss of access to artisanal mining sites. No evidence of ASM was found near the pumping stations during the baseline studies.

8.13.3.3 Operation

Generic Mitigation Measures

As there are no predicted generic impacts for pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Accidental damage to crops during maintenance activities

The stakeholder engagement plan and the resettlement action plan will include measures that address grievances arising from maintenance activities at the pumping stations.

The compensation framework from the RAP will provide compensation rates for damaged crops.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact will be not significant.

8.13.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on land-based livelihoods after mitigation measures have been implemented.

Table 8.13-1 summarises the potential generic land-based livelihoods impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.13-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on land-based livelihoods are considered not significant.

8.13.4.1 Ecosystem Services

Sections A11.4.6.1, A11.4.6.2, A11.4.6.3 and A11.4.6.4 in Appendix A11 identify ecosystem services associated with land-based livelihoods in the AOI. The following ecosystem services have been assessed in Sections 8.13.2 and 8.13.3:

Crop farming provisioning services:

- food for basic survival of the population
- income from selling surplus crops to pay for education, clothes and health-related items as well as other basic needs

- jobs for farm labourers
- products for agro processing activities.

Crop farming is undertaken throughout the AOI in PACs, sometimes being their only source of food.

In the sample PACs, most of the farming is subsistence and the agricultural produce is consumed within the family with a small portion being sold at the local market.

Livestock rearing provisioning services:

- rural income from selling livestock
- food security for families and future generations (if managed in a sustainable manner)
- financial security (livestock rearing is part of a diversification strategy to ensure some cash will be available when other means of income fail).

Livestock rearing cultural services:

- preservation of cultural heritage and traditional knowledge where livestock rearing is inter-generational.

Key points to note are that within the districts traversed by the AOI, livestock are used both for subsistence and for sale. Livestock rearing in the sample PACs is predominantly sedentary with grazing on owned or rented land, while a form of localised nomadism takes place due to increasingly unpredictable rains, particularly in the Kyankwanzi, Buseruka and the Sango Bay areas.

Land provides a provisioning service as a resource for livestock keeping. It provides grazing resources, water sources, ground for movement and habitation of livestock herds and trees for shelter and medicinal herbs.

ASM provisioning services:

- income from sale of minerals and construction materials (e.g., sand, clay, gravel)
- materials for dwellings and shelter
- salt for livestock and domestic consumption.

ASM is an abiotic provisioning ecosystem service undertaken throughout the AOI by sample PACs primarily in the dry season.

Natural resources use provisioning services:

- energy for cooking and food security
- construction materials for shelter
- income from selling natural resources
- traditional medicine.

Natural resources are obtained from a variety of ecosystems within or near the PACs including forests, wetlands and pasture rangelands. As such, these natural resources play a vital role in subsistence of rural communities. With an increasing population and a high demand and reliance on natural resources, continued protection of and access to these resources is essential.

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.13-1 Land-Based Livelihoods – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Use of Road Network	Improved ability to sell agricultural produce to nearby markets for farmers and traders	C	Y		B				
Impeded Movement of Animals	Due to access restrictions, livestock cause damage to crops	C	-	Community Health, Safety and Security Plan Stakeholder Engagement Plan Monitoring and Reporting Plan	6	2	1	5	14
Accidents Due to Open Excavations	Livestock falling into excavations	C	Y	Community Health, Safety and Security Plan Stakeholder Engagement Plan Monitoring and Reporting Plan	2	3	1	5	11
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of land used for crop farming	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Temporary loss of grazing land	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.13-1 Land-Based Livelihoods – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Increased traffic leading to spread of animal diseases	C	-	Transport and Road Safety Management Plan Community Health, Safety and Security Plan Biodiversity Management Plan	4	3	3	4	14
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of access to artisanal mining sites	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	4	11
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of natural resources	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	2	2	2	2	8
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Reduction in honey production due to loss of habitat	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	2	2	1	3	8
Disruption to Surface Water Catchments	Temporary disruption to surface water	C	Y	Infrastructure and Utilities Management Plan Resettlement Action Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.13-2 Land-Based Livelihoods – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plans	Residual Impact				
PACs near the four MCPYs	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Employment	Household members seeking employment with the project will no longer be available for land-based livelihood activities	C	-	Stakeholder Engagement Plan Labour Management Plan	4	3	1	4	12
PACs in areas of high value crop production	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of land cultivated with high value cash crops	C	Y	Resettlement Action Plan Stakeholder Engagement Plan	4	2	1	4	11
PACs where there is a concentration of gold ASM activities	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of access to artisanal gold mining sites	C	Y	Resettlement Action Plan Stakeholder Engagement Plan	4	2	1	4	11
PACs close to livestock watering points identified within the RoW	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Temporary loss of access to livestock watering points	C	Y	Resettlement Action Plan Stakeholder Engagement Plan	4	2	1	4	11

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.13-2 Land-Based Livelihoods – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plans	Residual Impact				
PACs near the two pumping stations	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the two pumping stations	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Accidental damage to crops during maintenance activities	O	-	Resettlement Action Plan Stakeholder Engagement Plan	4	1	1	5	11

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.13.5 Transboundary Project Impacts

8.13.5.1 Generic Transboundary Project Impacts

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Increased traffic leading to spread of animal diseases

Livestock diseases are prevalent in PACs, most notably, during baseline studies, foot and mouth disease. During construction, project-related traffic will move across districts and between countries. Because of these movements, animal diseases could be inadvertently spread on vehicle tyres, directly impacting livestock populations and indirectly impacting households whose livelihoods depend on them (particularly those with large herds).

The potential for increased traffic leading to the spread of animal diseases across national borders will be managed through the mitigation measures described in Section 8.13.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.13.6 Cumulative Impacts

8.13.6.1 Context

Section 6.4.3.8 describes the baseline condition of land-based livelihoods, the trends and sensitivity to change. Table 8.13-1 and Table 8.13-2 summarise project residual impacts.

Most of PAC households are rural and rely on land-based livelihoods, mainly crop farming and livestock rearing for subsistence and cash income. Baseline data indicates increasing pressure on land availability and productivity. Population increases, including in-migration and over-exploitation, is causing a decrease in natural resource availability.

Sensitivity is ranked as very high for households in PACs engaged in subsistence farming, landless farm labourers and female headed households engaged in farming.

EACOP residual project impacts, which may contribute to cumulative impacts include:

- temporary and permanent loss/severance of land and consequent disruption to land-based livelihoods
- disruption of surface water catchments
- increased spread of animal disease.

The cumulative impacts may be experienced in the districts, counties and subcounties within the shared AOI of the EACOP project, the associated facilities and third-party developments. The associated facilities and third-party developments are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
  - Tilenga Project (AF01)
  - Kingfisher Oil Project (AF02)
- third-party developments:
  - transmission line from the Tilenga Project Central Processing Facility (CPF) to Kabaale (UG0A)
  - Kabaale International Airport (UG04)
  - transmission lines to Kabaale Airport (UG05)
  - refinery (UG07)
  - Hoima-Buloba pipeline (UG08)
  - Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
  - Buhimba to Kakumiro road upgrade (UG20)
  - construction camp for Bulima–Kabwoya road (UG21)Bulima–Kabwoya road upgrade (UG22)
  - transmission line extension (UG34)
  - ICT infrastructure installation (UG44).

The preferred condition is for the standard of living of the impacted individuals and households of the PACs to be equal to, or better than, before construction.

8.13.6.2 Cumulative Impacts

Potential cumulative impacts linked to land-based livelihoods are predicted where:

- the EACOP project, the associated facility and/or third-party developments require land used by a particular PAC or household
- traffic from outside the local area is prevalent.

Associated Facilities

Impacts on Permanent and Temporary Loss of Land

For land-based livelihoods it is considered that the Tilenga Project feeder pipeline and Kingfisher Oil Project feeder pipeline components of the Tilenga Project and Kingfisher Oil Project respectively, not the upstream field development components, have the potential for cumulative impacts with EACOP. Cumulative impacts of the EACOP, the Tilenga and Kingfisher projects on land-based resources of PACs (and households within PACs) may lead to:

- insufficient remaining communal grazing land for the PAC to graze its livestock and receive nomadic livestock herds
- insufficient remaining communal land for the PAC to harvest natural resources
- insufficient remaining crop land for the PAC and for some households in particular for fallowing and crop rotation
- insufficient remaining land for land-based livelihood restoration (when required for physical and economic resettlement) within the PAC.
- insufficient access to water sources for the entire PAC. This could affect irrigation, livestock water points and sources of water used by households.

These cumulative impacts may apply to the following PACs:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5)

Information from the Tilenga Project and the Kingfisher Oil Project indicates that mitigation measures similar to those described in Section 8.13.3 will be implemented. In addition, the EACOP project will aim to avoid double economic displacement and where this is unavoidable, resettlement planning will ensure that livelihoods are, as a minimum, restored.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Increased Traffic Increasing the Spread of Animal Diseases

Vehicles for the construction of the EACOP and feeder pipelines of the Tilenga Project and Kingfisher Oil Project travelling through the same districts over similar timeframes, where cattle are present could potentially increase the spread of animal diseases.

Information from the Tilenga Project feeder pipeline and the Kingfisher Oil projects indicate that mitigation measures similar those described in Section 8.13.3 will be implemented. With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts associated with land-based livelihoods are predicted where the EACOP project and third-party developments have concurrent or consecutive construction phase timelines and where land take is required. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that construction will be conducted in similar timeframes.

Impacts on Permanent and Temporary Loss of Land

The third-party developments and the subcounties and districts that may be impacted are shown in Table 8.13-3.

Table 8.13-3 Cumulative Impacts: Land-Based Livelihoods

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district	No data available

Table 8.13-3 Cumulative Impacts: Land-Based Livelihoods

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district	The airport will be constructed within the 29 km^2 area of land already acquired by the government for Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in kind compensation moved to locations of their choice.
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at approximately KP12	Buseruka subcounty, Hoima district	The lines will have a 10 m construction corridor with a 5 m permanent right of way.
UG07	Refinery	0	PS1 approximately 0.2 km from UG07	Buseruka subcounty, Hoima district	The refinery will be constructed within the 29 km^2 area of land already acquired by the government for the Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in-kind compensation moved to locations of their choice

Table 8.13-3 Cumulative Impacts: Land-Based Livelihoods

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 runs parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka and Kiziramfumbi subcounties, Hoima district	No data available
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrades	0–19	PS1, approximately 3.2km from UG 19	For PS1: Buseruka subcounty, Hoima district	The road width will be increased from 4.5 m to a maximum of 12 m. The road will have a maximum RoW of 50 m.
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita and Nalweyo subcounties, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district	The proposed road will be constructed within a 30–50-m wide corridor
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district	The camp will be constructed on a 1.8-ha area
UG22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district	No data available
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty, Mubende district	The line will have a 10-m right of way
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses the pipeline	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district	No data available

The PACs that may be impacted by temporary or permanent loss of land are:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project, the transmission line from the Tilenga Project CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade. In the case of the transmission line from the Tilenga Project CPF to Kabaale, the transmission lines to Kabaale airport, and the Hoima-Buloba pipeline, the EACOP project may be responsible for more land-take than the other projects. The households that accepted replacement housing in the area allocated for the Kabaale Industrial Park which includes the airport and the refinery have already been relocated to a location in Kizirafumbi Subcounty that would not be affected by the EACOP project. For those households that accepted in-kind compensation, there is the potential that they resettled with the EACOP project footprint and may experience loss of severance of land and disruption of livelihoods in the location to which they resettled.
- Katikara (KP41) and Kisenyi (KP40) caused by the EACOP project and the Buhimba to Kakumiro road upgrade. The road upgrade will be the main contributor to the cumulative effect
- Kalembe (KP122) and Kyenda (125.5) caused by the EACOP project and the transmission line extension. EACOP will be the main contributor to the cumulative effect
- Nabigasa (KP283), Kabugimbi (KP282), Bigada (KP281.5) and Kabonera (KP284.5) caused by the EACOP project and the ICT infrastructure installation. Due to lack of data on the ICT project, the contribution of EACOP to the overall cumulative effect could not be identified.

As described for the associated facilities, the project will consider double livelihood resettlement into its resettlement plan to manage the cumulative impact with third party developments.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Increased Traffic Increasing the Spread of Animal Diseases

Vehicles for the EACOP project and the third-party developments travelling through the same districts over similar timeframes, where cattle is present could potentially increase the spread of animal diseases.

Due to lack of sufficient data on routes used by the third-party developments and movement of herds at the time of writing, a more detailed analysis of the affected PACs could not be provided.

8.13.6.3 Cumulative Transboundary Impacts

There are no cumulative transboundary impacts on land-based livelihood.

8.14 River and Lake-Based Livelihoods

This section describes potential impacts on river and lake-based livelihoods during the construction, commissioning and operation of the EACOP project and associated mitigation measure to be adopted.

8.14.1 Key Sensitivities and Considerations

The river and lake-based livelihoods baseline conditions are described in Section 6.4.3.9, as well as:

- river and lake-based livelihoods key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the river and lake-based livelihoods impact assessment.

Sensitivity is ranked as very high for:

- lake fisherfolk who fish full time and are dependent on fishing as a sole livelihood and subsistence activity
- women dependent on lakeshore fishing, who have no alternative means of livelihood and are dependent on fishing from lakeshores for food security and income generation
- landless fisherfolk who fish on rivers, who have limited alternative income generating opportunities other than freshwater fishing
- employees of aquaculture enterprises, who are often landless and exclusively dependent on their jobs.

Sensitivity is ranked as moderate for:

- lake fisherfolk who fish part time and women engaged in fish processing and marketing as part of a multiple livelihood strategy.

Key considerations are:

- lake fishing and aquaculture are small-scale subsistence activities
- those whose livelihoods are dependent on fishing are poor, lack access to credit and hence their resilience is low
- there is pressure on the fisheries sector; increasing crop failures, caused by drought or floods, are forcing crop farmers to look for alternative income sources
- young people are becoming more attracted to fishing activities as the size of farming plots for the younger generations is diminishing, rendering crop farming less profitable
- human rights to access to food and an adequate standard of living for communities.

Section A11.4.7 in Appendix A11 identifies ecosystem services associated with river and lake-based livelihoods in the AOI. The following ecosystem services have been considered:

Provisioning services:

- income from selling catch and fishing equipment
- food to supplement diets
- products for fish processing activities.

Cultural services:

- fishing has been an important activity for generations and is a major part of the PACs' way of life, particularly for the lake fisherfolk.

The main human right that is relevant to river and lake-based livelihoods is the right to an adequate standard of living. International standards for responsible business

also provide that individuals should receive adequate compensation when deprived of their means of livelihood. Adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods (see Section 4).

8.14.2 Potential Project Impacts

8.14.2.1 Construction

Generic Impacts

Restriction of Access to Fisheries

Fishing in lakes, rivers and ponds by PACs is mostly a small-scale subsistence activity. Due to the lack of formal employment opportunities and pressure on land, lake fishing is increasingly undertaken as a full-time occupation in certain PACs around lakes. Others combine lake fishing with land-based livelihood activities such as crop farming and livestock rearing. Increasing dependence on lake fishing for income generation and food security is, however, contributing to a decline in fish stocks.

River fishing is mainly a part time activity. However, landless people or those with plots of land that are too small to be economically viable and support the household are particularly reliant on fishing.

Pond and dam aquaculture is mainly a small-scale part time activity, often undertaken as part of a government scheme and executed alongside farming.

The fisheries sector also provides livelihoods for those engaged in the supply chain, which includes small-scale and industrial fish processing, fish trading, boat-building and trading in fishing equipment.

Impact: Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW

This may lead to direct and indirect impacts.

Temporary loss of access to fishing grounds, due to road closure and access restrictions, could impact the food security and cash income of fisherfolk and their households. Those who rely on fishing as a full-time occupation will be particularly vulnerable (usually the landless), as they have no other means of generating an income. Those who rely on aquaculture and the fisheries supply chain as their main livelihood will also be vulnerable (usually the landless) as they have no other income or means of obtaining food security.

The impacts will be short-term and will affect some households within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Resettlement

Land acquired permanently for the project may lead to the loss of an aquaculture pond or may require physical resettlement of some households, leading to a loss of access to their pond.

Impact: Permanent loss of access to ponds used for aquaculture due to project land acquisition

This may lead to direct and indirect impacts.

Permanent loss of access to ponds used for aquaculture may impact on the food security and cash incomes of those involved in aquaculture. It may also impact on their access to credit, as ponds may be used for collateral.

The impacts will be very long-term and will affect some households within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. The potential reduction in the availability of potable water in PACs due to PIIM is described in Section 8.18. The following specific impact is also applicable to these PACs:

Project Induced In-Migration (PIIM)

Impact: Reduction in local fish stocks due to PIIM

This may lead to direct and indirect impacts.

The potential PIIM of economic migrants to PACs surrounding the MCPYs may lead to a reduction in local fish stocks due to increased fishing activities in local rivers and streams. This may lead to a reduction in food security among PAC households reliant on these watercourses for subsistence.

The impacts will be short-term and will affect some households within the PACs. Owing to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Location: RoW: PACs Close to Pipeline River Crossings

During the construction period, the pipeline will cross the following rivers:

- River Kafu and wetland area (KP36.5)
- Nabakazi River and wetland area (KP114 and KP147.4)
- Katonga River and wetland area (KP165)
- Kibale River and wetland area (KP274).

The potential generic impacts are applicable to the 21 PACs close to pipeline river crossings. The following specific impact is also applicable to these PACs:

Impeded Flow of River or Channel

Impact: Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction

This may lead to direct and indirect impacts.

Open-cut crossing construction is typically completed over a short period. As a proportion of the total and average movement of sediment in these rivers, the amount of sediment mobilised by construction is likely to be small and short-term. Nevertheless, a temporary increase in levels of suspended sediment may lead to a temporary reduction in fish catch. This may reduce a household's food security and cash income.

The impacts will be short-term and will affect some households within the PACs. The landless with no alternative means of income will be most vulnerable. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.14.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.14.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect river and lake-based livelihoods.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.14.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to river and lake-based livelihoods such as minimising impacts on water bodies and water points/sources. The selected pipeline route was chosen partly because it had the lowest number of constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.14.3.2 Construction

Generic Mitigation Measures

Restriction of Access to Fisheries

Impact: Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW

The resettlement action plan and stakeholder engagement plan will include measures to manage access to fisheries.

A resettlement strategy has been developed to outline procedures related to loss of assets and livelihood restoration. A resettlement action plan or livelihood restoration plan will describe the procedures related to compensation for loss of assets as well as livelihood restoration strategies.

The project will engage and consult with internal and external stakeholders to keep them informed about progress with the project, understand and respond to their concerns and report to them on the project's environmental and social performance.

The project will implement a grievance procedure to provide opportunities for PACs to express grievances and a campaign focused on providing realistic community expectations about livelihood options and employment opportunities to avoid livelihood decisions based on incorrect information.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Resettlement

Impact: Permanent loss of access to ponds used for aquaculture due to project land acquisition

The resettlement action plan, the stakeholder engagement plan and the monitoring and reporting plan will include measures that will control this impact.

Resettlement action plan procedures will guide compensation for loss of assets and livelihood restoration strategies, and additional measures will be developed where necessary to ensure livelihoods are restored as a minimum to pre-project levels.

The stakeholder engagement plan will identify how to engage and consult with stakeholders to keep them informed on project activities and understand and respond to their concerns. A grievance procedure will provide opportunity to stakeholders to express grievances about project activities.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and duration from very long-term to short-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are applicable to the 20 PACs near the four MCPYs. The following additional specific mitigation measure is recommended for these PACs:

Project Induced In-Migration (PIIM)

Impact: Reduction in local fish stocks due to PIIM

A PIIM management plan will be developed and implemented with the aim of reducing the number of, and impacts associated with people attracted by job opportunities arriving into PACs.

Application of this mitigation measure will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Location: RoW: PACs Close to Pipeline River Crossings

The generic mitigation measures are applicable to the 21 PACs close to pipeline river crossings. The additional mitigation measures recommended for these PACs are as follows:

Impeded Flow of River or Channel

Impact: Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction

The pollution prevention plan and reinstatement plan will include mitigations that will manage impacts to PACs close to pipeline river crossings.

Location-specific method statements will be produced for watercourse crossing construction that will incorporate erosion control; sediment control, maintaining environmental base flows downstream of crossings, reinstatement, spill response and the notification of fisherfolk.

Application of these measures will reduce the magnitude of impact from large to small and the residual impact is not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.14.3.3 Operation

Generic Mitigation Measures

As there are no predicted generic impacts during pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.14.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on river and lake-based livelihoods after mitigation measures have been implemented.

Table 8.14-1 summarises the potential generic river and lake-based livelihoods impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.14-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on river and lake-based livelihoods will be not significant.

8.14.4.1 Ecosystem Services

Section A11.4.7 in Appendix A11 identifies ecosystem services associated with river and lake-based livelihoods in the AOI. The following ecosystem services have been assessed in Section 8.14.2 and Section 8.14.3:

Provisioning services:

- income from selling catch and fishing equipment
- food to supplement diets
- products for fish processing activities.

Cultural services:

- fishing has been an important activity for generations and is a major part of the PACs' way of life, particularly for the lake fisherfolk.

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.14-1 River and Lake-Based Livelihoods – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Restriction of Access to Fisheries	Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW	C	-	Resettlement Action Plan Stakeholder Engagement Plan	2	2	1	4	9
Resettlement	Permanent loss of access to ponds used for aquaculture due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Monitoring and Reporting Plan	4	2	1	5	12

Table 8.14-2 River and Lake-Based Livelihoods – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	PIIM	Reduction in local fish stocks due to PIIM	C	Y	Project-Induced In-Migration Management Plan	4	2	1	3	10
PACs close to pipeline river crossings	Impeded Flow of River or Channel	Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction	C	-	Pollution Prevention Plan Reinstatement Plan	4	2	1	2	9

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.14.5 Transboundary Project Impacts

No transboundary project impacts have been identified.

8.14.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the river and lake-based livelihoods VEC is negligible and no further mitigation measures other than those described in Section 8.14.3 are considered necessary.

8.14.6.1 Cumulative Transboundary Impacts

There are no cumulative transboundary impacts on river and lake-based livelihoods.

8.15 Land and Property

This section describes potential impacts on land and property during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.15.1 Key Sensitivities and Considerations

The land and property baseline conditions are described in Section 6.4.3.10, as well as:

- land and property key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the land and property impact assessment.

Sensitivity in the land and property AOI is ranked as very high for female headed households, who are particularly vulnerable due to long standing discrimination that excludes women from owning, inheriting and controlling land. Households and individuals who have been previously displaced and resettled, as a result of other developments in the AOI, are also deemed very highly sensitive.

Landholders without title deeds are considered highly sensitive VECs; without title deeds, landholders will be more vulnerable in terms of rights for compensation. Youths are potentially highly sensitive VECs as a result of having limited access to land outside their customary rights.

Sensitivity is ranked as moderate for livestock owners practicing localised nomadism; without access to land or water, livestock quality and quantity will be adversely affected.

Key considerations are:

- the increasing scarcity of land because of a growing population
- the vulnerability of the majority of landowners due to lack of formal title deeds
- women being disadvantaged in terms of access to land. Compensation for loss of land will mostly be paid to the head of household (men) without spousal consent, leaving women vulnerable in terms of access to that compensation
- the existence of numerous land conflicts exacerbated by shortage of land

- the lack of land management plans which impact on the distribution of land
- the existence of vulnerable groups in terms of land acquisition, such as illegal users of the land, including hunters and natural resource users (see Section 8.13)
- an increase in “land grabbing” schemes used to obtain land unlawfully or under false pretexts, high amounts of land speculation and reports of speculators extorting land from people creates fear and insecurity.

The ecosystem services associated with land have been considered in land-based livelihoods (see Section 8.13).

The key human rights relevant to land and property are the right to own property and the right to an adequate standard of living. Women’s rights and children’s rights should also be considered here as they are identified to be particularly vulnerable groups. International standards for responsible business also provide that individuals should receive adequate compensation when deprived of their land. Adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods (see Section 4).

Resettlement

This section describes the land acquisition and compensation process that will be implemented by the project.

The project will require permanent land acquisition of approximately 300 ha and a Resettlement Strategy (RS) has been developed. The purpose of the RS is to define the overarching principles for land access, compensation and resettlement planning, and is the foundation for the development of Resettlement Action Plans (RAPs) or Livelihood Restoration Plans (LRPs). The Ugandan Government, in coordination with the PPT, will acquire the permanent right of occupancy for project-required land. The Government of Uganda will lease the land to the project.

Land access and resettlement planning for the project will be undertaken in compliance with Ugandan legal and regulatory requirements and international good practice (IGP) as reflected in the International Finance Corporation (IFC) Performance Standard (PS) 5 on Land Acquisition and Involuntary Resettlement. In instances where a given project comprises subprojects or multiple components that cannot be identified before project approval, or that may be implemented sequentially over an extended period, PS5 allows for the prior development of a RS outlining the general principles for resettlement planning.

Project Land

Table 8.15-1 indicates the land required for each project component.

Table 8.15-1 Summary of Project Land Requirements

Project Component	Estimated Affected Area
Construction Facilities	
Four MCPYs	Approximately 74 ha
Construction and Operation	
New access roads to construction facilities, pipeline RoW and AGIs	Approximately 74 ha
Operational Facilities	
Export Pipeline	
30-m-wide RoW	30-m corridor: 888 ha
Additional temporary construction workspace along RoW (estimate)	333 ha
AGIs	
Two PS (includes buffer and construction staging area) (15 ha each with 1 ha in pipeline RoW)	2 x 15 ha outside 30-m RoW = 30 ha
Total project land requirement[18] (construction and operation)	Approximately 1330 ha

The following land will also be acquired and leased by the project:

- "orphaned land" where the pipeline corridor dissects a field, leaving small portions which are no longer viable to cultivate/use and classed as "uneconomic".
- temporary land requirements by contractors (e.g., for construction access, establishing of fly camps, storage of equipment and hydrotest water, access to land to undertake site surveys and related activities).

Approximately 72% of land that will be affected by the project is under cultivation (includes plantation areas and pastures).

Legislative and Regulatory Requirements and International Standards

The primary project obligation is to meet national legislative requirements for land acquisition, compensation and resettlement. In addition, international financing standards enshrined in the Equator Principles (EPs) III and the IFC PSs will apply to meet lender requirements. Based on these requirements, the RS has conducted a gap analysis to ensure both national and lender requirements are met. The RS ensures that, where a discrepancy exists between lender requirements (EPs and IFC PSs) and national legislation, the more stringent of the two will be used and/or applied.

Eligibility and Entitlements/Compensation Framework

The RS considers eligibility for compensation and resettlement entitlements. Eligibility is defined as entitlement to compensation and assistance granted to

[18] This excludes "orphaned land" where the pipeline corridor dissects a field, leaving small portions which are no longer viable to cultivate/use and classed as "uneconomic".

persons, groups of persons, families, or institutions due to displacement resulting from land acquisition, the revocation of rights, and/or the compulsory acquisition of property as a direct result of the project.

Only persons occupying or using an area in the project footprint before the cut-off date (the first date of valuation in a given area) are eligible for compensation for loss of land rights and assets established before this cut-off date. Only these assets will be recorded during the valuation process. Should affected persons not be present during the valuation process, such persons will be requested to provide proof of their presence in the project area during the valuation period, and/or proof of ownership of assets in the project area during that period, to be eligible for compensation.

Assets affected by the project will be valued to determine the compensation due to their owners and/or users. The valuation methodology to be used is prescribed in various acts and regulations which explicitly provide guidance on valuation practices. Different valuation methods are proposed for the various eligibility categories identified, particularly in relation to land, structures, crops and trees and businesses. The selection of the specific valuation method has been guided by the requirement of compliance with Ugandan legislation. Further to the valuation methodologies, options and packages are proposed by the project to ensure that IFC PS5 criteria are fully addressed, particularly to “improve, or restore, the livelihoods and standards of living of displaced persons”.

Entitlements associated with impacts and those impacted are set out in the RS in an eligibility and entitlements framework*.*

Resettlement Action Plans

Based on the RS the project’s resettlement process will culminate in the development of a suite of RAPs and/or LRPs. The geographical area to be covered by each is determined partly by administrative boundaries, and partly by the timing of required land access for various project components. The RAPs/LRPs proposed thus comprise the following:

- RAP/LRP for MCPYs that need to be prioritised in terms of early land access requirements; and
- RAPs/LRPs for the pipeline RoW and AGIs in each of the districts traversed by the AOI.

8.15.2 Potential Project Impacts

8.15.2.1 Construction

Generic Impacts

Resettlement

Pipeline route selection has been undertaken to minimise disruption to land and property. Nevertheless, on a project of this scale, some physical displacement (loss of shelter or relocation of households) and economic displacement (loss of, or interruption of access to, land or other livelihood resources) for communities is unavoidable.

The estimated project land requirements are summarised above in Table 8.15-1. The number of PAPs, with regards to temporary and permanent resettlement related impacts, is estimated at 300–400 households. These households will be physically displaced, permanently if located within the RoW, MCPY or AGI land requirements. An estimated 1700–3000 households will be economically displaced.

Uganda has four forms of land tenure[19]; customary, freehold, mailo and leasehold (see Section A11.4.8.1 in Appendix A11). The majority of households hold their land under customary tenure (approximately 60%), most of which is found in the northern, western and southern parts of the country. Land under this tenure system is communally, jointly or individually owned, often without a supporting title to acknowledge customary ownership.

Even though the laws of Uganda recognise customary tenure as a form of ownership the lack of formal title deeds leaves landowners vulnerable in terms of rights to compensation for loss of land. A lack of formal written documentation also has the potential to exacerbate disputes and generate fraudulent activity.

Availability of land for farming and livestock grazing is limited due to population growth (natural increase and in-migration) and changing land use patterns. In the AOI, the younger generations have limited access to family land due to inheritance protocols making inherited parcels of land too small to make a living. Land value awareness has grown significantly recently and is increasing land registration and sales. As a consequence, less land is being inherited.

Village land is increasingly being purchased by outsiders with greater purchasing power and there has been an increase in the number of fraudulent cases. The sale of land for private use is also impacting on availability of village communal land, which is used for grazing.

Despite policy and legal safeguards formalising the rights of women, children and disabled people's access to land, these groups, in reality, have often inferior land rights, as traditions and customs protect men's control over land. As the value of land increases, male dominance over land-related decisions is likely to increase (see Section A11.4.8.1 in Appendix A11).

From a human rights perspective, there is an additional potential impact if a woman cannot prove that she is married to her partner. Furthermore, numerous households include a complex family situation where multiple women can be partners to the same man. In these cases, women's rights and children's rights can be negatively affected if compensation is not granted to the persons who are entitled to receive it.

Impact: Permanent loss of private land due to project land acquisition

This will lead to direct and indirect impacts.

The project will require approximately 300 ha of land. Those affected by project land acquisition will lose an important asset as it sustains land-based livelihoods such as grazing, crop growing, mining and natural resource use. The impacts associated with loss of land-based livelihoods are described in Section 8.13.

[19] Article 237(3) Constitution of the Republic of Uganda (1995) and Section 2 of the Land Act, Cap 227, Laws of Uganda.

In addition to sustaining livelihoods, land ownership is important as collateral to access loans. One of the major constraints for agricultural development is limited access to credit for farmers. The purchase of agricultural inputs including seeds, fertilisers, pest control supplies and mechanised equipment, depends generally on the availability of credit, which can only be obtained with collateral. Loss of land due to project land acquisition will increase constraints on accessing credit among PAPs[20].

Those most affected by permanent loss of rights of occupancy to land are households for which the majority, if not all, of their land is impacted by the project, and households without alternative assets or sources of income. The latter often include female-headed households, the disabled, infirm and elderly individuals.

The impacts will be very long-term and will affect some households within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Land speculation by third parties

This may lead to direct and indirect impacts.

Speculation is a common consequence of public disclosure of the need for project driven land acquisition and is often initiated by resourceful individuals with access to privileged information. Acting on such information, speculators may extort land from ignorant or needy landowners (usually parcels held under customary tenure), often at below-market prices and often without consent from family or clan members. Land speculation could be exacerbated by the low rate of land registration in the AOI and may lead to inflation of land prices and commercialisation of land. Speculation may also drive a change in land tenure patterns, particularly a transition from customary ownership to freehold or leasehold tenure systems, which may further reduce access to land for poorer members of PACs.

Due to the large number of unregistered land parcels in the AOI, land is often transferred and registered without consent or due process by individuals who do not share interests in the targeted land (third parties) and who have access to the land administrative system. Legitimate landowners (with customary tenure rights) are thus deprived of their land rights, often without their knowledge. Information from the project indicates that such land disputes may cause significant delays in land acquisition planning and lead to:

- forced eviction of current landowners by outside purchasers (direct or in-direct pressure)
- fraudulent purchase of land
- increased land prices.

The impacts will be long-term and will affect some individuals within the PACs. However, due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Land and property speculation by landowners

[20] PAPs are parties affected by loss of assets.

This may lead to direct and indirect impacts.

Expectations of benefits from the project are high. To enhance benefits, potentially affected landowners may participate in speculation through the construction of new structures and/or the division of their own land to allow relatives or new tenants to construct new structures on the land.

This type of speculation may require short-term loans to purchase tenancies and construction materials. A prolonged or delayed compensation process may place those with short term loans in considerable long-term debt if short-term loans are not repaid on time. This situation will be further compounded if interest rates are high.

The impacts will be short-term and will affect some individuals within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: New disputes and exacerbation of pre-existing disputes and conflict around land and property

This may lead to direct and indirect impacts.

Conflicts over land are common in the AOI and constitute the highest percentage of both formal and informal disputes reported. Baseline studies revealed that there are currently ongoing land disputes in nearly all the PACs. Within the PACs, conflicts around land predominately relate to:

- crop farmers and pastoralists encroaching on each other's land. The lack of implementation of land management plans contributes to this problem
- land being sold to more than one person, and often being sold without formal title deeds, leaving buyers vulnerable
- family land being sold without the consent of the entire family
- disputes over exact boundaries between plots and even villages.

Land disputes are currently handled by the judiciary system through civil magistrate courts. The overall number of disputes involving land is reportedly increasing.

The acquisition of land and property for the project may cause new disputes and conflicts including:

- intra-family disputes and conflict linked to the sale of family owned land for project facilities (without consent of the entire family)
- disputes and conflicts over land boundaries
- disputes and conflicts over fraudulent land and property purchases related to land being acquired for the project.

Communal land is important for grazing and natural resource collection, in particular for those without or with limited access to private land and those with large herds. The decreasing availability of communal land is leading to competition between those using it. Added to which, the PIIM of opportunistic job seekers may add to existing pressure on land, in particular natural resources. The acquisition of land and property for the project may exacerbate this competition and lead to conflict.

Female-headed households may be more vulnerable to disputes and conflict around land and property as their access to land is generally more restricted (see Section A11.4.8 in Appendix A11).

The impacts will be long-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Permanent loss of physical structures due to project land acquisition

This may lead to direct and indirect impacts.

Some PAPs will permanently lose their dwelling, which is an asset and provides shelter. The exact number of PAPs affected is yet to be determined. However, GIS analysis identified 250 structures (not necessarily houses) within the 30m corridor. Within the AGI footprints, an estimated number of 12 structures (not necessarily houses) and 33 plots of agricultural land were identified. Within the footprint of the MCPYs, an estimated number of 15 structures (not necessarily houses) and 28 plots of agricultural land were identified.

The impacts will be very long-term and will affect some households within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of local enterprises due to project land acquisition

This may lead to direct and indirect impacts.

Baseline data shows that PACs generally boast some shops that sell daily necessities. These are relied upon by entire PACs, particularly in remote areas, which are not well connected to urban centres.

Land acquisition by the project may lead to the loss of businesses, which are an asset and a source of income for business owners and their employees.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition

This may lead to direct and indirect impacts.

The baseline indicates that community infrastructure is generally poor, with a lack of sufficient schools and clinics to meet local needs. Within the AOI, larger urban settlements are densely populated. The in-migration of working-age people in search of employment opportunities has placed additional pressure on infrastructure (in terms of health, education, water and electricity provision, culture and recreation). Land acquisition by the project may lead to the loss of community structures, which may have a further impact on education, health services and community life.

The impacts will be long-term and will affect entire PACs. Those most likely to be affected are individuals who rely heavily on access to community infrastructure (e.g., children, the elderly, disabled and infirm). Individuals living in dense urban

settlements will be particularly vulnerable given the scale of competition for services and infrastructure. Due to their small magnitude and small extent, before mitigation the impacts are considered not significant.

Impact: Loss of access to informal support networks and social services after physical displacement due to project land acquisition

This may lead to indirect impacts.

Due to a dearth of formal safety networks and services, PAPs are dependent on local social networks and community support. Women in particular rely on savings societies and other support groups.

The resettlement of PAPs may impact upon their informal social networks, which may negatively impact on their quality of life and ability to deal with problems. The most vulnerable PAPs are female-headed households, children, the elderly and infirm. Resettlement may also lead to loss of access to social services for these individuals.

The impacts will be medium-term and will affect some individuals within the PACs. Owing to their small magnitude and localised extent, before mitigation the impacts are considered not significant.

Vibration

There are two main house structures observed in the PACs:

- traditional structures made using wooden joists and uprights, with thatched roofing and adobe walls
- houses, locally called ‘improved houses’, built with brick walls and zinc or tiled roofing.

Construction phase activities that may cause vibration include:

- access road construction and upgrades
- vehicles transporting construction materials and the labour workforce along access roads
- site clearance, levelling and infrastructure construction and installation
- RoW clearing, grading, trenching and backfilling
- pile installation for AGI construction.

Impact: The generation of vibrations during construction works

This may lead to direct and indirect impacts.

The generation of vibrations during construction may cause physical damage to houses and other structures. Households lacking the means to repair their structures are most vulnerable to this impact. Vulnerable groups for this impact include females, the elderly and widows.

The impacts will be medium-term and will affect some individuals within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. However, the following impacts may be more pronounced in these PACs because a larger area of land will be acquired, and potential PIIM into the area from job seekers may place additional pressure on the land.

Resettlement

Impact: Permanent loss of private land due to project land acquisition

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Land speculation by third parties

This may lead to direct and indirect impacts.

The impacts will be long-term and will affect some individuals within the PACs. However, due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Land and property speculation by landowners

This may lead to direct and indirect impacts.

The impacts will be short-term and will affect some individuals within the PACs. Owing to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: New disputes and exacerbation of pre-existing disputes and conflict

This may lead to direct and indirect impacts.

The impacts will be long-term and will affect some individuals within the PACs. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of physical structures due to project land acquisition

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of local enterprises due to project land acquisition

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Loss of access to informal support networks and social services after physical displacement due to project land acquisition

This may lead to indirect impacts.

The impacts will be medium-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Location: RoW: KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5 and KP127.5 to KP135

The potential generic impacts are applicable to the 15 PACs located between these kilometre points. However, the following impacts may be more pronounced in these PACs:

Resettlement

Impact: Permanent loss of private land

and

Impact: Permanent loss of physical structures

These may lead to direct and indirect impacts.

Between these stretches of the pipeline route, there is a higher density of dwellings (14 or more) within the RoW.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: RoW: PACs Between KP0.5 and KP15 (Hoima district) and Sembabule Market Zone (KP190)

The potential generic impacts are applicable to the three PACs in Hoima district (from KP0.5 to KP15) and Sembabule Market Zone (KP190). However, the following impacts may be more pronounced in these PACs:

Resettlement

Impact: Land speculation by third parties

and

Impact: New disputes and exacerbation of pre-existing disputes and conflict

These may lead to direct and indirect impacts.

Stakeholder engagement processes and baseline studies revealed that there are particularly high expectations of the potential benefits to be secured through the resettlement process in these PACs, with instances of associated violence. Speculators reportedly extort land from land holders in these locations, who are desperate for cash, at below-market prices. Speculators are also reported to claim

land to be theirs through the use of false title deeds, resulting in forced eviction of land holders.

The impacts will be long-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.15.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation. During the operations phase, no additional land will be required.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation. Land leased for the MCPYs will be returned to the Ugandan government. There is the potential that the permanent structures in the MCPYs may be left in place after construction, which may lead to benefits for nearby communities (described in Section 8.19).

8.15.3 Mitigation Measures

This section includes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect land and property.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.15.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to land and property such as minimising impacts on social and community infrastructure and structures within 50m of the RoW centreline. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.15.3.2 Construction

8.15.3.3 Generic Mitigation Measures

Resettlement

Impact: Permanent loss of private land due to project land acquisition

Impact: Land speculation by third parties

Impact: Land and property speculation by landowners

Impact: New disputes and exacerbation of pre-existing disputes and conflict around land and property

Impact: Permanent loss of physical structures due to project land acquisition

Impact: Permanent loss of local enterprises due to project land acquisition

Impact: Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition

Impact: Loss of access to informal support networks and social services after physical displacement due to project land acquisition

The resettlement action plan, stakeholder engagement plan, community health, safety and security plan and the monitoring and reporting plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all PACs allowing for the resolution of potential grievances.

The Project will deal directly with those having customary rights of occupancy to land; with the compensation process witnessed by appropriate third party to minimise the risk of interference by intermediaries.

The resettlement action plan will ensure PACs will be sensitised to recent land speculation and instances of associated violence and informed of actions that can be taken. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.

Post-resettlement monitoring of livelihood restoration measures will be implemented, and the project will engage with authorities (security providers in particular) to ensure that in cases where compulsory acquisition is unavoidable no use of force is used to remove people.

The stakeholder engagement plan will identify how the project will engage and consult with stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them.

For the impact permanent loss of private land due to project land acquisition, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from very long-term to short-term. The residual impact is not significant.

For the impact land speculation from third parties, application of these mitigation measures will reduce the magnitude of impact from large to medium and the residual impact is not significant.

For the impact land and property speculation by land owners, application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

For the impact new disputes and exacerbation of pre-existing disputes and conflict around land and property, application of these mitigation measures will reduce the magnitude from large to medium and the residual impact is not significant.

For the impact permanent loss of physical structures due to project land acquisition, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from very long-term to short-term. The residual impact is not significant.

For the impact loss of community infrastructure (schools, clinics, community halls) due to project land acquisition, application of these mitigation measures will reduce the magnitude from small to negligible and the duration from long-term to short-term. The residual impact is not significant.

For the impact loss of access to informal support networks and social services after physical displacement due to project land acquisition, application of these mitigation measures will reduce the magnitude from small to negligible and the residual impact is not significant.

Vibration

Impact: The generation of vibrations during construction works

The infrastructure and utilities management plan will include measures that control impacts resulting from construction-related vibration.

A pre-construction entry survey area will be conducted for infrastructure that may be exposed to construction-related vibration. A post-construction exit survey will be conducted to assess the condition of infrastructure and any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, PAC or landowner.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs.

Location: RoW: KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5 and KP127.5 to KP135

The generic mitigation measures are also applicable to the 15 PACs between these kilometre points.

Location: RoW: PACs Between KP0.5 and KP15 (Hoima District) and Sembabule Market Zone (KP190)

The generic mitigation measures are also applicable to the three PACs in Hoima district (from KP0.5 to KP15) and Sembabule Market Zone (KP190).

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.15.3.4 Operation

Generic Mitigation Measures

As there are no predicted generic impacts during pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.15.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on land and property after mitigation measures have been implemented.

Table 8.15-2 summarises the potential generic land and property impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.15-3 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on land and property are considered not significant.

8.15.4.1 Ecosystem Services

Section A11.4.8 in Appendix A11 identifies that land and property does not provide ecosystem services. It does, however, rely on ecosystem services which are described in land-based livelihoods (see Section 8.13).

Table 8.15-2 Land and Property – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Resettlement	Permanent loss of private land due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
Resettlement	Land speculation by third parties	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	2	1	5	14
Resettlement	Land and property speculation by landowners	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	4	11
Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	4	1	5	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-2 Land and Property – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Resettlement	Permanent loss of physical structures due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
Resettlement	Permanent loss of local enterprises due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
Resettlement	Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	2	2	2	4	10
Resettlement	Loss of access to informal support networks and social services after physical displacement due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	2	3	1	4	10
Vibration	The generation of vibrations during construction works	C	Y	Infrastructure and Utilities Management Plan	4	3	1	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-3 Land and Property – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Resettlement	Permanent loss of private land due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Land speculation by third parties	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Land and property speculation by landowners	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	4	11
PACs near the four MCPYs	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	4	1	5	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-3 Land and Property – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Resettlement	Permanent loss of physical structures due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Permanent loss of local enterprises due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Loss of access to informal support networks and social services after physical displacement due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	3	1	4	12
PACs between KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5, KP127.5 to KP135	Resettlement	Permanent loss of private land due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-3 Land and Property – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs between KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5, KP127.5 to KP135	Resettlement	Permanent loss of physical structures due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs between KP0.5 and KP15 and Sembabule Market Zone (KP190)	Resettlement	Land speculation by third parties	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs between KP0.5 and KP15 and Sembabule Market Zone (KP190)	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	4	1	5	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.15.5 Transboundary Project Impacts

No transboundary project impacts have been identified.

8.15.6 Cumulative Impacts

8.15.6.1 Context

Section 6.4.3.10 describes the baseline condition of land and property, the trends and sensitivity to change. Table 8.15-2 and Table 8.15-3 summarise project residual impacts.

In Uganda, access to both private and communal land is becoming increasingly challenging due to population growth (natural increase and in-migration) and changing land use patterns. An added layer of complexity surrounding land and property rights is the absence of formal title deeds, the prevalence of land conflicts, as well as land speculation in areas with proposed developments. These factors are rendering land holders and land users vulnerable in terms of available land and, should their land be impacted, access to replacement land of suitable quality.

Residual project impacts that may contribute to cumulative impacts include:

- land speculation
- exacerbation of existing land disputes and conflicts
- permanent loss of private land due to project land acquisition
- loss of access to informal support networks and social services after physical displacement due to project land acquisition

The associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
  - Tilenga Project (AF01)
  - Kingfisher Oil Project (AF02)
- third-party developments:
  - transmission line from the Tilenga Project Central Processing Facility (CPF) to Kabaale (UG0A)
  - Kabaale International Airport (UG04)
  - transmission lines to Kabaale Airport (UG05)
  - refinery (UG07)
  - Hoima-Buloba pipeline (UG08)
  - Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
  - Buhimba to Kakumiro road upgrade (UG20)
  - construction camp for Bulima–Kabwoya road (UG21)
  - Bulima–Kabwoya road upgrade (UG22)
  - transmission line extension (UG34)
  - Kyotera- Rakai road upgrade (UG41)
  - ICT infrastructure installation (UG44).

The preferred condition is for the status of impacted individual or household livelihoods and general standards of living in PACs to be equal to, or better than, before construction.

8.15.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are predicted based on the premise that the EACOP and the feeder pipeline components of the Tilenga Project and Kingfisher Oil Project have concurrent or consecutive construction phases.

Land Speculation

The EACOP, Tilenga and Kingfisher projects may jointly lead to a rise in third party investors purchasing land with the intention to subsequently secure a financial return on selling land to project developers. As the exact boundaries of land required for the developments are not necessarily known to investors and local communities, the entire subcounty of Buseruka where the pipelines converge at PS1 may be affected.

Land speculation may lead to inflated land prices and a shift in land tenure patterns, which may reduce access to land for poorer community members.

The project will liaise with the Tilenga Project and Kingfisher Oil Project to support the management of potential cumulative impacts relating to speculation, the project will engage with relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and identify appropriate mitigation measures and interventions.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Exacerbation of Pre-Existing Disputes and Conflict

Consultation for the EACOP project identified a history of disputes over land. The land acquisition and construction activities for the EACOP project and the associated facilities, as well as the potential for PIIM of economic migrants attracted to the area because of the developments increases the potential for aggravation of pre-existing disputes and conflict over land.

The PACs potentially affected by pre-existing disputes and conflict are in Buseruka subcounty and include Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

Ongoing stakeholder engagement will support the project in engaging proponents of the associated facilities and relevant government agencies to consider options for management measures to address any exacerbation of conflicts. This may include liaising with the Tilenga Project and Kingfisher Oil Project on their land requirements and collaborating on stakeholder engagement.

With the additional mitigation measure implemented, it is predicted that the preferred condition will be achieved and hence the cumulative residual impact is not considered significant.

Permanent Land Loss

The EACOP project and the feeder pipeline components of the Tilenga Project and Kingfisher Oil Project will undertake permanent resettlement of some households. Permanent loss of land due to land acquisition from the EACOP project may cause double resettlement, where a household is required to relocate by one project and then again as a result of another project. Though exact land requirement details are not available at the time of writing the EACOP project will liaise with the other projects to understand respective resettlement requirements and the avoidance of double resettlement. PACs potentially impacted include Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5). In addition, the project will consider the matter of double livelihood resettlement into its resettlement plan.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Loss of Access to Informal Support Networks and Social Services After Physical Displacement due to Project Land Acquisition

Cumulative impacts on a PAC's land, may cause a shortage of land for resettlement in the same PAC, thereby affecting resettled households in terms of their access to support networks and social services. This may apply to the PACs affected by permanent loss of land cited above.

The project will engage proponents of the associated facilities and appropriate government agencies to consider options for management measures to address the cumulative impacts. This may include liaison with the on their land requirements and collaborating on stakeholder engagement.

With the additional mitigation measure implemented, it is predicted that the preferred condition will be achieved and hence the cumulative residual impact is not considered significant.

Third-Party Developments

The potential cumulative impacts of third party developments are similar to those of the associated facilities. In addition, the third*party developments may cause the following cumulative impacts:

Potential cumulative impacts associated with land and property are predicted where the EACOP project and third-party developments have parallel or consecutive construction schedules and require land acquisition. The third-party developments, and the subcounties/districts that may be impacted are shown in Table 8.15-4.

Table 8.15-4 Cumulative Impacts: Land and Property

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district	No data available
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district	The airport will be constructed within the 29 km^2 area of land already acquired by the government for the Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in-kind compensation moved to locations of their choice
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district	The lines will have a 10 m construction corridor with a 5 m permanent right of way.
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district	The refinery will be constructed within the 29 km^2 area of land already acquired by the government for the Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in-kind compensation moved to locations of their choice

Table 8.15-4 Cumulative Impacts: Land and Property

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 runs parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka, and Kiziramfumbi subcounties, Hoima district	No data available
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19	PS1, approximately 3.2km from UG 19	Buseruka and Kiziranfumbi subcounty, Hoima district	The road width will be increased from 4.5 m to a maximum of 12 m. The road will have a maximum RoW of 50 m.
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district	The proposed road will be constructed within a 30–50-m-wide corridor
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district	The camp will be constructed on a 1.8-ha area
UG22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district	No data available
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty, Mubende district	The line will have a 10 m RoW

Table 8.15-4 Cumulative Impacts: Land and Property

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG41	Kyotera-Rakai Road upgrade	258	Crosses pipeline at KP258	Kyotera, Rakai district	The proposed road will be constructed within a 30–50-m-wide corridor
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district	No data available

Land Speculation

Land speculation may be caused by the EACOP project and the third-party developments that have yet to acquire land. This may affect the subcounties and districts presented in Table 8.15-4 above.

EACOP is likely to be the main contributor to the cumulative impact of land speculation because it is a major international project, which has had national and international media attention. Land for Kabaale International airport and the refinery has already been purchased by the government, so land speculation will not occur for these sites. The scale and nature of the transmission line and road upgrade projects will make land speculation less profitable and therefore more unlikely. The scale and nature of the Hoima-Buloba pipeline and the ICT infrastructure project means that there is a greater risk of land speculation for these projects.

The project will liaise with the third-party developments to support the management of potential cumulative impacts relating to speculation, the project will engage with relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and identify appropriate mitigation measures and interventions.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Exacerbation of Pre-Existing Disputes and Conflict

The PACs that may be impacted by exacerbation of existing disputes and conflict include:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the construction of the EACOP project and the transmission line from the Tilenga CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade. The refinery and the Kabaale airport are likely to be the main contributors to the cumulative effect
- Kalembe (KP122) and Kyenda (125.5) caused by the EACOP project and the transmission line extension. EACOP is likely to be the main contributor to the cumulative effect
- Nabigasa (KP283), Kabugimbi (KP282), Bigada (KP281.5) and Kabonera (KP284.5) caused by the EACOP project and the ICT infrastructure. Due to lack of data on the ICT project, the contribution of EACOP to the overall cumulative effect could not be identified.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address any exacerbation of conflict. This may include liaising with the third parties on their land requirements and collaborating on stakeholder engagement.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Permanent Land Loss

The EACOP project and the third-party developments will undertake permanent resettlement of some households. Permanent loss of land due to land acquisition

from the EACOP project may cause double resettlement, where a household is required to relocate by one project and then again as a result of another project. Where data was available, land requirement details are presented in Table 8.15-4. PACs potentially impacted include:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the transmission line from the Tilenga Project CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade. In the case of the transmission line from the Tilenga Project CPF to Kabaale, the transmission lines to Kabaale airport, and the Hoima-Buloba pipeline, the EACOP project has a larger footprint and may involve the resettlement of more households than the other projects. The households that accepted replacement housing in the area allocated for the Kabaale Industrial Park which includes the airport and the refinery have already been relocated to a location in Kizirafumbi Subcounty that would not be affected by the EACOP project. For those households that accepted in-kind compensation, there is the potential that they resettled with the EACOP project footprint and may be required to relocate.
- Katikara (KP41) and Kisenyi (KP40) caused by the EACOP project and the Buhimba to Kakumiro road upgrade

The implementation of the RAP for the EACOP project will consider cumulative effects of projects that have preceded or developed concurrently with the EACOP project and will consider the matter of double resettlement and livelihood restoration in its resettlement plan.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Loss of access to informal support networks and social services after physical displacement due to project land acquisition

Cumulative impacts of third parties on a PAC's land, may cause a shortage of land for resettlement in the same PAC, thereby affecting resettled households in terms of their access to support networks and social services. This may apply to the PACs affected by permanent loss of land in Table 8.15-4 above.

The mitigation measures proposed for the cumulative impact of the associated facility will be applied.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address the impact of on access to support networks and social services following displacement. This may include liaising with the third-party developers on their land requirements and collaborating on stakeholder engagement. The project will also participate in the regional cumulative environmental management initiatives mentioned above in the AF section.

With the additional mitigation measures implemented, it is predicted that the preferred condition will be achieved and hence the cumulative residual impact is not considered significant.

8.15.6.3 Cumulative Transboundary Impacts

There are no transboundary cumulative impacts on land and property.

8.16 Workers' Health, Safety and Welfare

This section describes potential impacts on workers' health, safety and welfare during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

There is the potential for traffic to impact workers' health, safety and welfare through project-related road traffic accidents, which are considered in Section 9, Unplanned Events.

8.16.1 Key Sensitivities and Considerations

The workers' health, safety and welfare baseline conditions are described in Section 6.4.3.11, as well as:

- workers' health, safety and welfare key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the workers' health, safety and welfare impact assessment.

Sensitivity in the workers' health, safety and welfare AOI is ranked as very high for the local workforce owing to low levels of occupational health and safety awareness.

Key considerations are:

- unscrupulous recruitment agencies exist in Uganda and potential workers may be asked to pay fees to 'register' their interest in being part of a workforce
- a low level of awareness of health and safety and worker rights in the PACs
- low levels of understanding of a non-discriminatory work culture such as with a mixed gender workforce in the PACs
- human rights of workers with regards to health and safety.

Section A11.4.9.4 in Appendix A11 identifies that workers' health, safety and welfare does not provide ecosystem services.

The main human right that is relevant to this VEC is the right to safe and healthy working conditions. International standards for responsible business require that minimum labour standards are respected by companies and that they use their leverage to ensure that contractors and suppliers also respect labour rights. Another human right applicable to this VEC is the worker's right to security (see Section 4).

8.16.2 Potential Project Impacts

8.16.2.1 Construction

Generic Benefits

Employment

Many companies in Uganda have no previous exposure to basic health and safety standards. Workers active in informal economic sectors typically receive no occupational health and safety (OHS) training and hazards are not identified by their employers. Baseline data revealed a low level of awareness of health and safety and workers' rights in the PACs.

Benefit: An improvement in the health and safety of people employed from disease awareness and reduction programmes

The project will employ PAC members. As part of the project health and safety plan, the local workforce will be trained in safety principles and will be subject to disease awareness and reduction programmes implemented during project employment. Increased knowledge about health and safety on a personal level may lead to a more comprehensive understanding of diseases and improve health-seeking behaviour (HSB), all of which may lead to an improvement in general health.

The improvement in general HSB and disease knowledge may extend to the employees' immediate family, increasing general health status among additional PAC members.

The impacts are considered beneficial.

There may be a positive impact on the human right to life, the right to health and the right to safe and healthy working conditions.

Generic Impacts

Employment

Impact: Risk of wildlife interaction/animal bites and contracting zoonotic diseases

This may lead to direct and indirect impacts.

Zoonotic diseases, particularly viral haemorrhagic fevers (VHFs) like Ebola and Marburg, pose a significant risk in all of the districts traversed by the AOI. Transmission of certain zoonotic disease (e.g., rabies) depends on close interaction between animal hosts while others (e.g., leptospirosis) can be transmitted through other mediums, such as water.

Activities related to construction, such as bush clearing, may cause an increase of animal encounters by the project workforce, including workers from PACs. This may lead to a potential increase in disease transmission, bites (including snake bites) and an increase in morbidity and mortality among members of the local workforce. Workers charged with clearing vegetation will be most vulnerable.

The impacts will be medium-term and will affect some individuals within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

This may lead to direct and indirect impacts.

As stated above, baseline findings show that occupational health services across the project area are limited in number and scope. Existing laws and regulations do not reach the entire population and therefore may not offer sufficient protection to workers. Workers who are involved in the project as part of the supply chain may lack access to occupational health and safety protection.

Unskilled workers, especially those from PACs, are unlikely to have had exposure to work conditions and safety standards associated with a project of this nature and magnitude. Although it is anticipated that local unskilled workers will not be utilised in high-risk activities, the risk of involvement in occupational incidents, causing injury and mortality, remains.

It is expected that the local unskilled workforce will be working in environments where moving objects will be commonly encountered, including supply vehicles and diggers transporting heavy equipment. Therefore, incidents associated with moving objects pose a significant risk. The potential impacts may cause injury, permanent incapacity and even mortality in certain instances for those involved. This will in turn have an impact on families, who may lose a breadwinner.

Risks to workers' health and safety may also arise where unidentified contaminated soil is encountered during construction (see Section 8.5). In addition, the border of Tanzania and Uganda has been identified as a potential UXO area (see Section 2 and Section 8.5.2.1), which could pose a risk to workers' health and safety during construction.

There may be an impact on the human right to life, the right to health and the right to safe and healthy working conditions.

The impacts will be very long-term and will affect some households within the PACs. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are applicable to the 20 PACs near the four MCPYs. The following location-specific impacts are also applicable to these PACs:

Employment

Impact: Increased risk of vector-related diseases among the local workforce

This may lead to direct impacts.

Malaria and other vector-related diseases, such as dengue fever, are prevalent throughout the districts traversed by the AOI. An increase in vector-related diseases may be experienced in the MCPYs and in the workforce due to:

- changes in the environment in and around camps that may create vector breeding areas and, as a result, increase the density of disease transmitting vectors
- movement of people in and out of camps who may increase the risk for the transmission of disease as they may harbour parasites
- proximity of the MCPYs to PACs or make-shift settlements (caused by PIIM) that support an increased transmission of disease in the workforce due a high burden of disease in the community.

Both expatriate and local workers (who reside in the PACs) may be exposed to this increased localised risk, with a potential increase in morbidity and mortality. Malaria is the biggest risk and workforce members with limited natural acquired immunity from malaria will be more vulnerable.

The impacts will be long-term and will affect some households within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

8.16.2.2 Operation

Generic Benefits

The following potential generic benefit, described during construction, is also applicable during pipeline and AGI operation:

Employment

Benefit: An improvement in the health and safety of people employed from disease awareness and reduction programmes

The impacts are considered beneficial.

Generic Impacts

The following potential generic impact, described during construction, is also applicable during pipeline and AGI operation:

Employment

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect some households within the PACs. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Personnel during operations will be employed in accordance with national and project requirements. In addition, a set of management measures will apply (discussed in Section 8.16.3).

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.16.3 Enhancement and Mitigation Measures

This section describes the enhancement and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect workers' health, safety and welfare.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.16.3.1 Design

Generic Enhancement and Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to workers' health, safety and welfare such as population density, security, and social and community infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.16.3.2 Construction

Generic Enhancement Measures

Employment

Benefit: An improvement in the health and safety of people employed from disease awareness and reduction programmes

The occupational health, safety and security plan will include measures that contribute to the wellbeing of the workforce.

A risk-based worksite and construction camp training programme will be developed for the workforce, vendor representatives and site visitors.

Generic Mitigation Measures

Employment

Impact: Risk of wildlife interaction/animal bites and contracting zoonotic diseases

The occupational health, safety and security plan will include measures that contribute to management of worker-animal interactions.

The risk to worker health posed by wildlife at each camp and yard will be assessed and procedures will be developed to maintain the condition of each camp and to ensure camp facilities are kept clean and hygienic. A pest control plan will be developed, and pets will be prohibited in MCPYs.

Welded pipe sections will be capped to prevent fauna entering, morning trench inspection will be conducted, and fauna ladders will be placed in open excavations.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

The occupational health, safety and security plan, labour management plan and community health, safety and security plan will include measures that will contribute to the control of this impact.

A job-specific risk assessment process will be developed to identify specific risks associated with project activities and the appropriate associated mitigation measures; pre-deployment screenings will be implemented, there will be requirements for use of personal protective equipment, a medical emergency response plan will be developed and implemented, and a first aid needs assessment will be undertaken.

Mitigation of risks form worker fatigue will be addressed in the occupational health, safety and security plan and the transport and road safety management plan. A risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration of impact from long-term to short-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional location-specific mitigation measures for workers are:

Employment

Impact: Increased risk of vector-related diseases among the local workforce

The occupational health, safety and security plan will include measures to manage worker vector-related diseases.

Measures include development and implementation of a camp malaria and other vector control management plan and provision of workers with personal protection from prevalent diseases, for example insecticide treated bed nets at camps.

Vector management on all project sites (camps and construction) will align with national vector control programmes and strategies.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

8.16.3.3 Operation

Generic Enhancement Measures

The following generic enhancement measure, described for construction, is also applicable during pipeline and AGI operation:

Employment

Benefit: An improvement in the health and safety of people employed

The occupational health, safety and security plan will include measures that contribute to the wellbeing of the workforce.

A risk-based worksite and MCPY training programme will be developed for the workforce, vendor representatives and site visitors.

Generic Mitigation Measures

The following generic mitigation measures, described for construction, are also applicable during pipeline and AGI operation:

Employment

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

The occupational health, safety and security plan and the transport and road safety management plan will include measures that will contribute to the control of this impact.

Mitigation of risks from worker fatigue will be addressed in the occupational health, safety and security plan and the transport and road safety management plan. A risk-based worksite and an operational training programme will be developed and administered to the workforce, vendor representatives and site visitors.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration of impact from very long-term to short-term. The residual impact is not significant.

With respect to Human Rights:

The labour management plan and the occupational health, safety and security plan will ensure that project performance regarding the Voluntary Principles on Security and Human Rights (VPSHR) will be reviewed and performance improvement addressed where necessary.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts for pipeline and AGI operation, no mitigation measures are required.

8.16.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on workers' health, safety and welfare after mitigation measures have been implemented.

Table 8.16-1 summarises the potential generic workers' health, safety and welfare impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.16-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on workers' health, safety and welfare are considered not significant.

8.16.4.1 Ecosystem Services

Section A11.4.9.4 in Appendix A11 identifies that workers' health, safety and welfare does not provide ecosystem services.

Table 8.16-1 Workers' Health, Safety and Welfare – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Employment	An improvement in the health and safety of people employed from disease awareness and reduction programmes	C & O	-	Occupational Health, Safety and Security Plan	B				
Employment	Risk of wildlife interaction/animal bites and contracting zoonotic diseases	C	-	Occupational Health, Safety and Security Plan	4	2	1	5	12
Employment	Other occupational health and safety incidents causing diseases, injuries and mortality	C & O	-	Community Health, Safety And Security Plan Occupational Health, Safety and Security Plan Labour Management Plan Transport and Road Safety Management Plan	6	2	1	5	14

Table 8.16-2 Workers' Health, Safety and Welfare – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Employment	Increased risk of vector-related diseases among the local workforce	C	-	Occupational Health, Safety and Security Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.16.5 Transboundary Project Impacts

No transboundary project impacts have been identified.

8.16.6 Cumulative Impacts

No cumulative project impacts have been identified in relation to workers' health, safety and welfare.

8.16.6.1 Cumulative Transboundary Impacts

There are no transboundary cumulative impacts on workers' health, safety and workforce.

8.17 Social Infrastructure and Services

This section describes potential impacts on social infrastructure and services during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

Impacts associated with road traffic accidents are described in Section 9, Unplanned Events.

8.17.1 Key Sensitivities and Considerations

The social infrastructure and services baseline conditions are described in Section 6.4.3.12 and the traffic baseline conditions are described in Section 6.4.3.15, as well as:

- social infrastructure and services key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the social infrastructure and services impact assessment.

Sensitivity in the social infrastructure and services AOI is ranked as moderate for:

- PACs in relation to electricity; most PACs do not have access to grid electricity and rely on other means for cooking and lighting (e.g., firewood, fuel lamps)
- households without mobile phones and internet; these households may become increasingly vulnerable as media is increasingly shared through those platforms

Sensitivity is ranked as low for:

- PACs in relation to media (radio, television, newspapers); all households in the PACs have access to one or more media information source.

Sensitivity in the traffic AOI ranges from medium to very high, depending on the road type, condition and current levels of congestion.

Key considerations are:

- PACs rely on radio as a main means of receiving information
- mobile phone and internet is becoming increasingly important for exchanging information

- rural electrification is low, limiting general development
- in many parts of the AOI, the road network condition will be improved by upgrades made by the government as part of its ongoing improvements or by the project for construction purposes
- accident rates in Uganda are high, with pedestrians, children and cyclists considered particularly vulnerable
- traffic levels are low, so congestion is rare, except at the border with Tanzania and in Kampala.

Access to water, health and waste management facilities are discussed in Section 8.18.

Section A11.4.10 in Appendix A11 identifies ecosystem services associated with social infrastructure and services in the AOI. The following ecosystem services have been considered:

Provisioning services:

- electricity from hydro, fossil fuels and solar energy
- cooking fuel from biomass and firewood (see Section A11.4.6.4 in Appendix A11, land-based livelihoods – natural resources use).

The key human rights relevant to social infrastructure and services relate to the right to health, right to an adequate standard of living, right to education and right to water. International standards for responsible business also require that negative impacts of projects on communities should be avoided or at least minimised (see Section 4).

8.17.2 Potential Project Impacts

8.17.2.1 Construction

Generic Benefits

Use of Road Network

Benefit: Road widening and improvement

Many parts of the road network are in poor condition and will need to be upgraded to accommodate increased volumes of traffic generated by the project. In these instances, the roads will be widened and resurfaced or reprofiled to accommodate two-way traffic and ensure that the surface is even, which could otherwise lead to vehicle and motorbike damage and risk of accidents.

One of the criteria for the selection of construction facilities' locations was to maximise the use of existing roads that could be upgraded. Approximately 4 km of roads will be upgraded. These access roads will have an unsealed surface and will be maintained regularly by the project during construction. Once their construction is completed, these enhancements will improve road conditions for road users.

The potential benefits of road widening and improvement include enabling goods to be transported to market more quickly and reduced travel times for people commuting to major towns and cities for work. It will also improve access for healthcare and assist in the provision of health-related outreach activities by district

health authorities. Emergency response times may also be reduced. Due to the short length of road upgrades for the project, however, these impacts will be of limited benefit.

In addition, the risk of accidents is likely to reduce as roads are improved, and the incidence of potholes is reduced. However, the improved surface may lead to higher speeds and partially offset the reduction in accident risk.

The impacts are considered beneficial. Disruption to traffic flows is covered below.

Generic Impacts

Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)

The level of electrification in the PACs is low. The large majority of households rely on fuel lamps for light and firewood for cooking. Access to electricity for businesses and services in more urbanised PACs is slightly higher, however usage remains limited.

Mobile phones play an increasingly important role in PACs, enabling PAC members to communicate with one another and share information (including market information relating to produce pricing), access the internet and utilise mobile money services. The majority of PAC members rely on radios to access news and information concerning the local area.

Impact: Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction

This may lead to direct and indirect impacts.

Underground lines to be potentially crossed by the pipeline include fibre optic cables, electrical and communications cables.

Where the pipeline intersects electrical cables, local businesses, health facilities, households and other users may temporarily lose power. This may lead to a reduction in business operating hours, and temporarily close public services and schools.

Where the pipeline intersects fibre optic and communications cables, local businesses, services and households who use landline telephones and cable internet connections may lose access for a short period of time. This may hamper their ability to communicate with one another and send and receive information.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

Use of Road Network

During the construction period, traffic impacts may arise from vehicle movements, specifically:

- movement of pipe sections and other imported construction materials from a particular location, which usually follow defined routes for much of the journey
- national, regional or local movements of nationally sourced materials, often from several different locations and not following defined routes

- movement of workers from MCPYs to worksites.

Parts of the existing road network are currently in poor condition and not capable of accommodating increased traffic volumes. Poor road conditions increase travel time and costs considerably, particularly during the rainy season (discussed in Section 8.12). Potholes create a hazard for motorists, motorbikes (used as taxis) and bicycles. Local roads typically are murram and are mostly single lane. The poor quality of roads constitutes a substantial challenge for PACs.

New permanent and temporary access roads will need to be constructed to accommodate project traffic movements as some activities will take place on sites remote from the existing road network.

The development of construction facilities and access roads will require specialist materials and labour, which will be imported, and non-specialist materials and labour, which will be sourced locally, regionally or nationally. Access road upgrades and construction of new access roads will lead to traffic-related impacts from importing aggregates, plant and other materials and the movement of labour.

The MCPYs will be developed sequentially for each pipeline spread as the works move from the northern end and progress southwards. Therefore, it is likely that only one MCPY will be under construction at any time in each spread. Non-local workers are expected to live within temporary fly camps within the MCPY site during the construction of these facilities and therefore the impacts of their movements to and from the site are expected to be minimal. Locally sourced workers from the surrounding villages that live outside the camp will travel to work by shuttle bus service.

Table 8.17-1 summarises the heavy-goods-vehicle (HGV) movements required to transport construction materials to each location (no pre-construction activities required for PS1).

Table 8.17-1 Heavy Goods Vehicle Movements Required to Transport Construction Materials to Each Location

Facility	Purpose of Material Movements to the Facility	Average Daily No. of HGVs (Two Way)	Duration of Impact (months)
PS1	No activities	0	n/a
MCPY1	Camp construction	20	3
MCPY2	Camp construction	20	3
PS2	Upgraded access road	15	1
MCPY3	Camp construction plus upgraded access road	50	3
MCPY4	Camp construction plus upgraded access road	50	3

The construction of the pipeline will require a major movement of pipe to the RoW from the nearest MCPY, along with a smaller number of movements for other materials. Each MCPY will accommodate up to 1000 workers at any one time. Daily transport will typically consist of 200 local workers travelling to the MCPY and up to

300 pipeline workers travelling between the MCPY and the worksites. Pipeline construction will start at the northern end and progress southwards within a single spread for EACOP. It is expected that only one MCPY will typically be in use at any one time.

The operation of the MCPYs will require regular locally sourced deliveries to service the camps, including food and fuel for plant, and services like the removal of waste.

Pumping station construction will take place over a period of approximately 24 months. During this period, the movement of people and materials is provided in Table 8.17-2.

Table 8.17-2 Traffic Movements for Pumping Station Construction from Moving People, Material and Equipment

Facility	Purpose of Transport	Daily No. of Cars/ Motorcycles (Two Way)	Daily No. of Buses (30-Seater) (Two Way)	Daily No. of HGVs (Two Way)	Daily No. of Total Vehicles (Two Way)
PS1	Specialist materials, daily commuting	0	14	2	16
PS2	Specialist materials, daily commuting	0	14	2	16

Pipeline construction will be transient and therefore traffic volumes at some VECs may only be present for a few months as the works progress in a linear fashion. However, the impacts may be felt for longer where construction traffic is travelling along national roads to reach more than one MCPY, and on the access roads around the camps.

A summary of the transportation requirements for each location during pipeline construction is provided in Table 8.17-3 and illustrated in Figure 8.17-1.

Table 8.17-3 Traffic Movements for Pipeline Construction from Moving People, Material and Equipment

Route	Purpose of Transport	Daily No. of Cars/ Motorcycles (Two Way)	Daily No. of Buses (30-Seater) (Two Way)	Daily No. of HGVs (Two Way)	Daily No. of Total Vehicles (Two Way)
MCPY1 to spread	Pipe delivery, daily commuting and pipeline workers	72	42	61	175
MCPY2 to spread	Pipe delivery, daily commuting and pipeline workers	72	28	30	130
MCPY3 to spread	Pipe delivery, daily commuting and pipeline workers	72	42	32	146

Table 8.17-3 Traffic Movements for Pipeline Construction from Moving People, Material and Equipment

Route	Purpose of Transport	Daily No. of Cars/ Motorcycles (Two Way)	Daily No. of Buses (30-Seater) (Two Way)	Daily No. of HGVs (Two Way)	Daily No. of Total Vehicles (Two Way)
MCPY4 to spread	Pipe delivery, daily commuting and pipeline workers	72	28	30	130

Impact: Deterioration of road conditions

This may lead to direct and indirect impacts.

Roads typically deteriorate because of the number and weight of vehicles passing over them. Therefore, the additional traffic generated by the project, including HGVs, could lead to an increase in the rates at which road conditions deteriorate.

The potential impacts of deterioration in road conditions include an increase in the number and size of potholes and edge subsidence, particularly on unsealed roads. This could lead to increased accident rates as drivers swerve to avoid potholes and come into conflict with other road users or damage their vehicles when they cannot swerve.

Project traffic will make a relatively small contribution to the total volume of HGVs on the road network during the construction of the pipeline and AGIs. The volume, intensity and duration of traffic is expected to be greater during pipeline and AGI construction. Regardless of the level of change, the types of project traffic are likely to make pipeline and AGI construction traffic noticeable at local VECs because there are generally low traffic volumes at PAC level. In particular:

- locations between the trunk roads and the worksites are expected to experience impacts, but for a short duration owing to the transient nature of the works
- trunk road locations within the AOI; these will experience project related traffic for around 18 months
- no location is predicted to experience an increase in total traffic of more than 11%
- large parts of the road network within the AOI; these will experience an increase of more than 100 two-way HGV movements per day, although none will experience an increase greater than 40% in HGV and bus movements.

The impacts will be short-term and will affect entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Traffic congestion leading to delays

This may lead to direct and indirect impacts.

Sections of the road network are susceptible to traffic congestion where there are obstacles such as buildings, stalls and people walking in the road (including

children going to school), which interfere with two-way flow of traffic. These constraints can lead to congestion where traffic is reduced to a single lane. Where roads are narrow and winding, slow moving vehicles or convoys of vehicles can cause congestion problems. In these instances, driver frustration may lead to dangerous overtaking and an increased risk of accidents.

An increase in congestion and delays may increase journey time for traffic road users and pedestrians who use the road to head load goods to markets or to access farming plots on the peripheries of communities. Costs associated with delay caused by traffic congestion are discussed in Section 8.12. This may also have negative outcomes for PAC business owners travelling to purchase supplies (i.e., reduction in business opening times, increase in product prices) and people seeking health services. Public transport providers may also choose to increase fare prices.

The impacts will be short-term and will affect entire PACs. Owing to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Disruption of traffic flows

This may lead to direct and indirect impacts.

The development of construction facilities will include upgrading the access roads connecting project locations to trunk roads. During the road upgrades, local communities may experience disruption of traffic flows where full or partial road closure will be required.

The pipeline will cross roads connecting local communities to major trunk roads. The construction methods at these road crossings will vary, depending on the importance of the road, the traffic volumes travelling along it and the availability of alternative routes. For roads with low traffic volumes open cut crossings may be used.

The potential impacts of traffic disruption to local users may prevent access to local markets or require use of an alternative route, which could introduce a delay to their journey causing inconvenience.

The level of traffic-flow disruption will depend on the construction method at each location. The activity will be transient during facility construction as the upgrade works progress along the access road. However, where there are no alternative routes, a full road closure would cause a transient impact for local users.

The AOI for social infrastructure and services will change with the construction method selected for each location. The activity will generally be transient as the construction works progress along the pipeline route. However, there may be a short-term impact for local users where there are no alternative routes, or where travel times are significantly increased.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The traffic associated with developing each of the construction facilities will transport materials on the national road network and access roads. This additional traffic will vary in different parts of the road network depending on the concentration of facilities and the extent of access road upgrades.

Section 6.4.3.15 describes the baseline traffic volumes and HGV content for representative locations on the national road network. The impacts of the additional project traffic shown in Table 8.17-1 and Table 8.17-2 have been quantitatively assessed in each of these locations. The results are considered representative of the impacts on the road network surrounding each location. They are shown in Table 8.17-4 and Table 8.17-5 and are illustrated in Figure 8.17-1.

Table 8.17-4 Location-Specific Traffic Increases Associated with the Movement of Construction Materials for Construction Facilities

Assessment Location (Described in Section 6.4.3.15)	Daily Baseline Traffic (All Vehicles)	Daily Baseline Traffic (HGVs)	Average Daily No. of Project HGVs (Two Way)	Increase in HGVs (%)
Hoima	6,886	230	0	0%
Mubende	7,721	513	20	4%
Kitenga	2,440	968	20	2%
Masaka	10,289	1,214	65	5%
Kyotera	10,851	794	50	6%

These impacts will represent a negligible increase (less than 10%) in traffic volumes on the road network at each location.

Table 8.17-5 Location-Specific Traffic Increases for Pipeline Construction from Moving People, Material and Equipment

Assessment Location (Described in Section 6.4.3.15)	Daily Baseline Traffic (All Vehicles)	Daily Baseline Traffic (HGVs)	Average Daily No. Of Project Vehicles (Two Way)	Average Daily No. Of Project HGVs and Buses (Two Way)	Increase in All Vehicles (%)	Increase in HGVs and Buses (%)
Hoima	6,886	230	60	60	1%	26%
Mubende	7,721	513	266	194	3%	38%
Kitenga	2,440	968	266	194	11%	20%
Masaka	10,289	1,214	254	182	2%	15%
Kyotera	10,851	794	224	152	2%	19%

At all locations except Kitenga, the impacts for all vehicles are a negligible increase in traffic volumes (defined as less than 10%). At Kitenga, there is an 11% increase in all vehicles, which is considered a small increase (defined as 10–30%).

HGVs and buses also have a limited range of increases, being considered either as small (10–30%) or medium (30–100%), with only Mubende experiencing a medium increase.

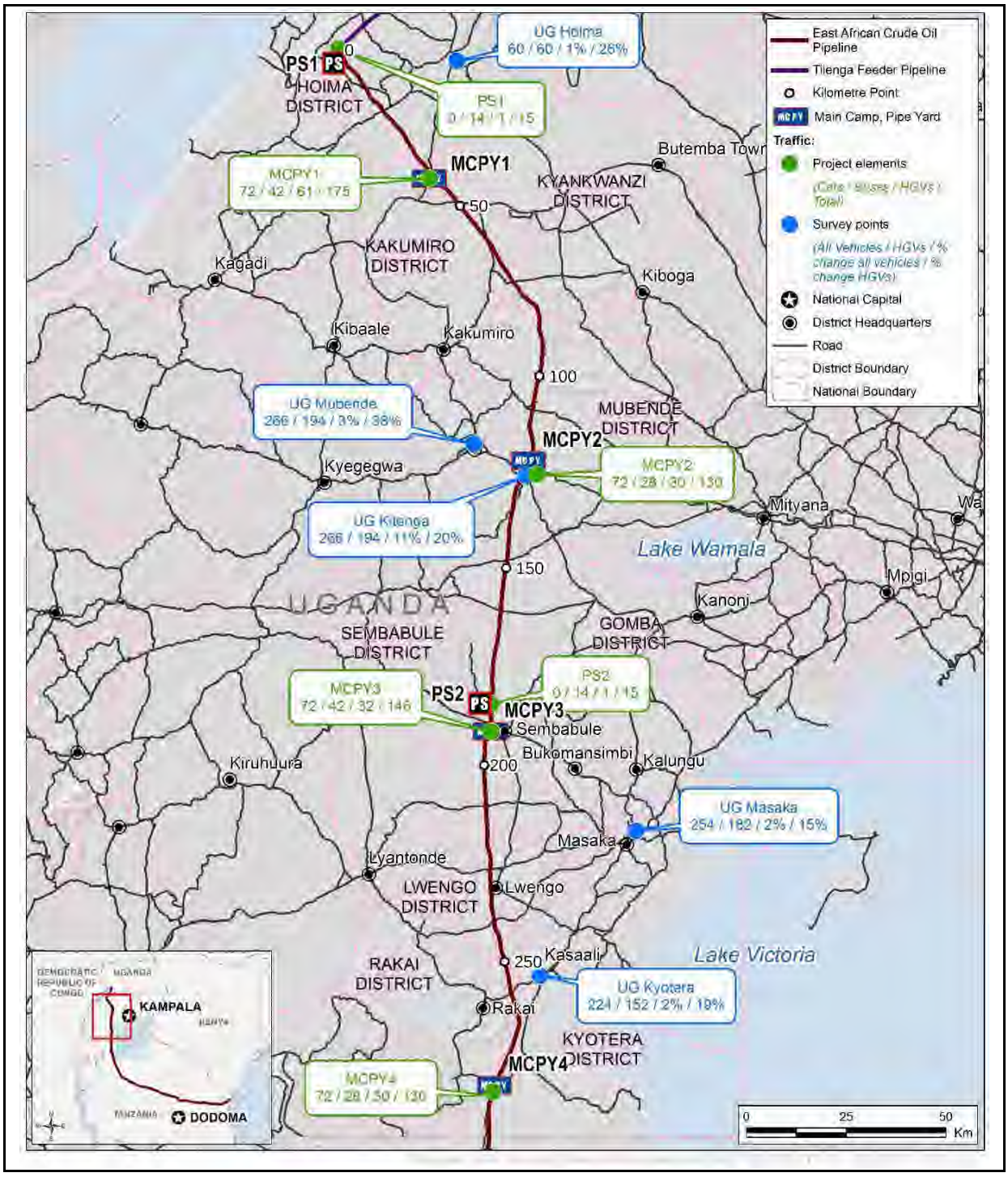


Figure 8.17-1 Baseline Traffic Flows (Blue) and Predicted Traffic Movements at Project Locations (Green) (Per Day)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. However, the following generic impact may be more pronounced in Katikara Trading Centre (KP41), Kyenda (KP125.5) and Sembabule Market Zone (KP190):

Use of Road Network

Impact: Traffic congestion leading to delays

This may lead to direct and indirect impacts.

These PACs are densely populated and growing in size due to rural-urban migration. Many local businesses are already present, attracting residents from neighbouring PACs which offer fewer goods and services. Traffic levels are higher in Katikara Trading Centre, Kyenda and Sembabule Market Zone than in other PACs close to the MCPYs. Understanding the pull factors of in-migration, these PACs, as established urban centres, are more likely to experience PIIM of opportunistic job seekers than neighbouring PACs due to proximity to the MCPYs. This may exacerbate traffic volumes with increased public transport, congestion and delays even further.

The impacts will be short-term and will affect the entire PACs. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

Mutukula town, at the border between Uganda and Tanzania, has experienced rapid population growth and rising levels of economic activity in recent years. Mutukula is one of the main entry points into Uganda from Tanzania and customs revenues have increased at the border, reflecting an increase in cross-border flows of goods and services. Heightened trading activities in Mutukula has resulted in an increase in traffic volumes in the town and surrounding area. KIIs reported that traffic levels are increasing in Mutukula by roughly 20% per year.

The potential generic impacts are also applicable to the border town of Mutukula. However, the following generic impact may be more pronounced in this PAC:

Use of Road Network

Impact: Traffic congestion leading to delays

This may lead to direct and indirect impacts.

The impacts will be short-term and will affect the entire PAC. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.17.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation. Vehicle movements for the duration of this period will mainly be to facilitate movement of people to and from the RoW and AGIs. The operation of the pipeline and AGIs will therefore introduce traffic onto the road network in the immediate vicinity, primarily for maintenance and inspection. However, the extent to which it affects the existing traffic volumes will depend on the origin of workers.

The traffic volumes from the operation of the pipeline and AGIs is unlikely to materially increase the baseline given the frequency of visits to any single location and the number of workers required on a daily basis at crewed locations.

The operation of the pipeline and AGIs across Uganda is predicted to have a not significant impact on infrastructure (e.g., power lines, roads), traffic volumes and movements.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.17.3 Enhancement and Mitigation Measures

This section describes the enhancement and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect social infrastructure and services.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.17.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to social infrastructure and services such as minimising impacts on settlements and social and community infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routeing options available.

The project will generate its own power and is thus independent of locally supplied electricity (see Section 2). This will mitigate increased pressure on local electricity supplies due to construction activities. Project water and waste management requirements are also described in Section 2.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.17.3.2 Construction

Generic Mitigation Measures

Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)

Impact: Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction

An infrastructure and utilities management plan will be developed, describing the specific mitigation measures to be implemented to ensure infrastructure and utility services are identified and protected during construction.

Potentially affected landowners, land users and communities will be consulted if there is likely to be any disruption to the existing infrastructure and utility services which will be communicated at least 72 hours before work starts and where disruption to infrastructure and utilities will occur for more than 12 hours, a risk analysis of impacts on affected settlements will be completed. Feedback from communities will inform planning of the works, especially when determining the options for temporary alternatives.

The project will notify third-party utility services of any damage and the damage will be repaired promptly in consultation with the service operator or utility owner.

Application of these mitigation measures will reduce the magnitude of impact from small to negligible with no significant residual impact.

Use of Road Network

Impact: Deterioration of road conditions

The infrastructure and utilities management plan will include these measures that will contribute to the management of this impact.

An initial survey will be completed of the condition of roads to be used by the project including bridges, drainage structures, signage, traffic management and other road infrastructure upon the completion of construction. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis.

Vehicle movements will be restricted to defined access routes and demarcated working areas. Where feasible, preference will be given to transport of pipe and other construction materials by rail.

Application of these mitigation measures will reduce the magnitude of impact from very large to medium with no significant residual impact.

Impact: Traffic congestion leading to delays

The transport and road safety management plan and stakeholder engagement plan will include measures that will contribute to the control of this impact to manage congestion.

The transport and road safety management plan will address site-specific traffic risk assessment and safe driving procedures. Vehicle movements will be restricted to defined access routes and demarcated working areas.

In addition to the mitigations for the deterioration of road conditions the following mitigation also applies to this impact:

Community liaison officers will encourage PAC leadership to provide advance warning of local events so that construction activities can be avoided at these times.

Application of these mitigation measures will reduce the magnitude of impact from large to small with no significant residual impact.

Impact: Disruption of traffic flows

The transport and road safety management plan and infrastructure and utilities management plan will restrict vehicle movements and times (unless in the event of an emergency). At major road crossings where it is necessary to maintain traffic flow, consideration will be given to trenchless crossing techniques or the crossing will be made in two stages and only half of the road width will be used at a time.

Application of these two mitigation measures will reduce the sensitivity of impact from very high to low with no significant residual impact.

Mitigation for deterioration of road conditions and traffic conditions leading to delay will control impacts resulting from disruption to traffic flows; no additional mitigation is necessary.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are applicable to the 20 PACs near the four MCPYs.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The generic mitigation measures are applicable to the border town of Mutukula.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are applicable to the eight PACs near the two pumping stations.

8.17.3.3 Operation

Generic Mitigation Measures

As there are no predicted generic impacts for pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts for pipeline and AGI operation, no mitigation measures are required.

8.17.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on social infrastructure and services after mitigation measures have been implemented.

Table 8.17-6 summarises the potential generic social infrastructure and services impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.17-7 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on social infrastructure and services are considered not significant.

Ecosystem Services

Section A11.4.10 in Appendix A11 identifies ecosystem services associated with social infrastructure and services in the AOI. The following ecosystem services have been assessed in Section 8.17.2 and 8.17.3:

Provisioning services:

- electricity from hydro, fossil fuels and solar energy
- cooking fuel from biomass and firewood (see Section A11.4.6.4 in Appendix A11, land-based livelihoods – natural resources use).

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.17-6 Social Infrastructure and Services – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Use of Road Network	Road widening and improvement	C	Y		B				
Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)	Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction	C	-	Infrastructure and Utilities Management Plan	2	1	2	2	7
Use of Road Network	Deterioration of road conditions	C	Y	Infrastructure and Utilities Management Plan	6	2	2	5	15
Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	4	2	2	3	11
Use of Road Network	Disruption of traffic flows	C	-	Infrastructure and Utilities Management Plan Transport and Road Safety Management Plan	4	1	2	2	9

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.17-7 Social Infrastructure and Services – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Katikara Trading Centre (KP41)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13
Kyenda (KP125.5)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13
Sembabule Market Zone (KP190)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13
Mutukula town (KP295.5)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.17.5 Transboundary Project Impacts

8.17.5.1 Generic Transboundary Project Impacts

The following generic transboundary project impacts have been identified:

Use of Road Network

Impact: Deterioration of road conditions

Impact: Traffic congestion leading to delays

Impact: Disruption of traffic flows.

Traffic generated in Uganda will cross the border to Tanzania to transport goods and materials. The potential transboundary cumulative impacts related to traffic are discussed in Section 8.17.6.3.

The potential for deterioration of road conditions, traffic congestion leading to delays and disruption of traffic flows will be managed through the mitigation measures described in Section 8.17.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.17.5.2 Location-Specific Transboundary Project Impacts

No location-specific transboundary project impacts have been identified in relation to social infrastructure and services.

8.17.6 Cumulative Impacts

8.17.6.1 Context

The baseline condition of social infrastructure and services, the trends and sensitivity to change are described in Section 6.4.3.12. Project residual impacts are summarised in Table 8.17-6 and Table 8.17-7. The traffic baseline conditions, the trends and sensitivity to change are described in Section 6.4.3.15.

Poor road conditions increase travel time and costs considerably. New permanent and temporary access roads will be constructed to accommodate project traffic movements as some activities will take place on sites remote from the existing road network. Traffic levels tend to be low, so congestion is rare outside the main urban areas.

Residual project impacts that may contribute to cumulative impacts include:

- several roads will be widened and improved as part of the project
- construction traffic leading to congestion and disruption of flow from the movement of equipment and people leading to delays
- additional project traffic, including HGVs, could lead to an increase in the rates at which road conditions deteriorate.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
  - Tilenga Project (AF01)
  - Kingfisher Oil Project (AF02)
- third-party developments:
  - Kabaale International Airport (UG04)
  - refinery (UG07)
  - Hoima-Buloba pipeline (UG08)
  - Lot 4 road upgrades (UG19)
  - Buhimba to Kakumiro road upgrade (UG20)
  - construction camp for Bulima – Kabwoya road (UG21)
  - Bulima – Kabwoya road upgrade (UG22)
  - ICT infrastructure installation (UG44).

No threshold is required for the long-term beneficial impacts of road improvements.

The preferred condition is defined as a return to, or near the original condition of social infrastructure and services (including road condition) before construction and that disruption is minimised and managed during construction so that pre-construction social infrastructure use patterns and services can be maintained.

8.17.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are predicted based on the premise that the EACOP, Tilenga, and the Kingfisher projects have similar construction phase timelines, causing an additional demand on infrastructure through increased traffic volumes.

The transportation of materials, equipment and personnel to and from construction camps and worksites will increase traffic on the assigned routes on public roads, causing congestion and disrupting traffic flows.

Using traffic predictions supplied by the other projects, Table 8.17-8 presents the assessment of cumulative traffic impacts from EACOP, Tilenga and Kingfisher projects. The three projects are estimated to have similar contributions to the cumulative impact.

Table 8.17-8 Location-Specific Traffic Increases for EACOP, Tilenga and Kingfisher Projects from Moving People, Material and Equipment

Location	Daily Baseline Traffic (All Vehicles)	Daily Baseline Traffic (HGVs)	Average Daily No. Of All Project Vehicles (Two-Way)	Average Daily No. Of All Project HGVs and Buses (Two-Way)	Increase in All Vehicles (%)	Increase in HGVs and Buses (%)
Hoima	6,886	230	165	165	2%	72%
Mubende	7,721	513	266	194	3%	38%
Kitenga	2,440	968	266	194	11%	20%
Masaka	10,289	1,214	359	287	3%	24%
Kyotera	10,851	794	329	257	3%	32%

At all locations except Kitenga, the increase in traffic volumes for all vehicles is considered of negligible magnitude (defined as a less than 10% increase in daily two-way traffic flow in the EACOP project impact assessment criteria). At Kitenga, the 11% increase in all vehicles from the three projects, is considered a small magnitude (defined as 10–30% increase in daily two-way traffic flow). The EACOP-only contribution to increases in traffic volume is considered as being of small magnitude.

At Hoima and Kyotera the increase in HGV and bus traffic from all three projects is considered of medium magnitude (30–100% increase in daily two-way traffic flow). This is an increase in magnitude from when only the EACOP project is considered (the project magnitude was ranked as small). At Mubende, the magnitude of increases in HGVs and buses for all three projects is considered medium which is the same ranking as for the EACOP project only. For Masaka and Kyotera, the magnitude of increases in HGV and bus traffic is small. The level of increase is considered the same as for the EACOP project alone.

The impact of increased volumes for all traffic and specifically for HGVs and buses for all three projects is considered not significant.

Information received from the Tilenga Project and the feeder pipeline component and the Kingfisher Oil Project indicate that mitigation measures similar to those in Section 8.17.3 will be applied.

With the mitigation measures implemented, it is predicted that the limit of acceptable change will be achieved and hence the residual cumulative impact is not significant.

The transboundary cumulative impacts from EACOP and the AFs is described in Section 8.17.6.3.

Third-Party Developments

Potential cumulative impacts are predicted where the EACOP project and the above mentioned third-party developments have similar construction phase timelines, resulting in an additional demand on infrastructure through increased traffic volumes. Table 8.17-3 shows the above-mentioned third-party developments, EACOP AGIs and MCPYs and the districts that may be impacted.

Table 8.17-9 Cumulative Impacts: Roads

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 is parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Buseruka and Kiziranfumbi subcounty, Hoima district Kisita and Banaywa subcounty, Kakumiro district

Table 8.17-9 Cumulative Impacts: Roads

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG19	Lot 4 road upgrades	0–19	PS1, approximately 3.2 km from UG 19	Buseruka subcounty, Hoima district
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisita subcounty, Kakumiro district
UG21	Construction camp for Bulima–Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from the pipeline	Kiziranfumbi subcounty, Hoima district
UG22	Bulima–Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses the pipeline	Lwengo subcounty, Lwengo district

Road Widening and Improvement

A long-term beneficial cumulative impact will occur from the upgrade of the EACOP project access roads and the third-party road upgrades, see Figure 8.17-2.

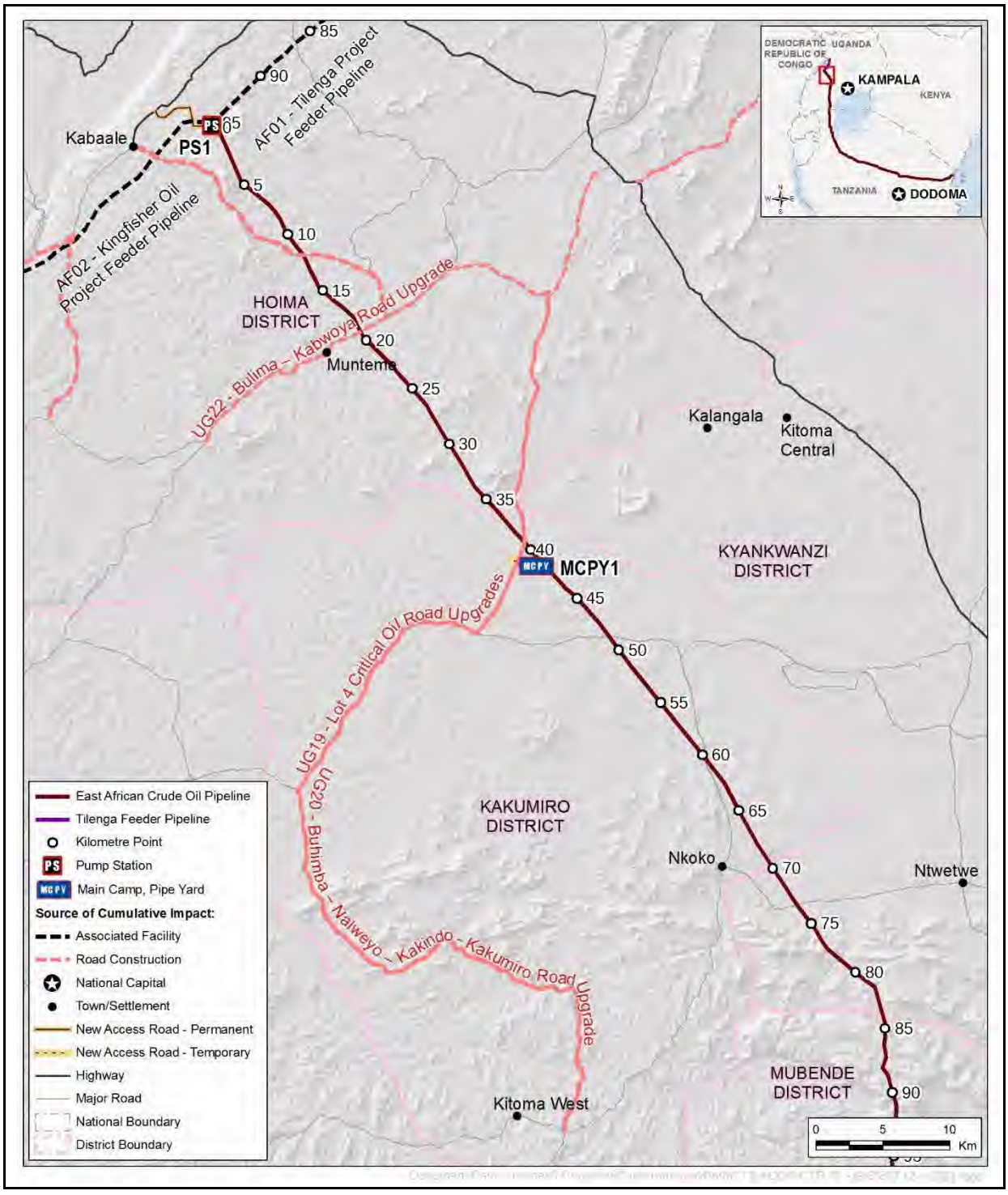


Figure 8.17-2 Cumulative Impacts: Road Improvements

The combined effect of the improved project access roads and the national road is that goods can be transported to markets more quickly and travel times will reduce. Access to health care and response times in emergency situations will be improved.

Traffic Congestion and Disruption of Traffic Flows

The transportation of materials, equipment and personnel to and from construction camps and worksites will increase traffic on public roads used by the same projects,

potentially causing congestion and disrupting traffic flows. and accelerating the deterioration of road conditions, bridges and communal infrastructure. The potentially affected routes are:

- Hoima to Kampala
- Kampala to Masaka
- Masaka to Kyotera.

It should be noted that assumptions have been made about routes and traffic volumes for third-party developments, as detailed data were not available, and therefore a more fulsome assessment has not been completed.

To manage the cumulative impact, the project will liaise with third-party developers, the police and authorities to identify and implement additional traffic management measures that limit disruption.

With the additional mitigation measure implemented, it is predicted that the limit of acceptable change will be achieved and hence the cumulative residual impact is not considered significant.

8.17.6.3 Transboundary Cumulative Impacts

Transboundary cumulative impacts will occur because of construction activities associated with the EACOP project and the Tilenga Project including the feeder pipeline. At the time of writing no information on the transportation of construction materials outside Uganda is available for the Kingfisher Oil Project. Traffic transporting imported construction materials for the EACOP project and the Tilenga Project is expected to have travelled from Dar es Salaam and Tanga ports in Tanzania, through Tanzania and to the Uganda MCPYs. The coated pipe would be transported from a coating facility planned for the Tabora region in Tanzania. This traffic will therefore affect the main highways in Tanzania and Uganda.

Similar baseline conditions exist in both countries with similar effects on VECs. As mentioned the Tilenga Project including the feeder pipeline component will implement mitigation measures similar to those in Section 8.17.3. Consequently, it is predicted that the limit of acceptable change will be achieved and hence the transboundary residual cumulative impact is not significant.

8.18 Community Health

This section describes potential impacts on community health during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.18.1 Key Sensitivities and Considerations

The community health baseline conditions are described in Section 6.4.3.13, as well as:

- community health key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the community health impact assessment.

Sensitivity in the community health AOI is ranked as potentially high for:

- children
- the elderly
- pregnant women
- people living in crowded areas
- PACs with decreased access to appropriate healthcare facilities
- people with poor access to clean water and adequate sanitation
- households using biomass fuel for indoor cooking and lighting
- female headed households
- women and young girls
- PACs near to artisanal mining sites, along transport routes and access roads
- PAC members with less access to wild foods
- PACs with members employed by the project and PACs where PIIM is likely.

Sensitivity is ranked as potentially very high in immuno-compromised individuals and commercial sex workers.

Key considerations are:

- population growth (natural and as a result of PIIM) may lead to local health care facilities being overstretched
- interaction between PACs and an expatriate labour force may increase the risk of transmission of communicable diseases
- given the high incidence of communicable diseases and the poor health facilities, PIIM into the PACs will likely increase the prevalence of communicable diseases
- construction activities may create standing water, in which malaria-spreading mosquitoes can breed
- vector management activities, if not aligned with national strategies, may increase vector resistance and compromise local authority interventions
- PIIM may promote vector breeding, disease transmission and an increased burden on health systems
- environmental sanitation, health care services and prophylaxis, vector control programmes and the management of PIIM are key for controlling malaria
- PIIM into PACs may influence the availability of clean drinking water, exacerbate unsanitary conditions and increase disease spread and BOD
- districts with a high prevalence of STDs, PIIM and a growing population are likely to have increased STI prevalence
- the majority of farmers in the AOI are subsistence farmers and an increase in external demand will need to be managed
- PIIM into the AOI may increase food prices and, as a result, affect food security of vulnerable groups
- VHFs and the associated outbreak potential remains a risk to PACs, in particular those that are impacted by PIIM
- PAC households that experience a sudden increase in disposable income may be affected by a loss of cohesion through increased use of substances such as alcohol and drugs, and sex workers
- PIIM may lead to pressure on health care services.

Section A11.4.11 in Appendix A11 identifies ecosystem services associated with community health. The following ecosystem services have been assessed in Sections 8.18.2 and 8.18.3:

Water-related diseases are linked to safe water, which provides the following ecosystem services:

Provisioning services:

- general health
- form of livelihood (see Section 8.14 on river and lake-based livelihoods).

Social cultural health practices are linked to the use of wild plants, which provides the following ecosystem service:

Provisioning services:

- ingredients for treatment of common illnesses (traditional medicine).

The key human rights that are relevant to community health relate to the right to health, which is also a component of the right to an adequate standard of living. Women's rights and children's rights should also be considered as they are particularly vulnerable to certain health risks related to EACOP. International standards for responsible business also require that negative impacts of projects on the health of the communities should be avoided or at least minimised (see Section 4).

8.18.2 Potential Project Impacts

8.18.2.1 Construction

Generic Impacts

Resettlement

Project land requirements for construction facilities and associated access roads will be permanent. The project has developed a Resettlement Strategy (RS) that will guide all land acquisition consistent with national and IFC requirements (see Section 8.15). Due to the land requirements, specific VECs in communities may be impacted through physical resettlement or economic displacement.

Impact: Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases

This may lead to direct impacts.

Physical displacement of households may result in households being moved to areas where environmental, semi-urban and urban conditions are more suitable for vector breeding, resulting in an increase in vector densities (e.g., wetlands and densely populated areas).

This may result in households being exposed to higher vector densities and a corresponding higher BOD. This impact not only relates to malaria but also to other vector-related diseases that are prevalent in the AOI, such as:

- arboviral diseases (dengue, yellow fever)
- human African trypanosomiasis (HAT)
- onchocerciasis.

From a human rights perspective, there is a potential impact on the right to health.

The impacts will be long-term and will affect some households within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Resettled households' decreased food security

This may lead to direct impacts.

Households affected by loss of land without adequate in-kind compensation may experience a decrease in food security if suitable alternatives to producing or procuring food and seeds for planting are not available. Longer-term food insecurity for sensitive VECs (female-headed households, children, pregnant women, elderly) may lead to nutritional disorders. Food insecurity has already been noted as a concern in the districts of Hoima, Kakumiro and Kyotera.

From a human rights perspective, there is a potential impact on the right to food and the right to health.

The impacts will be medium-term and will affect some households within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Community Health

Construction activities such as site clearing and road construction will cause changes in the natural environment, which may increase the number and suitability of breeding habitats for vectors.

Equipment, materials and other goods will be shipped to Tanga and Dar es Salaam and transported to project sites, thus allowing for the movement of vectors to these locations.

Impact: Project activities leading to an increase in vector-related diseases

This may lead to direct and indirect impacts.

An increase in vector density may increase the risk for localised disease transmission. High risk activities that may contribute to this impact include:

- site clearing activities
- borrow pit development
- road construction (with a specific focus on drainage)
- construction sites and MCPY drainage
- poor housekeeping at construction sites and MCPYs, resulting in conditions that promote the collection of standing water.

A localised increase in mosquito vectors that transmit arboviral conditions (Aedes spp.) may also give rise to an increased risk for the potential spread of rift valley fever if a localised outbreak was to occur. This disease is a zoonosis in East Africa, mosquitoes play an important role in transmission and higher densities may

increase the risk. Areas and objects allowing pooling of water provide the preferred breeding areas for these species of mosquito and MCPYs are therefore considered to be high risk areas.

There is a risk that movement of goods and materials via road from the ports of Tanga and Dar es Salaam can introduce vector-related diseases as shipments will arrive from global locations and may be stored in the port. Countries of origin may be endemic to different strains and types of arboviral diseases (particularly dengue) and infected larva and eggs may be transferred in goods or packaging, introducing these diseases to the AOI.

The impacts will be medium-term and will affect districts and regions. Due to their medium-term nature, before mitigation the impacts are considered not significant.

Noise

Construction activities are expected to change the noise environment in the immediate vicinity of construction sites. Sources of noise such as excavators, dozers, dump trucks, graders and vehicles may add a new noise character to the existing noise environment.

Impact: Excessive noise exposure due to project activities

This may lead to direct and indirect impacts.

The role of noise as an environmental pollutant and its impact on health are increasingly recognised. Beyond potential damage on the auditory system, noise causes annoyance, disturbs sleep and impairs cognitive performance.

Furthermore, evidence from epidemiological studies has demonstrated that environmental noise is associated with an increased incidence of arterial hypertension, myocardial infarction, disruptions of sleep structure and increases in stress hormone levels (Munzel et al. 2014).

Based on the available information (see Section 8.10), the following activities have been identified as potential contributors to noise exposure during the construction phase of the project:

- MCPY construction and power generation during pipeline and AGI construction
- access road construction and use
- RoW earthworks
- AGI construction.

An increase in general economic activity due to improved access caused by road improvement may cause an increase of non-project related traffic in PACs. This increase in traffic may contribute to potentially excessive environmental noise exposure.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Disposal of Solid and Liquid Waste

It is anticipated that the project will generate different types of solid and liquid waste which will need to be managed.

Impact: Increased pressure on regional waste management facilities due to project activities

This may lead to direct impacts.

All the project districts have limited local capacity to process municipal and household waste. Waste management facilities are virtually non-existent and formal waste handling and disposal procedures are scarce. Project activities have the potential to generate significant amounts of waste belonging to diverse waste streams (see Section 2).

Improper management and disposal of waste streams have the potential to impact on community health in the following ways:

- contamination of water sources and soil by general wastes such as oils and metals and infectious wastes from sanitary waste streams has the potential to spread disease to PACs that come into contact with these. This is of particular concern as it relates to spread of infectious diarrhoeal disease
- exposure of community members to improperly discarded medical waste poses a biological exposure risk from waste that may harbour infectious diseases, injuries from contaminated needles and other sharp objects pose a substantial risk as HIV and hepatitis B and C can be transmitted as a result
- improperly managed waste sites have the potential to attract vermin and animals, which can also increase the potential for human-animal interactions. This may result in injuries from bites (snake or animal) as well as the potential spread of zoonotic diseases.

The impacts could potentially be long-term but, due to their small extent, before mitigation the impacts are considered not significant.

Use of Road Network

It is anticipated that project logistics will be extensive during the construction phase; transport of materials from Dar es Salaam and Tanga will include the transport of materials from harbours and the movement of the construction workforce.

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

This may lead to direct impacts.

There is the potential for increased high-risk sexual behaviours along transport corridors to, from and within the project area. Drivers are a well-documented high-risk group, often having multiple sexual partners and supporting sexual networks along transport corridors. Thus, there is the potential for an increase in high-risk sexual practices that may promote the spread and incidence of sexually transmitted infections, including HIV.

Women who are already engaged in commercial sex, often target truck drivers for commercial or transactional sex as they are away from their usual family network and have disposable income. Truck drivers (mainly men) generally target women for company and entertainment. These encounters are often transactional in nature. Women and young girls, engaged in transactional and commercial sex, are considered to be sensitive VECs to this impact.

The impacts may be felt along the whole transport route. Truck rest stops (as drivers will be expected to take rest-stops every two hours and overnight stops after 10 hours of driving) are considered high risk areas.

From a human rights perspective, there are potential impacts on the right to health associated with commercial sex work. There are also potential impacts on the rights of women and children who may be vulnerable to exploitation in commercial sex work.

The impacts will be long-term and will affect districts and regions. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. The following specific impacts are also applicable to these PACs:

Abstraction of Groundwater

The baseline data revealed that 36% of households in the sample PACs relied on community wells for domestic water supply, while 51% had access to boreholes. However, during the dry season, water sources may dry up and households have to buy water. Shortage of clean drinking water is a concern in most of the PACs, particularly during the dry season. The districts of Mubende, Kakumiro and Sembabule, where some of the construction camps will be located, reported low levels of access to clean water.

Impact: Reduced availability of groundwater

This may lead to direct impacts.

Abstraction of groundwater to supply MCPYs may have a direct impact on the groundwater table in the vicinity of the wells through drawdown effects. This may have an adverse impact on the yield of nearby community boreholes and wells, negatively affecting the availability of safe water in PACs. This may negatively impact on the quantity and quality of available safe water for PACs near the MCPYs. During the dry season it may even lead to a total loss of the water source. A decrease in the availability of safe water may, in turn, lead to an increase in sanitation-related diseases. Households without alternative water sources in their vicinity will be most vulnerable.

From a human rights perspective, there is a potential impact on the human rights to water, sanitation and health.

The impacts will be short-term and will affect entire PACs that rely on a ground water source that is used for the project. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Employment

The project will employ both skilled and unskilled labour (see Sections 8.11 and 8.12). The majority will be skilled labour, which will be sourced outside the AOI and will be accommodated in the MCPYs.

Despite the requirement that camp residents must remain in the MCPYs after working hours, a certain amount of interaction between the project workforce and local PACs is unavoidable, primarily through the hiring of unskilled workers from PACs who will reside at home. These local workers may act as a conduit through which communicable diseases may be transferred from camp residents to PAC populations.

Impact: The transmission of communicable diseases between the project's externally contracted workforce and PACs

This may lead to direct impacts.

The utilisation of an externally contracted project workforce, including expatriates and Ugandan nationals from outside the AOI, may cause an increase in burden of communicable disease in PACs in the following ways:

- the externally contracted workforce may originate from a country or area where the burden of communicable diseases is appreciably higher than in the PACs. This refers in particular to PTB and HIV. This may increase local transmission patterns in both the project workforce and ultimately the communities, as workers work and reside in close association with one another, especially in the MCPYs. An additional risk related to the incoming workforce and PTB transmission is the potential introduction of multidrug or extreme drug resistant strains of the disease
- inadequate design and construction of the MCPYs may lead to favourable conditions that promote the spread of communicable diseases, leading to an increase in burden of communicable diseases in the workforce, and ultimately spreading to PACs through local workers working closely with MCPY residents
- inadequate development and implementation of pre-deployment and fitness-to-work medical screening programmes for project personnel may lead to the introduction of communicable diseases that may have significant public health implications, such as pandemic influenza and other novel communicable conditions.

The baseline data has shown that the capacity and capabilities of local health systems in the AOI are limited, a factor that will likely affect the initial identification and effective subsequent management of a communicable disease outbreak in PACs. It is anticipated that persons with a compromised immune status, the elderly and children below five years of age are the more sensitive VECs.

The impacts will be long-term and will affect entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities

This may lead to direct impacts.

Malaria and other vector control plans that are implemented by the project to provide protection to its construction workforce may, if not implemented to an adequate technical standard and in alignment with national malaria control strategies, result in the development of insecticide resistance in vectors. This may result in resistant vector populations that are no longer susceptible to vector control measures and bite prevention strategies implemented in PACs. The failure of vector control and bite prevention strategies are likely to lead to an increase in the burden of disease and associated morbidity and mortality.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Outbreaks of infectious conditions within MCPYs affecting the health of PACs

This may lead to direct impacts.

Following interaction between the local workforce based in the MCPYs and PACs, infectious conditions may be transferred to the PACs.

The impacts will be long-term and will affect some individuals in the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

PIIM

As a result of the perceived potential for employment prospects and other indirect economic possibilities, PIIM of potential job seekers, commercial sex workers and business opportunity seekers is likely to occur in the project area, in particular near the MCPYs. It is anticipated that the living conditions and housing standards of these job seekers may be of a poor standard as job opportunities may be of a temporary nature only and migrants may not settle permanently but elect to migrate along the pipeline route. Poor standards of housing, associated with overcrowding and poor environmental hygiene, is a contributing factor to the development and spread of diseases in communities.

Impact: PIIM of jobseekers into PACs carrying communicable diseases

This may lead to indirect impacts.

Multiple factors may lead to an increase in communicable disease in PACs:

- the job seekers may originate from areas where the burden of various communicable diseases may be higher than in the PACs they migrate to, resulting in the introduction of a higher disease burden
- migrant job seekers may have different hygiene standards and sanitation practices that may increase the risk of disease spread
- the increase in social ills, introduced by PIIM of job seekers, may lead to an increase in commercial sex work, which, in the existing polygamous environment, may cause an increase in sexually transmitted diseases.

The increased burden of disease introduced to the PACs, together with living conditions that are conducive to the spread of these conditions, may lead to an increase in incidence of diseases, including but not limited to:

- communicable diseases linked to the living environment (e.g., acute respiratory infections (ARIs), PTB, measles)
- soil-, waste- and water-related diseases (diarrhoeal disease, cholera, schistosomiasis)
- sexually transmitted diseases, including HIV and AIDS.

Community members with a compromised immune status, the elderly and children under five are considered sensitive VECs with regards to communicable diseases linked to the living environment and soil-, waste- and water-related diseases. Young women and women engaged in transactional and commercial sex may be more vulnerable to sexually transmitted diseases.

The impacts will be very long-term and will affect districts. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: PIIM of job seekers causing environmental changes in PACs that promote vector breeding

This may lead to indirect impacts.

Job seekers are likely to lodge in informal settlements generally characterised by poor housekeeping and environmental hygiene standards that promote standing water, increasing breeding habitats for vectors. This could lead to an increase in vector-related diseases in the PACs.

Community members with compromised immunity, the elderly, children under five and women are considered sensitive VECs.

The impacts will be medium-term and will affect entire PACs. Owing to their small extent, before mitigation the impacts are considered not significant.

Impact: PIIM of job seekers causing increased pressure on existing health services at the PAC level

This may lead to indirect impacts.

The existing health services in the districts traversed by the AOI reported significant challenges in relation to both capacity and capabilities. In general, all project districts reported inadequate infrastructure, number of staff and equipment required to provide an acceptable service to their target populations.

PIIM related to job seekers would, however, place additional pressure on, and in some instances even exceed the capacity of, what are already limited district level health care capabilities.

There is minimal institutional capacity to support this potential growth either from a planning, budget or delivery perspective; without early consultation, awareness and support, the inability to meet a sudden increase in demand will impact on local health service delivery. This can include acceptable infrastructure, effective supply chain for medications and consumables and diagnostic equipment.

The impacts will be medium-term and will affect entire PACs. PACs in the districts of Kakumiro, Kyankwanzi, Lwengo, Gomba and Sembabule are considered highly sensitive VECs due to difficult access to appropriate health care and services.

Owing to their small extent, before mitigation the impacts are considered not significant.

Impact: PIIM of job seekers causing uncontrolled disposal of waste in PACs

This may lead to indirect impacts.

Baseline findings show that there is limited local capacity to process municipal and household waste. Household waste is predominantly burnt in the open air near to homesteads, buried in the ground or often eaten by livestock. PIIM of job seekers may place an additional burden on existing waste management services with the potential for the spread of disease.

Most sanitation facilities conditions in PACs do not adequately prevent contact with human sewage. Development of informal settlements may exacerbate this situation. This has the potential to impact on the health of the PACs in the following ways:

- there is an existing high burden of diarrhoeal disease, and deterioration in waste management has the potential to increase the risk for spread of sanitation related diseases in the PACs. This can include diarrhoeal disease (of viral, parasitic and bacterial origin), typhoid fever, forms of dysentery, cholera, soil-transmitted helminths and schistosomiasis
- unregulated dumping and accumulation of domestic wastes may attract insects, vermin and other animals, which may potentially cause injuries to PAC inhabitants (due to human-animal interactions) and a risk for zoonotic disease transmission
- discarded domestic waste may cause an increase in favourable breeding sites for vectors and an increase in vector-related diseases.

It is anticipated that children, the elderly, immuno-compromised individuals and communities with poor access to safe water and adequate sanitation will be most likely affected.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Reduction in the availability of potable water in PACs due to PIIM

This may lead to indirect impacts.

PIIM may increase the pressure on local water resources and the accessibility and scarcity of water supplies in many settlements may make it difficult for PACs to cope with additional demands for water. This may cause a decline in the quality and quantity of available potable water resources. In combination with poor sanitation facilities and potential poor hygiene practices, this may result in an increase in water-related diseases (i.e., diarrhoea) and potentially increase the risk of outbreaks of typhoid, dysentery and cholera.

Access to potable water is a sensitive matter because it is a fundamental human right. There is also potential for conflicts to arise in PACs where local residents and newcomers compete for access to this vital resource.

The impacts will be long-term and will affect entire PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Provision of Goods and Services

Commercial activity in the PACs consists predominantly of informal small-scale enterprises that trade in agricultural produce, daily necessity goods and basic services.

Impact: Nutrition of PACs compromised by reduced food security

This may lead to direct and indirect impacts.

Procurement of food by the project from local markets may lead to a rise in the cost of basic foodstuffs. This may impact on food security and limit the diversity of diets in households that are dependent on food procurement as opposed to subsistence agricultural activities. This may manifest as an increase in malnutrition rates. Baseline findings identified the following districts where lack of food security was already reported: Hoima, Kakumiro and Kyotera.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

8.18.2.2 Operation

Generic Impacts

The following potential generic impact, described for construction, is also applicable during pipeline and AGI operation:

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

This may lead to direct and indirect impacts.

The operation of the pipeline and AGIs will introduce traffic onto the road network in the immediate vicinity, primarily for the purposes of maintenance and inspection.

The mobilisation of the operational project workforce, or a portion thereof, may result in workers engaging in casual sexual practices on routes, increasing the spread and incidence of sexually transmitted infections, including HIV.

Women and young girls, engaged in transactional and commercial sex, are considered to be sensitive VECs to this impact.

The impacts will be long-term and will affect districts and regions. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Impacts

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The following potential generic impact, described for construction, is also applicable to the eight PACs near the two pumping stations during operation:

Disposal of Solid and Liquid Waste

Impact: Increased pressure on regional waste management facilities due to project activities

This may lead to direct and indirect impacts.

During operations, the project will continue to generate waste belonging to diverse waste streams.

The impacts will be long-term and will affect entire PACs. Due to their small extent, before mitigation the impacts are considered not significant.

8.18.3 Mitigation Measures

This section describes the enhancement and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect community health.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.18.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to community health such as minimising impacts on settlements, water points/sources and social and community infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.18.3.2 Construction

Generic Mitigation Measures

Resettlement

Impact: Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases

and

Impact: Resettled households' decreased food security

The resettlement action plan and grievance procedure will include measures that will all contribute to the management of health impacts for resettled households.

A resettlement action plan will describe the procedures related to compensation for loss of assets and livelihood restoration strategies. Post-resettlement monitoring of livelihood restoration measures will be implemented.

The grievance procedure allows PAC inhabitants to express grievances about the project and resettlement action plan procedures. The grievance process will be communicated to PACs and it will be clearly communicated that complaints related to interactions with public or private security forces will be addressed.

For the impact resettled households' exposure to areas of higher vector densities increasing the burden of vector-related diseases, application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from long-term to short-term. The residual impact is not significant.

For the impact resettled households' decreased food security, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

Community Health

Impact: Project activities leading to an increase in vector-related diseases

The community health, safety and security plan, occupational health, safety and security plan and the stakeholder engagement plan will include measures to manage vector-related diseases.

As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with health management teams which consider the development and implementation of a community malaria control programme.

Project design specifications such as adequate drainage and the avoidance of standing water in construction sites will help manage PAC member health.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and duration of impact from medium-term to short-term. The residual impact is not significant.

Noise

Impact: Excessive noise exposure due to project activities

The community health, safety and security plan, pollution prevention plan and the stakeholder engagement plan will include measures to manage noise.

Detailed acoustic design will be undertaken for sensitive receptors which should consider location of noisy equipment away and the incorporation of noise abatement measures (e.g., acoustic barriers).

A monitoring plan will be developed and implemented to ensure that environmental noise exposure levels are periodically monitored and documented corrective measures will be implemented.

Application of these mitigation measures will reduce the magnitude of impact from small to negligible and the residual impact is not significant.

Disposal of Solid and Liquid Waste

Impact: Increased pressure on regional waste management facilities due to project activities

The waste management plan will identify suitable offsite disposal sites for waste soil and rock and implement appropriate management measures. Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible. Application of these mitigation measures will reduce the magnitude of impact from large to small with no significant residual impact.

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

The community health, safety and security plan, occupational health, safety and security plan, infrastructure and utilities management plan and the stakeholder engagement plan will include measures to manage the transport corridor burden of disease.

A workers' code of conduct outlining expected worker behaviours will cover the interaction between the national, international and local workforce, including interactions with PAC members.

A community health, safety and security plan will be developed to manage infectious disease outbreaks in MCPYs and to prevent their spread to PACs. A HIV/STD awareness and prevention programme, which includes monitoring, will be put in place at the rest stops used by project drivers to address the risks of HIV and STDs and the preventative measures they can take.

An awareness campaign targeting schools in PACs will address risks of relationships with transient workers, transactional and commercial sex.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and duration of impact from long-term to medium-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The following additional mitigation measures are recommended for these PACs:

Abstraction of Groundwater

Impact: Reduced availability of groundwater

The following mitigations will be included in the natural resource management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to manage groundwater availability.

As part of the project's permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered. During project water abstraction procedure will describe requirements for monitoring community water sources including surface water and groundwater.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from short-term to transient. The residual impact is not significant.

Employment

Impact: The transmission of communicable diseases between the project's externally contracted workforce and PACs

Impact: Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities

Impact: Outbreaks of infectious conditions within MCPYs affecting the health of PACs

The following mitigations will be included in the community health, safety and security plan, occupational health, safety and security plan, natural resources management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to contribute to the management of these impacts.

As part of the CHSSP, community-based programmes will be developed and implemented in cooperation with government health management teams which consider the implementation of a community malaria control programme, a community HIV/TB programme, a community water, sanitation and hygiene (WASH) programme and a communicable disease plan will be developed to manage infectious disease outbreaks in MCPYs and prevention of spread to PACs.

As part of the OHSSP, a malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps.

Pre-deployment screenings will be described in the labour management plan and communicated during the recruitment process and vaccinations will be identified and administered for the prevention of communicable diseases being transmitted between the national/international and local workforce. In addition, measures will be implemented to reduce the risk of water- and food-borne disease outbreaks in camps and the associated risk of transmission to local communities.

MCPYs will be designated as having "closed" status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures and a workers' code of conduct outlining expected worker behaviours will be developed and implemented.

For the impact of the transmission of communicable diseases between the project's externally contracted workforce and PACs, application of these mitigation measures

will reduce the magnitude of impact from very large to medium and the duration of impact from long-term to short-term. The residual impact is not significant.

For the impact of inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities, application of these mitigation measures will reduce the magnitude of impact from large to small wit and the residual impact is not significant.

For the impact outbreaks of infectious conditions within MCPYs affecting the health of PACs, application of these mitigation measures will reduce the magnitude of impact from very large to medium and the residual impact is not significant.

PIIM

Impact: PIIM of jobseekers into PACs carrying communicable diseases,

The following mitigation will be included in the PIIM management plan, community health, safety and security plan and the stakeholder engagement plan to manage effects of PIIM on communicable diseases.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration of impact from very long-term to long-term. The residual impact is not significant.

Impact: PIIM of job seekers causing environmental changes in PACs that promote vector breeding

Impact: PIIM of job seekers causing increased pressure on existing health services at the PAC level

Impact: PIIM of job seekers causing uncontrolled disposal of waste in PACs

Impact: Reduction in the availability of potable water in PACs due to PIIM

The following mitigations will be included in the PIIM management plan, community health, safety and security plan, occupational health, safety and security plan, resettlement action plan, natural resource management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to contribute to the management of these impacts.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

In addition, a cooperation agreement with the district health management teams (DHMTs) will be reached to evaluate potential health impacts, proposed mitigation measures and monitoring of specific key health indicators during construction.

For the impact of PIIM of job seekers causing environmental changes in PACs that promote vector breeding, application of these mitigation measures will reduce the magnitude of impact from large to medium and the residual impact is not significant.

For the impact of PIIM of job seekers causing increased pressure on existing health services at a PAC level, application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

For the impact of PIIM of job seekers causing uncontrolled disposal of waste in PACs, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

For the impact of reduction in the availability of potable water in PACs due to PIIM, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

Provision of Goods and Services

Impact: Nutrition of PACs compromised by reduced food security

The community health, safety and security plan, occupational health, safety and security plan, resettlement action plan, natural resource management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to contribute to the management of this impact.

An agreement with the DHMTs will be reached to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact is not significant.

8.18.3.3 Operation

Generic Mitigation Measures

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

The community health, safety and security plan, occupational health, safety and security plan, the infrastructure and utilities management plan and the stakeholder engagement plan will include measures that will contribute to the control of this impact.

A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with PAC members.

A community health, safety and security plan will be developed to manage infectious disease outbreaks in MCPYs and prevention of spread to PACs and a HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to raise awareness about the risks of HIV and STDs and preventative measures that they can take.

An awareness campaign targeting schools within the project AOI will be developed, addressing risks particularly to girls of relationships with transient workers, and transactional sex.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration from long-term to medium-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The following generic mitigation measures, described for construction, are also applicable to the eight PACs near the two pumping stations during operation:

Disposal of Solid and Liquid Waste

Impact: Increased pressure on regional waste management facilities due to project activities

The waste management plan will identify suitable offsite disposal sites for waste soil and rock and implement appropriate management measures. Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

8.18.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on community health after mitigation measures have been implemented.

Table 8.18-1 summarises the potential generic community health impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.18-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on community health are considered not significant.

8.18.4.1 Ecosystem Services

Section A11.4.11 in Appendix A11 identifies ecosystem services associated with community health. The following ecosystem services have been assessed in Sections 8.18.2 and 8.18.3:

Water-related diseases are linked to safe water, which provides the following ecosystem services:

Provisioning services:

- general health
- form of livelihood (see Section 8.14 on river and lake-based livelihoods).

Social cultural health practices are linked to the use of wild plants, which provides the following ecosystem service:

Provisioning services:

- ingredients for treatment of common illnesses (traditional medicine).

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.18-1 Community Health – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Resettlement	Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases	C	Y	Resettlement Action Plan	4	2	1	5	12
Resettlement	Resettled households' decreased food security	C	Y	Resettlement Action Plan	4	2	1	4	11
Community Health	Project activities leading to an increase in vector-related diseases	C	-	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Stakeholder Engagement Plan	6	2	3	4	15
Noise	Excessive noise exposure due to project activities	C	-	Community Health, Safety and Security Plan Pollution Prevention Plan Stakeholder Engagement Plan	2	2	2	4	10
Disposal of Solid and Liquid Waste	Increased pressure on regional waste management facilities due to project activities	C	-	Waste Management Plan	4	2	2	5	13
Use of Road Network	An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases	C & O	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	4	2	5	17

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Abstraction of Groundwater	Reduced availability of groundwater	C	Y	Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	1	2	4	11
PACs near the four MCPYs	Employment	The transmission of communicable diseases between the project's externally contracted workforce and PACs	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	6	2	2	5	15
PACs near the four MCPYs	Employment	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities	C	-	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Employment	Outbreaks of infectious conditions within MCPYs affecting the health of PACs	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	6	4	1	4	15
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: carrying communicable diseases	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Stakeholder Engagement Plan	6	4	3	5	18

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: causing environmental changes in PACs that promote vector breeding	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	6	3	2	4	15
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: causing increased pressure on existing health services at the PAC level	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: causing uncontrolled disposal of waste in PACs	C	-	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13
PACs near the four MCPYs	PIIM	Reduction in the availability of potable water in PACs due to PIIM	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Provision of Goods and Services	Nutrition of PACs compromised by reduced food security	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13
PACs near PS1 and PS2	Disposal of Solid and Liquid Waste	Increased pressure on regional waste management facilities due to project activities	O	-	Waste Management Plan	4	4	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.18.5 Transboundary Project Impacts

8.18.5.1 Generic Transboundary Project Impacts

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

It is anticipated that project long-range movements will be extensive during construction with transport of materials, equipment and personnel across the Tanzania–Uganda border. There is the potential for transfer of communicable disease between countries.

The potential for an increase in the BOD along the project's transport corridors will be managed through the mitigation measures described in Section 8.18.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.18.5.2 Location-Specific Transboundary Project Impacts

No location-specific transboundary project impacts have been identified in relation to community health.

8.18.6 Cumulative Impacts

8.18.6.1 Context

Section 6.4.3.13 describes the baseline condition of community health, the trends and sensitivity to change. Table 8.18-1 and Table 8.18-2 summarise project residual impacts.

There are several community health challenges in Uganda. These include inadequate cover by health facilities, a high burden of communicable, vector-related and infectious diseases, increasing burden of non-communicable diseases, inadequate waste, water and sanitation facilities and a shortage of medical supplies and equipment.

Section 8.18.2 describes the project impacts. The residual project impacts that may contribute to cumulative impacts include:

- an increase in the burden of disease along the project's transport corridors caused by drivers spreading infectious, communicable and zoonotic diseases
- decreased food security
- outbreaks of infectious diseases in the construction camp
- PIIM of job seekers who may
  - transmit communicable diseases
  - create local environments conducive to vector breeding
  - increase pressure on existing health services and waste management facilities.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
  - Tilenga Project (AF01)
  - Kingfisher Oil Project (AF02)
- third-party developments:
  - transmission line from the Tilenga Central Processing Facility (CPF) to Kabaale (UG0A)
  - Kabaale International Airport (UG04)
  - transmission lines to Kabaale Airport (UG05)
  - refinery (UG07)
  - Hoima-Buloba pipeline (UG08)
  - Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
  - Buhimba to Kakumiro road upgrade (UG20)
  - construction camp for Bulima–Kabwoya road (UG21)
  - Bulima–Kabwoya road upgrade (UG22)
  - transmission line extension (UG34)
  - ICT infrastructure installation (UG44).

The preferred condition is no outbreak or increase in disease and no overburdening of the healthcare system by the EACOP project in combination with the associated facilities and third-party developments.

8.18.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are predicted based on if the EACOP, Tilenga and Kingfisher projects have parallel or consecutive construction phase timelines.

Infectious and Communicable Diseases

While the workforce for the EACOP, Tilenga and Kingfisher projects are to be housed in closed camps, outbreaks and spread of infectious and communicable diseases (including HIV and AIDS) could occur because of the EACOP, Tilenga and Kingfisher project labour forces engaging with PAC members and each other's labour forces. There is an increased cumulative risk of outbreaks and spread of diseases in the situations described below.

Transport Routes

The use of transport routes by both the EACOP project and the Tilenga Project and Kingfisher Oil Project may increase the potential spread of communicable diseases, particularly sexually transmitted diseases (STDs) at rest stops.

This cumulative impact may apply to Buseruka subcounty where roads are jointly used by the EACOP project and the Tilenga and Kingfisher projects, in particular to the following PACs near roads used by the projects: Kayere (KP0), Katooke (KP1.5) and Nyamosoga (KP0).

Information from the Tilenga Project and Kingfisher Oil Project indicates that mitigation measures similar to those described in Section 8.18.3 will be implemented. In addition, the project will liaise with the proponents of the associated facilities and relevant government bodies to consider options for management measures to address the cumulative impacts. This may include sharing information about worker and community health management strategies, to enable an efficient and coordinated HIV prevention plan.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

PIIM

The effects of PIIM associated with the EACOP project such as increased rates of diseases overburdening local health facilities, water shortages, uncontrolled disposal of waste leading to environmental and health hazards and vector breeding increasing the transmission of malaria, may be exacerbated by the concurrent construction of the Tilenga Project and Kingfisher Oil Project feeder pipelines.

Cumulative impacts between EACOP and the associated facilities are most likely to occur in Buseruka subcounty and Hoima municipality at the following PACs: Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

The project will liaise with the Tilenga Project and Kingfisher Oil Project to support the management of potential cumulative impacts relating to PIIM and engage with relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and appropriate mitigation measures and interventions.

The project will also participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants.

With the management measures implemented, the preferred condition will be achieved, and the residual cumulative impact is considered not significant.

Decreased Food Security

Cumulative impacts of land acquisition for EACOP and the Tilenga Project and Kingfisher Oil Project feeder pipeline components may leave insufficient land available for farming, grazing and collection of natural resources, potentially affecting households' food security. This may apply to the following PACs: Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

Information from the Tilenga Project and Kingfisher Oil Project indicates that mitigation measures similar those described in Section 8.18.3 will be implemented. In addition, the project will engage proponents of the associated facilities and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration on livelihood restoration programmes.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts are predicted where the EACOP project and third-party developments have concurrent or consecutive construction phase timelines. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that the construction activities will be conducted in similar timeframes.

The third-party developments, EACOP AGIs and MCPYs and the subcounties that may be impacted are shown in Table 8.18-3.

Table 8.18-3 Cumulative Impacts: Community Health

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 runs parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Buseruka, Kiziranfumbi and Buhimba and Buhanika subcounties, and Busisi, Kahoora and Mparo divisions, Hoima district Nsambya, Butemba, Wattuba and Mulagi subcounties, and Butemba TC, Kyankwanzi district Kapeke, Lwamata and Bukomero subcounties, and Kigoba, and Bukomero TC, Kigoba district Kikandwa and Ssekanyonyi subcounties, Mityana district Namayumba, Kakiri and Wakiso subcounties and Kakiri, and Namayumba TC, Wakiso district Muduuma and Kirigente subcounties, Mpigi district

Table 8.18-3 Cumulative Impacts: Community Health

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19 188–189	PS1, approximately 3.2 km from UG 19	Kyangwali Kabwoya and Kyangwali subcounties, Hoima district
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Buhimba subcounty, Hoima district Kisiita and Nalweyo subcounty, and Kakumiro TC, Kakumiro district
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district
UG 22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kahoora and Busisi divisions, and Buhimba, Kiziranfumbi and Kabwoya subcounties, Hoima district
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga and bagezza subcounties, Mubende district
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto, Kasasa, Kasaali, Kalisizo, and Kirumba subcounties, and Kalisizo and Kyotera TC, Kyotera district Kabonera, Kimaanya/Kyabakuza, Katwe/Butego, Nyendo/Ssenyange and Mukungwe subcounties, Masaka district Kkingo, Kisekka and Lwengo subcounties and Lwengo TC, Lwengo district Bukulula subcounty and Lukaya TC, Kalungu district Nkozi, Buwama, Kammengo and Kirigente subcounties, and Mpigi TC, Mpigi district Nsangi subcounty, Wakiso district Lubaga division, Kampala district

The potential cumulative impact of the third-party developments are similar to those of the associated facilities and are summarised below:

Infectious and Communicable Diseases

As described above under associated facilities there is a heightened cumulative risk of outbreaks and spread of diseases from the concurrent or consecutive construction of the EACOP project and the third-party developments in Table 8.18-3. This may occur in the situations described below.

Transport Routes

The use of transport routes by both the EACOP project and the third party developments may increase the potential spread of communicable diseases. This cumulative impact may apply to all the subcounties included in the table above.

The project will liaise with the proponents of third party developments and relevant government bodies to consider options for management measures to address the cumulative impacts. This may include sharing information about their worker and community health management strategies, to enable an efficient and coordinated HIV prevention plan.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Construction Camps

The EACOP project and third-party developments may increase the risk of outbreaks of contagious diseases if their construction schedules coincide and they have construction camps in each other's AOI. The fact that EACOP has a closed camp will reduce this risk. However, due to lack of available data on the existence and location of construction camps for the third-party developments at the time of writing no detailed analysis could be conducted of this potential cumulative impact. Because of the proximity to the EACOP and third-party construction camps (using available information at the time of writing) cumulative impacts are most likely to occur in:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) PACs caused by the EACOP project and the refinery, Kabaale international airport and the transmission lines to Kabaale airport
- Kabaale-Kyabicwe (KP35), Kisenyi (KP40), Kakende (KP29.5) and Katikara (KP41) caused by the EACOP project and the Hoima-Buloba pipeline and the Buhimba to Kakumiro road upgrade.

The project will engage proponents of the third-party developments to consider options for management measures to address the cumulative impacts. This may include sharing information about their worker and community health management strategies, to enable an efficient and coordinated response to any potential disease outbreak.

With the above mitigation measure, the preferred condition will be achieved and the residual cumulative impact is considered not significant

PIIM

Cumulative impacts similar to those identified for the associated facilities may occur because of EACOP and the third-party developments. However due to lack of available data on the existence and location of construction camps of third party developments at the time of writing detailed analysis could not be conducted. Using available information cumulative impacts are most likely to occur in the same PACs as those listed above.

The project will liaise with the third-party developments to support the management of potential cumulative impacts relating to speculation, the project will engage with

relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and identify appropriate mitigation measures and interventions.

The project will also participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants.

With the additional mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Decreased Food Security

Cumulative impacts from EACOP and the third-party developments are similar to those of the associated facilities. PACs potentially impacted by the EACOP project and third parties include:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the transmission line from the Tilenga CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade
- Katikara (KP41) and Kisenyi (KP40) caused by the EACOP project and the Buhimba to Kakumiro road upgrade.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration on livelihood restoration programmes.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.18.6.3 Transboundary Cumulative Impacts

Transboundary cumulative impacts may occur as a result of construction activities for the EACOP project and the Tilenga project. Traffic bringing coated pipe and other imported construction materials for the EACOP project and the Tilenga project is likely to travel along the same routes through Tanzania and Uganda. There is no information from the Kingfisher project regarding transboundary transport routes.

The communities along the transport routes used by both EACOP and the Tilenga project could be vulnerable to the spread of communicable diseases. If the same rest stops are used these areas could experience increased risk of STDs.

In the unlikely event of an outbreak, the project will share information with the associated facilities about their worker and community health management strategies to ensure that they are commensurate and enable an efficient and coordinated response to any potential disease outbreak.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.19 Community Safety, Security and Welfare

This section describes potential impacts on community safety, security and welfare during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

There is potential for traffic to impact on community safety, security and welfare due to project-related road traffic accidents involving PAC members. Road traffic accidents are considered in Section 9, Unplanned Events.

8.19.1 Key Sensitivities and Considerations

The community safety, security and welfare baseline conditions are described in Section 6.4.3.14, as well as:

- community health, safety and security key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the community safety, security and welfare impact assessment.

Sensitivity in the community safety, security and welfare AOI is ranked as very high for women; cultural attitudes toward women and their role within the household hinders many females in PACs from engaging in income-generating activities and decision-making processes. Widow headed households, the elderly and the disabled are ranked as very highly sensitive because they are challenged to meet basic household needs and afford health care. Children are ranked as very highly sensitive, particularly those from poor households, AIDS orphans and boys from pastoralist and plantation agriculture communities, who will be less likely to attend school and are more likely to be relied upon to perform household tasks. Youths are also ranked as very highly sensitive due to their limited access to productive assets, lack of education and vocational skills and scarce employment opportunities. People living with illnesses are ranked as very highly sensitive as they are reliant on other people for financial and food security. Land users without land titles are also deemed very highly sensitive because, without formal acknowledgement of land ownership, they will not be eligible for compensation (only for crops grown).

Key considerations are:

- there are effective established mechanisms for conflict resolution and support groups at village level; however, lack of land and migrations, emerging use of technology and intermarriage are reducing their effectiveness
- although PACs are generally peaceful, conflicts arise because of changing demographics and decentralisation, underlining the requirement for effective stakeholder engagement
- there are vulnerable groups which will need special considerations.

Section A11.4.12 in Appendix A11 identifies that community safety, security and welfare does not provide ecosystem services.

The right to life and the right to health are the main human rights at risk. Women's rights also apply as they are particularly vulnerable to health risks related to interactions with truck drivers along trucking routes. International standards for responsible business also require that negative impacts of projects on communities

should be avoided or at least minimised, and for organisations to be prepared to react to emergency situations to prevent and mitigate harm to people and the environment. The UN has proclaimed 2011–2020 the International Decade of Road Safety and has developed documents to address the matter. Traffic safety is described in Section 9, Unplanned Events.

Regarding community security, the right to life can be at risk as well as the related rights to liberty and security of the person and the right to be free from cruel, inhuman or degrading treatment. Women's rights also apply as they are particularly vulnerable to certain security risks related to EACOP. The Voluntary Principles on Security and Human Rights (VPSHR) are the main reference in terms of security and human rights. International standards for responsible business also require that negative impacts of projects on communities should be avoided or at least minimised, and that security personnel hired must be chosen and trained to ensure that they are not a threat to persons inside or outside the project.

Regarding community welfare, the right to health, the rights to liberty and security of the person, the right to an adequate standard of living and the right to a healthy environment are all potentially affected by PIIM into communities in the AOI (see Section 4).

8.19.2 Potential Project Impacts

8.19.2.1 Construction

Generic Impacts

Community Safety

Baseline data indicates that PACs are generally not safety conscious. Children often roam freely around the village without adult supervision and may approach the construction sites. Risks to people from project traffic are addressed in Section 9.

Impact: Community health and safety incidents associated with construction activities causing accidents other than traffic accidents

This may lead to direct and indirect impacts.

The project activities that may pose a risk of accidents and injuries during construction include:

- inadequate access control of project sites. This may result in the community gaining entry to construction and other sites and sustaining injuries from accidental interaction with mobile construction equipment or through injuries sustained from falling into excavations, or interaction with construction materials and other environmental changes
- spills and accidental discharges of hazardous chemical substances (HCS).

The project will utilise different types of HCS in the construction phase to support elements of the project, including:

- insecticides, pesticides and rodenticides to control insect and other vermin such as rats

- chlorine and associated water treatment chemicals used in the treatment of potable water as well as waste water
- materials for construction and maintenance, including paints and solvents as well as flux and welding rods
- domestic cleaning agents
- petroleum products to support heavy vehicles and light duty vehicles, including diesel fuel, mineral oils, grease, degreasers and so forth
- potentially contaminated surface water including storm water, fire water and wash-down water originating from dirty areas.

Accidental discharge of any of the abovementioned HCS during the construction phase may affect PACs in proximity to the spill, through various impact pathways, and deteriorate health in PACs.

The impacts will be short-term and will affect some households within the PACs. It is anticipated that children will be most vulnerable. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Community Dynamics

PACs are usually peaceful but conflicts, mostly over land and natural resources, occasionally arise.

Households are tightly knit and interdependent with regards to livelihood activities. However, domestic disputes do occur and GBV is common.

Conflicts are predominantly resolved by the parties involved or community leaders; when these mechanisms fail, third parties (i.e., the police, local government officers) may get involved. The establishment of formal policing and security measures in the PACs is minimal.

Women are typically marginalised with regards to education, employment opportunities, access to and ownership of assets (both land and property) and decision-making. Widows and female headed households are considered particularly vulnerable and, as a result, women are deemed very highly sensitive to several of the impacts described under this VEC.

Impact: The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs

This may lead to direct and indirect impacts.

Men in the PACs may benefit from employment or compensation payments for loss of assets by the project. Existing cultural and social norms in the project districts favour the available project-related employment opportunities to be allocated to men.

Among PAPs, the main preference for compensation among men tends to be cash payments rather than in-kind compensation. The increased disposable income of men from compensation may not necessarily be used for the benefit of the household. Increased access to cash by men in the PACs may negatively impact on the quality of life of women and children in the household. It may lead to:

- increase in the incidence of social ills such as substance abuse, crime and a rise in GBV with regards to spouse and children

- loss of food security, especially for those households that do not, or no longer, engage in subsistence agriculture and depend on procuring food due to the income being spent on non-food items.

The impacts may be long-term and will affect some households within the PACs. Poor households where women do not have access to income-earning opportunities are likely to be most affected. Due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Conflict between PACs and project security personnel

This may lead to direct and indirect impacts.

During pipeline construction, security measures will be implemented along the pipeline RoW. Security posts and facilities will be established at pumping stations, along the RoW and at MCPYs.

Dissatisfaction in PACs over lack of project opportunities and benefits may lead to resentment among PAC members and may cause hostility toward project personnel. This could lead to conflict, demonstrations against the project or blockages. Any potential further escalation of conflict may require intervention by the national police force. The use of inexperienced security personnel or local security forces, who have not been adequately trained in the VPSHR, may lead to an escalation of conflict and the inappropriate use of force causing injuries to community members.

Members of PACs involved in ASM are considered sensitive VECs as it may be more difficult to keep them away from known mineral deposits (particularly gold). This may increase the interactions between miners and project security personnel.

The impacts will be long-term and will affect entire PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Benefits

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

Community Welfare

Benefit: Conversion of MCPY structures into community facilities, leading to improved service provision in PACs

After construction has been completed, the MCPYs, or some of the camp structures, may be transferred to the Government (see Section 2). The Government may convert the structures into community facilities (e.g., schools, medical facilities) and manage them on behalf of the host communities. In this case, there may be a positive impact on public service provision in PACs. This may lead to improvements at the household level with regards to living standards, health and education.

There may be a positive impact on the human right to health, education and an adequate standard of living.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are applicable to the 20 PACs near the four MCPYs. The following specific impacts are also applicable to these PACs:

Community Dynamics

Impact: Change in local community dynamics due to employment opportunities

This may lead to direct and indirect impacts.

The availability of economic opportunities for some PAC members could create income disparities and prompt a shift in local power dynamics and community structure. Employed youth may begin to challenge established local hierarchies and leadership structures, potentially resulting in a decline in community social cohesion. This may cause deterioration in well-being at the community level and a sense of insecurity and distrust among PAC members.

The employment of women may challenge household and community power structures. Marital clashes may occur where spousal support for women's employment in the project is absent.

The impacts will be medium-term and will affect the entire PACs. Due to their small extent, before mitigation the impacts are considered not significant.

Impact: PIIM causing an increase in social ills

This may lead to indirect impacts.

PIIM is likely to occur in areas and PACs where the potential for employment is perceived to be higher and other indirect benefits of the project may be anticipated. The PIIM of job seekers may result in a loss of social cohesion and traditional values and structures in these PACs which, in turn, may cause an increase in social ills (e.g., substance abuse, crime, commercial sex work, unplanned pregnancies and so forth).

Substance abuse is a significant contributor to social ills and gender-based domestic violence, as well as influencing crime and practices such as transactional sex and commercial sex work.

The impacts will be short-term and will affect the entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Tensions between non-local construction workforce and PACs

This may lead to direct and indirect impacts.

A proportion of project workers will be non-local and will belong to different ethnic groups and nationalities that have different cultural traditions and values from the PACs. These workers will be housed in the MCPYs near PACs and their lack of

local social ties may encourage anti-social behaviour, causing tension and potentially conflict with PAC members.

The impacts will be short-term and will affect the entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The potential generic impacts are also applicable to the border town of Mutukula. The following impact, described for the MCPYs, is also applicable to this PAC:

Community Dynamics

Impact: PIIM causing an increase in social ills

This may lead to indirect impacts.

Mutukula has a thriving commercial sex work industry with a relatively large number of sex workers. An increase in substance abuse in Mutukula during pipeline construction may lead to a growth in the town's commercial sex work industry, increasing the risk of Mutukula's sex workers to matters such as GBV.

The impacts will be short-term and will affect the entire PAC. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.19.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation. Security provision during operations will be in accordance with international and project requirements.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.19.3 Mitigation Measures

This section describes the enhancement measures and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect community safety, security and welfare.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.19.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to community safety, security and welfare such as minimising impacts on settlements, social and community infrastructure (including places of worship) and security. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routeing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.19.3.2 Construction

Generic Mitigation Measures

Mitigation measures relating to road safety, including for pedestrians, are discussed in Section 9.

Community Safety

Impact: Community health and safety incidents associated with construction activities causing accidents other than traffic accidents

The community health, safety and security plan, occupational health, safety and security plan and the stakeholder engagement plan will include measures to manage incidents. Regular meetings will be held with PAC representatives during construction to provide updates on construction progress and to receive comments or queries. In addition, specific measures will be implemented including, but not limited to:

- Construction barriers will have visible warning signs understandable by local communities. Signage will be in accordance with internationally accepted symbols and/or be well known to local communities.
- Welded pipe sections will be capped to prevent people entering a risk assessment will be conducted for excavations with consideration to community safety
- A first aid needs assessment will be undertaken for each camp to determine first aider and first aid kit requirements (e.g., qualifications, content of kits, locations).

Application of these mitigation measures will reduce the magnitude of impact from very large to small and the residual impact is not significant.

Community Dynamics

Impact: The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs

The community health, safety and security plan, stakeholder engagement plan, labour management plan and the resettlement action plan will include measures that contribute to management of project benefits.

Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods and prepare for the termination of their employment.

An information, education and communication programme will be developed for workers addressing social conduct and including topics such as gender-based violence and drug and alcohol misuse.

In relation to resettlement, during the land surveys, entitlement briefings and compensation agreement, both spouses will be consulted and present and both will sign the compensation agreements.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

Impact: Conflict between PACs and project security personnel

The community health, safety and security plan and stakeholder engagement plan will include measures to manage conflicts with security personnel.

The Voluntary Principles on Security and Human Rights (VPSHR) will be implemented by the project. Security personnel (this will include where army and/or security forces engaged by the project) will receive training and their performance in relation to VPSHR compliance will be monitored.

Public awareness programmes for stakeholders will include information on the security presence around camps and security protocols which apply. The project grievance procedure will be available for grievances related to security considerations.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration from long-term to short-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional specific mitigation measures are recommended for these PACs:

Community Dynamics

Impact: Change in local community dynamics due to employment opportunities

and

Impact: PIIM causing an increase in social ills

The following mitigations will be included in the PIIM management plan, community health, safety and security plan and the stakeholder engagement plan to contribute

to the management of local community dynamics and PIIM causing an increase in social ills.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

The grievance procedure will be communicated to and promoted within all PACs and it will be clearly communicated to PACs that complaints related to PIIM will be addressed.

For the impact changes in local community dynamics due to employment opportunities, application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

For the impact of PIIM causing an increase in social ills, application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Impact: Tensions between non-local construction workforce and PACs

The community health, safety and security plan, stakeholder engagement plan and the resettlement action plan will include measures that contribute to management of community – workforce tensions.

A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with PAC members not employed by the project. Compliance with the workers' code of conduct will be a contractual requirement for all contractors, including subcontractor employees.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact is not significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The generic mitigation measures are also applicable to the border town of Mutukula. The additional specific mitigation measures, described for the MCPYs, are recommended for this PAC:

Community Dynamics

Impact: PIIM causing an increase in social ills.

The following mitigations will be included in the PIIM management plan, community health, safety and security plan and the stakeholder engagement plan to contribute to the management of PIIM causing an increase in social ills.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

The grievance procedure will be communicated to and promoted within the PAC and it will be clearly communicated to the PAC that complaints related to PIIM will be addressed.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.19.3.3 Operation

Generic Mitigation Measures

As there are no predicted generic impacts during pipeline and AGI operation, no mitigation measures are required.

With Respect to Human Rights

The labour management plan, occupational health, safety and security plan and the community health, safety and security plan will ensure that project performance regarding the Voluntary Principles on Security and Human Rights will be reviewed and performance improvement addressed where necessary.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.19.4 Residual Impacts and Significance Summary

This section describes the residual impacts on community safety, security and welfare after mitigation measures have been implemented.

Table 8.19-1 summarises the potential generic community safety, security and welfare impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.19-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on community safety, security and welfare are considered not significant.

8.19.4.1 Ecosystem Services

Section A11.4.12 in Appendix A11 identifies that community safety, security and welfare does not provide ecosystem services.

Table 8.19-1 Community Safety, Security and Welfare – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Community Safety	Community health and safety incidents associated with construction activities other than traffic accidents	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Stakeholder Engagement Plan	4	2	1	5	12
Community Dynamics	The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs	C	Y	Community Health, Safety and Security Plan Stakeholder Engagement Plan Labour Management Plan Resettlement Action Plan	4	2	1	5	12
Community Dynamics	Conflict between PACs and project security personnel	C	-	Community health, safety and security plan Stakeholder engagement plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.19-2 Community Safety, Security and Welfare – Location-Specific Impacts

Location	Activity	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Community Welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs	C	Y		B				
PACs near the four MCPYs	Community Dynamics	Change in local community dynamics due to employment opportunities	C	Y	Project induced in-migration management plan Community health, safety and security plan Stakeholder engagement plan	4	2	2	4	12
PACs near the four MCPYs	Community Dynamics	PIIM causing an increase in social ills	C	Y	Project induced in-migration management plan Community health, safety and security plan Stakeholder engagement plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.19-2 Community Safety, Security and Welfare – Location-Specific Impacts

Location	Activity	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Community Dynamics	Tensions between non-local construction workforce and PACs	C	Y	Community health, safety and security plan Stakeholder engagement plan Resettlement action plan	4	2	2	5	13
Mutukula town (KP295.5)	Community Dynamics	PIIM causing an increase in social ills	C	Y	Project induced in-migration management plan Community health, safety and security plan Stakeholder engagement plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.19.5 Transboundary Project Impacts

8.19.5.1 Generic Transboundary Project Impacts

No generic transboundary project impacts have been identified in relation to community safety, security and welfare.

8.19.5.2 Location-Specific Transboundary Project Impacts

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The following location-specific transboundary project impact has been identified in Mutukula town (Uganda and Tanzania) during construction:

Community Dynamics

Impact: PIIM causing an increase in social ills

Mutukula's commercial sex work industry is comprised of nationals from both Uganda and neighbouring countries, particularly Tanzania. An increase in substance abuse and resulting growth in the town's commercial sex work industry may increase the number of foreign sex workers, and associated exposure to risks such as GBV.

In addition, criminal activities in Mutukula are known to be transboundary, with livestock theft across the border being a common problem. PIIM of newcomers into Mutukula may exacerbate transboundary criminal activities, particularly given the lack of security measures along the international border.

The potential for an increase in social ills across national borders will be managed through the mitigation measures described in Section 8.19.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.19.6 Cumulative Impacts

8.19.6.1 Context

Section 6.4.3.14 describes the baseline condition of community safety, security and welfare, the trends and sensitivity to change. Table 8.19-1 and Table 8.19-2 summarise project residual impacts.

While PACs are generally peaceful, conflicts occasionally arise, mainly over land and natural resources. Sensitivity is ranked very high for several groups in the PACs including women, the elderly and children, who are considered vulnerable in numerous ways.

Crime in Uganda, including in the sample PACs, is on the rise, however community policing has been established to help curb the increase. Gender based violence (GBV) also constitutes a significant and growing problem.

Section 8.19.2 describes the project impacts on community safety, security and welfare. The project impacts that may contribute to cumulative impacts include:

- potential increase in social ills (e.g., crime, drug use, alcoholism, commercial sex work, GBV and unplanned pregnancies) due to PIIM

- change in community dynamics due to employment opportunities.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
  - Tilenga Project (AF01)
  - Kingfisher Oil Project (AF02)
- third-party developments:
  - transmission line from the Tilenga Central Processing Facility (CPF) to Kabaale (UG0A)
  - Kabaale International Airport (UG04)
  - transmission lines to Kabaale Airport (UG05)
  - refinery (UG07)
  - Hoima-Buloba pipeline (UG08)
  - Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
  - Buhimba to Kakumiro road upgrade (UG20)
  - construction camp for Bulima–Kabwoya road (UG21)
  - Bulima–Kabwoya road upgrade (UG22)
  - transmission line extension (UG34)
  - ICT infrastructure installation (UG44).

The preferred condition is no increase in social ills and gender-based violence, no change in social cohesion and community wellbeing following the completion of construction.

8.19.6.2 Cumulative Impacts

The potential cumulative impacts will mainly arise between the EACOP project, associated facilities and third parties with significant labour forces and similar construction timelines.

Associated Facilities

The EACOP project impacts in Hoima district may be exacerbated by the construction of the Tilenga and Kingfisher projects where the pipelines converge at PS1.

PIIM and Social Ills

The EACOP, Tilenga, and Kingfisher projects are likely to encourage PIIM. PIIM will be the greatest in Hoima district which is home the most centrally located large urban centre, Hoima municipality, in the AOI. Workforces and influx of opportunistic job seekers may lead to an increase in social ills, such as crime, alcoholism and GBV.

Cumulative impacts are most likely to occur in PACs in Buseruka subcounty such as Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

The project will engage proponents of the associated facilities and relevant government agencies to consider options for management measures to address the

cumulative impacts. This may include collaboration to combat potential increase of social ills.

The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Community Dynamics

The population growth and increased employment opportunities associated with the EACOP, Tilenga and Kingfisher projects may prompt a shift in the social cohesion and community dynamics of PACs. Employed youths may begin to challenge established local hierarchies and leadership structures, potentially leading to a decline in social cohesion and deterioration in well-being at PAC level.

Change may therefore be experienced in the same PACs as listed above for PIIM and social ills.

The project will engage proponents of the associated facilities and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include alignment in terms of stakeholder engagement approaches to manage community dynamics.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts are predicted where the EACOP project and third-party developments have concurrent or consecutive construction timelines. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that the construction phases will have similar timeframes. The third-party developments and the subcounties that may be impacted are shown in Table 8.19-3.

Table 8.19-3 Cumulative Impacts: Community Safety, Security and Welfare

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG0A	Transmission line from the Tilenga Project CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district

Table 8.19-3 Cumulative Impacts: Community Safety, Security and Welfare

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 is parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka and Kiziramfumbi subcounties, Hoima district
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19	PS1, approximately 3.2km from UG 19	For PS1: Buseruka subcounty, Hoima district
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita and Nalweyo subcounties, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district
UG 22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty, Mubende district
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district

Cumulative impacts associated with the EACOP and third-party developments are similar to those described for associated facilities are summarised below:

PIIM

Multiple projects nearby may encourage PIIM, that is larger than PIIM created by the EACOP project alone. Cumulative impacts are most likely to occur in the following PACs:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the refinery, the transmission line from Tilenga CPF to Kabaale, Kabaale international airport, the transmission lines to Kabaale airport and R4 Kabaale–Kiziranfumbi road upgrade. The airport and the refinery will have the most important contribution to this impact
- Kabaale-Kyabicwe, Kisenyi and Kakende caused by the EACOP project and the Hoima-Buloba pipeline. Due to lack of information it is not clear which project would have the most important contribution.
- Kabaale-Kyabicwe, Kisenyi, Katikara and Kakende caused by the EACOP project and the Buhimba to Kakumiro road upgrade. EACOP will have the most important contribution to this impact.
- Kalembe, Kyenda, Lugala, Mijunwa and Kagoma caused by the EACOP project and the transmission line extension. EACOP will have the most important contribution to this impact.
- Nabigasa, Kabugimbi, Bigada and Kabonera caused by the EACOP project and the ICT infrastructure installation. EACOP will have the most important contribution to this impact.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration to combat potential increase of social ills. The project will also participate in regional cumulative environmental management initiatives mentioned above.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Community Dynamics

As discussed above for the associated facilities, increased employment opportunities associated with multiple large-scale third party developments and the EACOP project can prompt a shift in community dynamics. Change may therefore be experienced in the same PACs as listed above for PIIM and social ills.

The project will engage proponents of the third party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include alignment in terms of stakeholder engagement approaches to manage community dynamics.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.19.6.3 Cumulative Transboundary Impacts

There are no transboundary cumulative impacts on community safety, security and welfare

8.20 Tangible and Intangible Cultural Heritage

This section describes the potential impacts on tangible and intangible cultural heritage during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.20.1 Key Sensitivities and Considerations

Cultural heritage baseline is described in Section 6.4.3.16 and includes:

- key VECs and their sensitivity, ranked according to Table D38, Appendix D
- key considerations for cultural heritage.

The baseline and impact assessment include three categories of cultural heritage:

- Category 1 – tangible cultural heritage (TCH):
  - archaeological sites
  - areas of high archaeological potential
- Category 2 – tangible cultural heritage with strong intangible elements:
  - cemeteries and graves
  - religious places where worship associated with the main established religions is practised (such as churches or mosques)
- Category 3 – intangible cultural heritage (ICH) with a less well-defined tangible component:
  - sites with an intangible component and/or traditional value; the importance of which is not always a factor of geography but of belief and ritual. Such sites may be used for music making, dancing, storytelling and other rituals. This category may also include rituals that are not linked to any particular site, but to a particular group of people.

The impact of the project on a Category 1 or Category 2 site may be more objectively measurable and thus allowing impact identification based on the methodology presented in Section 5. Sites and features identified as Category 1 were ranked as low or high sensitivity and Category 2 as moderate or high sensitivity in the baseline study. However, the significance of a Category 3 VEC is defined by the local community who visit, use or engage in an intangible practice that is not objectively measurable. It takes time to develop relationships of confidence and trust to establish the sensitivity associated with intangible cultural heritage, making it a challenge to acquire a sense of importance to the communities in the time available when a baseline survey is conducted. In general, due to their value to communities, these intangible features are considered to have high sensitivities.

Uganda's long and complex history is reflected in the identified TCH and ICH within the study area. The key considerations are as follows:

- The tangible and intangible cultural heritage identified is considered a representative sample. The sample represents the full range of features for categories 1, 2 and 3 likely to be encountered, though there is less certainty for Category 3.
- Religious structures are the most common Category 2 sites.

- No known nationally or internationally designated sites or critical cultural heritage have been identified.
- Three high sensitivity Category 2 features (cemeteries) are within the AOI of which two are within the RoW.
- The remaining Category 1 and 2 features within the AOI are moderate sensitivity.
- Category 3 is closely linked to individual and group identity and therefore sensitive to cultural change.
- Many more features for each category are likely to be identified in the AOI.
- Identification of further Category 3 features requires active participation of local key informants based on establishing a sufficient degree of trust.

Based on professional experience and opinion, and a precautionary principle that acknowledges that archaeological sites may be unique even if superficially similar to others, the definition adopted by the project is that tangible cultural heritage is a finite resource and loss is considered nonreplicable. This is at variance with the IFC definition but considered more conservative (see Section 6.4.3.16).

The Convention for the Protection of the World Cultural and Natural Heritage, 1972 and the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage refer to international human rights in respect of tangible and intangible cultural heritage and the importance of:

- the tangible and intangible cultural heritage as mainsprings of cultural identity and diversity
- maintaining access to and right to practice traditional cultural heritage and beliefs.

8.20.2 Potential Project Impacts

8.20.2.1 Introduction

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operational impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on cultural heritage, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.20.2.2 Construction

Generic Impacts

Disturbance or Loss of Cultural Heritage

Benefit: Increased knowledge of tangible and intangible cultural heritage; employment of people to survey and investigate cultural heritage affected by the project

The pre-construction cultural heritage surveys and investigation and management activities will provide additional information for Category 1 and 2 sites and a better understanding of Category 3 by both internal and external parties. Publication of the TCH results may bring positive benefits, increasing the understanding and awareness of Ugandan history and development both inside and outside Uganda.

A further benefit will be the employment of people to undertake tangible and intangible cultural heritage surveys and research.

Impact: Damage, disturbance or disruption of access of unknown Category 1 or 2 cultural heritage

Impact: Damage, disturbance or disruption of access of unknown Category 3 cultural heritage

There is the potential for damage or disturbance, including disruption of access, to previously unknown TCH and ICH discovered during pre-construction surveys or construction. TCH may include evidence of previous settlement and graves. ICH may include meeting places, sacred natural sites, rivers or ceremonial ways, traditional dance, rituals, traditional healing and syncretism[21].

The significance of the impact on TCH pre-mitigation will depend on the find and the extent of the damage or disturbance but could range from not significant to significant. A qualitative assessment of the significance of ICH has been undertaken, for the reasons described in Sections 8.20.1 and 5.5.2.5. In general, owing to the sensitivity of practices at the community level, pre-mitigation impacts should be considered significant.

Location-Specific Impacts

Location: Known Category 1 and Category 2 Tangible Cultural Heritage Locations

Impact: Damage, disturbance or disruption of access of known Category 1 and Category 2 tangible cultural heritage

The following activities have the potential to cause damage or disturbance of the various Category 1 or 2 cultural heritage features identified in Table 8.20-2:

- removal of vegetation from the project footprint
- ground disturbance including:
  - the removal of topsoil and subsoil

[21] Syncretism is the amalgamation of established religions (Islam and Christianity) and traditional African belief systems.

  - levelling of the RoW at construction facilities and AGIs
  - excavation of the pipe trench
  - excavation for foundations, utilities or drainage at construction facilities and AGIs
- operation of construction equipment
- traffic movement.

The potential impacts are direct damage or disturbance including:

- physical damage of sites, including from noise, vibration and dust due to plant, equipment and heavy vehicles
- noise and visual intrusion on people's appreciation of cultural heritage
- disruption of access to cultural heritage sites.

Impacts will be restricted to the footprint or the AOI, which extends to 100 m around the project footprint. It is unlikely that there will be discernible effects from noise, vibration or dust or restriction of access beyond this distance, but this will be checked as part of the proposed programme of cultural heritage construction planning survey and assessment, based on the impact assessment for noise and air emissions and additional engineering studies for noise and air emissions.

Impacts to Category 1 and 2 cultural heritage are generally negligible to small magnitude and limited in extent. The sensitivity varies from low to high, with high scores usually associated with Category 2 cultural heritage, owing to the social and religious sensitivity of some features. Impacts are not significant pre-mitigation (see Appendix E, Table E-3). Impacts on Category 1 and 2 features may also lead to impacts on community safety and security, through generation of conflict or dissent and community health. These are discussed in Section 8.19.

Location: Known Category 3 Intangible Cultural Heritage Locations

Impact: Damage, disturbance or disruption of access of known Category 3 intangible cultural heritage

Construction has the potential to alter or change traditional cultural practices and belief systems that are tied to identity, but are not represented by any specific tangible place, entity or community structure. This can refer to a connection with the landscape (e.g., sacred trees, as in Category 2) or traditional cultural practices including ritual practices such as dance and traditional healing techniques if associated with a site.

The following activities have the potential to cause damage or disturbance of the various Category 3 sites, features, traditional practices, rituals and beliefs identified in Table 8.20-2:

- removal of vegetation from the project footprint
- ground disturbance from installation of the pipeline, construction facilities and AGIs
- project-induced in-migration (PIIM) of construction workers from outside communities
- resettlement of dwellings

- failure to address all the belief systems within a community leading to alienation of some groups.

The potential impacts are direct and indirect damage or disturbance of traditional beliefs and practices covering:

- physical damage of cultural heritage sites or
- loss or change of identity or significance of the intangible cultural heritage
- effects of noise and visual intrusion on communities' abilities to appreciate and use their ICH
- disruption of access to cultural heritage assets leading to loss of ability to practise traditional beliefs, rituals, dance and healing
- disruption or diminution of cultural ecosystem services including, customary ways of understanding the wider world and for maintaining social relations and group identity.

Local communities did not always comment on the value that they place on intangible cultural heritage (although where there were comments, the value was always 'very high'), and this, in addition to any concerns they may have about relocating intangible or spiritual values, will vary. Therefore, a qualitative assessment of impacts on ICH is provided. The impacts to ICH will be transient to short-term but owing to the sensitivity of practices at the community level, pre-mitigation impacts should be considered significant.

Impacts of PIIM of job seekers on community cohesion, and traditional values and structures, are assessed in Section 8.19.

8.20.2.3 Operation

Generic Impacts

Disturbance or Loss of Cultural Heritage

Impact: Damage or disturbance of Category 1 and Category 2 tangible cultural heritage

During operations there may be a need to implement soil-erosion prevention measures. These activities carry a low risk of inadvertently exposing new sites or portions of previously known sites that were not previously affected and mitigated as activities may extend to areas outside the RoW.

Impacts will be restricted to areas close to the footprint, for example, eroded slope or bank of watercourse immediately adjacent to the RoW and are likely to range from not significant to significant pre-mitigation.

Impact: Damage or disturbance of Category 3 intangible cultural heritage

Effects on ICH may also occur. For example, there is low risk of impacts related to the use of the RoW for ICH activities, but none have been identified at the time of writing; or effects on intangible elements of erosion control works. Effects are likely to be not significant, pre-mitigation.

Location-Specific Impacts

No specific impacts have been identified.

8.20.3 Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect cultural heritage.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.20.3.1 Design Phase

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered cultural heritage aspects. The selected route including the portion of the Ugandan pipeline avoided known cultural heritage sites identified during route selection.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.20.3.2 Construction

Generic Enhancement Measures

Disturbance or Loss of Cultural Heritage

Benefit: Increased knowledge of tangible and intangible cultural heritage; employment of people to survey and investigate cultural heritage affected by the project.

The cultural heritage management plan will include measures that support the increase in knowledge of tangible and intangible cultural heritage. Such measures could include working in conjunction with the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Antiquities to ensure that findings are shared within the cultural heritage expert community and programmes are implemented to share findings with a wider audience.

Generic Mitigation Measures

Disturbance or Loss of Cultural Heritage

Impact: Damage, disturbance or disruption of access of unknown Category 1 or Category 2 tangible cultural heritage

Impact: Damage, disturbance or disruption of access of unknown Category 3 intangible cultural heritage

The cultural heritage management plan will include measures to manage impacts on unknown resources.

The cultural heritage management plan will be implemented in agreement with government authorities in advance of construction.

Regular meetings will be scheduled with government authorities and appropriate community leaders.

The key mitigation measures are the implementation of a pre-construction survey, including consultations with community leaders, to identify the location and extent of previously unknown cultural heritage resources. The results of the survey will be used to inform location-specific actions. This will be supported by the implementation of the chance finds procedure to address finds during construction. Appropriate management actions will be implemented for chance finds consistent with the cultural heritage management plan. Such actions may include preservation by photo-record, excavation by suitably qualified and approved archaeologists in accordance with government authorisations, relocation of graves and maintenance of access to cultural heritage assets.

Awareness training will be given to project personnel and collection of cultural heritage artefacts for their own use will be prohibited. Decompaction/ripping or other ground disturbance activities will be planned to avoid cultural heritage features preserved in situ.

Although the pre-mitigation impact on unknown Category 1 and 2 cultural heritage could be either significant or not significant depending on the site or asset, the residual impact should be not significant, with the reduction of significance depending on the method chosen. For example, the duration of impacts on graves or cemeteries could be reduced from permanent to transient due to relocation. At other sites, the magnitude of impact could be reduced if access is maintained. Sensitivity may increase or decrease depending on the information gained as the site or asset is assessed. If sensitivity increases this will lead to the investigation of further mitigation to reduce the magnitude of impacts. As mitigation measures will not be known until sites are identified, a range of significance scores has been included in Appendix E2 and Table 8.20-1.

Although pre-mitigation impacts on unknown Category 3 intangible cultural heritage should be considered significant the application of the proposed mitigation measures should reduce the residual impact to not significant by reaching agreement with local communities on ways to avoid or manage effects such that access or enjoyment of the ICH is not affected.

Location-Specific Mitigation Measures

Location: Known Category 1 and Category 2 Tangible Cultural Heritage Features

Impact: Damage, disturbance or disruption of access of known Category 1 and Category 2 tangible cultural heritage features

The cultural heritage management plan will manage damage or disturbance to cultural heritage resources.

A pre-construction survey will be undertaken to collect data on the location and extent of known cultural heritage to assist in the development of location-specific mitigation measures, including maintenance of access to cultural heritage assets.

Although the pre-mitigation impact is considered to be not significant, the application of the above measures should further reduce impacts, depending on the method chosen. The duration of impacts on graves or cemeteries will be reduced from permanent to transient due to relocation. At other sites, the magnitude of impact will be reduced if micro re-routing is undertaken or access maintained. Sensitivity may increase or decrease depending on the information gained during the pre-construction survey. If sensitivity increases this will lead to the investigation of further mitigation to reduce the magnitude of impacts. As mitigation measures will not be finalised until the preconstruction survey has been undertaken, the pre-mitigation and residual magnitude and sensitivity scores are the same in Appendix E3 and Table 8.20-2.

Location: Known Category 3 Intangible Cultural Heritage

Impact: Damage, disturbance or disruption of access of known Category 3 intangible cultural heritage or disruption of access

The cultural heritage management plan will include measures that contribute to the management of this impact.

A pre-construction survey, including consultations with community leaders, will be undertaken to collect data on the location and extent of intangible cultural heritage; data from the survey will inform the cultural heritage management plan that will describe measures to reduce impacts.

Intangible cultural heritage should be identified with sufficient time to allow mitigations to be agreed with the affected communities.

Although pre-mitigation impacts should be considered significant the application of the proposed mitigation measures should reduce the residual impact to not significant by reaching agreement with local communities on ways to avoid or manage effects such that access or enjoyment of the ICH is not affected.

8.20.3.3 Operation

Generic Mitigation Measures

Disturbance or Loss of Cultural Heritage

Impact: Damage or disturbance of Category 1 and Category 2 tangible cultural heritage

The cultural heritage management plan will include measures that contribute to the management of this impact.

The cultural heritage management plan will include description of all cultural heritage features identified before and during construction to inform cultural heritage management measures that may be required during project operation.

Although the pre-mitigation impact could be either significant or not significant depending on the site or asset, the residual impact should be not significant with the

reduction of significance depending on the method chosen. For example, the duration of impacts on graves or cemeteries could be reduced from permanent to transient due to relocation. At other sites, the magnitude of impact could be reduced if access is maintained. The sensitivity of any new sites or assets identified may increase or decrease depending on the information gained as the site or asset is assessed. If sensitivity increases this will lead to the investigation of further mitigation to reduce the magnitude of impacts. As mitigation measures will not be known until sites are identified, a range of significance scores has been included in the Appendix E2 and Table 8.20-1.

Impact: Damage or disturbance of Category 3 intangible cultural heritage

The cultural heritage management plan will include measures that contribute to the management of this impact.

The cultural heritage management plan will include details of all cultural heritage features identified before and during construction to inform cultural heritage management measures that may be required during project operation.

Although pre-mitigation impacts are likely to be not significant, the application of the above measures should further reduce any residual impacts by reaching agreement with local communities on ways to avoid or manage effects such that access or enjoyment of the ICH is not affected.

Location-Specific Mitigation Measures

No specific measures are currently required for project operations as no location-specific impacts have been identified for this phase.

8.20.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on cultural heritage after mitigation measures have been implemented.

Table 8.20-1 summarises the potential cultural heritage impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.20-2 summarises specific impacts.

8.20.4.1 Generic and Location-Specific Impacts

With the implementation of the planned mitigation measures, no significant residual generic or location-specific impacts to all tangible or intangible cultural heritage are predicted.

8.20.4.2 Ecosystem Services

Various features, both tangible and intangible, in the AOI provide cultural ecosystem services (CES), see Section 6.4.3.15. These CES are highly inter-related and cannot be easily separated. Their value lies in providing communities and individuals with a sense of self and their role in the world. This gives intangible features meaning that is no less important than finding food or undertaking other everyday occupations such as farming or craftwork.

The impacts from construction and operation, including the human right to practice traditional cultural heritage and beliefs, have been fully addressed and integrated in the mitigation measures (Section 8.20.3). By engaging the local communities in the process of identifying and mitigating impacts to specific practices or beliefs, impacts to the CES will be managed with local community awareness. It is anticipated that residual effects on CES will be not significant, including human rights.

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Table 8.20-1 Tangible and Intangible Cultural Heritage – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Disturbance or loss of cultural heritage	Increased knowledge of tangible and intangible cultural heritage. Employment of people to survey and investigate cultural heritage affected by the project.	C	Y	Cultural Heritage Management Plan	B				B
Disturbance or loss of cultural heritage	Damage, disturbance or disruption of access of unknown Category 1 and 2 tangible cultural heritage features, such as evidence of previous settlement and graves.	C	TBC	Cultural Heritage Management Plan	1–3	1–5	1–2	2–8	5–18
Disturbance or loss of cultural heritage	Damage, disturbance or disruption of access of unknown Category 3 intangible cultural heritage, such as meeting places, sacred natural sites, rivers or ceremonial ways, traditional dance, rituals, traditional healing and syncretism	C	TBC	Cultural Heritage Management Plan	–	–	–	–	–
Disturbance or loss of cultural heritage	Damage or disturbance of Category 1 and 2 tangible cultural heritage	O	Y	Cultural Heritage Management Plan	1–3	1–5	1–2	2–8	5–18

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.20-1 Tangible and Intangible Cultural Heritage – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Disturbance or loss of cultural heritage	Damage or disturbance of Category 3 intangible cultural heritage	O	Y	Cultural Heritage Management Plan	–	–	–	–	–

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.20-2 Tangible and Intangible Cultural Heritage – Location-Specific Impacts

Location (KP)	Aspect	VEC	Potential Impact	Phase	Location (Within Footprint (F) or AOI (AOI))[22]	High Stakeholder Concern	Mitigation Measures	Residual Impact				
								M	D	E	S	SS
11	Disturbance or loss of cultural heritage	CHU129: Pentecostal Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
26.4	Disturbance or loss of cultural heritage	CHU159: Fellowship Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
43.15	Disturbance or loss of cultural heritage	CUH441: Pentecostal Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
50.16	Disturbance or loss of cultural heritage	CUH445: Pentecostal Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
184.8	Disturbance or loss of cultural heritage	CHU413: Kraal Category 1 tangible cultural heritage	Damage or disturbance of feature	C	F	TBC	Cultural Heritage Management Plan	1	5	1	6	13

[22] Sites that are within the project footprint or the AOI are included in this table.

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.20-2 Tangible and Intangible Cultural Heritage – Location-Specific Impacts

Location (KP)	Aspect	VEC	Potential Impact	Phase	Location (Within Footprint (F) or AOI (AOI))[22]	High Stakeholder Concern	Mitigation Measures	Residual Impact				
								M	D	E	S	SS
226.5	Disturbance or loss of cultural heritage	CHU398: Kyawagonya Cemetery Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	F	Y	Cultural Heritage Management Plan	2–3	1	1	8	12–13
244.6	Disturbance or loss of cultural heritage	CHU399: Kanga / Rusheshe cemetery Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	F	Y	Cultural Heritage Management Plan	2	1	1	8	12
277.5	Disturbance or loss of cultural heritage	CHU401: Kasoga Cemetery Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	8	11

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.20.5 Transboundary Project Impacts

There are no transboundary impacts on TCH or ICH.

8.20.6 Cumulative Impacts

No cumulative impacts have been identified at the time of writing.

8.20.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts.

8.21 Summary of Ecosystem Services Impacts

8.21.1 Ecosystem Service Impacts

Impacts on ecosystem services and mitigation measures have been considered in the assessments of the VECs that provide ecosystem services. References to ecosystem services documented in the VEC assessments are summarised in Table 8.21-1.

Table 8.21-1 Ecosystem Service References

Ecosystem Service*	Reference
Provisioning Services	
Crops	8.5 Soil, 8.6 Surface Water, 8.7 Groundwater, 8.13 Land-Based Livelihoods
Livestock	8.6 Surface Water, 8.7 Groundwater, 8.13 Land-Based Livelihoods
Capture fisheries	8.2 Habitats, 8.6 Surface Water, 8.14 River-, Lake- and Marine-Based Livelihoods
Aquaculture	8.14 River-, Lake- and Marine-Based Livelihoods,
Wild foods	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods, 8.18 Community Health
Live trade in animals	8.2 Habitats, 8.3 Species
Timber and wood products	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods
Fibres and non-wood products	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods
Aggregates	8.5 Soil, 8.13 Land-Based Livelihoods
Biomass fuel	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods, 8.17 Social Infrastructure and Services
Freshwater	8.6 Surface Water, 8.7 Groundwater, 8.13 Land-Based Livelihoods, 8.18 Community Health
Medicinal products	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods, 8.18 Community Health

Table 8.21-1 Ecosystem Service References

Ecosystem Service*	Reference
Regulating Services	
Local air quality regulation	8.2 Habitats, 8.4 Protected Areas
Global climate regulation	8.2 Habitats, 8.4 Protected Areas
Local climate regulation	8.2 Habitats, 8.4 Protected Areas
Water regulation	8.2 Habitats, 8.4 Protected Areas, 8.6 Surface Water, 8.7 Groundwater
Erosion regulation	8.2 Habitats, 8.4 Protected Areas, 8.5 Soil, 8.6 Surface Water
Waste assimilation	8.2 Habitats, 8.4 Protected Areas, 8.6 Surface Water
Soil quality regulation	8.2 Habitats, 8.4 Protected Areas, 8.5 Soil, 8.6 Surface Water
Cultural Services	
Recreation and ecotourism	8.2 Habitats, 8.3 Species, 8.4 Protected Areas
Aesthetics, landscapes	8.2 Habitats, 8.4 Protected Areas, 8.8 Landscapes
Sense of place/self	8.2 Habitats, 8.4 Protected Areas, 8.20 Cultural Heritage
Spiritual, sacred and religious values	8.2 Habitats, 8.4 Protected Areas, 8.20 Cultural Heritage
Ethical and biodiversity non-use values	8.2 Habitats, 8.3 Species, 8.4 Protected Areas
Supporting Services	
Habitats and species support	8.2 Habitats, 8.4 Protected Areas, 8.5 Soil, 8.6 Surface Water, 8.7 Groundwater

NOTE: *The order of ecosystem services is based on a standard list of ecosystem services in WRI (2012) Corporate Ecosystem Services Review Version 2.0.

All potentially significant ecosystem services related impacts are addressed by the VEC impact assessments and mitigation measures set out in the sections listed in Table 8.21-1, the ESMP (Appendix J) and Appendix E4.

Where additional surveys are planned, it is recommended that associated ecosystem service aspects are considered in their design and implementation.

8.21.2 Ecosystem Service Dependencies

IFC PS 6 includes specific requirements for assessing ecosystem services dependencies[23] and documenting associated proposed resource use efficiency measures, as summarised for the project in Table 8.21-2.

[23] An ecosystem dependency occurs where the EACOP project depends on the ecosystem service.

Table 8.21-2 Ecosystem Service Dependencies

Ecosystem Service	Dependency Description	Resource Use Efficiency Measure[24]
Water	Water use for hydrostatic testing, dust control and camp use as follows: Construction camps – potable water 200 m^3/day at maximum occupancy (up to 1000 people). Construction activities – 100–200 m^3/day. Hydrostatic testing – 16,000 m^3 per test section required	• Water conservation initiatives and opportunities to reuse water, e.g., for dust suppression or concrete, will be identified, assessed for impacts on the environment and human health and those deemed suitable will be implemented. • Re-use water between sections for hydrostatic testing to reduce volumes needed (see Section 2.4.4.2) • The grey water stream will be separated from black water (e.g., sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. • Water meters will be installed to measure the quantities of water supplied and wastewater discharged at the camps and detailed records will be kept of quantities of water reused and the purposes for which water is reused as part of the water management plan and the data used for monitoring water usage and project reporting requirements.
Energy	Energy use for operation of equipment and vehicles	• Electrical equipment of a size that is appropriate for the functions to be performed will be selected with a view to maximising energy efficiency. Electrical equipment will be turned off when not in use.
Aggregates	Used for various construction activities, requiring an estimated: 44,000 m^3 gravel, 52,000 m^3 sand, 4,400 m^3 cement and murram (quantities to be identified during construction)	• All excavated materials will be screened and reused where possible to reduce the need for newly quarried aggregates.
Timber	Used for various construction activities	• If timber is cleared (e.g., as part of right-of-way clearance), it will be reused for construction activities as far as possible. Release of any and all chemically treated waste timber will be made by on a case-by-case basis.
Food	Food required for feeding personnel	• Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.

[24] Reference is to either a proposed mitigation measure in Appendix E4 or design mitigation included in the project description, Section 2.

8.22 Climate

This section includes:

- an assessment of the potential impacts on the global climate of the EACOP project, comprising:
  - a description of the use of global warming potential (GWP) as the basis for comparing emissions of different greenhouse gases (GHG)
  - an evaluation of the carbon intensity (emissions per unit of energy exported) of direct[25] project operations phase GHG emissions
  - a description of the project's main direct and indirect[26] GHG emissions during construction and commissioning
  - a description of the project's main direct GHG emissions during the operations phase
  - a comparison of direct project operational phase GHG emissions to total national emissions and Ugandan reduction commitments, as described in Section 6.4.3.14 baseline
  - a description of indirect emissions during the operations phase
  - a description of the key mitigation measures used to reduce GHG emissions
- an assessment of the effects of climate change trends on the project and how these have been considered in project design and implementation.

8.22.1 Key Sensitivities and Considerations

Baseline Section 6.4.3.14 describes the climate baseline and key considerations.

The key considerations arising from the baseline are as follows:

- The global climate has undergone unprecedented change[27] and continuing change is predicted by climate scientists. Uganda's climate has changed and further change is predicted.
- Uganda is vulnerable to increased climate variability and climate change. For example, the severity and frequency of extreme events such as droughts and floods are projected to increase.
- Global anthropogenic GHG emissions, with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming of the global climate since the mid-20th century.
- The Ugandan government has put in place measures to reduce the risks of the changing climate. These include mitigation measures (reductions in GHG emissions relative to a business-as-usual (BAU) scenario[28]) and adaptation measures (reduction of the vulnerability of social and biological systems).

[25] Direct emissions are from sources owned or controlled by the project.

[26] Indirect emissions are a consequence of the project but are from sources not owned or controlled by the project.

[27] "Since the 1950s, many of the observed changes are unprecedented over decades to millennia" (IPCC 2014).

[28] The BAU scenario is "projections in the Background Paper for the 2012 Climate Change Policy", according to MWE (2015).

8.22.2 Project Greenhouse Gas Emissions

8.22.2.1 Greenhouse Gases and Global Warming Potentials

The dominant source of GHG emissions from EACOP in Uganda is combustion of crude oil during operation of the bulk heaters at the pumping stations potentially later in the life of the project. The principal GHG emitted will be carbon dioxide (CO_2). There will be small emissions of methane (CH_4) and nitrous oxide (N_2O), see Table 8.22-1. Emissions of other GHGs considered in the Kyoto Protocol from EACOP-related activities will be negligible.

It is standard practice to convert GHGs to a common unit, so that their relative effects can be expressed on a common basis. Each GHG has a GWP, which accounts for the total contribution to global warming resulting from the emission of one mass unit of that gas relative to one mass unit of the reference gas, CO_2, which is assigned a value of 1. Based on a GHG's GWP, its carbon dioxide equivalent (CO_2e) can be calculated[29]. The GWPs used for CO_2, CH_4 and N_2O and their contribution to a total GHG emission factor for crude oil combustion are shown in Table 8.22-1. GHGs have different GWPs depending on the 'time horizon' considered, as they have different lifetimes in the atmosphere. This assessment uses GWPs over a 100-year horizon, as primarily used by the US EPA (2018a, Internet site).

Table 8.22-1 GHG Emission Factors for Crude Oil Combustion

GHG	Emission Factor (kg GHG/kg fuel)[1]	GWP[2]	Emission Factor (kg CO_2e/kg fuel)
CO_2	3.13	1	3.13
CH_4	1.25×10^{-4}	34	4.24×10^{-3}
N_2O	2.43×10^{-5}	298	7.26×10^{-3}
Total CO_2e	–	–	3.14

NOTES: [1]EPA (2018b, internet site), converted to mass basis using fuel density of 868 kg/m^3 (EACOP crude blend E1)
[2]Myhre et al. (2013)

Table 8.22-1 shows that CO_2 comprises 99.6% of the GHG emissions from crude oil combustion. The data are similar for the combustion of gas oil, which will be the main fuel used in the construction phase of the project and as backup fuel in the operations phase.

8.22.2.2 Carbon Intensity

Carbon intensity (CI) is a measure of the rate of GHG emissions relative to the intensity of a specific activity, or an industrial production process. The EACOP project transports a (primarily) energy product to market, so the most appropriate CI

[29] For example, methane has a global warming potential of 34, which means that 1 kg of methane has the same impact on climate change as 34 kg of carbon dioxide and thus 1 kg of methane is 34 kg of carbon dioxide equivalent.

metric is GHG emissions per unit of energy exported, in units of grams of CO_2 equivalent per megajoule (gCO_2e/MJ).

Based on the predicted construction emissions and the emissions created to pump and heat the oil in the operational phase, EACOP's progressive total CI in Uganda is shown in Figure 8.22-1.

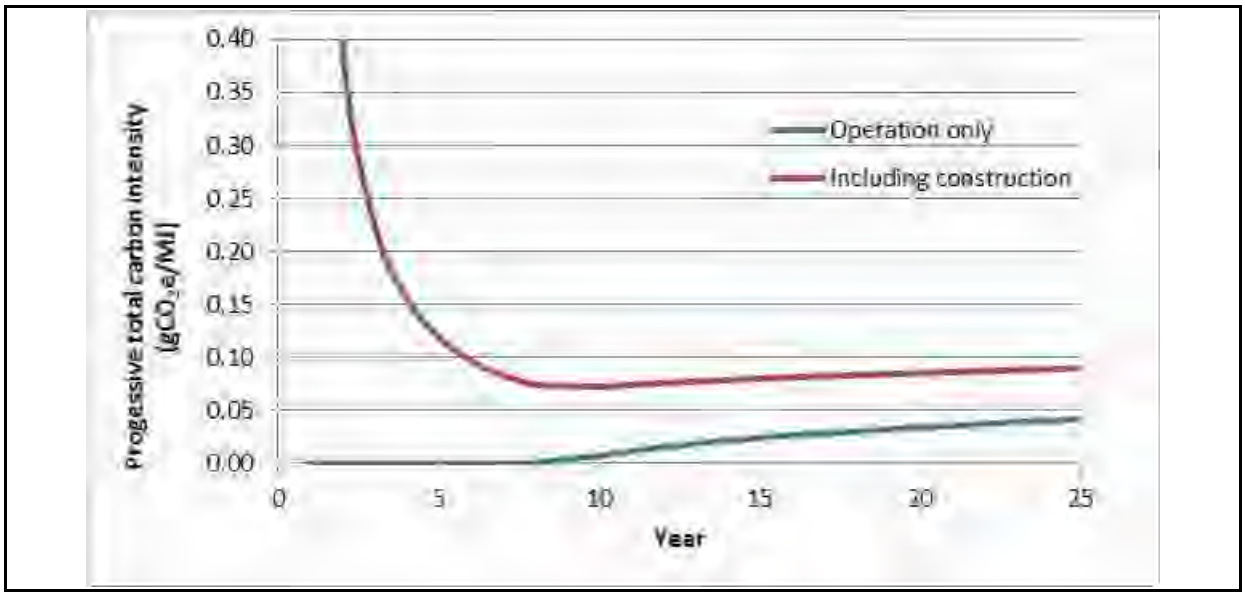

Figure 8.22-1 Progressive Total Carbon Intensity During Project Life

Emissions from the construction phase occur prior to any energy export, therefore a CI cannot be calculated until first energy export in year 1. At this point the total CI (including construction emissions) is 1.24 gCO_2e /MJ, but the y-axis in Figure 8.22-1 has been curtailed so that the operational curve's scale is not rendered obscure.

The operational CI is zero in the early years before the bulk heaters at PS1 and PS2 start up, when pumping power is provided from the Tilenga CPF, whose emissions are accounted for in that project's ESIA. After the bulk heaters start operation, the annual emissions peak at the 18 $ktCO_2e$ shown in Table 8.22-2. These peak annual emissions are from the heating of moderate flow rates of 70 kbpd. The largest annual CI occurs at the lowest flow rates in the later years. The progressive total operational CI increases as the influence of the zero years diminishes. Over the project life, the predicted average operational CI of all the exported oil is 0.043 gCO_2e/MJ.

As the emissions from the construction phase are divided by the cumulative energy exported in the operational phase, the total intensity rapidly decreases. By year 25, the total intensity is 0.091 gCO_2e/MJ. The total emissions from the construction and operational phases are close to equal. They respectively contribute 53% and 47% to the total intensity of the exported energy.

8.22.2.3 Direct Emissions – Construction and Commissioning Phases

For the purposes of this assessment, all in-country construction phase emissions are considered, including:

- equipment used during construction of the main camps and pipe yards (MCPY), pipeline, aboveground installations (AGIs)
- road vehicles and transport by rail to move pipe, equipment, materials, fuel and the workforce
- generators at MCPYs
- compressors for hydrotest drying
- net emissions created under the umbrella definition of land use, land use change and forestry activities[30].

The quantities of these emissions are uncertain at this stage, pending further definition of the precise quantities and methods involved in constructing the pipeline and activities associated with the construction. Estimates have been made based on the information currently available. This inventory is detailed, with the assumptions, methods and data sources used in its derivation, in Appendix G3. The key outcomes are:

- total[31] GHG emissions from the construction phase are estimated at 242 ktCO_2e
- non-road construction equipment used on the pipelay spread and in building the pumping stations is the dominant category of these emissions, contributing 68% (pipelay) and 28% (PSs) respectively
- several other categories, principally from the road transport of materials and the workforce[32], were estimated and collectively comprise the remaining 4% of the emissions total.

8.22.2.4 Indirect Emissions – Construction and Commissioning Phases

The main sources of indirect emissions in the construction and commissioning phases will be the extraction, production and outsourced transport of purchased materials and fuels. For examples, emissions created in manufacturing the steel for the pipe, and in extracting and processing the oil that is eventually used as diesel in construction vehicles and equipment.

The GHG emissions from these sources have not been quantified, as they are minor relative to the direct emissions over the life of the project.

8.22.2.5 Direct Emissions – Operation Phase

The largest source of direct GHG emissions during the operational phase will be potential use of the crude oil-fired heaters at the pumping stations. The bulk heaters will not be used until later in the project life.

[30] The primary effect under this category is the biological carbon stock changes caused by the project activity on the project site. This category includes carbon sinks (absorbers of carbon) as well as sources.

[31] Emissions from land use, land use change and forestry were not included in the estimates.

[32] The inventory was limited to emissions within Uganda. Emissions from road transport journeys including international portions are estimated based on the distances within Uganda only.

The power and heat demands vary over the project life. Greater pumping power is required during high flow rates of oil. Less pumping power, but greater heat demand, is required during periods with lower flow rates to maintain the pipeline at the minimum operating temperature.

Table 8.22-2 presents the predicted minimum and maximum annual direct emissions for the AGI sites. Appendix G3 presents detail on these data and their derivation.

Table 8.22-2 Operational Direct Greenhouse Gas Emissions Inventory

Site	Emission Source	Operational GHG Emissions (kilotonne CO_2e)	
		Minimum Annual	Maximum Annual
PS1	Bulk heating	0	14
PS2	Bulk heating	0	7
Total – Uganda		0	18[1]

NOTE: [1]The maximum and minimum years for the two pumping stations do not coincide, so the total is not the sums of the rows above

Other minor direct emission sources during the operational phase will include:

- diesel-fired combustion plant at the AGIs, e.g., firewater pumps and standby generators
- road vehicles for the movement of people and equipment for operations and maintenance, and supplies to the manned AGIs.

The GHG emissions from these sources have not been quantified, as they are negligible relative to the operational emissions over the life of the project.

National Emissions Context

As described in Section 6.4.3.14, the business-as-usual (BAU) emissions scenario predicts that Uganda's total emissions including land use, land-use change and forestry (LULUCF) will be 77.3 $MtCO_2e$[33] in 2030. The government intends to reduce emissions by around 22% of the BAU baseline by this date, according to its Intended Nationally Determined Contribution (INDC) report (MWE 2015), resulting in net emissions[34] of 60.3 $MtCO_2e$.

The project's direct operational emissions of 11–18 $ktCO_2e/a$ in Uganda[35] represent:

- 0.014–0.023% of Uganda's 2030 BAU emissions
- 0.018–0.029% of 2030 emissions under the INDC emission reduction scenario.

The construction emissions of 242 kt, occurring over a 2–3 year period, represent a higher proportion of these annual BAU and target emissions, but will not occur in

[33] Mt = megatonne, or one million tonnes, equal to 1000 kilotonnes.

[34] The term 'net emissions' reflects the fact that the land use change and forestry (LUCF) sector is predicted to become a carbon sink.

[35] This range excludes the years of zero emissions from the bulk heaters in the early years of the project.

2030 and therefore will not be counted in the emissions total that is assessed against the 2030 INDC target.

The contribution of EACOP to national emissions will not affect Uganda's ability to meet its emission reduction target published as part of the UNFCCC's Paris Agreement.

8.22.2.6 Indirect Emissions – Operation Phase

The main sources of indirect GHG emissions during the operational phase will be:

- end use of the products derived from the crude oil
- other parts of the chain that ultimately gets the products to end users:
- upstream extraction and processing
- EACOP feeder pipelines
- shipping crude oil from the MST to refineries abroad
- refining
- distribution of refined products
- indirect sources[36].

The types of indirect emissions listed in Section 8.22.2.4 may also occur in the operational phase.

8.22.3 Effect of Climate Change

The impacts associated with climate change for a region are hard to predict and its specific effects on the EACOP project cannot be determined. However, climate trends (see Section 6.4.3.14) predict an increase in the severity and frequency of extreme events such as droughts, storms and floods, an increase in temperature and a decrease in rainfall over much of the country. These events and trends may affect EACOP in varying degrees.

Climate change timescales are considered too short to have an effect on the construction phase. Effects are therefore limited to the operational phase and may include:

- erosion at watercourses which could affect pipeline integrity
- soil erosion on the RoW
- increased risk of landslides
- flooding of AGIs.

[36] Here, indirect means indirect to the entire fuel chain, i.e., removed by a further level relative to the emission sources that are indirect to EACOP. The category includes induced land development and co-product production.

8.22.4 Mitigation Measures

8.22.4.1 GHG Emissions

Design

Most of the decisions and measures that substantially affect greenhouse gas emissions are the conceptual alternatives described in Section 3.

The configuration[37] of the main pumps at the pumping stations has been optimised, with efficiency as a key consideration. This optimisation has led to larger pumps being specified, with an efficiency benefit that will save an estimated 2 $ktCO_2e/a$ in Uganda over the years of plateau flow rate, this emission being avoided at the Tilenga CPF owing to less power demand. Further study in detailed engineering will examine the performance over the varying flow rate during the project's life. Detailed engineering will also select the pump models, an evaluation process during which efficiency will be a key factor.

At the standalone block valve stations, solar power is the base case power source. For the estimated load of 31 kWh/day at each of 14 stations in Uganda, this use of renewable energy will save around 114 tCO_2e/a compared with generating that power from oil-fired generators.

Operation

Monitoring and management arrangements during operation (see Section 2.4.5.6) will address climate change effects.

8.22.5 Cumulative Impacts

The climate VEC has a global AOI and in effect, every source of GHG emissions is a source of cumulative impact and ultimately a contributor to the same impact (climate change) on the same VEC. Project contributions to national GHG emissions are described in Section 8.22.2 and project mitigation measures in Section 8.22.4.

8.22.6 Conclusions

The following are the key conclusions related to the EACOP project's impact on climate:

- Direct operational emissions in Uganda once the bulk heaters begin operation will range between 11–18 $ktCO_2e/a$, which represents around 0.014–0.029% of Uganda's total GHG emissions in 2030: the contribution of EACOP to national emissions is therefore low and will not affect Uganda's ability to meet its emission reduction target published as part of the UNFCCC's Paris Agreement.
- Predicted emissions within Uganda from the construction phase have been estimated at 242 $ktCO_2e$, comprising 53% of the total (i.e., with the quantified operational emissions) over the project life.
- Construction-phase indirect emissions have not been quantified, as they are minor relative to the direct emissions over the life of the project.

[37] Number of pumps and total capacity relative to maximum demand

The following key conclusion is related to climate change adaptation:

- Project design, construction and operation have taken into account events and trends that may be related to climate change.

8.23 Pipeline and AGI Decommissioning

When pipeline oil shipping volumes diminish to the point that it becomes inefficient to transport oil via the pipeline, then the pipeline will be decommissioned based on Ugandan regulations and standards and international standards and protocols. The decommissioning process will be based on the following principles:

- engagement with stakeholders at local, regional and district levels to determine potential use of all redundant equipment and structures
- project structures to be removed from land that is no longer required for operations
- environmental due diligence to ensure that no substance-affected soil is managed
- land to be reinstated to a capability similar to that which existed before pipeline construction.

A decommissioning plan, which includes a social management component that addresses the impact of decommission (loss of jobs, economic activity), will be prepared and the scope will be developed in consultation with stakeholders at that time.

The decommissioning plan will consider the available options for removal of AGIs and disposition of the pipeline, fibre optic and power cables, in-situ. It will assess, where necessary, options for remediating contaminated land and propose details for re-vegetation of the area and post-decommission environmental and social monitoring. The impacts of options will be considered and mitigation measures proposed. Activities, aspects and associated impacts will be similar to construction including:

- soil handling leading to soil erosion and sediment release to surface water
- activities and traffic leading to noise and air emissions
- workforce leading to potential social effects.

Effects may be limited and short term.

8.24 Associated Facilities

As outlined in Section 2.5.1 and Appendix H, the following have been identified as AFs:

- Tilenga Project
- Kingfisher Oil Project

- concrete batch plants, borrow-pits and waste management facilities where they meet the IFC definition of associated facilities[38].

In cases where there are overlapping AOIs from the EACOP project and an associated facility on a VEC, the cumulative impacts are identified and assessed in Sections 8.2 to 8.11. The potential residual impacts of AFs outwith the overlapping EACOP project AOI are discussed in this section. While the Tilenga feeder pipeline is part of the Tilenga project, the residual impacts are presented separately as a separate ESIA has been produced for the feeder pipeline. Potential associated facility impacts are categorised using the EACOP project VEC categories[39].

The locations of concrete batch plants, borrow-pits and any waste disposal sites required have yet to be defined. These will be subject to the management of change process described in Section 10.9, which includes environmental and social appraisal of the change.

8.24.1 Tilenga Project

This section summarises the impacts from the Tilenga field and the Tilenga feeder pipeline.

The beneficial impacts from both the field and the feeder pipeline are described in Table 8.24-1. The significant residual impacts from the Tilenga field are presented in Table 8.24-2.

There are no significant residual impacts for the Tilenga feeder pipeline (TEAM 2018).

[38] Associated facilities are defined in IFC Performance Standard 1, paragraph 8, as “facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.”

[39] The Tilenga feeder pipeline ESIA uses the same VECs as the Uganda EACOP project. The Tilenga Project and the Kingfisher Oil Project have similar VECs but where they differ they have been allocated to the equivalent EACOP VEC.

Table 8.24-1 Beneficial Impacts of the Tilenga Project

Beneficial Impacts	Phase
Socio-economic VECs	
Improved road accessibility within the Tilenga Project area (direct)	Site preparation and enabling works
Direct and indirect employment opportunities (direct/indirect/induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning[40]
Increased demand for goods and services (direct/indirect/induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Development of more educated and skilled workforce (direct/indirect)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Community empowerment and increased community participation in decision making (induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Increased revenue for government (direct)	Commissioning and operations
Improvement in nutritional status (indirect/induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Improved health seeking behaviour (induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Improved regional health planning and programme delivery (Induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning

[40] Closure is equivalent to decommissioning.

Table 8.24-1 Beneficial Impacts of the Tilenga Project

Beneficial Impacts	Phase
Ecosystem services	
Crop production may increase due to re-opening land for agriculture	Decommissioning
Livestock and fodder/ pastoralism – benefit of re-opening of pasture grounds	Decommissioning
Timber and woody biomass – limited increase in supply and shift in patterns of fuel use	Decommissioning
Wild foods and bushmeat – small increase in wild food availability due to recolonisation	Decommissioning
Fibres and ornamental resources – small increase in supply	Decommissioning
Improved knowledge of the region increasing scientific and knowledge values	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning

Table 8.24-2 Significant Residual Impacts of the Tilenga Project

Potential Residual Impact	Phase
Biodiversity: habitats of conservation importance	
Direct impacts on Forest-Savanna Mosaic (scattered to the south of the Tilenga Project area – the remnant forest patches within the overall savanna landscapes, generally outside protected forests), due to land use changes and loss of habitat and indirect impacts due to in migration (PIIM) causing land use changes and pressure on natural resources and habitats	Construction and pre-commissioning, commissioning and operations, decommissioning.
Indirect impact on natural habitat – Murchison Falls-Albert Delta Wetland System Ramsar site, stretching from the top of Murchison Fall to the Albert Delta, predominantly within the Murchison Falls National Park (MFNP)– due to PIIM pressures on natural resources and habitats in the region	Commissioning and operations, decommissioning
Biodiversity: flora and fauna species of conservation importance	
Direct impacts including loss, degradation or fragmentation of species' habitat, population changes, disturbance or barrier effects, and indirect impacts due to PIIM pressures on the natural environment, on fauna, including critical habitat qualifying species and other notable species, such as Rothchild's giraffe, Lelwel hartebeest, elephant, lion, spotted hyena, Bohor reedbuck, Uganda kob and Denham's bustard	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Biodiversity: legally protected, internationally or nationally recognised areas	
Direct impacts on grassland habitats including direct loss of the threatened ecosystem Hyparrhenia Grass Savanna and loss of integrity of the protected forests, and indirect impacts such as PIIM pressures and indirect loss of habitat, degradation or fragmentation on MFNP and Karuma Wildlife Reserve	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Indirect impacts, such as loss of habitat due to PIIM pressures, on Bugungu Wildlife Reserve, Budongo Central Forest Reserve, Forest Reserves in Masindi Area, Bugoma Forest	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Soils	
No significant impacts identified	–

Table 8.24-2 Significant Residual Impacts of the Tilenga Project

Potential Residual Impact	Phase
Surface water	
Impact of changed morphology of riverbanks and flow of the Victoria Nile River causing increased flood risk due to the construction of the Victoria Nile Ferry Crossing	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Groundwater	
No significant impacts identified	–
Landscape	
Impacts of construction and maintenance activities on local landscape character areas: Buliisa lowland pastoral farmland, Buliisa lowland rolling farmland, Lake Albert coastal fringe, Victoria Nile corridor and MFNP north, savanna plateau, and viewpoints: Kimoli, Buliisa (west), Kisimo, Kirama, Kabalega Wilderness Lodge, Murchison River Lodge, Nile Safari Lodge, Pakuba Safari Lodge, Paraa ferry crossing, Buligi track Delta track junction, Albert track, Kasinyi (west and east), Buligi track (Pakuba airfield)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Air quality	
See climate	
Acoustic environment	
Impact of site activity noise: night-time well drilling and well pad noise south of Victoria Nile, HDD drilling noise at the Victoria Nile crossing points, CPF night-time noise	Construction and pre-commissioning, commissioning and operations
Socio-economic VECs (economy; local economy (nonland-based livelihoods); land-based livelihoods; river and lake-based livelihoods; land and property; workers' health, safety and welfare; social infrastructure and services; community health; community safety, security and welfare)	
Economic displacement of communities due to land acquisition (direct)	Site preparation and enabling works
Changes to traditional land tenure system (induced)	Site preparation and enabling works
Increased pressure on education facilities (indirect/induced)	Site preparation and enabling works
Social disarticulation and increased family and community conflict (indirect/induced)	Construction and pre-commissioning

Table 8.24-2 Significant Residual Impacts of the Tilenga Project

Potential Residual Impact	Phase
Changes to traditional way of life leading to loss of community/sense of place (indirect/induced)	Construction and pre-commissioning
Increased prostitution (indirect/induced)	Construction and pre-commissioning
Local price inflation (induced)	Site preparation and enabling works
Loss of tourism revenue (indirect)	Construction and pre-commissioning
Increase in teenage and unwanted pregnancy (indirect)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Increased prevalence of HIV/AIDS and other STIs (indirect)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Tangible and intangible cultural heritage	
No significant impacts identified	–
Climate	
GHG emissions	Commissioning and operations
Ecosystem services	
Direct impacts including surface water runoff, disruption of fish and macroinvertebrates, and indirect impacts; overfishing and increased demand due to PIIM, and reduction in species diversity and catch size, on capture fisheries	Construction and pre-commissioning, commissioning and operations
Direct impact on wild foods and bushmeat through increased hunting, demand and instances of commercial hunting of flagship species, improved access and increases in human-wildlife conflicts	Commissioning and operations
Direct and indirect impacts on tourism and recreation values and wild species diversity, through disturbance to wild animals and visitors to Murchison Falls, damage to MFNP's reputation for remoteness and wildness, and increased hunting activities due to improved access	Construction and pre-commissioning, commissioning and operations

8.24.2 Kingfisher Oil Project

This section summarises the significant residual impacts from the Kingfisher Oil Project.

The beneficial impacts are described in Table 8.24-3 and the significant residual impacts are presented in Table 8.24-4. Information received from the project infers that an impact ranked as being of low significance does not require mitigation; Table 8.24-4 therefore includes the impacts ranked with moderate and high significance.

Table 8.24-3 Beneficial Impacts of the Kingfisher Oil Project

Beneficial Impacts	Phase
Socio-economic VECs	
Employment opportunities for local communities	Construction and operation
Skills development and training for employees	Construction and operation
Provision of accommodation and catering facilities for contract workers	Construction and operation
National and regional economic growth	Construction and operation
Local economic development	Construction and operation
Human capital development	Construction and operation
Increase in government revenue	Operation
Project acting as a persuasive and influential partner in promoting the development of a stable and diversified economy around the CPF	Operation
Project creating the impetus for increased government investment in district government funding	Operation
New well-ventilated, multi-roomed homes which will reduce the impact of respiratory diseases, in the case of relocation	Construction
Replacement of lost houses with modern weatherproof houses	Construction
Compensation from land acquisition combined with mechanisms to ensure effective livelihood restoration providing income to affected landowners along the feeder pipeline	Construction
Contribution of the project to the control of vector-based and non-communicable diseases in communities around the CPF	Operation
Improved access provided by regional road upgrades	Construction and operation

Table 8.24-4 Significant Residual Impacts of the Kingfisher Oil Project

Potential Impact	Phase
Biodiversity: habitats of conservation importance	
Indirect impacts of in-migration (PIIM) pressures including changes in water quality and increased soil erosion, increased harvesting and grazing on the habitats and ecosystem integrity of Buhuka Flats around the CPF	Construction and operation
Indirect impacts of PIIM pressures including changes in water quality and increased soil erosion, increased harvesting and grazing on the habitats and ecosystem integrity of the escarpment vegetation corridors near the CPF	Operation
Impact of the jetty upgrade at the CPF on sediment transport along the shoreline of Lake Albert affecting ecosystem composition	Construction
Impact of habitat loss of seasonal wetland and disturbance due to the extension of well pad 1 at the CPF on ecosystem composition	Construction
Indirect impacts of PIIM pressures including changes in water quality and increased sedimentation and erosion on wetlands and drainage lines along the feeder pipeline	Construction
Biodiversity: flora and fauna species of conservation importance	
Indirect impacts of PIIM pressure including habitat degradation, poaching, increased sedimentation on species of conservation concern including the mud snail (CR) along the shores of Lake Albert, grey-crowned crane (EN) on Buhuka Flats and Nahan's francolin (CR) and Eastern chimpanzees (EN) in the Bugoma Central Forest Reserve (BCFR), due to the CPF	Construction and operation
Direct impact of habitat loss and degradation through sedimentation and contamination on the mud snail (CR) along the shores of Lake Albert due to the CPF	Construction and operation
Impacts of additional construction traffic and transmission of human diseases on the survival and reproduction of Eastern chimpanzees within the BCFR	Construction and operation
Impacts on ecosystem configuration due to potential barrier effects of the road for fauna species through the escarpment vegetation corridors	Operation
Indirect impacts of PIIM pressure due to the feeder pipeline, including pressures on natural resources, on species of conservation concern, the grey-crowned crane (EN) on Buhuka Flats	Construction
Biodiversity: legally protected, internationally or nationally recognised areas	
Indirect impacts of PIIM pressures including encroachment on the habitats and ecosystem integrity of Bugoma Central Forest Reserve, due to the CPF and feeder pipeline	Construction and operation
Indirect impacts of upgrades of roads to the CPF within the Bugoma Central Forest Reserve, including collision, nuisance and harassment of wild animals	Construction
Soils	
No significant impacts were identified	

Table 8.24-4 Significant Residual Impacts of the Kingfisher Oil Project

Potential Impact	Phase
Surface water	
Impact on water levels in Lake Albert due to the CPF abstracting water	Operation
Groundwater	
No significant impacts were identified	
Landscape	
Impact on the visual aesthetics for local communities around the CPF (daytime and night-time)	Construction and operation
No significant impacts were identified along the feeder pipeline	
Air quality	
No significant impacts were identified	
Acoustic environment	
Impact of night-time CPF construction on structures and households close to CPF	Construction
Impact of night-time drilling noise on structures and households around the CPF	Construction and operation
Impact of night-time civil construction noise on structures and households	Construction
Socio-economic (economy; local economy (nonland-based livelihoods); land-based livelihoods; river and lake-based livelihoods; land and property; workers' health, safety and welfare; social infrastructure and services; community health; community safety, security and welfare)	
Indirect impacts due to PIIM, on infrastructure and community services such as increasing demand on limited schools, health and welfare services, emergency service and water supply at the CPF	Construction
Impact of loss of income due to layoff of casual labour around the CPF and along the feeder pipeline	Construction
Impact of sexually transmitted diseases (STDs), including HIV/AIDS on employee health and safety around the CPF and along the feeder pipeline	Construction and operation
Impact on land property and rates around the CPF and along the feeder pipeline	Construction
Impact of disrupted local livelihoods due to loss of grazing land on the Buhuka Flats due to CPF construction and of land on which subsistence agriculture is practiced along the feeder pipeline	Construction
Impacts due to PIIM, including competition for jobs and resources increasing tensions, increased pressure on existing services such as health centres and schools, dilution of local government influence, increase in vector-related diseases, STDs, water borne diseases, food and nutrition related diseases and zoonotic diseases, and increased crime and fire risks at the communities around the CPF	Construction and operation

Table 8.24-4 Significant Residual Impacts of the Kingfisher Oil Project

Potential Impact	Phase
Impacts due to PIIM, including competition for jobs and resources increasing tensions, increased pressure on existing services such as health centres and schools, and dilution of local government influence	Construction
Impact of STDs, including HIV/AIDS, on local communities around the CPF and along the feeder pipeline	Construction and operation
Impacts of land loss, resulting in loss of grazing land and resettlement around the CPF	Construction
Impact on land and property rates from increased land speculation on the Buhuka Flats due to the CPF and feeder pipeline	Construction
Impact of increased property prices and rental on existing tenants around the CPF	Construction and operation
Impact of social fragmentation and loss of sense of place in communities around the CPF	Construction
Impact of unmet expectations if work seekers are unsuccessful in communities along the feeder pipeline	Construction
Disruption of social networks due to resettlement of communities within the CPF footprint and along the feeder pipeline	Construction and operation
Impact of the release of hazardous materials or wastes through small spillages outside controlled areas on community safety around the CPF	Operation
Impact of restrictions on land use; prohibited further settlement or other built infrastructure within the buffer zone around the CPF	Operation
Tangible and intangible cultural heritage	
Direct impacts (loss or damage of site) on lithic archaeological sites from the Stone Age, a location where a bangle fragment was found, and sites of undated pottery scatter around the CPF location	Construction
Indirect impacts on intangible cultural landscapes, ritual sites, a sacred river and a sacred tree around the CPF location	Construction and operation
Climate	
No significant impacts identified around the CPF or along the feeder pipeline	

9 POTENTIAL IMPACT IDENTIFICATION AND EVALUATION – UNPLANNED EVENTS

9.1 Introduction

This section describes the process being undertaken and management measures being implemented to reduce the risk of unplanned events and manage them in the unlikely event that they occur.

Unplanned events are not expected to occur during the project's normal construction and operational phase activities.

The project has adopted engineering design criteria that aim to reduce the probability and consequences of unplanned events that could lead to impacts to valued environmental and social components (VECs). At each stage of the design process, a series of health, safety and environmental (HSE) studies have been, and will continue to be, undertaken.

This section includes:

- scope of evaluation of unplanned events
- the risk management approach
- risk reduction
- construction risks
- operation risks.

Unplanned events have been identified and assessed for:

- activities in all phases:
  - traffic accidents
  - fires
- construction, and commissioning phase activities:
  - damage to third-party assets
  - release of diesel from fuel storage tanks at the MCPY and construction sites
  - release of hydrotest water during commissioning
- operation:
  - potential external causes of a pipeline breach, including geotechnical (e.g., earthquakes, landslides) and sabotage
  - modelling of oil spills at sensitive locations.

The risks associated with other construction related activities, including minor unplanned spills, risk of communal violence and health epidemics have been considered in Section 8.

The risks associated with extreme meteorological conditions, non-project originating fires (wildfire), aircraft crashes, political coups, and cumulative impacts of unplanned project events occurring at the same time as a third-party development

unplanned event are not evaluated as these cannot be reasonably predicted or prevented.

Occupational health and safety (OHS) impacts associated with unplanned events are considered in Section 8.16. To ensure OHS readiness of the workforce for unplanned events, the project will:

- use national and international standards
- use equipment that can accommodate unplanned events
- provide readiness training
- establish a corporate OHS management system.

9.2 Risk Management Approach

The project conducted a technological risk assessment during front-end engineering and design (FEED) in accordance with the EACOP project HSE risk assessment methodology.

The project has undertaken risk assessment to inform:

- the design process
- the environmental and social impact assessment (ESIA) process and the development of mitigation measures.

Additional risk assessment will be undertaken during detailed engineering and construction planning. This will include updates to hazard identification (HAZID), hazard operability (HAZOP) and environmental aspects identification studies (ENVID). Construction planning will also include risk assessment for high risk construction activities such as traffic movement, heavy lifting, and spills.

The additional risk assessment will also inform the environmental and social management planning for the project.

The commitments register in Appendix E4 includes a summary of the measures, plans and programmes including the preparation of an emergency response plan for the project in concordance with International Finance Corporation performance standards and Environmental, Health and Safety Guidelines. The emergency response plan provides information on how the project will respond to a major emergency. As such, it describes:

- the project emergency response organisation, based on defined accident scenarios
- functions and responsibilities of key personnel
- the resources required
- emergency procedures.

The emergency response plan will be comprised of several management plans and procedures, such as an oil spill contingency plan and spill management and response plan.

The project will also prepare a community, health, safety and security plan which will include:

- control of preventable diseases
- transport management and road safety
- community safety and security.

9.2.1 Preliminary Risk Rating

Work has been undertaken that supports the establishment of a preliminary rating of the risks and related significance, based on existing engineering knowledge and project design (Section 2), and professional judgement.

A summary of the modelling of the migration of oil released from the pipeline or aboveground installation (AGI) is included in Section 9.5.2. The preliminary risk assessments undertaken will be reviewed and updated as the project design progresses.

9.3 Risk Reduction

The project will reduce risk through:

- design and construction mitigation
- health, safety, security, society and environment systems and procedures
- emergency response planning.

9.3.1 Design and Construction Mitigation

The project has incorporated design and construction mitigation measures to reduce risk during construction and operation, throughout the design process.

9.3.1.1 Construction

The following are risk reduction design and construction mitigation measures:

- Constructability risk was one of the main criteria evaluated during route selection. This included:
  - route refinements to reduce the degree of front and side slopes to ensure safe access for construction activities, increase the probability of reinstatement success and reduce the risk of landslide potential.
  - safe access to work sites to reduce the risk of accidents during transport of materials, equipment or people to the works sites.
  - construction methodologies that were evaluated to identify the options with lower risks. This included considering the number of construction spreads to be used and options to reduce road traffic during construction.
- The HAZID undertaken at the FEED stage identified the main construction hazards (including loss of containment and mitigation measures), which require further development during later project phases.
- Additional constructability reviews will be undertaken for construction facilities, which will include the development of construction environmental management plans (CEMPs) and risk assessments, method statements (RAMS) for construction. The intention of these documents is to ensure that appropriate mitigation measures are identified and implemented throughout construction.

9.3.1.2 Operation

Substantial work to identify operational hazards and unplanned events was undertaken during the early design stages of the project. This included route and site selection as described in Section 3 and during the geological, geophysical and geotechnical assessment of the route. This was undertaken to avoid or reduce the risks of unplanned events occurring during the operational phase. This included avoidance of, as much as possible:

- socially sensitive features (including residential populations)
- environmentally sensitive areas
- flooding and landslide hazards
- seismic activity (such as active rift regions and volcanoes)
- security risks.

Additionally, the following are risk reduction design and operation mitigation measures:

- The layout of the project's AGIs has been developed in accordance with established best practice and hazard mitigation principles, including:
  - selection of simple process designs to remove equipment complexity and reduce risk levels at AGIs
  - equipment grouped by nature or homogeneous levels of risk
  - sufficient spacing is provided to prevent transfer of hazardous consequences from a source to neighbouring equipment
  - restricted areas are defined for internal areas permanently affected by operations.
- The pipeline will be designed primarily based on the following industry standards:
  - ASMEB31.4 2016 Pipeline Transportation Systems for Liquids and Slurries.
  - ASMEB31.3 Gas Transmission and Distribution Piping Systems (US/International Standard).
- The pumps stations will be designed to API610, the standard for centrifugal pumps in the petroleum, petrochemical, and natural gas industries.
- The pipeline will be buried to a depth of 1.8–2 m.
- The pipeline will have welded joints with no flanges, meaning there is no potential for leakage at joints.
- The thickness of the pipe wall will be increased at waterbody and wetland crossings to reduce pipeline leakage risk.
- Fusion-bonded epoxy anticorrosion coating will be applied to protect the pipe against external corrosion over the course of its operational life.
- Corrosion inhibitors (if microbiologically induced corrosion is identified) will be selected to control internal corrosion.
- A dedicated pipeline integrity management system will be implemented during the commissioning and operations phase. This will include regular preventative maintenance including operational pigging, intelligent pigging and inspection campaigns to monitor the status of the pipeline. Regular pigging will maintain optimal flow by removing wax deposits, and the use of intelligent pigs will provide information on the line integrity and condition of the interior pipeline wall.

- Main line block valves (MLBVs) will be installed, which can be closed to prevent oil from flowing into a damaged pipeline section. The primary consideration for MLBV location is to limit the spread of oil, particularly in areas where the pipeline ascends or descends, and near water bodies and environmentally sensitive areas.
- Fault-line crossings have been designed with specific criteria regarding the angle of interception, trench design and the type of backfill used.
- Strain based design will be employed for the sections of pipeline traversing seismic fault locations.
- Insulation and electrical heat tracing (EHT) will maintain temperature of the oil in the pipeline above 50°C, which will maintain the internal integrity of the pipeline system by minimising wax build up and preventing the crude oil's wax content from depositing inside the pipeline.
- A fibre-optic cable will be used for pipeline leak, strain and intrusion detection.
- Restricted areas have been designated at AGIs where the project is required to have control of all possible sources of ignition likely to be present in the restricted area.
- Drainage at AGIs will be designed to reduce the risk of hydrocarbon fires, collect the surface waste liquids and limit discharge of substances to the environment.

9.3.2 Health, Safety, Security, Society and Environment Systems and Procedures

The project will establish an HSE management system for construction and operation.

The HSE management system will include safe systems of work and monitoring and training of personnel to ensure that the likelihood of unplanned events occurring during construction and operations are minimised. The system will include:

- developing focused management plans, including:
  - a reinstatement plan (MP07)
  - a stakeholder engagement plan (MP08)
  - a labour management plan (MP10)
  - a procurement and supply chain management plan (MP12)
  - a community health, safety and security plan (MP14)
  - an occupational health, safety and security plan (MP 15)
  - a transport and road safety management plan (MP16)
- undertaking planned maintenance to maintain optimal operating performance
- regularly inspecting facilities and safety critical activities to ensure they are within the intended design conditions
- monitoring areas of geotechnical instability, erosion potential and flood prone areas
- conducting active fibre-optic monitoring for intrusion or leak through the analysis of noise, vibration and temperature change, thus allowing for early detection of any leak, construction or other external activities near the pipeline

- putting in place a security system to provide layers of passive technical and physical measures to detect, deter and defend personnel and the installations against identified threats
- reviewing project operational performance and industry case studies to identify opportunities for enhanced performance
- delivering training to provide process knowledge and tools to diagnose the causes of process deviations should they occur and how to respond appropriately
- installing equipment to ensure the protection of personnel working at the facilities
- in the case of an unplanned event, reinstating and compensating for third-party damage off the right-of-way (RoW), where appropriate.

9.3.3 Emergency Response Planning

An emergency preparedness and response plan (EPRP) will be prepared to identify possible emergency scenarios, set out actions to be taken in the event of an emergency, and define resources that will be made available to respond to an emergency event. This plan will be developed in coordination with stakeholders including local communities where they could potentially be affected by emergency situations.

The emergency response plan will provide for:

- a combination of warning and communication equipment at project facilities
- essential and emergency power at AGIs
- emergency shutdown, pressure protection and relief systems that will shut down a facility to a safe state in case of an emergency, thus protecting personnel, communities, the environment and the facility
- a fire and gas detection system to detect the presence of abnormal concentrations of flammable gas and the existence of fire at the AGIs
- a fire protection and firefighting system to reduce the effect that fire can cause to the personnel and facilities at AGIs based on the following components:
    - passive fire protection - for example, spacing equipment, containment and fireproofing
    - active fire protection – for example firewater pumps, deluge, foam, hydrants and monitoring equipment
    - escape, evacuation and rescue provisions to ensure the safety of personnel who survive the initial effects of a hazardous event
- emergency pipeline repair system: The objective is to return the pipeline to pre-incident condition while ensuring an effective, comprehensive response that will prevent injury or damage to workers and the public and reduce impacts on the environment
- community protection measures where required.

In addition to the emergency evacuation and rescue facilities provided at the AGIs, the emergency response plan and water management plan include procedures for managing emergencies to effect a coordinated and safe response to emergencies. They include spill response procedures, requirements for the storage of hazardous

materials, and refuelling procedures. See Appendix E4 for the content of the emergency preparedness and response plans.

9.4 Construction Risks

Unplanned events during the construction phase include:

- traffic accidents
- fires
- damage to third-party assets
- release of diesel from fuel storage tanks at the MCPYs and construction sites
- release of hydrotest water during commissioning.

Traffic accidents and fires are a risk during construction, commissioning and operation. Owing to the intensity of activity, the likelihood of an accident and fire occurring is greatest in the construction phase and they are therefore considered in this document as construction activities. It is noted that many of the control measures described will also apply during the operational phase of the project.

9.4.1 Traffic Accidents

One of the most frequent causes of injuries or death in the construction industry is accidents involving vehicles. This includes journeys on public roads as well as on-site accidents. Project related journeys will include:

- delivery of machinery, material, fuel and chemicals from where it is sourced, imported or distributed to sites, using public roads
- site workers commuting to their workplace using public roads
- distribution of machinery, materials, fuel, chemicals and workers to new work areas using the roads network
- movement of machinery, materials, fuel, chemicals and workers to new work areas using the RoW
- deliveries, service call-outs, waste management collections and project visitors, using public roads.
- reinstatement of the RoW after construction.

Road traffic accidents can be attributed to several causes, including:

- driver fatigue
- driver behaviours and behaviour of other road users
- inappropriate level of driving experience for the vehicles being driven
- road conditions
- weather conditions
- vehicle maintenance
- congestion in town centres.

Road safety is a key consideration for the project. The right to life[1] and the right to health[2] are the main human rights at risk. The UN has proclaimed 2011–2020 the International Decade of Road Safety and has developed documents to address the issue.[3] The project is committed to adhering to the highest standards of road safety.

All road traffic accidents are considered significant and can result in impacts to several VECs. Pedestrians, specifically children, as well as cyclists, are considered particularly vulnerable road users. If they are involved in a road traffic accident, the consequences are likely to be severe. Table 9.4-1 shows different types of road traffic accident can affect different VECs.

Table 9.4-1 VECs Affected by Potential Road Traffic Accidents

Type of Road Traffic Accident	VEC Most Affected	Mechanism of Effect
Vehicle collision with member of the public (pedestrian, cyclist or driver)	Community safety, security and welfare	Injury or mortality to member of the public
Vehicle collision with member of the workforce (pedestrian, cyclist or driver)	Workers health, safety and welfare	Injury or mortality to member of the workforce
Vehicle collision with livestock	Land based livelihoods	Injury or mortality to livestock and consequent impact on livelihoods
Vehicle collision with community asset or structure	Social infrastructure and service	Physical damage to structure
Vehicle collision with project asset or structure	N/A	Physical damage to structure
Vehicle collision causing spillage of transported fuel or chemical	Soil, surface water, groundwater, flora and fauna	Contamination of soil or water, toxicity affecting living organisms

9.4.1.1 Preventive and Mitigation Measures for Traffic Accidents

To reduce the likelihood of traffic accidents, the project has adopted several management controls and mitigations based on the hierarchy of risk management:

- design measures
- mitigation measures

[1] Universal Declaration of Human Rights, article 3; International Covenant on Civil and Political Rights, article 6; African Charter on Human and Peoples' Rights, article 4.

[2] International Covenant on Economic, Social and Cultural Rights, article 12; African Charter on Human and Peoples' Rights, article 16. The right to health is an international human rights law standard in itself and is also a component of the right to an adequate standard of living: Universal Declaration of Human Rights, article 25.

OHCHR, Fact Sheet on the Right to Health: http://www.ohchr.org/Documents/Publications/Factsheet31.pdf

Guidance on human rights and health from the World Health Organization: http://www.who.int/mediacentre/factsheets/fs323/en/

[3] The United Nations and Road Safety: http://www.un.org/en/roadsafety/documents.shtml

- emergency response planning.

During the construction phase, the following measures have been, or will be implemented:

Design Measures

Design measures are intended to avoid, eliminate or reduce the probability that unplanned events and their impacts may occur. The following are design measures intended to reduce the risk of traffic accidents:

- completion of a traffic risk assessment as part of the engineering, procurement and construction management logistics study and assessment
- assessment of the potential to use alternative transportation modes to transport materials and chemicals (including rail transport for bulky equipment to some AGIs and construction facilities)
- identification of potential upgrades of road infrastructure to improve safety, especially at key junctions
- rest areas will be identified to allow drivers to comply with rest stop requirements and maximum daytime driving hours
- mandatory rest stops every two hours
- maximum daily hours of operation: 12 h/d
- maximum speed limits
- developing a strategy to minimise road movements by bulking up materials and by use of convoys
- site layout at construction facilities to segregate pedestrians and vehicles and reduce the requirement for reversing and operating a one-way system that separates in-coming traffic from exiting traffic
- developing traffic management measures that, where possible, avoid sensitive areas (e.g. schools or congested areas like town centres) or actively slow traffic.

Mitigation Measures

The potential impacts will be managed by the preparation and transportation of a transport and road safety management plan (TRSMP) which will be updated following completion of site-specific traffic risk assessments.

The TRSMP will include measures to limit vehicle speed, restrict the routes used, ensure drivers are appropriately trained and are not fatigued or under the influence of drugs or alcohol when driving. The TRSMP also includes measures that will be taken to inform and educate local communities about expected traffic movements, and the risks they pose.

Emergency Response Planning

The emergency response planning framework described in Section 9.3.3 will include measures to manage construction and operational phase traffic related accidents, including loss of hazardous materials as a result of traffic accidents, and will describe the response required for managing traffic accident related unplanned events.

Additional studies to identify specific traffic risks because of local road conditions will be undertaken. The findings will be used to develop additional local mitigation measures prior to the commencement of construction.

9.4.2 Fires

Fires can be caused by accidental ignition of dry vegetation during certain operations involving hot work (e.g. welding, grinding, cutting, etc.). Fires could also be caused by inappropriate human behaviour, such as workers not properly discarding cigarettes, as well as actions by third-party activities and by lightning strikes.

Fires can spread and cause environmental and social impacts. Section 6.4.1.2 describes the habitats that occur within the area of influence (AOI) that could be affected by fire. In view of the sensitivity of some of the habitats, it is important that stringent measures are enforced to minimise fire risks and the associated potential significant effects.

Fires can impact upon local community assets such as properties and local infrastructure and the health of community residents. Section 6.4.3.13 describes the land uses that occur within the AOI and within adjacent areas that could be affected by a fire. In the unlikely event of a fire, fire and smoke may cause both environmental and health effects.

Fire risk associated with project activities will be minimised through the definition and enforcement of strict control measures, including the adoption of a “permit to work” system for hot works. This will include use of dedicated fire waters, mobile fire protection measures (fire trucks and mobile firefighting measures). Smoking shall be strictly controlled by providing designated smoking areas for workers during all phases of the project, and other ignition sources (such as welding and cutting systems) will only be used under controlled conditions.

With appropriate control measures and monitoring in place, the likelihood of fires occurring during construction, commissioning or operation is expected to be low, however the magnitude of impact on the environment and communities will vary depending on the scale and location of the incident. While the impact of a minor fire will not be significant, the impact of a major fire resulting in harm to the personnel, the community, wildlife or loss of critical habitat would be significant.

9.4.3 Damage to Third-Party Assets

Large mobile construction machinery items, such as excavators, dozers, and construction vehicles have the potential to cause damage to third-party property.

The risk is considered low given the chosen pipeline route, although in some locations the pipeline may cross buried utilities and some impacts such as vibration may affect properties set slightly further back from the site preparation and enabling works activities. Impacts caused by vibration during construction are assessed in Section 8.10.

Third-party assets will be identified by a pre-commencement survey and delineated by temporary fencing to prevent accidental intrusion on third-party land. Transport

routes will be pre-planned and described as per the TRSMP mentioned in Section 9.4.1.1.

Before construction, local and national utilities companies will be consulted and utilities maps reviewed by the contractors. Local and national utilities companies to be consulted will include, but are not limited to:

- Ministry of Information and Communications Technology and National Guidance
- Uganda Communications Commission
- National Information Technology Authority
- Uganda Telecom Limited (national fixed line mobile and internet provider)
- National Water and Sewerage Corporation
- Uganda Electricity Transmission Company Limited, Electricity Regulatory Authority, Rural Electrification Agency
- Uganda Electricity Distribution Company Limited
- Ministry of Works and Transport
- Uganda Railways Corporation
- Civil Aviation Authority.

Should any utilities be identified or suspected, certain equipment may be prevented from using the RoW to avoid accidental damage. Procedures to stop work will also be implemented until the nature of the services can be established and the risk deemed safe. Project construction activities would restart following the definition of appropriate working methods, which would avoid impacting upon the integrity of the subject services or the health and safety of the workers.

With appropriate control measures and monitoring in place, the probability of damage to third party assets occurring is low. However if damage to third party assets were to occur, the impacts are expected to be local to the site of the unplanned event and short in duration.

9.4.4 Fuel Storage Tank Release – Main Camp Pipe Yards and Construction Sites

The construction phase will require the use of large mobile equipment, power generation equipment and vehicles. It is therefore envisaged that bulk fuel storage facilities will be required at each of the MCPYs and construction sites to support construction spread activities. Most oil or chemical spillage incidents are likely to be limited inventory during the construction phase (typically less than 100 L). However, there is potential for larger scale spillages from the bulk fuel storage (typically between 100 L and 10 m^3), resulting from a larger tank rupture, human error or equipment failure during fuel transfer activities. An indicative inventory for fuel storage during construction is described in Table 2.3-4 of Section 2.

The likelihood of fuel storage releases is considered medium owing to the level of activity and the frequency of fuel transfer operations during construction. There is the potential for acute and chronic impacts caused by larger fuel spillages depending on the type of fuel, the volume spilled, location, mobility and receptor sensitivity.

During the construction phase, the following measures will be implemented by the EACOP project.

Design Measures

- All fuels shall be stored within secondary containment providing appropriate containment in the event of a spill. Such facilities will be designed in accordance with best practices.
- Fuels will be supplied in vehicles specifically designed for the transportation of fuel oils and be made of sufficiently robust construction to prevent leaks and spills.
- All fuel storage tanks will be fitted with accurate level measurement.
- Ancillary equipment, e.g. valves, filters, sight gauges, vent pipes and fill points will be located within the secondary containment system.
- Pipework will be made of suitable material for use with fuel, supported and protected against corrosion and damage by impact or collision.
- Pumps used for refuelling will be equipped with automatic shut off and fuel storage will be fitted with electronic or mechanical overfill protection devices.
- Underground pipework will be avoided wherever practical.

Mitigation Measures

The potential impacts will be managed by implementation of measures in the pollution prevention plan, water management plan and emergency preparedness and response plan. These plans specify storage requirements for hazardous materials, define refuelling procedures, and specify actions to be taken in the event of an unplanned release of fuel. They also require the development, maintenance and testing of emergency response plans.

9.4.5 Hydrotest Water Release

Hydrotesting of pipelines is a pre-commissioning activity that tests the pipe weld and wall for defects and general pipeline strength and integrity as described in Section 2.4.4.2. It is therefore, an essential mitigation for minimising the unplanned events of a release of oil from the pipeline (Section 9.5.2). However, if the test identifies a defect, some volume of test water will be released through the defect. Depending on the size of the defect, test water can be released into the environment.

Once satisfactorily cleaned and gauged, the pipeline section will be filled with water to remove all air from the test section and will be pressurised to conduct a combined leak and strength test.

Approximately 35–50 km sections of the pipeline will be tested. The volume of water contained in a 50-km section of pipeline is 16,000 m^3 and is the theoretical maximum volume of test water that could be released through a defect. However, the realistic maximum release of hydrotest water is less than this for the following reasons:

- The pipeline will have main line block valves as described in Section 2.3.3.5, which when actuated, will isolate the section of the pipeline that has the defect limiting the volume of the release to a portion of the test water contained in the

segment. The portion would be dependent on the location of the defect, less if the defect is in the upper part of the pipeline.

- If a leak is detected, the test will be stopped and the pipeline inspected for the location of the defect(s) and repaired.
- In most credible leak scenarios, only a relatively small portion of the test water in the pipeline would be released.

The quantity of a potential release to the environment should therefore be minimised, with the impacts being localised erosion near the location of the release.

With control measures and monitoring in place, the likelihood of an undetected hydrotest water release during hydrotesting is low, however if it did happen the impacts would be localised and short term.

9.5 Operation Risk

9.5.1 Potential Causes of a Pipeline Breach

Unplanned releases of oil during operations is considered in Section 9.5.2. This section considers other risks associated with the commissioning and operational phase of the project, noting that some of the detailed design and operational mitigation measures related to this phase (e.g. pipeline integrity management system, TRSMP) will be developed as part of later phases of engineering.

9.5.1.1 Geophysical Hazards (e.g., Earthquakes, Landslides)

The project is in an area known to be seismically active and is in the western branch of the East African Rift, a major plate tectonic feature that is dividing the African continent under northwest-southwest extension (Midzi et al. 1999). The most northern part of the EACOP route, in Hoima, is within the Albertine region. Bwambale et al. (2015) (Ref. 20-18) reported that the return period for an earthquake capable of causing damage to engineering structures is averaged at 30 years in this region. Within the wider area, an earthquake of an intensity to cause moderate to heavy damage can, on average, be expected once every 50 years in the Western Rift Valley and the surrounding areas (Twesigomwe 1997). It is possible that the project may experience one earthquake during its lifetime. Should a seismic event occur, an earthquake may directly and indirectly cause unstable ground conditions, including liquefaction. The pipeline has been engineered to withstand earthquakes. However, an earthquake of a severe magnitude may result in a breach of the pipeline or slope failure causing land-slides and a release of oil.

Many of the risk reduction measures described in Section 9.3.1 will reduce the likelihood of a breach of the pipeline caused by a geotechnical event. In addition, to increase the project's resilience to earthquakes, the project has considered the following risks and will implement various actions through the emergency preparedness and response management plan (Section 10.7):

- site-specific site response analyses: The RoW is in areas of soft soil and there is a potential for significant ground motion modification as the seismic waves propagate from the bedrock to the ground surface. A good understanding of this through developing site-specific response analyses in the emergency response plan will aid emergency preparedness.

- slope failure hazard: slope failures are the dominant driver of hazards to engineered facilities and may pose a hazard to parts of the project. Mapping and controlling slopes that are at risk of failure within the project area is crucial to preventing land-slides that may endanger the project site. The landscape management plan and emergency response plan will both consider final slope design.
- surface fault rupture hazard: surface fault rupture hazards occur when fault plane dislocation is of sufficient size to propagate and intersect the ground surface. As parts of the project may be near the top of the surface projection of major active faults, the emergency response plan will include a surface fault rupture hazard.
- liquefaction: liquefaction occurs as seismic waves propagate through low-plasticity fine sediment layers that are (partially) saturated, leading to a local deformation of soils. As pore water pressures increase, the sediment layer softens, and structures are at further risk of collapse. Liquefaction may lead to a loss of bearing capacity, and permanent ground failure. Site specific ground testing will therefore be performed to identify continuity of the liquefiable soils.

The emergency response plan will include response measures to naturally occurring seismic events.

Should a high magnitude seismic event occur, it could potentially cause damage to the pipeline and AGIs, resulting in the release of oil in amounts that would cause impacts that would be significant.

9.5.1.2 Sabotage

The project could experience deliberate damage from people and communities, as part of community protests, terrorist attacks, or to illegally siphon oil for personal use or sale. This has the potential for environmental, social and community impacts, depending on the nature and scale of the sabotage and ability to respond to the damage.

The AGIs will be monitored using closed-circuit television and protected with security fencing.

Pipeline operational monitoring systems (Section 2.4.5.6) include equipment and pressure sensors designed to detect release and loss of oil from the pipeline will quickly identify sabotage that has compromised the integrity of the pipeline. Aerial surveillance of the RoW will also be employed to detect human activity in the RoW that has the potential to compromise pipeline integrity. When an act of sabotage is suspected, a response team will be activated.

If sabotage does occur, the impacts from a release of oil, depending on the environmental and social sensitivity of the location, have the potential to be significant.

9.5.2 Oil Spill Modelling

This section summarises the oil spill modelling, which has been conducted for the pipeline to consider the risks associated with oil releases from the pipeline or AGIs during operation. The oil spill modelling report is included in Appendix I.

This modelling applies to any unplanned release of oil (for this section “oil spills” is used interchangeably) from the pipeline, whether due to geological hazards, deliberate sabotage, corrosion or for any other reason.

9.5.2.1 Oil Spill Modelling Process Overview

The main objective of the oil spill modelling was to assess the potential consequence of an unplanned oil spill for valued environmental and social components.

Several locations were determined to be at greater risk from oil releases, and specific impacts were quantitatively assessed for these locations using modelling software. The software package used was the Risk-Based Corrective Action model with supporting modelling undertaken using the UK Environment Agency-approved remedial targets methodology. A description of the modelling, including descriptions of the software used, the operational scenarios modelled and the model input parameters is described in Section I1.3.3 of the report included in Appendix I, and the results are summarised in Sections 9.5.2.9–9.5.2.12.

9.5.2.2 Data Sources

Several sources of information were used for the oil spill modelling.

Geographic information system (GIS) data, including primary data collected during field work, topographic data and community surveys (water well and population size information), were used to assess overall environmental and social (based on impacts on water quality) sensitivity and selection of locations for a more comprehensive assessment.

Review of several third-party documents and preliminary pipeline design information was the basis for the development of worst case spill scenarios. The documents consulted are referenced within the oil spill modelling report.

The ESIA Section 6.3.2 (physical environment) and appendices (Appendix A5 for geology and soils, Appendix A6 for surface water, and Appendix A7 for groundwater, including data from borehole surveys) were also used for the oil spill modelling.

9.5.2.3 Initial Sensitivity Analysis

Using the data available, including mapping of surface watercourses and the location of areas of greater population density, an assessment of environmental and social sensitivity was undertaken for a 2-km-wide corridor for the pipeline route.

9.5.2.4 Oil Spill Valued Environmental Component Sensitivity Maps

The GIS datasets were used to rank sensitivity for groundwater, surface water and ecological VECs, and the data was then represented graphically as colour-coded oil spill receptor sensitivity maps. Resulting scores for the three VECs were then used to produce combined environmental sensitivity maps (provided in Appendix I).

Full information assessed for each VEC, sensitivity scoring and weighting are provided in Appendix I.

9.5.2.5 Environmental and Social Sensitivity

A map presenting a summary oil spill VEC sensitivity is provided as Figure 9.5-1, which illustrates the overall environmental and social sensitivity to a potential oil spill within the 2-km corridor, for 10-km sections. The pie charts (shown on this figure) associated with each 10-km section shows the proportions of the different sensitivity zones within that section (with sensitivity ranked from very high to very low). The locations at which detailed modelling and risk assessment have been undertaken are also shown.

9.5.2.6 Preliminary Quantitative Risk Assessment

The initial sensitivity analysis identified locations considered to have higher environmental sensitivity. From these areas, several locations were selected for more, site-specific quantitative risk assessment.

This assessment considered direct impacts to groundwater and surface water VECs, with an indirect assessment of impacts to human health.

The sites identified for further assessment were chosen based on whether there was high groundwater or surface water sensitivity, shallow groundwater, community use of water resources, legally protected, internationally or nationally recognised areas and wetlands. The information provided by modelling at the selected higher sensitivity sites can be used in a surrogate manner to evaluate the potential impacts of oil spills on other parts of the pipeline route with similar attributes.

The map shows that most of the pipeline route has medium environmental and social sensitivity. The preliminary quantitative risk assessment (PQRA) of unplanned oil spills at selected sensitive locations is described in Sections 9.5.2.9–9.5.2.12.

The process for selection of the study sites along with the conceptual site model for each location is presented in the report in Appendix I. The range in results between modelled locations is due to the variability in ground (e.g. soil permeability) and groundwater (e.g. groundwater depth) conditions along the pipeline route.

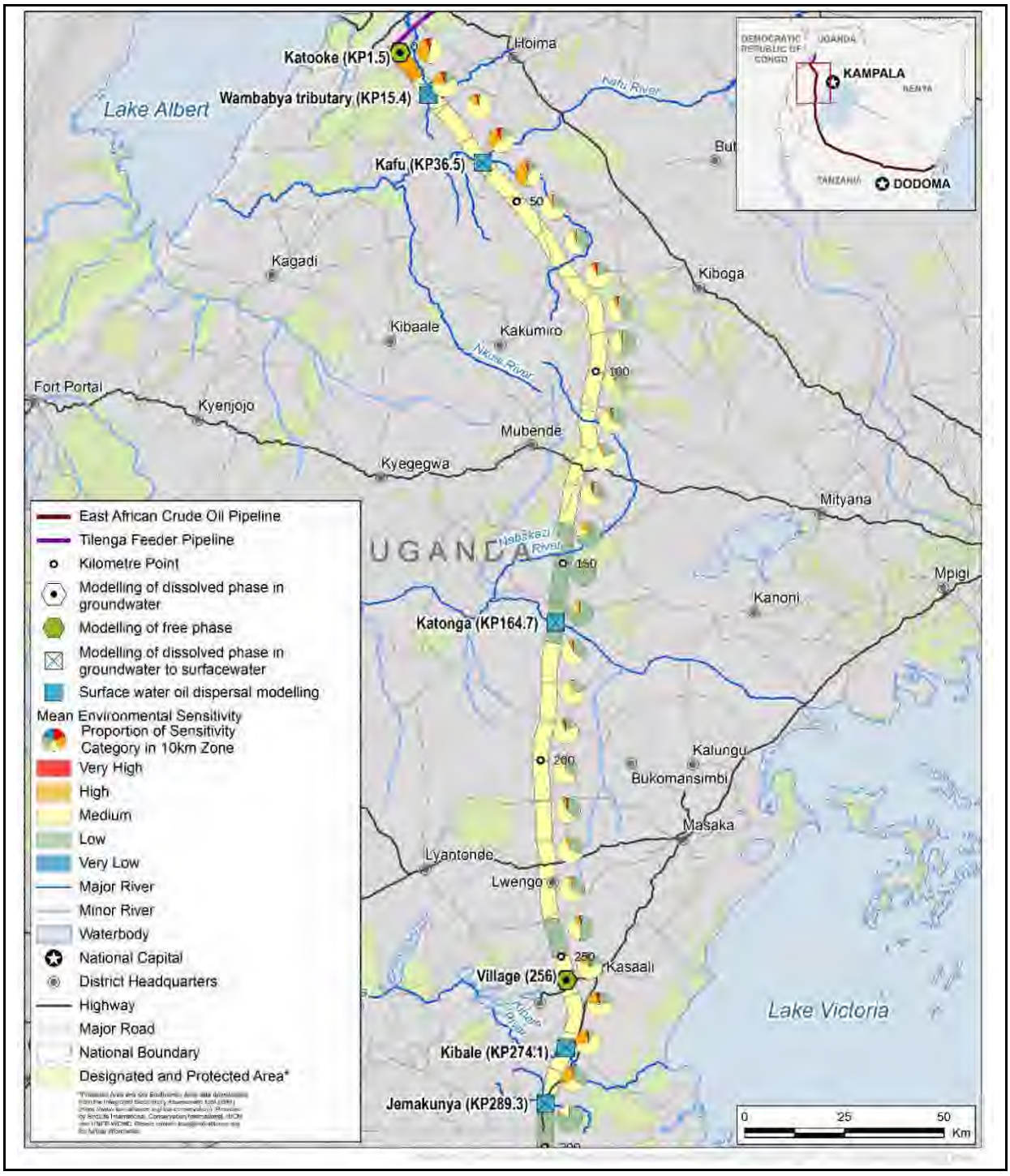

Figure 9.5-1 Oil Spill VEC Sensitivity

9.5.2.7 Guidance Values

To assess the impact of oil releases on the environment, it is necessary to have a set of guidance values so that it is clear what concentrations of oil components are unacceptable in the environment. The guidance values used in this assessment are the World Health Organization drinking water standards when considering groundwater VECs, in the absence of standards specific to Uganda.

9.5.2.8 Spill Scenario

The oil that will be transported is considered heavy oil, characterised by a pour point of 31–40°C (the temperature at which a liquid becomes semi-solid and loses its flow characteristics) and a waxing temperature of 45–57°C (the temperature at which the oil first precipitates). The general chemical and physical properties of the heavy oil influences the potential migration and impact of a release, as it tends to solidify when exposed to air or water which are at temperatures below those stated above.

The worst-case spill scenario was selected for assessment. This considered a volume of 1430 m^3 of oil, released from a 600 mm diameter hole in the pipeline for a one-hour period, causing a pool of oil 127 m in diameter extending across the ground surface.

For an explanation of the assessment parameters selected, refer to the report in Appendix I. For each location, the movement of oil was considered assuming that the spill spread without mitigation measures being implemented.

This is most important for modelling migration of dissolved phase substances in groundwater, which without intervention, would occur over several years. To account for the fact that oil would be removed, further analysis has been undertaken in addition to the modelling to assess how removing free oil from the environment within one year might reduce potential impacts.

The complete results for unplanned loss of oil to soil, surface water and groundwater sources and other oil constituents are included in the report in Appendix I.

9.5.2.9 Surface Water Impacts from Groundwater Migration of Dissolved Oil Spill Components

The report in Appendix I includes the predictions for five locations at which impacts to surface water are modelled quantitatively. Descriptions of the modelling software, the parameters used and the assumptions made during the assessment are included in the report in Appendix I.

The model considered migration of dissolved oil components such as benzene, toluene, ethylbenzene, xylene and other small-chain total petroleum (TPH) fractions in groundwater from oil in contact with groundwater beneath the spill location, or residual oil in soil, where groundwater is expected to be deeper than predicted reasonable worst case vertical oil migration.

The modelling predicted that, without intervention, a failure of the pipeline could cause dissolved oil components impacts on surface waterbodies by groundwater transport within a radius of 4 m to 85 m beyond the extent of the oil spill area. The modelling did include attenuation of the dissolved components.

Migration of dissolved hydrocarbons to the maximum modelled distances would take several years. Remediation to contain and remove the oil would be undertaken quickly and would prevent the spill from affecting areas as large as those predicted in the worst-case scenario.

The rapid recovery of oil would limit dissolved component infiltration into groundwater and being transported. This reduction in potential impact has been evaluated in an additional assessment considering removal of oil within one year presented in Appendix I. In summary, this indicates that remediation within one year would result in reduction of the distance in which there may be potential impact to surface water between 0.5 m and 30 m.

9.5.2.10 Groundwater Impacts from Migration of Dissolved Oil Spill Components

The report in Appendix I includes the predictions for the two locations of quantitatively modelled impacts to groundwater. For each location, the model considered migration of dissolved oil components in groundwater from residual oil in soil, and oil in contact with groundwater beneath the spill location.

The travel distances predicted by the modelling are distances that lighter constituents of dissolved oil may travel within groundwater beyond the initial spill extent.

The modelling predicted that, without intervention, a failure of the pipeline could cause dissolved oil components to impact groundwater quality based on drinking water use, within a radius of up to 300 m to 340 m (depending on local conditions, including soil type) beyond the extent of the oil spill area. It should be noted that travel times for dissolved oil components in groundwater over distances greater than 200 m would likely be greater than one year.

As with surface water impacts, the model is based on a worst-case scenario as remediation following a large spill would be expected to take place rapidly after the incident occurred. This would remove the source of oil to the extent that it would no longer produce dissolved components that would infiltrate into groundwater.

Predicted distances for groundwater impact, assuming remediation of the oil spill taking place within one year (not groundwater remediation), range between 35 m and 45 m. It should also be noted that the maximum modelled distances for dissolved oil migration would be for areas of the pipeline route with the most permeable ground conditions. For other areas of the pipeline, migration distances may be substantially less.

Additional description of mitigation and remediation of oil spills is provided in Section 9.5.3

9.5.2.11 Unsaturated Zone Impacts from Oil Spills

The report in Appendix I includes the predictions for the two locations of quantitative modelling of the potential maximum depth of vertical migration of oil into unsaturated soil, to assess whether the oil could reach the water table. Based on the characteristics of the heavy oil, it will solidify upon contact with groundwater, and hence there would be no lateral migration of oil beyond the extent of the spill zone.

The complete results of the oil migration modelling are in the report in Appendix I. The modelling predicted that the depth to which oil could migrate within the unsaturated zone is approximately 1.38 m below the spill area. Groundwater at the

two locations could be as shallow as 1 m bgl, hence oil is predicted to reach the water table at some locations.

There is inherent conservatism within the assessment model and the oil would have very low mobility at ambient temperatures if a pipeline spill occurs. The migration depths modelled are conservative and the modelled scenario is considered to represent the possible worst case.

9.5.2.12 Surface Water Crossings Impacts from Oil Spills

The potential impacts of oil spills at surface water crossings caused by a failure of the pipeline have also been modelled. Five locations were assessed, with full details provided in Appendix I.

Generally, the rivers are so narrow that an oil spill would cover the entire river surface. The pour point temperature of 40°C means the oil will solidify in the water, and hence minimise the spreading of oil. The oil will quickly become extremely sticky and would therefore - in solid form - either adhere to the riverbanks or to the vegetation. In this solid state, the oil will quickly introduce a “barrage effect” that will further reduce drift and spreading, particularly in narrow areas of the rivers. The narrowness and curvature of the rivers and the small discharge contribute to the high retention of oil near the spill.

The modelling suggests that at four of the five crossing locations, the modelled length of river affected ranges between 0.6 km and 3.0km. The relatively short transport distances are attributable to the high viscosity of the oil and the curvature of most of the rivers.

The model result for the Jemakuna River predicts a 0.1-km length of affected river. This limited migration distance compared to the other rivers modelled is because the Jemakuna River has a very low flow rate, narrow channel dimensions and shallow water compared with the other rivers.

The predicted distance is the potential length of impact, defined as the area where most of the oil (90–95%) will become stuck. A smaller amount of oil can be expected to drift down the river as small tar balls. The oil is slightly less dense than water and is therefore not expected to sink to the river bed.

Furthermore, this prediction does not account for any recovery or cleanup of oil.

When considering the predictions, it should be noted that they are a worst-case scenario. The following factors are expected to limit the likelihood and extent of releases and hence the impact:

- The modelled quantity of oil is unlikely to be released owing to the design measures described in Section 2 and the risk reduction described in Section 9.3.
- The inclusion of block valves in the pipeline design provides a means of restricting the volume of oil released from a breach of the pipeline. The location of block valves near the sensitive locations modelled is shown in Table 9.5-1.

Additional description of the mitigation and remediation of oil spills is included in Section 9.5.3.

Table 9.5-1 Block Valves Near Sensitive Locations

Location	KP	KP of Closest Block Valve to North	KP of Closest Block Valve to South	Distance Between Block Valves
Katooke	1.5	0.0	14.40	14.40 km
Wambabya tributary	15.4	14.40	16.00	1.60 km
Kafu River	36.5	35.40	37.20	1.80 km
Katonga River	164.7	163.60	165.50	1.90 km
Rakai village area	256	243.20	258.00	14.80 km
Kibale River	274.0	270.90	277.20	6.30 km
Jemakunya	289.3	277.20	323.40	46.20 km

9.5.3 Preventive and Mitigation Measures Reducing Impact of Oil Spills

Preventive and mitigation measures to avoid, reduce, or control impacts from an oil spill from the pipeline have been considered during the design process, and will continue to be considered during the development of operating procedures. The preventative and mitigation measures that apply to the unplanned release of oil are considered in Section 9.3.

9.6 Decommissioning

The pipeline will be decommissioned based on Ugandan regulations and standards, and international standards and protocols. The decommissioning plan is described further in Section 2.4.6.2. It will include specific consideration of unplanned events, which may occur during decommissioning consistent with the EACOP Project requirements.

9.7 Summary of Unplanned Events

A summary of the unplanned events, their potential impacts, and the key mitigation measures that will be in place to prevent or manage impacts is provided in Table 9.7-1.

Table 9.7-1 Summary of Unplanned Events

Unplanned Event	Potential Impact	Key Mitigation Measures	Likelihood of Event (Low, Medium, High)
Construction			
Traffic accidents	Vehicle collision resulting in injury or mortality to member of public, workforce or livestock, or physical damage to community asset, structure or project asset	Transport and road safety management plan Emergency preparedness and response plan	Medium to high
Traffic accidents	Vehicle collision leading to spillage of transported fuel or chemical and resulting in contamination of soil or water, toxicity affecting living organisms		Medium to high
Fire	Impact to VECs including biodiversity, community safety, security and welfare, land and property (e.g., sensitive habitats, local community assets and the health of local community residents)	Emergency preparedness and response plan	Low
Damage to third party assets	Physical damage to third-party property	Transport and road safety management plan Infrastructure and utilities management plan	Low
Diesel release from oil storage tanks at the MCPYs and construction sites	Diesel release causing in contamination of soil or water, toxicity affecting living organisms	Pollution prevention plan Water management plan Emergency preparedness and response plan	Low (MCPYs) Medium (construction sites)
Loss of hydrotest water during commissioning	Localised erosion	Emergency preparedness and response plan	Low

Table 9.7-1 Summary of Unplanned Events

Unplanned Event	Potential Impact	Key Mitigation Measures	Likelihood of Event (Low, Medium, High)
Operation			
Traffic accidents	Vehicle collision resulting in injury or mortality to member of public, workforce or livestock, or physical damage to community asset, structure or project asset	Transport and road safety management plan Emergency preparedness and response plan	Low
Traffic accidents	Vehicle collision leading to spillage of transported fuel or chemical and resulting in contamination of soil or water, toxicity affecting living organisms		Low
Fire	Impact to VECs including biodiversity, community safety, security and welfare, land and property (e.g., sensitive habitats, local community assets and the health of local community residents)	Emergency preparedness and response plan	Low
Geophysical hazards	Rupture of pipeline or slope failure leading to land-slides, and oil spills	Emergency preparedness and response plan	Low
Sabotage	Deliberate damage with environmental and social impacts	Emergency preparedness and response plan	Medium (political) – Low (theft)
Modelled oil spill from pipeline or AGIs	Impact to surface water via migration of oil components dissolved in groundwater	Emergency preparedness and response plan	Low
Modelled oil spill from pipeline or AGIs	Impacts to groundwater via migration of oil components dissolved in groundwater	Emergency preparedness and response plan	Low
Modelled oil spill from pipeline or AGIs	Impacts to soil from non-aqueous phase liquids in the unsaturated zone	Emergency preparedness and response plan	Low
Modelled oil spill from pipeline	Oil dispersal on surface water following leak at pipeline crossings	Emergency preparedness and response plan	Low

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLANS

10.1 Introduction

This section describes how the management plans and associated mitigation measures identified in this environmental and social impact assessment (ESIA) will be implemented and monitored. This section has been prepared in accordance with the requirements of the:

- National Environment Act, Cap 153, 1995
- Ugandan Environmental Impact Assessment Regulations, 1998
- Guidelines for Environmental Impact Assessment in Uganda (National Environmental Management Authority [NEMA] 1997)
- Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014[1]
- International Finance Corporation Performance Standard 1.

The project has taken every effort, informed by technical experience and industry knowledge, to evaluate all potential impacts and identify appropriate mitigation measures. Should unforeseen impacts arise during the implementation of the project, the project will undertake the necessary assessments, develop adequate mitigation measures and, inform NEMA.

In accordance with the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014, an environmental and social management plan (ESMP) has been developed. Normally, the ESMP would be presented in the main body of an ESIA; however, owing to the physical size of the ESMP, and to facilitate ease-of-use, the ESMP is presented as Appendix J. Section 10, Appendix E4 and Appendix J have also been issued as a stand-alone volume to further facilitate ease-of-use.

A suite of construction phase management plans will be prepared prior to construction activities commencing and a suite of operational phase management plans will be prepared prior to operational activities commencing. These management plans, described in Section 10.7 will support implementation of the ESMP.

The commitments register (Appendix E4) lists the management plans and the associated mitigation measures. The commitments will inform the management

[1] The Environmental Impact Assessment Guidelines for the Energy Sector (NEMA 2004) encompass all types of energy projects including oil pipelines, whereas the 2014 guidelines refer to oil only in the context of thermal generation. Nonetheless, the 2014 guidelines include text from both the 2004 guidelines and refinements, such as additional information on the ESMOP, and hence are considered current best practice.

plans which, once drafted, will control, manage and monitor the environmental and social impacts identified in this ESIA.

Stakeholder consultation has been ongoing and will continue during all project phases with lead agencies, local leaders and communities. The aim of continuous stakeholder consultation is to provide ongoing project information and receive feedback regarding the effectiveness of project mitigation. Received feedback will inform responsive and adaptive management of environmental and social impacts.

This section includes:

- health, safety, security, society and environment charter
- objectives and targets
- reporting system
- ESMP matrix reference
- roles and responsibilities
- supporting management plans
- supporting subplans
- training needs and capacity building
- management of change.

10.2 Health, Safety, Security, Society and Environment Charter

The project ESMP is guided by the Total East Africa Midstream (TEAM) BV Health, Safety, Security, Society and Environment (H3SE) Charter which has the following ten principles, and which TEAM:

1. Holds safety, security, health, respect for the environment, customer satisfaction, listening to all stakeholders by way of an open dialogue, as paramount priorities.
2. Complies with all applicable laws and regulations wherever it conducts its business and supplements them with specific requirements and commitments when necessary.
3. Promotes among its employees a shared culture of which the core components are professionalism, the rigorous compliance and application of regulations, skills management, incident feedback and continuous learning. This approach relies on the vigilance and commitment of all.
4. Expects each and every team member, at all levels, to be aware of their role and personal responsibility in the practice of their duties. Individuals must demonstrate the strictest discipline in preventing accidents and deliberate damage; in protecting health, the environment and product and service quality whilst addressing stakeholder expectations. Rigor and exemplarity in these fields are important criteria in evaluating the performance of each member of personnel, in particular for those in positions of responsibility.
5. Favours the selection of industrial and business partners on the basis of their ability to apply policies similar to its own concerning health, safety, security, the environment, quality and societal measures.

6. Implements, for all its operations, appropriate management policies regarding health, safety, security, the environment, quality, societal commitment and a periodic risk assessment of relevant policies and measures. Any development of a project or launch of a product is undertaken upon full lifecycle risk assessment.
7. Applies appropriate health, safety, environmental, quality and societal commitment management systems, which undergo regular assessment involving measurement of performance setting milestones, formulating relevant action plans and instituting suitable control procedures.
8. Implements incident response plans and means of intervention designed to face different types of events it may encounter. Such measures are periodically updated and reviewed during exercises.
9. Is committed to managing its energy consumption, emissions in natural environments (water, air and soils), production of final waste, use of natural resources and impact on biodiversity. It develops new processes, products and customer services to enhance energy efficiency and reduce environmental footprint.
10. Adopts a constructive attitude towards health, safety, security, the environment and quality, based on transparency and an open dialogue with stakeholders and outside parties. Through its societal commitment, TEAM is particularly keen on contributing to the sustainable development of neighbouring communities, with a focus on environment, human, economic and social matters. It conducts its operations in such a way as to responsibly ensure security, in compliance with the Voluntary Principles on Security and Human Rights.

10.3 Objectives and Targets

A project objective is to design, construct and operate a pipeline that does not present risk, injury or harm to personnel or host communities and their supporting ecosystem services.

The ESMP presents monitoring parameters and proposed performance indicators and targets that will steer environment and social performance toward continuous improvement.

10.4 Reporting System

A comprehensive reporting system will be developed including:

- internal reporting of environmental and social performance
- external reporting to government relating to:
  - permitting and licensing requirements, e.g., notification before starting an activity
  - monitoring results in accordance with the terms and conditions of any licences or consents
  - annual environmental and social compliance audits
  - environmental and social incidents as required by legal requirements.

10.5 Environmental and Social Management and Monitoring Plan Matrix

The ESMP (Appendix J) reflects the findings of the ESIA and is based on the detailed impact assessment tables presented in Appendices E2 and E3 and summarised in Section 8.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Section 10.7 and Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

The ESMP has been developed so that an impact can be monitored using an appropriate monitoring parameter that will, by default, provide information about potential secondary impacts. For example, monitoring of “contamination of surface water” will, by default, address potential impacts to aquatic biodiversity and ecosystem services associated with surface water, thus simplifying the monitoring programme whilst maximising information and control of impacts.

Monitoring parameters and performance indicators are included in the ESMP.

Four different ESMP matrices have been developed, namely:

- construction generic impacts
- construction location-specific impacts
- operational generic impacts
- operational location-specific impacts.

10.6 Roles and Responsibilities

Roles and responsibilities of parties implementing management plans, associated mitigation measures and the ESMP are outlined below in Table 10.6-1.

Table 10.6-1 Roles and Responsibilities

Role	Responsibilities
The project	Defining the minimum content of the ESMP and (see Section 10.7) Ensuring implementation and monitoring of the management plans and ESMP, and that negative impacts are adequately mitigated and positive impacts enhanced Allocation of adequate means within the project organisation for implementation of the plans and mitigation measures Ensuring that all contractors set up their management systems with consideration of the ESIA findings Approval of contractors' ESMP Ensuring compliance with the project commitments Notifying NEMA in case of changes to the design or activities that can result in changes to the ESIA findings Preventing pollution and actions that will harm or may cause harm to the environment Preparing for emergencies Notifying the relevant authorities in case of emergencies Ensuring continuous stakeholder engagements throughout the project lifetime Providing resources for adequate environmental and social training and awareness of its employees Ensuring adequate financing for implementation of the ESMP to ensure compliance and desired outcomes The implementation of some management plans and mitigation measures will depend, not solely on the project, but also on other parties including government agencies and third parties operating in the project area of influence
Project representative	Informing the H3SE team on changes in the design Ensuring development and approval of detailed management plans by respective contractors Performing periodic audits of contractor's activities jointly with H3SE team Reporting on the implementation of management plans and any nonconformances

Table 10.6-1 Roles and Responsibilities

Role	Responsibilities
Project H3SE team	Ensuring detailed management plans are produced are consistent with ESIA findings Ensuring implementation of the management plans including impacts monitoring Ensuring update of the H3SE Management System and ESMP on a periodic basis or in case of important changes to the impacts or mitigation measures Advising contractors on the ESIA findings Monitoring project activities on site, ensuring adherence to the management plans and reporting nonconformances Planning and undertaking stakeholder engagement throughout the project lifetime Performing audits of site activities and reporting accordingly. Reporting any significant environmental incidents to the responsible authorities as may be required Analysing incidents to prevent re-occurrence Assessing design changes for further notification to NEMA where it may result in changes to the ESIA findings Monitoring project related grievances according to grievance management procedure Undertaking regular environment and social reporting Providing environmental and social training and awareness to the employees
Project Responsible on Site for Safety and Environment (RSES) The RSES is a delegate of the project on site, and all personnel working on that site are answerable to the RSES on H3SE issues.	Ensuring H3SE leadership on site (training, site committees, managing site action plans) Ensuring risk assessment of project activities and management of risks on site Implementing the emergency preparedness system and managing on-site command posts in case of emergency

Table 10.6-1 Roles and Responsibilities

Role	Responsibilities
Contractor on behalf of project	Developing detailed management plans consistent with Section 10.7 and the requirements of the ESMP and project requirements relative to the scope of work Ensuring work conducted is done within the framework of the contractor's management plans, Tanzanian legislation and good international industry practice Ensuring that contractors' and sub-contractors' employees are aware of the contents of the management plans relative to the scope of work and their roles and responsibilities in its implementation Ensuring that all sub-contractors have a copy of, and are fully conversant with, the contents of the management plans and associated roles and responsibilities Providing regular reports to project representatives on implementation of contractor's management plans and nonconformances Participating in monitoring compliance and impacts upon the surrounding environment through independent audits or led by the project, implement corrective mitigation measures where required Appointing persons responsible on site for H3SE Informing project representatives on incidents or complaints from stakeholders Addressing concerns raised from the activities including activities-related grievances according to grievance management procedure Implementing the emergency response on site

10.7 Management Plans

This section describes the management plans that will be drafted to support the implementation of the ESMP. Minimum content of these management plans are the mitigation commitments developed throughout the ESIA and used in Sections 8 and 9 and appendices E2 and E3 (to facilitate impact evaluation and calculate the significance ranking of residual impacts). The commitments are presented in Appendix E4.

The management plans are applicable during construction and operation, except for the decommissioning plan.

Where applicable, separate plans will be drafted for construction and operation that account for the activities and anticipated potential impacts.

Management plans will be revised annually as a minimum or more frequently as required in response to project changes, lessons learnt or adaptive management.

The project will be responsible for the content, drafting, implementation and revisions of the management plans described in this section.

A separate suite of management plans will be drafted for construction and operations.

An overview of each management plan is described in Section 10.7.1. The project will prepare management plans for the relevant phase of the project that include, but are not limited to, this minimum content in support of implementation of the ESMP.

10.7.1 MP01: Biodiversity Management Plan

The biodiversity management plan will define the approach to reduce impacts on biodiversity and will address:

- pre-construction surveys and pre-clearance surveys
- biodiversity action plan
- construction biodiversity considerations, such as signage, reducing habitat disturbance, habitat and species protection, biosecurity plan
- mitigation measures to be applied immediately before the onset of construction, such as translocation plan for flora and fauna and immediate pre-clearance checks.

10.7.2 MP02: Pollution Prevention Plan

The pollution prevention plan will define the approach to prevent pollution and will specify minimum requirements for:

- good international industry practice that will be used in project activities to attenuate impacts resulting from noise, light, dust, nuisances and other sources of pollution
- blast management
- energy management, including sources of emissions and project emission limits
- selection, safe management, use and disposal of chemicals
- handling and disposal of contaminated soil (from chance finds as well as potential project incidents)
- watercourse crossings addressing issues such as fuel and chemical handling and storage, surface run-off into watercourses at crossing points and management of potential project-related sediment loading of the watercourse.
- management of washwater from vehicles and concrete delivery trucks
- planned maintenance of facilities and equipment.

10.7.3 MP03: Waste Management Plan

The waste management plan will define the approach to reduce potential waste related impacts and will address:

- development of a waste management hierarchy
- identification and classification of project waste streams
- requirements for waste collection, segregation, treatment, storage and transportation
- final disposal options
- waste management documentation to demonstrate compliance with duty of care.

10.7.4 MP04: Natural Resource Management Plan

The natural resource management plan will define the approach to manage natural resource use and will address:

- aggregates management (sourcing, storage, use, reuse and disposal)
- water management including potable water and sharing community resources
- timber management.

10.7.5 MP05: Soil Management Plan

The soil management plan will define the approach to soil management and temporary erosion control and will address:

- construction planning surveys and assessments
- soil handling, including topsoil stripping and segregation of soil types during temporary soil storage
- disturbance of contaminated land
- temporary erosion control.

10.7.6 MP06: Cultural Heritage Management Plan

The cultural heritage management plan will define the approach to the identification, assessment and mitigation of potential impacts on tangible and intangible cultural heritage and will address:

- pre-construction surveys and assessments avoidance or preservation of known archaeological or cultural heritage assets
- chance finds procedure for tangible and intangible cultural heritage
- interface meetings.

10.7.7 MP07: Reinstatement Plan

The reinstatement plan will define the approach to manage reinstatement incorporating permanent erosion control and bio-restoration, and will address:

- permanent erosion control
- bio-restoration, revegetation and reseeding
- site reinstatement, including decommissioning of temporary work sites and facilities
- watercourse and wetland crossings reinstatement including vegetation removal and bank stabilisation
- the procedure to identify where location-specific reinstatement plans are required as per the findings of the ESIA
- exit surveys documenting site condition on construction completion.

10.7.8 MP08: Stakeholder Engagement Plan

The stakeholder engagement plan will define the approach to maintain a social licence to operate[2] among project-affected communities and will address:

- effective messaging, including: construction safety awareness, communicable diseases, employment opportunities and limitations, expectation management, grievance procedure
- activities of community liaison officers
- information sharing
- community relations training
- initiatives to establish good community relations
- the grievance procedure.

10.7.9 MP09: Resettlement Action Plan

The resettlement action plan will define the approach for addressing physical or economic displacement of project affected persons (PAPs) and will detail:

- the applicable national and international laws, policies and standards that will govern the resettlement programme and the land acquisition process
- the methods of identifying PAPs
- resettlement, valuation and compensation mechanism for planned activities and accidental damage
- livelihood restoration process for land and water-based livelihoods
- stakeholder engagement and participation.

10.7.10 MP10: Labour Management Plan

The labour management plan (LMP) will define the approach to ensure recruitment practices and working conditions comply with legal requirements and project standards.

The LMP will:

- comply with international labour standards, National labour laws and regulations concerning transparency, accountability, anticorruption and human rights
- recognise workers' right to trade union representations and organise collective bargaining
- provide suitable working conditions, including rest facilities and breaks
- provide a mechanism for compliance with the International Labour Organisation Maternity Protection Convention (2000)
- respect workers' rights to privacy including data protection requirements.

The LMP will include:

- recruitment policies and process, including guidance for local recruitment

[2] A social licence to operate exists when a project has ongoing approval or acceptance within the local community and other stakeholders.

- provision for national content, development of local enterprise and capacity development
- location and operation of recruitment centres
- labour contracts, including workers' rights, workers' conduct, camp rules and workers' grievance procedure
- disciplinary procedures
- a retrenchment plan to manage retrenchment at the end of the construction phase
- workforce environmental and social training and awareness programmes, and local skills development
- training to ensure workforce have the skills to perform their responsibilities.

10.7.11 MP11: Project Induced In-Migration Management Plan

The project induced in-migration management plan will define the approach to prevent project induced in-migration and manage associated impacts and will address:

- measures to avoid or minimise consequences associated with the in-migration of people into project areas due to the project's presence and activities.
- measures to manage planned and unplanned in-migration and the indirect impacts of this on biodiversity and host communities.

10.7.12 MP12: Procurement and Supply Chain Management Plan

The procurement and supply chain management plan will define the approach to supply chain management including environmental, social and quality considerations, maximise the purchase of local goods and services, and will address:

- procurement and supply standards
- national content policy for local business and community development
- third-party vendors of services, materials and products
- third-party aggregate extraction and batching facilities
- capacity development
- ring-fencing contracts
- workers' rights compliance.

10.7.13 MP13: Infrastructure and Utilities Management Plan

The infrastructure and utilities management plan will define the approach to monitor use of, or accidental damage to, infrastructure and utilities, define the process of corrective action and will address:

- crossing schedule and planning
- use of public roads and associated infrastructure
- utilities and service integrity
- irrigation and drainage systems
- flood control

- buildings.

10.7.14 MP14: Community Health, Safety and Security Plan

The community health, safety and security plan will define the approach to manage community health, safety and security matters and will address:

- community health including the management of sexual and communicable diseases, and vector control plan
- construction activity awareness and community safety
- community security.

10.7.15 MP15: Occupational Health, Safety and Security Plan

The occupational health, safety and security plan will define the management of workforce occupational health, safety and security and will address:

- camp workforce health and wellbeing
- drug and alcohol policy
- camp facilities, including health clinics and potable water provision
- workforce fitness for work, sexual and communicable diseases prevention plan, vaccine preventable diseases management plan and vector control plan
- pest control and appropriate measures to reduce workforce interactions with wildlife (e.g., reptile control at camp-sites)
- safe procedure should unexploded ordnance be encountered during construction and or operation activities.

10.7.16 MP16: Transport and Road Safety Management Plan

The transport and road safety management plan will guide project logistics and support community and driver road safety during project related transportation activities and will address:

- definition of project transport routes
- local road upgrades
- notification of over-sized loads
- **p**ayload monitoring
- journey management, including convoys and scheduling of traffic movements
- suitable diversions routes during temporary closure of roads
- safety awareness education for local communities
- signage of hazards.

10.7.17 MP18: Emergency Preparedness and Response Plan

The emergency preparedness and response plan will define the approach to emergency preparedness and response and will address:

- emergency risk analysis, emergency preparedness and response planning and definition of the relationships with contractors' emergency response plans

- incident management, including spill response planning, location of emergency response equipment and personal protective equipment (PPE), material recovery and remediation techniques
- the type and content of emergency response exercises and the minimum personnel participation in these exercises
- the location of emergency response equipment; minimum equipment and PPE at these locations
- roles and responsibilities and specify communication and notification requirements (according to Tier 1, 2 and 3 thresholds).

10.7.18 MP19: Monitoring and Reporting Plan

The monitoring and reporting plan will define the approach to ensure that:

- monitoring, inspections and audits are undertaken in a systematic way
- the implementation of the environmental and social mitigation measures is monitored
- monitoring programmes would involve appropriate external stakeholders such as local government and civil society
- data on environmental and social conformance is gathered
- investigation of non-conforming monitoring results
- internal and external reporting requirements are met

The monitoring approach for potential impacts is described in the ESMP matrix (Appendix J), with monitoring parameter(s), target criteria and monitoring frequency. The plan will address:

- a monitoring programme identifying monitoring locations (based on sensitive valued environmental and social components and receptors) and monitoring methodologies
- environmental and social inspections and audit programme
- non-compliance management
- monitoring results tracking system
- responsibilities for reporting, content, level of detail and format of reports and reporting deadlines
- internal and external notifications and reporting.

10.7.19 MP20: Decommissioning Plan

The decommissioning plan will define the decommissioning of operation[3] infrastructure at the end of the life of the project and will:

- identify applicable laws and standards that will guide the decommissioning process
- define a schedule during the project life for developing a decommissioning process, including financing arrangements
- outline the approvals process for decommissioning

[3] Decommissioning of construction phase infrastructure will be addressed in the reinstatement plan (see Section 10.7.1.7).

- define the environmental and social evaluation process.

10.8 Supporting Subplans

The management plans described in Section 10.7 define the minimum requirements based on the findings of the ESIA.

There will be a requirement for other, more specialised supporting subplans to be developed, including but not limited to:

- location-specific biodiversity management plans specifying features and species for retention and protection, translocation, biorestoration requirements
- plans for erosion and sediment control and reinstatement for areas of fragile, sensitive or thin topsoil, side slopes or narrow ridges and at watercourse crossings
- management of chemicals
- radiation protection plan to manage risks from the use of radiography to test pipeline welds, includes emergency procedures, contingency plans and emergency response training
- OHSSP subplans, addressing, amongst other things, substance misuse, malaria (and vector controls) and communicable diseases.

The subplans, as with all the primary management plans, will be revised annually or more frequently if required, in response to project evolution, new information and or adaptive management.

10.9 Training Needs and Capacity Building

10.9.1 Training Needs

An environmental and social training programme will be implemented and will include a system for assessing the competence and training needs of staff.

The environmental and social training programme will include:

- induction training – both worksite induction and construction camp induction
- worker awareness training, including:
  - toolbox talks to be conducted as a minimum prior to any new work activity or work at a new site to include site-specific requirements such as sensitive vegetation, features of biodiversity and cultural heritage value to be protected
  - workers' rights and grievance procedure
  - health awareness
- financial literacy
- skills training to:
  - ensure competent and safe performance of duties, appropriate to the work being performed
  - training that optimises skills development for local staff.

10.9.2 Capacity Building

The LMP and the procurement and supply chain management plan will identify priorities for capacity development and measures to increase the capacity of the project workforce, contractors and sub-contractors. Capacity development priorities include:

- waste management
- safe driving
- handling of chemicals
- rules of engagement for security personnel
- basic health and safety training
- first aid training.

10.10 Management of Change

Changes to the project may occur subsequent to preparation and submission of this ESIA. A management of change procedure will be implemented, that includes:

- environmental and social appraisal of the change, including the identification of new or revised mitigation measures
- health and safety evaluation
- consultation with engineering and H3SE disciplines
- consultation with NEMA on the need for amendments to the ESIA permit
- management of change approval process.

Following management of change approval, changes to the ESMP and supporting management plans will be implemented.

10.11 Estimated Costs

Estimated costs have been developed before finalisation of the HGA between the Government of Uganda and the project, detailed project engineering and other associated commercial agreements. These costs should therefore be considered as estimates and are most likely to change with further definition of the project.

The costs are based on technical experience from implementation of similar projects. As it is challenging to monetise financial costs associated with some environmental loss or disturbance and costs to communities, the costs considered are those associated with mitigation and monitoring of potential impacts. The costs considered include:

- RAP planning and implementation in excess of USD 50 million (subject to final approval of valuation reports and signing of the agreements with project affected persons)
- Environmental mitigation through design and engineering for an estimated USD 10.7 million other environmental mitigation measures for an estimated USD 0.6 million per year and environmental monitoring for an estimated USD 1.3 million
- Management and mitigation of community impacts for an estimated USD 2.9 million including livelihood restoration initiatives.

Responsibilities for stakeholders, especially regulators, is expected to include:

- site inspections during construction and operation
- compliance audits associated with the ESMP during construction and operation
- review of routine reporting submissions such as those associated with permits and licenses
- as necessary, review of change management submissions.

As the project progresses and there is clarity on approval, permitting and licensing requirements, the project will collaborate with regulators on the planning of joint ESMP implementation responsibilities.

11 SUMMARY AND RECOMMENDATIONS

11.1 Introduction

This section provides a summary of the ESIA process and provides recommendations.

11.2 Stakeholder Engagement

Stakeholder engagement has been an integral part of the development of the EACOP. It is also an integral component of the environmental and social impact assessment (ESIA) process and the foundation for developing and maintaining the project's social licence to construct and operate. It has been undertaken in accordance with the requirements of Ugandan legislation, international requirements as set out in the Equator Principles III and the International Finance Corporation Performance Standards (IFC) (2012) and EACOP principles, protocols and policies for stakeholder engagement.

Stakeholder engagement has been inclusive of all stakeholder categories, including government, civil society, directly and indirectly affected people and communities, with a particular attention paid to the needs of women and those vulnerable to potential impacts. It also included engagement activities regarding human rights.

Stakeholder engagement has been tailored to fit the EACOP project, the ESIA process and the local context, including the nature of the stakeholders. A Stakeholder Engagement Plan (SEP) to support effective engagement throughout the ESIA process was developed. It provides direction for the ESIA engagement approach, stakeholder identification, specific engagement plans for the different ESIA phases and the key deliverables from engagement activities. It focuses on:

- a stakeholder identification and analysis process
- methods, materials and protocols for stakeholder engagement including information disclosure, consultation, and reporting to stakeholders
- the ESIA stakeholder engagement activities
- a data management system for all stakeholder data and minutes of meetings for analysis and follow up
- a project grievance procedure, which also serves as the ESIA grievance procedure.

Stakeholder engagement was conducted during the scoping phase, the baseline and impact assessment phase and pre-ESIA submission to fulfil the objectives. The objectives of stakeholder engagement included:

- obtaining an understanding of the number and types of stakeholders in the socioeconomic study area
- informing stakeholders about the ESIA baseline studies in the areas traversed by the project and associated infrastructure
- obtaining stakeholder input into the scope of the ESIA, including the development of valued environmental (and social) components (VECs), impact

identification, mitigation measures and potential sources of cumulative impact and impact mitigation

- listening to questions and concerns from stakeholders and ensure these are addressed in the ESIA
- conducting pre-submission meetings to consult a sample of potentially impacted local stakeholders, prior to the submission to NEMC to acquire their feedback on ESIA findings (impacts and mitigation measures), cumulative impact assessment and mitigation measures.

The engagement provided stakeholders with information about the project and the ESIA, including the engagement process and grievance management. It also provides a mechanism for ongoing stakeholder engagement.

11.2.1 Stakeholder Concerns

A summary of the stakeholder concerns raised and how the project intends to address them is provided below.

11.2.1.1 Socio-economic and Health

Most stakeholder concerns related to socio-economic and health matters.

Stakeholders raised concerns over land acquisition and compensation for loss of land, livelihoods and properties. The difficulty of finding and acquiring replacement land, the timing of compensation and compensation needs for land-owners and tenants were also raised. There were also concerns about forced resettlement, choice of host area and livelihood restoration, and clarifications were sought about the project right-of-way (RoW).

Stakeholders were informed that the project will manage land acquisition by developing a resettlement action plan (RAP) and a livelihood restoration plan (LRP) and that compensation will be provided in accordance with national law and international standards and before construction begins. It was explained that during construction a permanent 30-m RoW would be required, and a permanent 10-m RoW for operations.

Concerns were raised about project induced in-migration (PIIM), influx management and PIMM related impacts. Stakeholders were informed that an in-migration management plan will be developed and implemented with the objective of reducing the number of people that come to the project-affected communities (PACs) for either direct or indirect project opportunities.

Stakeholders were interested in employment opportunities and procurement opportunities for local people, particularly for women and youths. In response, stakeholders were informed that a transparent recruitment strategy would be developed and shared with communities; about the local content plan developed to maximise the purchase of goods and services from within Uganda; and about the procurement and supply chain management plan which reinforces the use of local workers and suppliers.

Community health and safety concerns were raised, with questions asked about the potential health impacts of the project, including the spread of communicable diseases, road safety, and potential impacts on water quality and of dust generation

water quality. In response, information was provided about the health impact assessment and the traffic impact assessment included in the ESIA, the community health, safety and security plan containing the appropriate mitigation, and the pollution prevention plan including dust suppression measures. Stakeholders were also advised that water quality will be monitored regularly and alternative community water sources will be provided where access to water sources would be restricted by construction. It was noted that the project construction workforce would be accommodated in camps with health and recreational facilities to avoid impacts on local health and other public infrastructure, that camps would be closed and that interactions with local communities would be discouraged.

11.2.1.2 Physical Environment

Stakeholders raised concerns that the heat from the pipeline would affect the soil productivity and the potential effects on community water sources. The stakeholder engagement team explained that the pipe would be insulated and that the heat from the pipe would not affect soils or crop productivity, and informed stakeholders of the pollution prevention plan which includes measures to minimise impacts on water sources.

Concerns were raised about potential project impacts on air quality and climate change. The stakeholder engagement team explained that the project engineering team will ensure compliance with applicable emission standards.

11.2.1.3 Biodiversity

Stakeholders raised concerns about the impact of the project on Lake Albert fisheries and impacts on biodiversity in the project area, including impacts on sensitive ecosystems, the interconnectivity of habitats for migratory and endemic species and loss of biomass. Stakeholders were informed that the selection of the pipeline route included consideration to avoid environmental and social sensitivities and that the pipeline will be constructed along existing infrastructure corridors where feasible. They were also informed of the biodiversity management plans and the project aims for no net loss for biodiversity.

11.2.1.4 Project and ESIA-Related Matters (Including Stakeholder Engagement)

Questions were asked about the ESIA, a definition of the AOI and the grievance mechanism. Stakeholders also requested information about pipeline routing and project design. The stakeholder engagement team informed stakeholders about the ESIA process and stakeholders were advised on the various levels of handling grievances within the grievance procedure. Feedback was also provided on project design such as pipeline routing, including emphasis of the fact that the route would only be finalised once all studies were completed, oil spill contingency and emergency response planning, and security planning.

11.2.2 Grievance Procedure

EACOP has established a non-judicial grievance procedure to respond to stakeholders' concerns and to facilitate resolution of stakeholders' grievances. The grievance procedure is compliant with the United Nations Guiding Principles on

Business and Human Rights effectiveness criteria for project level grievance mechanisms.

The grievance procedure describes the process available to stakeholders for lodging a grievance during pre-construction, construction and project operations, and is accessible to all stakeholders at no cost and without retribution. Judicial and administrative options can also be pursued by stakeholders.

The project's grievance procedure has been presented to stakeholders during each consultation phase and is managed by EACOP staff (CLO and grievance administrator).

11.2.3 Ongoing Stakeholder Engagement

Post submission stakeholder engagement on the disclosure of the ESIA report will be undertaken after the ESIA report has been submitted to the regulators. The engagement will focus on key stakeholders identified in the scoping and baseline phases. The government EIS disclosure will be conducted in concordance with the National Environmental Act (1998).

Following the ESIA disclosure phase, the project stakeholder engagement team will continue to engage with stakeholders at national, regional and local level throughout the project lifecycle to further discuss the results of the ESIA and how stakeholder concerns have been considered in the ESIA. The engagement strategy will also include targeted engagement with identified vulnerable stakeholders or their representatives.

Engagement activities will be adjusted to reflect evolving project activities, stakeholder preferences and concerns over the life of the project. The project will also seek to build partnerships with NGOs, CSOs and communities to support the development and implementation of practical impact management strategies.

During the construction phase of the EACOP project, local community offices will be established at locations along the route to provide stakeholders direct access to community relation coordinators (CRCs), community liaison officers (CLOs) and grievance officers.

The grievance procedure will continue to provide opportunities for stakeholders and PACs to express grievances about project activities.

A stakeholder engagement monitoring and evaluation programme will be developed to ensure efficient and effective stakeholder engagement, in parallel with community awareness programmes.

11.3 Impacts – Normal Operations

A primary project objective is to design, construct and operate and decommission a pipeline and its AGIs with minimal risk, injury or harm to personnel, host communities and their ecosystem services.

Potential impacts on biodiversity, the physical environment, socio-economic and health, and cultural heritage during the construction, operation and decommissioning phases are considered in the ESIA. These include:

- biodiversity:
  - permanent loss of habitat from operational RoW
  - PIIM to areas around the main camp and pipe yard (MCPY) causing increased pressure on natural resources
  - stress or mortality to flora and fauna
  - Loss of chimpanzee habitats and disturbance to chimpanzees
  - reduced primary productivity in watercourses
  - temporary or permanent loss of breeding and foraging habitat
  - modified habitats due to non-native species establishment
  - loss of ecological function and integrity of protected sites
- physical environment:
  - loss of soil structure, drainage, fertility and seed bank
  - soil contamination
  - contamination of surface and groundwater
  - deterioration of water quality
  - decreased water level due to abstraction for project use
  - reduced air quality from combustion of fuel in construction equipment and vehicles
  - disturbance or nuisance from noise from construction on the RoW and traffic movement
- socio-economic and health:
  - dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities
  - competition over employment opportunities
  - inflation and effects on supply owing to project procurement
  - increased transportation costs and travel time with economic consequences
  - permanent loss of land used for crop farming and grazing
  - permanent loss of natural resources
  - temporary loss of access to fishing grounds (rivers, Lake Albert, dams and ponds)
  - permanent loss of private land due to project land acquisition
  - land and property speculation by landowners and third parties
  - increased risk of vector-related diseases amongst the local workforce
  - traffic congestion leading to delays
  - increased pressure on regional waste management facilities due to project activities
  - an increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases
  - nutrition of PACs compromised by reduced food security
  - community health and safety incidents associated with accidents during construction
  - change in local community dynamics due to employment opportunities
  - damage, disturbance or disruption of access to cultural heritage.

The potential impact of the project on climate change has also been assessed.

Management plans and mitigation measures are actions or systems that have been or will be used to enhance the benefits provided by the project or avoid, remove, reduce or compensate for negative impacts. Mitigation of potential impacts has been an integral part of the EACOP project design and ESIA process that will continue through detailed design, construction, operation and decommissioning.

The design and construction of pipelines has evolved over many years and a substantial body of good design, construction and operational practices that contribute to impact mitigation exist. Standard good practices are being implemented by the project, including:

- minimisation of the overall footprint
- burying the entire pipeline along the route to reduce permanent habitat fragmentation, interference by third parties and security concerns
- measures to reduce sediment release during watercourse crossings
- measures to reduce sediment runoff to watercourses, such as silt fences
- reinstatement of the RoW and construction facilities after completion of construction
- waste reduction and waste segregation
- soil management measures to enhance natural revegetation after reinstatement including topsoil segregation and erosion control
- maximising local employment
- development and implementation of a resettlement policy framework
- implementation of an archaeological watching brief during topsoil stripping and trench excavation to ensure damage to unknown archaeological sites is reduced.

The ESIA process has included identifying potential significant impacts and technically and financially feasible and cost-effective means of mitigating location specific impacts.

Where a potential impact has been identified, a hierarchy of options for mitigation has been considered including:

- avoiding at source – remove the source of the impact
- abating at source – reduce the source of the impact
- attenuating – reduce the impact between the source and the VEC
- abating at VEC – reduce the impact at the VEC
- remedying – correct the impact after it has occurred
- compensating or offsetting – replace in kind or with a different resource of equal or better value.

The EACOP project will develop and implement a biodiversity action plan incorporating enhancement and conservation measures to meet this requirement.

The assessment of impacts and the application of mitigation measures is an iterative process, which continues until an impact is deemed as not significant as reasonably practicable. Residual impacts are those that remain after the completion of this process.

Section 11.3.2 presents the significant residual impacts remaining after mitigation, and the procedure for decommissioning. Beneficial pipeline impacts are discussed

in Section 11.3.1. All potential ecosystem services related impacts are addressed in VEC impact assessments (Section 8).

Pre-mitigation impacts and their significance as well as post mitigation significance are provided in Appendices E2 and E3.

11.3.1 Beneficial Impacts

A number of potential project impacts, predominantly relating to socio-economic VECs will be beneficial, including:

- contribution to the national economy from investment
- generation of national and local employment opportunities
- provision of training and skill development opportunities
- opportunities for national and local businesses through project procurement
- improvement in the health and safety of employees from disease awareness and reduction programmes
- increased knowledge and recording of tangible and intangible cultural heritage.

Where possible, enhancement measures will be implemented to increase the benefits to local people, and the local and national economy.

11.3.2 Significant Residual Project Impacts

The impact assessment process included applying proposed mitigation to the potential project impacts identified for each VEC. Table 11.3-1 summarises the number of generic and location specific impacts assessed and the mitigation measures for each VEC group. The significance of impacts was then re-assessed.

Based on the mitigation measures planned, including for aspects of biodiversity, for which further enhancement and conservation measures will be developed and implemented through the production of a site specific Biodiversity Action Plan and support for ongoing forest conservation initiatives, no significant residual impacts are predicted.

Table 11.3-1 Impacts Assessed and Mitigation Measures

	Generic Impacts	Generic Impact Mitigation Measures	Location-Specific Impacts	Location-Specific Impact Mitigation Measures
Biodiversity	33	49	33	28
Physical Environment	25	33	101	36
Social	59	51	158	42

11.3.3 Transboundary Impacts

No significant residual transboundary impacts were identified.

11.3.4 Cumulative Impacts

The Hoima Municipality is likely to experience a general economic boost due to the beneficial cumulative impacts from employment, training and purchasing associated with the EACOP project and its associated facilities (Tilenga and Kingfisher projects), and other third-party developments.

The upgrade of the EACOP project access road and the third-party road upgrades is also a long-term beneficial cumulative impact, which will enhance access to the national road network and to health care and reduce travel times including response times in emergency situations.

After mitigation measures have been implemented, a potential cumulative impact remains significant:

- The EACOP project, associated facilities and other third-party developments will change the characteristic rural quality of the landscape and visual receptors around PS1, although the contribution from the EACOP project and associated facilities is small.

The EACOP project and associated facilities will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. An example is the joint forest conservation initiative mentioned below.

Enhancement and conservation measures that will be developed and implemented through the production of a site specific Biodiversity Action Plan and support for ongoing joint forest conservation initiatives will not only reduce the project impact on chimpanzee habitat but will also reduce the potential cumulative impacts from associated facilities and third party projects.

11.3.5 Associated Facilities

Tilenga Project, Kingfisher Oil Project and concrete batch plants, borrow-pits and waste management facilities (where they meet the IFC definition of associated facilities) have been identified as associated facilities (AFs). The locations of concrete batch plants, borrow-pits and any waste disposal sites required have yet to be defined and so will be subject to the management of change process.

The beneficial impacts of the Tilenga Project and Kingfisher Oil Project are similar to the EACOP project, e.g., increased economic growth, increased employment opportunities and improved health planning.

The Tilenga Project and Kingfisher Oil Project have significant residual impacts on biodiversity and social VECS, particularly impacts relating to PIIM, as well as impacts on surface water, the acoustic environment and landscape character. While the Tilenga feeder pipeline is part of the Tilenga project, the residual impacts are presented separately as a separate ESIA has been produced for the feeder pipeline, however there are no significant residual impacts from the Tilenga feeder pipeline.

11.4 Impacts – Abnormal Operations and Unplanned Events

Unplanned events considered in the ESIA include:

- traffic accidents
- fires
- damage to third-party assets
- release of diesel from fuel storage tanks at the MCPY and construction sites
- release of hydrotest water during commissioning
- oil spills
- sabotage
- geophysical hazards.

The pipeline engineering design criteria were adopted with an aim to reduce the probability and consequences of unplanned events that could lead to impacts on social or environmental receptors. At each stage of the design process, a series of health, safety and environmental (HSE) studies have been, and will continue to be, undertaken.

The project has completed a technological risk assessment (TRA) during front end engineering design (FEED) in accordance with the Tilenga feeder pipeline HSE risk assessment methodology. The TRA has been undertaken to inform:

- the design process
- the ESIA process, and the development of mitigation measures.

Additional risk assessment will be undertaken during detailed engineering and construction planning.

An emergency response plan will be prepared which clearly identifies possible emergency scenarios, sets out actions to be taken in the event of an emergency, and defines resources that will be made available to respond to an emergency event. It will comprise of several management plans and procedures, such as an oil spill contingency plan, spill management and response plan, and a community health, safety and security plan.

Work has been undertaken that supports the establishment of a preliminary rating of the risks and related significance, based on existing engineering knowledge and project design and professional judgement.

The pipeline will have risks reduced through:

- design and construction mitigation
- health, safety, security, society and environment (H3SE) systems and procedures
- emergency response planning.

The project has considered design and construction opportunities to reduce risk during construction and operation throughout the design process and will have in place an HSE management system with which contractors will be required to comply during construction.

11.5 Decommissioning

The project components (i.e. pipeline, PS) will be decommissioned based on Ugandan regulations and standards and international standards and protocols.

A decommissioning plan, which includes a social management component that addresses the impact of decommissioning (loss of jobs, economic activity), will be prepared and the scope will be developed in consultation with stakeholders at that time. The decommissioning plan for the construction facilities will ensure that all the project components that were required for constructing the pipeline, but that will no longer be required during the operational phase, are removed and land is returned to the Government. The decommissioning plan will include specific consideration of unplanned events which may occur during decommissioning consistent with EACOP project requirements.

11.6 Environmental and Social Management Plans

In accordance with the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014, an environmental and social management plan (ESMP) has been developed.

The project ESMP is consistent with the EACOP code of conduct and H3SE policy, and charters.

The ESMP presents monitoring parameters and proposed performance indicators and targets that will steer environment and social performance toward continuous improvement. A comprehensive reporting system will also be developed.

A suite of management plans will be prepared to support implementation of the ESMP. Minimum content of these management plans are the mitigation commitments developed throughout the ESIA.

A separate suite of management plans will be drafted for:

- construction
- operations.

The following is a list of the management plans that will be developed prior to the commencement of construction and operation activities. Tables of content for the management plans are included in Appendix E5.

- biodiversity management plan
- pollution prevention plan
- waste management plan
- natural resource management plan
- soil management plan
- cultural heritage management plan
- reinstatement plan
- stakeholder engagement plan
- resettlement action plan

- labour management plan
- project induced in-migration management plan
- procurement and supply chain management plan
- infrastructure and utilities management plan
- community health, safety and security plan
- occupational health, safety and security plan
- transport and road safety management plan
- emergency preparedness and response plan
- monitoring and reporting plan
- decommissioning plan.

Changes to the project may occur subsequent to preparation and submission of this ESIA. A management of change procedure will be implemented, that includes:

- environmental and social appraisal of the change, including the identification of new or revised mitigation measures
- health and safety evaluation
- consultation with engineering and H3SE disciplines
- consultation with NEMA on the need for amendments to the ESIA permit
- management of change approval process.

After management of change approval, changes to the ESMP and supporting management plans will be implemented.

11.7 Recommendations

This ESIA has been prepared by an experienced team with extensive pipeline engineering, environmental and social impact assessment knowledge, including Ugandan partners with expertise in ESIA development in the Ugandan oil and gas sector. The team has quantitatively and qualitatively identified and assessed potential interactions between the project and VECs in the project AOI. The recommended measures, consolidated in the ESMP, which are either incorporated into project design, or actioned during project implementation, are intended to mitigate the impacts and their significance.

The EACOP project, with due consideration to the management of associated environmental and social impacts, will:

- contribute to economy
- provide business opportunities for different sectors of the economy and enhance capacities of local companies
- provide employment, knowledge transfer and skills development opportunities during construction and operation.

As these are benefits in the public interest, it is requested that NEMA approve this environmental impact statement.

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Appendix A: Baseline Reports

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GLOSSARY AND ACRONYMS

A	
AOI	area of influence
B	
bioquality	aspect of a plant community's conservation value, derived from the concentration of restricted range species occurring in the community
Black Star species	plant species of highest conservation concern as a result of their very small global area of occupancy
Blue Star species	plant species of modest conservation concern as a result of their somewhat restricted global range (24 degrees square on average)
D	
DMU	discrete management unit – defined in IFC PS6 as an area with a definable boundary within which the biological communities or management matters have more in common with each other than they do with those in adjacent areas.
E	
EACOP	East African Crude Oil Pipeline
ESIA	environmental and social impact assessment
F	
FAO	Food and Agriculture Organisation of the United Nations
FR	forest reserve
G	
GHI	Genetic Heat Index – a measure of the conservation importance of vegetation. High index represents higher importance. A continuous metric used to measure bioquality.
GIS	geographic information system
Gold Star species	plant species of high conservation concern as a result of their small global area of occupancy
Green Star species	plant species of no conservation concern with respect to their area of occupancy. Could be of concern owing to other characteristics, such as local use, or ecological dominance.
I	
IBA	Important Bird Area
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
K	
KBA	key biodiversity area
KP	kilometre point

L	
LIDAR	light detection and ranging: an airborne or satellite-borne detection system that works on the principle of radar, but uses light from a laser and is used to map topography
M	
MCPY	main camp and pipe yard
P	
PS6	IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
R	
RBS	Rapid Botanic Survey
RoW	right-of-way
S	
sp. and spp.	abbreviation of species, singular and plural
Star rating	conservation rating for a species derived from the global range of the plant species, in terms of the number of degree squares in which a species is recorded as being present in (worldwide)
V	
VEC	valued environmental component
W	
WCS	Wildlife Conservation Society

A1 BOTANY BIODIVERSITY BASELINE REPORT

A1.1 Introduction

This baseline report describes the habitats and flora:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions:
  - floral communities of conservation importance
  - floral species of conservation importance
  - forest reserves (FRs) and other protected areas
  - ecosystem services provided
  - sensitivity rankings
- key considerations.

FRs and other protected areas are included in this baseline report to assess the conservation importance of those protected areas in terms of habitat structure and quality, to identify the presence of globally rare vascular plants and to identify current threats and management measures focused on habitats and plants of conservation importance.

A1.2 Area of Influence and Study Area Boundaries

A1.2.1 Area of Influence Boundary

The spatial AOI encompasses the project footprint and areas within an ecologically relevant distance of the project to account for habitat connectivity and potential direct and indirect project-related impacts (i.e., effects of habitat loss, facilitated access, habitat fragmentation, edge effects and spread of invasive species).

Where appropriate, the AOI includes downstream wetland and riparian habitats that are potentially at risk from project-related impacts (e.g., from accidental spills or sedimentation). Using a precautionary approach, the spatial AOI for habitats of conservation importance was generally defined by a 2-km-wide corridor centred on the pipeline route.

Most impacts to habitats, protected areas and species of conservation importance will occur during the construction phase and early operation. Indirect impacts such as human influx, including access to previously difficult-to-access land, may extend beyond this duration. As such, the temporal AOI is defined as the construction period and the time required for habitat to be re-established to preconstruction condition. For new access roads and parts of construction facilities that may be transferred with the land to a third party when no longer needed for project use, the impacts will be considered permanent.

A1.2.2 Study Area Boundary

The study area is the same as the AOI; this provided a sufficient area over which to assess the potential effects of the project.

The 2-km-wide corridor was the focus of the habitat mapping work (Section A1.2.4). A map of the sites surveyed is provided in Section A1.2.5.

A1.2.3 Secondary Data

Secondary data were used to inform survey site selection and provide context to the information returned from the field surveys.

Secondary data sources included:

- light detection and ranging (LIDAR) data and satellite imagery
- Protected Planet (2018)
- The Vegetation of Africa, a Descriptive Memoir (White 1983) – to Accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2017-3) database
- Ugandan Red List (WSC 2016)
- The Flora of Tropical East Africa (FTEA) 1948–2012 (Royal Botanic Gardens, Kew 2016)
- Field Guide to Common Trees and Shrubs of East Africa (Dharani 2011)
- Field Guide to Acacia of East Africa (Dharani 2006)
- The diversity and distribution of climbers and trellises in some forests of the Albertine Rift, western Uganda (Eilu 2003)
- Density and diversity of tree species in forests of the Albertine Rift, western Uganda (Eilu, Hafashimana and Kasenene 2004)
- Distribution patterns of forest trees in Uganda and their historical significance (Hamilton,1974)
- Nature conservation in Uganda's protected forest reserves (Howard 1991)
- Diversity and distribution of vascular plants in the Important Bird Areas of Uganda (Kalema 2005)
- Patterns of plant diversity in Uganda (Kalema and Bukenya-Ziraba 2005)
- Conservation checklist of the trees of Uganda (Kalema and Beentje 2012)
- The use of herbarium plant databases in identifying areas of biodiversity concentration: the case of family Acanthaceae in Uganda (Kalema 2008)
- Kenya trees, shrubs and lianas (Beentje 1994)
- Global Invasive Species Database – Version 2015.1 (April 2018)
- citation sheets and management plans for protected areas, where available
- publicly available scientific literature, information and studies
- environmental and social impact assessments (ESIAs) and other technical studies relevant to the AOI.

A1.2.4 Habitat Mapping

Habitat mapping was undertaken using remote sensing, which is an effective approach used to map remote habitats across large areas. It was then refined using data collected from the botanical field surveys.

A1.2.4.1 Data Acquisition

The European Space Agency's Sentinel-2 satellite imagery was considered the most suitable for habitat mapping owing to its 10-m pixel size, 10 multispectral bands and five-day repeat coverage. Wet and dry season imagery was acquired to observe seasonal changes to key habitat types. Figure A1.2-1 shows the Sentinel-2 coverage along the pipeline route.

Four separate images were required to cover the full project extent in Uganda. Table A1.2-1 summarises the acquisition date for each Sentinel-2 image used in the habitat mapping. The project area's proximity to the lower left corner of Tile 36NUG resulted in it having to be covered using two different images.

In addition to satellite imagery, the following data sets have been used in the mapping:

- tree height data derived from LIDAR surveys undertaken in 2017 (East African Crude Oil Pipeline [EACOP])
- slope data derived from the LIDAR Digital Elevation Model (DEM) (EACOP)
- very-high-resolution aerial imagery (EACOP)
- existing Africover land cover mapping (FAO).

Figure A1.2-1 Satellite Image Coverage of the Pipeline Corridor

Table A1.2-1 Sentinel-2 Image Capture Dates

Image Tile Name	Image Acquisition Date	
	Dry Season	Wet Season
36NTG	14 December 2017	7 June 2017
36NUG	14 December 2017 (West)	7 June 2017 (West)
	15 January 2017 (East)	6 December 2016 (East)
36NUF	15 January 2017	6 December 2016
36MUE	25 January 2017	21 November 2017

A1.2.4.2 Image Preparation and Enhancement

Each of the satellite images was enhanced using specialist software to reduce effects such as topographic shading, light and shadows from solar illumination and forest fires. Each Sentinel-2 image was clipped to match the 2-km-wide LIDAR data corridor captured in 2017.

A1.2.4.3 Integration of Survey Data into Desk-Based Habitat Mapping

Physiognomic habitat classes were selected for mapping using the satellite imagery based on their occurrence throughout the project area and readily distinguishable differences in height and density. These habitat classes, shown in Table A1.2-2, are derived primarily from the physiognomic types defined by White (1983).

The data collected during the botanical surveys were used with the high-resolution aerial imagery to inform the analysis of the satellite imagery into the physiognomic habitat classes; see attachment A1.1 Habitat Map. One of the key benefits of using remote sensing to map the physiognomic habitat classes is the ability to generate mapping over a very large area using data from a limited number of surveyed sites. A total of 260 example sites from the four images were studied, proportional to the distribution of the physiognomic habitat classes present in the AOI.

Table A1.2-2 Physiognomic Habitat Classes in the Area of Influence

Habitat Class	Summary of Description
Natural Habitats	
Forest	Semi-evergreen rainforest, with canopy >10 m high and emergent trees evident. Crowns generally interlocking
Swamp and Riparian Forest	Tall woody vegetation (>10 m in height) occurring within lower parts of the landscape with evidence of inundation and proximal to other wetland vegetation
Woodland	Open stands of trees of at least 8 m in height – canopy cover of 40% or more. Crowns never interlocking. Usually a layer of grass species dominates ground-level vegetation
Bushland	Open stands of bushes (usually 3–7 m tall) with a canopy cover of 40% or more
Wooded Grassland	Open woodland habitat dominated by *Combretum* sp. around native grasslands Trees >7 m tall, bushes (3–7 m), dwarf trees and shrubs <2 m tall
Wetland	Permanent or seasonally inundated wetland area dominated by closed canopy of papyrus. Habitat periodically harvested in large uninterrupted tracts
Modified Habitats	
Shrubland	Open or closed stands of shrubs up to 2 m tall
Cultivation/ Pasture	Mosaic of small-scale cropping, fallow, tree-crops (banana or coffee) and human settlements. A modified grassland habitat with clear evidence of livestock grazing
Plantation	Monoculture of woody species cultivated for timber production

A1.2.4.4 Classification of Imagery in Habitat Maps

Each Sentinel-2 tile was processed using the Random Forests algorithm in the ERDAS IMAGINE geospatial tool; this allocates a habitat type, based on the statistical similarity, to each homogeneous area. This is a widely recognised geospatial tool commonly used to map large areas.

Following the automated classification of physiognomic habitat classes described above, the ESIA project team corrected any anomalies in the classification of the habitat types.

Maps showing the habitat types are presented in Attachment A1.1.

A1.2.4.5 Categorisation into Modified and Natural Habitats

Habitats were further categorised into modified and natural habitats in accordance with IFC Performance Standard 6 criteria (IFC 2012), which defines these as follows:

- Natural habitats are areas composed of viable assemblages of plant or animal species of largely native origin, or where human activity has not essentially modified an area's primary ecological functions and species composition.
- Modified habitats are areas of land that support a large proportion of flora and fauna species that are non-native in origin, or where human activity has substantially modified an area's primary ecological functions and species composition.

Areas composed of shrubland habitat were considered transitional habitat. These areas are included as modified habitats.

A1.2.5 Field Surveys

The baseline habitat and flora survey followed the Rapid Botanic Survey (RBS) methodology (Hawthorne and Marshall 2016) and was undertaken by Dr James Kalema, Ahmad Bukenya, Kennedy Mullasa, Serunjugi Derick (botanical specialists from Makerere University) and Dr William Hawthorne and Dr Cicely Marshall (botanical specialists from the University of Oxford).

This approach is advantageous as the RBS assessment process addresses the data gaps of the IUCN Red List of Threatened Species (IUCN 2017) in which many vascular plants have not been evaluated; the IUCN Red List status of most plants in the AOI is currently unknown. Hence, when describing species rarity and range, the RBS star rating system is particularly useful when no IUCN and or Ugandan red list data exist.

The RBS assessment process is explained in more detail in Section A1.2.6.2 and the RBS manual (Hawthorne and Marshall 2016) is presented in Attachment A1.2.

The RBS has been used in a variety of projects around the world, including extractive industry projects that are funded by the World Bank and IFC, providing comparable data and indices for different regions (Hawthorne 1992, 1996; Hawthorne & Hughes 1997; Chua et al. 1998; Hughes et al. 1998; Tchouto 2004; Gordon et al. 2003, 2004; Hawthorne et al. 2007, 2008, Hawthorn 2009; Ndam et al. 2001; Marshall and Hawthorne 2012, 2013; Baksh-Comeau et al. 2016).

Within the AOI, the RBSs were undertaken in two phases, which included a portion of the wet and dry seasons. Phase 1 sampling was conducted between 4 May 2017 and 9 June 2017. Phase 2 sampling was conducted between 18 October 2017 and 14 November 2017. Local guides were employed to help the survey team find and access the sample sites.

Before the field work, 65 sample sites were selected in key areas of natural homogenous vegetation within the AOI, using satellite imagery and geographic information system (GIS) data, with the aim of characterising the habitat types within the AOI, the right-of-way (RoW) and the surrounding landscape.

Surveyors visited these 65 sample sites and used the RBS method to record or collect voucher specimens of all vascular plant species and assign an abundance category to each species. Canopy trees were recorded individually to give proportional estimates of species composition of the canopy. The altitude, landscape and soil type were also recorded for each sample site. Figure A1.2-2 shows the location of each sample site.

Vouchered material was taken to the Makerere University Herbarium for identification. The identification of vouchers at Makerere University Herbarium was led by Dr James Kalema in coordination with international specialists.

A survey of the Main Camp and Pipe Yard 4 (MCPY) was undertaken in August 2018. A biodiversity walkover assessment was used rather than the RBS method, which included collecting information on the following parameters:

- inventory of habitat types, including modified and natural habitats (in accordance with the baseline assessment of the pipeline corridor) and existing threats to habitat quality
- habitats of conservation importance (in accordance with the botanical baseline assessment)
- habitats of conservation importance for priority species, i.e., fauna, avifauna, vascular plants and aquatic species that are nationally rare according to the Ugandan Red list (WCS 2016), globally rare (IUCN 2017), restricted range or endemic species, migratory species or congregatory species
- priority vascular plant species, i.e., globally or nationally rare, endemic or restricted range.

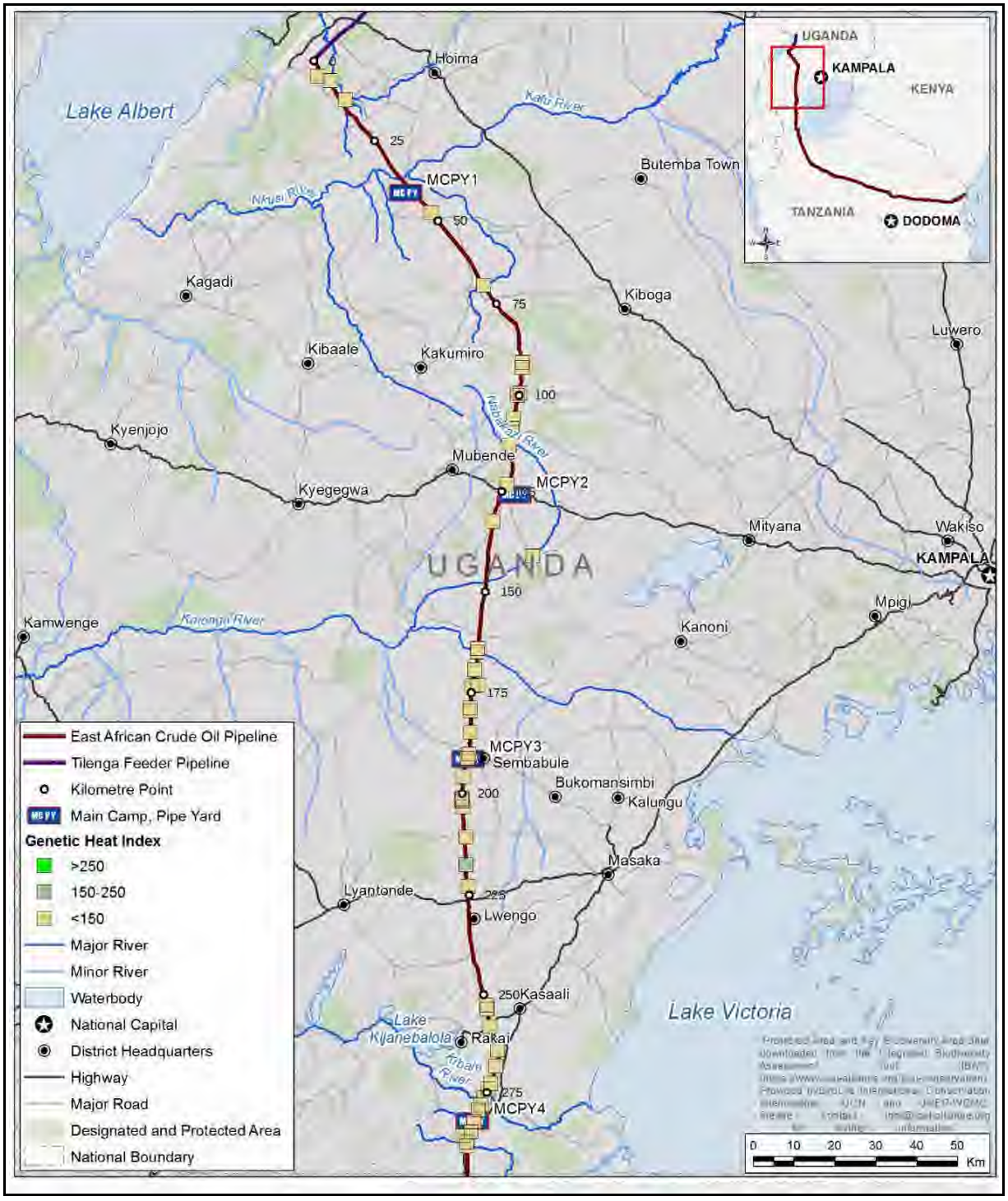


Figure A1.2-2 Sample Site Locations

A1.2.6 Data Analysis

Secondary data and the results of the field surveys were used to:

- characterise key habitats in the broader region
- identify the presence of flora species of conservation importance i.e., nationally protected species, globally rare species and IUCN critically endangered, endangered and vulnerable species
- determine the bioquality of each habitat type; bioquality identifies how rare a particular species is relative to the global population of that species, as per RBS methodology.

A1.2.6.1 Identification of Habitat Types in the AOI

The field data were analysed using a type of multivariate statistical analysis called ordination. Within the AOI, five main habitats (or floristic vegetation groups) were identified, which were subdivided into vegetation types along the gradient of variation, namely:

- Guineo-Congolian semi-evergreen forest
- riparian and swamp forest
- swamp
- secondary *Acacia* sp. woodland, bushland and wooded grassland
- cultivated land and plantations.

Detailed descriptions of the habitats within the AOI, vegetation types and their alignment with the physiognomic habitat classes (illustrated by the habitat map) are presented in Attachment A1.3. Section A1.2.6.2 presents habitats of conservation importance with respect to the project AOI; all other habitat types, including those not of conservation importance along the RoW and in the broader region are presented in Attachment A1.3.

A1.2.6.2 Identification of Habitats of Conservation Importance

The conservation value of each habitat was measured using the Genetic Heat Index (GHI) tool which is an integral component of the RBS methodology (Hawthorne 1996, Hawthorne and Marshall 2016). The GHI tool estimates the botanical importance of the vegetation or plant communities based on a ranking of species rarity using star rating criteria (see Section A1.2.6.3) and identifies the concentration of globally rare species in a habitat. GHI scores are high where the habitat supports a high proportion of globally rare species; this is termed a hotspot (Marshall and Hawthorn 2016).

GHIs calculated for habitats across the whole of Africa range from 0 to 2700 (Marshall and Hawthorn 2016). Botanical specialists have confirmed that habitats in the AOI with a GHI between 150 and 249 are considered of moderate conservation importance, while those with a GHI over 250 are considered of global conservation importance.

A1.2.6.3 Identification of Species of Conservation Importance

In the context of this baseline assessment, vascular plants of conservation importance are defined as nationally rare species, globally rare species, and endemic or restricted range species. The presence of these plants in the AOI was identified based on the following criteria:

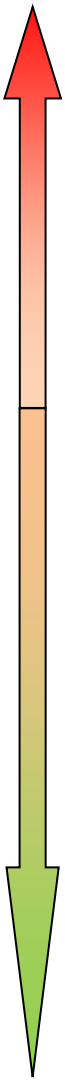
- IUCN Red List of Threatened Species (2017): The field data were screened against IUCN's defined categories to assess the global rarity of species in the study and their sensitivity to change (Table A1.2-3). In the context of this baseline assessment, only species in the AOI that are listed as IUCN vulnerable, endangered or critically endangered are of conservation importance. It is important to acknowledge that most vascular plant species in the AOI are categorised as IUCN not evaluated.
- Species listed on the Ugandan Red List prepared by the Wildlife Conservation Society (WCS) in 2016 and which was upheld by the lead agencies of the Government of Uganda, conferring official recognition on the lists. Species are classified into Red List categories and assessed on information at the national (not global) level.
- The RBS star rating: the field data were screened against the RBS star rating criteria to determine the presence of endemic or restricted range species in the AOI (Table A1.2-4). This rating ranges from Black Star species (the rarest species on a global scale and of high conservation importance) to Green Star species (species that are common, widespread and of no obvious conservation concern). The global range of each species is expressed as degree squares occupied (1 degree square is approximately 100 × 100 km squares). All plant species in the study were assigned a star rating (Hawthorne and Marshall 2016). The RBS star rating is described in more detail in the RBS manual (Hawthorne and Marshall 2016), which is presented in Attachment A1.2. The RBS star rating does not rely on Red Listing and takes into consideration records of a species' distribution and abundance. The star rating for each species is derived from a database of global plant rarity. This database was compiled from the same data sources used by IUCN when making evaluations on the statuses of vascular plant species (i.e., herbarium records, monographs global, Genebank Information System). However, in comparative terms, the RBS database is comprehensive with up to date information that accounts for historic and recent taxonomic changes.

Table A1.2-3 International Union for Conservation of Nature Red List Criteria for Identifying Globally Rare Vascular Plants

Red List Categories	Definition
Critically Endangered (CR)	The best available evidence indicates that the species is facing an extremely high risk of extinction in the wild. These species are considered to have a very high sensitivity to change
Endangered (EN)	The best available evidence indicates that the species is facing a very high risk of extinction in the wild. These species are considered to have a very high sensitivity to change
Vulnerable (VU)	The best available evidence indicates that the species is facing a high risk of extinction in the wild. These species are considered to have a high sensitivity to change
Near Threatened (NT)	The species has been evaluated against the criteria and does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. These species are considered to have a low sensitivity to change
Least Concern (LC)	The species has been evaluated against the criteria and does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant taxa are included in this category. These species are considered to have a low sensitivity to change
Data Deficient (DD)	Listing in these categories indicates that no assessment of extinction risk has been made, though for different reasons. Until an assessment is made, taxa listed in these categories should not be treated as if they were nondthreatened (IUCN 2012)
Not Evaluated (NE)	

SOURCE: Definitions adapted from IUCN (2012)

Table A1.2-4 Star Rating Criteria for Identifying Globally Endemic and Restricted Range Species

Conservation Importance of Species	Star Rating Colour	Range of Individual Species	Description
High  **Low**	Black	2.7 degree squares on average globally (1 degree square is approximately 100 x 100 km)	Local endemics – endemic to a small part of a region (e.g., a mountain range or forest block, small island groups, or corners of a region with unusual rainfall patterns) where they might be locally common or scattered within a slightly wider range. These are high conservation priority, global rarities and the places in which they are concentrated should similarly be highly ranked
	Gold	8 degree squares on average globally	Some global conservation priority rarities. These might be quite common in parts of a biogeographic region (e.g., Upper Guinea, or across the Lesser Antilles), but are not globally widespread, or they may occur in two or more average-sized countries but very sparsely
	Blue	24 degree squares on average globally	Barely of global conservation concern. This category includes continentally widespread species, which are scattered in their range (typically riverine, coastal or high-altitude species); or extremely common throughout several countries and vegetation types but are not continentally widespread. They are often the species that add distinctiveness to unusual habitats, but unless many such species occur in a single sample (as often occurs on mountains) they have limited influence on the ranking of community level bioquality scores
	Green	50 degree squares on average	Species of no obvious conservation concern in terms of their rarity because they are widespread, typically across a continent in appropriate and common habitats, wherever that habitat occurs, or even global. Continent-wide species that live only in scattered islands, or islands of montane forest, however, might well qualify for Blue or Gold Star status. These species, for instance, “widespread across tropical Africa, in Guineo–Congolian forest” generally account for more than half of all species in most regions

SOURCE: Definitions adapted from Hawthorne and Marshall (2016)

A1.2.7 Sensitivity Ranking

The sensitivity of the habitat and botanical receptors has been ranked according to the botany section of the sensitivity table in Appendix D.

A1.2.8 Data Considerations

Where it was not possible to acquire cloud-free Sentinel-2 imagery, the next most suitable image was selected.

Most of the vascular plants identified during this baseline assessment fall within the "Not Evaluated" category of the IUCN Red List (see Table A1.2-3). Many species have been identified for Red Listing by the IUCN East African working group (coordinated by the IUCN East African Plant Red List Authority, Quentin Luke [IUCN 2018]), but are not yet on the list (IUCN 2017). As such, the IUCN Red List status of most plants in the AOI is currently unknown.

A1.3 Baseline Conditions

A1.3.1 Habitats of Conservation Importance

A1.3.1.1 Overview

Most habitat types in the AOI are categorised as modified with approximately 28% of the AOI classed as natural. The five main habitats supporting different types of vegetation were identified during the baseline studies:

- Guineo-Congolian semi-evergreen forest
- riverine and swamp forests
- swamp
- secondary *Acacia sp.* woodland, bushland and wooded grassland
- cultivated land and plantations.

All of these habitats are characterised by low bioquality scores (GHI 1–149), hence they are not of moderate (GHI 150 and 249) or global conservation importance (GHI 250+).

A description of each of the habitat types within the AOI including their GHI scores and their alignment with the physiognomic habitat classes illustrated by the habitat map (Attachment A1.1), are presented in Attachment A1.3.

Anthropogenic activities have severely impacted natural habitats in Uganda. Natural habitat is characterised as highly fragmented with low land cover (National Environment Management Authority 2016; Winterbottom and Eilu 2016). Hence, given the current status of natural habitats in Uganda it is considered that Guineo-Congolian semi-evergreen forest and riverine and swamp forest to be of conservation importance in the context of the AOI and broader region. Section A1.3.1.2 presents habitats of conservation importance with respect to the project AOI only; all other habitat types, including those not of conservation importance along the RoW and in the broader region are presented in Attachments A1.3.

A1.3.1.2 Guineo-Congolian Semi-Evergreen Forest

Baseline Condition

The estimated coverage of Guineo-Congolian semi-evergreen forest based on remote sensing is illustrated in Figure A1.3-1 and the habitat map (Attachment A1.1). Within the AOI, approximately 68% of this habitat type is within the Wambabya FR, ca. 13 km from Lake Albert. Only 34 ha of Guineo-Congolian semi-evergreen forest are outside this protected area, as illustrated by the habitat map.

Guineo-Congolian semi-evergreen forest is a highly threatened and unique ecosystem (as defined in IFC 2012).

Figure A1.3-1 Estimated Extent of Guineo-Congolian Semi-evergreen Forest in the Area of Influence

The RBS characterised the floristic composition of Guineo-Congolian semi-evergreen forest within the Klambabya Community Forest, which forms part of the Wambabya FR at kilometre point (KP) 6.7 (approximately 667 m from the pipe centre line). This is the largest remnant stand of forest in the study area and represents one of a few forest stands in the region. Hence, Guineo-Congolian semi-evergreen forest is of conservation importance in the context of the AOI.

In Uganda, Guineo-Congolian semi-evergreen forest is restricted to the periphery of Lake Victoria, Lake Albert and Lake Edward (Kindt et al. 2011). This forest type is typically floristically diverse with an estimated 78 species. The understorey is characteristically evergreen and the forest canopy has a short patchy deciduous phase (White 1983).

The botanical survey confirmed that the canopy Guineo-Congolian semi-evergreen forest was characterised by a mix of tree species, with no obvious single species dominance. Principal canopy species were identified as:

- *Albizia zygia*
- *Antiaris toxicaria*
- *Celtis mildbraedii*
- *Chaetachme aristata*
- *Chrysophyllum albidum*
- *Chrysophyllum perpulchrum*
- *Homalium* sp.
- *Maerua duchesnei*
- *Moraceae sp.*
- *Ricinodendron heudelotii*
- *Sapindaceae* sp.
- *Vepris* sp.

The understorey was characterised by an abundance of shrubs and small trees comprising *Argomuellera macrophylla* and *Maesobotrya barteri*. This forest stand at KP6.7 had a low bioquality (GHI 44) as the majority of these species are common and widespread in nature, with some species' ranges extending to West Africa.

However, the survey confirmed the presence of four species of vascular plants within the reserve that are listed nationally rare on the Ugandan Red List (2016), namely:

- *Chrysophyllum perpulchrum* – vulnerable
- *Chrysophyllum albidum* – vulnerable
- *Citropsis articulata* – vulnerable
- *Leplaea cedrata* – endangered.

The evergreen tree *Leplaea cedrata* is also listed as vulnerable by the IUCN Red List of Threatened Species (IUCN 2017).

Trend in Condition and Sensitivity to Change

Forest habitats, including Guineo-Congolian semi-evergreen forest, are under major threat in Uganda with rapid losses occurring within and outside protected areas. Between 1990 and 2015, Uganda's forest cover was reduced from 4.9 million ha to 1.8 million ha. An average of 86,400 ha (2.1%) of forest cover per year was cleared between 2000 and 2015 (Ministry of Water and Environment 2016). Figure A1.3-2 illustrates the decline in forest cover in Uganda over this period. Guineo-Congolian semi-evergreen forest are therefore considered to be highly threatened and in a state of decline.

The primary causes of forest degradation and deforestation are land conversion for agro-pastoral activities and urbanisation; unsustainable exploitation of timber for fuel (firewood and charcoal); illegal and unregulated trade in forest products and unsecure forest tenure rights (Ministry of Water and Environment 2016).

Only 9% of Uganda is covered by forest (IUCN 2016). In addition to the increased pressure on forest resources for natural resource collection, remnant forest fragments are vulnerable to edge effects that can have serious impacts on species diversity, composition, community dynamics and ecosystem functioning (Laurance et al. 2010). Hence Guineo-Congolian semi-evergreen forest is considered to have high sensitivity to change.

However, an estimated 8,079,622 ha of land in Uganda have been identified as suitable sites for forest restoration (Ministry of Water and Environment 2016). These sites appear to include landscapes within the Guineo-Congolian semi-evergreen forest range. Several techniques have been identified, including alternative livelihood restoration, the implementation of planting schemes, seeding programmes, passive restoration and enhanced protection/patrolling of protected forested areas (Ministry of Water and Environment 2016). This indicates that Guineo-Congolian may be effectively restored and recovered following clearance.

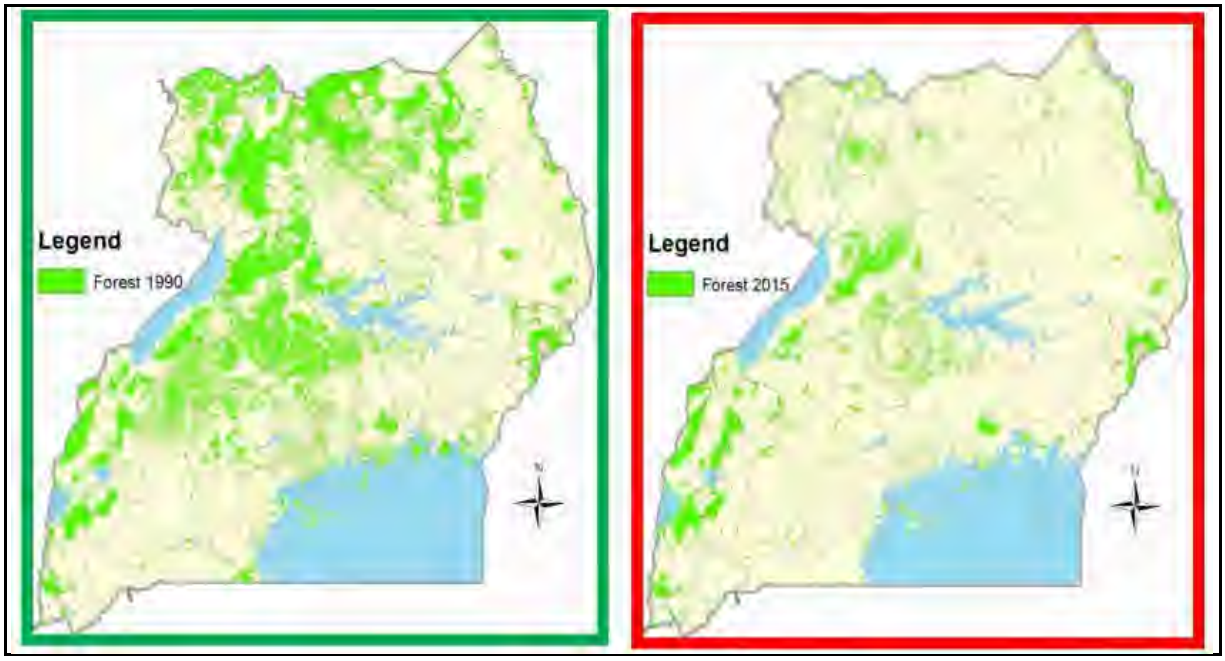


Figure A1.3-2 Change in Forest Cover Between 1990 and 2015
SOURCE: Ministry of Water and Environment (2016)

A1.3.1.3 Riverine and Swamp Forests

Baseline Condition

Small and highly fragmented stands of riverine and swamp forests (types of wetland forests) are scattered along the extent of the AOI. These forest stands are restricted to the margins of watercourses and springs and are predominantly surrounded by cultivated land and plantations; they collectively comprise 289 ha in the AOI and approximately 5 ha in the RoW. The extent of wetland forests (i.e., riverine and swamp forests) within the AOI are illustrated in Figure A1.3-3 and by the habitat map (Attachment A1.1). The location of wetland forest and their extent at river and stream at pipeline crossing points in the AOI is also presented in Table A1.3-1. It is important to note that approximately 102 ha of scattered stands of wetland forests

are outside these sites (presented in Table A1.3-1) in the AOI. Wetland forest (i.e., riverine and swamp forest) is a highly threatened and unique ecosystem (as defined in IFC 2012).

Figure A1.3-3 Estimated Extent of Riverine and Swamp Forest Within the Area of Influence

Table A1.3-1 Approximate Location and Coverage (ha) of Wetland Forest (Riverine and Swamp Forests) At Crossing Points in the Area of Influence Based on Remote Sensing

Approximate Location of Wetland Forest (KP)	Approximate Total Coverage (ha) of Riverine and Swamp Forests (Wetland Forests) at River or Stream Pipeline Crossing Points in the AOI Based on Remote Sensing	Name of Adjoining Rivers
6	0.1	Unnamed tributary of Wambabya River
13	2.5	Unnamed tributary of Wambabya River
15	7.4	Upper Wambabya River
19–21	9.5	Unnamed tributary of Wambabya River
25	1.9	Unnamed tributary of Kafu River
32–33	22.6	Kanywabarogo river (tributary of Kafu River)
36	23.9	Kafu River
38	83.4	Lwebikere river (tributary of Kafu River)
55	6.1	Mabengere river (tributary of Kafu River)
65	2.3	Unnamed tributary of Kafu River
72	4.4	Unnamed tributary of Kafu River
79	4.0	Unnamed tributary of Lugolima River
88.5	4.6	Unnamed tributary of Lugolima River
98.4	1.4	Unnamed tributary of Nabakazi River
105.1	12.2	Nabakazi River

Several types of riverine forest are present in Uganda. Evergreen or semi-evergreen riverine forests, with tree height above 20 m, occur on the fringes and banks of perennial streams in areas where annual rainfall exceeds 1000 mm. In contrast, riverine forests dominated by tree species that are deciduous for at least two months of the year are confined to the banks of watercourses in areas where annual rainfall is less than 800 mm (Kind et al. 2011). This type of riverine forest is often characterised by a relatively open canopy layer, which is maintained through browsing of large mammals and by periodic flooding. This enables heliophilous (sun-loving) vascular plants and trees to flourish (White 1983; Kind et al. 2011). Riverine forests within the AOI are considered evergreen, however further survey work would be required to fully verify the characteristics of each stand.

The endemic/restricted range (Black Star) species *Leptonychia mildbraedii,* was recorded in an area of riverine forest of low bioquality (GHI 71) at KP12.3,

approximately 967 m from the pipe centre line. This area of riverine forest was characterised by an abundance of the following tree species:

- *Ficus vallis-choudae*
- *Phoenix reclinata*
- *Pseudospondias microcarpa*.

Ground flora comprised:

- *Marantochloa leucantha*
- *Shirakiopsis elliptica*
- *Trachyphrynium braunianum*.

Swamp forests (a subtype of riverine forests) occur around springs and along watercourses where the water table is high and the movement of water is slow, and are often prevalent on alluvial deposits around Lake Victoria (White 1983; Kind et al. 2011). During the survey, swamp forests were recorded at KP92 (approximately 5.5 m from pipe centre line) and KP106 (about 4.5 m from the pipe centre line). The principal canopy species comprised:

- *Ficus vallis-choudae*
- *Phoenix reclinata*
- *Pseudospondias microcarpa*
- *Tabernaemontana holstii*.

The understorey of both areas of swamp forest was dominated by *Neoboutonia macrocalyx* in combination with either:

- *Cyperus papyrus* and *Tabernaemontana pachysiphon*

or

- *Ficus vallis-choudae* and *Phoenix reclinata*.

These species are common and widespread on the shores of Lake Victoria and elsewhere in Africa, and the bioquality of both areas of swamp forest are low (GHI 26 and 46). The presence of fig species at both sites indicate habitat disturbance in these areas.

The perennial woody climber *Mondia whitei*, was recorded within a swamp forest of low bioquality (GHI 46) in the AOI, about 4.5 m from the pipe centre line at KP106. This species is listed as vulnerable by the Ugandan Red List (WCS 2016).

While riparian and swamp forests are of low bioquality, they represent one of the few natural habitats (IFC 2012 criteria) found within the AOI and the surrounding landscapes. One particular stand of swamp forest was also found to support *Mondia whitei*, a vascular plant of conservation importance. Hence, these habitats are of conservation importance in the context of the AOI.

Trend in Condition and Sensitivity to Change

Deforestation and forest degradation is occurring at a rapid rate in Uganda. Remnant areas of forests are under increasing anthropogenic pressures as forest stocks decline (International Resources Group 2016; Ministry of Water and Environment 2016). In Uganda, riparian and swamp forests are fragmented, in a

state of decline and highly threatened by anthropogenic activities, which continue to cause losses, fragmentation and degradation (International Resources Group 2016; Ministry of Water and Environment 2016).

The RBS survey indicates that riverine and swamp forests are degraded. Existing threats to the habitat quality and integrity of these forests include over-exploitation of timber resources and habitat clearance for the development of plantations and agropastoral activities. This trend is likely to continue in the absence of intervention.

Generally, wetland forests are unlikely to naturally regenerate if upstream seed stock is depleted and edaphic and hydrological dynamics are disrupted by extensive clearance. Hence wetland forest, such as riparian and swamp forests are unlikely to be resilient to substantial disturbance over large areas.

A1.3.2 Flora Species of Conservation Importance

A1.3.2.1 Globally Rare, Nationally Rare, Black Star and Gold Star Species

Overview

A total of 482 species of vascular plants were identified within the AOI during the field surveys; of these, 38 species have been assessed by the IUCN Red List of Threatened Species (IUCN 2017).

Within this survey sample, one tree, *Leplaea cedrata,* is listed as vulnerable. The remainder are categorised as IUCN listed least concern, and as such are not globally rare or of conservation importance.

However, according to the Ugandan Red List (WCS 2016), six plant species recorded in the AOI are nationally rare with threat categories ranging from critically endangered to vulnerable. These species are described below.

Leptonychia mildbraedii, a restricted range or endemic species (Black Star Species) was identified in a sample plot in the AOI at KP12.3 (see Attachment A1.4). *Leptonychia mildbraedii* is of high conservation importance as it has highly limited distribution and is found in just 2.7 degree squares worldwide, where one degree square is an area approximately 100 x 100 km.

Rytigynia beniensis, a restricted range or endemic species (Black Star Species), is thought to have been identified in a sample plot in the AOI at KP201.1 (see Attachment A1.4); however, further surveying is necessary to explicitly verify the presence of this species in the project AOI. *Rytigynia beniensis* is of high conservation importance as it has highly limited distribution and is found in just 2.7 degree squares worldwide, where one degree square is an area approximately 100 x 100 km. The botanical survey also confirmed the presence of two Gold Star species of vascular plants, namely: *Blepharispermum pubescens* (at KP51, 33, 57, 43, 110, 50, 52, 46 and 55) and *Leucas calostachys* (at KP57, KP39 and KP51). These species are relatively more widespread with higher abundance levels than Black Star species. The botanical specialists also consider these species to be of conservation significance.

Some of these tree species are protected in Uganda in accordance with the Forest and Tree Planting Act 2003 (amended 2016) and include commercial and cultivar

tree species. Hence, these species are not considered to be of conservation importance unless they meet the criteria presented in Section A1.2.6.3. Tree species are listed on Schedule 8 and are presented in Attachment A1.5 and a licence is required to remove or fell Schedule 8 species.

Baseline Condition

The baseline condition of each vascular plant species of conservation importance, their known Ugandan Red List (WCS 2016) status, IUCN (2017) category and star rating, and their proximity to the pipeline centre line are presented in Attachment A1.3 and described below.

Nymphaea nouchali

The aquatic herb *Nymphaea nouchali* is listed critically endangered by the Ugandan Red List (WCS 2016). This species was recorded outside the AOI, in an area of swamp grassland, occasionally interspersed with woody species at KP287.1, approximately 1458 m from the pipeline. The abundance and distribution of this species in the AOI is uncertain. While this individual record is outside the AOI and will not be directly impacted by habitat clearance during construction, further studies would be required to verify the presence and likely absence of this species in the RoW. This type of swamp habitat had a low bioquality (GHI 15). In Uganda, natural occurrences of this species are known from Lake Mutanda (approx. 192 km from the pipeline) and Lake Bunyonyi (approx. 167 km from the pipeline) (WCS 2016).

This species is native to more than 50 counties ranging from temperate and tropical Asia, Australia and much of tropical Africa and is IUCN listed least concern. *Nymphaea nouchali* typically inhabits ponds, stagnant pools, lake edges, swamps dominated by *Cyperus papyrus* and drying mud (IUCN 2017). The RBS classified this herb as a Green Star species and as such is not endemic or range-restricted.

Leplaea cedrata

The evergreen tree, *Leplaea cedrata,* was recorded in an area of semi-evergreen Guineo-Congolian in Klambabya Community forest, which forms part of the Wambabya FR at KP6.7 (approximately 667 m from the pipeline). This species is listed as endangered by the Ugandan Red List (WCS 2016) and vulnerable by the IUCN Red List of Threatened Species (IUCN 2017).

This species is known to occur in several national parks and FRs in addition to Wambabya FR (i.e., Semuliki National Park, Kibale National Park, Bwindi Impenetrable National Park, Budongo FR, Bugoma FR, Kasyoha Kitomi FR). Records have also been reported from Damba Island (Lake Victoria) and Masaka district (WCS 2016).

Leplaea cedrata is native to Uganda, Cameroon, Democratic Republic of Congo, Republic of Congo, Côte d'Ivoire, Ghana, Liberia, Nigeria and Sierra Leone and commonly inhabits moist semi-deciduous forest and the drier undisturbed areas of moist evergreen forest in these countries (IUCN 2017).

Chrysophyllum albidum

The evergreen tree*, Chrysophyllum albidum* was recorded in the AOI among Guineo-Congolian semi-evergreen forest within Wambabya FR. This species is listed as vulnerable by the Ugandan Red List and has been recorded in 13 protected areas in Uganda, including Wambabya FR (WCS 2016).

Chrysophyllum albidum inhabits dense lowland rainforests and occasionally gallery forest in Western tropical Africa from Sierra Leone, extending eastwards to central tropical Africa (Fern 2014).

Chrysophyllum perpulchrum

Chrysophyllum perpulchrum was recorded in the AOI among Guineo-Congolian semi-evergreen forest within Wambabya FR. This species is listed as vulnerable by the Ugandan Red List and has been recorded in seven protected areas in Uganda, including Wambabya FR (WCS 2016).

Chrysophyllum perpulchrum is native to Uganda, Cameroon, Democratic Republic of Congo, Gabon, Ghana, Guinea, Ivory Coast, Liberia, Nigeria and Tanzania (IUCN 2017) and is typical of semi-deciduous forest and dry forest types and rainforests at elevations of 800–1200 m in East Africa (The Tropical Plants Database 2018).

Citropsis articulata

Citropsis articulata was recorded in the AOI among Guineo-Congolian semi-evergreen forest within Wambabya FR. This species is listed as vulnerable by the Ugandan Red List and has been recorded in 10 protected areas, namely Kibale National Park, Semuliki National Park, Bwindi Impenetrable National Park, Mabira FR, Budongo FR, Bugoma FR, Itwara FR, Kagombe FR, Kasyoha Kitomi FR and Kalinzu FR.

Citropsis articulata is also listed by the Ugandan Red List (WCS 2016) as an Albertine Rift Endemic. However, this is an error as the species is known to occur throughout East and West Africa (Dr William Hawthorne 2018, pers. comm). Habitats of occurrence of *Citropsis articulata* throughout this species' range include rain-forest, dry (semi-) deciduous and secondary forests, forest edges and edge of rivers at elevations of 480–1550 m (Useful Tropical Plants 2018).

Mondia whitei

Within the AOI, *Mondia whitei*, a perennial woody climber, was recorded within three separate vegetation types of low bioquality, namely *Cyperus papyrus* swamp (KP112.6), swamp forest (KP106.0) and swampy grassland with occasional woody species (KP100.1). This species is listed as vulnerable by the Ugandan Red List and has been recorded in 14 Ugandan protected areas (WCS 2016). This species is distributed widely throughout Africa, excluding North Africa (IUCN 2017) often in forest habitats.

Leptonychia mildbraedii

Leptonychia mildbraedii has only been recorded in 15 locations in Uganda, within stands of riverine forest and small areas of moist forest between 1150 and 1800 m

altitudes. This restricted range and endemic (Black Star) tree or shrub was recorded outside the AOI among an area of riparian forest of low bioquality (GHI 71) at KP12.3 (approximately 1967 m from the pipeline); therefore this individual tree will not be impacted by the Project. However, further studies would be required to verify the presence or likely absence of this species in the RoW.

Rytigynia beniensis

The endemic and restricted range (Black Star) species, *Rytigynia beniensis,* reportedly inhabits forest edge, thicket woodland or grassland that are swamp-like in places and rocky or eroded landscapes at altitudes ranging from 1240 to1500 m above sea level (Royal Botanic Gardens, Kew 2016).

The genus *Rytigynia* encompasses 51 species, which are often morphologically very similar in structure, and includes many in which the taxonomy has not been resolved. It is possible that *Rytigynia beniensis* has been wrongly identified within the AOI and could be *Rytigynia umbellulata,* which is widespread and ranges from Guinea-Bissau to Mozambique. These two species have highly variable morphology and are characterised by subtle morphological features that are difficult to distinguish (Dr William Hawthorne 2018, pers. comm.).

Within the AOI, this small shrub *Rytigynia beniensis* is thought to have been recorded within swamp grassland, occasionally interspersed with woody species at KP201.1, approximately 3.4 m from the pipeline centre line. This type of swamp habitat had a low bioquality (GHI 110). Further surveys and verification of the herbarium type specimen are recommended in order to verify the presence of this species in the AOI.

Blepharispermum pubescens

The Gold Star species, *Blepharispermum pubescens,* is an evergreen scrambling shrub that grows up to 4.5 m high. This species was recorded in swamp habitats and multiple vegetation types in secondary *Acacia* sp. woodland, bushland and wooded grassland with low bioqualities (GHI range of 33–110). Attachment A1.4 presents the KPs where this species was identified.

This species is native to Uganda, Kenya, Tanzania, Democratic Republic of Congo and Rwanda (IUCN 2017).

Leucas calostachys

Leucas calostachys (Gold Star) is an erect shrub that typically grows in open grassland, bushland and occasionally on hillsides and forest margins at altitudes of 1400 and 2500 m.

Within the AOI, this species was recorded in two stands of secondary *Acacia* woodland, bushland or thicket with exotic vascular plants of low bioquality at approximately KP99.5, and within two areas of swampy grassland interspersed with occasional woody species of low bioquality at approximately KP1101.1 and KP93.1.

Trend in Condition and Sensitivity to Change

Nymphaea nouchali

The geographical range of *Nymphaea nouchali* is limited in Uganda and in a state of decline (WCS 2016).

As *Nymphaea nouchali* is listed as critically endangered by the Ugandan Red List, it has a high sensitivity to change.

Leplaea cedrata

The abundance and distribution of *Leplaea cedrata* is thought to be in a state of decline in Uganda (WCS 2016). Unsustainable exploitation of this species' timber continues to pose a threat at national and global scales (WCS 2016; IUCN 2017).

As *Leplaea cedrata* is IUCN vulnerable and listed as endangered by the Ugandan Red List, it has a high sensitivity to change.

Chrysophyllum albidum

Chrysophyllum albidum is restricted to Guineo-Congolian semi-evergreen forest, particularly in protected areas in Uganda. The abundance and distribution of this species is thought to be in a state of decline (WCS 2016).

As *Chrysophyllum albidum* is listed as vulnerable by the Ugandan Red List, it has a moderate sensitivity to change.

Chrysophyllum perpulchrum

Chrysophyllum perpulchrum has been recorded in seven protected areas in Uganda including Wambabya FR. This species is thought to be in a state of decline in Uganda (WCS 2016).

As *Chrysophyllum perpulchrum* is listed as vulnerable by the Ugandan Red List, it has a moderate sensitivity to change.

Citropsis articulata

This species is thought to be in a state of decline in Uganda (WCS 2016).

As *Citropsis articulata* is listed as vulnerable by the Ugandan Red List, it has a moderate sensitivity to change.

Mondia whitei

There is evidence of population decline in Uganda (WCS 2016). The main threat to the species is overexploitation for subsistence and commercial purposes and habitat loss (Bester 2009).

As *Mondia whitei* is listed as vulnerable by the Ugandan Red List, it has a moderate sensitivity to change.

Leptonychia mildbraedii

The rare and threatened status of *Leptonychia mildraedii* has not been assessed by IUCN (2017). However, this species has only been recorded in 15 relatively widespread locations in Uganda (WCS 2016).

As *Leptonychia mildraedii* is an endemic and restricted range (Black Star) species, it has a high sensitivity to change.

Rytigynia beniensis

The distribution of *Rytigynia beniensis* is restricted to two zones in the southwest of Uganda, the Democratic Republic of Congo and Rwanda (Royal Botanic Gardens, Kew 2016).

As *Rytigynia beniensis* is an endemic/restricted range (Black Star) species, it has a high sensitivity to change.

Blepharispermum pubescens

Blepharispermum pubescens has been recorded within all of the Flora of Tropical East African Zones Uganda and North West Tanzania at an attitude of 1110–1800 m (Royal Botanic Gardens, Kew 2016).

As *Blepharispermum pubescens* is a Gold Star species, it has a low sensitivity to change.

Leucas calostachys

Leucas calostachys is reportedly widely distributed across Uganda, Kenya, Tanzania, Democratic Republic of Congo, Rwanda, Burundi, Sudan and Ethiopia. The species' habitats of occurrence (i.e., open grassland, bushland and forest margins) are unlikely to be in decline (Royal Botanic Gardens, Kew 2016).

As *Leucas calostachys* is a Gold Star species, it has a low sensitivity to change.

A1.3.3 Forests Reserves and Other Protected Areas

A1.3.3.1 Overview

Several protected areas (i.e., FR) are crossed by, or are immediately adjacent to, the pipeline and the aboveground facilities. These sites are described and mapped in Section 6 of the ESIA. FRs addressed in this section are identified as protected areas supporting areas of high habitat quality in Uganda or vascular plants of conservation importance. Other protected areas that do not meet these criteria (i.e., Taala FR) are described in Section 6 of the ESIA.

An analysis of satellite imagery and the botanical survey results indicate that the habitat integrity of the majority of FRs and other protected areas in Uganda has been adversely impacted. Habitats within each site appear to be degraded to varying degrees of anthropogenic disturbance, including the collection of timber and nontimber forest resources and habitat clearance.

While the majority of the reserves in the AOI are not of high conservation value in terms of their botanical or floristic values, several provide refuge for fauna and avifauna that are of conservation importance (including Kasana-Kasambya FR, Wambabya FR, Taala FR and the Wambabya FR- Bugoma Central FR forest corridors (which are not protected areas): refer to Appendix A4 Fauna Biodiversity Baseline Report).

Two FRs of botanical or floristic value are Kasana-Kasambya FR and Wambabya FR. Note, Bugoma FR is outside the AOI.

A1.3.3.2 Kasana-Kasambya Forest Reserve

Baseline Condition

At KP123 the pipeline runs approximately 100 m to the eastern border of Kasana-Kasambya FR. The pipeline also runs parallel to, by approximately 450 m, the FR near KP113. Both these sections of reserve closest to the pipeline comprise exclusively pine tree plantation that are commercially managed. Field studies revealed that eucalyptus plantations and maize fields are also widely present in the reserve, further to the west.

The Gold Star evergreen scrambling shrub *Blepharispermum pubescens* was identified on the boundary of the reserve during the botanical survey. This area had a low bioquality (GHI 57) and comprised swampy grassland with occasional woody species.

Trend in Condition and Sensitivity to Change

The Kasana-Kasambya FR is a commercial plantation and there is no anticipated change in condition.

The reserve comprises modified habitat that supports a Gold Star plant species on its borders which is considered to have low sensitivity to change.

A1.3.3.3 Wambabya Forest Reserve

Baseline Condition

Between KP5 and KP9, the EACOP project is within 100 m of the Wambabya FR. This is the largest remnant stand of semi-evergreen forest in the AOI and is of botanical importance as this reserve represents one of a few remnant stands of Guineo-Congolian semi-evergreen forest in the region. This is likely to be attributed to the site's protected area status.

The reserve covers 34.25 km^2 (Protected Planet 2018) and the botanical composition of this forest is typical of other semi-evergreen forests in the margins of the Guineo-Congolian region. Commonly occurring species includes *Celtis mildbraedii, Celtis adolfi-friderici, Ricinodendron heudelotii, Antiaris toxicaria, Albizia zygia, Chrysophyllum perpulchrum, Chrysophyllum albidum, Cola gigantea, Chaetachme aristata*, *Argomuellera macrophylla, Olyra latifolia, Marantochloa leucantha, Maesobotrya barteri* and *Tapura fischeri.*

The survey also confirmed the presence of four species of vascular plants within the reserve that are listed on the National Red List, namely:

- *Chrysophyllum perpulchrum* – listed vulnerable
- *Chrysophyllum albidum* – vulnerable
- *Citropsis articulata* – vulnerable
- *Leplaea cedrata* – endangered.

The evergreen tree *Leplaea cedrata* is also listed as vulnerable by the IUCN Red List of Threatened Species (IUCN 2017).

Wambabya FR may become an important part of a proposal by non-governmental organisations, hopefully in collaboration with the Ugandan Government to restore and enhance ecological corridors in the broader Albertine Rift landscape to enhance the conservation of chimpanzees within these forested areas and sustainable ecosystem services for local communities. These corridors are between Wambabya FR and Bugoma FR (situated approximately 3.5 km southwest of Wambabya FR, in Hoima district), and Budongo FR (approximately 29 km northeast of Wambabya FR) and Mukihani (approximately 20 km northeast of Wambabya FR).The restoration and enhancement of ecological corridors is being investigated by Ecotrust, Jane Goodall and Flora and Fauna International (Lamprey 2017).

Trend in Condition and Sensitivity to Change

Wambabya FR is predominantly surrounded by agro-pastoral land and settlements. Areas of forest habitat within the periphery of the reserve have been cleared for agro-pastoral activities. Selective logging also threatens the integrity of the reserve. However, illegal logging is notably less apparent compared with other FRs in the region (e.g., Bugoma FR). These threats are likely to continue in the absence of intervention, as the local population increases and pressure on natural resources (e.g., timber) and land access rises (Hänni 2010).

Afforestation and restoration of the ecological connectivity between Wambabya FR and Bugoma FR would potentially reduce pressure on the reserve (FFI 2018). The Uganda Wildlife Authority also intends to initiate a revegetation programme in degraded parts of Wambabya FR. Should these programmes proceed, it is anticipated that the condition of Wambabya FR would improve.

A1.3.4 Ecosystem Services Provided

The habitats described in the preceding sections, with the species they comprise, generate a range of ecosystem services as set out below. Further details on the general nature and extent of the provisioning ecosystem services listed can be found in the land-based livelihoods section of Appendix A11 Socio-economic and Health Baseline Report.

Provisioning services:

- Community interviews identified and characterised the use of plants for provisioning services by local communities (i.e., trees used for construction and fuel; plants for food and medicinal products). These findings are presented in Appendix A11 and are summarised in Table A1.3-2. It has not been possible to assign scientific names to these plants without collecting specimens for specialist identification; typically, a single species will be known by a different common name from district to district and even, at times, by different common names within a local community sharing the same language.

Regulating services:

- climate change amelioration, in terms of carbon sequestration and carbon sinks, and attenuating directional and or hemispherical surface albedo

- microclimate and climate regulation by vegetation and soils, in terms of regulating ambient temperatures and water vapour levels
- local water and air pollution control through waste assimilation, water and air filtration
- water regulation, erosion control and water catchment protection, in terms of maintaining higher flows in rivers and for longer duration; reducing flood surges; and reducing sedimentation of receiving waters through the stabilisation of riverbanks and steep slopes by vegetation including riparian, emergent habitats
- erosion control of terrestrial habitats (i.e., arising from wind erosion), in terms of controlling ambient fugitive dust emissions though the stabilisation of soil by terrestrial habitats and maintaining edaphic conditions including soil moisture levels
- regulation of ambient noise levels. Habitats and vegetation act as a natural sound barrier buffering noise emissions, including those arising from anthropogenic sources (i.e., vehicle movement, people, machinery).

Cultural services:

- ethical and biodiversity values, particularly maintaining populations of endangered and endemic species. These values are difficult to ascertain and are more likely to be held by wealthier national and international populaces.
- sense of place and way of life. These locations are likely to provide value to local people who use these areas as part of their way of life and who have a special connection with them.
- eco-tourism, particularly in protected areas
- aspects of these locations may provide spiritual, sacred or religious values, inspiration for culture and design, and cognitive development.

Habitat and species support:

- The abovementioned habitats provide important refuge, feeding, watering, breeding and nursery areas for many animals that spend only part of their life in such areas.

Other supporting services:

- The abovementioned habitats and the species they contain provide a range of supporting services such as photosynthesis and water, and carbon and nutrient cycling, and whose benefits are typically accounted for in other ecosystem services.

Table A1.3-2 Natural Resource Use (Wild Plants) by Local Communities

District	Subcounty	Settlement Name	Common Name of Wild Plant	Purpose	Point of Collection	Estimated Collection Frequency	Proportion of Wild Plants Directly Used by Collector (%)	Proportion of Collected Wild Plants Sold (%)
Hoima	Buseruka	Katooke	Mature Vines	Food	Wambabya forest	Anytime	50	50
Hoima	Buseruka	Katooke	Kibirizi, Omusesa, Omuyenje, Omuko and Omufuula	Medicine	Wambabya FR, Kayeera bushes and in gardens	Any time required	100	0
Hoima	Buseruka	Katooke	Nswiga nakati	Food	Wambabya forest, Kayeera bushes and gardens	Any time required	100	0
Hoima	Kiziranfumbi	Kakende	Muhomozi	Medicine	No specific place	When required by a sick person	0	100
Hoima	Kiziranfumbi	Kakende	Kibirizi	Medicine	No specific place	When required by a sick person	0	100
Hoima	Kiziranfumbi	Kakende	Nyawahya	Medicine	From the area where she farms. The woman actually pulled me aside to talk to me as she said it was secret.	When required by a sick person	0	100
Hoima	Kiziranfumbi	Kakende	Omuhotora	Medicine	From the area where she farms. The woman actually pulled me aside to talk to me as she said it was secret.	When required by a sick person	0	100
Kyankwazi	Ntwetwe	Nzoo	Vegetable Nakati	Food	Forest, plantation, gardens and farms	Dry season	100	0

Table A1.3-2 Natural Resource Use (Wild Plants) by Local Communities

District	Subcounty	Settlement Name	Common Name of Wild Plant	Purpose	Point of Collection	Estimated Collection Frequency	Proportion of Wild Plants Directly Used by Collector (%)	Proportion of Collected Wild Plants Sold (%)
Kyankwazi	Ntwetwe	Nzoo	Vegetable Nsuga	Food	Forest, farms and in plantations	Dry season	100	0
Kyankwazi	Ntwetwe	Nzoo	Vegetable Doodo	Food	Gardens, plantations and in the farms	Dry season	100	0
Kyankwazi	Ntwetwe	Nzoo	Kamunye, Bombo, Mululuza, Kanalongo, Kigagi	Medicine	Bushes, farms, gardens and in the plantations	When required by a sick person	50	50
Mubende	Butoloogo	Nyondo	Omululuza, Ebombo, Makaayi, Kamunye, Namirembe, Kafugankande and Olweza	Medicine	Farms, bushes and in plantations, plus our gardens	When required by a sick person	50	50
Mubende	Butoloogo	Nyondo	Dodo	Food	Plantations, gardens and in farms	Rainy season - Every day	100	0
Mubende	Butoloogo	Nyondo	Nsuuga	Food	Plantations, bushes	Almost every day	100	0

A1.3.5 Sensitivity Rankings

Based on the survey data, the trend in condition, sensitivity to change and the sensitivity of the receptors have been ranked and are shown in Table A1.3-3.

Table A1.3-3 Habitat and Flora Sensitivity Ranking

Ecology Receptor	Sensitivity Ranking	Rationale for Ranking
Guineo-Congolian Semi-Evergreen Forest		
Habitat of conservation importance	Very High (5)	Highly threatened and unique ecosystem Natural habitat (as defined by IFC PS6 and the accompanying Guidance Note).
Flora species of conservation importance	High (4)	Supports IUCN vulnerable species: • *Leplaea cedrata.* Supports Ugandan Red List (WCS 2016) endangered species: • *Leplaea cedrata.* Supports Ugandan Red List (WCS 2016) vulnerable species: • *Chrysophyllum perpulchrum* • *Chrysophyllum albidum* • *Citropsis articulate.*
Swamp and Riparian Forest		
Habitat of conservation importance	Very High (5)	Highly threatened and unique ecosystem Natural habitat (as defined by IFC PS6 and the accompanying Guidance Note).
Flora species of conservation importance	High (5)	Supports range-restricted range or endemic (Black Star) species: • *Leptonychia mildbraedii* Supports Ugandan Red List vulnerable species: • *Mondia whitei*
Kasana-Kasambya FR		
Legally protected, internationally or nationally recognised areas	Moderate (3)	Designated as a FR and retains some biodiversity value
Flora species of conservation importance	Low (2)	Gold Star endemic species recorded on reserve border: • *Blepharispermum pubescens*

Table A1.3-3 Habitat and Flora Sensitivity Ranking

Ecology Receptor	Sensitivity Ranking	Rationale for Ranking
Wambabya FR		
Legally protected, internationally or nationally recognised areas	High (4)	Legally protected site designated as a nature FR
Habitat of conservation importance	Very High (5)	Supports Guineo-Congolian semi-evergreen forest, a highly threatened and unique ecosystem
Flora species of conservation importance	High (4)	Supports IUCN vulnerable species: • *Leplaea cedrata* Supports Ugandan Red List (WCS 2016) endangered species: • *Leplaea cedrata* Supports Ugandan Red List (WCS 2016) vulnerable species: • *Chrysophyllum perpulchrum* • *Chrysophyllum albidum* • *Citropsis articulata*

A1.4 Key Habitat and Vascular Plant Considerations

A1.4.1 Habitats

Based on the outcomes of the botanical assessment, the following habitats are considered sensitive receptors:

- Guineo-Congolian semi-evergreen forest (KP6.7)
- swamp and riparian forest (KP12.3, KP91.7 and KP106).

A1.4.2 Flora

The RBS confirmed the presence of seven species of vascular plants of conservation importance in the AOI. Two additional species were approximately 1 km from the pipe centre line; further studies would be required to verify the presence or likely absence of these species in the RoW. Further surveys and verification of the herbarium type specimen are recommended to verify the presence of *Rytigynia beniensis* (Black Star) in the AOI and RoW. Table A1.4-1 summarises species of conservation importance.

A1.4.3 Protected Areas

Based on the outcomes of the baseline assessment, and particularly the known or likely presence of species and habitats of conservation importance, the following protected areas and corridors are identified as sensitive receptors:

- Wambabya FR
- Kasana-Kasambya FR.

Table A1.4-1 Key Flora Considerations

Species	Location(s)	Conservation Status	Considerations for Impact Assessment
Nymphaea nouchali	Secondary *Acacia* sp. woodland, bushland and wooded grassland Over 1 km from the project	Uganda Red Listed Critically Endangered	The IUCN listed vulnerable vascular plant species *Leplaea cedrata* is at risk of extinction. Generally, this species has undergone major declines in distribution and abundances arising from unsustainable harvesting Restricted range or endemic (Black Star) species have a highly localised distribution, niche, physical and environmental requirements. These species are particularly vulnerable to the impacts of habitat loss, degradation and fragmentation. Most globally rare and restricted range or endemic species and Gold Star species in the AOI were recorded in the habitat types: Guineo-Congolian semi-evergreen forest and swamp and riparian forests. While these habitats are of low bioqualities, they are highly threatened and unique ecosystems. The impact assessment should consider conserving these key habitat types.
Leplaea cedrata	Guineo-Congolian semi-evergreen forest	IUCN Vulnerable; Uganda Red Listed Endangered	
Chrysophyllum perpulchrum	Guineo-Congolian semi-evergreen forest	Uganda Red Listed Vulnerable	
Chrysophyllum albidum	Guineo-Congolian semi-evergreen forest	Uganda Red Listed Vulnerable	
Citropsis articulata	Guineo-Congolian semi-evergreen forest	Uganda Red Listed Vulnerable	
Mondia whitei	Swamp forest Wetland	Uganda Red Listed Vulnerable	
Leptonychia mildbraedii	Swamp and riparian forest Bugoma-Wambabya Corridor	Endemic or restricted range (Black Star)	
Rytigynia beniensis	Swamp and riparian forest	Endemic or restricted range (Black Star)	
Blepharispermum pubescens	Secondary *Acacia* sp. woodland, bushland and wooded grassland, swamp	Gold Star	
Leucas calostachys	Secondary *Acacia* sp. woodland, bushland and wooded grassland, swamp	Gold Star	

A1.5 References

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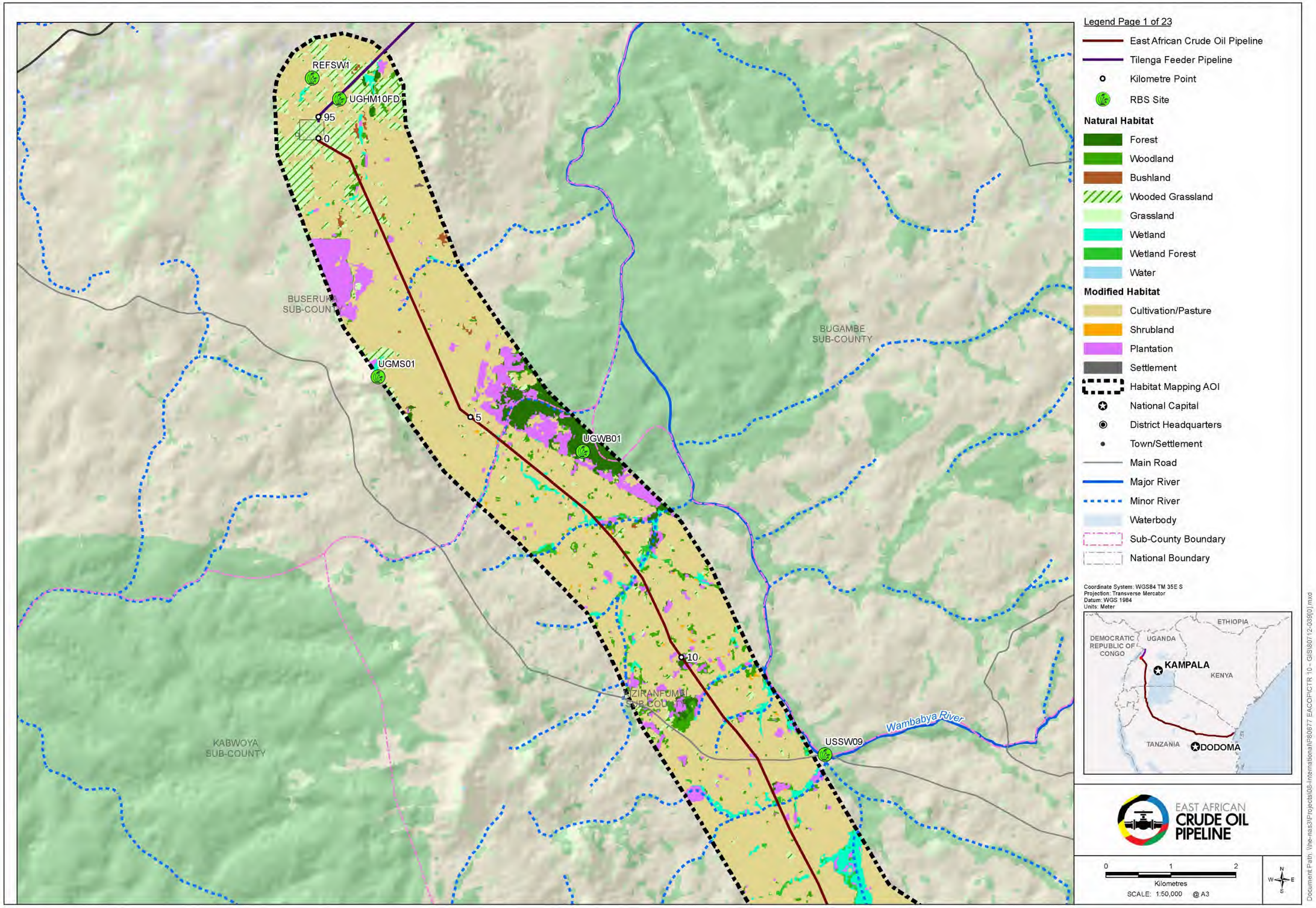
ATTACHMENT A1.1 HABITAT MAP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Legend Page 1 of 23
East African Crude Oil Pipeline
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Natural Habitat
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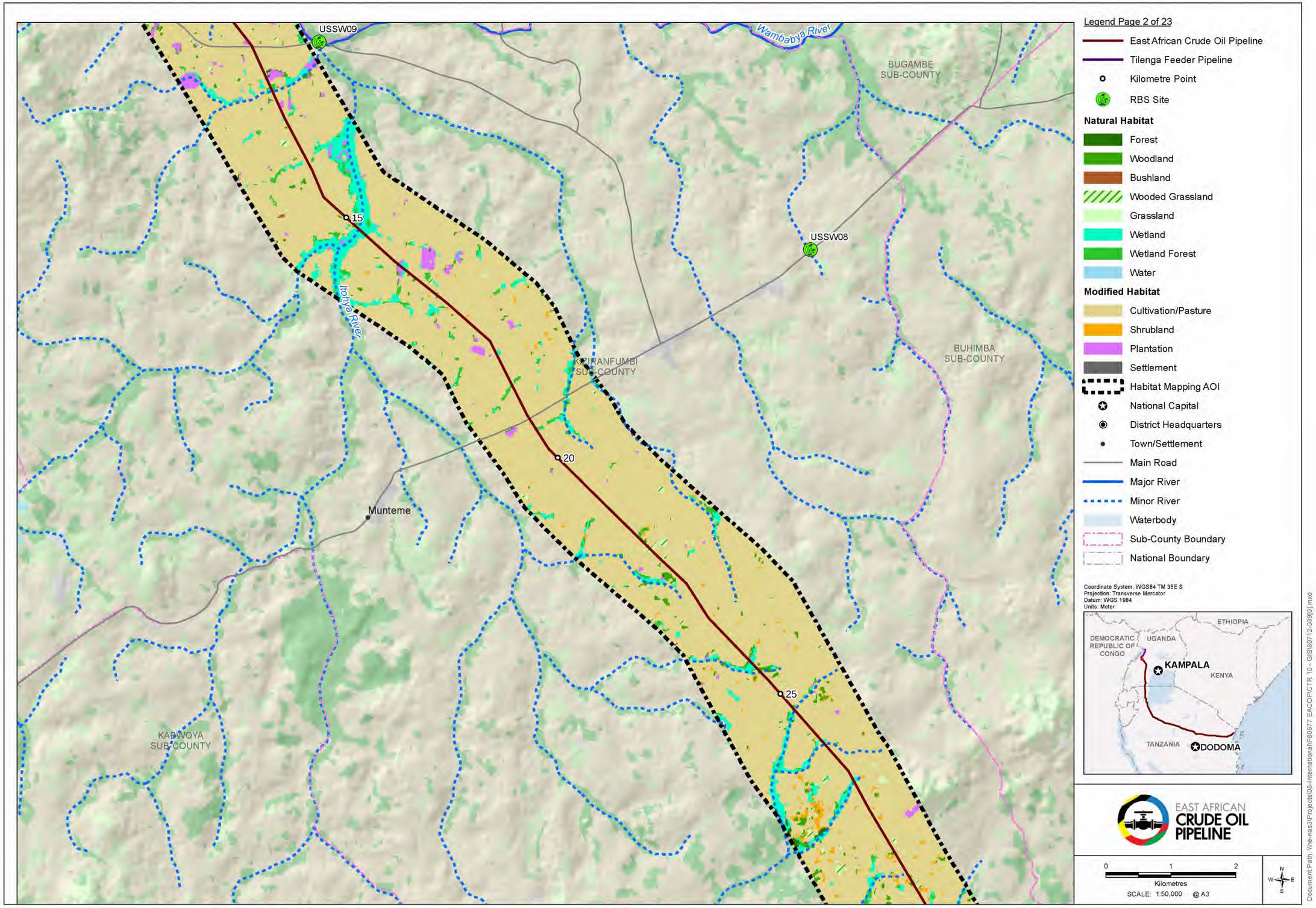
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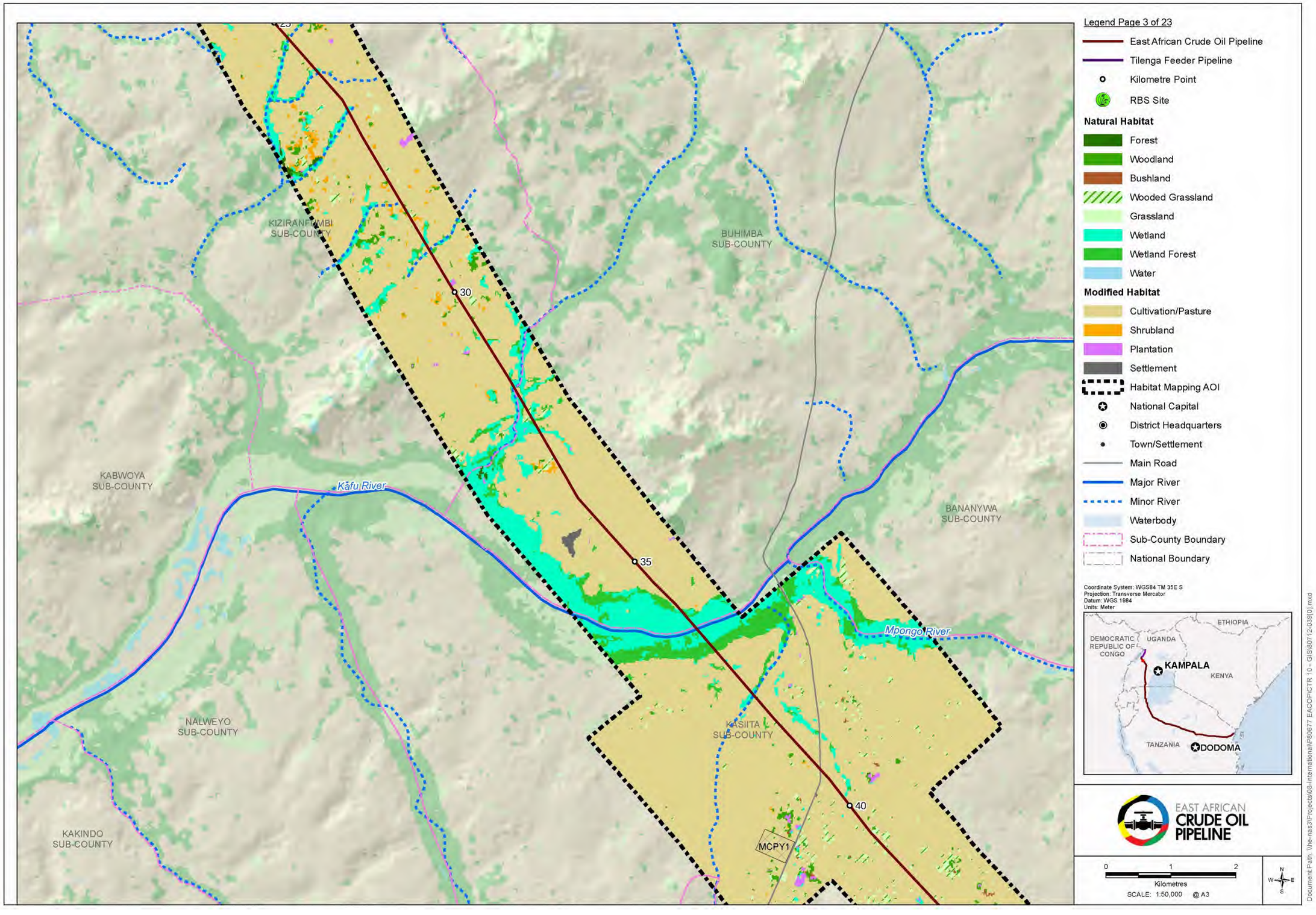
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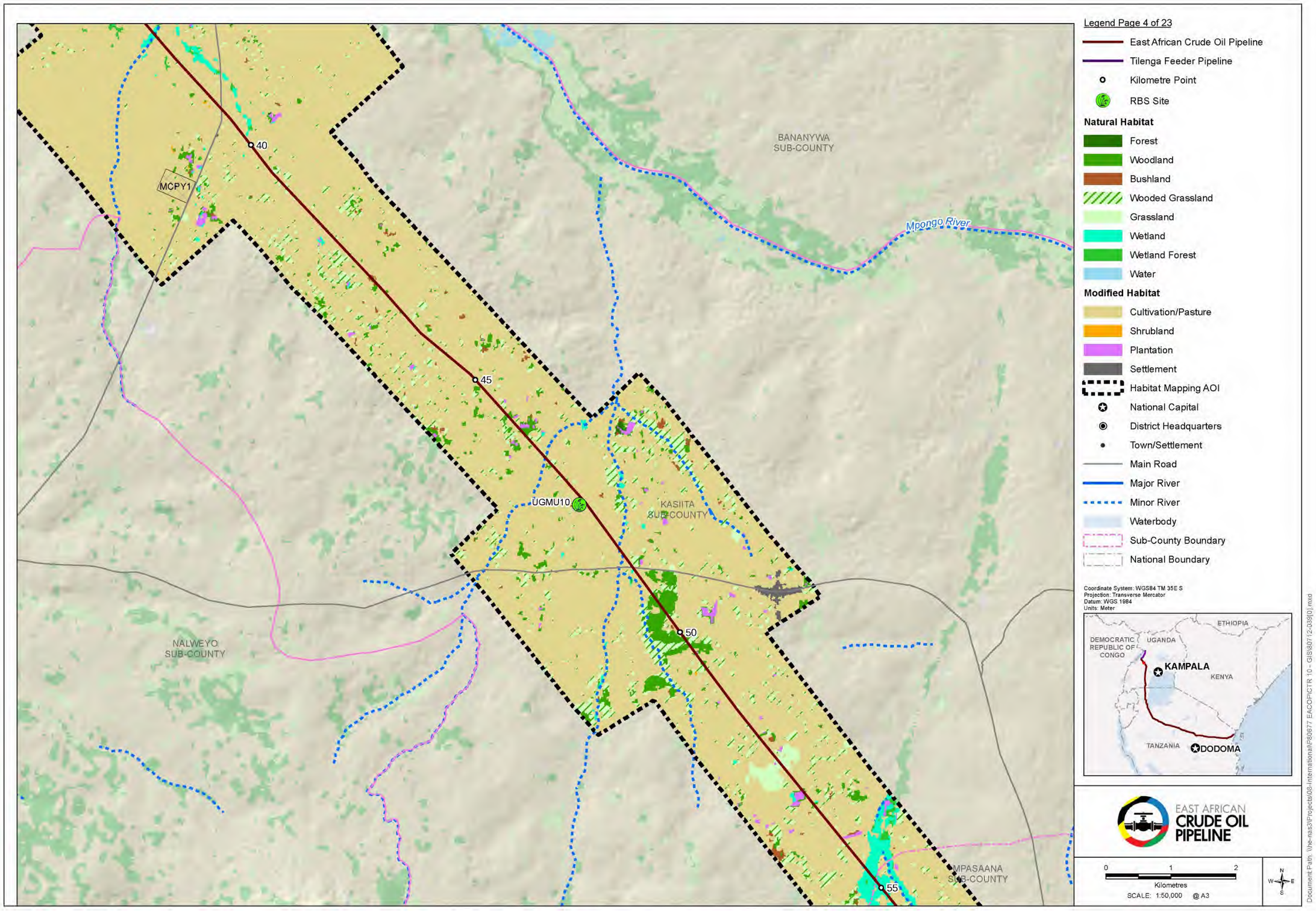
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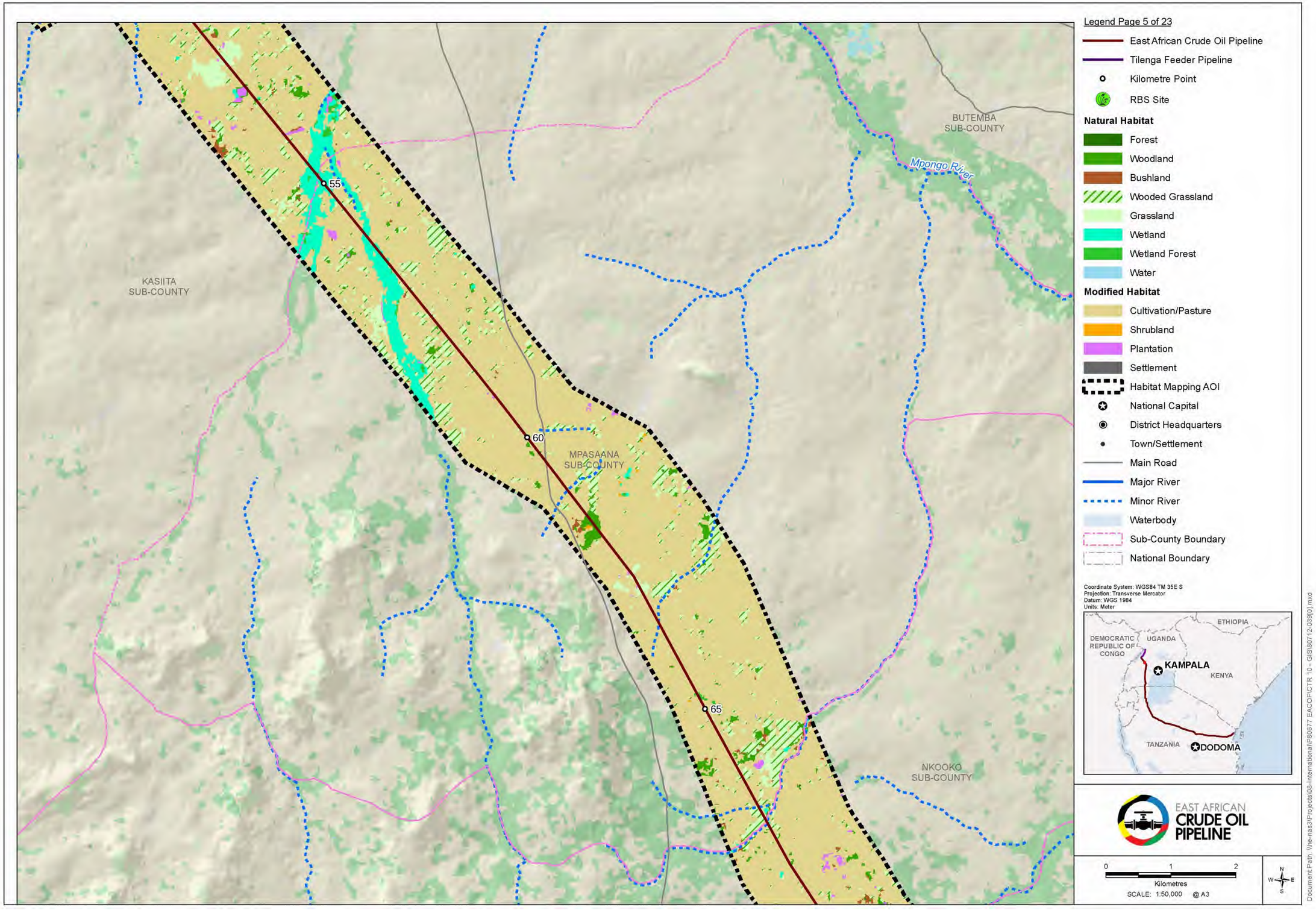
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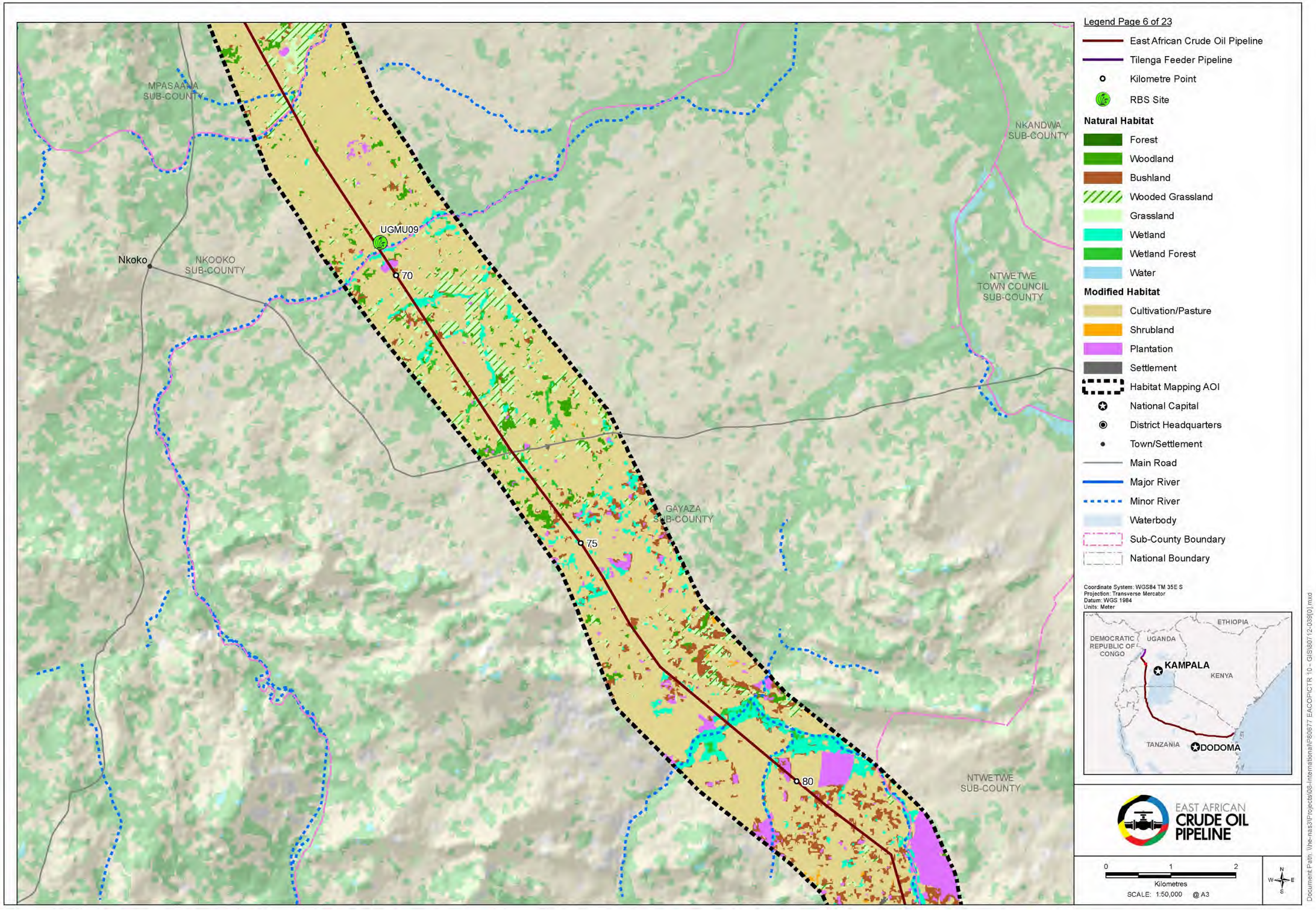
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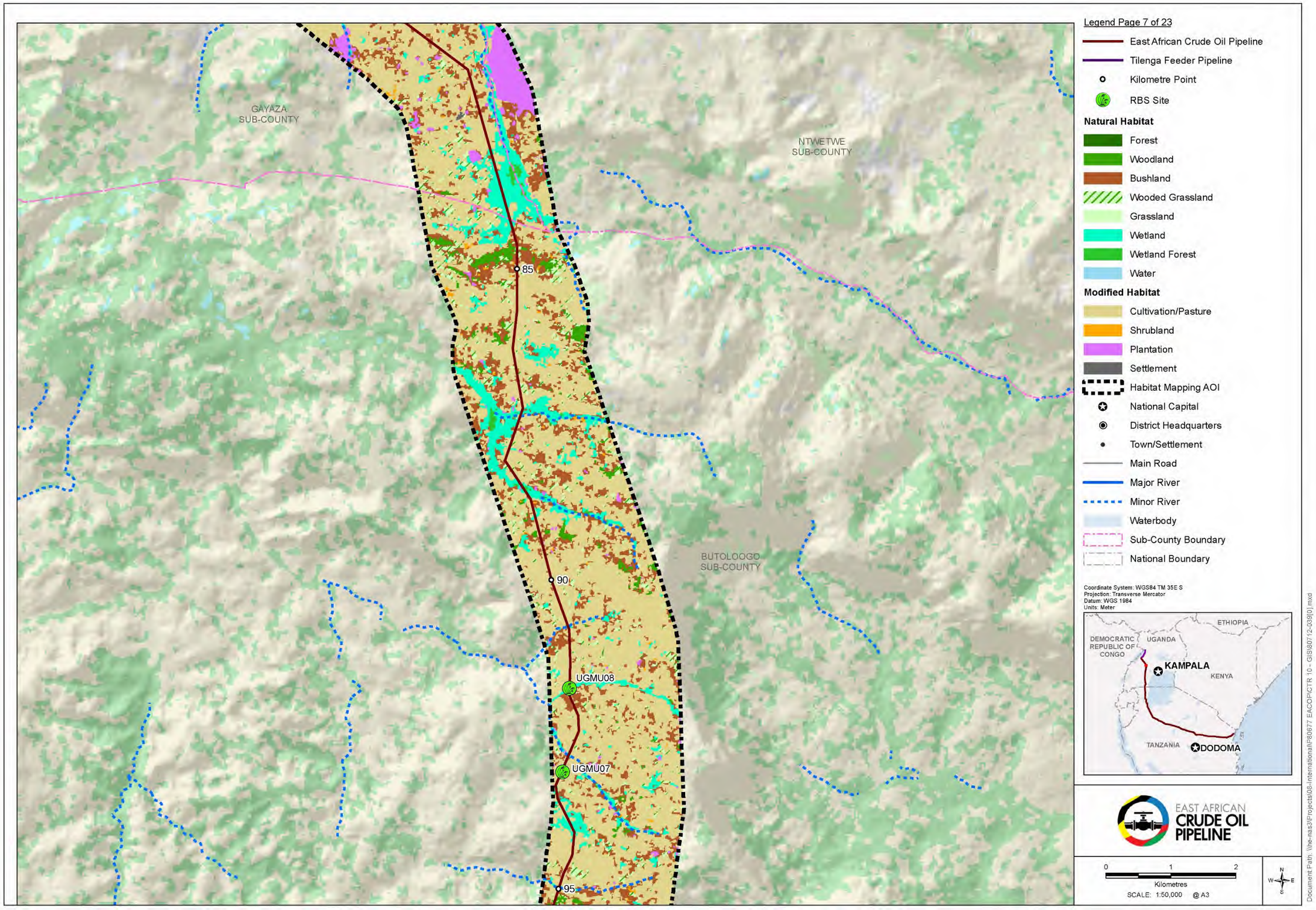
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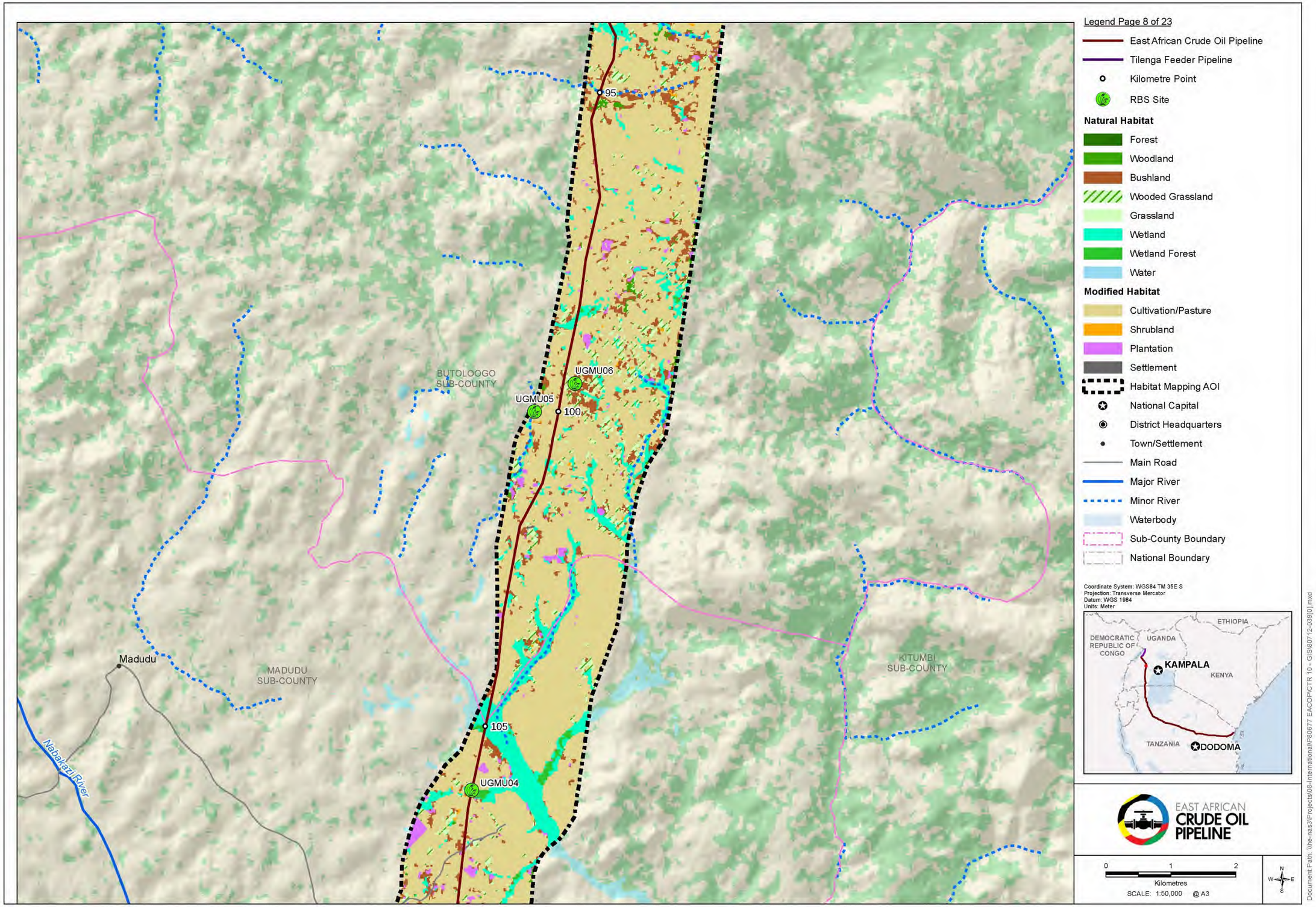
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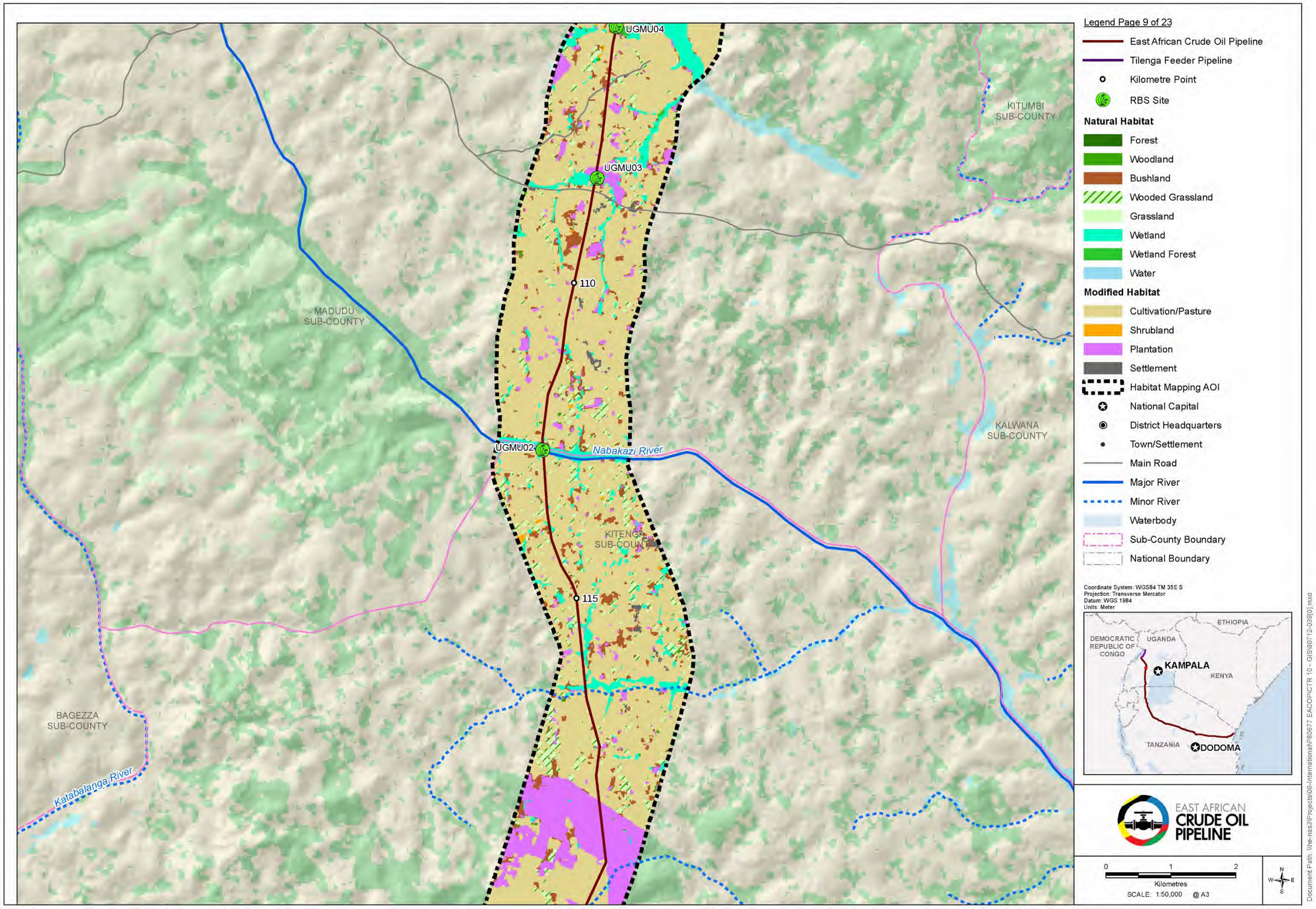
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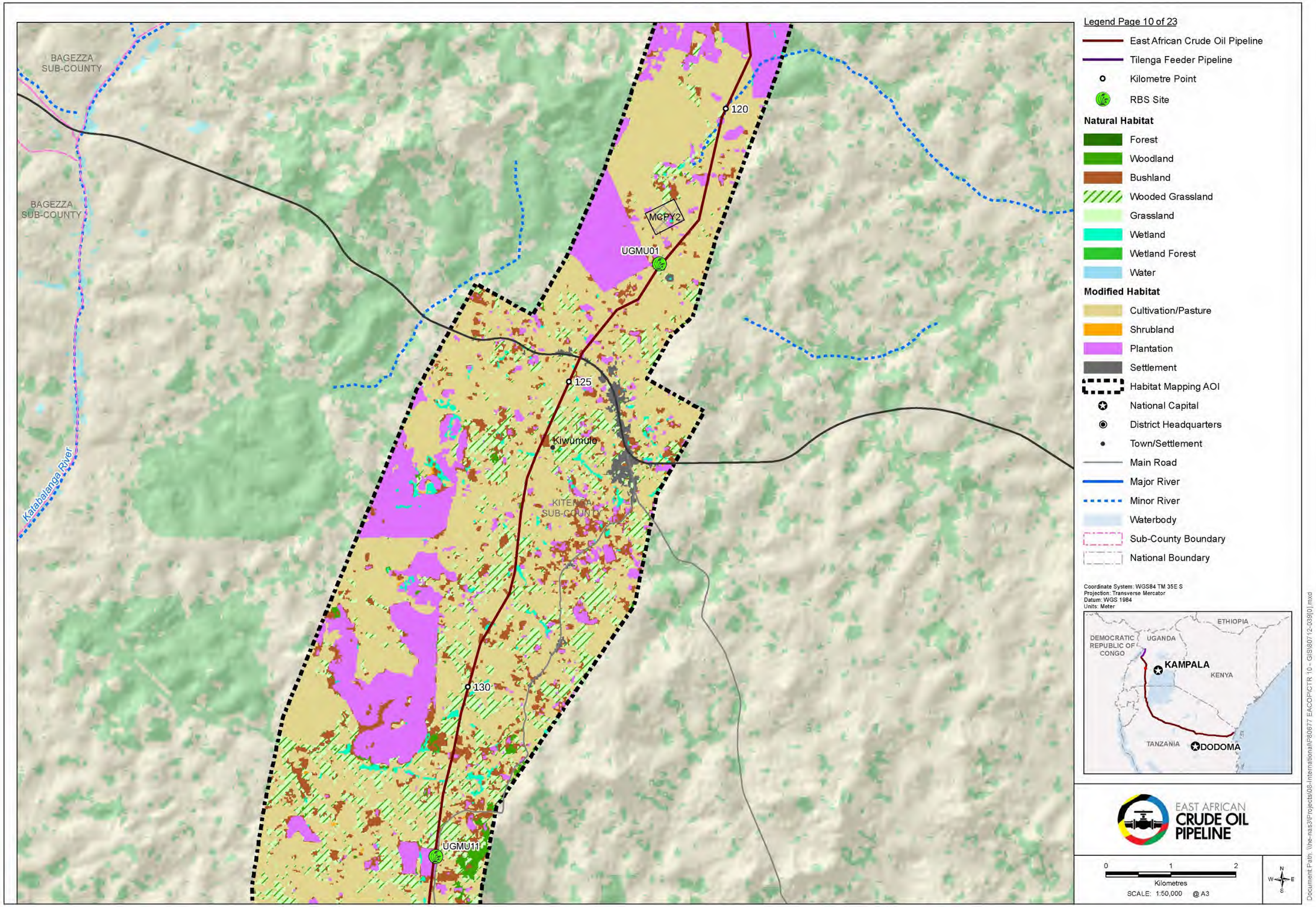
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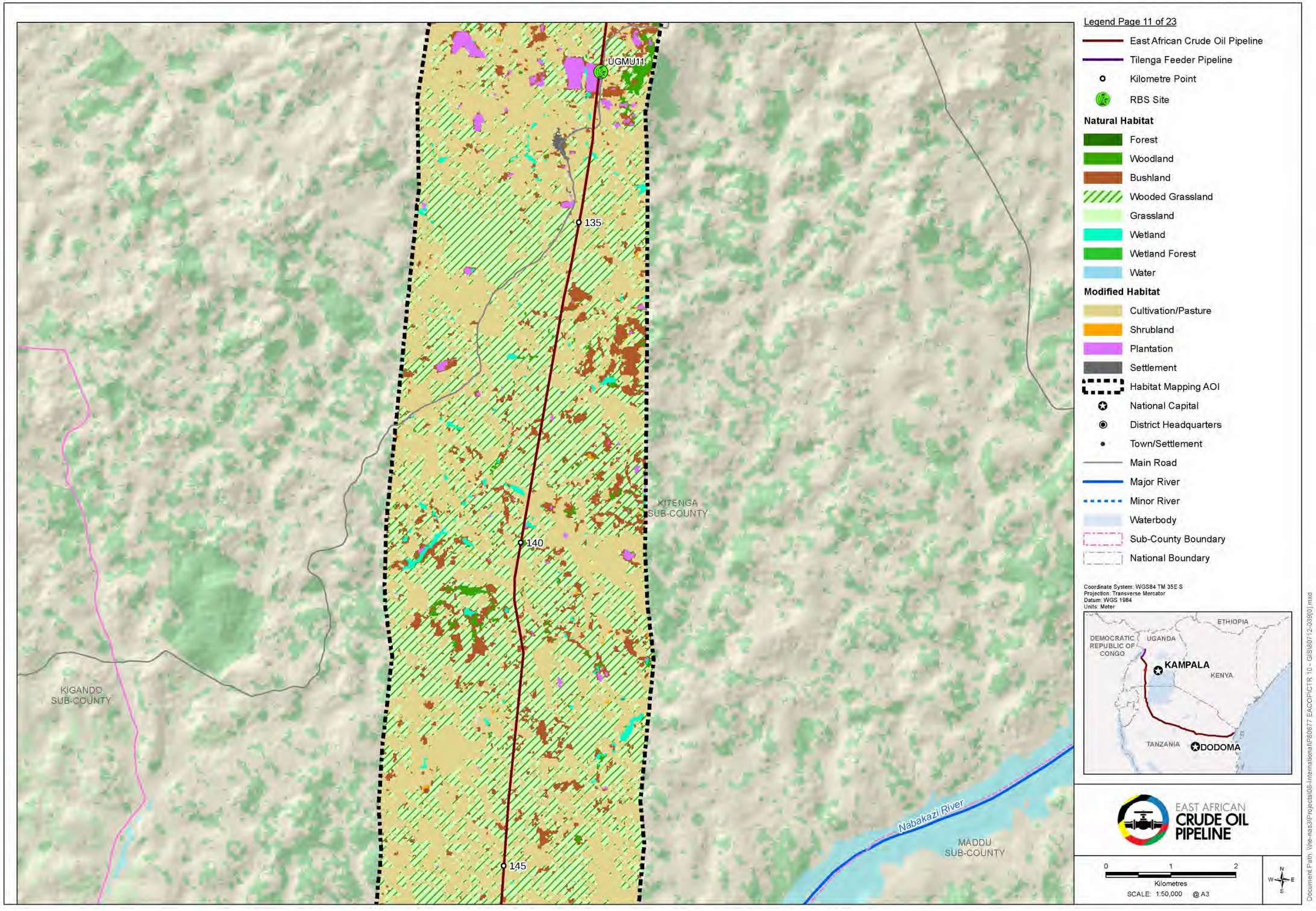
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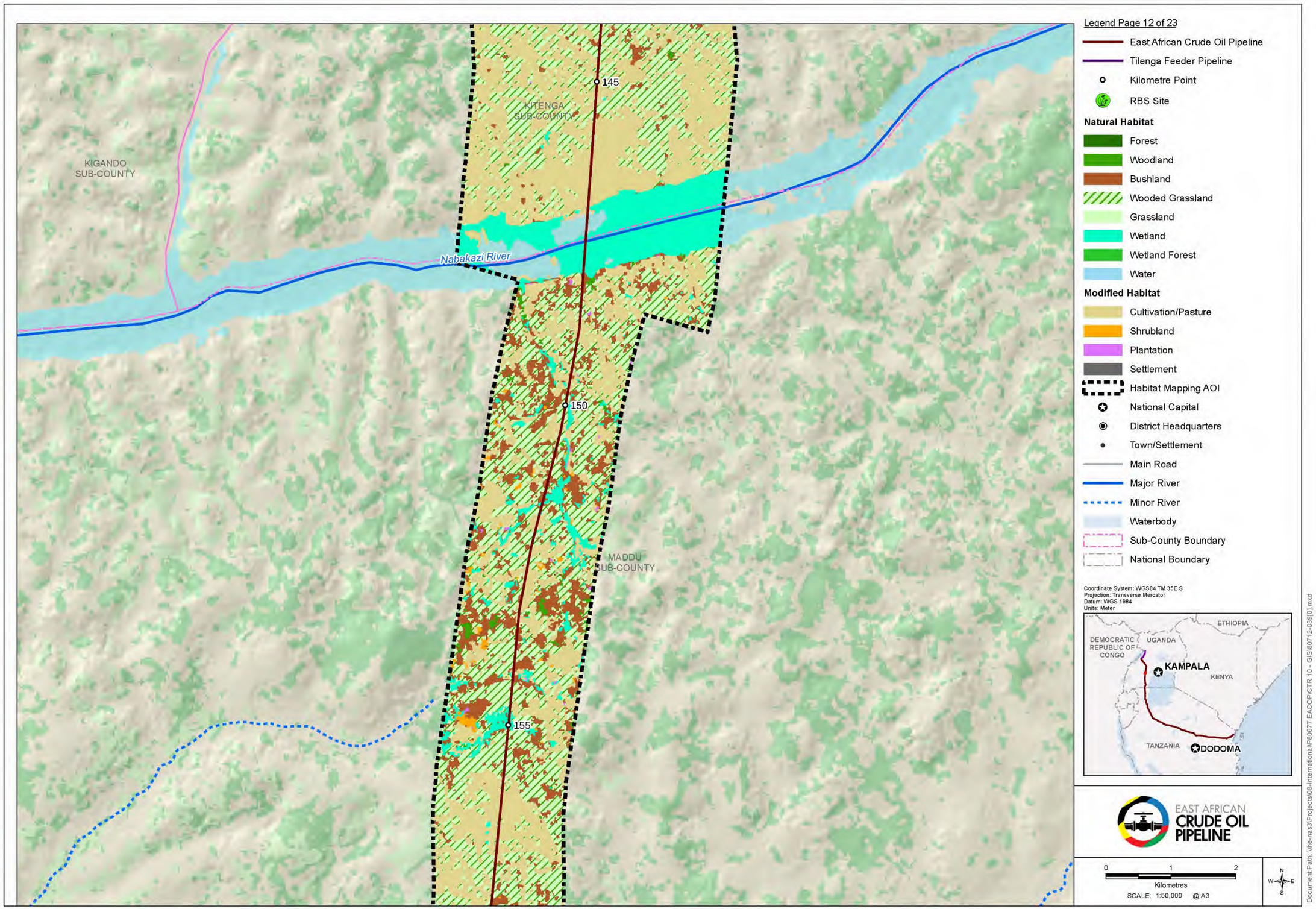
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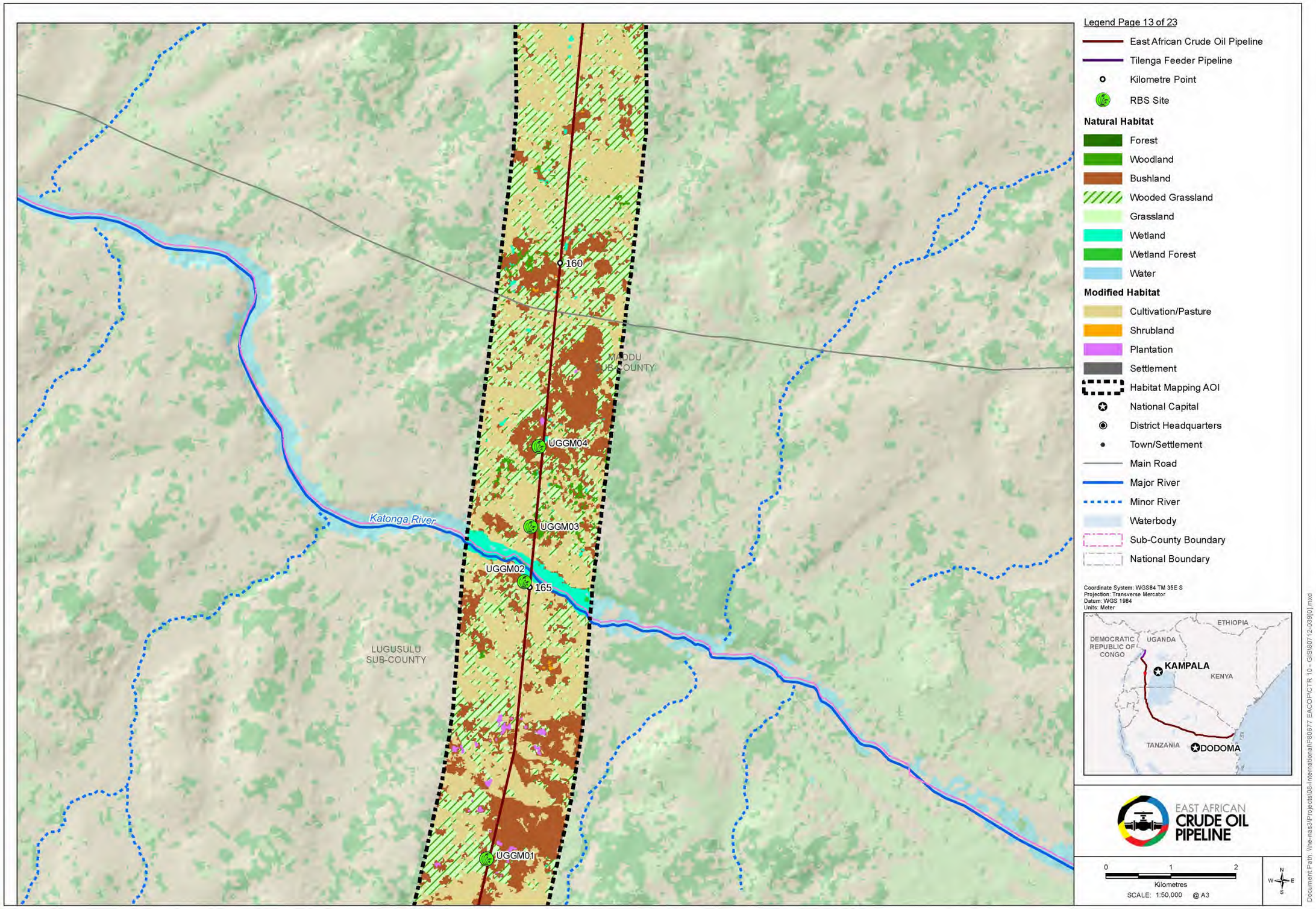
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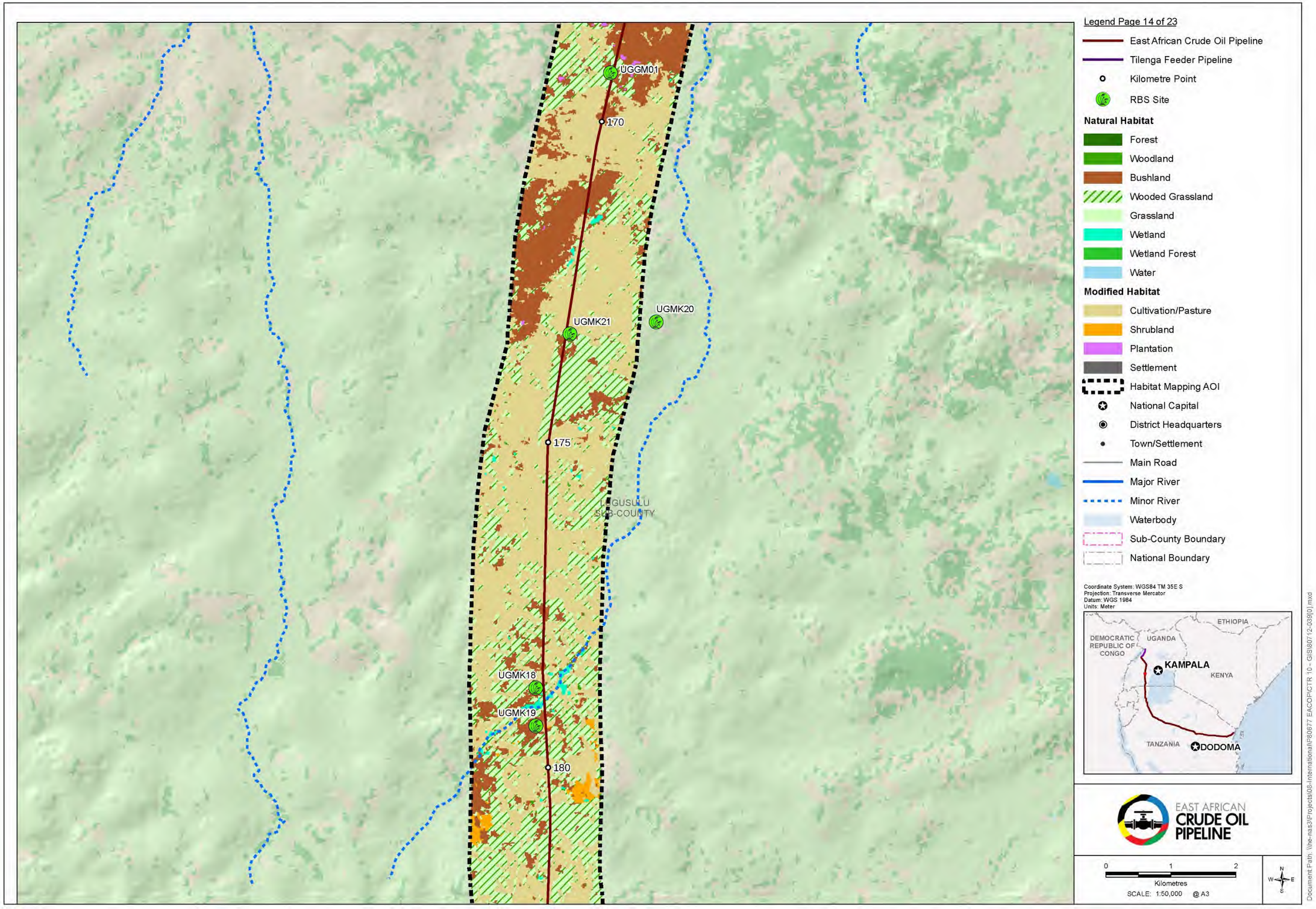
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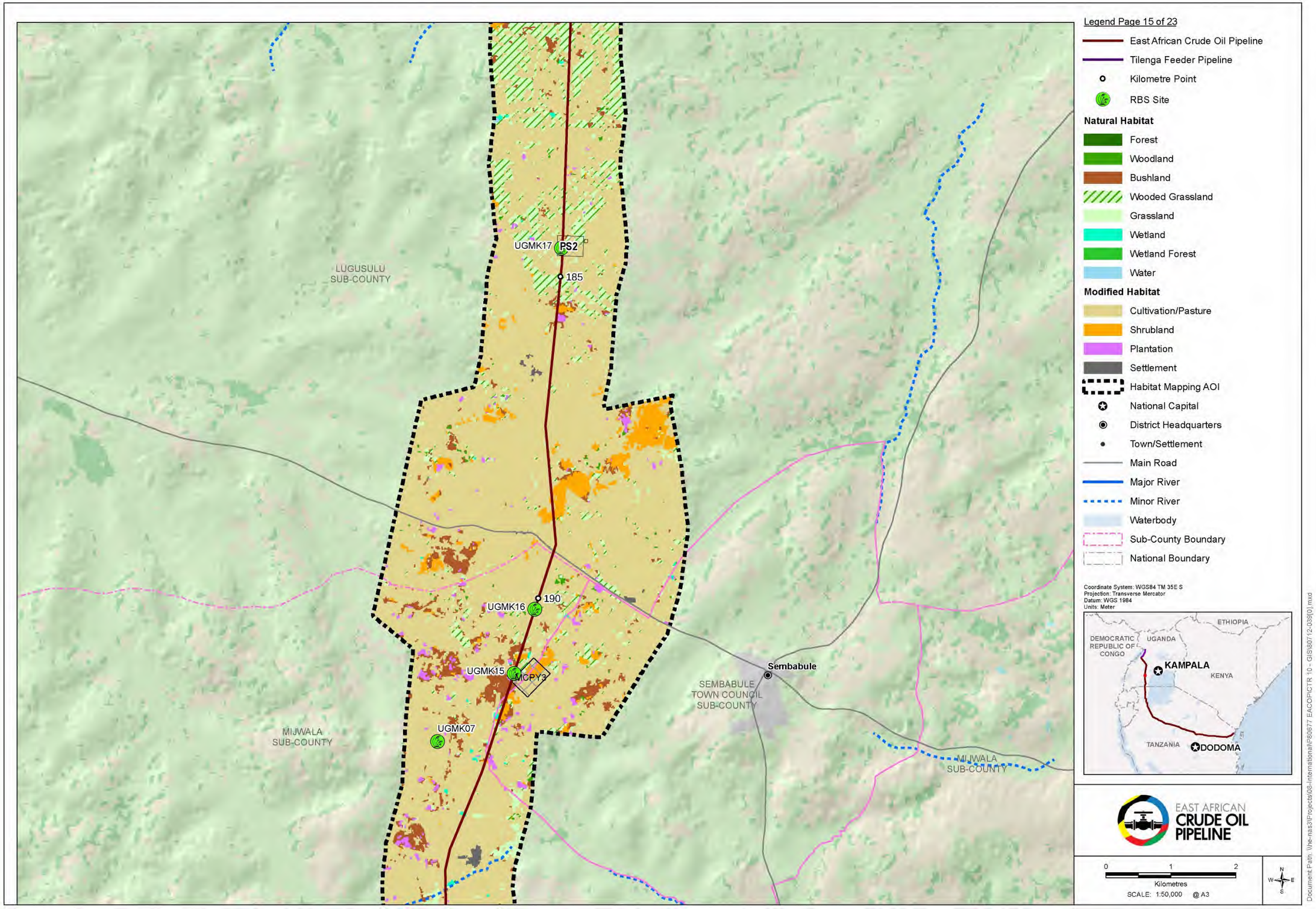
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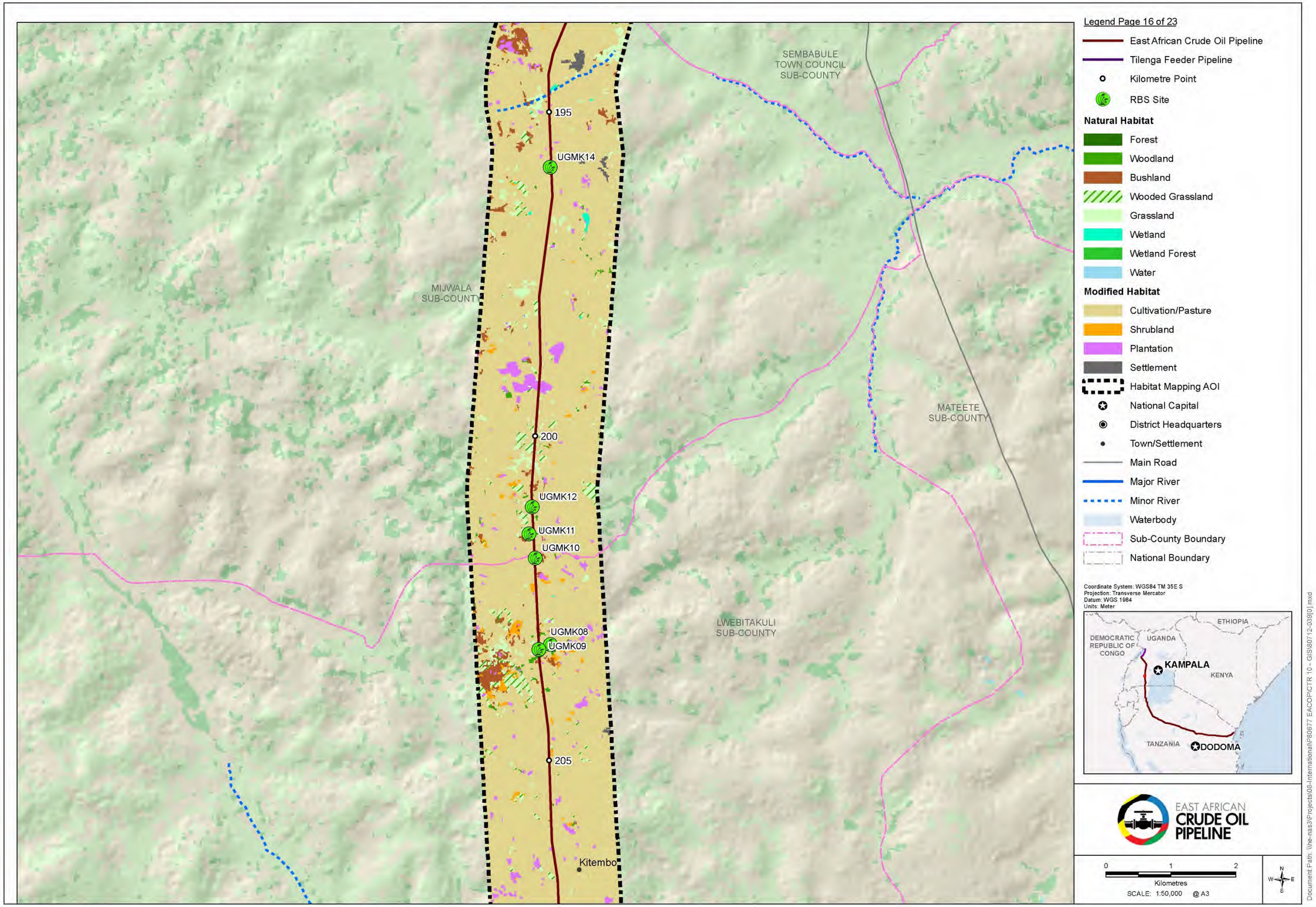
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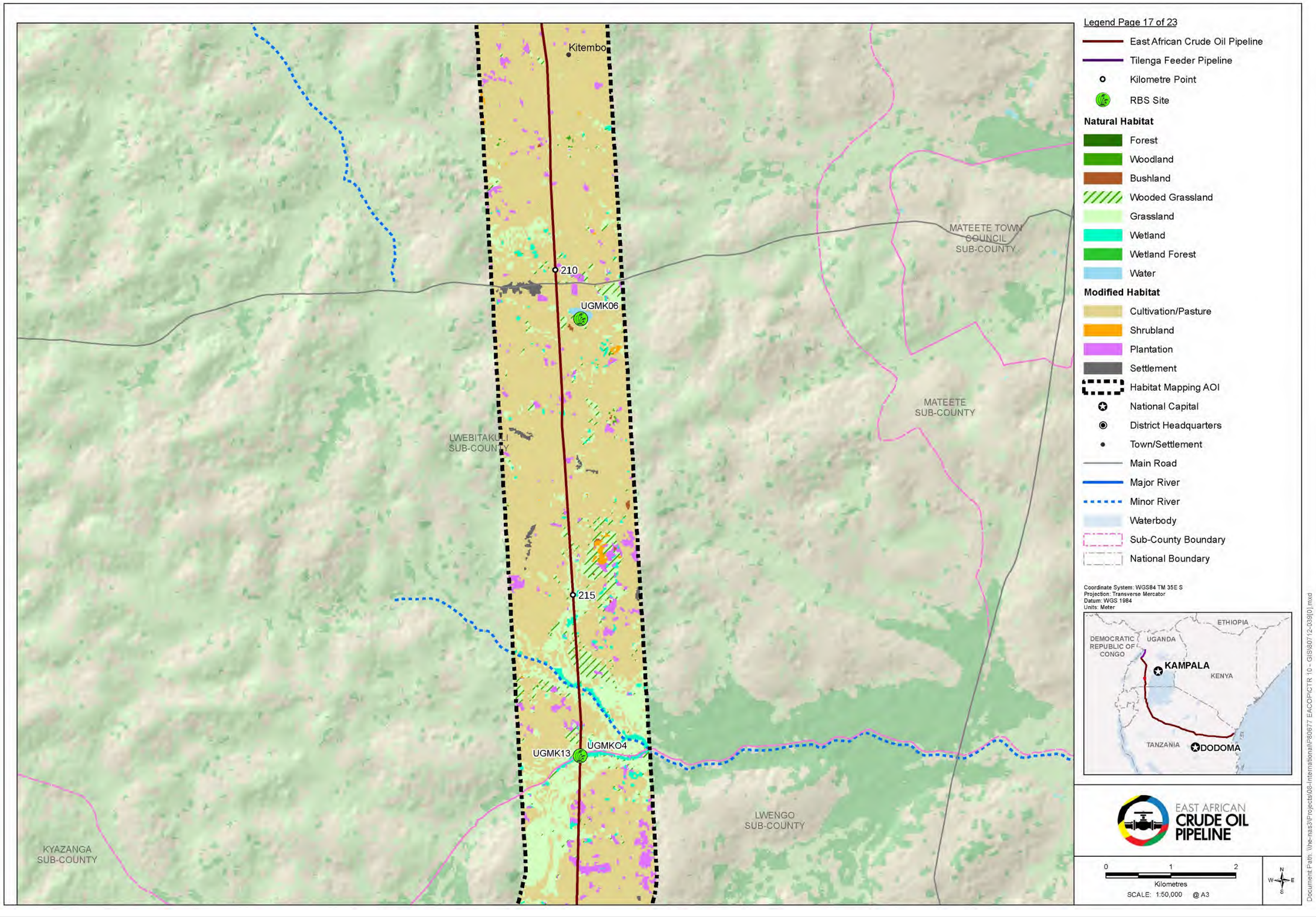
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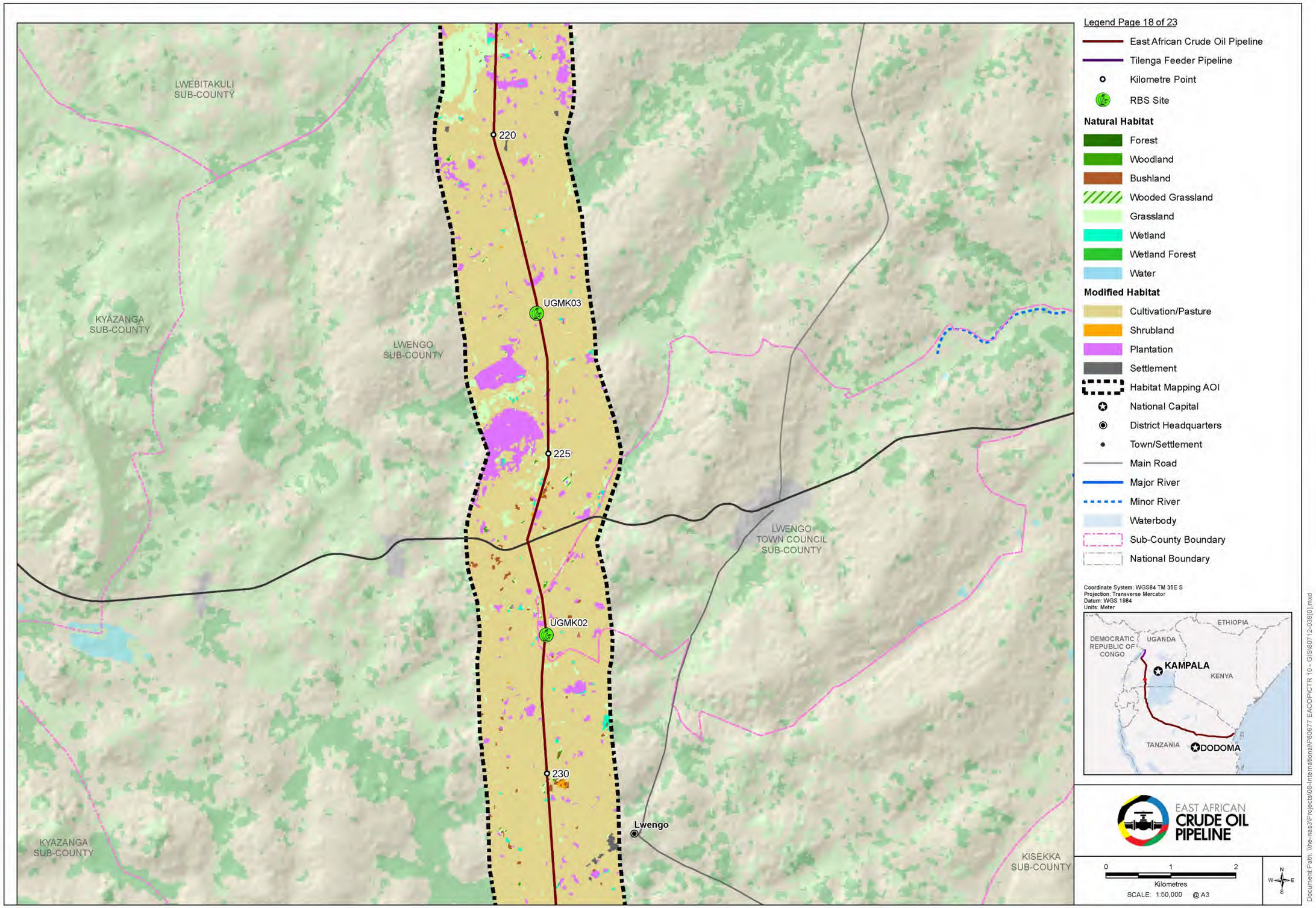
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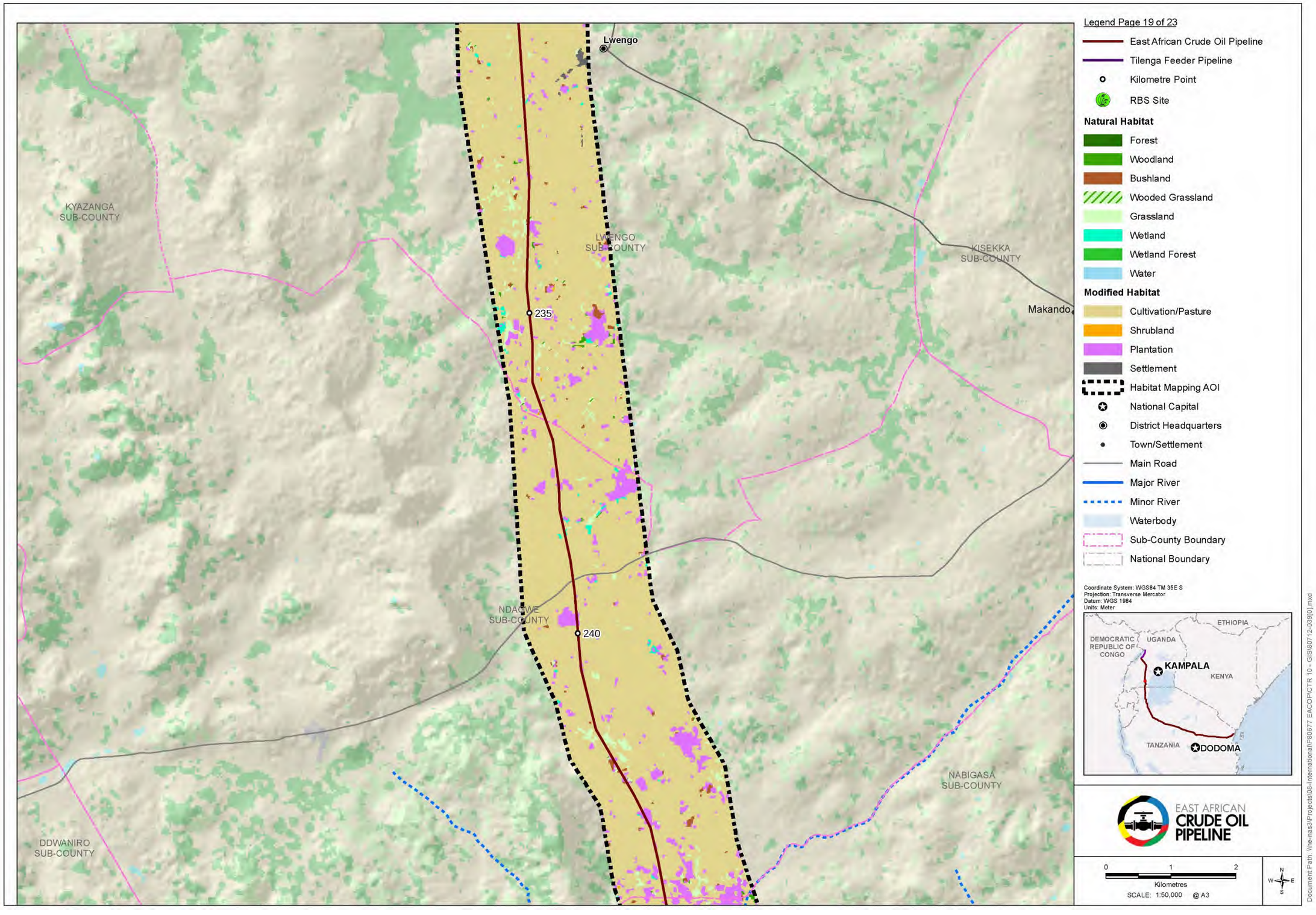
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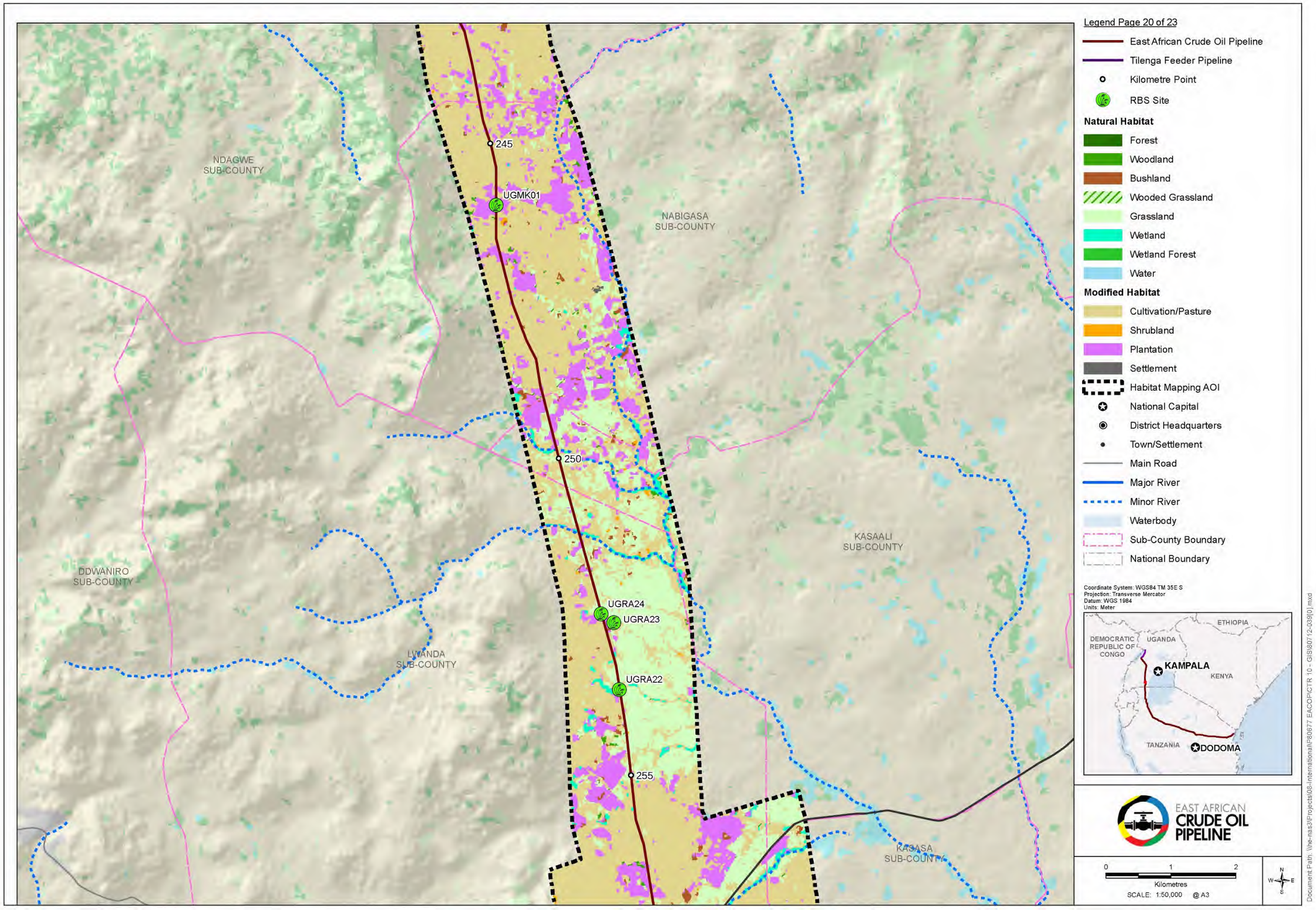
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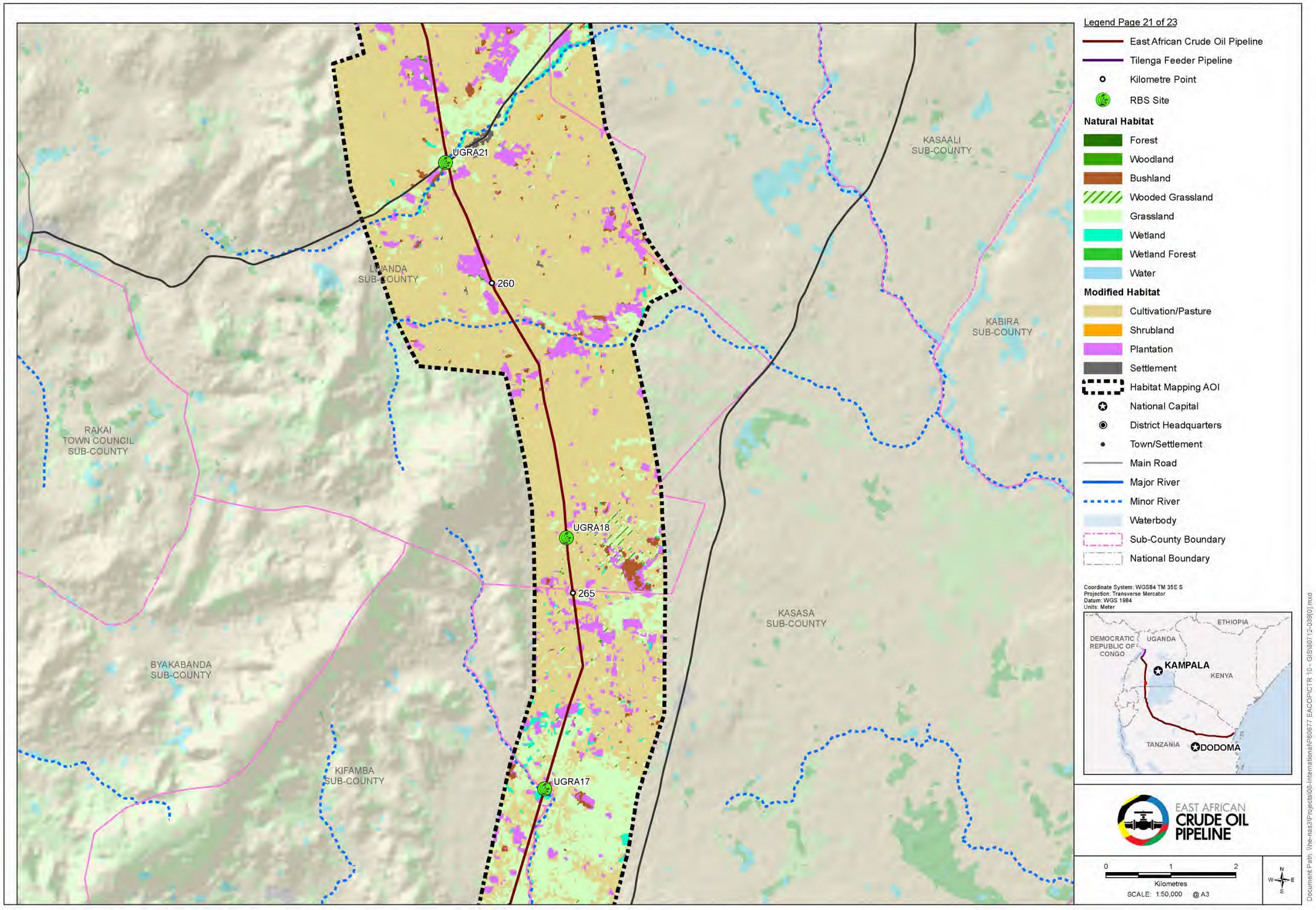
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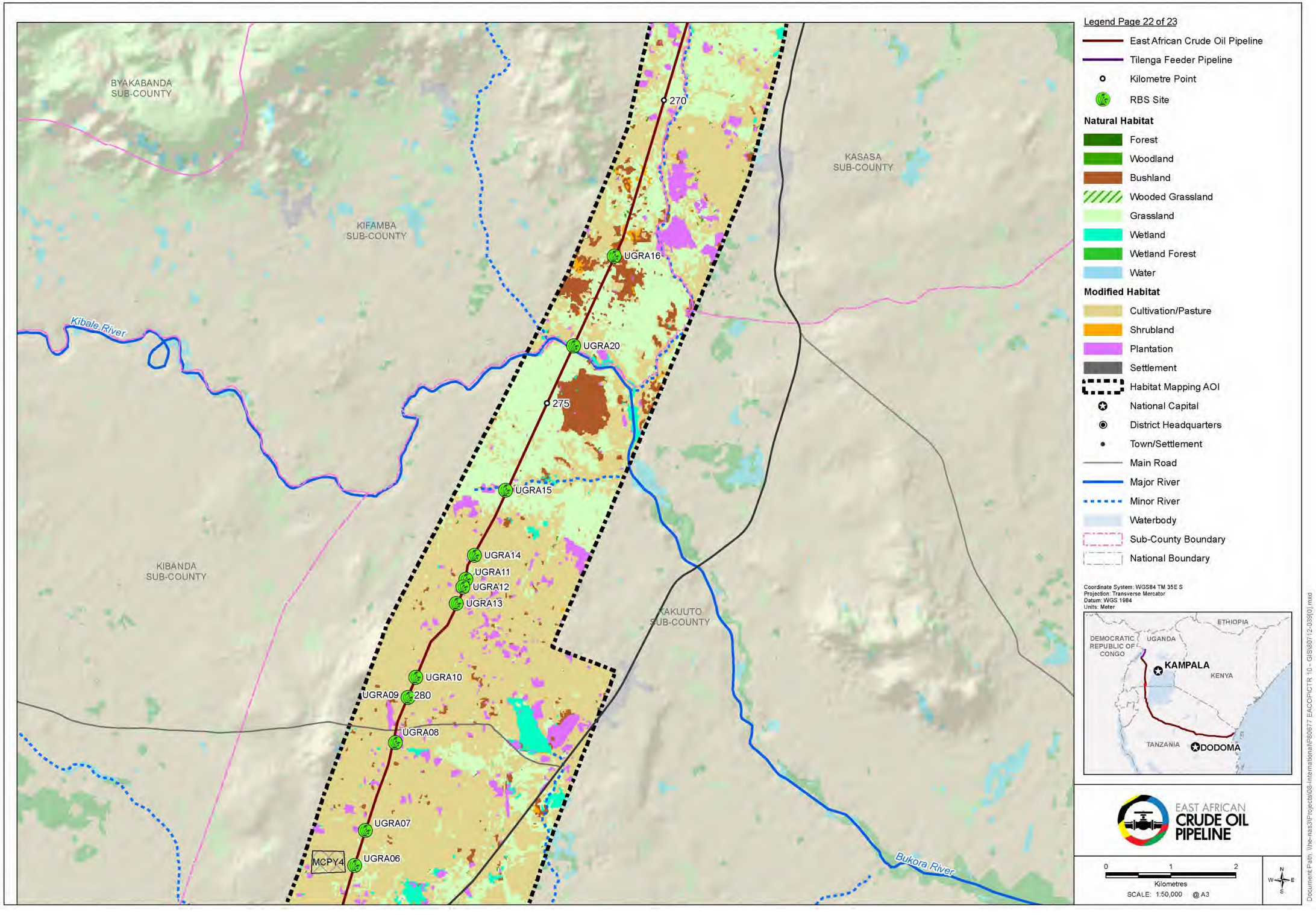
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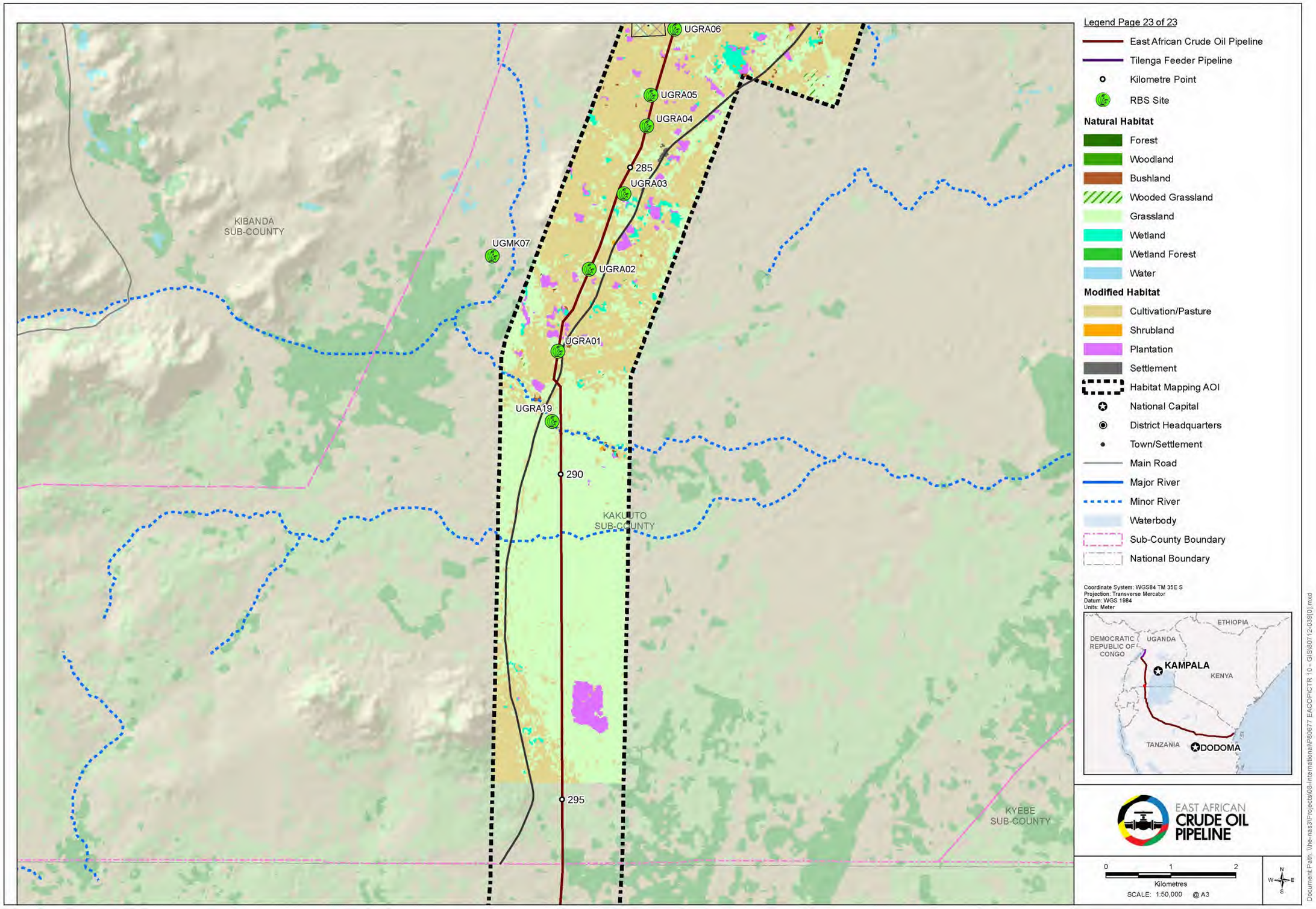
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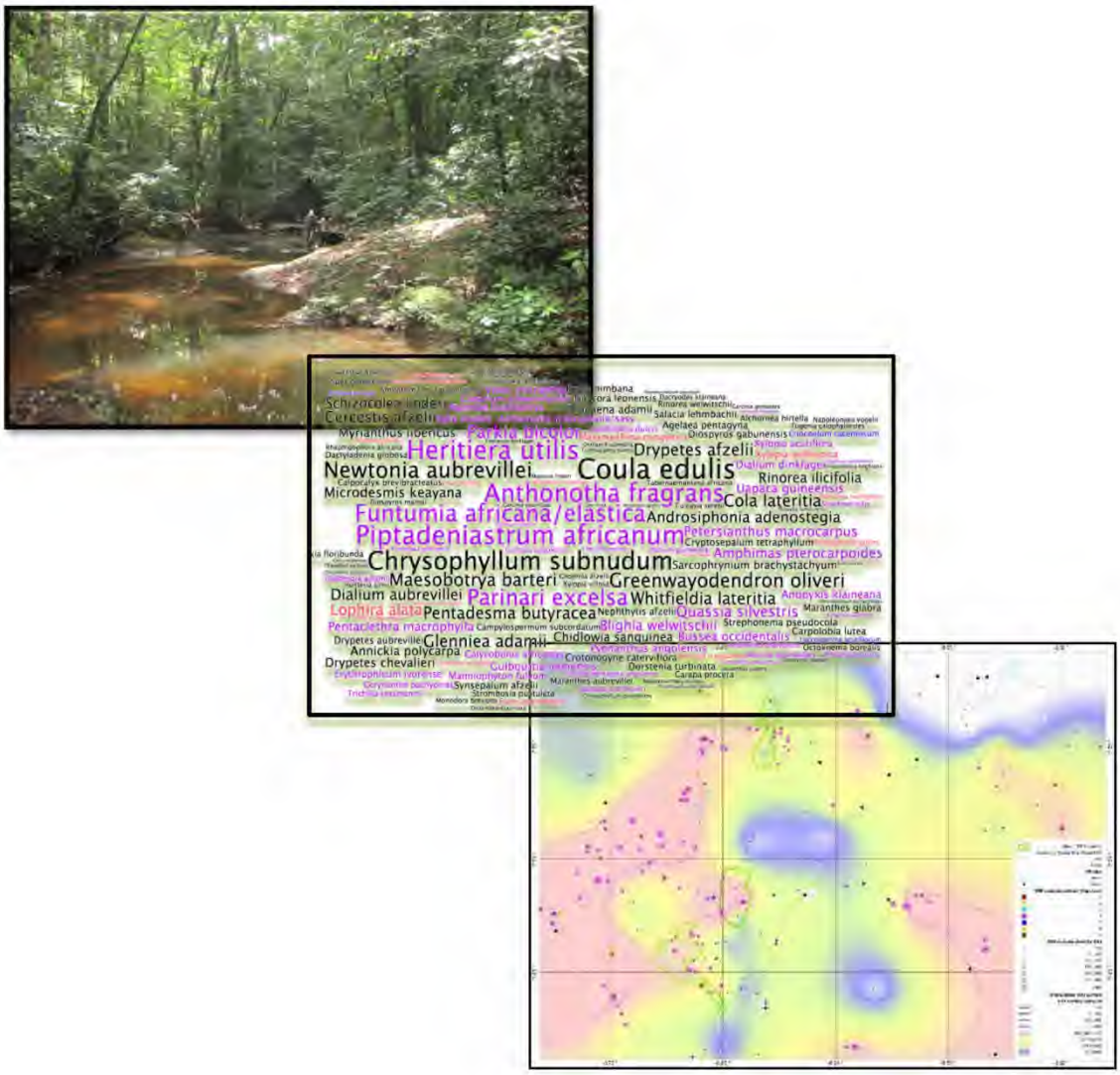
ATTACHMENT A1.2 RAPID BOTANIC SURVEY MANUAL AND MEASUREMENTS OF VEGETATION BIOQUALITY

A MANUAL FOR RAPID BOTANIC SURVEY (RBS) AND MEASUREMENT OF VEGETATION BIOQUALITY

W.D. Hawthorne & C. A. M. Marshall, June 2016



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Hawthorne, W.D. & C. A. M. Marshall. *A Manual for Rapid Botanic Survey (RBS) and measurement of vegetation bioquality*. Published online, June 2016. Department of Plant Sciences, University of Oxford, U.K.

QUICK SUMMARY

Rapid Botanic Survey (RBS) is primarily a field survey methodology for assessing species-rich plant communities, but it is associated with a range of non-field activities, analyses and outputs that can be considered part of RBS in a broad sense. This document is about the full range of typical RBS activities, from field to herbarium to database to output.

RBS outputs are used for mapping vegetation and prioritising areas for different management purposes, including conservation. RBS activities integrate species and community level assessments. RBS is particularly appropriate in species-rich, incompletely explored vegetation, but could be used in any plant community. RBS data are used to determine the main patterns of floristic variation in plant communities across a landscape. RBS is also used, even in well-known vegetation, for measuring bioquality 'temperature': the degree to which a sample is a biodiversity hotspot. RBS can be applied at any scale; it has been used to plan national and regional conservation strategies, as well as local Environmental Impact Assessments (EIAs).

RBS builds on a foundation of herbarium data and provides a generally more complete and less biased picture of plant biogeographic and ecological patterns than is available from herbaria alone. A typical survey involves databasing some existing herbarium and published data of various types, and enumeration of a suite of new RBS-specific samples in the field. The new samples fill the often substantial gaps in knowledge about plant distribution and provide data on a cross-section of habitats in a defined survey area, using a standardised approach.

The field survey tells us where each plant species lives within sampled landscapes. The background research meanwhile leads to the categorisation, into 'Stars', of the global rarity of each species as a basis for highlighting the global significance of local populations and vegetation patches. Plant communities, even local associations of species occupying a few square metres, are scored or evaluated based on the species found there and other local information collected during the surveys. The way in which Star ratings feed into community level "bioquality" valuations is described on p. 9.

Whilst biodiversity hotspots have been crudely and ambiguously defined on the broad global scale, RBS aims to achieve greater precision, higher resolution, practicality and transparency in biodiversity hotspot research. Global plant biodiversity is being eroded daily, and ideal solutions to its conservation are not going to be possible soon enough in many areas. One of the premises of RBS is that it is essential to make the most of what can be assessed with limited resources, rather than waiting for perfect answers. RBS promotes successive approximation and encourages fuzzy logic, when crisp logic and detailed studies would not lead anywhere fast enough. The RBS framework provides objective, transparent and repeatable, best-available answers that are open to refinement if time allows. This is one of the key differences between RBS and various other, 'Ivory Tower' approaches to biodiversity evaluation. Whilst the bull-dozers push back nature throughout the world, RBS places pragmatism before academic purity in a bid to do something before the subject matter disappears.

It is possible to define and use Star ratings and measure bioquality without RBS samples; and to make good use of RBS sample data without defining Stars. If you are interested in using RBS for purposes other than bioquality evaluation, skip to page 7.

RBS-derived data form a good foundation for studies in many related disciplines, for example the impacts of development or climate change on biodiversity, or studies of possible or actual impacts on species distribution.

ABBREVIATIONS AND GLOSSARY

Term	Abbreviation	Page	Meaning
Bioquality		9	A term expressing the global rarity of species in a community. A community with a higher concentration of globally rare plants has higher bioquality. This contrasts with biological diversity, which expresses the number of species in a community and their abundance. Bioquality emphasises the concentration of "high conservation value" elements (species, varieties, genes) of biodiversity in a community, in respect of their global rarity and distinctiveness. See GHI below.
Diameter at Breast Height	DBH		A standard measurement for the size of a tree. The bole diameter is measured 1.3 m above the ground, or equivalent on buttressed trees.
Environmental Impact Assessment	EIA		The process of assessing the likely significance of damage to the environment and biodiversity of an area caused by a proposed operation, e.g. mining or construction; often including recommendations for avoiding or mitigating the worst effects.
Genetic Heat Index	GHI	10	A standardised and practical index of bioquality in a plant community; a first approximation to a range size rarity score based on the weight allocated to each species by virtue of the species' Star.
Ordination		25	Ordination refers to a family of statistical methods, usually specific computer software, which attempts to reveal the relationships between ecological communities in respect of their species content, sometimes incorporating environmental variables.
Star		10	A category for a species, variety or subspecies indicating the significance of local populations for global biodiversity conservation. Based primarily on global rarity, the basis for weighting Stars relative to each other in the GHI. Sparseness of individuals in populations, ecology, taxonomic distinctiveness and variation within taxa are secondary considerations.
Range Size rarity Index			Weighted average score summarising a list of species, wherein the rarer species have higher weight. Unlike GHI, the analysis is self-contained, and rarity is based entirely on individual records in the database being analysed.
Rapid Botanic Survey	**RBS**	6	A survey including many samples of plant communities in a given area and using the protocols described in this document.

RBS HISTORY

RBS and associated methods for analysing and using RBS data were originally designed for rapid assessment of rain forest biodiversity in Africa, but RBS has since been used in other continents and vegetation types.

The sampling method was originally inspired by:

- Plant community lists on herbarium labels, for instance: "*this species is abundant in rocky, limestone ravines on the east of the hill, with Impatiens blogsii, Cynometra webberi, Julbernardia, Asteranthe asterias, Croton jacquesii*". This type of herbarium-based, label information is like a cut-down version of an RBS sample, though the species lists are usually incomplete or at least of unknown completeness and bias, and provide no means for checking the accuracy of the species listed.
- Some of the aspects of field survey associated with Braun-Blanquet phytosociology, notably respect for the value of subjective, surveyor's choice of representative sample sites (Westhoff & van der Maarel 1978; Wikum & Shanholtzer, 1978). This method was designed for European types of vegetation, is not ideal for rainforest, and the samples (relevés) are measured, unlike typical RBS samples.
- A national forest type survey in Ghana by Swaine and Hall (Hall & Swaine, 1981), which included a subset of unmeasured, so-called 'B' samples, to help interpolate data from a network of larger measured plots. Swaine and Hall (1976) had established in Ghana that records of just 30 random species provided enough information to identify the forest types established using full 50-150 species lists from measured 25 x 25m plots. RBS samples are similar to these B plots in that they are unmeasured, but are in general are more thorough samples of the local landscape unit.

RBS-like sampling evolved from these approaches during a survey of coastal forests in Tanzania and Kenya, where the sample units were called 'sublocalities' (Hawthorne et al., 1981; Hawthorne, 1984, 1993a). The protocol was subsequently developed into its current form in a national plant biodiversity survey of Ghana (Hawthorne & Abu Juam, 1995; Hawthorne, 1996), complementing a national forest tree inventory. The approach was initially designed to make maximum use of available data sources, including herbaria, plot based samples and published, whole-forest check-lists. RBS outputs have subsequently had a prominent influence in decisions about protected areas and objective allocation of global biodiversity funds in Ghana (Hawthorne *et al.*, 1998a). A bioquality hotspot map for Ghana's forest zone, derived from RBS, is shown in Figure 1.

RBS has since been used in a variety of projects around the world, providing comparable data and indices for different regions (Hawthorne 1992, 1996; Hawthorne & Hughes, 1997; Chua *et al.*, 1998; Hughes *et al.*, 1998; Tchouto, 2004; Gordon *et al.*, 2003, 2004; Hawthorne *et al.* 2007, 2008, 2009; Ndam *et al.*, 2001; Marshall & Hawthorne, 2012, 2013; Baksh-Comeau *et al.*, 2016). RBS has been carried out in Chile, Senegal, Liberia and Trinidad & Tobago, amongst other locations.

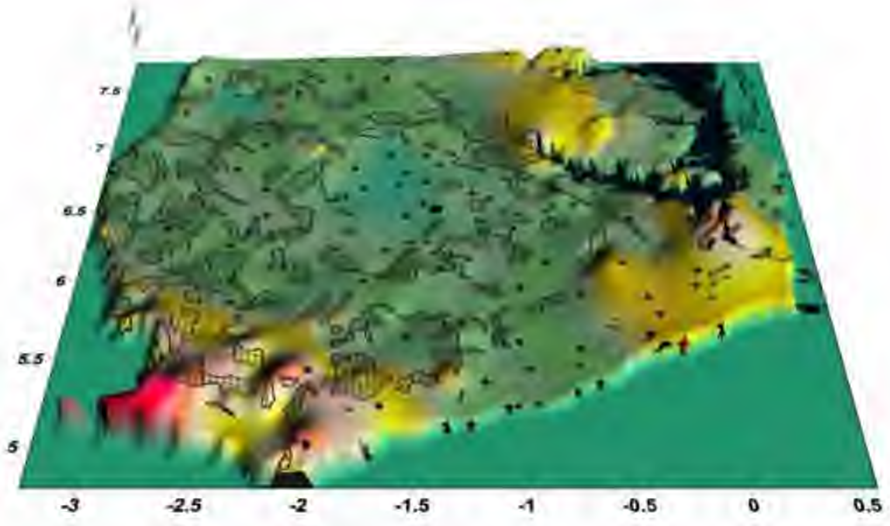

Figure 1 Ghana, showing forest reserves as outlines. The colours and the apparent landscape altitude indicate bioquality. Note the red 'peaks' or hotspots of GHI in the SW (species rich, wet evergreen forest); and around the south and west of Volta lake, which is the lake in the NE quarter of the map (dry, species poor forest). Following this survey, an increased proportion of the hotspot areas in particular received complete protection.

RBS AND BIODIVERSITY

The term biodiversity is usually defined as the variety of life at its various organizational levels, from the genes in populations to the living planet, or biosphere. RBS addresses a small but crucial part of this web.

Budgets are always limited and we cannot sample all types of organism rapidly: RBS focuses on vascular plants and is designed to deal with the vegetation in a specific landscape – it is part of a bottom up approach to biodiversity analysis. Most of the RBS focus is on named plants, i.e. formal taxa, rather than the subtler elements of biodiversity. However, RBS does also address indirectly some of the less tractable aspects of biodiversity:

- For the broad scale of biodiversity, the position of a surveyed landscape within a regional or global vegetation classification is an important theme when reporting RBS results, showing the significance of local vegetation types in a global context. We are developing an online RBS database for all RBS survey results, to help provide the bigger picture – pinpointing the status of the plant communities of an area in a global context.
- Regarding genetic diversity within species, it is usually impractical to consider in RBS the genetic variation within and between species if it is not covered by formal taxonomy (for instance, in terms of named varieties and subspecies). However, when species are categorised for RBS into Stars (p. 12), allowance is made where possible for the fact that species and other taxa are not all defined on an equal basis, but are susceptible to the varied and fickle sensibilities of taxonomists. One taxonomist's variety is another's species. The apparent genetic variation within species on the one hand and the relatedness of species to others can both be used to modify the biodiversity value attached by the RBS analysts to different species or infra-specific names. These aspects are considered as part of the rapid

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global rarity assessment for each species, so in this context RBS does strive to consider deeper aspects of biodiversity than can be covered by the formal plant names.

RBS does not otherwise deal with genetic issues, but it is proposed that the undocumented patterns of genetic variation within widespread species should match, to some extent, the patterns on which RBS focuses, in the species content of vegetation. Biogeographic factors like isolation, climatic history leading to refugia, and unusual environmental conditions today can be associated with clusters of endemic species, so one might expect they would be associated also with other local peculiarities in the composition of gene pools.

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BIODIVERSITY, BIOQUALITY AND HOTSPOTS

Bioquality is often considered with reference to RBS samples, but both bioquality and RBS can be discussed or surveyed independently. Skip this section if your only interest is in RBS *per se*, for purposes other than surveying bioquality.

A CONFUSION OF HOTSPOTS

The term 'hotspot' implies an area rich in, or threatened by, something. For instance, for geologists a hotspot is an area with high levels of volcanic activity. The term ***Biodiversity Hotspot*** is used in a variety of ways in the literature, not only to mean areas with a high diversity of life:

1. Rich. A region rich in species, or in rare or endemic or endangered species (Allaby, 1998). It is important even with this simple definition to specify which types of species richness formula is meant, but often the term is used indiscriminately.
2. Rich and Risky. Regions biologically rich as in 1, but that are also threatened by destruction and therefore priorities for conservation action. This is the definition favoured by Myers and many others (e.g. Myers *et al.*, 2000).
3. Rich or Risky. The term hotspot is also applied explicitly in three different ways by the same authors, e.g. to specify richness, rarity and threat (Orme *et al.* 2005).

In the current context, definition 1 is followed for the meaning of "biodiversity hotspot", trying to avoid the confusion due to inclusion of threat in the concept.

To convey meaning 2, phrases like "Critical Biodiversity hotspot" or "threatened biodiversity hotspot" are more appropriate. Composite definitions as in 2 have the problem of weighting the relative importance of threat and species richness when ranking areas in an objective way.

BIOQUALITY

Because of the ambiguity inherent in the term biodiversity hotspot, and because areas "rich in endemics" depend on the size of the area being considered, the term **Bioquality** is used to convey the value associated with areas being rich in, i.e. hotspots of, globally rare species, taking into account the varied geographical ranges of the component species (Hawthorne & Abu Juam, 1995; Hawthorne 1996).

Like biodiversity, bioquality is a property of a set or community of species. Unlike true diversity measures, though, bioquality relates to the concentration of valued species in a sample or community. By contrast, diversity specifically denotes the numbers of species and their relative abundance (as in Fisher's alpha and the Simpson or Shannon-Weaver index).

If unspecified, bioquality implies the global value associated with representation of globally rare species in a sample of a community. The Genetic Heat Index (GHI) discussed below represents an attempt to formulate this sense of bioquality.

- If unqualified, *Bioquality* specifically implies *valued due to a high concentration of globally rare taxa*, and with a value weighted by the degree of rarity.
- However, more loosely, and if defined explicitly, one might use the term bioquality in other contexts where the biodiversity of a community is scored by summing, integrating or otherwise combining valuations of the component species. For example, "locally perceived bioquality" might imply species had been weighted according to the sensibilities of the human societies living in and around the

vegetation in question. Clearly, in these other cases one can expect many, often conflicting values by different groups of people for the same plant community.

- "Tree community bioquality" might be calculated as a GHI for tree species with individuals above a certain specified size class, within a sample area.

Vegetation on an old, urban rubbish tip can have a high diversity, with many different exotic and pioneer species, but if these are all globalised weeds, the bioquality would be very low. Conversely, a patch of forest dominated by hundreds of trees of one locally endemic tree species in a mono-specific genus has higher bioquality than a patch of similar forest with 100 widespread species. Every individual plant in the first case is part of a high priority, globally rare species, and in the second case there are no individuals of globally rare species. One expects, in general, to encounter globally rare plants (and genes) more frequently whilst walking randomly in high bioquality vegetation than in low bioquality vegetation.

BIOQUALITY ASSESSMENT USING THE GENETIC HEAT INDEX (GHI)

To recap and emphasize, bioquality could be expressed in various ways, and for different taxonomic groups, but when it is specified in terms of the Genetic Heat Index (GHI) for plant communities, it indicates the degree of global endemicity – the localness – represented there.

Bioquality assessment was developed hand-in-glove with the RBS field method. The techniques used to analyse RBS data reveal the main trends in vegetation content and local and regional peaks of bioquality, showing where globally rare species are concentrated, perhaps in particular valleys or rocky slopes. Such peaks are bioquality hotspots, and can be detected for any size of area providing there are enough species in the sample.

Bioquality can vary over a matter of metres, from hot to cool, so it is possible to use the GHI as a basis for objective, and fine-tuned environmental impact assessments (EIAs) – alerting operators to globally sensitive areas in a standard way and also providing a framework in which success or progress towards restoration can be monitored accurately and objectively.

Although herbarium collections have been used to indicate locations of supposed hotspots of rare plants, these often prove in retrospect to highlight areas with relatively easy access and are often areas (for instance 'Mt Cameroon') which on close inspection reveal a mosaic or gradient of hot and cold spots. Hotspots are traditionally mapped on broader scales and tend to be of little use for local management. RBS and the GHI, on the other hand, provide a means to highlight hotspots at all scales, down to clusters of rare plants on rocks.

STARS AND THE CALCULATION OF THE GHI

The Genetic Heat Index (GHI) is an index of bioquality for a sample, whether that sample is a single plot, or a forest or regional checklist. The GHI indicates the chance that a random species from the specified plant community is a globally rare one – a Black, Gold or Blue Star species - weighted by the degree of global rarity. To calculate GHI, species are assessed for Global rarity (put into Star categories) using all available data, and species lists for various community samples are assembled separately, ideally using RBS fieldwork. The spectrum of different Stars in the samples determines the GHI, The process is shown in Figure 2.

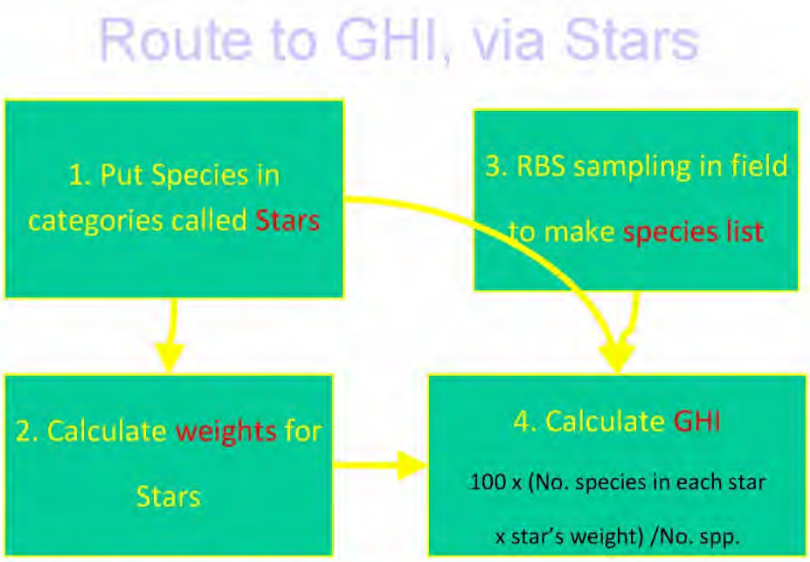

Figure 2: The steps for calculating the GHI of a sample of species

The three main steps are discussed in various sections, as follows:

- Step 1: Categorise and define species into Stars (p. 12)
- Step 2: Calculate and check weights for Stars (p. 17).
- Step 3: RBS sampling in the field (p.21).
- Step 4: Calculate GHI for samples of species (p. 20)

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STEP 1. CATEGORISE SPECIES INTO STARS

Species are allocated to colour coded categories of global rarity called Stars, based on their global distributions and, to a lesser extent, taxonomic and ecological rules.

Table 2. Global rarity is very much the strongest influence on the Stars allocated to species, but cannot be considered separately from various other issues.

Black Stars are the top, i.e. rarest, category. At the other extreme, Green Stars are widespread and of no special conservation concern in terms of their rarity. The sequence from high to low rarity or conservation value is: Black, Gold, Blue and Green Star[1].

In the earliest RBS in Ghana, heavily exploited but globally common species were originally distinguished as separate Reddish (Scarlet, Red or Pink) Stars (Hawthorne, 2001) depending on how intensively they were exploited. It is now the standard method to keep the bioquality index simpler and more specifically linked to global rarity, so all species are defined as Black, Gold Blue or Green Stars, even if heavily exploited. Where global usage status is well-known, Reddish Stars can be listed alongside, not instead of the four main Star colours (as with other conservation-related categories, such as IUCN status).

DEVELOPING A REGIONAL STAR FRAMEWORK

In order for the Star system to be comparable across regions, Stars defined in different continents should imply equivalent global rarity, although obviously the details of the distribution of species in a particular Star change from region to region.

Star	Ideal mean range* (tropical degree square or 100x100 km)	Standard Weight
Black	2.66	27
Gold	8	9
Blue	24	3
Green	(72)	(1) 0 for calculation of GHI

Table 1 Ideal, mean geographic ranges and standard weights for each Star

Global range is expressed as degree squares occupied, or 100 x 100 km squares (at higher latitudes), whichever is the larger area. So, degree square counts are used where most species' ranges lie below 40 degrees latitude, in the tropics and subtropics. The average geographical ranges expected for each Star is three times smaller than that of the next rarest Star (72/3 =24, 24/3=8, 8/3 ≈2.67), and the weights therefore decrease by the same factor (27, 9, 3, 0). As the ratio between mean range is used for weighting, not absolute range, slight variations in grid

[1] The colours of Stars can perhaps be remembered using the following symbology: Black Stars are exotic and invisible objects. Gold Stars are more conspicuous globally, but still with a significant global rarity value. Many Blue star species with a widespread and sparse distribution are riverine or sea-shore species, so the allusion is to blue water. Green suggests character-less background vegetation, a species adding no 'local colour' or local distinctiveness in a plant community

system used for counting range in different projects makes no significant difference, especially when one considers other factors that make any range size estimates imprecise.

The initial goal of Star rating is to estimate degree square (or 100 x 100 km) occupancy for the species of interest. Increasingly, this can be achieved by using published, digitised distribution data. Digitised distribution data remain patchy however, so a set of chorological (biogeography-related) rules can also be generated to allow the botanist to extract information from other sources such as Floras, monographs and biogeographic treatments of floras, and relate it to the Star categories.

To use digitised distribution data, a species list for the region of interest is required. This species list can be used to download and compile distribution records for the species. Sources of digital distribution data vary by region, but are commonly held by regional herbaria, and other herbaria with a history of collection in the region. Distribution data are also available through GBIF (www.gbif.org). *Global* distribution data for the species should be compiled, such that the global ranges of the species can be estimated (e.g. not only records from inside your region). This degree square occupancy estimate for each species should be referred to when using the regional framework for Star rating, keeping in mind the typical degree square occupancy suggested for each Star category. Degree square occupancy estimated in this way should be considered as the minimum occupancy, unless there is reason to believe that collection and digitisation has been particularly complete for a species. The Stars are as far as possible standardised globally, and adapted regionally into a regional Star definition framework. Thus far, regional frameworks have been developed as and when demanded by RBG related projects, with separate projects for example covering all of mainland tropical Africa, Trinidad and Tobago, Japan and the Brazilian cerrado. Each regional framework is work in progress, the best practicable answer that can be made at a stated time for a given region. Botanists are encouraged to debate both the definitions for each Star in the regional framework and the Stars allocated to particular species using these rules, both of which may change as plant exploration progresses.

The regional framework can be presented as a table or key (see example in Table 3), devised so that:-

- It is fairly easy to work out which Star most or all species in the region should be in, at least for a first approximation, from a summary of the global distribution pattern of the species, for instance from a published Flora or monograph or distribution data.
- The geographic ranges of species placed in the different Stars are significantly different, in terms of the mean and standard deviation of the geographic range for species in that Star, and are as close as possible to those defined in Table 1.

The rules are adapted regionally to yield Stars with similar mean geographical range in different regions, so Gold Star Chilean species, for instance, have an average range that is as close as possible to the Gold Star Ghanaian species[2].

[2] Insofar as exact alignment is not possible for the mean ranges of species in a given Star in each region, the weights for Stars could be fine-tuned within specific projects to reflect their relative rarity more precisely. However, as the results are of greatest interest when compared globally, we propose to use the same standard set of weights, as it would make no sense for a Blue, Black or Gold Star species to be weighted differently depending on region/project of assessment. The actual, statistical difference between the adjusted and default weight for Stars should in any case be stated when the Star framework is set up.

GHI weights for a given Star should always be based on extant facts, referring to all herbarium-based distribution data for a subset of or all species in the Star, rather than their hypothetical or modelled ranges. However, the primary categorisation of species into Stars is made practical by considering species range in terms of broad biogeographical categories, like 'widespread across tropical Africa'. The framework definition clarifies specifically what this might mean in terms of distribution patterns (e.g. "one or more records from each of East Central and West Africa", or 'known only from a single Kenya flora district).

The mean range of species in such categories is calculated for a subset of species, those which are more certain taxonomically and for which the reliable distribution data is available.

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Table 2 Meaning of the Stars, in general terms. More specific biogeographic criteria are devised for different regions, using precise geographic rules. The Typical Range column indicates a typical geographic range in degree squares. The mean range is derived from various projects, and should be taken as a target for new Regional frameworks. The stated range is not the absolute basis for the classification into Stars, but merely a guideline for devising the regional rules and setting weights.

Star	Typical range of individual taxa (mean)	Generalised definition: the spirit of the category.
Black	<5 (2.67).	'Local endemics'. Endemic to a small part of a region (a mountain range or forest block, small island groups, or corners of a region with unusual rainfall patterns) where they might be locally common; or scattered* within a slightly wider range. These are high conservation priority, global rarities and the places in which they are concentrated should similarly be highly ranked. Species known only from the type locality, or from there and a few areas within c. 100 km, are automatically Black Stars, unless there is reason to suspect they occur widely elsewhere (e.g., the name is a probable synonym of a widespread species). A species known only from a few scattered mountain tops in a region would also qualify.
Gold	5- 12 (8)	Some global conservation priority rarities. These might be quite common in parts of a biogeographic region (e.g. 'Upper Guinea', or across the Lesser Antilles), but are not globally more widespread, or they may occur in as many as two or more average-sized countries but very sparsely*.
Blue	12-50 (24)	Barely of global conservation concern. This category includes continentally widespread species, which are scattered* in their range, typically riverine, coastal or high altitude species; or they may be extremely common throughout several countries and vegetation types, but are not continentally widespread. It is difficult to dismiss these species as 'of no conservation concern'. They are often the species that add local 'colour' or distinctiveness to unusual habitats, but unless many such species occur in a single sample (as often occurs on mountains) they have limited influence on the ranking of community level bioquality scores.
Green	50+ (72 used as default baseline)	Species of no obvious conservation concern in terms of their rarity, because they are widespread, typically across a continent in appropriate and common habitats, wherever that habitat occurs, or even global. Continent-wide species that live only in scattered islands, or islands of montane forest, however, might well qualify for Blue or Gold Star status. These species, for instance 'widespread across tropical Africa, in Guineo-Congolian forest' generally account for more than half of all species in most regions.

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Table 3 Example of a Regional Star framework, developed for Trinidad and Tobago. Global range categories were defined for the Trinidad & Tobago (T&T) flora (left column). These were translated initially to Stars in the right hand column as shown (sometimes over-ruled by secondary adjustments). Very few changes would be required to the rules (mainly to Black and Gold Star definitions), for it to be usable in other parts of the Southern Caribbean.

Global range	Meaning of Global range category	Sub-conditions, if any, to qualify for Star	Star
1	Endemic or near endemic to T&T. Near endemics are, for example, on Venezuela's Patos island, Paria peninsular, in the Dutch Antilles or Grenada, not more widespread in S. America or Lesser Antilles.		**Black**
2	EITHER found more widely in, for example, Venezuela or Guyana, and southern Lesser Antilles; not just a small extension beyond T&T. OR apparent T&T endemics but with very plausible records or (including likely synonymy) from well outside T&T.		**Gold**
3	EITHER fairly widespread across Venezuela, the Guianas, southern Caribbean	but sparsely distributed, for example, scattered on a few higher Caribbean mountain tops	**Gold**
	OR widespread in Caribbean (to Greater Antilles) and also in northern S. America.	in most or all countries in range with several distant localities, or known to be very abundant in part of range	**Blue**
4	As 3, but extending, for example, to Brazil, Bolivia, Peru OR to Mexico and N. America (if both, see 5)	If, for example, only known in a distinct patch of northern Brazil, S. Guyana; or very scattered throughout	**Blue**
		As far as known, found regularly throughout most of the area at least on a 1 degree resolution.	**Green**
5	Widespread in the Americas, but either not generally in the Caribbean, or scattered throughout range	Normally distributed in range, for example, in most degree squares throughout forest or savannah belts	
		Unusually scattered or sparse, even allowing for restriction to forest, savannah or similar broad formations, for example, montane endemics on scattered peaks would belong here.	**Blue**
6	Widespread neotropical (as 5 but more densely distributed plus Caribbean)		
7	Globalised floristic elements	Widespread in Americas (probable origin), but also known today in the Old World	**Green**
8		Widespread global weeds; or seeds of global strand and seashore; origin obscure or Old World	
9		Exotics and garden or crop plants, commonly planted, not indigenous, at least to T&T	

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SECONDARY ADJUSTMENTS TO THE STAR FOR A TAXON

Once all species have been allocated a default Star based on geographic range, secondary adjustments – up or down one or more Stars from that which the regional framework prescribes for the recorded global range– are allowed for taxa that are judged to be, in effect, more or less globally rare (ecologically or taxonomically) than normal, providing data are judged to be reliable and according to the following considerations.

- Species with unusually scattered distributions within their whole range can be upgraded. Some 'scattered' species suggest a relict (once more widespread) distribution; other cases may be due to erratic, long distance dispersal. In both cases, these species are often associated with specific, scattered habitat e.g. isolated mountain tops.
- Species that tend to regenerate sporadically or occur very sparsely within their range may be upgraded a Star – if they are deemed to be, in effect, globally more than three times rarer than average for species with the same range.
- Some taxa, like canopy epiphytes and small aquatics, are under-sampled in herbaria compared to terrestrial shrubs with conspicuous flowers. Classifiers should try to compensate for this, if necessary downgrading very inconspicuous and significantly under-collected species relative to what the framework suggests, as it is reasonable to assume that they are commoner than they seem.
- Invasives, aggressive pioneers that are naturalised and expanding their range, typically dominant over large areas, can be downgraded a Star. They are in effected counted as globally less rare than their recorded range suggests. In practice, most such species are widespread Green Star species even without this adjustment.
- Species that are widely cultivated, such as *Coffea spp.* should have a lower Star than that implied by the supposed natural range, when assessing communities where such species are found persisting after, or escaping from cultivation. It may be appropriate and possible to distinguish escaped cultivars from wild-type ancestral plants, and score them separately. A separate informal name entry and higher weight Star can be introduced in the database to designate isolated wild and genetically distinct populations. ('*Coffea arabica*- wild Ethiopian population', Black Star; vs 'Coffea arabica (cult.)', Green Star)
- Species very isolated taxonomically from their nearest relative can also be upgraded, e.g. species of mono-specific genera. Species very dubiously distinct from other species can be downgraded.

In case of doubt, about taxonomy or range, the lower value (commoner option) from a range of Star options should as a rule be selected. Two very closely related and similar species are more likely to become sunk into one species by future taxonomists than two distantly related ones: secondary adjustments should help stabilise the Star assessment in the face of shifting taxonomic opinion.

Consideration of relatedness is justified not only to help stabilise assessments, but also because maintenance of both inter- and infra- specific genetic diversity globally is an aim of biodiversity conservation, and this is only partly captured in the formal taxonomy. The global range of taxa, the key criterion for Stars, is not at all independent of taxonomic opinion and patterns of variation. The importance of this approach becomes more obvious when one tries to assign Stars to infra-specific taxa.

STARS FOR DIFFERENT TAXONOMIC RANKS & INFLUENCE OF RELATEDENESS

Basic consideration of relatedness between taxa provides a philosophical framework for allocating Stars to infra-specific taxa: it allows a rationale for varieties and subspecies to be allocated a Star that is different from the species as a whole. Varieties, sub-species and forms (any infra-specific taxa – **VARS** below) can have higher, or the same Star as the species which contains them, for the following reasons.

- VARS are obviously always rarer globally than the species which includes them, as they are but part of the whole species. On the other hand, they may be very closely related to other VARS of the same species which together constitute the full species' range. It would make little sense if VARS were always higher-ranked on the basis of this greater rarity. That way we could end up with an illogical situation where two Black Star varieties constitute a Gold Star species.
- Yet, it is not unreasonable that a **species as a whole may be lower ranked than SOME of its VARS**, e.g., a Gold Star species composed of one Gold Star and one Black Star variety. This signals uncertainty over which variety is represented by any record referred to only at the species level. In the face of uncertainty, bioquality estimates should be conservative, so the Star for a species is always equal to that of its lowest ranked VAR. It is important to ensure all VARS of the species are considered, not just those from the region under study, so where some VARS are missing for a species otherwise included in a regional database, the Star of this species should be set at the default for the total species' range, pending more detailed assessment of all missing VARs.

Guidelines for secondary adjustment of Stars based on relatedness can be laid out as follows:

1. First of all calculate the Stars for species as a whole, as if no VARS had ever been published.
2. VARS can never have a lower ranked Star than their species as a whole. By default, all VARS have the same star as their species, so pending further consideration repeat the species' Star for all VARS.
3. When adequate data are available, consider the range of each VAR in turn, using the geographic guidelines as if each was a separate species. The VAR can be upgraded to a maximum of the Star it would be allocated if it were a separate species, but usually in view of the close relateoness of the VAR to other VARS it may be appropriate to allocate a Star between this value and that of the whole species.
4. If expert taxonomic opinion shows they are very well defined and distinct VARS, such that other taxonomists might well have treated them as a different species, prefer the higher ranked Star option. If the VARS are only subtly different, and have very similar sister VARS that would extend their range dramatically if considered together, choose the lower option.
5. If a VAR is different in only trivial ways (e.g. only slightly hairier flowers and stems), then be more disposed to use the same Star as for the species as a whole. Or, if populations of the VAR are more distinct than usual from the rest of the species, tend towards the Star suggested for the VAR if it were a distinct species.
6. If the VAR has a particularly narrow range in a distant locality, geographically isolated from the rest of the species, prefer the higher Star possibilities. If the range overlaps considerably with that of the rest of the species, maybe enclosed within it and not isolated ecologically, choose the lower option.
7. If all VARS (globally) of a species have been assessed, ensure the species' Star equals that of the lowest ranked VAR.

For example:

Begonia quadrialata is widespread across the Guineo-Congolian region.

- *Begonia quadrialata* subsp. *quadrialata* is widespread in West Africa, and Lower Guinea (to Gabon).
- *Begonia quadrialata* subsp. *nimbaensis* is endemic to the Nimba mountains of Upper Guinea in an area less than 50 km wide (in three 0.5 degree square cells, or one 1 degree square – Poorter *et al.* 2004).

First, consider the species as a whole. It is very widespread and common and therefore Green Star. Likewise, the widespread subsp. *quadrialata* is Green Star.

If *B. quadrialata* subsp. *nimbaensis* were a distinct species, i.e. if it had species status, it would qualify for a Black Star. If the variety had been very distinct, it might have been kept as a Black Star species, given the very narrow range, but subsp. *nimbaensis* is very similar to the other subspecies, and so qualifies as Gold Star at best. In fact,

the two subspecies have recently been found growing closely together in intimately mixed colonies on Mt. Nimba suggesting even slighter genetic differences than previously thought. Knowing this, and that subsp. *nimbaensis* could soon be sunk, or reduced to a mere *forma*, leads us to downgrade it to Blue Star, reflecting very close affinity to the more widespread form. This has the useful side effect of helping stabilise the GHI of samples which include it, in the context of future likely taxonomic changes.

So, subsp. *nimbaensis* is Blue Star, yet the species as a whole is Green Star. i.e. the species as a whole has a lower rank than one of its subspecies as outlined above, the lowest, more conservative possible interpretation. The onus is on the botanist to specify the subspecies in these cases. Often the VAR can be deduced from geographic location of the specimen, so can be applied automatically once the species is determined (but this does not apply here).

On a slightly different basis, one can sometimes allocate Stars to unidentified specimens of known species in particular genera, at least within the context of a specific project area. If all species of a genus are Gold Star, then any unidentified specimen is very likely to be one of them (but unspecified maybe due to lack of flowers) and can be given a Gold Star in that context. Time spent trying to identifying sterile specimens for bioquality assessment is reduced if one knows there is no point spending a lot of time deciding which of several species of a Green star genus one has. This shortcut is not possible if various species from a genus have different Stars.

Tabernaemontana trees in West Africa belong to one of a few widespread (Green Star) and common species, so unidentified *Tabernaemontana* trees are also allocated Green Star. This is particularly useful because the species are common and can usually not be distinguished when infertile.

STEP 2. CHECKING WEIGHTS FOR STARS FROM GLOBAL RANGES

As a draft Star framework is developed, the mean global rarity for each Star is established for a sub-sample of the species in each Star from recent taxonomic monographs and revisions. It is assessed as the number of degree squares occupied (or of 100 x 100km grid squares outside the tropics and subtropics where degree squares become smaller than this area). This is only calculated for a subset of species because, for the majority of species, detailed degree square distribution maps are usually not available.

The category of the globally commonest species (Green star) is treated as a baseline of zero value, equivalent to an infinite range, but the value of 72 degree squares is taken as a standard value for the Green Star range, for weighting purposes. There is little need to calculate this range for many of the Green Star species, except to check that the concept is correctly applied and that the regional framework leads to Green Stars with a mean distribution of more than 50 d.s.. Weights for other Stars are calculated based roughly on the inverse mean global rarity of each Star (rounded to an integer), relative to this baseline, of 72 d.s,. for Green Star.

The aim is that Stars defined in different regions lead to sets of species with similar mean range. The framework rules for Stars should be adjusted as far as possible to lead to sets of species with the preferred mean range, although exact alignment is not always possible.

The rarest category - Black Star species – should be defined in a way which means they occupy as close as possible to 2.7 degree squares on average, as the weight of 27 (72/2.66=27) is used for standard calculation of GHI.

A standard grid should be specified for any survey, e.g. for tropical regions, the degree square grid with origin at the equator and the Greenwich meridian. The alignment of the surveyed area with respect to the degree square grid can influence the weights slightly, particularly for Black Star species. Many species with a narrow range that could fit in a single degree square have occurrences which straddle the standard latitude and longitude lines, falling in 2-4 grid cells. It is preferable to keep the range estimates objective rather than trying to minimise ranges

by shifting the grid origins for each species, not least because published data usually does not allow such regridded estimates. In regions where the grid alignment biases the estimated ranges (e.g. with a narrow mountain range running along a meridian line), a slightly higher than the default mean range (2.7) for Black Star species is acceptable.

STEP 4. CALCULATE GHI FOR A SAMPLE OF SPECIES

We will describe the RBS field methods below. Even though that is potentially Step 3 in the four step process for calculating bioquality, there is a lot more to RBS field methodology that needs to be explained. Here, readers only need note that a RBS sample provides a local list of species, and that a GHI can be calculated from any list of species. How meaningful the GHI is, though, depends on how the sample was assembled in the first place.

For any RBS (or other random or sub-complete) sample of species, a GHI is calculated by:

- Summing the number of species of each Star;
- Multiplying each subtotal by the Star's weight;
- Adding these weighted totals and dividing the sum by the total number of species that have any Star. Unidentified species and other species with no Star allocated, are completely ignored.
- This value is multiplied by a hundred and rounded to a whole number (to avoid the need for decimal places in the GHI).

Table 4 Worked example of calculation of GHI.

Star	A = Number of species in sample	B = Weight for Star	A x B
Black	2	27	=54
Gold	5	9	=45
Blue	13	3	=39
Green	50	0	=0
Unidentified or no Star allocated *	(6)	0	
Total, excluding *	70		140

GHI= 100 x (140 / 70) = 200

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RBS SAMPLING IN THE FIELD (STEP 3)

RBS fieldwork is Step 3 out of four key steps defined above for calculating the bioquality across a landscape. RBS has other uses, apart from bioquality scoring. In this section the RBS field methodology is introduced and explained, after a recap of generic RBS aims.

SUMMARY OF RBS AIMS

RBS aims, with minimal effort, to provide a rapid, yet penetrating and useful overview of the vascular plant biodiversity and vegetation in an area, in relation to the landscape, and to provide information on various aspects of plant distribution, including:

- Plant distribution in the surveyed area. RBS helps uncover unknown localities of rare species whilst paying due attention to the distribution of common ones.
- The main trends in vegetation variation and how species are distributed with respect to environmental variables, especially position in the landscape and disturbance history.
- Vegetation bioquality and conservation priority, at the finest scale practical for vascular plants. (See page 9 for discussion on how RBS can act as a bioquality thermometer.) A key aim of many RBS projects is to expose and dissect plant bioquality hotspots, employing a particular and precise definition of biodiversity hotspot, whereby:
  - the threat factor is excluded from the index of 'hotspotness', in contrast to Myers *et al.* (2000) where high threat is a necessary condition for a region to be counted as a hotspot;
  - The GHI can be applied at any scale, so RBS focuses on a fine scale and a bottom-up approach.

RBS outputs, including statistical summaries, bioquality and vegetation maps and annotated check-lists, are also useful for generating hypotheses on aspects of local ecology and biogeography, which may then be tested by further RBS sampling or more applied sampling or experiment.

RBS also has the following benefits, which can be considered secondary aims.

- RBS provides a context in which groups of botanists, foresters, ecologists, professionals or students, are in the field together, becoming familiar with the current status of the vegetation and landscape under investigation. RBS teams therefore learn about botanical and other local issues of relevance to the management of the vegetation, often whilst working with representatives of the relevant state and local authorities and communities.
- RBS facilitates the flow of relevant botanical information back and forth between local and global levels. Information collected locally is databased and published globally, if appropriate and ethical, whilst information from elsewhere flows "back to the roots". Local participants in RBS teams become informed about which species are globally rare, useful or otherwise considered valuable elsewhere. RBS can also facilitate production of field guides or other educational materials.

RBS IN RELATION TO OTHER SAMPLING APPROACHES

Many methods have been used for sampling plant biodiversity, and each has its own strengths and weaknesses. Three commonly used methods are compared with RBS in Table 5. These are:

- Herbaria, or rather databases of herbarium collections, can be used to generate samples of plant biodiversity data for particular places. These can be check-lists of all species ever recorded in given localities, districts or grid squares, and the sampling "method" is the informal and unplanned wanderings of plant collectors over the centuries (combined with the database query, if appropriate).
- The Gentry type transect method (see Missouri website, 2010) is a record of all plants with stems ≥ 2.5 cm (DBH) along ten 2 x 50 m transects, totalling 1/10 hectare at each site. There have been various modifications, and many types of small, measured plot that include all, or most plant species that have similar attributes, so are considered in the same column in Table 5.
- The relevé samples associated with the Braun-Blanquet method (Westhoff & van der Maarel, 1978), which has been the mainstay sample method for continental European phytosociology for almost a century, are subjectively sited to provide a 'typical' sample but are measured plots. The area is chosen in theory to include all species, so there is a problem in patchy vegetation in maintaining homogeneity with a square area whilst encompassing all the species. Nevertheless, the result can be similar sample to RBS, and very similar to an RBS made using the optional measured sample area.
- Even before biodiversity survey became an issue, foresters used a wide range of sample plot types for measuring tree density and size class distribution. These "Classic Forestry" plots normally include only trees larger than 30 cm DBH, sometimes with a subplot for smaller trees. Although individual trees are recorded in detail, the rest of the flora is ignored. There is therefore some overlap between the Gentry and Forestry plots, especially in terms of their measured area and focus on plants with stems above a certain diameter.

RBS field methods incorporate aspects of 'classical' herbarium collecting, ecological sampling and tree inventory. RBS is a less biased, and more systematic and thorough method for sampling plant communities than casual herbarium collection but is not as systematic (or random) as most forest inventories and other all-tree permanent plots used for growth studies.

Plant collectors vary in the amount of information they put on the labels for their herbarium specimens. Some collectors mention lists of species associated with each collected specimen. For example: "Growing with *Ceiba, Manilkara obovata, Microdesmis* and *Diospyros* with a dense under layer of *Olyra latifolia* in a shaded gulley". It is usually unclear how complete these lists are, and often names are generic, but they are still interesting when researching the ecology of the species represented by the specimen, and even of some interest when considering the other species in the list. RBS takes this several steps further, by requiring a thorough listing of the species in each landscape sub-unit. By altering the pattern of the collection compared to classic herbarium collections, RBS makes the variation in the vegetation the main focus, and the local check-list becomes the primary goal of the exercise.

RBS samples themselves are generally unmeasured and plotless, based around a point, and in a patch that represents a defined position within the spectrum of local vegetation and landscape conditions. As many species as possible locally, representing a highly representative majority at least, are recorded within the chosen vegetation type. Ideally, recording continues until no more species can be found easily in the defined area. An RBS database is a suite of micro-checklists like this, with extra information on the places and species concerned. Sometimes there are linked photographs and other details for the plants in the plots.

Table 5 Features of four types of botanical of floristic and vegetation sample to demonstrate the spectrum of attributes. Standard RBS samples lie between check-lists of species for a given area, derived from herbaria (left), and classic forestry tree inventory plots (right).

		Herbarium locality	*RBS*	*Gentry type transect*	*Classic Forestry Tree inventory plot*
Measured sample area		No	No (optional)	Yes	Yes (usually)
Completeness[3] for sampled landscape units		Very varied	High	Low	
How much choice does the surveyer have over...	..location of sample units?	Very high	High	High	Very low
	..physical limits of one sample?	Very high	High, e.g. to exclude patches different from sample definition	Low	Very low
	.. species to mention	Very high	Very low	Very low	
Range of plants sampled overall		Very high e.g. incl. mosses	High: all vascular plants	Medium (e.g. >2.5cm DBH)	Low (larger trees)
Homogeneity of vegetation of single sample		Very low, especially large localities over many decades	Very high	Moderate to low, as standard shape constrains the maximum "purity"	
Sample coherence[4]		Very low – species in a sample from varied eras and areas	Very High	Medium. Not as high as RBS, as the predefined plot shape can include varied patches	
Appropriate for GHI scoring?		With great care, (for completely sampled small localities or large regions)	Yes	No	

RBS aims to be more locally complete[2] than sample plots or transects. RBS samples are not confined to a standard square plot or transect, and they include all types of vascular plant, not just trees. RBS can provide 'purer' samples of a particular habitat, because samplers can specifically choose to ignore patches deemed unrepresentative of a stated target vegetation type (e.g., canopy gaps). The trade-off is that RBS samples are less constant in area and less random in sample location than are Forestry plots.

[3] **Completeness** for a landscape unit represents the extent to which the sample is a complete species listing for the defined locality, vegetation type, species types (i.e. vascular plants for RBS) and landscape unit combined. A feature of RBS is that it strives to generate samples that are as complete as possible, allowing for practical constraints, whereas most other sample types are explicitly token subsets.

[4] Sample **coherence** refers to the extent to which the list of species for a typical, single sample unit represents plants cohabiting closely, at one moment in time and in one place. High coherence should imply a narrow successional stage and a physically homogeneous ecological community. A very patchy sample area, e.g. forest with many canopy gaps, has lower coherence. The value in the table refers to typical, ideal samples of each type, but of course any sample can be forced to be highly incoherent.

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RBS is therefore a compromise between the extremes of plant sampling, designed to produce adequately reliable all-species datasets as rapidly as possible and at a resolution required for documentation and management of tropical plant biodiversity. RBS does not substitute for other types of plot. Each has a niche of its own. However, these other types of sample can often be modified to make them compatible with RBS surveys.

The question has been asked...Why call it 'Rapid', when some other methods are faster? The answer is that RBS achieves a near-complete inventory decades faster than that of casual herbarium collecting (which is compiled from fertile plants over sporadic visits for many decades). Other fast sampling methods rarely generate such a complete listing of all plant species, and even if they do, much time is spent on plot demarcation.

RBS AND CLASSICAL HERBARIUM COLLECTIONS

Many of the decisions about plant hotspots and conservation areas have historically been based on a legacy of herbarium collections, or on the same information published via Floras. Herbaria are essential for 'getting to know' the geographic patterns in a flora, for describing new species and understanding the relationships between plant groups. They are also essential for identifying collections, such as those produced by RBS itself. However, herbarium databases are not ideal on their own for spatial assessments of biodiversity on a practical, local scale. Some of the main differences between casual herbarium and RBS data are:

- Herbarium collectors generally target a small subset of the species in the landscape that are fertile at the time of visiting and considered useful for taxonomic purposes. Often, individual collectors have their own specific taxonomic group of interest, and it is quite usual that many of the commonest and most conspicuous plants in a forest at the time of a herbarium collection visit will not be recorded at all. (If a herbarium collector methodically collected all species and environmental details from discrete, well-documented, homogeneous sample areas, they would in effect be doing RBS).

- RBS surveyors, on the other hand, record as many species as possible – ideally all species regardless of whether they have flowers or fruits – so that absence of a species' record from a site at least shows that it was not obviously present at the time of the survey. At least, no plant species seen in the sample area are consciously excluded. Inevitably, even RBS surveys miss some species that are ephemeral or appear seasonally, epiphytes that are far out of reach and (the relatively few) species that are practically unidentifiable when not flowering, considering the time available for identification. But, there are often many fewer species missing after a weeks' work in a suite of RBS samples than following decades of collecting records for the same, albeit generally more vaguely defined, collecting locality.

- Common plants are not recorded in herbaria in proportion to their commonness. Collectors tend to give up re-collecting very common plants, and even when they are brought in for identification by amateurs, curators are not inclined to accept all specimens of the commoner species after a certain number has been included in the herbarium.

- Whereas the very common plants that are included tend to be recorded in herbarium databases from accessible regions closer to herbaria, collectors travelling further from the herbarium on difficult or expensive field trips often feel disinclined to "waste" their time and luggage or press space with widespread, common plants when they get there. Thus, we hypothesise that little-visited, remote sites are more likely to be represented in the herbarium record in a biased way, as if they were disproportionately rich in rarer species. RBS strictly avoids this "rarer species from remoter places" bias.

- Herbarium collectors tend to drift around the landscape and successive records may be from very different habitats. RBS is focused on creating a complete species list for any sample areas mentioned, usually one landscape unit at a time.

- Herbarium locality data tends to be rather imprecise and associated data, e.g. position in landscape, are recorded inconsistently or not at all by different collectors. These types of metadata are routinely recorded, and in a consistent way for RBS samples.
- Herbarium specimens for a given locality were often collected over a period of many decades, and species may be absent from the same areas today. RBS is linked to a very short collecting window, so implications are of known relevance to today's decisions.

Check-lists for particular areas derived from herbaria are therefore often 'incoherent ' lists of species collected at a wide range of times, from not very precisely localised areas, e.g. in both wetter and drier sites, with different levels of attention paid to different plant groups.

In spite of these limitations, herbarium data can still be useful for analysing spatial patterns at a broad spatial resolution (e.g. for Guyana, Ter Steege *et al.* 2000; for West Africa Poorter *et al.*, 2005). Surveys at a scale where individual "samples" have an area of more than 10,000 km^2 (roughly, a degree square) are perhaps the most appropriate use for herbarium data in most countries. The main problem even at this broad scale is that one can never be confident *a priori* that the results obtained are truly representative of what is on the ground today.

From the context of herbarium staff, who often form the backbone of RBS teams, RBS gets people into the field, to see what is happening today and to provide precisely localised snapshots of the biodiversity for this period. RBS is also typically associated with a period of increased data collation and "cleansing" of determinations on old specimens relevant to the survey area, along with a flurry of other beneficial activity in the herbarium. The RBS snapshots of the plant community can be compared to new samples in subsequent years (or seasons), and allow surveyors to monitor changes that occur over time with better resolution than if herbarium work had simply ticked on in the traditional manner, with at best a steady drip of more or less randomly located, fertile specimens.

In botanically interesting and little-known places, places where RBS is so much needed, RBS teams also select and photograph the best fertile specimens for herbaria independently of making ecological voucher collections for the basic RBS.

Typical analyses and outputs and their demands on RBS samples

RBS data can be analysed in various ways, but the three most commonly employed types of analysis are:

- Ordination or similar multivariate techniques (amply summarised at http://ordination.okstate.edu/). These provide a neutral, or 'all species equal' method to highlight the overall patterns in community composition across the landscape or through successional change.
- Bioquality scoring (p. 10), where all species are weighted by Star categories of global rarity, and a bioquality score (e.g., GHI) is derived from the array of Stars in each sample.
- Species x sampling effort charts, to allow prediction of how many species are likely to be represented in the whole sampled landscape based on typical rate of expansion of species list for samples to date.

A local species list in the range of 50-150 species is a useful order of sample size for these purposes, depending on the vegetation being surveyed. The same analyses can also be applied to measured sample plots or even herbarium locality samples, if various minimum criteria are met. RBS surveys can include measured samples (see p. 32) to provide extra information.

The shape and extent of plotless RBS samples depends on the shape and extent of landscape subunits, e.g. a watercourse, defining the sample. It makes little difference to the types of analysis outlined above whether a

set of species is from a measured or unmeasured area – they produce compatible results independently of scale. Smaller samples, and samples following natural boundaries are likely to be more homogeneous and thus can be more precisely defined ecologically (less blurred or mixed). Therefore indices of the content of small samples, and of samples with an adaptive shape, can be more extreme in an ordination, than a large sample e.g. a check-list for a whole forest. However, like a pH value for acidity of a bucket or a cup of water, or a centigrade value for temperature, the values are not otherwise affected by sample size or shape *per se*.

RBS data can therefore be analysed and compared with other sample types (e.g. more general check-lists for a whole forest, or more formal plots) independently of scale, providing the other lists are obtained as effectively random subsets or as almost complete lists of the same range of species groups (e.g. all vascular plants). Otherwise, differences in rarity and ecological response shown by different groups of organisms can strongly bias the results.

Providing the samples have enough species and are not biased by varied taxonomic coverage, results for check-lists of large areas tend towards the mean or higher end values of the plots within these areas: smaller (RBS style) samples are more useful for generating means and standard errors rather than a single overall score. Statistically, many RBS samples for smaller parts of the landscape should have a higher variance of bioquality, or of ordination score, than fewer larger samples across the same landscape. It is easier to capture smaller nuances and local facets of the vegetation with smaller plots, but also to pick up uninteresting statistical noise related to the vagueries of regeneration and random tree-falls.

SCOPE, RESOURCES AND THE NUMBER OF SAMPLES IN A SURVEY

An RBS is often project-based, and in any case is best planned as an enterprise of a few months or years. The scope of an RBS project should be defined with interested parties as concisely as possible, in terms of area on the map and the precise purpose of the survey. Examples are:

- 'to build up a national biodiversity database for our country, to tell us where our plant species live, how the forest varies and where the plant hotspots are; and as a training ground for student botanists';
- 'as a basis for delimiting plant hotspots precisely and a baseline for future EIAs around our mining concession to help plan operations in a way that minimises long term impacts to the flora';
- 'as a forum for forestry and the university herbarium to collaborate, especially concerning biodiversity conservation priorities in the forest reserves'.

A few samples outside the primary scope and theme are useful. For instance, management of a specific forest or park is often enhanced by gaining more data for species in a few selected areas outside of the boundaries; and forest management can be improved by samples showing which species regenerate well in fallow outside the forests.

Usually, one is trying to stretch a limited budget to survey a given area in as much detail as possible. It is advisable first to estimate how many samples can be completed with the available resources (vehicles, money, staff, and identification skills). Typical examples of productivity are:

- 2 RBS samples per day per team is a reasonable rate to expect from a team working in a tropical forest, reducing to 1 per day where logistics or plant biodiversity make for hard work; and increasing to 3-4 samples per day in species-poor vegetation where access is easy.
- A team for a week in the field is about the minimum useful survey effort, yielding 10-20 samples, suitable perhaps for surveying a single forest patch where the national vegetation pattern and flora is already fairly well known.
- In a team month about 40-60 samples can be completed and these are likely to highlight the major trends e.g. for a single 30,000 ha forest or small mountain.
- It is usually most efficient to plan RBS as a year or longer project, part-time, so that databases can be optimised in the same period. Over 2 to 4 years, it is possible to complete a survey of all the major forests of a modest sized country.
    - A single team surveyed Ghana's forest zone, and identified, input and analysed the data for more than 200 forest reserves, in three years (Hawthorne and Abu Juam, 1995), although some useful data had been inherited from earlier studies.
    - Over 3 years, 250 samples were completed by a team in Trinidad and Tobago, sampling the islands densely, but intermittently as the team members had other duties in the same period.

Projects with a broader geographical scope tend to have a lower sample intensity. Surveys with thousands of samples may have to be broken up into smaller themes for analysis anyway. Better then to complete a smaller survey and, on the basis of the results, survey adjacent areas, or fill in more detail for interesting parts of the same area.

PREPARATORY WORK BEFORE RBS FIELD SURVEYS

It is useful or essential to complete the following activities prior to starting RBS field work:

- Definition of the geographical scope, aims and aspirations for any survey.
- Choice and preparation of personnel.
- Review of literature and preparation of a database of species known in the area, typically by reference to herbarium collections or publications
- Initial GIS analysis, combining available maps of roads, place names, vegetation, land use and soils type or geology. Best available remote sensing imagery should be compiled and traced to highlight major vegetation types.

PLANNING THE PLACEMENT OF RBS SAMPLES

Having decided on the scope, and how many samples will be possible, it is useful to plan a rough layout of samples. As a first approximation, equal numbers of the projected sample total can be apportioned to equal divisions of the area (e.g., 1 % of the sample effort in each of one hundred cells in a grid superimposed on a map), but there may be priorities for the survey that overrule this even division (Figure 3). Varied vegetation and rugged landscapes probably deserve proportionately more samples than flat and homogeneous samples of constant vegetation type. It can be useful to plan by distributing counters, representing planned samples, across a map of the area.

Tentative vegetation maps, derived for instance from remotely sensed imagery, are also useful to help stratify the area for sampling. Even if only major vegetation types, they can be used to help allocate samples to each type, in proportion maybe to their perceived importance, or in proportion to the area of each type, in either case hopefully to obtain a representative sample of each major type.

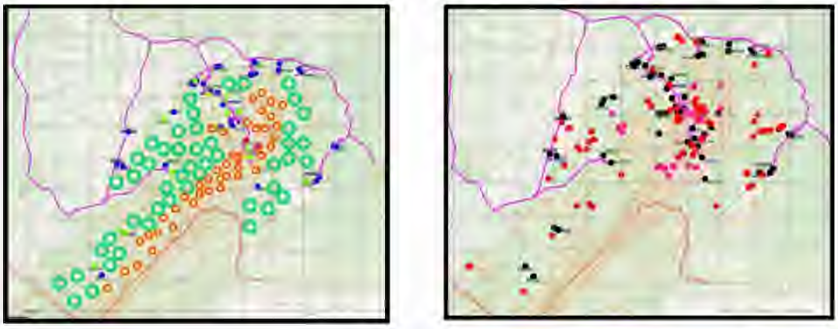

Figure 3 Default planned RBS samples (left) based on a 2km grid for a very steep-sided African mountain; and where the actual samples were placed a few months later (right). Filled small circles in both maps show completed samples; open hoops show samples planned for forest (large, green) or savanna (small, orange) based on a default strategy of maximum dispersion. Deviations from plan were due to a) the team discovering much of the SW corner of forest was very degraded (and obviously low bioquality) and slow to access; b) access to the ridge in the south was too dangerous due to heavy rain; and c) a transect line showing variation up the slope became the preferred strategy in the NE.

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SAMPLE DEFINITION

RBS sampling normally seeks to fulfil a broad sampling plan outlined above, and to find samples that are as different as possible from those already enumerated nearby. The survey director and team leader(s) must ultimately choose the location of a suite of samples that provides an adequate cross section of the full range of vegetation in question, dispersed appropriately.

- For example, if a grid square has been allocated three samples, they should usually be as different from each other as possible, generally by choosing different landscape features or disturbance history. A hill top, slope and valley, swamp or river might be chosen in one cell.

The choice of how to subdivide the spectrum of vegetation locally into individual sample units and the actual location of each sample depends on the aims of the survey, as interpreted by the team leader, who usually decides upon this precise sample definition after arriving in the predesignated sample area (e.g., a grid cell).

The sample definition must be broad enough to include more than the minimum number of species, discussed below (and enough individual, large trees if they are being counted separately – see p. 34). The spatial limits of a given sample are best defined by observable features of the vegetation and/or landscape. Easily visible landscape units are almost always worth sampling. Ecotone or Transition areas between e.g. slopes and ridge tops can be left out of one or both units by careful definition of sample limits. The sample definition can incorporate landscape features, vegetation structure, apparent disturbance history, and sometimes arbitrary physical limits to prevent surveyors wandering too far. Typical examples of definitions of single RBS sample sites might include:

- All forest plants on the flat part of hill top A.
- All species in a few-hectare oil palm plantation.
- Roadside plants along both sides of a particular stretch of road, up to but not including the wall of large trees >5cm DBH of the forest edge.
- All plants growing on a particular south facing cliff, accessed from various approaches.
- Plants from the rocks and cascades within river Y.
- All plants in an area of savanna in the dry season, and again (a separate sample to show seasonal variation) in the wet season. However, a study whose main aim was to follow phenological change

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should probably rather employ a permanently demarcated plot with subplots and tagged plants in a fine grid.

- Samples from burnt forest, and unburnt forest in the same area. However, for detailed regeneration studies, one should probably turn to measured regeneration samples.

Note that, in many of these cases, measured quadrats would be impossible to organise or to make internally consistent.

Closely linked to the choice of sampled vegetation type and location is the question of how to define the precise extent of any given sample. This sample definition is also the responsibility of the team leader, who must communicate and enforce the decision carefully with the whole team, and record the details on the field form.

Precise physical limits to the sample are most important where the vegetation is very heterogeneous, and are not so important within large tracts of low diversity vegetation, which can soon be sampled exhaustively even if one searches hundreds of metres from the starting point. Any tract of vegetation in the survey area that occurs in large, very homogeneous stands justifies at least one RBS sample, even if it has low interest or diversity. In vegetation like mangrove swamp forest where fewer than 40 species may occur altogether, but where the vegetation unit is physically well-defined, a sample with fewer species than the recommended minimum is acceptable. This low species count option is more useful than the other option, which would be to define the sample more broadly and include, for instance, a stand of mangroves plus the vegetation behind it.

- In cases where a constant vegetation type continues for miles in all directions, a roughly circular area around a convenient (for pressing) point is chosen.

At another extreme, consider a vegetation unit that contains many discrete patches of a clearly different type, like a nutty chocolate bar, each patch (or nut) many metres in diameter and very distinct from the matrix. For example, rock pools on the sea-shore or a set of small, isolated rocky outcrops (or termite or ant hills) in a meadow. At what point might one consider the internal patches as separate samples? When does one count pure nuts as a sample and pure chocolate as another, as opposed to counting the whole confection as a single sample? The decision can be based on species diversity as follows.

- If one such patch had clearly more than 40 species, one could make this a single sample, maybe with others as replicates (below). The sample description would be e.g. "rocky patch distinct from rest of meadow vegetation".
- If one patch is enumerated, and yields only 20 or so species, one could sample other clumps and add the species to the same sample, defining the sample as "Flora from 4 termite hills in the savanna"). This should then be contrasted with a separate sample with a definition like 'savanna excluding areas in and 1 m from termite hills'
- If, having enumerated even several patches, or the matrix, the total species count is still below 40, one might then choose not to try to resolve the differences between the matrix and the patches, and treat the whole mosaic as one sample e.g. 'Meadow including the species only found on rocks within it'
- One can always combine samples later, so a useful approach can be to define separate sub-samples with a view to possibly merging them later for some analyses. However, the more similar the flora of the possible subunits, the less efficient this approach becomes. Usually, the extent of the survey is so great that small local variants like this are best considered minor distractions, to be combined in more inclusive vegetation subunits.

The edges of forests are often a confusing tangle of forest and non-forest species. If the prime aim of the survey is to consider the conservation of the forest flora, it is best to avoid disturbed or transitional areas by stating 'sample more than 20m east of the road', or 'avoiding areas within 30m of the forest edge'. Then, if the team is

interested in seeing how the secondary or disturbed vegetation samples relate to others, use the opposite or similar definitions e.g. "sample at and within 1 m of the forest edge".

- When areas are inspected but then not sampled because they are deemed identical to other areas sampled already nearby, and there are enough replicates already, it is still useful for vegetation mapping purposes to record that the area is 'same as vegetation type XXYY01' with a GPS record. A special notebook and map could be kept for this purpose.

REPLICATE SAMPLES

Samples should be repeated in the same vegetation types, but spread across the surveyed area. A good cross-section of the vegetation will require sufficient and well-dispersed replicates of samples in each of the various types of vegetation, so team leaders need to be observant, to anticipate what the main types are likely to be, following analysis. Samples of the same vegetation types across the map help the mapping of vegetation types, by interpolation or other GIS techniques. Once grouped into formal vegetation types following an ordination or classification, the different samples of the same type can be used to show statistics of variation for each type, across the landscape.

Samples in the same, perceived vegetation type in other grid cells should suffice for these aims if the strategy is using a fine grid to encourage dispersed samples; an equivalent arrangement of samples can also be enforced without a specific grid.

Some samples can also be repeated in exactly the same sample sites, for various reasons. Replicate samples in the same exact location but during different seasons could be used to control for effects of season on sample results, especially in highly seasonal vegetation like deciduous forests and savanna. Return visits could be used to compile separate sample lists. These could then be merged to form a single sample of that place, for most analyses. If only a single all-season sample is needed for the site, only new records need strictly be added at the later visits, but this is then not a replicate, and it may be difficult to remember what was sampled there previously, so a complete new sample is often the best choice.

Also, samples can be repeated for the same locations by the same or different teams on different occasions, to test team reliability, or the reliability of the results in general. Replicate samples by the same team in the same place are best done during the same season, but at least several days apart, as it can be easy to forget which species are already recorded for a sample if one has collected there recently. These separate enumerations of the same area can then be included in the same analyses – hopefully the inevitable variation between enumerations is much smaller than the variation between different samples.

- It is best to arrange for two samples enumerated by the same team on the same day to be as different in species composition as practical.

OPTIONAL MEASURED RBS SAMPLE AREAS (PLOTS)

Samples of a measured size, i.e. orthodox plots, can be included as RBS samples, if the surveyor wants to calibrate the species richness (or strict species-area curves) for given vegetation types. Another potential role for measured RBS plots is to act as more tightly controlled, standard sized samples, when a formal vegetation classification is being defined. Measured plots can provide data that are compatible with RBS data from unmeasured samples, but involve more work to obtain the same sized species list.

For instance, for forests in Ghana, 20 or 25m square plots have proved adequate for this purpose, optionally broken into 5 strips, which might be end to end (along a road or river) or side-by-side in a square. These can provide data on number of species per unit area that is not obtainable from unmeasured RBS samples. In one survey, a measured subplot was included within a normal RBS sample area. Each sample started with a full enumeration of a 20 x 20m plot. On completion, a line was drawn on the field sheet and further species records from the surrounding habitat were added, as for a standard RBS. Trees above 5 cm were enumerated in the small plot only, and a separate tally of 30+ cm trees was made for the RBS as a whole (30+ cm DBH tree stems in the measured subplot were flagged as belonging to both sample units).

Whilst collection of this additional measured plot data is often of modest extra value, it is often unachievable for certain vegetation subunits (e.g. cliffs), and may require an extra hour per sample point than an RBS plot with the equivalent species list. It may be of greatest value in herbaceous vegetation where enforced, closer scrutiny of the ground layer could be a helpful discipline.

WHAT TO RECORD IN EACH RBS SAMPLE?

As described above, for a single RBS sample, a landscape unit or other well-defined vegetation unit is chosen by the team leader, depending on both the general scope and plans and opportunistically, based on what is found on the ground. Then, over a few hours, as many plant species as possible – ideally all of the vascular plant species that occur there - are recorded. For less well known and diverse vegetation, this should involve collecting most or all records as specimens, rather than as observations. Each species from the plot need only be pressed once, and it is up to the booker to decide whether or not the species has already been pressed, with the default being to collect more rather than less. When a species is pressed and recorded on the form, it is not necessary for the booker to know its full scientific name, but short or useful names should be given to help keep track. Often, most of the specimens collected are sterile and a large part of the operation and skill required is concerned with organising and ultimately identifying these specimens, often by reference to a herbarium.

As a rule of thumb, a single RBS sample should yield more than 40 named species and not take more than 3 sampling hours, but the more species that are recorded the better, providing one does not sample outside the defined vegetation unit. Also, it is often the case for an efficient team in some vegetation types that after 2 hours, the species list for the sampled vegetation unit has been exhausted in that area.

- Typically, 50-150 species are in fact recorded in rain forest RBS samples, but savanna and other vegetation types may yield only 20-50 species in some localities, if that is the limit of the local diversity.

A complete species list for a sampled area of vegetation is very desirable, and should be the default aim for any sample, but this is not absolutely essential providing either more than 40 species can be identified in a sample before analysis, or almost all the species (more than 95%) are collected or recorded. Around and beyond 40 species, extra species records influence community scores only marginally, but do allow greater statistical confidence, and any records of extra species for the sample area are of course always valuable for distribution maps drawn from the data.

Data can in any case be statistically rarefied, or reduced to a standard "40 random species" per sample where needed. Mean and associated error values are, however, normally generated in respect of variation across individual sample scores (all species) within a given landscape unit (e.g. values for different plots in forest of a given altitude band).

ABUNDANCE SCORES

Simple abundance scores are allocated to each non-canopy species, reflecting their abundance specifically in the understorey of the sampled area and not, for instance, influenced by the abundance of the species in unsampled areas nearby.

- 1 = scattered or only seen once in the sample area. This is the default score, if a species does not attain 2 or 3.
- 2 = common in the sample area
- 3 = very abundant or dominant in its own stratum in the sample area

More precise definitions can be adopted depending on vegetation structure. For instance, for vegetation in Trinidad and Tobago survey, the following guideline was used: 3 – Easily found within ten seconds from any point in the sample area; 2 – seen at least every minute while sampling, but not achieving abundance 3; 1 – present, but not attaining abundance 2 or 3.

There are usually several species scoring 2, may be one or none scoring 3, with the large majority of species scoring 1 in most patches of species rich vegetation. These are rough estimates of abundance, made relative to other plants of their stratum/habit. It is usually easiest to do abundance scoring at the end of a sample, when everyone has become familiar with the patch of vegetation.

- In a sample of vegetation of wet rocks in a river, a plant scoring 3 might coat all of the scattered rocks seen, but would in no way attain the biomass of a tree species. For a ground herb, the ground would be carpeted by it for an abundance 3 score. Shrubs, Marantaceae or gingers would be in a thicket occupying most of the sample area to attain 3.

- There are often no species with an abundance score of 3 in a sample, and rarely more than one. As a rule of thumb, 2/3 or more of its stratum (understorey, herb layer etc) should be covered by the foliage of a species with abundance score of 3.

In practice, abundance scores make little difference to ordinations of RBS samples, and do not affect GHI calculations. They are useful to help work out where species reach their ecological optimum.

When canopy tree counts are being made (below), abundance scores for the non-canopy-tree component of the sample should reflect the performance of species excluding their abundance in the canopy – hence saplings recorded in the understorey should be recorded separately from the canopy records for the same species. As the canopy tree counters are usually independent of the other recorders, this would normally happen anyway.

CANOPY TREE COUNTS

In addition to the local species checklist output outlined above, in RBS samples of tree-dominated vegetation it is also useful to enumerate canopy trees over exactly the same sample area, and then a minimum of 40 individual canopy trees is also stipulated.

Trees above a predefined size, usually ≥ 30 cm DBH, and covering the same area as the main RBS sample, are simply identified and counted. Note, this is a count (summed separately for each species) totalling at least 40 individual trees, not a tally that must attain 40 different tree species. Often, only a few tree species are present.

The team may not stop searching for new species and extra trees before this target is reached. A larger number of counted trees is not a problem.

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WHY COUNT TREES AS WELL?

Tree species are often overlooked (underlooked?), as surveyors tend to concentrate on understorey plants, often inadvertently. The extra tree count requirement is useful to overcome this bias, and a specialist team member helps achieve it.

Also, in forest and denser savanna woodland, the requirement to count a minimum number of larger trees ensures a minimum area is covered or effort is applied by the survey team. The whole team should not stop searching for new species and extra trees, at least before the target of 40 canopy trees is reached.

Apart from these advantages, canopy tree counts are more subtly weighted abundance scores for larger tree species than the main RBS abundance scores could account for, and so are potentially useful for making a tree-centric classification of woodland. This can help link the complete RBS outputs on vegetation type, bioquality etc. to other tree-biased information, notably:

- Remotely sensed imagery: the reflectance of woodland is influenced most by the canopy trees; in some cases, maybe even individual trees can be spotted in the imagery and thus linked to the tree counts, enabling extrapolation from imagery alone.
- Classic forest inventory data: forest stock maps and classifications are often based on tree inventories, so canopy stem counts have a better chance of being correlated with independent forest classifications than the full plant community data.

DECIDING ON THE DBH THRESHOLD FOR TREES TO BE COUNTED

The tree count is merely a sketch of canopy tree composition, not a full tree inventory nor one which precisely picks out species with a given overhead exposure. To keep the count practical, the diameter (DBH) threshold for trees to be included in the canopy tree count is set before each plot enumeration such that:

- more than 40 trees above the threshold can be found in the sampled area, and
- the canopy sample is dominated by trees with crowns fully exposed from above.

Maybe the data would be marginally more useful if the canopy tree counts were the 40 largest trees in the sample area. However, this is impractical, so in most cases and in all forest, canopy trees are defined in the RBS as any tree with bole diameter ≥30 cm DBH.

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- Various extra rules can be useful for refining the link between understorey and canopy components of the sample, at the discretion of the team leader. For instance, along narrow streams, where a stream canopy tree may be sparser than in normal forest and rooted at some distance from the rest of the sampled stream flora, an additional horizontal or vertical distance can be applied by the surveyor within which the canopy trees must be rooted to be included. For instance, this threshold might be up to 5m from the water edge for the trees and maybe only 1 or 2 m for the lower vegetation. The limit should be chosen, depending on typical bank steepness, so that the resulting tree sample can exceed 40 individuals whilst still being the canopy of the stream basin; the understorey and canopy limits should both be narrow enough to reflect a special stream flora within them, if this is what the sample is designed to detect. These two distances should be documented on the plot description in the field form.

- Obviously if the area is grassland with only a few scattered large trees, the count is of little value and can be dropped. These samples will not feature in tree canopy analyses. In savanna woodland or thickets where the canopy is low (and often broken), and too few trees reach 30 cm DBH, the limit can be lowered to 20, 10 or even 5 cm DBH, a fact which is recorded with the field data, so such samples can be filtered from analyses if desired. It is best in the survey as a whole to adopt at most only one other such threshold apart from 30 cm DBH so results are comparable.

- Likewise, in more sparsely wooded or disturbed vegetation, a more lenient definition of DBH can be taken – e.g. to include leaning or forked trees where the lower diameter exceeds the limit even if the diameter at 1 .3 m vertically above the ground is not strictly so.

As with species records, more than 40 trees can be counted and the extra data are useful. Where this is so, the tree data can still be analysed alone, with abundance standardised to a proportion of the total tree count, or rarefied on the computer to yield 40 randomly chosen trees for a given analysis.

RELATING GENERAL ABUNDANCE AND TREE COUNT DATA

When trees are being counted separately, the normal RBS abundance score (1-3) explicitly excludes the canopy trees, and rather reflects understorey abundance, so the abundance and tree count scores returned from the field are independent of each other. However, for all-species ordinations and other all-species analyses weighted by abundance, the overall abundance score for species in the plots should be adjusted to include both strata. A reasonable conversion rate from tree counts to abundance scores is as follows:

- Canopy abundance score 1 = Up to a third (33.33%) of all canopy trees counted.
- Canopy abundance score 2 = One third up to two thirds of all canopy trees.
- Canopy abundance score 3 = Two thirds or more of canopy trees counted.

The species abundance in the sample as a whole is then taken for analysis as the higher of the two scores, i.e. observed non-canopy abundance and calculated canopy tree abundance scores.

RECORDING LOCAL PERCEPTIONS OF VEGETATION WITH RBS

Assessment of local usage and valuation of plant resources has been integrated into the RBS process. Local botanical experts are included in RBS teams, and with their help it is a relatively simple matter to collect basic ethnobotanical data, such as local names and priority species, alongside normal RBS activities. Ethnobotanic data collected as part of RBS can be used to provide evidence of the cultural and provisioning aspect of ecosystem services, and allows the differing values attached to biodiversity and ecosystem services by communities to be accounted for; these elements are considered best practise for ESIAs. Nationally or regionally, these data could be used to flag dwindling resources and prioritise support, or simply to record how people are using plants.

HOW DOES IT WORK?

1. Recruiting informants: At the beginning of the field work, the local people who know the most about the local vegetation are identified through community consultations. Typically, one or two local experts (e.g. a woman and a man) would accompany an RBS team at a time, but in each community or subset of communities different local experts can be recruited to reduce individual bias.
2. What is recorded: The local experts accompany the team to the field, and for each specimen collected, gives their name for the species, how they use it, and how important it is to their community (using a 1-3 score). Use notes are kept perfunctory, e.g. 'medicine for toothache', and preparation details are not requested; this protects the knowledge of local experts whilst providing enough relevant information for most applications. For canopy tree species, the informant who knows the most about trees should accompany the tree spotters.
3. Importance scoring: similar in philosophy and execution to abundance scoring, where species receive a score of 1 by default ('useful'); 2 for species that are more valued than average; and 3 for the very most useful species from the sample. Sometimes, no species in a sample will achieve a 3, sometimes several will, depending on the vegetation. It is usually easiest to do this exercise after all names and specimens have been recorded.
4. Workshops: Species identified as the most important through the 1-3 scoring can be discussed in greater detail with the communities. Typical questions would be: Is there enough of this plant around? Do you have any experience cultivating it? What could be done to improve the supply of this species?
5. Outputs and analysis:
    - A lexicon of local names and the scientific species to which they correspond. This activity is greatly facilitated by the collection of many specimens: it is possible to 'weed out' incorrectly named plants, and it becomes clear when a local name corresponds to several scientific species, or when two local names cover the same scientific species. This becomes very useful during the management stage, because it means that local people, scientists and managers can communicate about plant resources.
    - A summary of how people use plants locally. Plant uses are summarised into use categories, such as 'food', 'medicine', 'magic', 'materials'; the numbers of species used for each application are presented, with example uses detailed.
    - A list of the most important species locally, with notes about their supply and how they are currently managed.
    - An analysis showing to what extent local valuations correspond to global (bioquality) values, for which species and plant communities these two valuations diverge, and for local applications, a management plan that takes account of both areas of high bioquality and high local use value.
6. Follow up work: The data and outputs can form the basis for follow-up surveys conducted by specialists rather than botanists e.g. market surveys, detailed studies of the customs and rituals linked to plants;

such studies are easier to conduct if the botanic element has already been sorted out. Agricultural species and farming practises are not specifically covered by the above approach, which focuses on the use and value of biodiversity: Studies of livelihoods, farming practises, and issues of compensation must be dealt with separately by the relevant experts.

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PROCESSING SPECIMENS AND DATA

RBS often generates many plant specimens, and much data. It is important to develop a strategy to optimise the identification of the specimens by sequential and thoughtful sorting. These aspects and other aspects relating to logistics and practicalities are dealt with in the Annexes below.

- Organisation of field team p. 48
- Identification and Herbarium work associated with RBS p. 49
- What resources do you need for a typical RBS? P. 49
- Data arrangement and input p. 51

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EXAMPLES OF RBS PROJECTS AND BIOQUALITY MAPS

RBS surveys with bioquality assessment started in Ghana, and subsequent projects have since been completed across West Africa, both Upper Guinea (see Figure 4), and Cameroon. A single Star Framework covers all of tropical Africa, though the details recorded in each project differ slightly, appropriate to project aims.

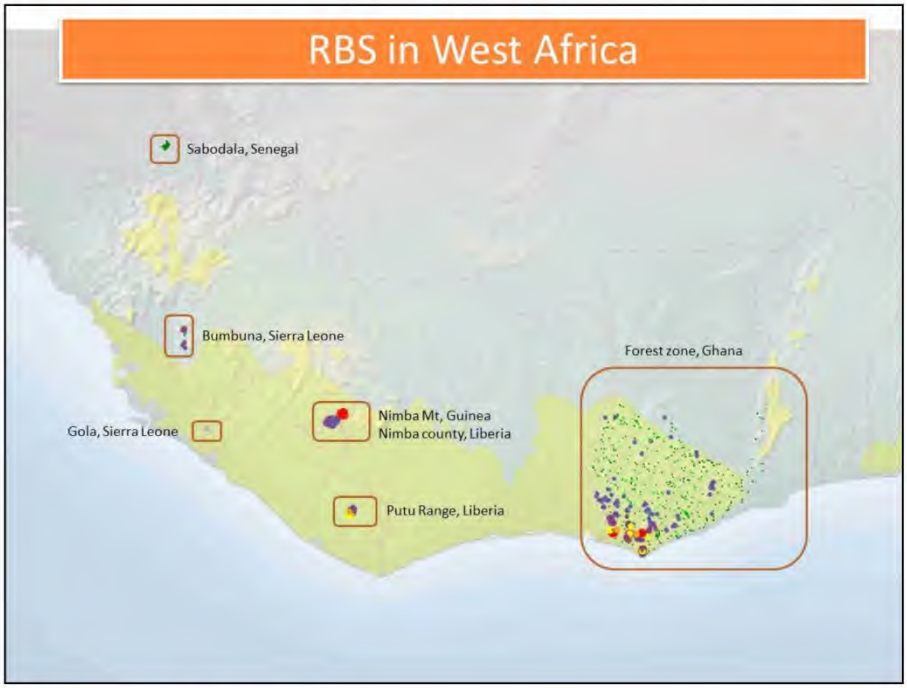
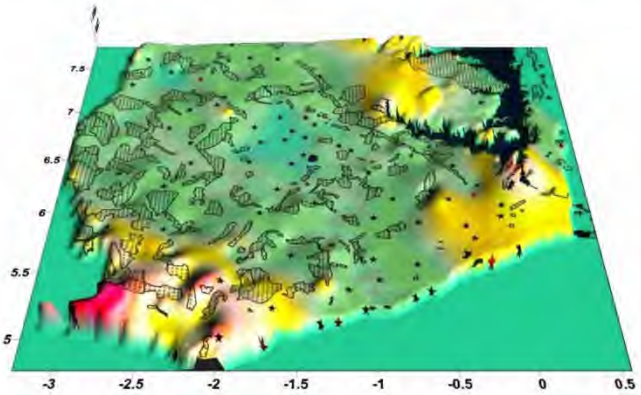


Figure 4 RBS projects in Upper Guinea

GHANA'S FOREST ZONE

A three year RBS (1990-1993) by a small team from Ghana's Forestry department, funded by the UK's Department for International Development (DfID) was the foundation for an assessment within 200 forest reserves, development of a conservation plan and subsequent increased protection; and the training of several botanists who have gone on to help inform and influence biodiversity management in the country (Hawthorne & Abu Juam, 1995; Hawthorne, 1992, 1996).

Subsequent surveys have filled in details for specific areas, including (GSBAs) Globally Significant Biodiversity areas (set up as a result of the national survey); Ankasa Conservation area (a baseline for conservation management); Subri F.R. and Afram Headwaters F.R. (baseline surveys for industrial plantation projects); and ongoing research by Marshall et al. looking in more detail at the gradient of bioquality in the SW corner.



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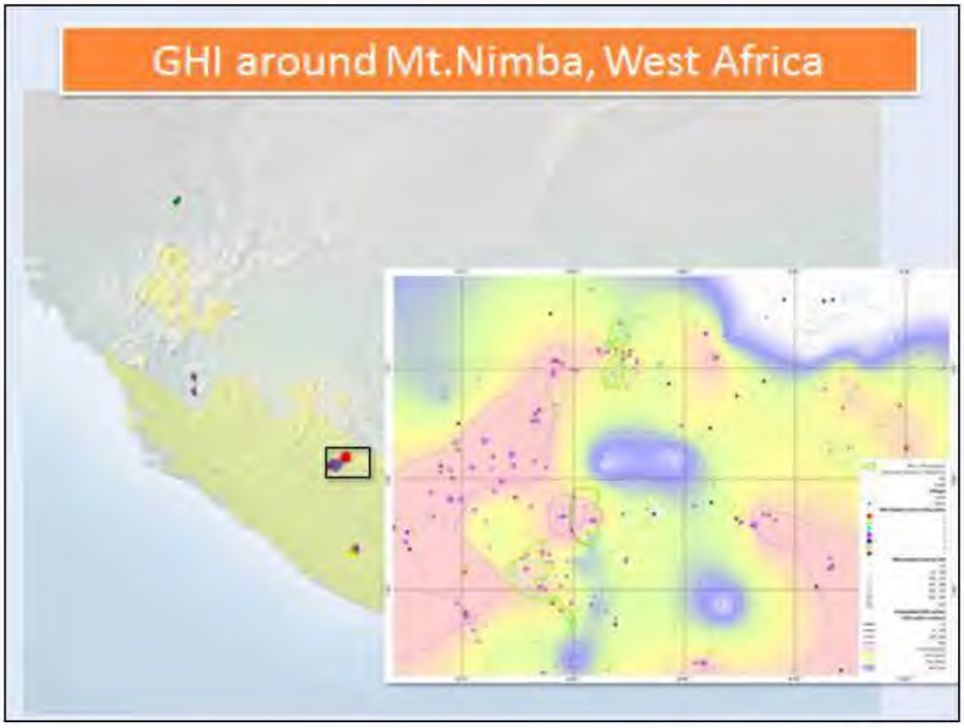
LIBERIA, NIMBA COUNTY

A survey commissioned for the Liberian portion of the Nimba and adjacent mountains, by ArcelorMittal Liberia (AML), in 2010-12, prior to mining in the area (Hawthorne & Marshall, 2013). The survey highlighted subtle patterns of GHI in the forests inside and around the mining concession. AML was able to avoid some of the impacts of mining, and used the results to target locally used and globally important species for restoration and other plantings. Much of the hottest forest in the area is to the west of the mine. Today, this area is being managed and conserved under a community forest, supported by AML.

The RBS here also included assessments of important, locally useful plants (Marshall & Hawthorne, 2013).

Other mining related surveys in the area include surveys of Guinean Nimba (2008-9); a proposed railway route to the coast and port area; and the Putu Range (2011), near Sapo N.P.



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TRINIDAD AND TOBAGO

This three year project involved the University of the West Indies, Forestry Dept. of Trinidad & Tobago and the University of Oxford, as well as various NGOS. It was funded by the UK government/DEFRA, though the Darwin Initiative. A bioquality framework was established for the whole country, including a generalized hotspot map, using RBS samples and the existing herbarium database. The project updated the national flora database, trained students and foresters, and the data contribute to forest and conservation policy and planning. As well as the globally significant hotspots detected in the mountains of both Trinidad and Tobago, warm spots (GHI 150-250) are located on the foothills of these mountains and in other areas to the south and east, and in the small islands in north west Trinidad.

Yellow and red areas indicate high bioquality areas, measured with the GHI. These areas contain high concentrations of rare plants and demand the most conservation attention. Ideally, these areas should be avoided during development and exploitation activities. If they cannot be avoided, they set a baseline against which restoration or offset activities can be measured. The RBS database was also used in a study of potential future impacts of climate change in the country (Maharaj, 2012)

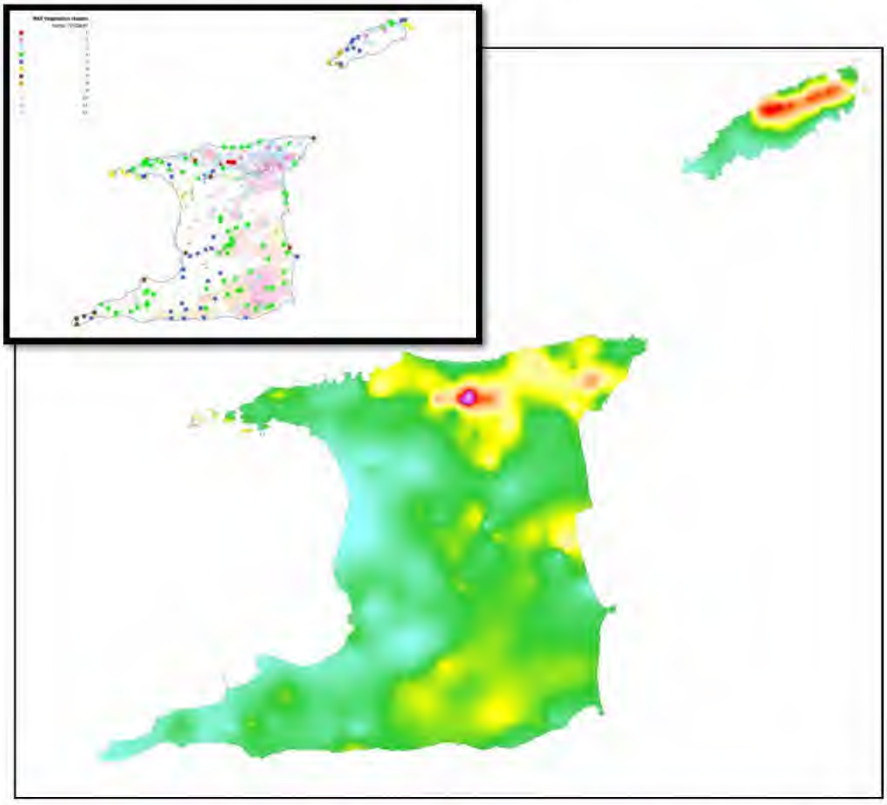

Figure 5 Bioquality hotspot map, Trinidad and Tobago. Peaks of GHI in red (at higher altitudes).

CLIENTS AND PARTNERS

Our previous clients and sponsors include government departments, industry, charities and NGOs.

Government Departments:

Forestry Departments of Ghana, Liberia, Trinidad & Tobago, Brunei.

UK's DFID; DEFRA (Darwin Initiative)

Forestry & Wildlife division, Government of Ghana

Add in Cameroon?

Mining and Natural Resources Industry:

BP Biofuels (Brazil)

BHP Billiton; ArcelorMittal Liberia; SMFG (Guinea); Oromin (Senegal); Putu Iron Ore; Euronimba (Liberia)

Bumbuna dam Hydroelectric Power Scheme (Sierra Leone)

Commonwealth Development Corporation (Mt. Cameroon; Ghana Plantations).

Subri Industrial Plantations Ltd (Ghana)

Universities, NGOs and charities:

RSPB/Birdlife International

Kew Millennium Seed Bank

University of the West Indies, St.Augustine, Trinidad & Tobago

University of Talca, Maule Region, Chile

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APPENDIX A: NOTES ON RBS LOGISTICS

ORGANISATION OF FIELD TEAM

After arriving at the sample area, the team leader carefully discusses and ultimately refines and defines the limits of sample area with the survey team, taking great care to ensure the whole team is on the same wavelength as to the limits for the sample.

In any RBS sample area, a convenient, fairly central point is usually chosen for pressing and supervision, and botanical recording radiates from this point until new species for the sampled vegetation declines, perhaps to less than one in about five minutes of the whole team searching, and all the typical plants, and also most of the locally rarer plants, have been included. If 40 species haven't been achieved by this time, then more time should be spent searching more carefully, before stopping. Alternatively, if the team has been sampling briskly for more than three hours, and the specimen list is well above 100 and there is still no sign of the inflow ending, then it is time to think about stopping that sample, unless there is nothing else planned for the rest of the day.

Although the optimum organisation for collecting all species in the defined sample area varies with conditions and is a decision for the team leader, the following is often a good approach:

- The first few species are collected around the central press point with the whole team watching and helping.
- The team then all focus on the five metres around the sample area to collect the next suite of species, again so that collectors are aware of what is collected or recorded by others, and do not collect again.
- Thereafter, collectors gradually spread out to find new records independently. Inevitably some of the same species will be repeatedly collected, and the excess specimens are discarded, but this is still useful for the booker who ultimately has to codify the abundance of each species.
- It may be useful for collectors to collect into a tough dustbin-liner size polythene bag, but generally not to collect more than 10 species at once in case they forget details, and because specimens become lost or damaged if too many are stuffed into a bag.
- Generally a tree spotter (plus assistant) is a specialist and will move around the whole sampled area recording the trees, usually counting the canopy trees individually (see p. 34). Any extra non-tree, or smaller than canopy tree species they spot can also be collected. The assistant can help with the tree-spotting, tree climbing, catapulting of specimens or bagging of specimens. As the tree spotters usually cover the most ground, it is best to send the GPS with tracking turned on with the tree spotter.
- If some collectors are put in charge of other particular groups (e.g. grasses) the director should ensure all are absolutely clear of these limits (e.g. what about Xyridaceae, Cyperaceae etc), and that all plant types are covered in all parts of the sample area. In thick vegetation it is generally more efficient if the sample area is subdivided physically and different collectors work different areas looking for all types of species.
- Towards the end of the sample period, the booker or team leader, who has probably been centred around the press until then, should make one last tour around the area with other collectors, particularly to discuss and finalise which few species are common enough to earn the higher (2 or 3) abundance scores.

IDENTIFICATION AND HERBARIUM WORK ASSOCIATED WITH RBS

In typical tropical situations and diverse vegetation elsewhere, 100-200 specimens might be collected by one team per day, maybe 1,000-4,000 specimens per month or two. In these cases, part or all of every few days in the field should be spent by the field team keeping abreast of specimen management, by sorting into families at least. This helps the team become familiar with the names or other attributes of the plants, maybe alerting them to the need to collect more complete specimens, and the process also speeds up subsequent work in the herbarium.

For difficult floras, it takes as long or much longer to identify the plant specimens in a herbarium than the original field work, even with the high efficiency gains that are to be made by sorting together many months' collections and identifying all the specimens of the same taxon at once. Once all the various, mostly sterile specimens have been sorted together into apparent species ('morphospecies'), it is generally easier to spot the links to the usually rather different spectrum of fertile specimens in the herbarium.

After the identification phase, the specimens will probably have been arranged in order of species but, if not, they should be rigorously sorted into species order to facilitate data input, assuming most species are represented by more than one specimen.

WHAT RESOURCES DO YOU NEED FOR A TYPICAL RBS?

RBS sampling can be done by one botanist, with minimal collection of specimens if all the species are known well; and with minimal logistical effort if the sampled area can be easily reached. However, RBS is normally performed by a small team of people in species-rich and often remote areas, where at least some of the species are not known for certain by any of the field team. This then involves more attention to logistics and budget, and a rather more "industrial" approach to specimen collection than can be managed by one person.

RBS, in species-rich tropical vegetation at least, normally involves:

- A field team usually of 4 or more people. RBS is an excellent framework for students to learn practical field botany, as part of the team. More than one team can operate at once for large or hurried surveys, but then it is good to shuffle the members regularly, to discourage team-related biases and unusual practices creeping in.

  A typical RBS field team has the following staff:

  1. A booker (usually team manager) to make records onto forms or a ruled notebook and supervise the field team. The booker should senior enough be able to manage the individuals in the rest of the team, be technically competent and fully aware of the RBS goals and limitations, and have neat handwriting. Almost always with a higher degree or relevant diploma. In some cases the team leader and booker may be independent, in which case the booker is responsible for managing the inflow of specimens and other data, and the team leader may be helping with the identification and other aspects of supervision.
  2. A competent field botanist/tree spotter in charge of enumerating individual trees above a stated girth, and of organising collection of specimens for those trees in doubt. This is a specialised skill. Tree counts can be booked onto a separate form which is later joined with the main set prepared by the booker.
  3. 1 or 2 'ferrets' i.e. reasonably competent field botanists or people with a botanical eye at

least, to collect specimens of plants other than the large trees. There can be more, but more than two make it harder for the booker to manage, and there may be no gain in speed. Forest field staff, university technicians or academics can all fill this 'team engine' crucial role.

4. A "presser" to press the specimens. Neat and patient people are best.
5. Labourers, tree climbers, forest guards, cooks, camp attendants, drivers etc. depending on local norms can all be put to good use, and may be essential in some cases, but the core team of 1-4 can suffice. Usually, people like hunters or others with local knowledge of footpaths, interesting forest types and locally rare plants are extremely helpful, especially if they double as tree climbers, tree-spotters, or press carriers. They can also help develop a local plant name dictionary.

- Herbarium support. Usually herbarium technicians will participate in the field team, but in any case one or more assistants will be vital for helping to sift thousands of specimens in the herbarium.
- A secretary or research assistant is very useful for the heavy burden of data input. Else, the booker or other team members can take on this task.
- Use of a long bench space (10 m or more total length, a metre or more wide) is useful to facilitate specimen sorting. If nothing else is available, trellis tables or a conference room can be perhaps be used for a short period. If options exist, an air-conditioner is very much better than a fan in a specimen sorting room in hot seasons, for obvious reasons.
- Transport, camping and other logistical arrangements may well be necessary and in some cases form a large part of the total effort.
- Equipment requirements are usually the same and little different from normal botanical collecting, except for a much higher volume of specimen drying. Details depend on logistics and whether the field work involves returning to a herbarium daily or camping on 2-3 week field trips. Specimens to be pressed can go directly from hand to press, although a small bin-liner or sack for holding 10 minutes' worth of specimens prior to pressing can be used. This can lead to errors and losses however.

  - GPS (maybe a spare as they are so important. Certainly spare batteries). Maps etc. For forest use, a high sensitivity Garmin model like the GPSMAP 62 is very useful.
  - Booking equipment: clip board, spare pens etc.
  - Sharp bush knives
  - "Lunch" related equipment (even if only water bottles).
  - Digital cameras. To enhance interpretation and dissemination of the results. Also useful for making quick field guides etc. A good macro lens (focusing to within a cm or less) is recommended.

  Collecting and Pressing equipment

  - 3 pairs of secateurs
  - Press with long robust straps, hopefully light press ends
  - A lot of newspapers (200 or more sheets per day)
  - Corrugates: Aluminium corrugates are worth obtaining. Otherwise cardboard corrugates will do. Some for field use (spiny plants), most in camp to facilitate drying. If enough porters, the drying press interleaved with corrugates can be directly filled in the field to save time. Usually this is a job for the evening, and most corrugates left in camp
  - Robust indelible black marker pens, for writing on leaves and newspaper
  - A few sealable poly bags useful for fruits

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- Maybe a few bottles with spirit if there is a chance of meeting rare/fleshy species deserving good collections.
- Strong catapult, for shooting down canopy leaves is useful.
- Binoculars useful but not essential.
- Drying Oven: For protracted field work these need to be light and ideally collapsible, and their fuel supply and supply of heat (?electricity) needs to be thought about. Modified electric heater fans, arrays of 60 watt light bulbs, or camp cooking hot plates are the most convenient if there is electricity. Charcoal braziers, kerosene lamps, etc if not. Naked camp fires not a good idea. See separate document **"Making a plant drying oven".**
- Strong polythene sacks for storing bundles of dried specimens

- For RBS Data input, BRAHMS (see Brahms Online website) is strongly recommended, with other vegetation analysis (e.g. PC-ORD, R) and GIS software. The RBS data format is fairly simple, but a large survey involves many specimens with details to be managed and kept up to date. Analysis can involve fiddly manipulations of species, places and plot files, and display of results in particular involves manipulations that would be tedious using e.g. a spreadsheet. Therefore, Brahms is our preferred database and analysis tool for handling RBS data. Denis Filer is gradually enhancing Brahms' facilities to facilitate this.

DATA ARRANGEMENT AND INPUT

The following text describes the data management protocols normally employed by the author, using BRAHMS software.

SAMPLE NAMES (SAMPNAME)

All samples are given a mnemonic sample name in the field. In the Brahms database, this fits in the 8 letter character field SAMPNAME. SAMPNAME is normally composed of three parts:

e.g. SUBRS03

- 3 or 4 initial letters (SUB) are an abbreviation for the locality (Subri Forest Reserve) or other major organisational unit of the survey (e.g. team leader name, if there is more than one team).
- Two middle letters are codes (RS=Riverside) for a landscape unit or forest type.
- The final two letters are sequential to distinguish otherwise identical Sample codes (this is the third sample from Subri riverine forest).

The code is convenient for displaying on maps, graphs and in other outputs, and is also crucial for organising and linking the data tables efficiently inside the database.

MAJOR DATA TYPES

RBS sample data has four main components. In the following discussion, data management is explained by reference to the BRAHMS database software, which has been programmed to handle RBS data.

1. **Sample headers**. This relates to the header data on the field form (p. 54), i.e. data generally recorded once per sample like latitude and longitude of sample centre. There is a special plot metadata section of BRAHMS for dealing with this called the header file. The plant data records must all be identified with the same Sampname code.

2. **Sample plant data**. This relates to the main columns of data on the field form (p. 54), one record per species. It is best to input as the work progresses, even though most species records may only be recognised by unidentified vouchers at this stage. Each record is linked to the header by repeating the Sampname code. (Brahms automatically maintains a numeric code for each plot as well, and uses this to link Sample header and Sample plant data, based on the real-world Sampname code from the field).

3. **Herbarium plot voucher determination data**. Brahms manages the links between vouchers in sample data files and a separate **voucher determination file** (a separately typed rapid data entry (RDE) file which may relate to one or many sample data files).

4. Logistics often result in large piles of specimens being identified in batches. These are conveniently input into Brahms RDE determination files by a typist in the herbarium, from the piles of specimen. Sometimes experts in distant herbaria work on specimens of particular families, and produce separate lists of determination. Brahms facilitates the linking of these separate batches of determination RDE files into the Master voucher file; and from there the plot data can be updated automatically. Only the voucher number (**PREFIX, VOUCHER, SUFFIX**) fields and species name fields and determination person/date need be typed in **determination RDE files**. If specimen names to be typed in are sorted in species order, input in BRAHMS only involves looking species names up when the name changes, as the name and determination fields can be set to be auto-copied from one record to the next.

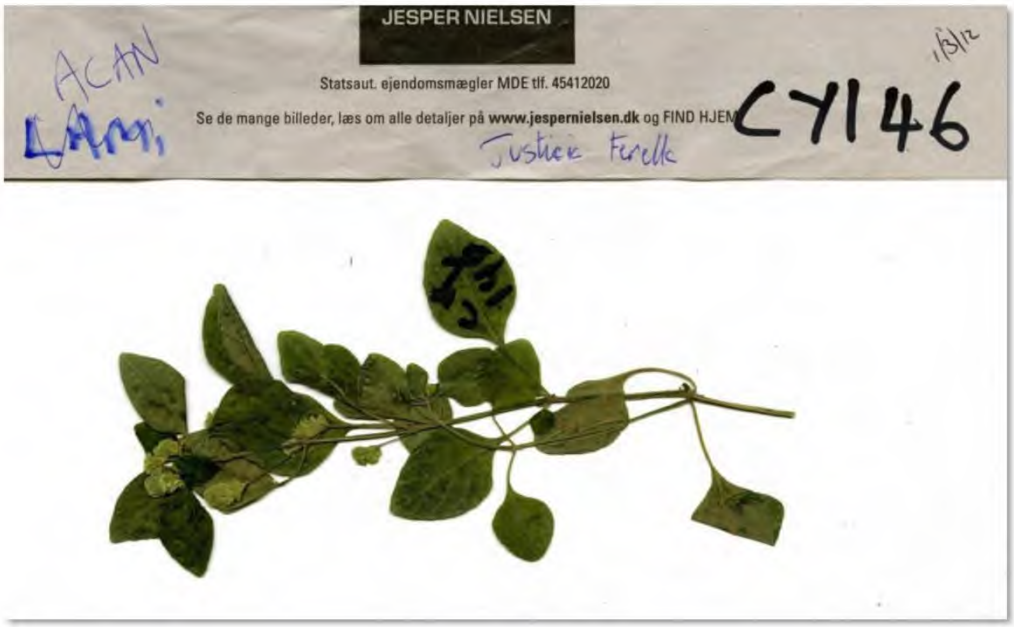
   In contrast to orthodox herbarium specimens, which may be identified with full collector names and a globally unique number, plot vouchers are conveniently allocated a short prefix (e.g. one unique to each field team) and are generally numbered from zero in each survey. The full prefix and number should be written using an indelible marker directly onto leaves (or a tag for fine leaflets) and the newspaper.

5. **Orthodox herbarium specimens**. Like ordinary one-off herbarium collections, these may be recorded outside samples, and so need a full set of data per specimen.

6. Additionally, if **photographs** have been taken, these can be linked to records of species, either of orthodox herbarium specimens if not in samples, or to sample plot data if from a sample record, or as standalone image records in the same database. These linked images can ultimately find their way onto the Virtual Field herbarium website.

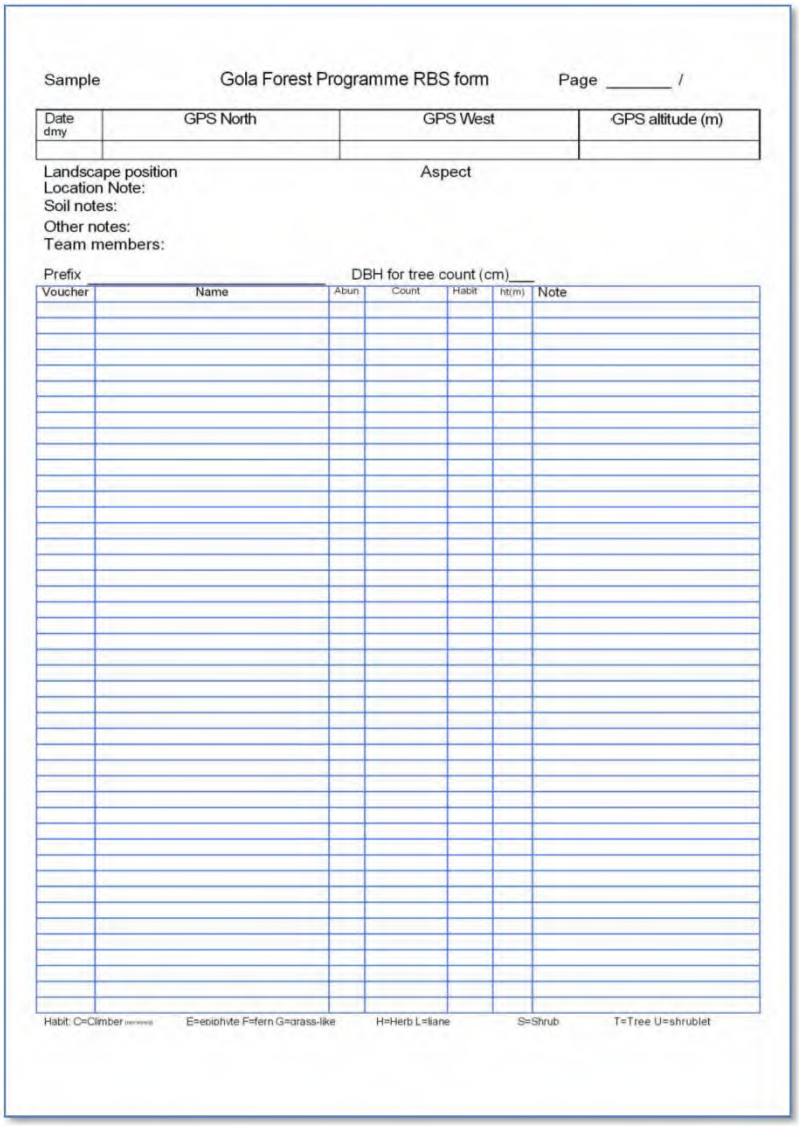
If plot and voucher data are typed in the field, with especially the sample header data kept up to date, at least, the distribution of sample locations can be monitored on a GIS linked to Brahms.

Figure 6 RBS voucher, with data on foot of pressing newspaper. Voucher number CY146 (CY is the prefix) in standard lower right margin of outer sheet of paper, for easy filing and data input. The date indicates the identification has been typed in. The determination is centered and the family code lower left.



SAMPLE RBS FIELD FORM

This is an image of a typical (A4) field form. The prefix for specimen numbers is constant for at least a plot and marked at the top of the plant list grid in the form. The variable part of the voucher numbers only (the number after the prefix) are written under voucher.



Sample Gola Forest Programme RBS form Page _____ /

Date dmy	GPS North	GPS West	GPS altitude (m)

Landscape position Aspect
Location Note:
Soil notes:
Other notes:
Team members:

Prefix _____ DBH for tree count (cm)___

Voucher	Name	Abun	Count	Habit	ht(m)	Note

Habit: C=Climber E=epiphyte F=fern G=grass-like H=Herb L=liane S=Shrub T=Tree U=shrublet

STAR FRAMEWORK DEFINITIONS IMPLEMENTED IN CHILE, MAULE REGIÓN 2009

(see Hawthorne, San Martin, Sepulveda, Penalillo.. *et al.* 2010)

Sistema clasificación ESTRELLAS

1a. Las especies que se encuentran tanto dentro como afuera de Chile.

2a. Ampliamente distribuidas en cono sur de Sud-América incluyendo el S de Brasil S., o ruderales bien distribuidas en la región Andina; o de distribución más amplia que lo anterior, por ejemplo, malezas neotropicales, o exóticas. **Estrella Verde**

2b. Más restringida, por ejemplo, de los bosques subantárticos o de Chile y Argentina.

3a. Común en Chile >5 regiones y que estén presentes en Argentina **Estrella Verde**

3b. De distribución levemente menos amplia. **Estrella Azul**

3c. Rara pero en Chile y Argentina. **Estrella Dorada**

1b. Especie endémica de Chile.

4a. >2 Regiones; si <5 debe ser abundante en estas regiones.

5a. >4 Regiones y abundante en las condiciones actuales. **Estrella Azul**

5b. 2-4 Regiones, o si es más amplia debe estar muy poco distribuido y con otros factores de priorización, por ejemplo género monoespecífico; rara en el rango de distribución, límite norte y sur de la especie, clasificada en alguna categoría de conservación. **Estrella Dorada**

4b. 1-2 Regiones, o hasta 4 regiones, pero restringida dentro de esta área.

6a. Abundante en >5 grados cuadrados. **Estrella Dorada**

6b. No es abundante en todo, ó en 1 a 5 grados cuadrados. **Estrella Negra**

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ATTACHMENT A1.3 MAIN HABITATS AND VEGETATION TYPES

Table Att1.3-1 Main Habitats and Vegetation Types Identified

Habitat Type Identified by the RBS	Vegetation Type	Sample or Plot Codes	GHI Range	Altitude Range (m)	Code	Habitat Type Illustrated in Habitat Map (Attachment A1.1)
Guineo-Congolian semi-evergreen forest	Semi-deciduous Guineo-Congolian rainforest	UGWB01	44	1061	FR	Forest
Swamp and riparian forest	Swamp or riverine forest, with *Phoenix reclinata* and *Pseudospondias microcarpa*	UGMU04, UGMU08, UGSW09	26–71	1396	SF	Wetland Forest
Swamp (wetlands)	Swampy grassland, occasional woody species	UGMU01, UGMU05, UGMU07, UGMU11, UGRA17, UGRA19, UGRA22, UGRA24, UGMK04, UGMK06, UGMK12, UGGM02	0–110	1181–1255	SG	Wetland
	Papyrus swamp (*Cyperus papyrus*)	UGMU03, UGMU02, UGMU12, UGMU09, UGRA20, UGRA21, UGMK09, UGSW08	0–52	1073–1261	SP	

Table Att1.3-1 Main Habitats and Vegetation Types Identified

Habitat Type Identified by the RBS	Vegetation Type	Sample or Plot Codes	GHI Range	Altitude Range (m)	Code	Habitat Type Illustrated in Habitat Map (Attachment A1.1)
Secondary *Acacia* sp. woodland, bushland and wooded grassland	*Acacia* woodland, wooded grassland and bushland Generally rather low lying	UGRA18, UGMK08, UGMK13, UGMK14, UGMK15, UGMK16, UGMK17, UGMK18, UGMK19, UGMK21, UGGM01, UGGM03	21–52	1162–1299	GB	Woodland, bushland, shrubland and wooded grassland
	Very disturbed *Acacia* woodland, wooded grassland and bushland Generally rather low lying Lacking trees, or tree layer replaced by cultivated species	UGRA16, UGRA23, UGMK07, UGMK11, UGRA06	15–50	1165–1252	GW	
	Secondary *Acacia* woodland, bushland or thicket with exotics	UGMU06, UGMK10, UGRA10, UGRA15, UGMS01	14–51	1182–1354	GX	
	Acacia polyacantha woodland in farmland	UGMK20	39	1224	AP	

Table Att1.3-1 Main Habitats and Vegetation Types Identified

Habitat Type Identified by the RBS	Vegetation Type	Sample or Plot Codes	GHI Range	Altitude Range (m)	Code	Habitat Type Illustrated in Habitat Map (Attachment A1.1)
Cultivated land	Farmland and garden	UGGM04, UGRA02, UGRA05, UGRA07, UGRA09, UGRA11, UGRA12, UGRA13, UGRA14	(0–50)	1191–1210	XA	Cultivations
	Plantation	UGMU10, UGMK01, UGMK02, UGMK03, UGRA01, UGRA03, UGRA04, UGRA08, UGMK05	(0–46)	1099–1311	XP	Plantations

Table Att1.3-2 Results of the MCPY4 Habitat Survey

Site	Location	Habitat Type	Description of Vegetation Types
MCPY4		*Lantana-Erlangea-Sporobolus* shrubland with open grassland Shrubland with scattered thicket *of Grewia, Lantana, Rhus, Erlangea* and *Psydrax* with Loudetia grassland	The dominant vegetation types were *Lantana-Erlangea-Sporobolus* Shrubland, open *Loudetia kagerensis* grassland and *Psydrax-Lantana-Capparis* Thicket on old termite mounds. A large part of the area had evidently been degraded owing to grazing, with high abundance of *Lantana camara*, a notorious invasive species which tends to thrive with disturbance conditions. Small pockets had been planted with the exotic *Eucalyptus* spp. while a few others had been planted with maize.

Figure Att1.3-1 illustrates the location of the habitat types. Symbols are colour-coded to represent the different habitat types and sized in proportion to GHI (larger symbols have higher bioquality: a higher percentage of globally rare species). Note that several plots overlap.

Guineo-Congolian Semi-evergreen Forest

Semi-evergreen forest was sampled at Klambabya Community forest (UGWB01), part of the Wambabya FR. The forest is a diverse community with 78 species and no one species dominant in the canopy, as would be expected of Guineo-Congolian rain forest in good condition. All these species are found in similar forests as far away as Sierra Leone, (although *Drypetes gerrardii* represents an East African element). Because of this, the bioquality is low (GHI = 44).

Riparian and Swamp Forests

Riparian and swamp forests are types of wetland forests. The most common tree species of wetland forest (SF) are the palm *Phoenix reclinata* and *Pseudospondias microcarpa.* Increasing disturbance leads to the invasion of fig species, including *Ficus sycomorus* and *Ficus vallis-choudae*. Because of the steep gradients around such communities, samples of them often include species typical of more open swampy vegetation at their extremes, such as *Cyperus papyrus* and aquatic herbs. The *Phoenix* palm dominates in a different part of the environmental gradient from larger riverine trees such as *Pseudospondias*.

These forests generally support a diverse vegetation community. *Leptonychia mildbraedii* (IUCN vulnerable and Black Star species) was recorded during the RBS in sample plot UGSW09. This species is provisionally Red Listed as near threatened. Generally, the plant species of this vegetation type are common and widespread, and consequently the GHI values are low. Most of the remaining forest habitat in the AOI is appears to comprise wetland forests.

Secondary *Acacia* sp. Woodland, Bushland, Wooded Grassland

Habitat types mapped as woodland, bushland, shrubland, wooded grassland and grassland represent various stages of maturity of secondary (typically *Acacia*) wooded grassland, cultivated to varying degrees. Floristically, woodland, bushland, shrubland, wooded grassland and grassland are not distinguishable, and represent different stages of maturity of the same secondary *Acacia* woodland, depending on, e.g., time since clearance or current grazing levels. The vegetation is secondary, regenerates easily and is of no concern from a conservation perspective.

The natural climax vegetation of the AOI, according to White (1983) should be evergreen and semi-evergreen bushland and thicket, excluding patches of semi-evergreen forest and wetland forests described above. According to White (1983), the principal bushy species of this thicket vegetation type are *Allophylus africanus, Azima tetracantha, Canthium schimperanum, Carissa edulis, Capparis fascicularis, Capparis tomentosa, Erythrococca bongensis, Grewia bicolor, Maerua triphylla, Olea africana, Rhus natalensis, Tarenna graveolens* and *Turraea nilotica.* Climbing species of these thickets include *Cissus quadrangularis, Cissus rotundifolia, Senecio stuhlmannii* and *Vernonia brachycalyx.*

White noted in 1983 that this vegetation had already been extensively destroyed, and was already only represented by small degraded relics on shallow soil and by small patches of secondary regrowth. The thicket vegetation is replaced by secondary *Acacia* wooded grassland (as in the AOI), which is characterised by pioneer *Acacia* species, such as *Acacia hockii, A. gerrardii, A. kirkii, A. senegal*, as well as *Euphorbia candelabrum*.

The (re)establishment of thicket from these secondary *Acacia* wooded grasslands occurs when lianes (woody climbers) eventually smother the crowns of the *Acacia* trees, casting shade, which allows the establishment of shrubs and bushes. With time, these can suppress the regeneration of *Acacia* seedlings. *Euphorbia candelabrum* may shade the grass layer, enabling the invasion of woody species that require less light (White 1983).

Although some thicket species are found in the AOI (*Allophylus africanus*, *Cissus quadrangularis*), most of the vegetation sampled (and occurring) in the AOI seems to be of the secondary *Acacia* wooded grassland vegetation type. Areas of thicket vegetation in good condition were not identified within the AOI.

Four classes of secondary *Acacia* woodland, bushland or wooded grassland with a Guineo-Congolian influence have been defined near Lake Victoria. GHI is low, and the vegetation is secondary and continues to be modified by human activity. Exotics and cultivated species regularly appear in the samples.

Type GB probably represents the most mature of the vegetation group, i.e., it has not been disturbed or cleared recently, and there are fewer cultivated species present in the sample. *Acacia sieberiana, Acacia gerrardii, Acacia mildbraedii* are the dominant tree species, which in general are species characteristic of wetter sites within secondary *Acacia* woodland. Also dominant in the tree layer are *Albizia coriaria* and *Grewia trichocarpa*, characteristic of riverine or wetter *Acacia* woodland vegetation. Present is *Albizia glaberrima*, also of riverine margins of woodland. *Euphorbia candelabrum* and *Combretum molle* occur; these are typical species of undifferentiated woodland vegetation in Africa and Sudanese Regions but preferring better drained conditions. However, they are widely distributed and ecologically tolerant. The woody understorey and climbing species include *Cissus quadrangularis*, *Grewia similis*, *Vepris nobilis*, *Maytenus senegalensis* and *Scutia myrtina*, all wide ranging species of woodland habitats, throughout east and southern Africa or across tropical Africa running to the north of the Guineo-Congolian region. Otherwise, the understorey is dominated by grasses and sedges.

Type GW, GX and GB form a gradient in vegetation composition and are similar to each other. Type GW is differentiated by the lack of a substantial tree layer, or the presence of cultivated trees (e.g., *Pinus* sp. or mangoes). It is associated with lower lying, and thus cultivated, land and is at the secondary, degraded or disturbed end of this vegetation spectrum.

Type GX represents the freer draining end of the vegetation spectrum, e.g., on rockier soils, or small hilltops or slopes.

One area of *Combretum* sp. woodland *(*dominated by *C. molle* and *C. collinum)* was identified and sampled within the AOI (UGMS01). It has been classified within this GX vegetation type. *Combretum molle* woodland is an alternative secondary vegetation of the AOI, and one that is fire-induced. It also replaces the natural evergreen bushland vegetation, described above, in upland areas (White 1983). *Combretum* woodland relies on the absence of grazing and disturbance to prevent the invasion of *Acacia* species.

Vegetation type AP is dominated by *Acacia polyacantha*, characteristic of more disturbed and lower lying or riverine land. *Acacia polyacantha* is associated with rich alluvial and fertile soils, thus the land is typically under cultivation within the AOI, and the vegetation type described here is associated with cultivated species and weedy species of farm margins.

Swamp

Swamps occur in depressions that permanently or seasonally hold water to a shallow depth and tend to develop around shallow lakes and rivers. Two types were distinguished floristically during the RBS.

Habitat type SG represents other types of low-lying wetland with, e.g., *Typh*a spp., *Setaria* spp., *Cyperus articulatus*, and sometimes with *Phoenix reclinata* and *Pseudospondias microcarpa* or *Cyperus papyrus* at lower abundance than in type SP. Sample UGMK12 of type SG achieves the highest GHI of the AOI, owing to the presence of *Rytigynia beniensis* (Black Star, but see discussion below) and *Blepharispermum pubescens* (Gold Star), but in general this is not a vegetation type that achieves even moderately high bioquality.

Cultivated Land

Type XA describes farmland and gardens, and type XP describes tree plantations (typically *Eucalyptus* or *Pinus*). This represents modified habitat as defined by IFC PS6. The habitat is of very limited interest or value from either a botanic or ecological perspective. The GHI of UGMK03 (vegetation type XP) achieves 150, but only six species are recorded, of which two are Blue Star, therefore this GHI can safely be ignored as it is not reliable at these low species-sampling levels.

The locations of the map codes (Vegetation floristic Type code + Sample code; see Table Att1.3-1) are presented in Figure Att1.3-1. Symbols are also colour-coded with floristic type codes and sized in proportion to GHI (larger symbols have higher bioquality: a higher percentage of globally rare species). Note that several plots overlap.

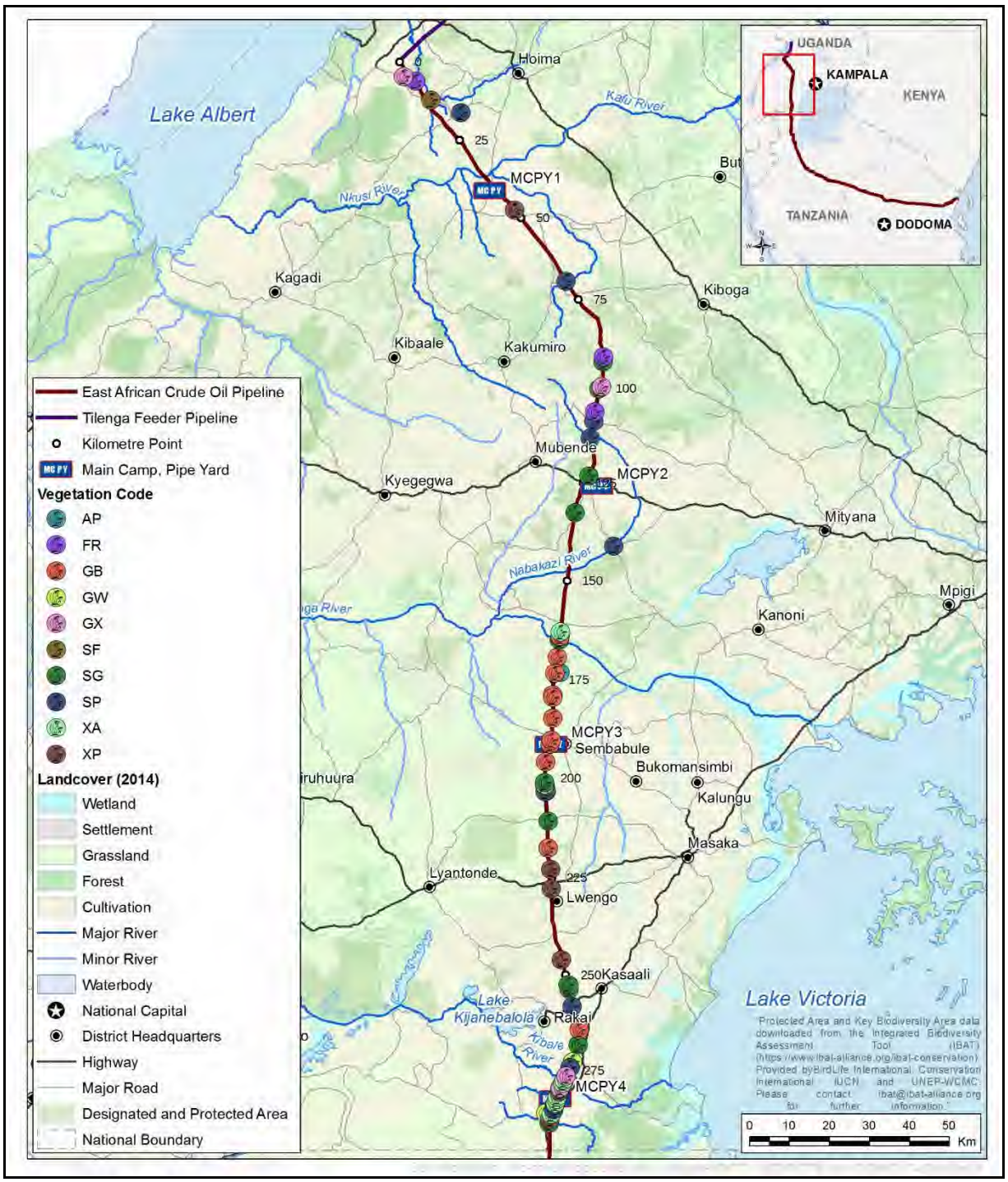

Figure Att1.3-1 Locations of the Main Habitats and Vegetation Types Identified by the RBS

ATTACHMENT A1.4 GLOBALLY RARE, NATIONAL RED LIST SPECIES, BLACK STAR AND GOLD STAR VASCULAR PLANTS WITHIN THE AOI AND BROADER REGION

Species	IUCN Status	Restricted Range/ Endemic (Star) Status	Ugandan Red List Status	Area of Endemism (see Figure Att1.4-1)	Habitats of Occurrence in the AOI	Vegetation Type (VT) of Occurrence in the AOI	GHI of VT[1]	KP	Approx. Distance from Pipe Centre-Line (m)
Nymphaea nouchali	NA	-	CR	-	Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGMK07 *Acacia* woodland, wooded grassland and bushland Generally rather low lying	15	287.1	1458.0
Leplaea cedrata	VU	-	EN	-	Guineo-Congolian semi-evergreen forest	UGWB01 Semi-evergreen forest	44	6.7	666.7
Chrysophyllum perpulchrum	NA	-	VU	-	Guineo-Congolian semi-evergreen forest	UGWB01 Semi-evergreen forest	44	6.7	666.7
Chrysophyllum albidum	NA	-	VU	-	Guineo-Congolian semi-evergreen forest	UGWB01 Semi-evergreen forest	44	6.7	666.7

[1] Key: Green = low bioquality vegetation type, orange = moderate bioquality, red = high bioquality of conservation importance

Species	IUCN Status	Restricted Range/ Endemic (Star) Status	Ugandan Red List Status	Area of Endemism (see Figure Att1.4-1)	Habitats of Occurrence in the AOI	Vegetation Type (VT) of Occurrence in the AOI	GHI of VT[1]	KP	Approx. Distance from Pipe Centre-Line (m)
Citropsis articulata	NA	-	VU	-	Guineo-Congolian semi-evergreen forest	UGWB01 Semi-evergreen forest	44	6.7	666.7
Mondia whitei	NA	-	VU	-	Swamp forest	UGMU04 Swamp or riverine forest, with *Phoenix reclinata* and *Pseudospondias microcarpa* Also supporting *Leptonychia mildbraedii*	46	106.0	4.6
					Wetland	UGMU05 Swampy grassland, occasional woody species	57	100.1	363.1
					Wetland	UGMU02 Papyrus swamp (*Cyperus papyrus)*	39	112.6	6.4
Leptonychia mildbraedii	NA	Black star	-	15 sites in Uganda	Swamp and riparian forest	UGSW09 Swamp or riverine forest, with *Phoenix reclinata* and *Pseudospondias microcarpa*	71	12.3	967.4
Rytigynia beniensis (likely misidentification)	NA	Black star	-	U2, U4, DRC and Rwanda	Swamp	UGMK12 Swampy grassland, occasional woody species	110	201.1	3.4

Species	IUCN Status	Restricted Range/ Endemic (Star) Status	Ugandan Red List Status	Area of Endemism (see Figure Att1.4-1)	Habitats of Occurrence in the AOI	Vegetation Type (VT) of Occurrence in the AOI	GHI of VT[1]	KP	Approx. Distance from Pipe Centre-Line (m)
Blepharispermum pubescens	LC	Gold star	-	Not endemic U 1–4; K 5, 6; T 1 Also recorded in native to Uganda, Kenya, Tanzania, Democratic Republic of Congo and Rwanda	Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGMU06 Secondary *Acacia* woodland, bushland or thicket with exotics	51	99.5	176.6
					Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGRA15 Secondary *Acacia* woodland, bushland or thicket with exotics	33	276.5	21.9
					Swamp	UGMU01 Swampy grassland, occasional woody species	57	122.7	26.3
					Swamp	UGMU05 Swampy grassland, occasional woody species	57	100.1	363.1
					Swamp	UGGM02 Swampy grassland, occasional woody species	43	164.9	91.0
					Swamp	UGMK12 Swampy grassland, occasional woody species	110	201.1	3.4

Species	IUCN Status	Restricted Range/ Endemic (Star) Status	Ugandan Red List Status	Area of Endemism (see Figure Att1.4-1)	Habitats of Occurrence in the AOI	Vegetation Type (VT) of Occurrence in the AOI	GHI of VT[1]	KP	Approx. Distance from Pipe Centre-Line (m)
					Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGMK11 Very disturbed *Acacia* woodland, wooded grassland and bushland. Generally rather low lying Lacking trees, or tree layer replaced by cultivated species	50	201.5	69.9
					Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGMK13 *Acacia* woodland, wooded grassland and bushland. Generally rather low lying	52	217.5	0.9
					Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGMK15 *Acacia* woodland, wooded grassland and bushland. Generally rather low lying	46	191.2	0.1
					Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGMK18 *Acacia* woodland, wooded grassland and bushland. Generally rather low lying	55	178.8	119.2

Species	IUCN Status	Restricted Range/ Endemic (Star) Status	Ugandan Red List Status	Area of Endemism (see Figure Att1.4-1)	Habitats of Occurrence in the AOI	Vegetation Type (VT) of Occurrence in the AOI	GHI of VT[1]	KP	Approx. Distance from Pipe Centre-Line (m)
Leucas calostachys	LC	Gold star	-	East Africa (Uganda, Kenya, Tanzania, DRC, Rwanda, Burundi, Sudan and Ethiopia)	Swamp	UGMU05 Swampy grassland, occasional woody species	57	1001.1	363.1
					Swamp	UGMU07 Swampy grassland, occasional woody species	39	93.1	13.6
					Secondary *Acacia* sp. woodland, bushland and wooded grassland	UGMU06 Secondary *Acacia* woodland, bushland or thicket with exotics	51	99.5	176.6

NOTES: CR – Critically Endangered; VU – Vulnerable; EN – Endangered; NA – Not Applicable; LC – Least Concern

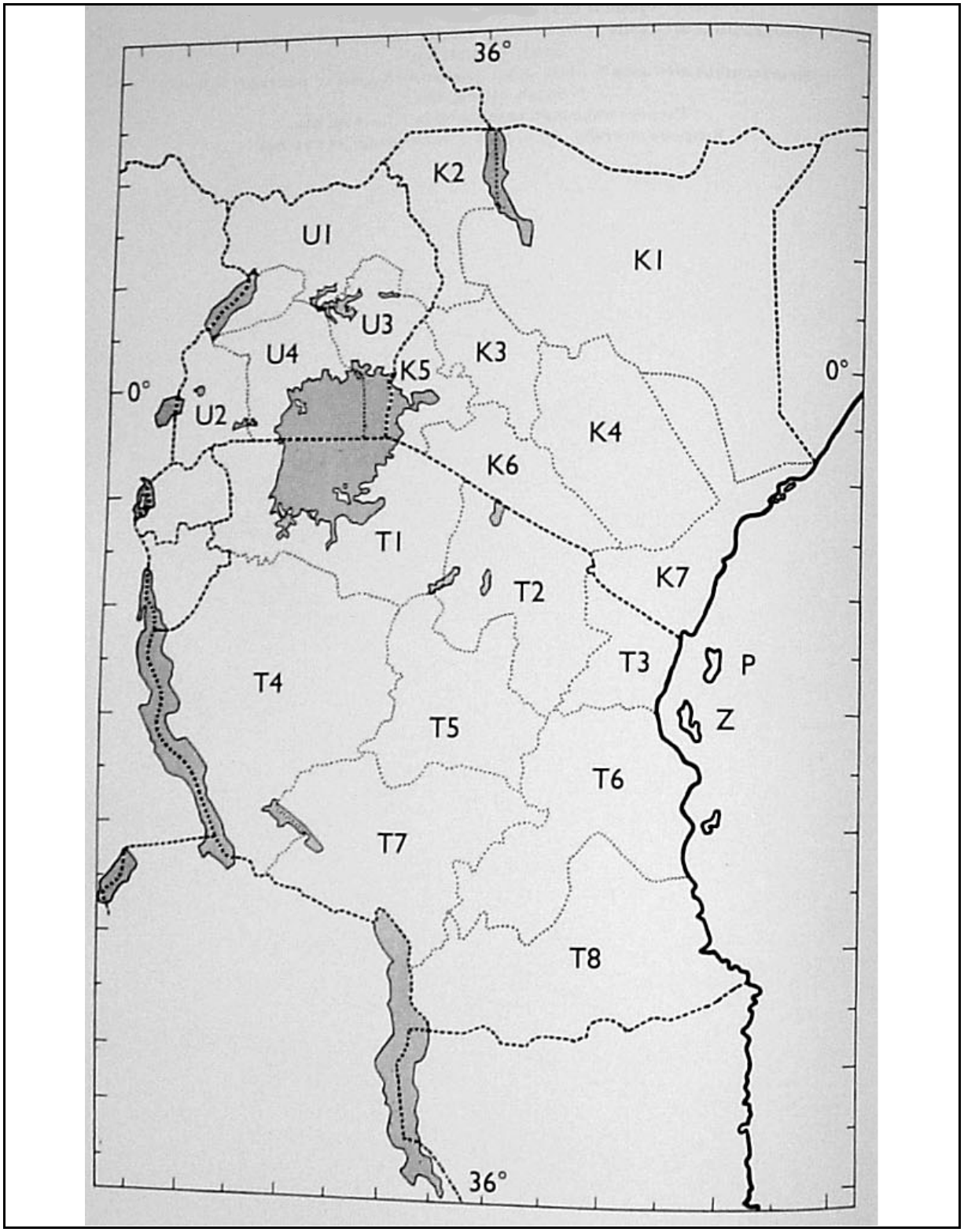

Figure Att1.4-1 Flora of Tropical East Africa Zones, Developed by The Royal Botanic Gardens, Kew, and Used to Describe Species Distributions Through Uganda, Tanzania and Kenya (Royal Botanic Gardens, Kew 2016)

ATTACHMENT A1.5 FLORA PROTECTED UNDER UGANDAN LAW

Several trees species are protected in Ugandan law under the Forest and Tree Planting Act 2003 (amended 2016). Tree species listed on Schedule 8 of the Forest and Tree Planting Act 2003 (amended 2016) are protected from felling without a licence. These species are often over-exploited and the law is intended to curtail this. However, the law does not specifically relate to rare trees, so they are not considered as sensitive receptors, unless they are nationally rare, globally rare or endemic and restricted range (Black Star) species.

The Schedule 8 species found in the RBS sample plots are listed below along with their star rating and the plots in which they were recorded.

***Albizia coriaria* Welw. ex Oliv.** [*Fabaceae*] GN Star: **AP:** UGMK20 **GB:** UGGM01 UGGM03 UGMK08 UGMK13 UGMK15 UGMK16 UGMK18 UGMK19 UGRA18 **GW:** UGMK07 UGMK11 **GX:** UGMK10 UGMS01 UGMU06 UGRA10 UGRA15 **SF:** UGMU08 **SG:** UGGM02 UGMK06 UGMK12 UGMU01 UGMU05 UGMU07 UGMU11 **XA:** UGGM04 **XP:** UGMU10

***Albizia grandibracteata* Taub.** [*Fabaceae*] BU Star: **GX:** UGMS01 **SG:** UGMU01 UGMU07 **XP:** UGMU10

***Albizia gummifera* (J.F. Gmel.) C.A. Sm.** [*Fabaceae*] GN Star: **SP:** UGRA20

***Albizia schimperiana* Oliv.** [*Fabaceae*] GN Star: **GX:** UGRA15

***Albizia* sp.** [*Fabaceae*] : **GW:** UGRA16 **GX:** UGRA15 **SF:** UGSW09

***Albizia zygia* (DC.) J. F. Macbr.** [*Fabaceae*] GN Star: **FR:** UGWB01

***Canarium schweinfurthii* Engl.** [*Burseraceae*] GN Star Habit=T: **SF:** UGMU08 **SG:** UGMU07

***Ficus asperifolia* Miq.** [*Moraceae*] GN Star Habit=S: **SF:** UGMU04 UGMU08 **SG:** UGMU01 UGMU05 UGMU07

***Ficus elastica* Roxb.** [*Moraceae*] GX Star: **GX:** UGMU06

***Ficus exasperata* Vahl** [*Moraceae*] GN Star: **FR:** UGWB01 **SG:** UGMU05

***Ficus mucuso* Welw. ex Ficalho** [*Moraceae*] GN Star: **SP:** UGRA20

***Ficus natalensis* Hochst.** [*Moraceae*] GN Star: **GW:** UGRA06 **XA:** UGRA05 UGRA11 UGRA12 UGRA13 UGRA14

***Ficus* sp.** [*Moraceae*]: **FR:** UGWB01 **GB:** UGGM03 UGMK08 UGMK16 **GW:** UGMK07 UGMK11 UGRA16 **GX:** UGMU06 UGRA15 **SF:** UGMU04 UGSW09 **SG:** UGMK12 UGMU01 UGMU05 UGMU07 **SP:** UGRA20 UGRA21 **XA:** UGRA07 **XP:** UGMU10 UGRA01 UGRA03

***Ficus vallis-choudae* Delile** [*Moraceae*] GN Star: **SF:** UGMU04 UGSW09

***Ficus variifolia* Warb.** [*Moraceae*] GN Star: **GX:** UGRA15

***Maesopsis eminii* Engl.** [*Rhamnaceae*] GN Star: **SG:** UGMU07 **SP:** UGRA20 **XA:** UGRA05 UGRA11 UGRA12 UGRA13 **XP:** UGRA03

***Mangifera indica* L.** [*Anacardiaceae*] GX Star Habit=T: **GB:** UGMK16 **GW:** UGMK07 UGMK11 UGRA06 **GX:** UGMK10 UGRA15 **SP:** UGRA20 **XA:** UGRA05 UGRA07 UGRA11 UGRA12 UGRA13 UGRA14 **XP:** UGMU10 UGRA03

***Newtonia buchananii* (Baker f.) G.C.C. Gilbert & Boutique** [*Fabaceae*] GN Star: **SF:** UGSW09

***Piptadeniastrum africanum* (Hook. f.) Brenan** [*Fabaceae*] GN Star: **FR:** UGWB01

Appendix A2: Aquatic Biodiversity Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

A	
anadromous	fish that are born in freshwater then migrate to the ocean as juveniles where they grow into adults before migrating back into freshwater to spawn
AOI	area of influence
aquatic	freshwater habitats or species only, in the context of this report
C	
cascade	tumbling, white water, e.g., waterfall, typical over bedrock or boulders
CPUE	Catch per unit effort
G	
glide	flowing water with an unbroken or undisturbed surface
I	
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
K	
KBA	key biodiversity area, a site that contributes to the global persistence of biodiversity; identified using 11 criteria across five categories
KP	Kilometre point
M	
marginal vegetation	predominantly or fully aquatic vegetation growing in the marginal areas of a river (i.e., in the water along the edge of the river under typical flow conditions)
migratory [fish]	fish that undertake longitudinal movements within rivers or between lakes and rivers or the sea and rivers usually for spawning (reproduction) purposes (see also anadromous and potamodromous)
macrophyte	aquatic plant that is easily visible with the naked eye
mid-stream bar	raised area of the substrate forming a mound or hump running along the middle of the channel, the upper parts of which may or may not be exposed above the water surface
O	
online pond	pond directly connected to a river
P	
pool	still water area, i.e., no discernible flow, usually with a water depth greater than that of the main channel
potamodromous	fish that undertake migrations (usually for spawning) entirely in freshwater
R	
riparian vegetation	predominantly terrestrial vegetation growing on the banks of a river but not in the river (except perhaps during times of flood)

run	flowing water with a broken surface but no wavelets, white water or sound
riffle	fast-flowing water with some sound, a broken surface and small standing waves, but no white water
rapid	fast-flowing water with a loud sound, standing waves and white water
S	
side bar	raised area of the substrate forming a mound or hump running along the edge of the channel, which may or may not be connected to the bank or exposed above the water surface
sp and spp.	abbreviation of species, singular and plural
U	
IUCN	International Union for Conservation of Nature
V	
VEC	valued environmental (and social) component

A2 AQUATIC BIODIVERSITY BASELINE REPORT

A2.1 Introduction

This baseline report describes the surface water:

- area of influence (AOI) and study boundaries
- methods
- baseline conditions
  - trends in condition and sensitivity to change
  - ecosystem services provided
- key considerations.

A2.2 Area of Influence and Study Area Boundaries

A2.2.1 Area of Influence

The spatial area of influence (AOI) for the aquatic biodiversity surveys encompasses 250 m upstream and 750 m downstream of the proposed pipeline crossing location for the following watercourses:

- Kafu River
- Nabakazi River (two crossings)
- Katonga River
- Kibale River.

Direct impacts on these watercourses occur only during the construction phase. The temporal AOI will be the duration of pipeline-crossing construction and the time required for the watercourse to recover to pre-construction condition.

The habitat maps provided in Attachment A2.1 illustrate the AOI boundaries.

A2.2.2 Study Area Boundary

The secondary data review study area extended beyond the AOI, including the upstream and downstream catchment areas of the watercourses crossed by the pipeline, to provide regional context to the data acquired during the field survey.

The field study area was the same as the AOI.

The five river crossings represent all the main watercourses identified on satellite imagery and crossed by AOI. The proposed survey sites were discussed with in-country aquatic ecologists familiar with the region to confirm that no other major watercourses required consideration.

A2.3 Methods

A2.3.1 Secondary Data

The desktop study for aquatic biodiversity baseline data included a review of the following secondary data sources, the:

- FishBase[1]
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Red List)
- National Policy for the Conservation and Management of Wetlands
- environmental and social impact assessments (ESIA) and other technical studies relevant to the same drainage basins
- scientific and grey literature referenced throughout.

The desktop study focused on identifying aquatic habitats, fish and macroinvertebrate species known or considered likely to occur in the AOI. The secondary data were used to define the baseline survey methodology and, in combination with satellite imagery, also used to identify potential sampling locations.

A2.3.2 Field Surveys

The field survey was undertaken during June 2017.

The June survey was conducted during the period between the wet and dry seasons because high water levels in watercourses during the wet season would make them unsafe to survey and obscure many habitat features. The dry season was avoided because many fish species move out of the main river channels to avoid risks associated with low water levels such as isolation, increased predation risk and poor water quality.

The five locations (Figure A2.3-1) were selected for:

- river habitat mapping
- multi-method fish surveys
- kick-sweep sampling for macroinvertebrates.

Descriptions of the field methods are provided in Attachment A2.2.

[1] FishBase is an online global database of fishes

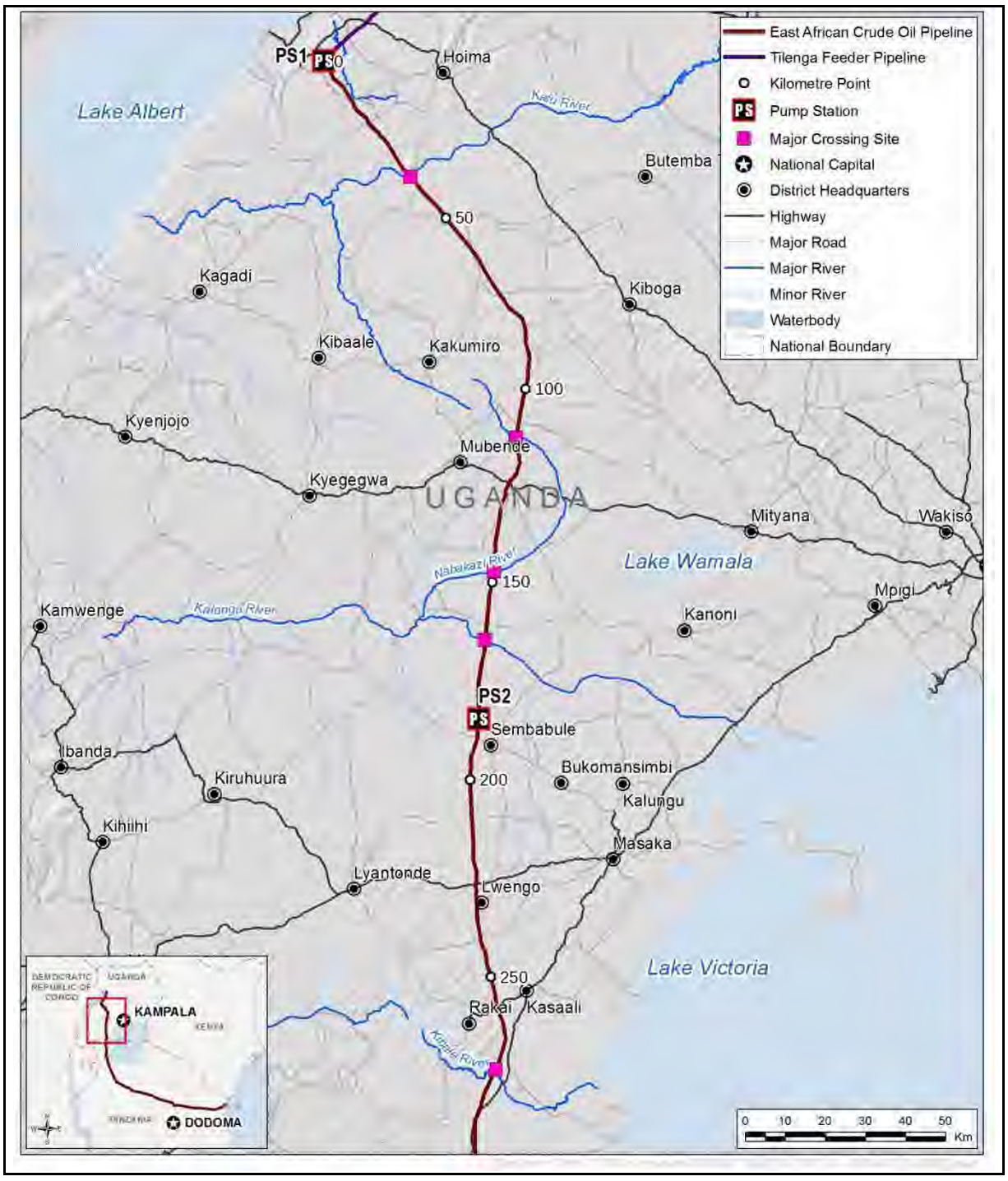

Figure A2.3-1 Aquatic Biodiversity Survey Locations

A2.3.3 Data Analysis

Fish species composition was identified using the descriptions provided in Greenwood (1996) and the relative abundance was calculated. Preserved macroinvertebrate samples were sorted for laboratory identification using various keys and guides (Penmak 1953, Mandahl-Barth 1954, Merrit and Cummins 1997, De Moor et al. 2003a and 2003b, and Cumberlidge 2011). The majority of organisms were identified to genus level, though some only identified to family level.

Information on endemism and conservation status was obtained from the IUCN and Ugandan National Red Lists.

A2.3.3.1 Sensitivity Ranking

The sensitivity of the aquatic biodiversity receptors has been ranked according to the aquatic biodiversity section of the sensitivity table in Section 8.

A2.3.4 Data Considerations

Although surveys were undertaken in all the rivers, it should be noted that access was constrained in some cases. This limited the ability of the surveyors to undertake more comprehensive surveys, although some data collection was still possible and the data provide some information on the aquatic habitat and communities at the respective sites.

The ecology of the rivers in the AOI has been poorly studied and, as such, there is a relative lack of information on specific habitats and species. This applies to all the watercourses and associated wetlands surveyed in this study. It is likely that, as more studies are undertaken throughout Uganda, more species will be identified and knowledge of the status and habitat requirements of species will improve.

Field survey data only provides a snapshot in time and is unlikely to represent the full diversity of species supported at a site. Baseline assessments therefore include secondary data and data gathered during field surveys. In case of doubt regarding the presence of a species, a precautionary approach was taken in accordance with the International Finance Corporation (IFC) Performance Standard 6 (PS6) and the accompanying Guidance Note.

A2.4 Baseline Conditions

A2.4.1 Aquatic Habitats of Conservation Importance

The following sections of this report provide:

- an overview of the aquatic habitats in AOI based on secondary data
- a description of the aquatic habitat at the surveyed sites.

Attachment A2.1 provides habitat maps illustrating the locations and extents of key habitat features within the area surveyed at each location.

A2.4.2 Overview

There are several areas of biodiversity importance associated with the broader region (but outside the project AOI), including:

- the Queen Elizabeth National Park and the Lake George catchment freshwater key biodiversity area (fKBA) is ecologically linked to the Katonga River, which is crossed by the project AOI
- Lake Victoria is ecologically linked to the Kibale River, which is crossed by the project AOI.

All wetlands that are legally protected under the Ugandan National Policy for the Conservation and Management of Wetlands.

Rivers are generally important features owing to the ecosystem services they provide (e.g., drinking water, crop irrigation and fishing).

A2.4.2.1 Kafu River

Baseline Condition

The Kafu River survey site is close to kilometre point (KP) 37 of the pipeline right-of-way (RoW). It is in the middle of a large, dense papyrus wetland. Habitat mapping, and fish and macroinvertebrate surveys were undertaken from the road that passes through the wetland.

The habitat predominantly comprises a large wetland covered almost entirely by papyrus with no obvious main river channel. There are small channels and areas of open water (Figure A2.4-1) between papyrus stands, and local inhabitants advised that these have been created by local fishermen.

Figure A2.4-1 Kafu River with a Small Open Channel Between Dense Stands of Papyrus

Although there is no obvious main river channel, there is notable flow from a perched culvert that runs under the road (Figure A2.4-2).

Figure A2.4-2 Perched Road Culvert on the Kafu River

The culvert's elevation and relatively high flow velocity would make it difficult for most fish species to pass upstream, but they could easily pass downstream through the culvert. During periods when water levels are high enough to reach the culvert, it may be possible for species to pass in both directions depending on the water velocities through the culvert and the individual fish species or life stages' swimming capabilities. Notwithstanding this, the road and associated culvert represent a significant obstacle to the movement of fish at this location.

There are also small areas of open water interspersed with wetland plants other than papyrus (Figure A2.4-3). These areas are predominantly found along the road margins. These areas may provide refuge and foraging areas for some species and life stages of fish as well as various macroinvertebrates. They may also provide hunting opportunities for fish-eating birds and other fauna.

Figure A2.4-3 Wetland Vegetation on the Kafu River

Except for the road passing through the centre of the papyrus wetland and the small channels cut through the wetland by fishermen, the observed habitat appeared to be in an undisturbed state. Although there is clear flow through the wetland, the river channel was indistinct from the rest of the papyrus wetland.

Trend in Condition and Sensitivity to Change

Papyrus wetlands are under increasing anthropogenic pressure with large areas being cleared for agriculture or the harvesting of papyrus. Clearing of wetland vegetation can increase evaporation rates, shrinking the wetland area. This site is currently subject to low levels of clearing, but this is likely to increase with increasing land use pressures and the overall condition of the site, from an ecological perspective, is considered to be declining. While papyrus will regenerate readily, increasing pressure on this system will affect the flora and fauna.

Wetlands can be very sensitive to change. This site is considered sensitive to any activities that might cause a temporary or permanent reduction in the papyrus stands or increase in the amount of open water.

A2.4.2.2 Nabakazi River – Crossing 1

Baseline Condition

A large papyrus wetland area surrounds the Nabakazi River near KP114. No safe access routes to the pipeline crossing point could be identified and consequently, no surveys were undertaken at this location in the first round of surveys. Access was gained during a second round of surveys in June 2018. Water depths within the accessible areas of the main channel at the survey site are more than 2 m. The channel substrate comprises clay predominantly, overlain with sand in patches and some accumulations of organic debris towards the edges of the small area of open water. Ditches approximately 1 m wide and 1.5 m deep have been dug along the

sides of the access road providing potential habitat for fish and access for local fishermen.

Figure A2.4-4 shows the papyrus wetland extending from the edge of the banana plants visible in the foreground.

Figure A2.4-4 Nabakazi River Papyrus Wetlands

Observations made from the road suggest that the papyrus wetlands are in an undisturbed condition, with only the outer edges having been cleared for farming of sweet potato and maize crops (Figure A2.4-5). Evidence of an unidentified herbaceous creeper was found at the survey site (Figure A2.4-6).

Figure A2.4-5 Nabakazi River Wetland Cleared to Enable Farming

Figure A2.4-6 Nabakazi River, June 2018

Although fish and macroinvertebrate surveys could not be undertaken at this location, papyrus wetlands are known to act as a nursery for several fish species (Mnaya and Wolanski 2002) and to support abundant and diverse macroinvertebrate communities.

Trend in Condition and Sensitivity to Change

As described above, papyrus wetlands are under increasing pressure with large areas being cleared for agriculture or harvesting of papyrus. This particular location currently supports undisturbed papyrus wetland, but there is evidence of agricultural encroachment; this trend is anticipated to continue as a result of increasing demand for agricultural land.

Wetlands are typically very sensitive to change, particularly activities that reduce the extent of papyrus or otherwise increase the amount of open water, which increases evaporation and can result in the wetland drying.

A2.4.3 Nabakazi River – Crossing 2

Baseline Condition

A large papyrus wetland area surrounds the Nabakazi River near KP148. No safe access routes to the pipeline crossing point could be identified and consequently, no surveys were undertaken at this location in the first round of field surveys.

Figure A2.4-6 shows an open water area and the border of the reed bed that prevented access to the Nabakazi River. The river is approximately 1 km beyond the wetland seen in Figure A2.4-7.

Figure A2.4-7 Wetland Surrounding the Nabakazi River at KP148

Observations made from the road suggest that the papyrus wetlands are in an undisturbed condition.

An old railway line splits a narrow strip of wetland from the main papyrus wetlands and is well supplied with water through culverts to the south of the Nabakazi River. This strip of wetland has a diverse flora dominated by sedges or *Typha* sp. Papyrus mats are the dominant vegetation cover comprising the bulk of the main wetland. Among the papyrus are several sedge-dominated vegetation mats fringed by *Vossia* species (Figure A2.4-8). Anthropogenic disturbance, mostly trampling and erosion of the banks at watering points for large herds of cattle, was observed. Sampling took place at this watering point, using basket traps, hand nets and gillnets.

Figure A2.4-8 Wetland Surrounding the Nabakazi River at KP148

Trend in Condition and Sensitivity to Change

As described above, papyrus wetlands are under increasing pressure with large areas being cleared for agriculture or harvesting of papyrus. This particular location currently supports undisturbed papyrus wetland.

Wetlands are typically very sensitive to change, particularly activities that reduce the extent of papyrus or otherwise increase the amount of open water, which increases evaporation and can result in the wetland drying.

A2.4.3.1 Katonga River

Baseline Condition

The pipeline RoW crosses the Katonga River close to KP165. The survey team was not able to identify suitable access routes for a vehicle within approximately 10 km of the proposed survey site despite discussions with local inhabitants. Most of the land was used for livestock grazing and the landowner was not available to request permission for access.

During a second round of surveys in June 2018, the survey team accessed the main river channel. Water depths to 2.6 m were recorded, but floating mats of

vegetation blocked access to most of the channel. The banks of the channel support *Vassia* sp*,* papyrus and dwarf sedges. Approximately 2-m-wide and 1.5-m-deep ditches have been dug on either side of the road. While offering potentially good habitat for fish, they were in places packed with thorny branches and rocks from road construction making surveying difficult. Evidence of hippopotamus was recorded close to the survey site.

Figure A2.4-9 Katonga River Main Channel, Blocked by Floating Mats of Vegetation

Schraml and Tichy (2010) describe the watercourse as 'an eastward flowing river resembling a swamp, to a large extent choked by papyrus and other vegetation, with no direct visible current' and noted that the sympatric occurrence of air-breathing fish species such as *Ctenopoma muriei* may indicate low dissolved oxygen concentrations in the water.

Trend in Condition and Sensitivity to Change

Rivers are sensitive to change and disturbance. The flora and fauna associated with the Katonga River are likely to be sensitive to factors such as water quality, suspended sediment and changes in flow.

A2.4.3.2 Kibale River

Baseline Condition

The Kibale River survey site is close to KP274 on the pipeline RoW.

The left[2] bank has steeply sloping farmland with banana and plantain plantations, with cleared scrub on the level ground at the base of the slope closer to the river channel. This level area between the base of the slope and the river channel appeared to have been cleared relatively recently and was almost certainly papyrus wetland before clearance (Figure A2.4-10). Remnants of the papyrus beds could still be found in a thin strip only a few metres wide along much of the left bank (Figure A2.4-10).

Figure A2.4-10 Kibale River, Narrow Strip of Papyrus Along the River Bank and Adjacent Farm

The right bank is mostly papyrus wetland with occasional areas of scrub and, towards the upstream limit of the survey section, steeper slopes covered in denser scrub and trees (Figure A2.4-11).

[2] It is standard practice for aquatic surveys to describe the river banks as being either the left or right of the channel, as observed when facing downstream.

Figure A2.4-11 Kibale River - Looking Upstream

The river is mostly glide flow, and has a silt substrate and densely vegetated marginal and riparian zones (Figure A2.4-12).

Figure A2.4-12 Kibale River near KP274

Several sections of the river have shallow, marginal slack water areas with aquatic vegetation (Figure A2.4-13). Such habitat can be important refuge areas for juvenile and small fish species.

Figure A2.4-13 Marginal Slack Water Areas Along the Kibale River

Flow and substrate diversity throughout the channel is poor. However, the riparian and marginal vegetation, and papyrus wetland on the right of the channel provide habitat diversity. Macrophytes provide spawning and refuge habitat for a variety of fish and macroinvertebrate species. Predatory fish species may also use the vegetation for camouflage to ambush prey.

The land on the left of the river channel has been cleared for farming. The land on the right bank appears to be undisturbed. The river channel shows no obvious signs of disturbance, although the turbidity levels are high. Overall, the river habitat is in a very near to natural state at this location.

A reasonably good range of different fish and macroinvertebrate species were caught at this location (Section A2.4.4.6). This indicates that the river and its associated fauna are in relatively good condition.

Trend in Condition and Sensitivity to Change

This section of the Kibale River appears to be in relatively good condition, although there was evidence of human activity along the left bank. Clearing the papyrus beds

surrounding the channel for farmland removes the buffering effect provided by riparian vegetation. Continuing this practice will almost certainly increase pressure on the river and its associated flora and fauna.

Rivers are generally very sensitive to change. Changes to land adjacent to the river or the river channel are likely to result, as a minimum, in localised impacts on associated flora and fauna.

A2.4.4 Aquatic Fauna Species of Conservation Importance

A2.4.4.1 Overview

The following sections of this report describe aquatic fauna biodiversity based on secondary data and data from the fish and macroinvertebrate surveys.

Species of conservation importance are defined as those that are listed as vulnerable, endangered or critically endangered on the IUCN Red List; those that are migratory or congregatory; and those that are range-restricted or endemic. Keystone species are also considered to be of conservation importance.

IUCN threat categories are defined as follows:

- critically endangered – when the best available evidence indicates that a species is facing an extremely high risk of extinction in the wild. Critically endangered species are considered to have a very high sensitivity to change.
- endangered – when the best available evidence indicates that a species is facing a very high risk of extinction in the wild. Endangered species are considered to have a very high sensitivity to change.
- vulnerable – when the best available evidence indicates that a species is facing a high risk of extinction in the wild. Vulnerable species are considered to have a high sensitivity to change.
- near threatened – when a species has been evaluated against the criteria and does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. Near threatened species are considered to have a low sensitivity to change.
- least concern – when a species has been evaluated against the criteria and does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant taxa are included in this category. Least concern species are considered to have a low sensitivity to change.

Listing in the not-evaluated and data-deficient categories indicates that no assessment of extinction risk has been made, though for different reasons. Until an assessment is made, taxa listed in these categories should not be treated as if they were nonthreatened (IUCN 2012).

At the time of writing, the FishBase (2018) and IUCN (2018) websites identified 72 fish species occurring in Ugandan freshwater habitats listed by the IUCN as vulnerable, endangered or critically endangered. Many of these species are also considered endemic or at least range restricted (i.e., only found in the Lake Victoria or Victoria–Nile basins). All these species could be present in the AOI.

Further information provided on the Earth's Endangered Creatures website (http://earthsendangered.com) shows 18 *Haplochromis* species and a further four endangered species:

- *Schilbe mystus*
- *Lates macrophthalmus*
- *Barbus huloti*
- *Barbus alluandi*.

Rivers and wetlands associated with the Victoria Nile and Lake Victoria systems are thus hotspots for endemic and threatened fish species.

Freshwater macroinvertebrates, like the fish species in the AOI, have been poorly studied. Notwithstanding this, 44 threatened dragonfly species are listed in the National Red List for Uganda (WCS 2016). Of these species, only one (*Pseudagrion bicoerulans*) is listed as vulnerable on the IUCN Red List and this species has only been recorded from montane streams greater than 2000 m above sea level and therefore would not be expected to be found in the AOI. All other species are listed globally as not evaluated, data deficient, least concern or near threatened, but are considered to be threatened (critically endangered, endangered or vulnerable) at a national level.

There are also five freshwater crustacean species identified as endangered by Earths Endangered Creatures website (http://earthsendangered.com):

- *Potamonautes mutandensis*
- *Potamonautes ignestii*
- *Potamonautes gonocristatus*
- *Thermodiaptomus galeboides*
- *Tropodiaptomus stuklmanni*.

A2.4.4.2 Kafu River

Fish

Baseline Condition

Three fish species were caught during the Kafu River fish surveys. Figure A2.4-14 illustrates these species and their relative abundance (percentage of the total catch).

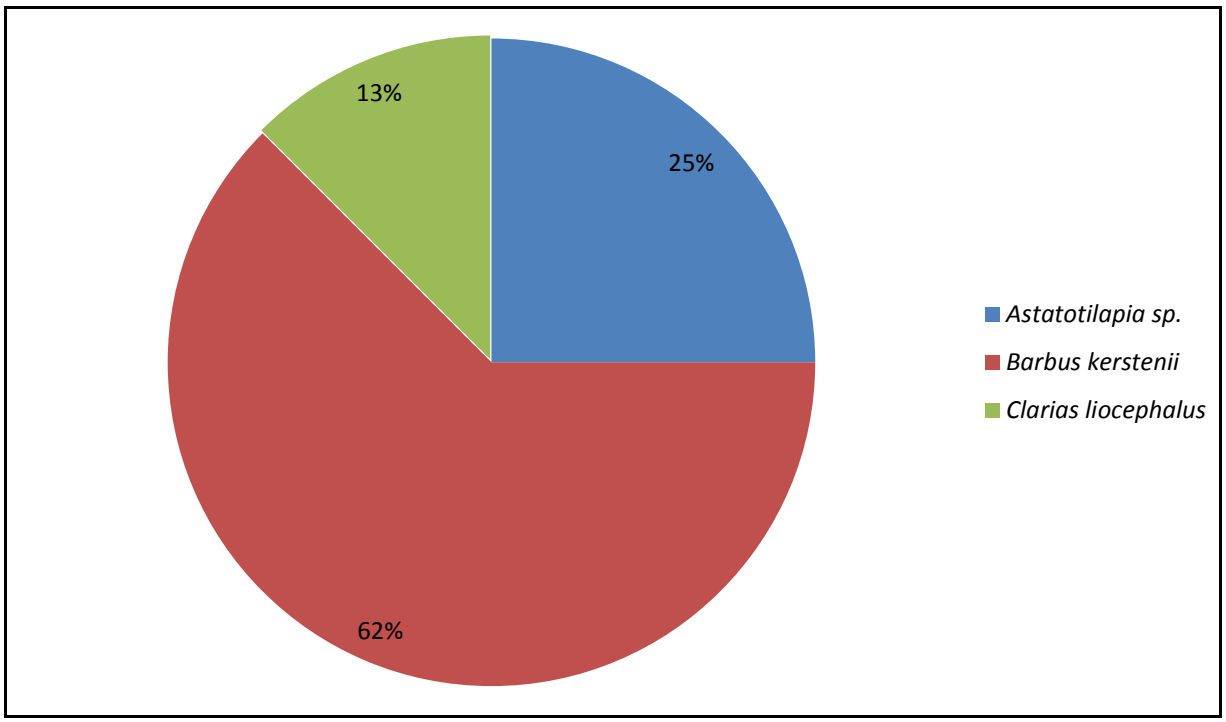

Figure A2.4-14 Kafu River Fish Survey Catch Composition

Most of the catch at this location was *Barbus kerstenii*. This species undertakes freshwater migrations to breed (IUCN 2018). It is likely that other species will occur at this site that were not caught during surveys. Local inhabitants informed the survey team that the following species were also encountered regularly at this location:

- *Protopterus aethiopicus*
- *Schilbe intermedius*
- *Labeo* sp.
- small mormyrid spp.

Trend in Condition and Sensitivity to Change

None of the fish species sampled during the surveys are considered to be critically endangered, endangered or vulnerable (IUCN Red List), although secondary data indicates that fish species of conservation importance are likely to be present. Two of the fish species known or likely to be present in the Kafu River (*Barbus kerstenii* and *Schilbe intermedius*) undertake in-river migrations (i.e., are potamodromous) and are therefore of conservation importance.

The global population of *B. kerstenii* is declining and it is thought this is also true of the East African population (FishBase team RMCA and Geelhand 2016a). The population trend of *S. intermedius* is not currently known although fisheries catches are reported to have declined in many lakes (FishBase team RMCA and Geelhand 2016b).

Taking a precautionary approach, both fish species are considered to have high sensitivity to change.

Macroinvertebrates

Only three macroinvertebrate types were recorded for the Kafu River. Figure A2.4-15 illustrates these species and their relative abundance (percentage of the total catch).

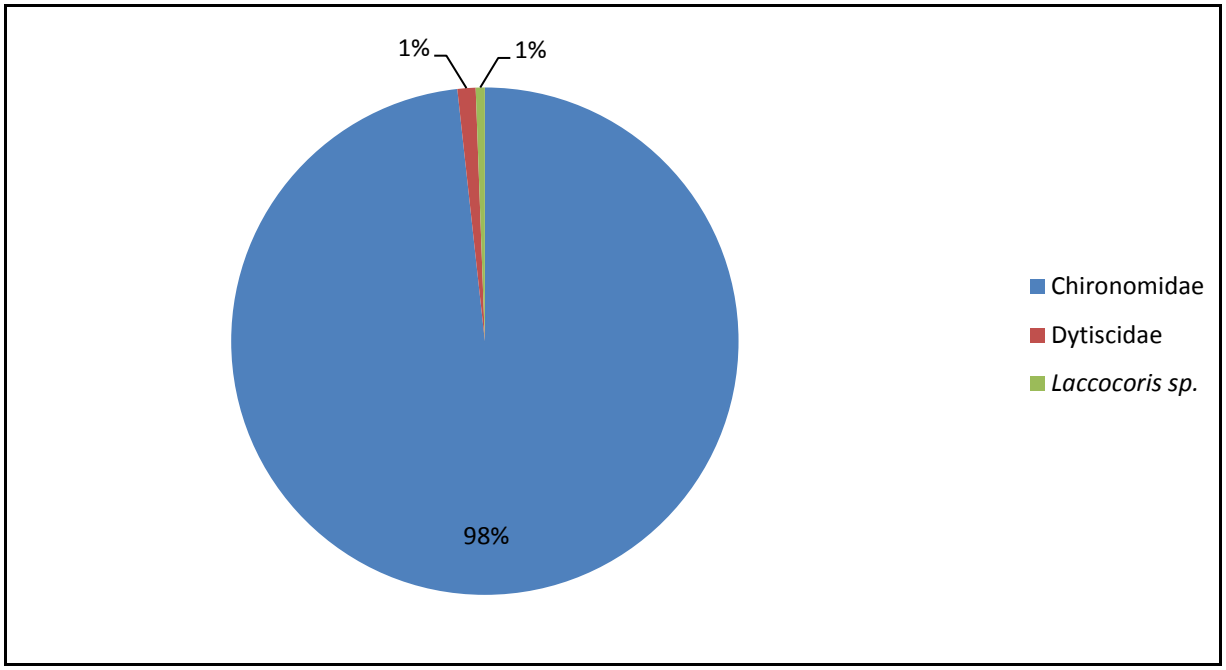

Figure A2.4-15 Kafu River Macroinvertebrate Community Composition

Chironomids (midges or lake flies) dominated the samples with a relative abundance of 98%.

Secondary literature indicates that papyrus wetlands are known to act as nursery areas for several fish species (Mnaya and Wolanski 2002) and to have abundant macroinvertebrate communities. The actual number of fish and macroinvertebrate species can therefore be assumed to be much larger than the sampling results indicate.

A2.4.4.3 Nabakazi River – Crossing 1

Fish

Baseline Condition

Six fish species were caught during the Nabakazi River crossing fish surveys. Figure A2.4-16 illustrates these species and their relative abundance (as a percentage of the total catch). Most of the catch was *Barbus neumayeri* with 11 individuals caught. *Clarius liocephalus, Clarius gariepinus, Protopterus aethiopicus* and unknown species of *Astatotilapia and Aplocheilichts* were also caught. All the species are classed by the IUCN as least concern.

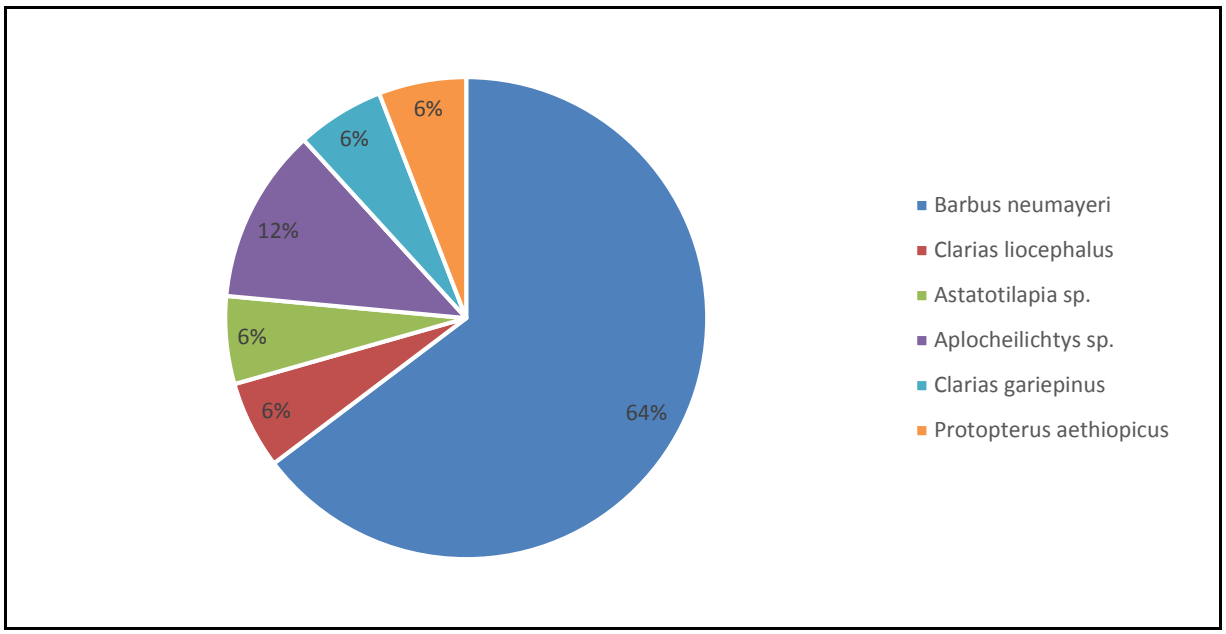

Figure A2.4-16 Nabakazi River Crossing 1 Fish Survey Catch Composition

It is likely that other species will occur at this site that were not caught during the surveys. The district state of environment report for Mubende (NEMA, 2004) suggests the following species also inhabit the river system:

- Oreochromis niloticus – IUCN not assessed
- *Oreochromis zilli* – IUCN not assessed
- Oreochromis leucostictus – IUCN least concern
- *Clarias* species.

Trend in Condition and Sensitivity to Change

None of the fish species sampled during the surveys are considered critically endangered, endangered or vulnerable (IUCN Red List), and therefore are considered to have a low sensitivity to change.

Macroinvertebrates

Eighteen macroinvertebrates species were recorded during the June 2018 surveys. Figure A2.4-17 illustrates these species and their relative abundance (as a percentage of the total catch). Of these, Oligochaetes and then *Biomphalaria sudanica* were the most often recorded.

The macroinvertebrates recorded here were varied indicating a relatively undisturbed habitat that is free from serious degradation. The survey results show that overall the species diversity was relatively high with no significant dominance of any particular species or taxonomic group.

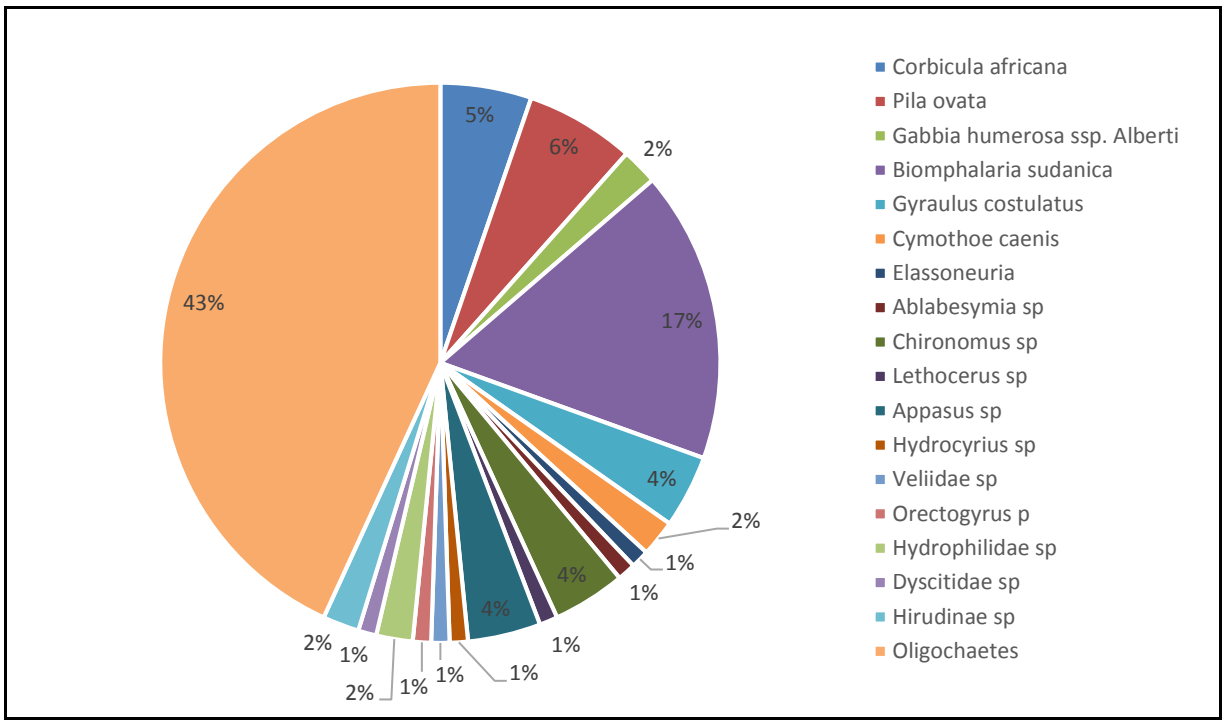

Figure A2.4-17 Nabakazi River Crossing 1 Macroinvertebrate Community Composition

One species of conservation importance was recorded here, *Gabbiella humerosa spp alberti* – IUCN endangered. This species has a disjunct distribution in the Great Lakes of central Africa, but is subdivided into six subspecies according to which lake they are found (Van Damme and Lange 2017). The Lake Albert subspecies *Gabiella humerosa* ssp. *Alberti* is classed as endangered by the IUCN on the basis of being an endemic species to Lake Albert and being found in only five known locations (Kyambadde 2010).

A2.4.4.4 Nabakazi River – Crossing 2

Fish

Baseline Condition

Five fish species were recorded at this river crossing. Figure A2.4-18 illustrates these species and their relative abundance (as a percentage of the total catch). *Ctenopoma muriei* (IUCN least concern) was the most common. The other further four species were:

- *Clarias liocephalus*
- *Aplocheilichyts* sp. – unknown species
- *Clarias gariepinus*
- *Protopterus aethiopicus*.

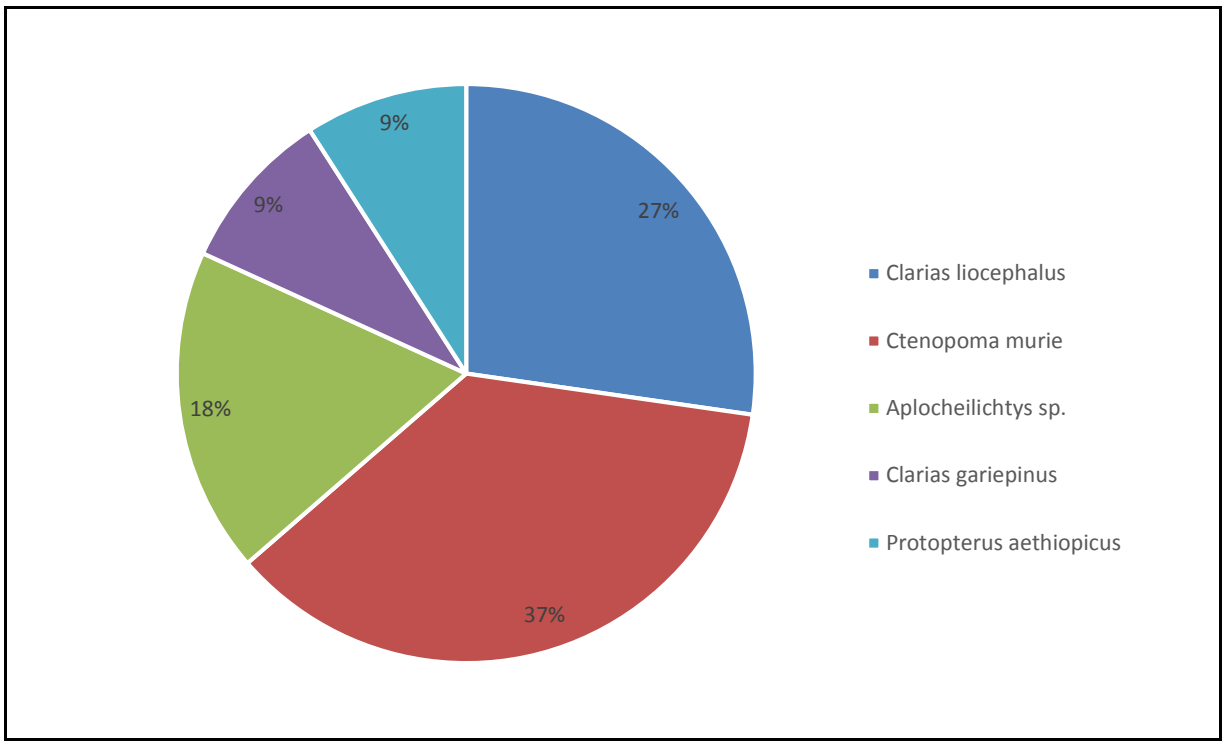

Figure A2.4-18 Nabakazi River Crossing 2 Fish Survey Catch Composition

It is likely that other species occur at this site that were not caught during surveys. The district state of environment report for Mubende (NEMA 2004) suggests the following species also inhabit the river system:

- *Oreochromis niloticus*
- *Oreochromis zilli*
- *Oreochromis leucostictus*
- *Clarias* species.

The IUCN classes all these species as least concern.

Trend in Condition and Sensitivity to Change

None of the fish species sampled during the surveys are considered critically endangered, endangered or vulnerable (IUCN Red List), and therefore are considered to have a low sensitivity to change.

Macroinvertebrates

Fourteen macroinvertebrate species were recorded during the June 2018 surveys. Figure A2.4-19 illustrates these species and their relative abundance (as a percentage of the total catch). Of these, *Biomphalaria sudanica* was the most often recorded, with an unknown species of the genus *Derallus* the second most frequent.

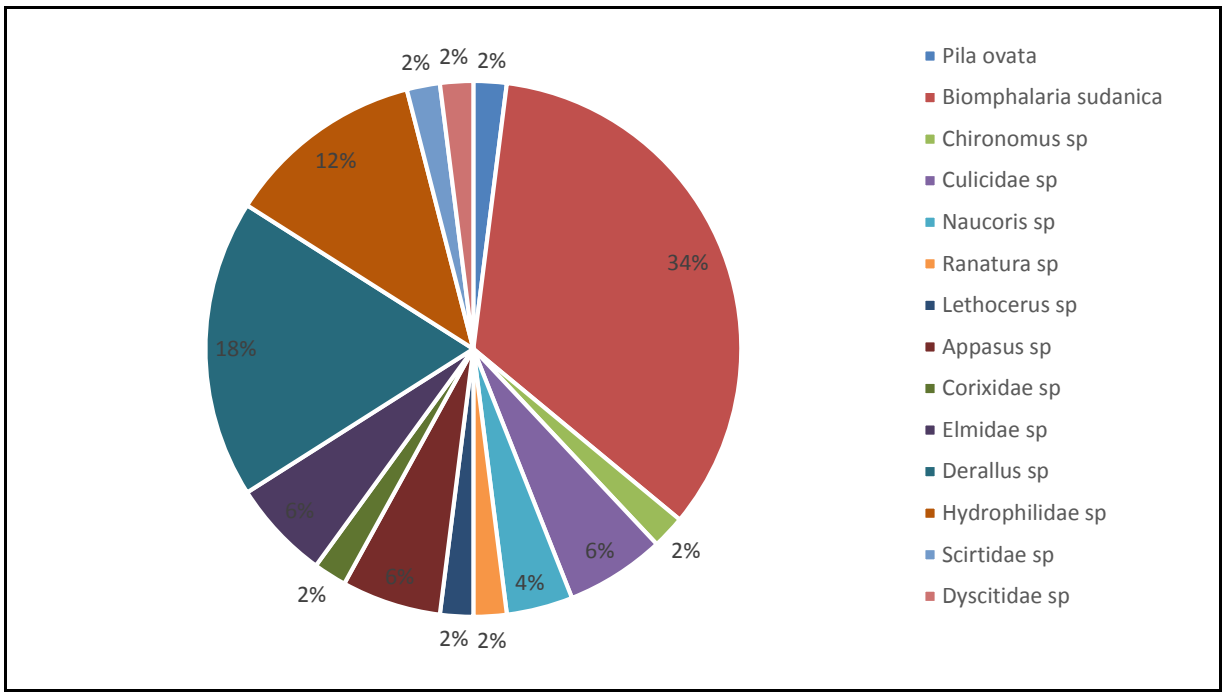

Figure A2.4-19 Nabakazi River Crossing 2 Macroinvertebrate Community Composition

A2.4.4.5 Katonga River

Fish

Baseline Condition

Only four fish species were recorded in the Katonga river during the field surveys. Figure A2.4-20 illustrates these species and their relative abundance (as a percentage of the total catch). These were:

- *Clarias liocephalus*
- *Clarias gariepinus*
- *Protopterus aethiopicus*
- *Ctenopoma muriei*.

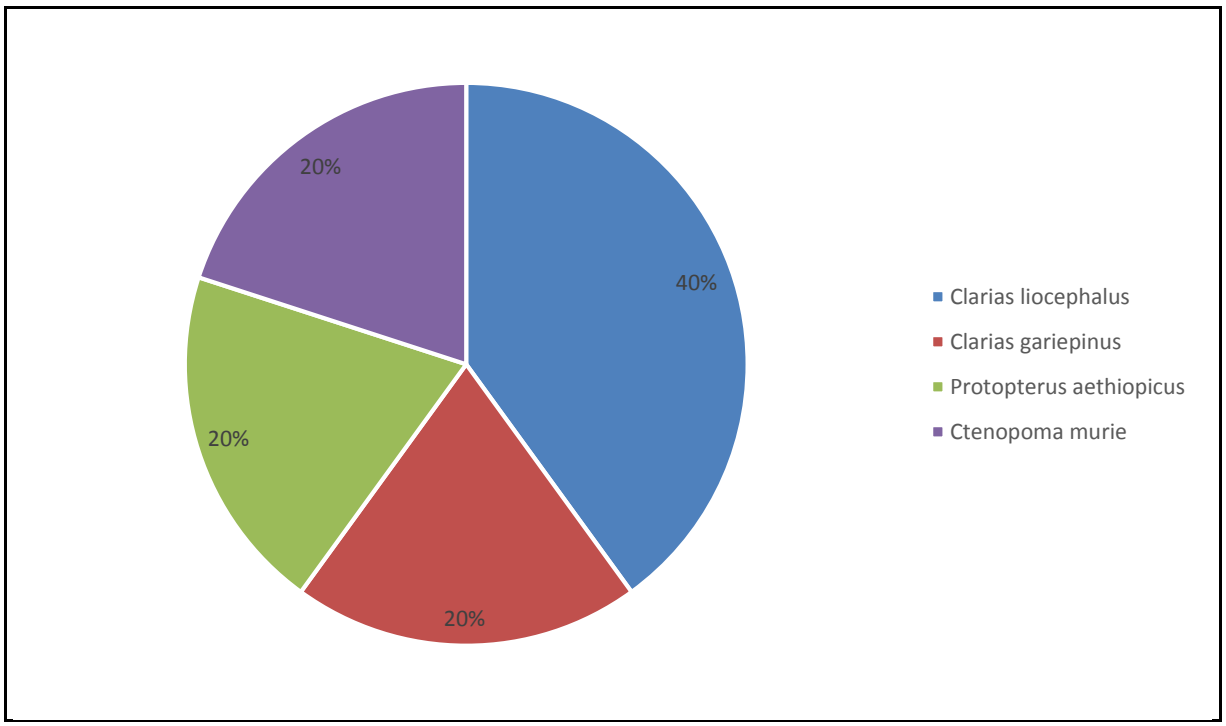

Figure A2.4-20 Katonga River Fish Survey Catch Composition

All species found during the surveys are listed by the IUCN as least concern.

However, the species *Haplochromis katonga* (IUCN data deficient) is only known from the type locality in the Katonga river (FishBase team RMCA and Geelhand 2016). While little is known about this species, it is assumed that it is not a very common species.

Trend in Condition and Sensitivity to Change

Although the species found during the surveys are not of conservation importance, secondary data suggest the presence of endemic species. As such, the site has a high sensitivity to change.

Macroinvertebrates

Three species of macroinvertebrate were recorded during the surveys. Figure A2.4-21 illustrates these species and their relative abundance (as a percentage of the total catch).

These could not be identified to species level but were of the genus *Chironomidae*, *Naucoris* and *Appasus*. None of these species are of conservation importance.

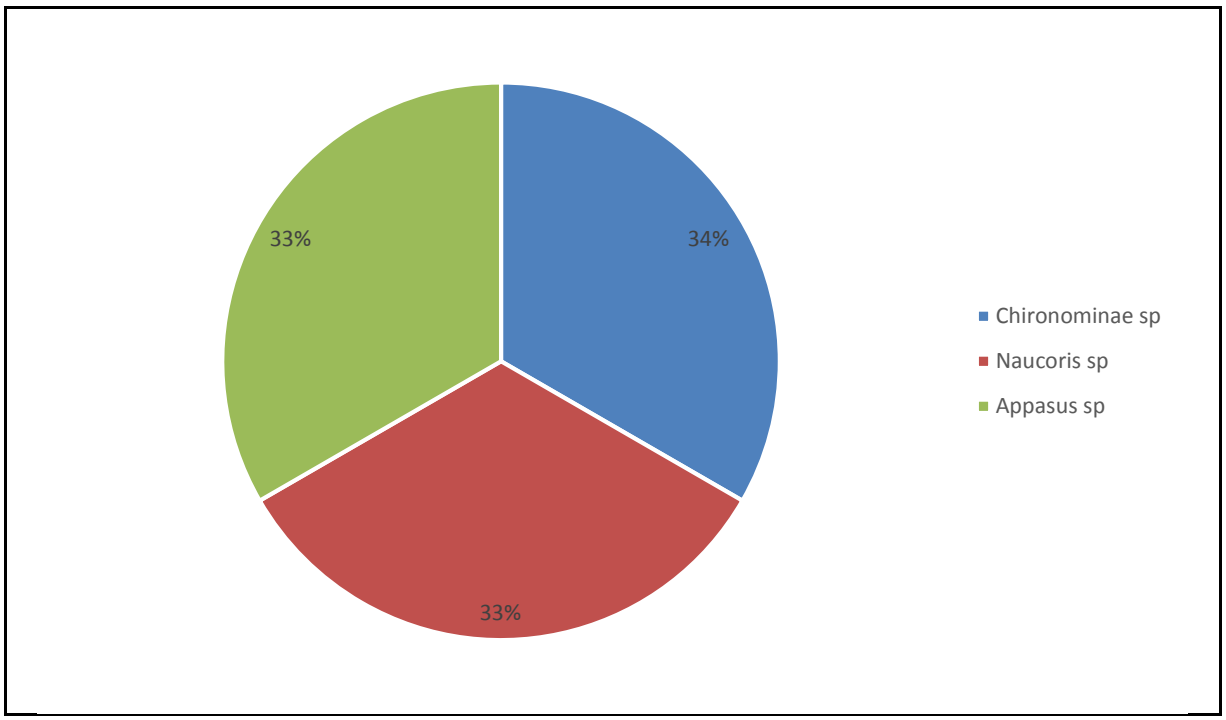

Figure A2.4-21 Katonga River Macroinvertebrate Community Composition

A2.4.4.6 Kibale River

Fish

Baseline Condition

Seven different fish species were caught in the Kibale River. Figure A2.4-22 illustrates these species and their relative abundance (as a percentage of the total catch).

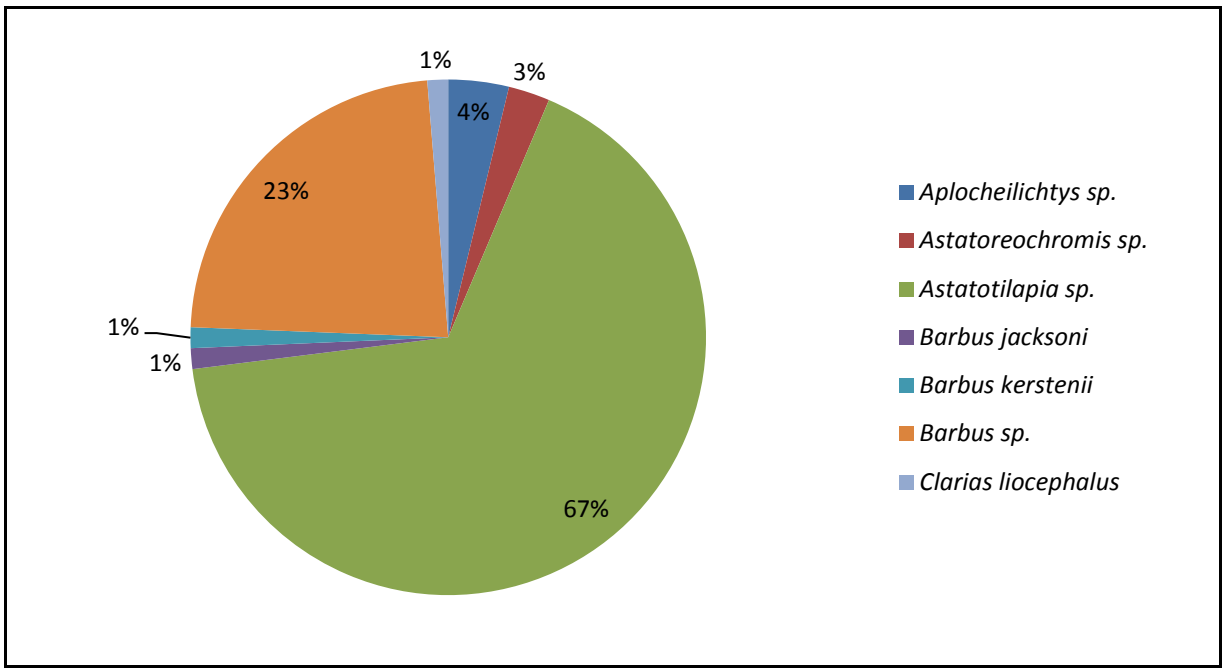

Figure A2.4-22 Kibale River Fish Catch Composition

Most of the catch at the Kibale River was fish from the genus *Astatotilapia* followed by fish from the genus *Barbus*. The other six species were recorded in small numbers or as single specimens.

Local inhabitants informed the surveyors that the following species were caught regularly from this section of the Kibale River:

- *Protopterus aethiopicus*
- *Schilbe intermedius*
- *Labeo* spp.
- small mormyrid species.

Trend in Condition and Sensitivity to Change

None of the fish species sampled during the surveys are considered to be critically endangered, endangered or vulnerable (IUCN Red List), although secondary data indicate that fish species of conservation importance are likely to be present. Two of the fish species known or likely to be present in the Kafu River (*Barbus kerstenii* and *Schilbe intermedius*) undertake in-river migrations (i.e., are potamodromous) and are therefore of conservation importance.

The global population of *B. kerstenii* is declining and it is thought this is also true of the East African population (FishBase team RMCA and Geelhand 2016a). The population trend of *S. intermedius* is not currently known although fisheries catches are reported to have declined in many lakes (FishBase team RMCA and Geelhand 2016b).

Taking a precautionary approach, both fish species are considered to have high sensitivity to change.

Macroinvertebrates

Nine macroinvertebrate types were recorded in the Kibale River. Figure A2.4-23 illustrates these species and their relative abundance (as a percentage of the total catch).

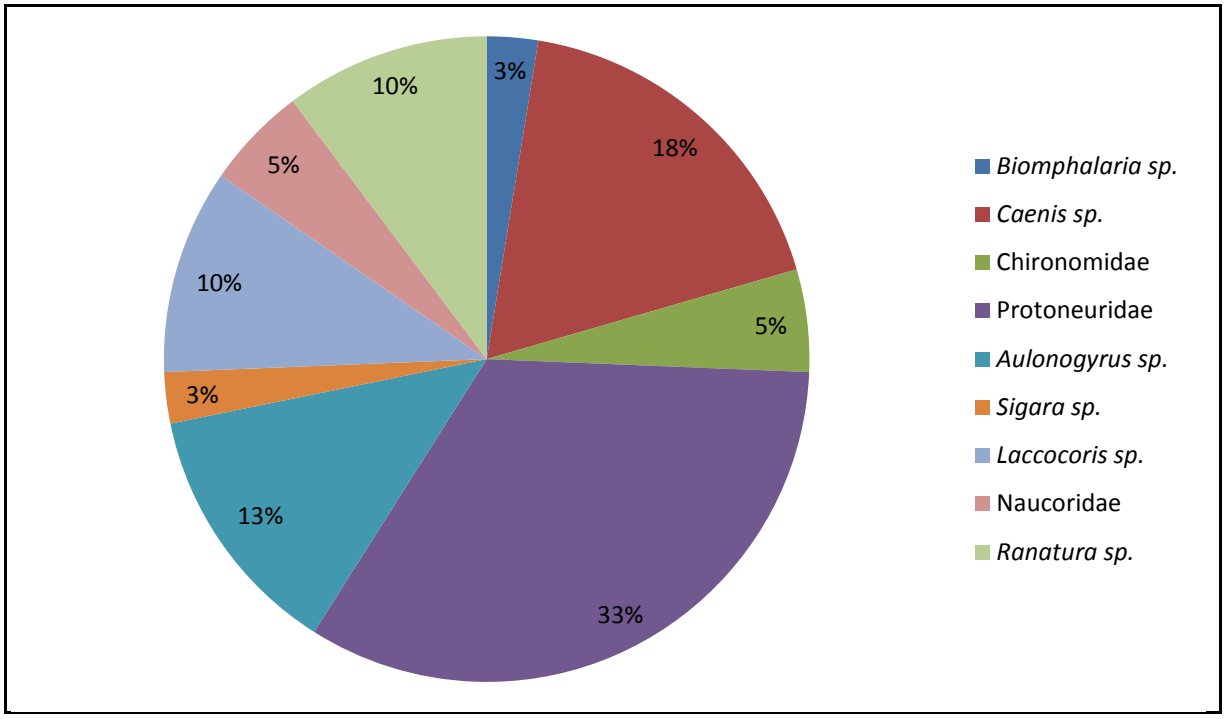

Figure A2.4-23 Kibale River Macroinvertebrate Community Composition

Protoneuridae species (a type of damselfly) were the most abundant macroinvertebrates. However, the survey results show that overall the species diversity was relatively high with no significant dominance of any particular species or taxonomic group.

A2.5 Ecosystem Services Provided

The surface water resources described in this report (the Kafu, Nabakazi, Katonga and Kibale Rivers and associated papyrus wetlands) provide the following ecosystem services:

- fisheries and a source of other wild food, i.e., foraging for food. These provisioning ecosystem services are covered in the freshwater livelihoods section of Appendix A11 Socio-economic and Health Baseline Report.
- water regulation, whereby the river helps to retain and control the flow of water in times of heavy rainfall and during the wet season. The vegetation and shape of the river is an important factor in this role.
- habitat and species support services, whereby the river supports various fauna that either use the water for drinking or cooling in the heat, or as a food source (e.g., birds eating the insects that frequent the river). It also provides important connectivity between habitats, particularly during the wet season.

A2.6 Sensitivity Rankings

Based on the survey, the trend in condition and sensitivity to change, the sensitivity of the VECs has been ranked and is shown in Table A2.6-1.

Table A2.6-1 Aquatic Ecology VECs and Sensitivity Ranking

Aquatic Ecological VEC	Sensitivity Ranking	Rationale for Ranking
Kafu River		
Legally protected, internationally or nationally recognised areas	High (4)	The Ugandan National Policy for the Conservation and Management of Wetlands protects the Kafu River wetlands. This includes elements that protect the river as a biodiversity area and as a resource for local communities.
Flora and fauna species of conservation importance	Very high (4)	Endemic, range-restricted and migratory (potamodromous) species are known or considered likely to be present.
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	The Kafu River and associated wetlands are considered natural habitat[1]. Apart from a road crossing, there were no obvious signs of anthropogenic habitat modifications. The Kafu River provides connectivity, including riparian corridors and wetlands, which create ecological linkages between the Albertine Rift Lakes.
Nabakazi River		
Legally protected, internationally or nationally recognised areas	High (4)	The Ugandan National Policy for the Conservation and Management of Wetlands protects the Nabakazi River wetlands. This includes elements that protect the river as a biodiversity area and as a resource for local communities.
Flora and fauna species of conservation importance	High (4)	Endemic, range-restricted and migratory (potamodromous) species are known or considered likely to be present such as *Gabbiella humerosa* spp *alberti*.

Table A2.6-1 Aquatic Ecology VECs and Sensitivity Ranking

Aquatic Ecological VEC	Sensitivity Ranking	Rationale for Ranking
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	Secondary sources and information from in-country aquatic ecologists indicate that the river and associated wetlands can be classified as natural habitat[1]. The river and associated wetlands are likely to be important breeding and feeding grounds for aquatic fauna. The Nabakazi River provides connectivity, including riparian corridors and wetlands, which create ecological linkages between the Albertine Rift Lakes.
Katonga River		
Legally protected, internationally or nationally recognised areas	Very High (5)	The Katonga River and associated wetlands and tributaries are connected with or flow through numerous nationally protected sites. The river also connects with Lake George to the west, which is a Ramsar wetland and fKBA.
Flora and fauna species of conservation importance	High (4)	Endemic, range-restricted and migratory (potamodromous) species are known to be present, such as *Haplochromis katonga* (IUCN data deficient).
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	Although the river could not be accessed during surveys, reports from in-country surveyors suggest that the river and associated wetlands can be classed as natural habitat[1]. The river and wetlands are also likely to be important breeding and feeding grounds for a range of fauna. The Katonga River provides connectivity, including riparian corridors and wetlands, which create ecological linkages between the Albertine Rift Lakes.

Table A2.6-1 Aquatic Ecology VECs and Sensitivity Ranking

Aquatic Ecological VEC	Sensitivity Ranking	Rationale for Ranking
Kibale River		
Legally protected, internationally or nationally recognised areas	High (4)	The Kibale River and associated wetlands and watercourses are connected with or flow through numerous nationally protected sites. The river also connects with the Nabajjuzi wetland to the east, which is a Ramsar site.
Flora and fauna species of conservation importance	High (4)	Endemic, range-restricted and migratory (potamodromous) species are known to be present.
Aquatic habitat of conservation importance (wetlands and watercourses)	High (4)	There are no obvious signs of anthropogenic disturbance or modification apart from the road crossing, so the site can be classed as natural habitat[1]. The Kibale River provides connectivity, including riparian corridors and wetlands, which create ecological linkages between the Albertine Rift Lakes.

NOTE: [1] As defined by PS6 and the accompanying Guidance Note

A2.7 Key Considerations

Based on the outcomes of the aquatic biodiversity study, and particularly, the known presence of fish and macroinvertebrate species of conservation importance, the following watercourses are identified as sensitive receptors:

- Kafu River
- Nabakazi River
- Katonga River
- Kibale River.

None of the species sampled during the surveys is considered critically endangered, endangered or vulnerable (IUCN Red List), although secondary data indicates that fish, crustacean and macroinvertebrate species of conservation importance are likely to be present in the AOI. Secondary data also indicate the likely presence of endemic and range-restricted species in the AOI.

Two of the fish species sampled (*Barbus kerstenii* and *Schilbe intermedius*) undertake in-river migrations (i.e., are potamodromous) with an additional species' (*Clarias liocephalus*) migratory status unknown (IUCN 2018). Temporary or permanent in-river obstacles could affect such species, particularly if they prevent free movement during their migration periods.

Macroinvertebrate species were identified only to family or genus level and, as such, their IUCN status cannot be assessed. Notwithstanding this, the order Ephemeroptera includes several species that are sensitive to environmental degradation (Wenn 2008). Their presence, though in low numbers, in both sampled watercourses is a potential indicator that these rivers are largely undisturbed. The presence of large intact mats of aquatic or wetland vegetation through which the rivers flow is further evidence that the river habitats are undisturbed.

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ATTACHMENT A2.1 HABITAT MAPS

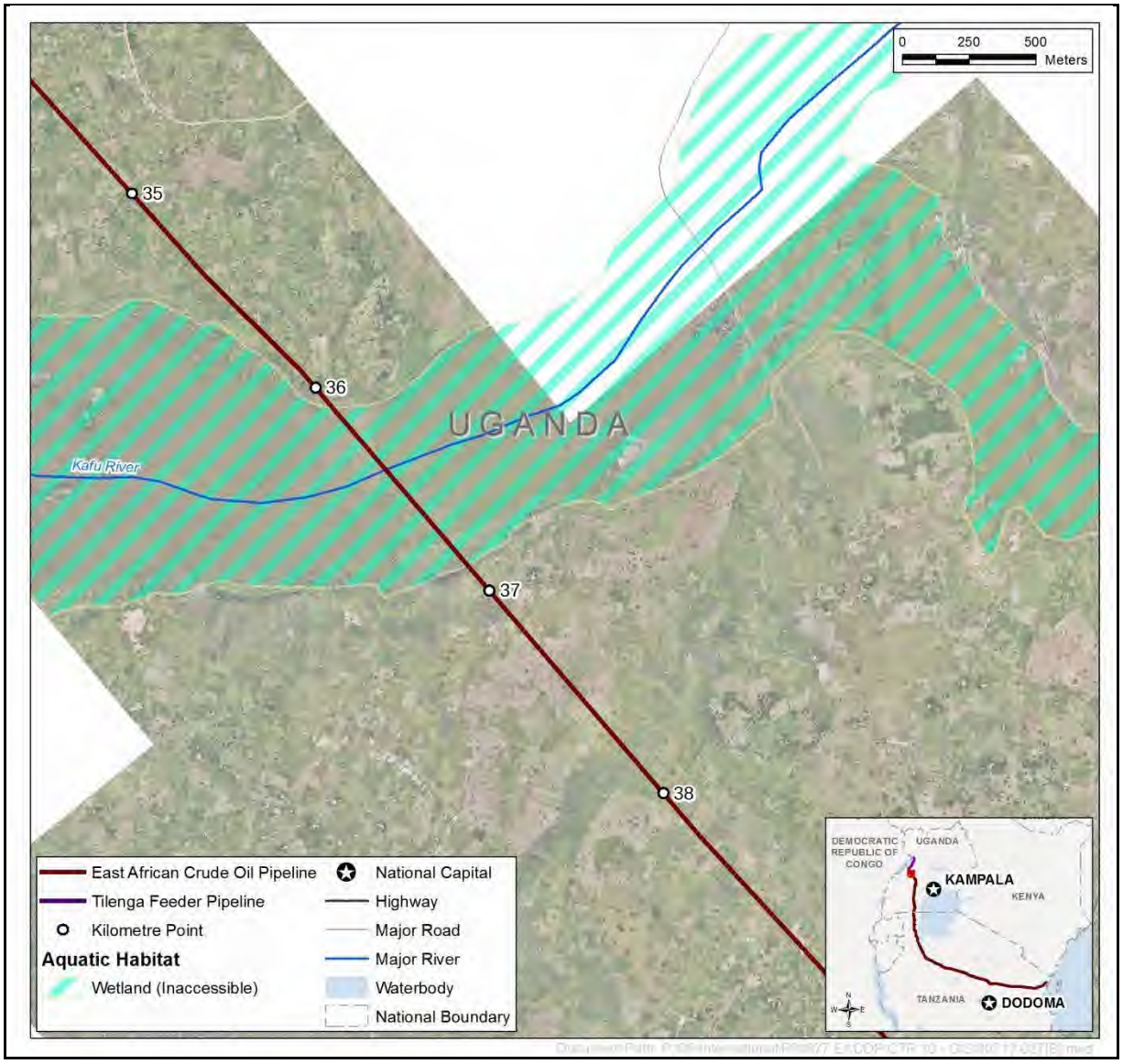

Figure Att2.1-1 Kafu River Habitat

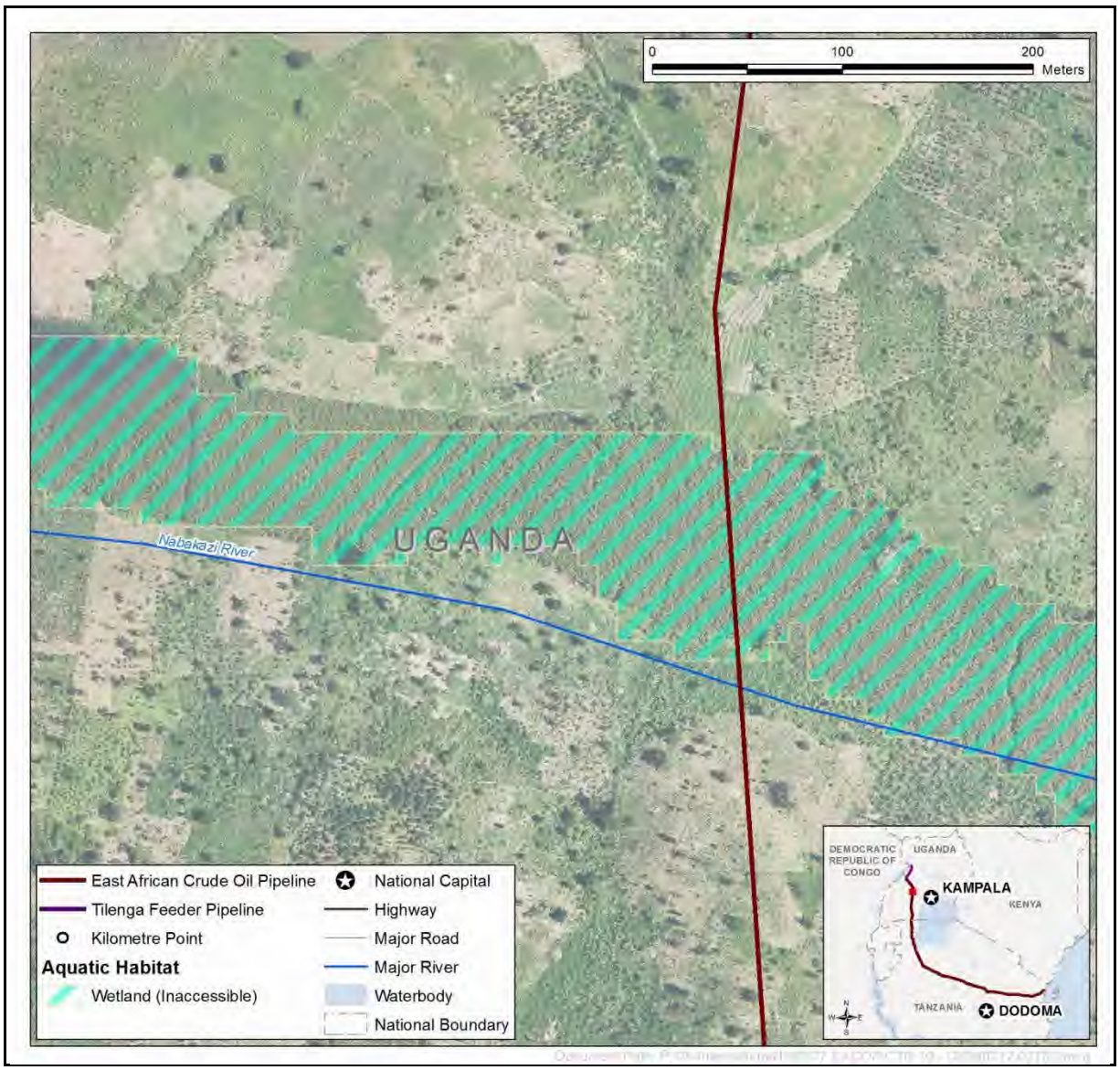

Figure Att2.1-2 Nabakazi River Habitat – Crossing 1

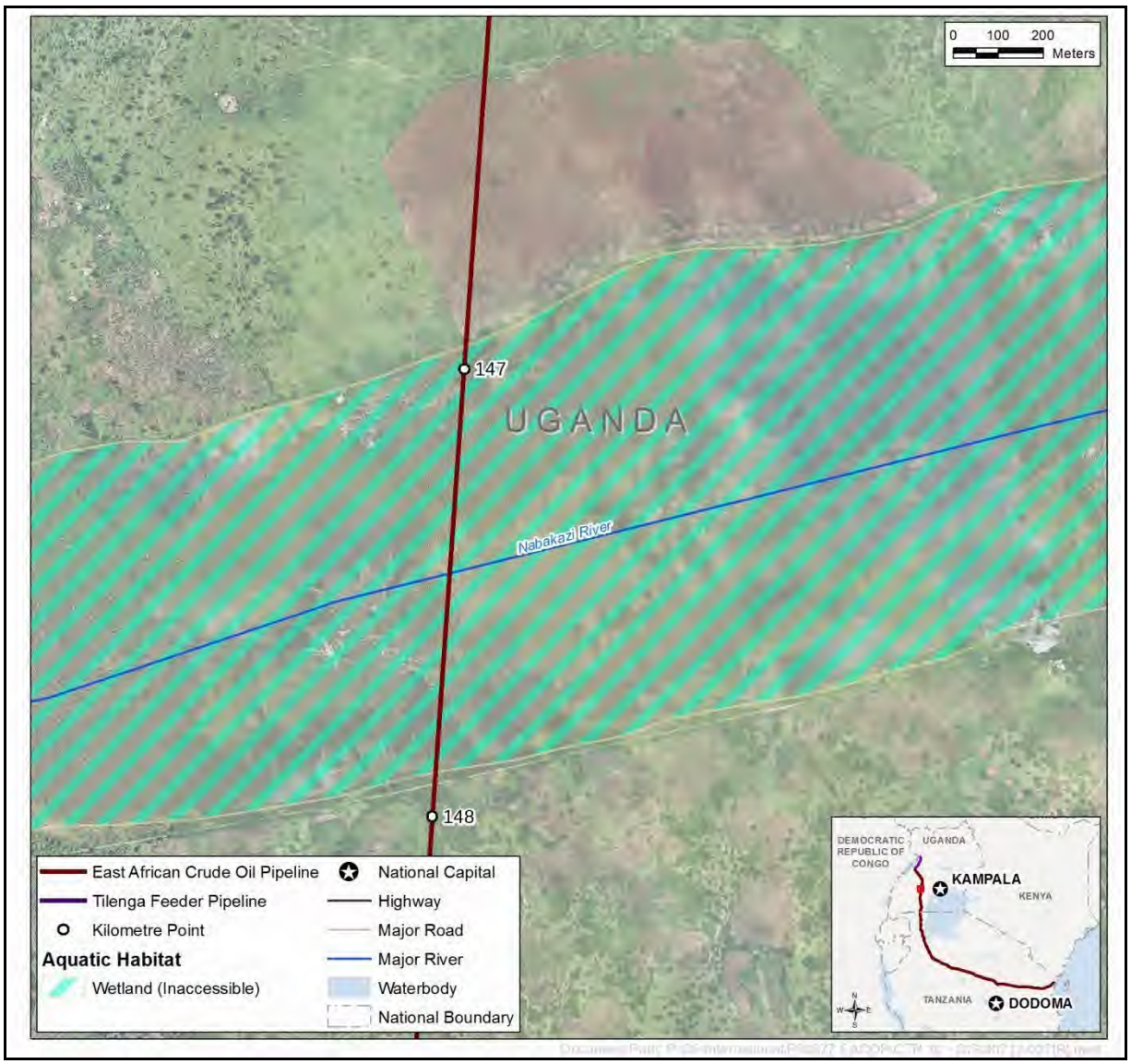

Figure Att2.1-3 Nabakazi River Habitat – Crossing 2

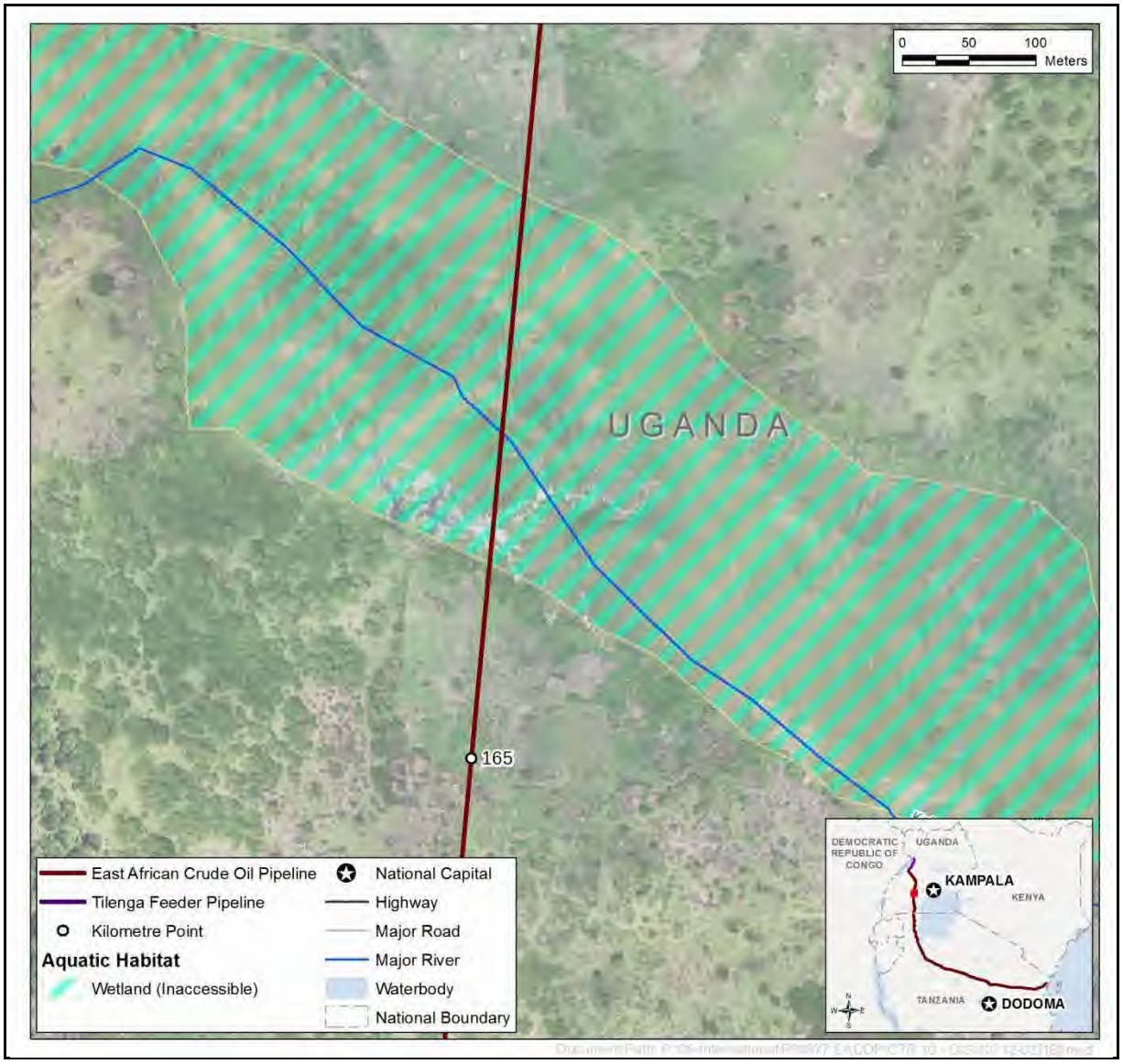

Figure Att2.1-4 Katonga River Habitat

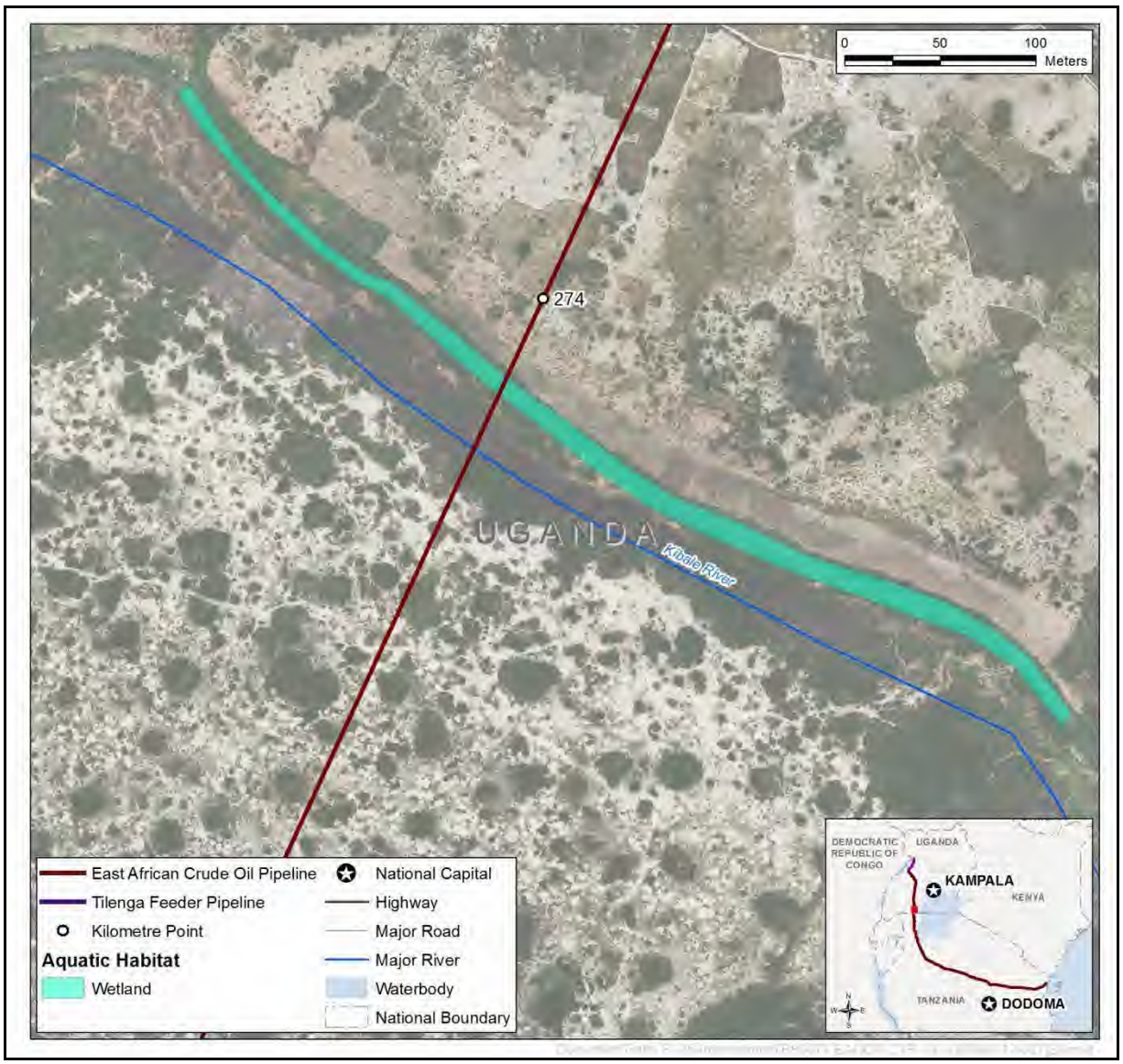

Figure Att2.1-5 Kibale River Habitat

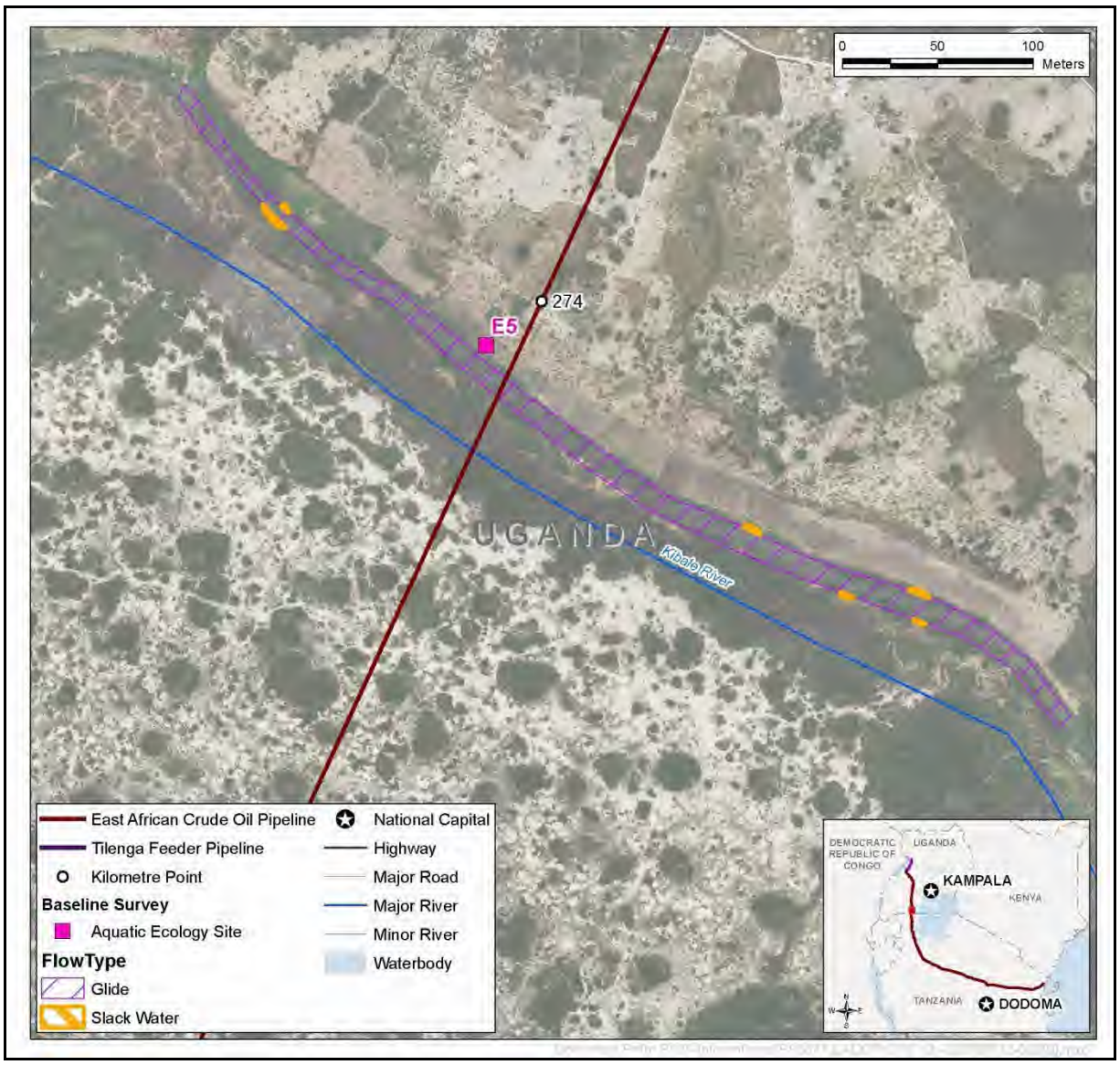

Figure Att2.1-6 Kibale River Flow Type

ATTACHMENT A2.2 DETAILED SURVEY METHODOLOGIES

River Habitat Mapping

Habitat surveys were completed by surveyors walking along the riverbank (where it was physically possible and safe to do so) for approximately 250 m upstream and 750 m downstream of the proposed pipeline crossing location and recording the key habitat features observed including their precise location and extent. The survey methodology has been adapted from that outlined in Hendry and Cragg-Hine (1997) such that it incorporates habitat types for all species of fish. This field mapping technique entails drawing sketch maps (or preferably hand-drawing onto a high resolution (e.g., 1:10,000 scale) map or digitally using a hand-held tablet device and GIS software) illustrating the river outline and other main geographical locaters (e.g., bridges over the river, buildings). Further detail is added to the maps as the surveyor progresses along the river channel or survey route ultimately building up a map mosaic of the dominant or most important habitat features observed. Habitat features recorded during the walkover survey included:

- flow type (e.g., glide, run, riffle, cascade, pool and rapid)
- substrate type (e.g., boulder, cobble, pebble, gravel, sand, silt as defined using the Wentworth scale)
- macrophyte presence and type (e.g., emergent linear, emergent broad-leaf, submerged linear, submerged broad-leaf, floating linear, floating broad-leaf)
- other key features (e.g., side bar, mid-stream bar, man-made dams, weirs, large woody debris, coarse woody debris, spawning area, fry and juvenile fish refuge area)
- evidence of birds nesting in mud banks adjacent to the river.

Field maps were transcribed subsequently into GIS for each survey site. Digital photographs of important habitat features were also obtained during surveys and these, with the maps, will provide a permanent digital record of the habitat at the time of the surveys and against which future changes can be compared (e.g., post-construction recovery).

Fish Surveys

When undertaking fish surveys, a multi-method approach was adopted. This included both active and passive fishing methods. Active fishing methods included electrofishing, hand netting and baited hooks or rod and line. Passive methods included gill nets and small fish and crayfish traps.

Electrofishing

Electrofishing was undertaken using a small portable SUM electrofishing device equipped with a 2-m-long floating copper cathode and a handheld anode with a 47-cm-diameter net-mounted anode on a 2-m handle. The device was battery powered with an output of approximately 1200 V or 12 Amps. Surveys were only undertaken in water with a maximum depth of 1.2 m for health and safety reasons. Surveyors waded in a downstream to upstream direction taking care to survey in all habitat types that were accessible by wading.

Gill Nets

A multi-panel gill net with mesh sizes ranging from 25 mm to 65 mm, a total length of up to 20 m (depending on the individual site characteristics and access) and a maximum depth of 1.5 m. Nets were equipped with a weighted bottom line and a surface line supported by floats attached to it. Nets were set at an angle to the flow and in a location that covered a range of in-channel habitat types. Nets were left in place for between 2 and 4 hours.

Hand Netting

Shallow marginal areas were hand netted from the bank using long- and short-handled hand nets with a mesh size of <1 mm and a net mouth diameter of between 200 mm and 300 mm. Fast sweeps through the habitat were undertaken to attempt to capture any fish present. This method can be useful for sampling slower swimming juvenile fish.

Small Fish and Crayfish Traps

Various types of small fish traps (minnow traps) and crayfish traps were deployed with some containing bait and others unbaited. The traps were deployed predominantly in marginal areas of the river channel.

Baited Fishing Hooks and Line

At selected locations, and where the survey schedule allowed, hooks baited with small pieces of cooked meat or bread were deployed. The hooks were monitored constantly to ensure that any hooked fish were immediately retrieved, unhooked and transferred to water-filled buckets. Constant observation of the baited hooks also ensured that other wildlife (e.g., birds) was not accidentally hooked. Barbless hooks were used because any damage caused by this type of hook is negligible and heals very quickly compared with barbed hooks.

Fish Processing

Any captured fish were transferred immediately to water-filled buckets with the water being refreshed roughly every 15 minutes to ensure that it did not become excessively warm and that dissolved oxygen levels were not excessively depleted.

Upon completion of the surveys, all fish were identified to species by experienced fisheries ecologists and confirmed using descriptions provided in Greenwood (1996). Following processing of the catch, all fishes were returned alive close to their original site of capture.

Macroinvertebrate Surveys

Macroinvertebrates were sampled at multiple locations within each watercourse close to the location of the proposed pipeline crossing. Sampling methods included kick-sweep sampling and crayfish traps or small fish traps (minnow traps).

All samples were washed on the riverbank in 500-µm mesh nets and transferred to sample pots containing 70% ethanol solution. Preserved samples were then returned to the laboratory for subsequent sorting and identification. The majority of organisms were identified to genus level with some only identified to family level. Various keys and identification guides were used including Penmak (1953), Mandahl-Barth (1954), Merrit and Cummins (1997), De Moor et al. (2003a, 2003b) and Cumberlidge (2011).

The field survey methods used at each survey location are detailed in Table Att2.2-1.

Table Att2.2-1 Summary of the Survey Methods at Each Aquatic Biodiversity Survey Site

Survey Site Name or River	District	KP Location	River Habitat Mapping	Fish Surveys					Macroinvertebrate Surveys	Survey Method Rationale
				Electrofishing	Gill Nets	Hand Netting	Small Fish or Crayfish Traps	Baited Fishing Hooks and Line		
Kafu	Hoima/Kakumiro	36.5	Yes	No	No	Yes	Yes	Yes	Yes	Restricted access and deep water prevented the use of gill nets or electrofishing.
Nabakazi 1	Mubende	114	No	No	No	No	No	No	No	Site could not be accessed to survey.
Nabakazi 2	Mubende/Gomba	148	No	No	No	No	No	No	No	Site could not be accessed to survey.
Katonga	Gomba/Semabule	165	No	No	No	No	No	No	No	Site could not be accessed to survey.
Kibale	Rakai/Kyotera	274	Yes	Yes	Yes	Yes	Yes	Yes	Yes	All survey methods were suitable for use at this location.

Appendix A3: Avifauna Biodiversity Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

A	
AOI	area of influence
C	
E	
EACOP	East African Crude Oil Pipeline
ESIA	environmental and social impact assessment
F	
FR	forest reserve
I	
IBA	important bird area, identified by BirdLife International as being of global importance for the conservation of bird populations, using an internationally agreed set of criteria
IUCN	International Union for Conservation of Nature
K	
KP	kilometre point
M	
MCPY	main camp and pipe yard
T	
TSC	timed species count
V	
VEC	valued environmental component

A3 AVIFAUNA BIODIVERSITY BASELINE REPORT

A3.1 Introduction

This baseline report describes the avifauna biodiversity:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions:
  - main avifauna habitat types
  - trends affecting habitat condition and their sensitivity to changes
  - avifauna species
  - ecosystem services provided
  - sensitivity rankings
- key considerations

The report concludes with ranking the sensitivity of the sites and species and a summary of the key considerations arising from the baseline study.

A3.2 Area of Influence and Study Area Boundaries

A3.2.1 Area of Influence Boundary

The area of influence (AOI) for the avifauna study is a 2-km corridor centred on the pipeline alignment, as this encompasses the area that has the potential for direct impacts during construction and operation. This is extended at certain locations where possible pathways exist to sites designated specifically for avifauna (e.g., a watercourse crossing upstream of an important bird area, IBA).

The temporal AOI for avifauna habitats of conservation importance is defined as the duration of the project construction phase extended by the time required for the relevant habitat to recover to its pre-project potential (i.e., the habitat can support the species diversity and abundance, and ecological processes of the habitat in its pre-project condition). In the case of some new access roads that will be left in situ for third-party use once the project is completed, the impacts associated with these will be considered permanent. For AGIs the temporal AOI for avifauna species of conservation importance is the duration of operation of the aboveground installations where these have the potential to cause noise or visual disturbance.

A3.2.2 Study Area Boundary

The desk-based study area comprises a minimum 30 km-corridor centred on the pipeline alignment in order to provide regional context to the data acquired during the field surveys. This 30 km-corridor took into account the mobility and range of bird species, a broader region, which is a study area larger than the AOI to provide regional context. The study area for the field surveys is the same as the AOI (i.e., a

2-km corridor), as it provides data over a sufficient area to assess the potential effects of the project.

A3.3 Methods

A3.3.1 Secondary Data

The desktop study for the avifauna biodiversity baseline included a review of secondary data sources:

- International Union for Conservation of Nature (IUCN) Red List of Threatened Species
- National Red List for Uganda
- citation sheets and management plans for protected areas, where available
- environmental and social impact assessments (ESIAs) and other technical studies relevant to the AOI
- scientific and grey literature[1] referenced throughout.

The desktop study focussed on identifying species that are known, or are considered likely, to occur in the AOI.

Secondary data and satellite imagery were used to identify potential survey locations and refine the baseline survey methodology.

A3.3.2 Field Surveys

The proposed survey sites were agreed with in-country ornithologists familiar with the habitats affected by the project. Surveys were undertaken during May 2017 to coincide with the wet season, and during December 2017 and January 2018 to coincide with the dry season. A walkover survey of the main camp and pipe yard (MCPY) 4 site was undertaken in August 2018. Undertaking surveys during varying seasons enabled a robust dataset to be gathered to inform the impact assessment.

Proposed survey sites were selected following analysis of geographic information system files, which identified the proposed pipeline route, and satellite imagery. Legally protected and internationally and nationally recognised areas (such as IBAs) were identified and targeted for survey with sampling within larger areas.

During field surveys, site selection was honed based on habitat quality as in many cases, habitats identified from satellite imagery have subsequently been converted to agriculture. Similarly, many areas thought to be natural forest have been converted to eucalyptus plantation.

Field survey methods varied according to the habitat type being assessed. Further descriptions of the field methods are provided in Attachment A3.1. All survey locations are illustrated on Figure A3.3-1.

[1] Grey literature refers to literature that is produced on all levels of government, academia, business and industry in print and electronic forms, but which is not controlled by commercial publishers.

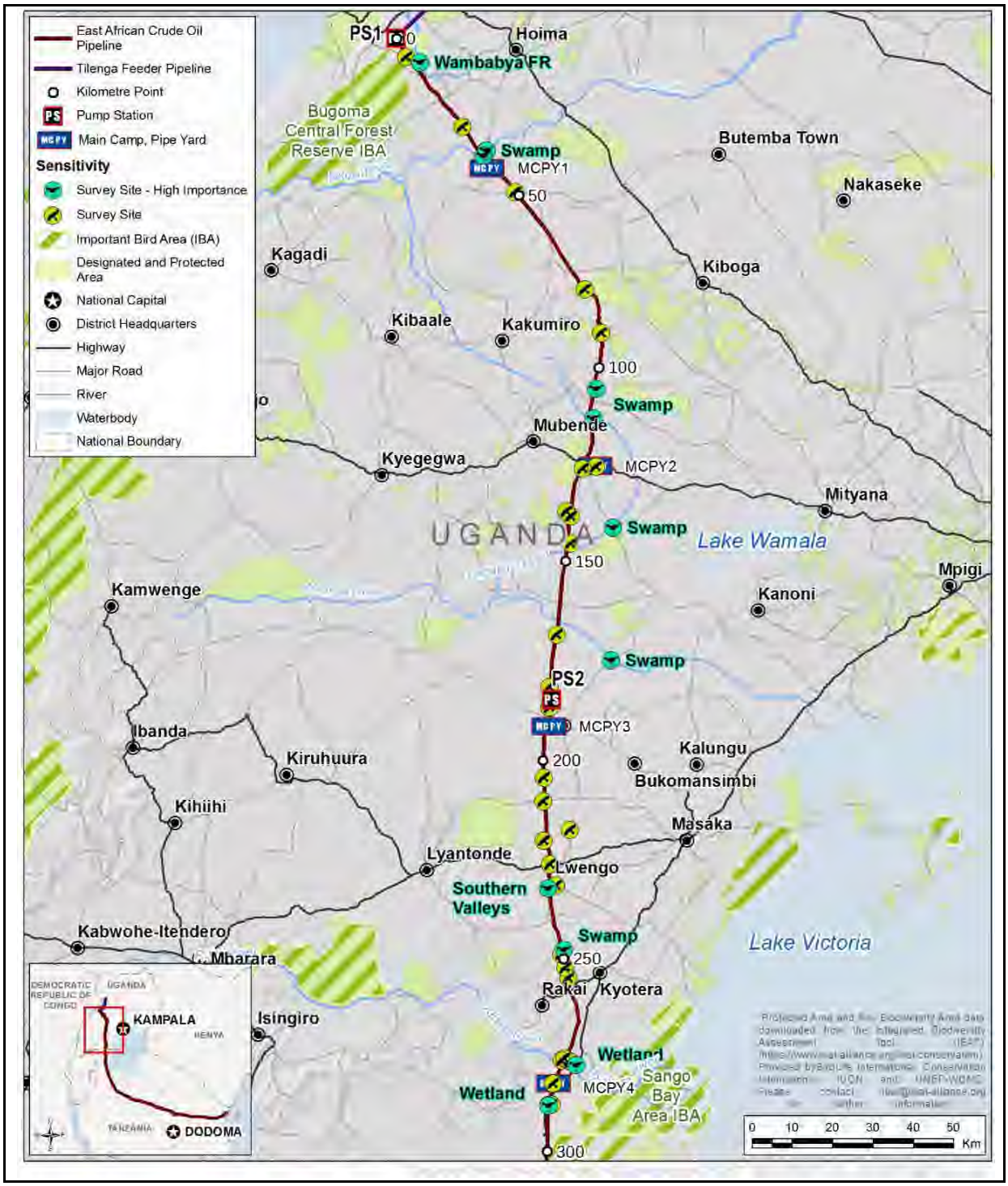

Figure A3.3-1 Avifauna Survey Locations

A3.3.3 Data Analysis

Species composition and information on endemism were principally obtained from the IUCN website. Species of conservation importance were identified by the relevant IUCN Red List category and the National Red List for Uganda (WCS 2016).

In addition, Bennun et al. (2000) gives a complete listing of all East African bird species that fall within regional red list categories namely: critically endangered, endangered, vulnerable, near threatened and regionally responsible.

Within each valued environmental and social component (VEC), trends are also presented to allow appreciation of changes in their condition on a local and regional scale.

A3.3.3.1 Sensitivity Ranking

The sensitivity of the avifauna biodiversity receptors has been ranked according to the avifauna biodiversity section of the sensitivity table presented in Section 8 of the ESIA.

A3.3.4 Data Considerations

Field survey data provide a snapshot in time and are unlikely to represent the full diversity of species supported at a site. Baseline assessments therefore include secondary data and data gathered during field surveys. Where there is uncertainty as to whether a particular habitat is supporting certain avifauna species then a precautionary approach has been taken in keeping with the International Finance Corporation Performance Standard 6 (PS6) and the accompanying Guidance Note.

The following data considerations are accounted for in this baseline:

- some species that inhabit dense vegetation, thickets and papyrus swamps may be undetected during the field survey and therefore these species may be under recorded
- although wet and dry season field surveys were completed, the level of rainfall from year to year can affect the number and diversity of species that are present; rainfall recorded at Bugungu Wildlife Reserve indicated that between May 2017 and February 2018 rainfall was well below the long-term average
- within the AOI, there was less survey time spent where habitat suggested that birds of importance would not be present.

A3.4 Habitats of Conservation Importance

The following sections of this report provide:

- an overview of the habitats of conservation importance to avifauna in the broader region based on secondary data
- a description of the habitat at the surveyed sites.

Figure A3.3-1 illustrates the locations of these sites.

A3.4.1 Regional Overview

Uganda is a bird-rich country, with about 1040 species recorded, of which about 800 are resident species (Carswell et al. 2005). The pipeline corridor avoids any significant Protected Areas, but the Lake Albert flats, which are pastoral areas, are known to be species-rich (D Pomeroy, unpublished data for Total). Uganda's predominantly small-scale farmlands are also species-rich however, other than species that require native trees for breeding, the species found there are typically not of conservation importance (Douglas et al. 2013).

South of the Masaka–Mbarara road, the topography supports seasonal wetlands and dams used for watering livestock; this area provides habitat for various bird species including the grey-crowned crane (Pomeroy et al. in press).

Eucalyptus plantations are extensive, particularly in the south, but are of almost no conservation value (Pomeroy and Dranzoa 1998) except where poor forest management allows for considerable amounts of undergrowth.

A3.4.2 Wambabya Forest Reserve

A3.4.2.1 Baseline Condition

There are a few remaining old trees in this riverine forest but generally the reserve is degraded.

During field surveys, 76 species were recorded including forest-specialist species such as:

- spotted greenbul, *Ixonotus guttatus* (IUCN least concern)
- toro olive greenbul, *Phyllastrephus hypochloris* (IUCN least concern, Uganda near threatened)
- grey parrot, *Psittacus erithacus* (IUCN endangered, Uganda vulnerable).

Full species data are provided in Attachment A3.4. The grey parrot is described in more detail in Section A3.5.

Survey results highlight the habitat the site provides for forest specialists, see Figure A3.4-1.

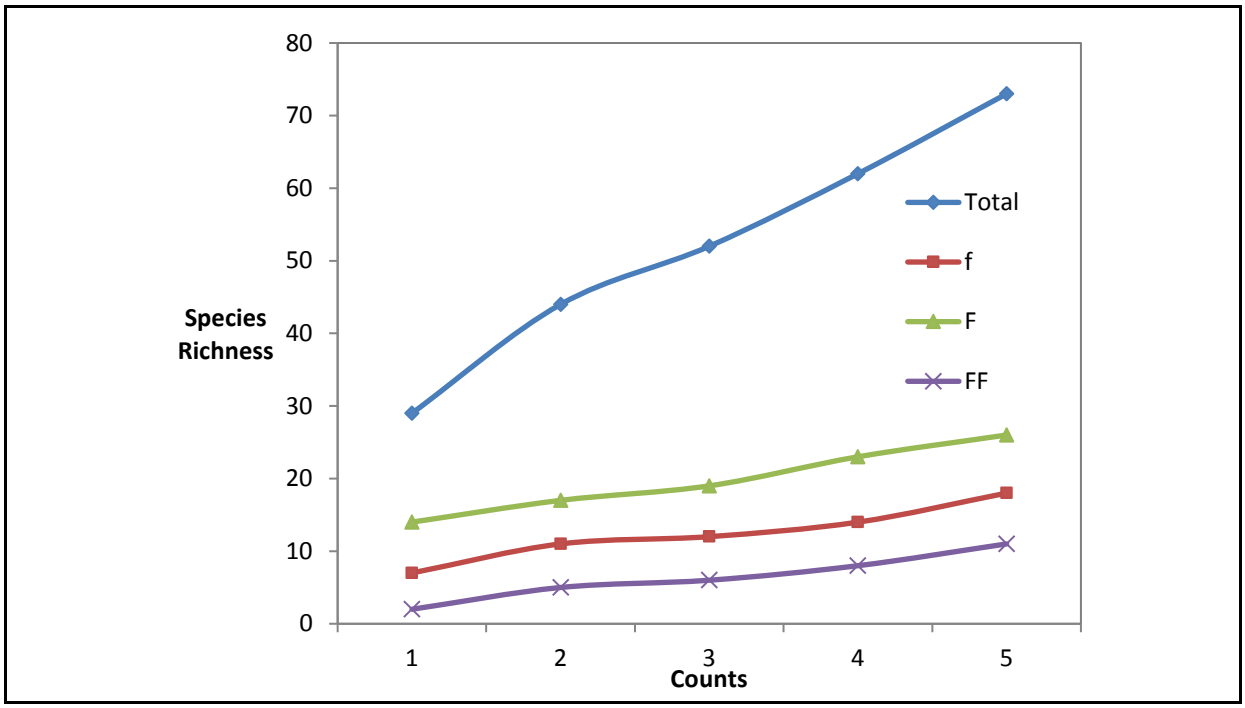

Figure A3.4-1 Species Accumulation Curves for Wambabya Forest Reserve

NOTES: FF = specialist forest interior species; F = less specialised forest birds, sometimes found in well-wooded areas outside forest; f = nonforest birds that also commonly use trees.

A3.4.2.2 Trend in Condition and Sensitivity to Change

Uganda is estimated to be losing its forest cover at a rate of 200,000 hectares per year, implying a loss in forestry biodiversity (NEMA 2016). The current trend throughout Uganda is a continued loss of this habitat.

Wambabya Forest Reserve (FR) could become an important part of an ecological corridor being investigated for restoration and enhancement by Ecotrust, the Jane Goodall Institute and Fauna & Flora International within the broader Albertine Rift landscape (Lamprey 2017). Similarly, the Ugandan Wildlife Authority has advised the project of its intention to initiate a revegetation programme in degraded parts of Wambabya FR. Should these programmes proceed, it is anticipated that the condition of Wambabya FR would improve; conversely, no positive intervention would likely result in continued degradation of habitat carrying capacity.

As Wambabya FR provides nesting habitat for grey parrot (IUCN endangered, Uganda vulnerable) as well as other forest-specialist avifauna, it is considered to have very high sensitivity to change.

A3.4.3 Papyrus Swamp and Other Wetlands

A3.4.3.1 Baseline Condition

Extensive swamps, largely dominated by papyrus, are found throughout the pipeline corridor. The best example is the Kafu River at KP37. Surveys at these swamps recorded several papyrus endemics, notably papyrus gonolek, *Laniarius*

mufumbiri (IUCN near threatened, Uganda vulnerable). This species is described in more detail in Section A3.5.

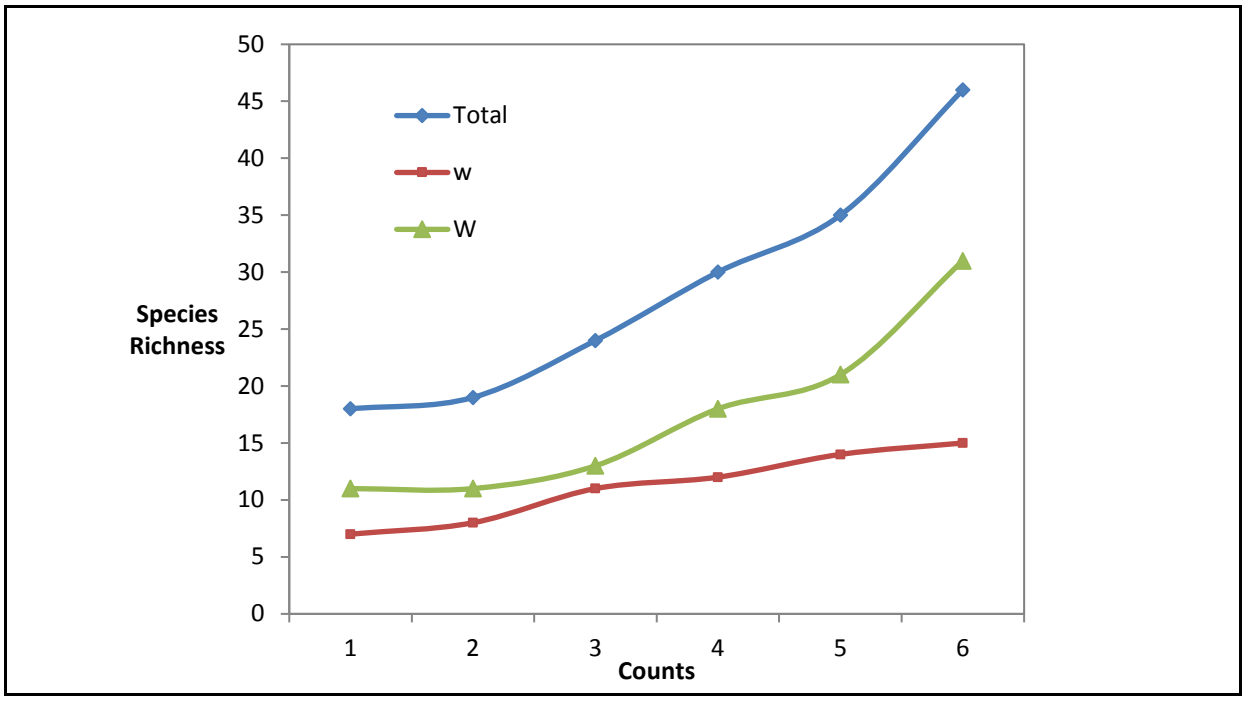

Figure A3.4-2 Species Accumulation Curve for Waterbirds and Other Species at the Kafu River Site

NOTE: W = species usually occurring on or by rivers and lakes; w = species more common at or near wetlands.

The species accumulation curve in Figure A3.4-2 for the Kafu River site indicates rich waterbird diversity.

Another wetland site of note is the airstrip ponds at KP289. Although artificial, these ponds are now well vegetated with native plants and support an interesting variety of birds, including white-backed duck, *Thalassornis leuconotus* (IUCN least concern, Uganda vulnerable, congregatory) and rufous-bellied heron, *Ardeola rufiventris* (IUCN least concern, Uganda vulnerable, congregatory). These species are described in more detail in Section A3.5.

A3.4.3.2 Trend in Condition and Sensitivity to Change

While papyrus is a fairly robust plant and will regenerate from activities such as burning and cutting, as noted in Appendix A2 (Aquatic Biodiversity Baseline report), papyrus wetlands are under increasing anthropogenic pressure with large areas being cleared for agriculture or the harvesting of papyrus itself. Threats include encroachment, drainage, pollution, siltation and over-exploitation. Clearing of wetland vegetation can increase evaporation rates leading to a shrinking of the wetland area. Further, this is likely to increase with rising land use pressures. The overall condition of these sites from an ecological perspective is declining.

Wetlands and the specialist bird species such as the papyrus gonolek that depend on them for nesting and foraging have high sensitivity to change.

A3.4.4 Southern Valleys

A3.4.4.1 Baseline Condition

Grassland and agricultural land typify the southern valleys. The grey-crowned crane, *Balearica regulorum* (IUCN endangered and Uganda endangered), is the national bird of Uganda and is present in a variety of open habitats including grasslands and agricultural land.

During both the wet and dry season surveys, pairs were recorded in about two-thirds of the valleys in the southern sites (sites 1, 5, 8, 9 10, 11, 13 and 24). According to the bird atlas of Uganda, this once-widespread species is now confined largely to southwest Uganda.

The species distribution maps for *Balearica regulorum* indicate that the EACOP project is likely to cross areas where this species is present. While only a sample of valleys were surveyed it is likely to be present in other areas of suitable habitat within the same area. Grey-crowned crane is described in more detail in Section A3.5.

A3.4.4.2 Trend in Condition and Sensitivity to Change

The grasslands are subject to existing pressures through over-grazing and conversion to agriculture; these pressures on land-use are anticipated to continue.

As the southern valleys provide important habitats for grey-crowned crane they are considered to have high sensitivity to change.

A3.5 Avifauna Species of Conservation Importance

Based on secondary data and the results from the field surveys, species of conservation importance within the AOI are presented below.

A3.5.1 Globally Threatened Species

Species of conservation importance are defined as those that are listed by the IUCN and Uganda Red List as critically endangered, endangered or vulnerable; migratory or congregatory; and range-restricted or endemic. Keystone species are also considered to be of conservation importance.

IUCN threat categories are defined as follows:

- critically endangered – a species is critically endangered when the best available evidence indicates that it is facing an extremely high risk of extinction in the wild. Critically endangered species are considered to have a very high sensitivity to change.
- endangered – a species is endangered when the best available evidence indicates that it is facing a very high risk of extinction in the wild. Endangered species are considered to have a very high sensitivity to change.
- vulnerable – a species is vulnerable when the best available evidence indicates that it is facing a high risk of extinction in the wild. Vulnerable species are considered to have a high sensitivity to change.

- near threatened – a species is near threatened when it has been evaluated against the criteria and does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. Near threatened species are considered to have a low sensitivity to change.
- least concern – a species is least concern when it has been evaluated against the criteria and does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant taxa are included in this category. Least concern species are considered to have a low sensitivity to change.

Listing in the categories of not evaluated and data deficient indicates that no assessment of extinction risk has been made, though for different reasons. Until such time an assessment is made, taxa listed in these categories should not be treated as if they were nonthreatened (IUCN 2012).

A3.5.1.1 Summary of Survey Results

Bird species richness was high at almost all sites with 40 or more species often being recorded. Table A3.5-1 presents bird species that were identified as being of conservation importance. Additional detail on these species is provided in the following sections.

Table A3.5-1 Key Species of Conservation Importance

2016 No.	Common Name *Scientific Name* (Alternative Name)	Global					Uganda					
		CR	EN	VU	NT	DD	CR	EN	VU	NT	RR	DD
4	White-backed duck *Thalassornis leuconotus*								✓			
152	Grey-crowned crane *Balearica regulorum*		✓					✓				
166	African woollyneck *Ciconia microscelis*								✓			
168	Saddlebill *Ephippiorhynchus senegalensis*								✓			
178	Striated heron *Butorides striata* (green-backed heron)									✓		
181	Rufous-bellied heron *Ardeola rufiventris*								✓			
301	Hooded vulture *Necrosyrtes monachus*	✓						✓				
332	Ovambo sparrowhawk								✓			

Table A3.5-1 Key Species of Conservation Importance

2016 No.	Common Name *Scientific Name* (Alternative Name)	Global					Uganda					
		CR	EN	VU	NT	DD	CR	EN	VU	NT	RR	DD
	Accipiter ovampensis											
488	Grey parrot *Psittacus erithacus*				✓				✓			
547	Papyrus gonolek *Laniarius mufumbiri*				✓				✓			
911	Toro olive greenbul *Phyllastrephus hypochloris*									✓		
Number of species		1	1	-	2	-	-	2	8	2	-	-

NOTE: CR = critically endangered, EN = endangered, VU = vulnerable, NT = near threatened, RR = regionally restricted, DD = data deficient

A3.5.1.2 Hooded Vulture

Baseline Condition

The hooded vulture, *Necrosyrtes monachus*, (IUCN critically endangered, Uganda endangered) was recorded during field surveys at KP127 close to the Kasana–Kasambya FR.

The hooded vulture is often associated with human settlements north of the equator, but is also widespread in sub-Saharan Africa, found in open grassland, forest edge, wooded savannah, desert and along coasts. It tends to occur at higher densities in areas where populations of larger vultures are low or non-existent. It feeds mainly on carrion, but also takes insects.

Breeding occurs between May and June, with nests occurring in trees with a clutch of one egg. Data and observations suggest that the species is undergoing a very rapid decline in its global population with an estimated 83% decline over three generations (BirdLife International 2017a).

Its main threats include:

- conversion of habitat to agro-pastoralism, loss of nesting sites and reduced abundance of available food (primarily ungulate kills)
- poisoning, either intentionally by poachers (as vultures signal a kill) or unintentionally by ingesting anti-inflammatory drugs administered to cattle or agricultural pesticides
- bushmeat hunting and body parts for traditional medicine
- a single egg per year in a single breeding season, with shared nesting, means that the loss of one parent will often result in the loss of the offspring.

Trend in Condition and Sensitivity to Change

The hooded vulture has experienced rapid population decline and this is anticipated to continue as the main threats to the species continue.

The hooded vulture is IUCN critically endangered and Uganda endangered, and hence has very high sensitivity to change.

A3.5.1.3 Grey-Crowned-Crane

Baseline Condition

Grey-crowned-cranes, *Balearica regulorum* (IUCN and Uganda endangered), were recorded during field surveys at KP91, KP210, KP220, KP226, KP232, KP259 and KP289. The species inhabits wetlands such as marshes; pans and dams with tall emergent vegetation; riverbanks; open riverine woodland; shallowly flooded plains and temporary pools with adjacent grasslands; open savannahs; croplands; pastures; fallow fields and irrigated areas.

The nest is a circular platform of uprooted grasses and sedges concealed in tall emergent vegetation in or along the margins of wetlands. The species nests in solitary pairs, but often flocks together and roosts communally at night in groups of 20–200 individuals during dry periods.

The grey-crowned crane has a varied diet consisting of seed heads, new tips of grasses, pulses, nuts and grains, insects, frogs, lizards and crabs.

Its main threats include:

- loss and degradation of wetland breeding areas through drought-related changes in land use, drainage and overgrazing
- illegal captive trade relating to the pet trade, captive facilities and informal zoos
- hunting and egg capture
- human disturbance.

Trend in Condition and Sensitivity to Change

The population of the grey-crowned-crane is estimated to have declined by 50% over a period of 19 years (1985–2004) (BirdLife International 2016a). This trend is expected to continue.

Grey-crowned-cranes are IUCN endangered and hence have very high sensitivity to change.

A3.5.1.4 White-Backed Duck

Baseline Condition

The white-backed duck, *Thalassornis leuconotus*, is Uganda vulnerable, congregatory and partially migratory, making local dispersive movements during the rainy season to take advantage of temporary wetlands. It was recorded during field surveys at the airstrip ponds near MCPY4 at KP288.5.

The species inhabits quiet shallow freshwater lakes, pools, lagoons, pans, inland deltas, floodplains, marshes and swamps fringed with abundant emergent and

floating vegetation such as reeds, papyrus and waterlilies. Nests are constructed of vegetation either floating on, or up to 45 cm above water among reedbeds or papyrus beds, or on the ground in waterside vegetation on small islands.

Wetlands modification threatens the species, especially where the native aquatic flora is affected (e.g., through the introduction of herbivorous fish, the introduction of exotic plants, deterioration in water quality as a result of deforestation and soil erosion in catchment areas, and pollution). The species' large eggs are especially prized as food by people living near wetlands (BirdLife International 2016b).

Trend in Condition and Sensitivity to Change

The overall population trend for white-backed duck is decreasing, although some populations may be stable (BirdLife International 2016b).

The white-backed duck is listed as vulnerable nationally, hence it has moderate sensitivity to change.

A3.5.1.5 African Woollyneck

Baseline Condition

The African woollyneck, *Ciconia microscelis*, is IUCN least concern, Uganda vulnerable and congregatory. This species is predominantly sedentary, although it may make migratory north–south movements. It mainly breeds during the dry season.

The species shows a preference for natural wetland habitats in savannah and grassland, including rivers, streams, lakes, ponds, water-holes, lagoons, dams, floodplains, marshes, and freshwater and peat swamp forests. It will also use artificial habitats such as rice paddy fields, flooded pastures, cultivated fields, golf courses, firebreaks and roads in tree and sugarcane plantations (BirdLife International 2016c).

Trend in Condition and Sensitivity to Change

The global population is thought to be stable (BirdLife International 2016c) and therefore the trend in condition is not anticipated to change.

The African woollyneck is listed as vulnerable nationally hence it has moderate sensitivity to change.

A3.5.1.6 Saddlebill

Baseline Condition

The saddlebill, *Ephippiorhynchus senegalensis*, is IUCN least concern, Uganda vulnerable and congregatory. It inhabits extensive fresh, brackish or alkaline wetlands in open, semi-arid areas and savannah, with relatively high abundances of fish and with large trees nearby for nesting and roosting (although it avoids densely forested areas).

Suitable habitats include shallow freshwater marshes, wet grasslands, the margins of large or small rivers, lake shores and pans. Nests comprise a large flat platform

of sticks placed up to 20–30 m in a tree near water isolated from other trees and disturbance sources. It may also nest on cliffs and in the abandoned nests of other bird species (BirdLife International 2016g).

Trend in Condition and Sensitivity to Change

The species is susceptible to disturbance, wetland degradation (e.g., pesticide contamination) and conversion of habitat to agriculture. The overall population trend is suspected to be decreasing (BirdLife International 2016g).

The saddlebill is listed as vulnerable nationally hence it has moderate sensitivity to change.

A3.5.1.7 Rufous-Bellied Heron

Baseline Condition

The rufous-bellied heron, *Ardeola rufiventris*, is IUCN least concern, Uganda vulnerable and congregatory. This species is mainly sedentary, although it may make partial migratory movements in relation to seasonal flooding of river floodplains. It breeds during the rainy season, or when flooding is at a peak (which may be in the early dry season). When not foraging, it roosts in trees.

The species inhabits seasonally flooded grasslands, marshes, floodplains and inland deltas, shallow water along riverbanks and lake shores, stands of papyrus, reedbeds and rice fields. The nest is a small platform of vegetation positioned low down in reeds, trees or shrubs that are usually standing in water. It usually nests on the periphery of mixed-species bird colonies.

Trend in Condition and Sensitivity to Change

The population trend for the rufous-bellied heron is not known, but the population is not believed to be decreasing sufficiently rapidly to approach IUCN thresholds under the population trend criterion (BirdLife International 2016d).

The rufous-bellied heron is listed as vulnerable nationally hence it has moderate sensitivity to change.

A3.5.1.8 Ovambo Sparrowhawk

Baseline Condition

The ovambo sparrowhawk, *Accipiter ovampensis*, is IUCN least concern and Uganda vulnerable. Its habitat preference is for edges of drier forest, woodland and exotic plantations, moving into surrounding savannah. The small stick nest is placed high in the crown of a large tree. Nesting in patches of tall alien trees, especially gray poplars, has probably greatly expanded its breeding range. It feeds mainly on small birds, which it usually captures after fast pursuits.

Trend in Condition and Sensitivity to Change

The global population trend appears to be increasing; this species has adapted well to exotic plantations and is increasing in much of its range (BirdLife International 2016e).

The ovambo sparrowhawk is listed as vulnerable nationally, hence it has moderate sensitivity to change.

A3.5.1.9 Grey Parrot

Baseline Condition

The grey parrot, *Psittacus erithacus*, is IUCN endangered and Uganda vulnerable. This species was observed near to Wambabya FR (site 8/5.) Although typically inhabiting dense forest, it is commonly observed at forest edges, clearings, gallery forest, mangroves, wooded savannah, cultivated areas, and even gardens. It is highly gregarious, forming large roosts that have, historically, contained up to 10,000 individuals. Feeding takes place in smaller groups of up to 30 birds and the diet consists of fruit and seeds. The grey parrot nests in a tree cavity 10–30 m aboveground. Trapping for the wild bird trade is the main threat to the species, with habitat loss also being a notable threat in East Africa (BirdLife International 2017b).

Trend in Condition and Sensitivity to Change

This species has recently (2016) been re-categorised to IUCN endangered because of the extent of the annual harvest for the international pet trade and ongoing habitat loss; this indicates that the trend in population decline is likely to continue. Local population declines have been noted in Uganda (BirdLife International 2017b).

The grey parrot is listed as IUCN endangered, hence it has very high sensitivity to change.

A3.5.1.10 Papyrus Gonolek

Baseline Condition

The papyrus gonolek, *Laniarius mufumbiri*, is IUCN near threatened and Uganda vulnerable. Within its range, the species is confined to papyrus swamps and beds, in meandering river valleys and along lake shores. It feeds on ants, beetles, weevils, small flies, hymenopterans, caterpillars, snails and fruit. The highly specialised habitat required by this species makes it vulnerable to threats such as drainage, burning and the over-exploitation of wetlands (BirdLife International 2016f).

Trend in Condition and Sensitivity to Change

This species is listed as IUCN near threatened because it is estimated to be in moderately rapid population decline owing to the ongoing conversion and degradation of its wetland habitats (BirdLife International 2016f).

The papyrus gonolek is listed as vulnerable nationally, hence it has moderate sensitivity to change.

A3.6 Ecosystem Services Provided

The habitats described in this report, with the avifauna species they support, generate a range of ecosystem services as set out below.

Provisioning services:

- food (particularly egg gathering).

Regulating services:

- as noted within this report, many of the bird species (raptors and vultures) within the AOI are keystone species that provide pest control and other regulating services.

Cultural services:

- eco-tourism, particularly in protected areas
- use of feathers, bones and other body parts in ceremonial rituals.

Habitat and species support:

- the habitats described in this report provide important refuge, feeding, watering, breeding and nursery areas for a range of bird species.

Supporting services:

- pollination and seed dispersal.

A3.7 Sensitivity Rankings

Based on the survey, the trend in condition and sensitivity to change, the sensitivity of the VECs has been ranked and is shown below in Table A3.7-1.

Table A3.7-1 Avifauna VECs and Sensitivity Ranking

Avifauna VEC	Sensitivity Ranking	Rationale for Ranking
Wambabya FR		
Legally protected, internationally or nationally recognised areas	High (4)	Legally protected as a FR
Flora and fauna species of conservation importance	Very high (5)	Supports the IUCN endangered (Uganda vulnerable) grey parrot
Habitats of conservation importance (terrestrial and aquatic)	High (4)	Habitats providing important breeding habitat for several forest-specialist species, including the IUCN endangered (Uganda vulnerable) grey parrot
Papyrus Swamp and Other Wetlands		
Flora and fauna species of conservation importance	Moderate (3)	Supports several Uganda vulnerable species: • papyrus gonolek • white-backed duck • rufous-bellied heron
Habitats of conservation importance (terrestrial and aquatic)	High (4)	Natural habitat providing nesting and foraging habitat for wetland-specialist birds

Table A3.7-1 Avifauna VECs and Sensitivity Ranking

Avifauna VEC	Sensitivity Ranking	Rationale for Ranking
Southern Valleys		
Flora and fauna species of conservation importance	Very high (5)	Supports IUCN and Uganda endangered species: • grey-crowned crane
Habitats of conservation importance (terrestrial and aquatic)	High (4)	Natural habitat supporting the national bird of Uganda, the grey-crowned crane
Avifauna Species		
Flora and fauna species of conservation importance	Very high (5)	IUCN critically endangered and endangered species: • hooded vulture (critically endangered) • grey-crowned crane (endangered) • grey parrot (endangered) Uganda vulnerable species: • papyrus gonolek • white-backed duck • rufous-bellied heron

A3.8 Key Considerations

A3.8.1.1 Habitats

Based on the outcomes of the avifauna biodiversity study, and particularly the known or likely presence of species of conservation importance, the following areas are identified as sensitive receptors:

- Wambabya FR
- papyrus swamp and other wetlands
- southern valleys.

A3.8.1.2 Avifauna

Several avifauna species of conservation importance were recorded that are key considerations for the impact assessment. These species are important because they are listed as IUCN or Uganda critically endangered, endangered or vulnerable; some are congregatory; and some are range-restricted or habitat specialists.

The key considerations for the impact assessment on avifauna species will be:

- loss of habitat
- disturbance to nesting and foraging, both of which occur throughout the year.

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ATTACHMENT A3.1 METHODS

Field Surveys

Open areas of savannah or agricultural land were sampled using timed species counts (TSCs) (Bibby et al. 2000; Freeman et al. 2003). During TSCs, species recorded in the first 10 minutes are given a score of 6, then 5 for the next 10 minutes, down to 1 for the last minute (Freeman et al. 2003). The common species are recorded in most counts, usually with a score of six, while rare species only score an occasional one. Sites were then walked freely within each area, recording all species in order of their being encountered, whether by sight or sound, but mainly remaining within the identified habitat. One exception is when there happened to be a small wetland within the area, often with some waterbirds, and these are therefore highlighted in blue in the baseline TSC tables provided in Attachment A3.2 (May 2017 survey) and A3.3 (December 2017 survey), which are otherwise the results of the landbird counts.

For open water bodies, such as the airstrip ponds near to KP288, total counts were undertaken and reported separately. In the case of swamps, species lists were collected (with a note if a species was seen or heard several times). All species' data tables, with the dates, times and other details of all counts, are provided in the attachments.

Birds were mostly identified on sight, but two field guides were carried, namely Stevenson and Fanshawe (2002) and Sinclair and Ryan (2003), which were referred to when queries arose. In a few cases, interesting records that were less than certain are shown as 'probable', indicated by 'p' in data tables. These tables list species in the current East African order (DA Turner, in press). For calls, a smartphone (which has recordings of most Ugandan species) was used. Species encountered in the same habitat as a particular count, but outside the count time, are listed as P (present).

During the May 2017 surveys, thirty counts were undertaken along or near the pipeline corridor, with nine wetland sites. The sites are numbered in the order in which they were counted, in some cases out-of-order with respect to KP numbers. One swamp (associated with the Kafu River) was counted out and back.

During the December 2017 survey, TSCs were undertaken at 21 sites (some sites having multiple visits) with 10 open water sites and 4 swamps. Additional counts at the Kafu River swamp and Wambabya FR were undertaken in January 2018.

The avifauna survey team comprised:

- Derek Pomeroy (all surveys)
- Micheal Kibuule (all surveys)
- Tom Smith (May 2017 only).

Birds of Conservation Concern

The bird lists in the tables show species that are globally Red-listed by the IUCN or nationally by the Wildlife Conservation Society (WCS in press). However, we also consider some other categories to be of concern, namely:

- Deforestation in Uganda is rampant. Birds commonly needing trees: FF are forest interior species, almost absent from our counts, F are less specialised forest birds, sometimes found in well-wooded areas outside forest, and f-species are nonforest birds that also commonly use trees (Bennun et al. 1996).
- Wetlands all over Uganda are being drained, large lakes are increasingly over-fished and polluted, all of which affects waterbirds. Those that usually occur on or by rivers and lakes are designated 'W' while birds that are more common at or near wetlands are labelled 'w' (NBDB, unpubl.).
- Grasslands are almost all over-grazed which adversely affects species that need longer grass – these are 'G' species.
- Aerial species (swallows, swifts, bee-eaters) appear to be declining globally; these are labelled 'Ae'.

Habitat Descriptions

Vegetation structure, as the basis of landbirds' habitats, was recorded for all non-aquatic sites, following the procedure described by Pomeroy (1992). The presence of trees is particularly important for many species (Douglas et al. 2013). To assess vegetation cover, plants were first considered as native or planted (non-native, exotic) and then divided into nonwoody (grass and herbs) and woody (shrubs and trees). The percentage cover in each category was then estimated in four vertical layers: 0–1, 1–3, 3–8 and >8-m high, and all within a 10-m radius of the count point. For woody vegetation, the first two height categories were considered to be shrubs and the latter two as trees. Savannah areas (those with ground layers dominated by grasses) were ranked according to the long-established criteria of Pratt and Gwynne (1977). Here, a cover of more than 20% of shrubs or trees is referred to as bushland or woodland (B, W), respectively, while a cover of 2–20% is referred to as bushed or wooded (b, w). Lower levels are referred to as grasslands (G) although in some sites there was almost no grass, but considerable bare ground (as shown in Table Att3.2-3).

Most sites had six estimates, made at 5, 15, 25, 35, 45 and 55 minutes from the start of the TSC. These were considered to be random, as they were determined by time not by the vegetation at any particular point. One small source of bias is that walking routes did not go through thickets, for obvious reasons.

For each site, various categories of human activity were recorded on a 0 to 3 scale, and these are also shown in Table Att3.2-3.

ATTACHMENT A3.2 WET SEASON SURVEY DATA

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
20	YELLOW-BILLED DUCK *Anas undulata*	W	890										4				3	4																
25	HELMETED GUINEAFOWL *Numida meleagris*	G	1300				2							P			4				6			4										
31	BLUE QUAIL *Synoicus adansonii* (African Blue Quail)	G	46	AM, R-VU																					5									
34	SCALY FRANCOLIN *Pternistis squamatus*	F	310		6	5	3		P				4	5		6	3	4		6														
36	RED-NECKED SPURFOWL *Pternistis afer*		480	R-VU, U-VU					5					1		5		5																
38	CRESTED FRANCOLIN *Dendroperdix sephaena*		265				2		6	3			4											5										
48	LITTLE GREBE *Tachybaptus ruficollis* (Dabchick)	W	150												P			4																

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
62a	RING-NECKED DOVE Streptopelia capicola					5	6	4	3	4	6	6	6	5	6	6		6	6	6	5		6	6		5		5		6				P
62	RED-EYED DOVE *Streptopelia semitorquata*	f	195		3	6	6	3	6	5	6	6	6	5	6	6	4	6	6	6	5	6	6	6	6	5		2	6	6	2	4	4	
64	LAUGHING DOVE *Streptopelia senegalensis*		91					6					3		2		6	5	6		4	3		4	3		1	4		5			6	
66	AFRICAN GREEN PIGEON *Treron calvus*	F	160			4	5				3		6			1								5		3							2	
69	BLUE-SPOTTED WOOD DOVE *Turtur afer*	F	62		4	6	4	5	5		6	6	5	5	5	6	4		6	6	6	6	6	6	5	1	6	5	6	5	5	6	1	3
70	TAMBOURINE DOVE *Turtur tympanistria*	F	67			5			6	6		6				1							3				5		4	3			6	
91	AFRICAN PALM-SWIFT *Cypsiurus parvus*	Ae	11									1																						
94	WHITE-RUMPED SWIFT *Apus caffer*	Ae	22					4				2							1						4		2	5	2					
96	LITTLE SWIFT *Apus affinis*	Ae	24																					4										
104	WHITE-BROWED COUCAL *Centropus superciliosus*		170		6	6	5		6	5		3	6		3		6	2	6	4	6		3		5	5			6	6	3	5	4	
106	CHATTERING YELLOWBILL *Ceuthmochares aereus*	F	70																												1		3	

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
107	JACOBIN CUCKOO *Clamator jacobinus* (Black-and-white Cuckoo)	A	73																					3	5									
108	LEVAILLANT'S CUCKOO *Clamator levaillantii* (Striped Cuckoo)	Af	125													5						3												
112	KLAAS'S CUCKOO *Chrysococcyx klaas*	f	27											5				4					2	1	6			1	4					
114	DIEDERIK CUCKOO *Chrysococcyx caprius*		32										3		5			1	P			6	5			4				6		5		
118	RED-CHESTED CUCKOO *Cuculus solitarius*	AF	73		2	6	6		6		6					6		3		3	5	4		5	6	6	6					3	6	2
119	BLACK CUCKOO *Cuculus clamosus*	Af	86																					6				1						
123	GREAT BLUE TURACO *Corythaeola cristata*	F	980																									5	4					
125	EASTERN PLANTAIN-EATER *Crinifer zonurus*		600		3	3	4		4	4	4		6	6				4	1			3		2	2		3	5	6	6	4			2
126	BARE-FACED GO-AWAY-BIRD *Corythaixoides personatus*		250	R-RR	5		6		1	6			6	5	1		5		5	P	6													
132	ROSS'S TURACO *Musophaga rossae*	F	405			6	6	5	5	6				4										4	2					3			4	

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
139	BLACK CRAKE *Zapornia flavirostra*	W	50																4															
145	COMMON MOORHEN *Gallinula chloropus*	W	245															4																
148	WHITE-SPOTTED FLUFFTAIL *Sarothrura pulchra* (White-spotted Pygmy-crake)	FW	43																													2	
152	GREY-CROWNED CRANE *Balearica regulorum*	WG	3520	G-EN, R-NT, U-EN	2				P			5	4	3	5		6										3						
163	AFRICAN OPENBILL STORK *Anastomus lamelligerus* (African Openbill)	AwG	1130			6	1		4			4																6			3		
165	ABDIM'S STORK *Ciconia abdimii*	AG	1200	AM			P																										
166	AFRICAN WOOLLYNECK *Ciconia episcopus*	W	1200	R-NT, U-VU									4																				
171	HAMERKOP *Scopus umbretta*	w	420		2		6		1			4	5						2						1		6						

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
177	BLACK-CROWNED NIGHT HERON *Nycticorax nycticorax*	PW	535	PM									P			5		3	5															
179	SQUACCO HERON *Ardeola ralloides*		300													4																		
181	RUFOUS-BELLIED HERON *Ardeola rufiventris*	W	300	R-NT, U-VU												3																		
182	CATTLE EGRET *Bubulcus ibis*	G	345		1					6			6			1								4										
183	GREY HERON *Ardea cinerea*	W	1430	R-NT									4																					
184	BLACK-HEADED HERON *Ardea melanocephala*	w	1040			6	6		4	5		6	5					3						6										
187	GREAT WHITE EGRET *Ardea alba* (Great Egret)	W	1110	R-VU									2					4																
188	INTERMEDIATE EGRET *Ardea intermedia* (Yellow-billed Egret)	W	500										4			3																		
190	LITTLE EGRET *Egretta garzetta* (includes Western Reef Heron *E.gularis/schistacea*)	W	450													4																		

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
191	SACRED IBIS *Threskiornis aethiopicus*	W	1530									P																						
196	HADADA IBIS *Bostrychia hagedash*	w	1260		5	6	3		3	6	3	6	6	6	6	6	6		5				3	5										
198	LONG-TAILED CORMORANT *Microcarbo africanus* (Reed Cormorant)	W	550										4					5																
203	WATER THICK-KNEE *Burhinus vermiculatus* (Water Dikkop)	W	320																4															
225	SENEGAL LAPWING *Vanellus lugubris* (Plover)	AGw	110														6																	
226	CROWNED LAPWING *Vanellus coronatus* (Plover)	Gw	170		1																													
227	WATTLED LAPWING *Vanellus senegallus* (Plover)	W	225		6								6	4		3										3								
231	JACANA *Actophilornis africanus*	W	150															4	5								6							
286	BLACK-WINGED KITE *Elanus caeruleus*	G	250										4		1												3			4				

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
290	AFRICAN HARRIER HAWK *Polyboroides typus* (Gymnogene)	f	680							**6**																						**5**		
291	PALM-NUT VULTURE *Gypohierax angolensis*		1610																														**4**	
297	BLACK-CHESTED SNAKE-EAGLE *Circaetus pectoralis*																**1**							**pP**									
298	BROWN SNAKE-EAGLE *Circaetus cinereus*		2050	R-NT									**6**															**4**		**5**				
299	WESTERN BANDED SNAKE-EAGLE *Circaetus cinerascens*	F	1800	R-VU																										**2**				
301	HOODED VULTURE *Necrosyrtes monachus*	f	1010	G-CR, U-EN																			**4**											
308	LONG-CRESTED EAGLE *Lophaetus occipitalis*	F	1240																									**4**						
316	WAHLBERG'S EAGLE *Hieraaetus wahlbergi*		1150																						**6**					**1**				
319	LIZARD BUZZARD *Kaupifalco monogrammicus*	F	275											**P**						**6**					**3**		**3**	**1**	**5**	**3**				**2**

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
321	GABAR GOSHAWK *Micronisus gabar*		760					3												1													
359	SPECKLED MOUSEBIRD *Colius striatus*		54		4	6	6	5	6	6	2	4	6	5	4	6	5	5	5		6	6	6	3	4	6	6	6		5				1
360	BLUE-NAPED MOUSEBIRD *Urocolius macrourus*		49							3						6					5												
367	CROWNED HORNBILL *Lophoceros alboterminatus*	f	215																											P			
368	AFRICAN PIED HORNBILL *Lophoceros fasciatus*	F	260											4							6				2								
375	BLACK-CASQUED HORNBILL *Ceratogymna atrata*	FF	1160																														5
377	WHITE-THIGHED HORNBILL *Bycanistes albotibialis*	FF	1150																													1	
378	BLACK-AND-WHITE CASQUED HORNBILL *Bycanistes subcylindricus*	F	1200																												6	6	
380	GREEN WOOD HOOPOE *Phoeniculus*		70						4				4	P								5								3			

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
	purpureus (Red-billed Wood-hoopoe)																																	
396	GREATER HONEYGUIDE *Indicator indicator* (Black-throated Honeyguide)	f	53																	P												6		4
401	NUBIAN WOODPECKER *Campethera nubica*		61						5	6	4			2		6	6			3			6			5								
408	CARDINAL WOODPECKER *Dendropicos fuscescens*		31																										6					
426	YELLOW-RUMPED TINKERBIRD *Pogoniulus bilineatus*	F	10				4																			6		1	1				5	4
427	RED-FRONTED TINKERBIRD *Pogoniulus pusillus*		10				4		4														4	4				6						
428	YELLOW-FRONTED TINKERBIRD *Pogoniulus chrysoconus*	f	12			4	4						6	4	2		2		3	5					6						6			3
431	SPOT-FLANKED BARBET *Tricholaema lacrymosa*		23	R-RR	3													5																
433	WHITE-HEADED BARBET *Lybius leucocephalus*		67			4							6						1	3												5		

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
437	DOUBLE-TOOTHED BARBET *Pogonornis bidentatus*	f	78							5								6	2	4				6	4			4		4		6	3	2
441	WHITE-THROATED BEE-EATER *Merops albicollis*	Af	24	AM																												5		
450	BLUE-BREASTED BEE-EATER *Merops variegatus*	W	22					6																										
451	LITTLE BEE-EATER *Merops pusillus*	G	14												4		2					3								3		6		6
458	BROAD-BILLED ROLLER *Eurystomus glaucurus*	Afw	115			5		6		4			5			6				6				3		4			6		1		
460	AFRICAN PYGMY KINGFISHER *Ispidina picta*	fw	12				P			5																		5				6		
462	MALACHITE KINGFISHER *Corythornis cristatus*	W	15											2		5																		
465	PIED KINGFISHER *Ceryle rudis*	W	84													4																		
468	STRIPED KINGFISHER *Halcyon chelicuti*		37																	2			1	4				2	5	5	5	3	6	

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
470	WOODLAND KINGFISHER *Halcyon senegalensis*	A	36													**2**											**4**	**3**	**4**	**2**				
476	GREY KESTREL *Falco ardosiaceus*		230													**3**						**3**										**1**		
483	AFRICAN HOBBY *Falco cuvieri*	F	180				**6**										**4**																	
489	BROWN-NECKED PARROT *Poicephalus robustus*	F	340	R-NT		**6**	**6**					**4**	**5**						**3**					**3**											
490	BROWN PARROT *Poicephalus meyeri* (Meyer's Parrot)		165											**2**	**5**			**3**																
502	RED-SHOULDERED CUCKOOSHRIKE *Campephaga phoenicea*		27																											**4**				
507	EASTERN BLACK-HEADED ORIOLE *Oriolus larvatus*	f	50										**3**							**3**					**5**			**6**						
518	CHESTNUT WATTLE-EYE *Dyaphorophyia castanea*	FF	13						**P**																									
521	BROWN-THROATED WATTLE-EYE *Platysteira cyanea* (Common Wattle-eye)	f	15			**4**								**2**			**2**			**2**			**2**	**1**		**1**	**2**	**2**		**6**			**1**	

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
525	AFRICAN SHRIKE FLYCATCHER *Megabyas flammulatus*	FF	29	R-NT							4																							
526	BLACK-AND-WHITE SHRIKE FLYCATCHER *Bias musicus* (Vanga Flycatcher)	f	21							2													1			4				5		2		
529	GREY-HEADED BUSH-SHRIKE *Malaconotus blanchoti*		77			6			4					3			4		2	4	5		2	5		6	5			6	6			
533	NORTHERN PUFFBACK *Dryoscopus gambensis*	F	32				5				4								5	6	6	4	4	5	1	2						6	6
537	BLACK-CROWNED TCHAGRA *Tchagra senegalus*		49										6			5	6					6	4	6									
540	SULPHUR-BREASTED BUSH-SHRIKE *Chlorophoneus sulfureopectus* (Orange-breasted Bush-shrike)	f	25							5						5			1	3				6	4	2	6	5		2				2
546	TROPICAL BOUBOU *Laniarius aethiopicus*	f	46		4	6	6		6	3	6	5		5	6	6	5	4	6	3	6	6	6	6	6	6			5	6		6		
548	BLACK-HEADED GONOLEK *Laniarius erythrogaster*	f	49		5	6	4	4	6	6	5	6	6	6	5	6	3	6	6	6	6	5	5	6	6	5	3							

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
550	FORK-TAILED DRONGO *Dicrurus adsimilis* (Common Drongo)	f/F	49			5		6	6		5		5	P	3	6	6	1	4	6			P	5	4	3				3				
555	RED-BACKED SHRIKE *Lanius collurio*	P	30	PM																			5											
560	GREY-BACKED FISCAL *Lanius excubitoroides*	Afw	53		6	5	4	6	5				6	6	2	6	5		6	5			3	1										
562	COMMON FISCAL *Lanius collaris*	G	35																			3	3					6						
564	PIAPIAC *Ptilostomus afer*		100										5																					
566	PIED CROW *Corvus albus*		605																												2			
570	AFRICAN PARADISE FLYCATCHER *Terpsiphone viridis*	f	15								6	1																						
580	GREEN-HEADED SUNBIRD *Cyanomitra verticalis*	F	13							1																								
586	SCARLET-CHESTED SUNBIRD *Chalcomitra senegalensis*	f	13							1			3	P	1			1				4	3					6		2	6			1
590	BRONZE SUNBIRD *Nectarinia kilimensis*	f	15																			5					2	3						

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
600	MARICO SUNBIRD *Cinnyris mariquensis* (Mariqua Sunbird)		10				4	4	3			3	5	1		5				6			1		5			5		6				5
601	RED-CHESTED SUNBIRD *Cinnyris erythrocercus*	w	8	R-RR						5	2						3		3						3		4							
607	VARIABLE SUNBIRD *Cinnyris venustus*	f	7		4			6					5					1			3	5	2	3						3	2		
608	COPPER SUNBIRD *Cinnyris cupreus*	fw	8							5		3	6				3	1		4	3		4					6						2
616	GROSBEAK WEAVER *Amblyospiza albifrons* (Thick-billed Weaver)	fW	37					4												3								4		2				
621	BLACK BISHOP *Euplectes gierowii*	w	28																			6										2		2
626	YELLOW-MANTLED WIDOWBIRD *Euplectes macroura*	G	23															1				4										6		
627	WHITE-WINGED WIDOWBIRD *Euplectes albonotatus*	G	19					5																										
628	RED-COLLARED WIDOWBIRD *Euplectes ardens* (Red-naped Widow)		21																													1		2

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
629	FAN-TAILED WIDOWBIRD *Euplectes axillaris* (Red-shouldered Widow)	w	23			6	6	5	5	6			6	2	6	6	4		4				5	1			6					6		6
631	BAGLAFECHT WEAVER *Ploceus baglafecht*	f	32																								6							
632	LITTLE WEAVER *Ploceus luteolus*		13						2	2			5	2		6									3							3		1
634	SPECTACLED WEAVER *Ploceus ocularis*	f	26								2					4							2	4	2	3						5		
640	NORTHERN BROWN-THROATED WEAVER *Ploceus castanops*	Fw	27	R-RR																							5							
646	BLACK-HEADED WEAVER *Ploceus cucullatus* (Village Weaver)		39			6		6			4	5	6		6		3	4	5		6	6	6							P	5			
647	VIEILLOT'S BLACK WEAVER *Ploceus nigerrimus*	f	29															4					2				6					6	2	
651	YELLOW-BACKED WEAVER *Ploceus melanocephalus* (Black-headed Weaver)	W	28		1									2	6	4	3	4	4										3				3

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
652	GOLDEN-BACKED WEAVER *Ploceus jacksoni* (Jackson's Golden-backed Weaver)	w	24	R-RR										2	4			3				4			3									
665	RED-BILLED FIREFINCH *Lagonosticta senegala*		8		4		5	4		6		3	1	5	5	P	2	5				6	6				4					6		
667	AFRICAN FIREFINCH *Lagonosticta rubricata* (Blue-billed Firefinch)		8																											5		2		
669	BROWN TWINSPOT *Clytospiza monteiri*	f	15											P																				
676	RED-CHEEKED CORDON-BLEU *Uraeginthus bengalus*		9										5	5		5	6																	1
681	FAWN-BREASTED WAXBILL *Estrilda paludicola*		7																								1							
685	COMMON WAXBILL *Estrilda astrild*	wG	8							2					1										1			1			6			
686	BLACK-CROWNED WAXBILL *Estrilda nonnula*	f	7																								6			6	4		6	1
705	BRONZE MANNIKIN *Spermestes cucullata*		9		4	5	5			6	4			3	1		4	2	6			4	5				6	5	4		6	6		3

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
706	BLACK-AND-WHITE MANNIKIN *Spermestes bicolor* (Red-backed Mannikin)	f	9																								2		1	3	4	4		2
709	PIN-TAILED WHYDAH *Vidua macroura*	G	14			5	6	4	3	5				1	4	5	1					3	6		4			4	3		6	6		
713	VILLAGE INDIGOBIRD *Vidua chalybeata* (Red-billed Firefinch Indigobird)		12																								1				4			
717	NORTHERN GREY-HEADED SPARROW *Passer griseus* (Parrot-billed Sparrow)		37					5						6			6		P				2				5	5	6		4			6
	GRASSLAND PIPIT *Anthus cinnamomeus*				5																													
728	YELLOW-THROATED LONGCLAW *Macronyx croceus*	G	47		5				2				6	2	4									3	2	6	6	1		3		4		
732	WESTERN YELLOW WAGTAIL *Motacilla flava*	Pw G	17	PM	5																													
733	AFRICAN PIED WAGTAIL *Motacilla aguimp*	w	26				6																								6			6
742	YELLOW-FRONTED CANARY *Crithagra mozambica*		12			5			4	4			6		3				1			5	3		3			2				6		

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
744	BRIMSTONE CANARY *Crithagra sulphurata* (Bully Canary)		21												2																			
786	NORTHERN CROMBEC *Sylvietta brachyura*		6																												1			
788	GREEN CROMBEC *Sylvietta virens*	F	8																														2	
802	YELLOW-BREASTED APALIS *Apalis flavida*	f	8											2																	3			
811	BUFF-BELLIED WARBLER *Phyllolais pulchella*	f	6			6					5																		3				
814	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	f	10		4	6	6		6	5	5		5	5		6	4	5	6	5	6	6	6	6	5	6		6	5	5	6	6		6
817	GREY-CAPPED WARBLER *Eminia lepida*	fw	20	R-RR	3	4	4	5	3	6		3		2		6	4	6				6	3	3	1	2	4		1			6		
818	RED-FACED CISTICOLA *Cisticola erythrops*	w	14		4	6	6	3	4	6	6			4								4					4	4	5		6	1		5
821	TRILLING CISTICOLA *Cisticola woosnami*		13				6	3	5			6	4	5	3	6	6	6	6	6	6		6	6	6	6				6				
828	WINDING CISTICOLA *Cisticola marginatus*	w	12		5				6	3			6			4		6	3				2						6		6		

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
831	CROAKING CISTICOLA *Cisticola natalensis*	G	16																							3								
841	TAWNY-FLANKED PRINIA *Prinia subflava*	fw	12			6			6	6			5	4			4		6	6	6	4	6	5		6		4		5		2		5
870	WHITE-HEADED SAW-WING *Psalidoprocne albiceps* (White-headed Rough-wing)	f	10	R-RR		6		6	5	5								2					3				5		4		3	5		3
873	LESSER STRIPED SWALLOW *Cecropis abyssinica*	Ae	18																			P	1	3			6							
874	RUFOUS-CHESTED SWALLOW *Cecropis semirufa* (Red-breasted Swallow)	Ae	23		4								5	1	4	6		6	3				2											
882	ANGOLA SWALLOW *Hirundo angolensis*	wAe	16					6	3		1		2			3			1			4						3			4			
890	YELLOW-THROATED GREENBUL *Atimastillas flavicollis* (Yellow-throated Leaflove)	f	48							6				4	6	5		3	5				5	3	6		5			4			5	2
898	YELLOW-WHISKERED GREENBUL *Eurillas latirostris*	F	27																														1	
899	LITTLE GREENBUL *Eurillas virens*	F	22																										3		3	1	5	

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
908	WHITE-THROATED GREENBUL *Phyllastrephus albigularis*	FF	24																														5	
914	COMMON BULBUL *Pycnonotus barbatus* (Yellow-vented Bulbul)	f	36		3	6	5		6	6	6	6		6	6	6	3	6	6	4	6		4	6	6	3	6	6	6	6	6	6	6	6
933	NORTHERN YELLOW WHITE-EYE *Zosterops senegalensis*	f	8							6							5													5				
941	BLACK-LORED BABBLER *Turdoides sharpei* (Sharpe's Pied Babbler)		82		4	6	6	3	5		6		3	3	5	2	6		6		5		4											
944	ARROW-MARKED BABBLER *Turdoides jardineii*		68									2				5	P	5		4					6	4								
958	RÜPPELL'S STARLING *Lamprotornis purpuroptera* (Rüppell's Long-tailed Starling)		77		6	5	6	6	6	6	5	6	6	6	6	6	6	5	6	6		4	6	6	6	6	5	6		5	1	6	4	3
961	LESSER BLUE-EARED STARLING *Lamprotornis chloropterus* (Glossy Starling)		64																				5	4		4								

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
965	VIOLET-BACKED STARLING *Cinnyricinclus leucogaster* (Plum-coloured Starling)	Af	43	AM						3						4							4		2			6						
970	BROWN-BACKED SCRUB ROBIN *Cercotrichas hartlaubi*	f	19																					1	3							4		6
971	WHITE-BROWED SCRUB ROBIN *Cercotrichas leucophrys*		16				1		5				5		1	4	5	2					P	5	5		3	5			5	5	6	
985	PALE FLYCATCHER *Bradornis pallidus* (Mouse-coloured Flycatcher)		23				3										1								2				1	1				
989	NORTHERN BLACK FLYCATCHER *Melaenornis edolioides*		30					6					2			2		3					4	4	1			4						
990	SOUTHERN BLACK FLYCATCHER *Melaenornis pammelaina*		28														6																	
994	WHITE-BROWED ROBIN CHAT *Cossypha heuglini*	f	35		3		3		6	5	5	1				3		6	5		6	6	5	2	4	5	6	2	5	5	3			
996	SNOWY-CROWNED ROBIN CHAT *Cossypha niveicapilla*	Fw	40							1																						3	

Table Att3.2-1 TSC Data, May 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Mass (g)	Conservation	Site 1	Site 2	Site 3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
1019	SOOTY CHAT *Myrmecocichla nigra*		41				**3**																**5**											
1037	AFRICAN THRUSH *Turdus pelios*	f	62		**3**	**5**	**6**	**3**	**2**	**5**	**6**	**6**		**1**	**1**	**4**	**3**	**6**	**3**	**1**	**5**	**6**	**5**	**4**		**6**	**4**			**6**	**5**			**5**
Number of species per site					35	(39)*	44	(31)*	44	47	28	28	58	46	38	54	46	49	44	33	(25)*	35	54	50	45	34	39	46	30	45	31	46	29	36
Number of **W**-species					**21**																													
Number of **w**-species					**26**																													
Total number of species					**186**																													

NOTES: P=– present outside count time; p = probable.

Waterbirds are shown in blue shading and birds found closer to water in blue text.

Table Att3.2-2 Dates, Times and Other Details of TSCs

Serial	KP	Way Point	Name	UTM	Date (May 2017)	Observer	Start Time	Temp °C
1	289	134/135	Ponds, savannah	36 M 0325777, 9897154/ 36M 0324986, 9896967	12	MK/DP/TS	1630	33
2	296	136	Kakuuto	36 M 0330474, 9907797	13	MK/DP/TS	815	25
3	275/6	137/8		36 M 0328238, 9908032/ 36M 0328926, 9908472	13	MK/DP/TS	1010	32
4	258	139	Camp	36 M 0331819, 9906841	13	MK/DP/TS	1405	30
5	259	141		36 M 0329916, 9928487	14	MK/DP/TS	750	26
6	252.5	142		36 M0329123, 9930953	14	MK/DP/TS	920	27
7	249	143		36M0328093, 9934267	14	MK/DP/TS	1235	26
8	232	144	lwengo FR	36M 0326914,9951412	15	MK/DP/TS	800	24
9	232	145	Valley	36M 0324792,9950699	15	MK/DP/TS	910	32
10	226	146	Camp	36 M0325361, 9956640	15	MK/DP/TS	1100	32
11	220	148		36M0323808, 9962490	15	MK/DP/TS	1310	30
12	218	149		36 M 0330289, 9965111	16	MK/DP/TS	740	27
13	210	150		36M 0323687, 9972297	15	MK/DP/TS	950	31

Table Att3.2-2 Dates, Times and Other Details of TSCs

Serial	KP	Way Point	Name	UTM	Date (May 2017)	Observer	Start Time	Temp °C
14	204	152		36 M 0323822, 9978114	15	MK/DP/TS	1140	27
15	187	153		36 M 0325275, 9995557	17	MK/DP/TS	840	28
16	182	154	Camp or pump	36N 0325204, 0000639	17	MK/DP/TS	1020	
17	169	155		36N0327055, 0013599	17	MK/DP/TS	1220	32
18	125	158	Camp	36N0336797, 0055162	18	MK/DP/TS	1235	31
19	127	159	Kiwumulo	36N0333512,0054704	18	MK/DP/TS	1335	28
20	138	160		36N0329350,0044109	19	MK/DP/TS	800	23
21	139	161		36N0330583,0042867	19	MK/DP/TS	1140	24
22	146	162/3		36N0336119, 0067182/36N0340979, 0040123	20	MK/DP/TS	1050	31
23	123	164		36N 0330608, 0036125	20	MK/DP/TS	1320	29
24	91	167		36N0338050, 0088298	21	MK/DP/TS	1930	27
25	79	168	Taala FR	36N 0333969, 0099134	21	MK/DP/TS	1155	28
26	49	170		36N 0316711, 0123297	23	MK/DP	1035	30

Table Att3.2-2 Dates, Times and Other Details of TSCs

Serial	KP	Way Point	Name	UTM	Date (May 2017)	Observer	Start Time	Temp °C
27	28	171		36N 0303617, 0139390	23	MK/DP	1335	32
28	8	173	Outside Wambabya FR	36N0293082, 0155370	24	MK/DP	925	29
29	8	172	Wambabya FR	36N 0293125, 0155360	24	MK/DP	810	26
30	6	174	Kajumbi village	36N0289666, 0156703	24	MK/DP	1125	33

Table Att3.2-3 Vegetation Cover for Native and Non-Native Plants

Site	Native Vegetation						Non-Native Vegetation						Human Use						
	Nonwoody		Woody				Nonwoody		Woody										
	0–1	1–3	0–1	1–3	3–8	>8	0–1	1–3	0–1	1–3	3–8	>8	Cultivation	Fallow	Fire	Tree Cutting	Grazing	People	Notes
2	88	1	5	5	1	0	0	0	9.4	10	0	0	0	0	0	1	1	1	0
3	62	0	28	26	9.2	0	0	0	5.5	0.8	0	0	0	0	0	0	2	0	0
4	85	0	13	5		0	0	0	6.3	0	0	0	1	0	0	2	1	1	0
5	88	0	11	8.3	0.8	0	0	0	2.5	1.7	0	0	0	0	0	1	2	0	0
6	72	0	18	12	1.7	0	0	0	3.7	2.5	1.7	0	0	0	0	2	2	0	0
7	65	0	23	28	5	0	0	0	8.8	16	11	3.8	1	0	0	1	1	1	0
8	62	0	12	5.8	0.8	0	0	0	5	10	21	0	0	0	0	2	2	2	0
9	97	2	3.7	5	12	0	0	0	1.7	0	0	0	0	0	0	1	0	0	0
10a	15	0	5	2.5	2.5	0	25	25	18	10	0	0	3	0	0	1	0	2	0
10b	65	2.5	39	34	8	0	0	0	0	0	0	0	0	0	0	0	1	0	0
11	97	0	6.2	5.3	1.5	0	0	0	0.2	0	0	0	0	0	0	1	1	1	0
12	87	2.3	22	20	12	0	0	0	0	0	0	0	0	0	0	0	1	0	0
13	80	0.8	17	11	2.5	0	4.2	0	0	0	0	0	1	0	0	0	2	1	0
14	80	0	21	18	11	0	0	0	4.2	2.5	0	0	0	0	0	1	2	1	0

Table Att3.2-3 Vegetation Cover for Native and Non-Native Plants

Site	Native Vegetation						Non-Native Vegetation						Human Use						
	Nonwoody		Woody				Nonwoody		Woody										
	0–1	1–3	0–1	1–3	3–8	>8	0–1	1–3	0–1	1–3	3–8	>8	Cultivation	Fallow	Fire	Tree Cutting	Grazing	People	Notes
15	95	0	10	16	15	0	0	0	0	0	0	0	0	0	0	0	2	1	0
16	98	0	6.3	12	15	0	0	0	0	0	0	0	0	0	0	0	1	0	0
17	88	0	7.5	10	11	0	0	0	8.8	0	0	0	1	0	0	1	0	0	0
18	43	2.5	24	3.8	0	0	15	2.5	0	0	0	0	2	1	0	1	0	1	0
19a	55	0	2.5	2.5	2.5	0	25	15	0	0	0	0	2	0	0	1	0	1	0
19b	63	0	39	40	24	0	0	0	2.3	0	0	0	0	0	0	1	2	1	0
20	73	0	32	30	11	0	0	0	0	0	0	0	0	0	0	1	2	1	0
21	83	0	28	23	13	0	0		0	0	0	0	0	0	1	2	2	1	0
22	73	0	29	26	7.8	0	0	0	0.8	0	0	0	0	0	1	1	2	0	0
23	60	6.7	37	37	12	0	0	0	1.2	0.7	0	0	1	0	0	2	0	1	0
24	92	0	9.2	15	12	0	0	0	1	0	0	0	0	0	0	1	2	0	0
25	49	7.5	18	13	13	12	15	10	4	4	4	4	2	0	1	2	0	0	0
26	92	0	11	13	5.8	0	0	0	0	0	0	0	0	0	0	1	0	0	0
27	62	4.2	62	16	7.5	1.7	0	0	1.5	2.5	0.8	0	1	0	0	1	1	2	0

Table Att3.2-3 Vegetation Cover for Native and Non-Native Plants

Site	Native Vegetation						Non-Native Vegetation						Human Use						
	Nonwoody		Woody				Nonwoody		Woody										
	0–1	1–3	0–1	1–3	3–8	>8	0–1	1–3	0–1	1–3	3–8	>8	Cultivation	Fallow	Fire	Tree Cutting	Grazing	People	Notes
28	86	6.3	12	8.3	5	0	0	0	0	0	0	0	1	1	0	1	0	1	0
29	2.5	0	90	77	50	15	0	0	0	0	0	0	0	0	0	0	0	0	0
30	6.7	0	24	24	5.8	0	9.2	0.8	2	9.2	8.3	0	2	0	0	1	0	1	0

NOTES: Data are averages of six sites per 60-minute counts.
Human data use is on a 0–3 scale.

Table Att3.2-4 Species of Conservation Importance

				Site 1	Site 2	Site3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site14	Site 15	Site 16	Site 17	Site18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
Red Listed Species	Global	Critically Endangered	G-CR																		1												
		Endangered	G-EN	1							1	1	1	1		1	1																
		Vulnerable	G-VU					1			1	1	1			1											1		1				
		Near Threatened	G-NT																														
		Data Deficient	DD																														
	East African	Critically Endangered	R-CR																														
		Endangered	R-EN																														
		Vulnerable	R-VU					1				1	1		1		2							5					1				
		Near Threatened	R-NT	1	1	1		1		1	2	5	1	1	1	1		1					1				2		1				
		Data Deficient	DD																														
		Regional Responsibility	R-RR	3	2	2	2	3	4	1	1	1	3	2	1	3	4	2	1	1	2	2	1	3	2	3	1	2		1	2		1

Table Att3.2-4 Species of Conservation Importance

				Site 1	Site 2	Site3	Camp	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site14	Site 15	Site 16	Site 17	Site18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26	Site 27	Site 28	Site 29	Site 30
	Uganda	Critically Endangered	U-CR																														
		Endangered	U-EN	1				1			1	1	1	1		1						1					1						
		Vulnerable	U-VU					1				1	1		2		1																
		Near Threatened	U-NT																														
		Data Deficient	DD																														
Habitat specialists	Forest specialist		FF					1	1																						2	1
	Forest generalist		F	4	8	9	5	6	3	5	3	5	6	2	7	4	3	4	6	4	3	4	7	6	6	4	5	5	6	3	4	13	5
	Other tree species		f	9	15	11	10	12	22	11	8	12	17	10	14	14	16	14	18	10	13	22	21	17	15	15	17	10	19	13	19	7	15
	Waterbird specialist		W	2			2	1			2	7	3	3	8	3	7	4	2		1						1	1	1		1	1	1
	Wetland visitor		w	9	9	10	6	11	13	4	6	12	8	5	8	8	6	9	4	2	6	7	7	4	5	6	7	5	1	3	10	1	6
	Grassland specialist		G	5	2	4	2	4	3		2	4	4	6	2	5	1			1	4	2	3	4	2	2	5	2	3	1	6		1
	Aerial species		Ae	1			2	1		1	2	2	1	1	2		1	3			2	2	2	1		2	2	1		1			

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
2	WHITE-FACED WHISTLING DUCK *Dendrocygna viduata* (White-faced Duck)	W	630											P	
4	WHITE-BACKED DUCK *Thalassornis leuconotus*	W	710	R-VU, U-VU			3								
20	YELLOW-BILLED DUCK *Anas undulata*	W	890				4								
62	RED-EYED DOVE *Streptopelia semitorquata*	f	195					P	P	P					
66	AFRICAN GREEN PIGEON *Treron calvus*	F	160											P	
69	BLUE-SPOTTED WOOD-DOVE *Turtur afer*	F	62											P	
70	TAMBOURINE DOVE *Turtur tympanistria*	F	67											P	
91	AFRICAN PALM-SWIFT *Cypsiurus parvus*	Ae	11						P					P	
94	WHITE-RUMPED SWIFT *Apus caffer*	Ae	22					P			P				
103	BLUE-HEADED COUCAL *Centropus monachus*	W	205						P	P			P	P	
118	RED-CHESTED CUCKOO *Cuculus solitarius*	AF	73												P
125	EASTERN PLANTAIN-EATER *Crinifer zonurus*		600							P				P	

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
132	ROSS'S TURACO *Musophaga rossae*	F	405					P		P					
139	BLACK CRAKE *Zapornia flavirostra*	W	50				2		P					P	
145	COMMON MOORHEN *Gallinula chloropus*	W	245				2				P				
152	GREY-CROWNED CRANE *Balearica regulorum*	WG	3520	R-NT, U-EN, G-EN								2			
165	ABDIM'S STORK *Ciconia abdimii*	AG	1200	AM		1		1							
171	HAMERKOP *Scopus umbretta*	w	420				1								
177	BLACK-CROWNED NIGHT-HERON *Nycticorax nycticorax*	PW	535	PM	1						P				
178	STRIATED HERON *Butorides striata* (Green-backed Heron)	W	215	R-NT, U-NT	2										
179	SQUACCO HERON *Ardeola ralloides*	W	300		P					P					
181	RUFOUS-BELLIED HERON *Ardeola rufiventris*	W	300	R-NT, U-VU							P				
182	CATTLE EGRET *Bubulcus ibis*	G	345					1	P						
183	GREY HERON *Ardea cinerea*	W	1430	R-NT					P	P				P	

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
184	BLACK-HEADED HERON *Ardea melanocephala*	w	1040				1							P	
186	PURPLE HERON *Ardea purpurea*	W	870	R-NT					P	P				P	
187	GREAT WHITE EGRET *Ardea alba* (Great Egret)	W	1110	R-VU										P	
188	INTERMEDIATE EGRET *Ardea intermedia* (Yellow-billed Egret)	W	500				1		P						
190	LITTLE EGRET *Egretta garzetta* (includes Western Reef Heron *E.gularis/schistacea*)	W	450		P										
196	HADADA IBIS *Bostrychia hagedash*	w	1260					4	P					P	
198	LONG-TAILED CORMORANT *Microcarbo africanus* (Reed Cormorant)	W	550				1							P	
203	WATER THICK-KNEE *Burhinus vermiculatus* (Water Dikkop)	W	320								P				
227	WATTLED LAPWING *Vanellus senegallus* (Plover)	W	225				1		P			P			
230	LESSER JACANA *Microparra capensis*	W	41	R-NT			1								

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
231	JACANA *Actophilornis africana*	W	150		**2**	**0**	**5**	**1**						**P**	**P**
290	AFRICAN HARRIER HAWK *Polyboroides typus* (Gymnogene)	f	680					**1**							
297	BLACK-CHESTED SNAKE-EAGLE *Circaetus pectoralis*								**P**						
308	LONG-CRESTED EAGLE *Lophaetus occipitalis*	F	1240					**P**							
314	AFRICAN HAWK-EAGLE *Aquila spilogaster*		1450						**P**						
316	WAHLBERG'S EAGLE *Hieraaetus wahlbergi*		1150						**P**						
337	BLACK KITE *Milvus migrans* (Race *M.parasiticus* sometimes treated as full species Yellow-billed Kite.)	pA	640	PM					**P**						
401	NUBIAN WOODPECKER *Campethera nubica*		61											**P**	
408	CARDINAL WOODPECKER *Dendropicos fuscescens*		31							**P**					
454	LILAC-BREASTED ROLLER *Coracias caudatus*		110						**P**						

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
458	BROAD-BILLED ROLLER *Eurystomus glaucurus*	Afw	115						P	P					P
462	MALACHITE KINGFISHER *Corythornis cristatus*	W	15		1				P						
465	PIED KINGFISHER *Ceryle rudis*	W	84		1	0	1	1							
470	WOODLAND KINGFISHER *Halcyon senegalensis*	A	36											P	P
489	BROWN-NECKED PARROT *Poicephalus robustus*	F	340	R-NT						P					
490	BROWN PARROT *Poicephalus meyeri* (Meyer's Parrot)		165											P	
529	GREY-HEADED BUSH-SHRIKE *Malaconotus blanchoti*		77					P						P	
533	NORTHERN PUFFBACK *Dryoscopus gambensis*	F	32					P							
546	TROPICAL BOUBOU *Laniarius aethiopicus*	f	46						P						
547	PAPYRUS GONOLEK *Laniarius mufumbiri*	w	45	G-NT,R-NT,U-VU					F	P			P	S	

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
601	RED-CHESTED SUNBIRD *Cinnyris erythrocercus*	W	8	R-RR				2	P						
608	COPPER SUNBIRD *Cinnyris cupreus*	fw	8											P	
626	YELLOW-MANTLED WIDOWBIRD *Euplectes macroura*	G	23						P						
627	WHITE-WINGED WIDOWBIRD *Euplectes albonotatus*	G	19												P
629	FAN-TAILED WIDOWBIRD *Euplectes axillaris* (Red-shouldered Widow)	w	23		1	1	1	1	P		P			P	
632	LITTLE WEAVER *Ploceus luteolus*		13					P							
640	NORTHERN BROWN-THROATED WEAVER *Ploceus castanops*	Wf	27	R-RR	1			S					P		
646	BLACK-HEADED WEAVER *Ploceus cucullatus* (Village Weaver)		39						P	P	P				
647	VIEILLOT'S BLACK WEAVER *Ploceus nigerrimus*	f	29						P	P					

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
651	YELLOW-BACKED WEAVER *Ploceus melanocephalus* (Black-headed Weaver)	W	28					**M**	**P**	**P**			**P**	**P**	**P**
686	BLACK-CROWNED WAXBILL *Estrilda nonnula*	f	7							**P**					
705	BRONZE MANNIKIN *Spermestes cucullata*		9											**P**	**P**
706	BLACK-AND-WHITE MANNIKIN *Spermestes bicolo*r (Red-backed Mannikin)	f	9											**P**	**P**
717	NORTHERN GREY-HEADED SPARROW *Passer griseus* (Parrot-billed Sparrow)		37					**P**							
811	BUFF-BELLIED WARBLER *Phyllolais pulchella*	f	6					**P**							
814	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	f	10					**P**							
817	GREY-CAPPED WARBLER *Eminia lepida*	fw	20	R-RR	**1**			**P**	**P**	**P**			**P**	**P**	
818	RED-FACED CISTICOLA *Cisticola erythrops*	w	14										**P**		
828	WINDING CISTICOLA *Cisticola marginatus*	w	12		**1**		**2**		**P**					**P**	
829	CARRUTHERS'S CISTICOLA *Cisticola carruthersi*	W	12	R-RR					**pP**						

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
844	RED-WINGED WARBLER *Prinia erythroptera*	F	12												P
850	WHITE-WINGED SWAMP WARBLER *Bradypterus carpalis*	W	23	R-RR					S	P				P	
866	LESSER SWAMP WARBLER *Acrocephalus gracilirostris* (Cape Reed Warbler)	w	14						pP						
870	WHITE-HEADED SAW-WING *Psalidoprocne albiceps* (White-headed Rough-wing)	f	10	R-RR				P							
873	LESSER STRIPED SWALLOW *Cecropis abyssinica*	Ae	18						P					P	
874	RUFOUS-CHESTED SWALLOW *Cecropis semirufa* (Red-breasted Swallow)	Ae	23					3		P		P			
878	WIRE-TAILED SWALLOW *Hirundo smithii*	w,Ae	12					2							
882	ANGOLA SWALLOW *Hirundo angolensis*	w,Ae	16						P		P			P	P
914	COMMON BULBUL *Pycnonotus barbatus* (Yellow-vented Bulbul)	f	36					P	P	P				P	P
975	SWAMP FLYCATCHER *Muscicapa aquatica*	W	11						S	S			P	S	P

Table Att3.2-5 Counts at Waterbird Sites

2016 No	COMMON NAME *Scientific Name* (Alternative Name)	Ecology		Conservation	Open Water				Swamp						
					Site 1			Site 2	Swamp 4	Swamp 5	Swamp 1	Swamp 2	Swamp 3	Swamp 6a	Swamp 6b
		Habitat	Mass (g)	Red list migrants	1.1	1.2	1.3								
994	WHITE-BROWED ROBIN-CHAT *Cossypha heuglini*	f	35											P	
996	SNOWY-CROWNED ROBIN-CHAT *Cossypha niveicapilla*	Fw	40							P					
1037	AFRICAN THRUSH *Turdus pelios*	f	62					P							
Total species per site					11	4	14	26	34	21	8	3	7	33	12
Total species					87										

NOTES: For open water, numbers are given but for swamps only presence. P = present; p = probable; M = many; S = several
Nonwaterbirds using the wetlands are also included.

Table Att3.2-6 Dates, Times and Other Details of Waterbird Surveys

	Serial	KP	Way Point	Name	UTM	Date May 2017	Observers	Start time	End time	Temp °C	Notable Weather
Open	1			Airstrip ponds		13	MK/DP/TS	1515	1625	30	Sun
	2		39	Kibale River		13	MK/DP/TS	1245	1315	31	Fine
Swamp 1	1	248		Pond		14	MK/DP/TS				
	2	168	156	6 km E.KP168		17	MK/DP/TS	1335	1350	32	Just before rain
	3		162	(10 km N. Mubende)		19	MK/DP	1525	1545	31	Warm
	4	147(10 km east of KP147) along same swamp	163			20	MK/DP/TS	730	930	26	Fine
	5	106	166			21	MK/DP/TS	750	940	28	Fine
	6a	37	169	Kafu River1		23	MK/DP	750	855	23	
	bb	37	169	Kafu River2		23	MK/DP	1215	1255	32	Warm, sun

Table Att3.2-7 Species of Conservation Concern, Waterbird Surveys

			Open Water				Swamps						
			Site 1			Site 2	Swamp 1	Swamp 2	Swamp 3	Swamp 4	Swamp 5	Swamp 6a	Swamp 6b
			1.1	1.2	1.3								
Global	Critically Endangered	G-CR					`						
	Endangered	G-EN						1					
	Vulnerable	G-VU											
	Near Threatened	G-NT							1	1	1	1	
	Data Deficient	DD											
East African	Critically Endangered	R-CR											
	Endangered	R-EN											
	Vulnerable	R-VU			1							1	
	Near Threatened	R-NT	1		1		1	1	1	3	4	3	
	Data Deficient	DD											
	Regional Responsibility	R-RR	2			4			2	4	2	2	6

Table Att3.2-7 Species of Conservation Concern, Waterbird Surveys

			Open Water				Swamps						
			Site 1			Site 2	Swamp 1	Swamp 2	Swamp 3	Swamp 4	Swamp 5	Swamp 6a	Swamp 6b
			1.1	1.2	1.3								
Uganda	Critically Endangered	U-CR											
	Endangered	U-EN											
	Vulnerable	U-VU			1		1		1	1	1	1	
	Near Threatened	U-NT	1										
	Data Deficient	DD											
Forest Specialist		FF										3	2
Forest Generalist		F				3					3		
Other Tree Specialist		f		1		9			2	6	6	5	3
Waterbird Specialist		W	8		10	5	4	2	4	12	7	11	3
Wetland Visitor		w	3	1	4	4	2		3	8	4	8	2
Grassland Specialist		G		1		1		1					
Aerial Species		Ae				3	2	1		3	1	3	1

ATTACHMENT A3.3 DRY SEASON SURVEY DATA

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
2	WHITE-FACED WHISTLING-DUCK *Dendrocygna viduata*	W														P								
20	YELLOW-BILLED DUCK *Anas undulata*	W													4						6	3		
25	HELMETED GUINEAFOWL *Numida meleagris*	G					2						5					P				4		
34	SCALY FRANCOLIN *Pternistis squamatus*	F		6		6	3	6	6			P	2		4	3		5			6	3		
36	RED-NECKED SPURFOWL *Pternistis afer*		R-VU, U-VU									5						1						
38	CRESTED FRANCOLIN *Dendroperdix sephaena*						2					6			4									
48	LITTLE GREBE *Tachybaptus ruficollis*	W																		P				
	RING-NECKED DOVE *Streptopelia capicola*				4	6	6	6	6	5		3	6	5	6	6	6	5		6	6		6	6
62	RED-EYED DOVE *Streptopelia semitorquata*	f		3	6		6		6	6	6	6	6	4	6	6	6	5	6	6	6	4	6	6
64	LAUGHING DOVE *Streptopelia senegalensis*								6						3	6				2	1	6	5	6

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
66	AFRICAN GREEN PIGEON *Treron calvus*	F					5	5	6	4	5		2		6	P	4							
69	BLUE-SPOTTED WOOD-DOVE *Turtur afer*	F		4	6	5	4			4	6	5	6		5	6	6	5	5	5		4	6	6
70	TAMBOURINE DOVE *Turtur tympanistria*	F										6												4
91	AFRICAN PALM-SWIFT *Cypsiurus parvus*													1										
104	WHITE-BROWED COUCAL *Centropus superciliosus*			6	1	6	5	6	4	6	1	6	5	6	6	6	5			3	5	6	5	3
107	JACOBIN CUCKOO *Clamator jacobinus*	A						P																
112	KLAAS'S CUCKOO *Chrysococcyx klaas*	f																5						
114	DIEDERIK CUCKOO *Chrysococcyx caprius*														3	2				5				
118	RED-CHESTED CUCKOO *Cuculus solitarius*	AF		2			6				6	6	6	6										
125	EASTERN PLANTAIN-EATER *Crinifer zonurus*			3			4	4	6	6	6	4	6	5	6	6	6	6	4		5			
126	BARE-FACED GO-AWAY-BIRD *Corythaixoides personatus*		R-RR	5	1	2	6	6	1	3		1			6	5	6	5	6	1		5	6	1
132	ROSS'S TURACO *Musophaga rossae*	F					6			6	6	5	5				5	4						
139	BLACK CRAKE *Zapornia flavirostra*	W																			5			

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
152	GREY-CROWNED CRANE *Balearica regulorum*	WG	G-EN, R-NT, U-EN	2	2	2						P		1	4	6		3	P	5	6	6		
163	AFRICAN OPENBILL STORK *Anastomus lamelligerus*	AwG					1					4												
165	ABDIM'S STORK *Ciconia abdimii*	AG	AM				P																	
166	AFRICAN WOOLLYNECK *Ciconia episcopus*	W	R-NT, U-VU												4									
168	SADDLEBILL *Ephippiorhynchus senegalensis*	W	R-VU, U-VU																					1
171	HAMERKOP *Scopus umbretta*	w		2			6		5			1			5		5		P				1	1
177	BLACK-CROWNED NIGHT-HERON *Nycticorax nycticorax*	pW	PM												P									
178	STRIATED HERON *Butorides striata*	W	R-NT, U-NT													2								
181	RUFOUS-BELLIED HERON *Ardeola rufiventris*	W	R-NT, U-VU																		3			
182	CATTLE EGRET *Bubulcus ibis*	G		1	4	5			3				2	2	6		5		4					
183	GREY HERON *Ardea cinerea*	W	R-NT		4										4									
184	BLACK-HEADED HERON *Ardea melanocephala*	w			5	3	6	5	4			4		4	5						3			6

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
187	GREAT WHITE EGRET *Ardea alba* (Great Egret)	W	R-VU												2									
188	INTERMEDIATE EGRET *Ardea intermedia*	W													4									
191	SACRED IBIS *Threskiornis aethiopicus*	W				3																		
196	HADADA IBIS *Bostrychia hagedash*	w		5		6	3	6	6		5	3	6	5	6	6	3	6		6	5	6	6	1
198	LONG-TAILED CORMORANT *Microcarbo africanus*	W													4									
221	LONG-TOED LAPWING *Vanellus crassirostris*	W				4																		
225	SENEGAL LAPWING *Vanellus lugubris*	AG			5	5																6		
226	CROWNED LAPWING *Vanellus coronatus*	G		1																				
227	WATTLED LAPWING *Vanellus senegallus*	W		6	3	5			1						6			4			6			
247	COMMON SNIPE *Gallinago gallinago*	PW	PM			3																		
250	COMMON SANDPIPER *Actitis hypoleucos*	PW	PM			2																		
290	AFRICAN HARRIER HAWK *Polyboroides typus*	f			6																1			
297	BLACK-CHESTED SNAKE-EAGLE *Circaetus pectoralis*				6				6								1					1	6	6

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
298	BROWN SNAKE-EAGLE *Circaetus cinereus*		R-NT					4							6						1			
299	WESTERN BANDED SNAKE-EAGLE *Circaetus cinerascens*	F	R-VU,G-VD										2											
308	LONG-CRESTED EAGLE *Lophaetus occipitalis*	F											5	3					P		6		5	
316	WAHLBERG'S EAGLE *Hieraaetus wahlbergi*																1						6	
319	LIZARD BUZZARD *Kaupifalco monogrammicus*	F											4			6		P	6					
321	GABAR GOSHAWK *Micronisus gabar*															4			6		4			
323	AFRICAN MARSH-HARRIER *Circus ranivorus*	W	R-NT		2												6							
328	SHIKRA *Accipiter badius*	F																					2	
332	OVAMBO SPARROWHAWK *Accipiter ovampensis*		R-NT, U-VU						P															
337	BLACK KITE *Milvus migrans*	pA	PM		2												1							
359	SPECKLED MOUSEBIRD *Colius striatus*			4	6	5	6		5	6		6	6	1	6	6	6	5	6	4	4	5	4	5
360	BLUE-NAPED MOUSEBIRD *Urocolius macrourus*				4			4	4					6		5	5		5		6			5

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
367	CROWNED HORNBILL *Lophoceros alboterminatus*	f									5													
368	AFRICAN PIED HORNBILL *Lophoceros fasciatus*	F																4						
370	AFRICAN GREY HORNBILL *Lophoceros nasutus*																		3					
378	BLACK-AND-WHITE CASQUED HORNBILL *Bycanistes subcylindricus*	F											3											
380	GREEN WOOD HOOPOE *Phoeniculus purpureus*											4			4			P						
393	LESSER HONEYGUIDE *Indicator minor*	f														1								
401	NUBIAN WOODPECKER *Campethera nubica*							4	3	3	5	5		6		3		2	2		2	6	3	
413	GREY WOODPECKER *Mesopicos goertae*	f				2					5													
426	YELLOW-RUMPED TINKERBIRD *Pogoniulus bilineatus*	F					4				3													
427	RED-FRONTED TINKERBIRD *Pogoniulus pusillus*						4					4												
428	YELLOW-FRONTED TINKERBIRD *Pogoniulus chrysoconus*	f					4	6		4					6			4		2		2		
431	SPOT-FLANKED BARBET *Tricholaema lacrymosa*		R-RR	3					5							2			5					

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
433	WHITE-HEADED BARBET *Lybius leucocephalus*							2							6									
437	DOUBLE-TOOTHED BARBET *Pogonornis bidentatus*	f												1		3	5							
441	WHITE-THROATED BEE-EATER *Merops albicollis*	Af	AM										1						6					
447	EUROPEAN BEE-EATER *Merops apiaster*	Pf	PM													4					4			5
451	LITTLE BEE-EATER *Merops pusillus*	G																		4	5	2	3	2
458	BROAD-BILLED ROLLER *Eurystomus glaucurus*	Afw				6		6	3	3	5				5				5				5	
460	AFRICAN PYGMY KINGFISHER *Ispidina picta*	fw				6	P			2							6		2					
462	MALACHITE KINGFISHER *Corythornis cristatus*	W																2	4					
470	WOODLAND KINGFISHER *Halcyon senegalensis*	A							1															
476	GREY KESTREL *Falco ardosiaceus*																		2					
483	AFRICAN HOBBY *Falco cuvieri*	F					6															4		
489	BROWN-NECKED PARROT *Poicephalus robustus*	F	R-NT				6								5									

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
490	BROWN PARROT *Poicephalus meyeri* (Meyer's Parrot)					3		5					1	2				2	4	5	4			
493	RED-HEADED LOVEBIRD *Agapornis pullarius*	F				5		6	3															
507	EASTERN BLACK-HEADED ORIOLE *Oriolus larvatus*	f													3		3							
518	CHESTNUT WATTLE-EYE *Dyaphorophyia castanea*	FF										P												
521	BROWN-THROATED WATTLE-EYE *Platysteira cyanea*	f				3		2					5					2				2		
526	BLACK-AND-WHITE SHRIKE FLYCATCHER *Bias musicus*	f									1		3											
529	GREY-HEADED BUSH-SHRIKE *Malaconotus blanchoti*							2	4			4	5					3				4		
533	NORTHERN PUFFBACK *Dryoscopus gambensis*	F					5	6	2	6			6			2			6		6		6	
537	BLACK-CROWNED TCHAGRA *Tchagra senegalus*														6							6		
540	SULPHUR-BREASTED BUSH-SHRIKE *Chlorophoneus sulfureopectus*	f						3	6	6				5		5								
546	TROPICAL BOUBOU *Laniarius aethiopicus*	f		4			6	6	6	5	4	6	6	3			6	5	6	6	6	5		4

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
547	PAPYRUS GONOLEK *Laniarius mufumbiri*	w	G-NT,R-NT,U-VU						2															
548	BLACK-HEADED GONOLEK *Laniarius erythrogaster*	f		5	6	6	4	6				6			6	6	6	6	6	5	6	3	6	6
550	FORK-TAILED DRONGO *Dicrurus adsimilis*	f/F			P			2	3	6	6	6	3	5	5			P	6	3		6	5	5
560	GREY-BACKED FISCAL *Lanius excubitoroides*	Afw		6	6	5	4	3	3			5		6	6	6	5	6	6	2	6	5	6	5
564	PIAPIAC *Ptilostomus afer*														5									
570	AFRICAN PARADISE FLYCATCHER *Terpsiphone viridis*	f											6											
580	GREEN-HEADED SUNBIRD *Cyanomitra verticalis*	F			2														2				2	
586	SCARLET-CHESTED SUNBIRD *Chalcomitra senegalensis*	f			1	5		3	5	3			4	4	3	3	5	P	6	1	2			
590	BRONZE SUNBIRD *Nectarinia kilimensis*	f							6															
600	MARICO SUNBIRD *Cinnyris mariquensis* (Mariqua Sunbird)				3	3	4			2	5	3	6		5	2		1					6	5
601	RED-CHESTED SUNBIRD *Cinnyris erythrocercus*	w	R-RR																			3		

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
606	SUPERB COPPER SUNBIRD *Cinnyris superbus*	F								2									6					
607	VARIABLE SUNBIRD *Cinnyris venustus*	f		4				3		4	6		6	6	5				1				6	6
608	COPPER SUNBIRD *Cinnyris cupreus*	fw						5		1					6		1				1	3		5
616	GROSBEAK WEAVER *Amblyospiza albifrons*	fw			3			5			1			2		1								
619	RED-BILLED QUELEA *Quelea quelea*	A												1					6				6	6
622	SOUTHERN RED BISHOP *Euplectes orix*	G																					3	6
626	YELLOW-MANTLED WIDOWBIRD *Euplectes macroura*	G														5	2							
629	FAN-TAILED WIDOWBIRD *Euplectes axillaris*	w			6	6	6	6	5			5		5	6	6	3	2	3	6	5	4	4	3
631	BAGLAFECHT WEAVER *Ploceus baglafecht*	f				4			3				6											
632	LITTLE WEAVER *Ploceus luteolus*								4			2			5	5	3	2						4
634	SPECTACLED WEAVER *Ploceus ocularis*	f						5			6					1	5		3				3	1
643	LESSER MASKED WEAVER *Ploceus intermedius*															3	3				5			6
646	BLACK-HEADED WEAVER *Ploceus cucullatus*				6	6		6	6				1		6	6	4			6		3	5	

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
651	YELLOW-BACKED WEAVER *Ploceus melanocephalus*	w		1	1	1										5	4	2	2	6	1	3	4	6
652	GOLDEN-BACKED WEAVER *Ploceus jacksoni*	w	R-RR															2		4				
665	RED-BILLED FIREFINCH *Lagonosticta senegala*			4	6	3	5	1	5				5		1	5		5		5	6	2		5
667	AFRICAN FIREFINCH *Lagonosticta rubricata*								2								2						6	
669	BROWN TWINSPOT *Clytospiza monteiri*	f																P						
676	RED-CHEEKED CORDON-BLEU *Uraeginthus bengalus*				1	4		P	3				3	5	5	4	3	5	5		6	6	5	5
680	BLACK-BELLIED SEEDCRACKER *Pyrenestes ostrinus*	F								4														
685	COMMON WAXBILL *Estrilda astrild*	wG						3								5	1			1				6
705	BRONZE MANNIKIN *Spermestes cucullata*			4	5	5	5	6	3	6			5	5			3	3	4	1		4	6	6
706	BLACK-AND-WHITE MANNIKIN *Spermestes bicolor*	f			5																			
709	PIN-TAILED WHYDAH *Vidua macroura*	G			5	5	6	6	4			3		5		6	4	1		4		1		1
713	VILLAGE INDIGOBIRD *Vidua chalybeata*																						1	5
717	NORTHERN GREY-HEADED SPARROW *Passer griseus*							6					6					6				6	6	

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
727	AFRICAN PIPIT *Anthus cinnamomeus*			5		4																		
725	PLAIN-BACKED PIPIT *Anthus leucophrys*	G			4											4	4							
728	YELLOW-THROATED LONGCLAW *Macronyx croceus*	G		5	4	4		P	2			2	1		6	5	5	2		4	5		5	1
732	WESTERN YELLOW WAGTAIL *Motacilla flava*	PwG	PM	5	2	6		1	5										5		6			
733	AFRICAN PIED WAGTAIL *Motacilla aguimp*	w					6	1	6															
742	YELLOW-FRONTED CANARY *Crithagra mozambica*				P			6	6			4	6	4	6	5	6		3	3	5		5	2
744	BRIMSTONE CANARY *Crithagra sulphurata* (Bully Canary)																			2				
786	NORTHERN CROMBEC *Sylvietta brachyura*									6						6								
791	MOUSTACHED GRASS-WARBLER *Melocichla mentalis*				2			6	5	6						6					5			
802	YELLOW-BREASTED APALIS *Apalis flavida*	f																2						
811	BUFF-BELLIED WARBLER *Phyllolais pulchella*	f						6	3	6	6					4								
814	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	f		4		6	6	3	5	6	6	6	5	6	5	5	5	5	5		6	4	6	5

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
817	GREY-CAPPED WARBLER *Eminia lepida*	fw	R-RR	3	4	5	4					3						2			5	4	4	5
818	RED-FACED CISTICOLA *Cisticola erythrops*	w		4		4	6	5	5			4	2	6		4		4	6					
821	TRILLING CISTICOLA *Cisticola woosnami*						6	4	6	5	1	5	3	3	4			5	6	3		6	6	4
828	WINDING CISTICOLA *Cisticola marginatus*	w		5	6	6						6			6				6		5			
831	CROAKING CISTICOLA *Cisticola natalensis*	G														3					1		5	
841	TAWNY-FLANKED PRINIA *Prinia subflava*	fw			5			6	3		4	6	6	1	5	5		4			6	4	6	
863	EURASIAN REED-WARBLER *Acrocephalus scirpaceus*	s	PM																					4
870	WHITE-HEADED SAW-WING *Psalidoprocne albiceps*	f	R-RR									5					2							
873	LESSER STRIPED SWALLOW *Cecropis abyssinica*													4										
874	RUFOUS-CHESTED SWALLOW *Cecropis semirufa*			4		5								6	5			1		4	3		2	
880	BARN SWALLOW *Hirundo rustica*	Pw	PM		6	6		6					5			6	6				5		6	3
882	ANGOLA SWALLOW *Hirundo angolensis*	w			3	2			4			3		6	2		3		3				4	6

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
886	COLLARED SAND MARTIN *Riparia riparia*	Pw	PM			3		3	5							4								
890	YELLOW-THROATED GREENBUL *Atimastillas flavicollis*	f							4				1					4	4	6			3	6
899	LITTLE GREENBUL *Eurillas virens*	F									4													
914	COMMON BULBUL *Pycnonotus barbatus*	f		3	5	6	5	6	6	6	6	6	6	6		6	6	6	5	6	6	3	5	5
933	NORTHERN YELLOW WHITE-EYE *Zosterops senegalensis*	f						6	4				3	3								5		3
941	BLACK-LORED BABBLER *Turdoides sharpei*			4		5	6	6	6	5	6	5	5	6	3	6	6	3	6	5		6	3	6
943	BROWN BABBLER *Turdoides plebejus*				6	6										5					6			
944	ARROW-MARKED BABBLER *Turdoides jardineii*																					P		
958	RÜPPELL'S STARLING *Lamprotornis purpuroptera*			6	6	6	6	5	5	6		6		1	6	6	6	6	6	6	6	6	6	4
959	SPLENDID STARLING *Lamprotornis splendidus*	F						P	1		2		1	1										
965	VIOLET-BACKED STARLING *Cinnyricinclus leucogaster*	Af	AM					4	3	3	6					2	5		5					
970	BROWN-BACKED SCRUB-ROBIN *Cercotrichas hartlaubi*	f				6					4													

Table Att3.3-1 TSC Data, December 2017

2016 No	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 1/1	Site 1/2	Site 1/3	Site 3/1	Site 3/2	Site 3/3	Site 3a/1 Forest Remnant	Site 3a/2 Forest Remnant	Site 5/1	Site 5/2[x]	Site 5/3	Site 9/1	Site 9/2	Site 9/3	Site 10/1	Site 10/2	Site 11/1	Site 11/2	Site 13/1	Site 13/2	Site 13/3
971	WHITE-BROWED SCRUB-ROBIN *Cercotrichas leucophrys*				5		1	4	6			5	3		5	5			5	1	3	5		1
972	SPOTTED FLYCATCHER *Muscicapa striata*	P	PM														4							
985	PALE FLYCATCHER *Bradornis pallidus*						3															1		
989	NORTHERN BLACK-FLYCATCHER *Melaenornis edolioides*							2							2									
990	SOUTHERN BLACK-FLYCATCHER *Melaenornis pammelaina*																					6		
994	WHITE-BROWED ROBIN-CHAT *Cossypha heuglini*	f		3		5	3	4	3	5	4	6	4			4	4				1		6	6
1003	SPOTTED PALM-THRUSH *Cichladusa guttata*					5																		
1019	SOOTY CHAT *Myrmecocichla nigra*				1	1	3						1				5							
1021	NORTHERN WHEATEAR *Oenanthe oenanthe*	P	PM		P																			
1037	AFRICAN THRUSH *Turdus pelios*	f		3			6	1		3	4	2				5	2	1		1		3		
Number of species per site				**35**	**45**	**53**	**44**	**56**	**60**	**35**	**31**	**44**	**50**	**41**	**58**	**59**	**53**	**46**	**46**	**38**	**51**	**46**	**49**	**51**
Total number of species				**178**																				

NOTES: P = present outside count time; p = probable.

*X site for this count was about 4 km south of this site for counts 1 and 3 but with similar natural vegetation. Wetland specialists are shaded blue.

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
	STRUTHIONIDAE																
2	WHITE-FACED WHISTLING-DUCK *Dendrocygna viduata*	W												P			
3	FULVOUS WHISTLING-DUCK *Dendrocygna bicolor*	W	AM								1		p				
4	WHITE-BACKED DUCK *Thalassornis leuconotus*	W	R-VU, U-VU								1						
8	KNOB-BILLED DUCK *Sarkidiornis melanotos*	W						3		3							
20	YELLOW-BILLED DUCK *Anas undulata*	W									2						
62	RED-EYED DOVE *Streptopelia semitorquata*	f					6	4			4						
66	AFRICAN GREEN-PIGEON *Treron calvus*	F										P	p	P			
69	BLUE-SPOTTED WOOD-DOVE *Turtur afer*	F												P			
70	TAMBOURINE DOVE *Turtur tympanistria*	F												P			

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
91	AFRICAN PALM-SWIFT *Cypsiurus parvus*													P			
94	WHITE-RUMPED SWIFT *Apus caffer*																
103	BLUE-HEADED COUCAL *Centropus monachus*	W										P		P			1
118	RED-CHESTED CUCKOO *Cuculus solitarius*	AF													P		
125	EASTERN PLANTAIN-EATER *Crinifer zonurus*													P			
132	ROSS'S TURACO *Musophaga rossae*	F															
139	BLACK CRAKE *Zapornia flavirostra*	W										P		P			
143	PURPLE SWAMPHEN *Porphyrio porphyrio*	W					2	2									
145	COMMON MOORHEN *Gallinula chloropus*	W			1		2										

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
152	GREY-CROWNED CRANE *Balearica regulorum*	WG	VU,R-NT, U-EN				6	2									
162	YELLOW-BILLED STORK *Mycteria ibis*	W								1	2						
165	ABDIM'S STORK *Ciconia abdimii*	AG	AM							1	1						
171	HAMERKOP *Scopus umbretta*	w				1						1					
177	BLACK-CROWNED NIGHT-HERON *Nycticorax nycticorax*	pW	PM	1				1			2						
178	STRIATED HERON *Butorides striata*	W	R-NT, U-NT	2													
179	SQUACCO HERON *Ardeola ralloides*	W		P			1										2
181	RUFOUS-BELLIED HERON *Ardeola rufiventris*	W	R-NT, U-VU		1					2	2						
182	CATTLE EGRET *Bubulcus ibis*	G			12		2										
183	GREY HERON *Ardea cinerea*	W	R-NT				c370			12		1		P			

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
184	BLACK-HEADED HERON *Ardea melanocephala*	w			1		1			3	1			P			
186	PURPLE HERON *Ardea purpurea*	W	R-NT				1	1		3	1			P			
187	GREAT WHITE EGRET *Ardea alba*	W	R-VU											P			
188	INTERMEDIATE EGRET *Ardea intermedia*	W															1
190	LITTLE EGRET *Egretta garzetta*	W		P				1									
191	SACRED IBIS *Threskiornis aethiopicus*	W							1		1						
196	HADADA IBIS *Bostrychia hagedash*	w								17	1			P		2	4
198	LONG-TAILED CORMORANT *Microcarbo africanus*	W					1					4		P			7
203	WATER THICK-KNEE *Burhinus vermiculatus*	W			1			1			1						

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
208	BLACK-WINGED STILT *Himantopus himantopus*	pW	PM								5						
211	COMMON RINGED PLOVER *Charadrius hiaticula*	PW	PM								5						
221	LONG-TOED LAPWING *Vanellus crassirostris*	W			2		3										3
222	SPUR-WINGED LAPWING *Vanellus spinosus*	WG					3		2	5							
227	WATTLED LAPWING *Vanellus senegallus*	W								6	7						2
230	LESSER JACANA *Microparra capensis*	W	R-NT				2	1		25	4						
231	JACANA *Actophilornis africana*	W		2	6		1	1						P	P		
238	RUFF *Calidris pugnax*	PW	PM			0	4	5	1	8	2	1					
250	COMMON SANDPIPER *Actitis hypoleucos*	PW	PM		1						5						
251	GREEN SANDPIPER *Tringa ochropus*	PW	PM				2			2	1						

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
253	COMMON GREENSHANK *Tringa nebularia*	PW	PM							1	1					1	
255	WOOD SANDPIPER *Tringa glareola*	PW	PM				2			3	1						
290	AFRICAN HARRIER HAWK *Polyboroides typus*	f					1			1							
297	BLACK-CHESTED SNAKE-EAGLE *Circaetus pectoralis*											1					
308	LONG-CRESTED EAGLE *Lophaetus occipitalis*	F															
314	AFRICAN HAWK-EAGLE *Aquila spilogaster*											P					
316	WAHLBERG'S EAGLE *Hieraaetus wahlbergi*																
322	WESTERN MARSH HARRIER *Circus aeruginosus*	Pw	PM													1	
323	AFRICAN MARSH HARRIER *Circus ranivorus*	W	R-NT														

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
336	AFRICAN FISH-EAGLE *Haliaeetus vocifer*	W			1					1							
337	BLACK KITE *Milvus migrans*	pA	PM														
401	NUBIAN WOODPECKER *Campethera nubica*													P			
408	CARDINAL WOODPECKER *Dendropicos fuscescens*																
450	BLUE-BREASTED BEE-EATER *Merops variegatus*	W														3	
454	LILAC-BREASTED ROLLER *Coracias caudatus*																
458	BROAD-BILLED ROLLER *Eurystomus glaucurus*	Afw													P		
462	MALACHITE KINGFISHER *Corythornis cristatus*	W		1									p				
465	PIED KINGFISHER *Ceryle rudis*	W		1	1												
467	GREY-HEADED KINGFISHER *Halcyon leucocephala*	Afw				0	7	1			1	1					

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
470	WOODLAND KINGFISHER *Halcyon senegalensis*	A											p	P	P		
489	BROWN-NECKED PARROT *Poicephalus robustus*	F	R-NT										p				
490	BROWN PARROT *Poicephalus meyeri*													P			
521	BROWN-THROATED WATTLE-EYE *Platysteira cyanea*	f															
529	GREY-HEADED BUSH-SHRIKE *Malaconotus blanchoti*												p	P			
533	NORTHERN PUFFBACK *Dryoscopus gambensis*	F										P					
546	TROPICAL BOUBOU *Laniarius aethiopicus*	f										P					
547	PAPYRUS GONOLEK *Laniarius mufumbiri*	w	G-NT,R-NT,U-VU										p	S		3	3
548	BLACK-HEADED GONOLEK *Laniarius erythrogaster*	f											p				

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
600	MARICO SUNBIRD *Cinnyris mariquensis*												p				
601	RED-CHESTED SUNBIRD *Cinnyris erythrocercus*	W	R-RR										p				
608	COPPER SUNBIRD *Cinnyris cupreus*	fw										2		P			
626	YELLOW-MANTLED WIDOWBIRD *Euplectes macroura*	G											p				
627	WHITE-WINGED WIDOWBIRD *Euplectes albonotatus*	G													P		
629	FAN-TAILED WIDOWBIRD *Euplectes axillaris*	w		1										P			
632	LITTLE WEAVER *Ploceus luteolus*					1		1				1					
640	NORTHERN BROWN-THROATED WEAVER *Ploceus castanops*	fW	R-RR	1								P					
646	BLACK-HEADED WEAVER *Ploceus cucullatus*											S					

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
647	VIEILLOT'S BLACK WEAVER *Ploceus nigerrimus*	f															
651	YELLOW-BACKED WEAVER *Ploceus melanocephalus*	W												P	P	1	6
686	BLACK-CROWNED WAXBILL *Estrilda nonnula*	f										M	p				
705	BRONZE MANNIKIN *Spermestes cucullata*													P	P		
706	BLACK-AND-WHITE MANNIKIN *Spermestes bicolor*	f											p	P	P		
717	NORTHERN GREY-HEADED SPARROW *Passer griseus*																
732	WESTERN YELLOW WAGTAIL *Motacilla flava*	PwG	PM		2							P	p				
811	BUFF-BELLIED WARBLER *Phyllolais pulchella*	f					3			1	3						

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
814	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	f										P					
817	GREY-CAPPED WARBLER *Eminia lepida*	fw	R-RR	1								P	p	P		2	4
818	RED-FACED CISTICOLA *Cisticola erythrops*	w										P	p				
828	WINDING CISTICOLA *Cisticola marginatus*	w		1									p	P		1	5
829	CARRUTHERS'S CISTICOLA *Cisticola carruthersi*	W	R-RR					2									
844	RED-WINGED WARBLER *Prinia erythroptera*	F													P		
850	WHITE-WINGED SWAMP-WARBLER *Bradypterus carpalis*	W	R-RR											P		1	1
866	LESSER SWAMP-WARBLER *Acrocephalus gracilirostris*	w														2	2
867	GREATER SWAMP-WARBLER *Acrocephalus rufescens*	W															3

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
870	WHITE-HEADED SAW-WING *Psalidoprocne albiceps*	f	R-RR														
873	LESSER STRIPED SWALLOW *Cecropis abyssinica*											P		P			
874	RUFOUS-CHESTED SWALLOW *Cecropis semirufa*																
878	WIRE-TAILED SWALLOW *Hirundo smithii*	w										3	p				
880	BARN SWALLOW *Hirundo rustica*	Pw	PM									2				1	1
882	ANGOLA SWALLOW *Hirundo angolensis*	w												P	P		
886	COLLARED SAND MARTIN *Riparia riparia*	PW	PM														10
914	COMMON BULBUL *Pycnonotus barbatus*	f												P	P		
958	RÜPPELL'S STARLING *Lamprotornis purpuroptera*											P	p				

Table Att3.3-2 Counts at Waterbird Sites, December

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Open Water										Swamp			
		Habitat	Red List Migrants	Site 1/1	Site 1/2	Site 2/1	Site 2/2	Site 3/1	Site 3/2	Site 4/2	Site 5/2	Site 6/1	Site 6/2	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d
959	SPLENDID STARLING *Lamprotornis splendidus*	F											p				
975	SWAMP FLYCATCHER *Muscicapa aquatica*	W											p	S	P	4	4
994	WHITE-BROWED ROBIN-CHAT *Cossypha heuglini*	f												P			
996	SNOWY-CROWNED ROBIN-CHAT *Cossypha niveicapilla*	Fw											p				
1037	AFRICAN THRUSH *Turdus pelios*	f										p					
Number of species per site				11	11	4	20	14	3	18	24	26	22	33	12	12	17
Total number of species				115													

Table Att3.3-3 Counts of Waterbirds at the Kafu River, January 2018

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Swamps					
		Habitat	Red List Migrants	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d	Swamp 6e	Swamp 6f
2	WHITE-FACED WHISTLING-DUCK *Dendrocygna viduata*	W		**P**					
8	KNOB-BILLED DUCK *Sarkidiornis melanotos*	W							**3**
62	RED-EYED DOVE *Streptopelia semitorquata*	f							**P**
66	AFRICAN GREEN PIGEON *Treron calvus*	F		**P**					**P**
70	TAMBOURINE DOVE *Turtur tympanistria*	F		**P**				**P**	**P**
91	AFRICAN PALM-SWIFT *Cypsiurus parvus*			**P**					
166	AFRICAN WOOLLYNECK *Ciconia episcopus*	W	R-NT, U-VU					**1**	
168	SADDLEBILL *Ephippiorhynchus senegalensis*	W	R-VU, U-VU						**1**
103	BLUE-HEADED COUCAL *Centropus monachus*	W		**P**			**1**	**2**	
118	RED-CHESTED CUCKOO *Cuculus solitarius*	AF			**P**				
125	EASTERN PLANTAIN-EATER *Crinifer zonurus*			**P**				**P**	**P**
181	RUFOUS-BELLIED HERON *Ardeola rufiventris*	W	R-NT, U-VU						**1**

Table Att3.3-3 Counts of Waterbirds at the Kafu River, January 2018

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Swamps					
		Habitat	Red List Migrants	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d	Swamp 6e	Swamp 6f
132	ROSS'S TURACO *Musophaga rossae*	F							**P**
139	BLACK CRAKE *Zapornia flavirostra*	W		**P**					
186	PURPLE HERON *Ardea purpurea*	W	R-NT					**3**	**1**
152	GREY-CROWNED CRANE *Balearica regulorum*	WG	VU,R-NT, U-EN						**3**
163	AFRICAN OPENBILL *Anastomus lamelligerus* (African Openbill)	AwG							**25**
								1	
319	LIZARD BUZZARD *Kaupifalco monogrammicus*	F						**P**	**P**
179	SQUACCO HERON *Ardeola ralloides*	W					**2**		**1**
182	CATTLE EGRET *Bubulcus ibis*	G							**14**
378	BLACK-AND-WHITE CASQUED HORNBILL *Bycanistes subcylindricus*	F						**P**	**P**
183	GREY HERON *Ardea cinerea*	W	R-NT	**P**					
184	BLACK-HEADED HERON *Ardea melanocephala*	w		**P**					

Table Att3.3-3 Counts of Waterbirds at the Kafu River, January 2018

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Swamps					
		Habitat	Red List Migrants	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d	Swamp 6e	Swamp 6f
186	PURPLE HERON *Ardea purpurea*	W	R-NT	**P**					
437	DOUBLE-TOOTHED BARBET *Pogonornis bidentatus*	f						**P**	
187	GREAT WHITE EGRET *Ardea alba*	W	R-VU	**P**					
188	INTERMEDIATE EGRET *Ardea intermedia*	W					**1**		
190	LITTLE EGRET *Egretta garzetta*	W							**2**
191	SACRED IBIS *Threskiornis aethiopicus*	W							**21**
196	HADADA IBIS *Bostrychia hagedash*	w		**P**		**2**	**4**	**2**	**16**
198	LONG-TAILED CORMORANT *Microcarbo africanus*	W		**P**			**7**		**2**
221	LONG-TOED LAPWING *Vanellus crassirostris*	W					**3**		**1**
227	WATTLED LAPWING *Vanellus senegallus*	W					**2**		
231	JACANA *Actophilornis africana*	W		**P**	**P**				
250	COMMON SANDPIPER *Actitis hypoleucos*	PW	PM						**1**

Table Att3.3-3 Counts of Waterbirds at the Kafu River, January 2018

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Swamps					
		Habitat	Red List Migrants	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d	Swamp 6e	Swamp 6f
253	COMMON GREENSHANK *Tringa nebularia*	PW	PM			**1**			
290	AFRICAN HARRIER-HAWK *Polyboroides typus*	f							**P**
322	WESTERN MARSH HARRIER *Circus aeruginosus*	Pw	PM			**1**			
323	AFRICAN MARSH HARRIER *Circus ranivorus*	W	R-NT					**1**	**1**
336	AFRICAN FISH-EAGLE *Haliaeetus vocifer*	W							**1**
401	NUBIAN WOODPECKER *Campethera nubica*			**P**					**P**
450	BLUE-BREASTED BEE-EATER *Merops variegatus*	w				**3**		**1**	
458	BROAD-BILLED ROLLER *Eurystomus glaucurus*	Afw			**P**			**P**	**P**
462	MALACHITE KINGFISHER *Corythornis cristatus*	W							**2**
468	STRIPED KINGFISHER *Halcyon chelicuti*							**P**	
476	GREY KESTREL *Falco ardosiaceus*								**P**
470	WOODLAND KINGFISHER *Halcyon senegalensis*	A		**P**	**P**				

Table Att3.3-3 Counts of Waterbirds at the Kafu River, January 2018

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Swamps					
		Habitat	Red List Migrants	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d	Swamp 6e	Swamp 6f
490	BROWN PARROT *Poicephalus meyeri*			**P**					**P**
529	GREY-HEADED BUSH-SHRIKE *Malaconotus blanchoti*			**P**					
547	PAPYRUS GONOLEK *Laniarius mufumbiri*	W	G-NT,R-NT,U-VU	**S**		**3**	**3**	**4**	**5**
608	COPPER SUNBIRD *Cinnyris cupreus*	fw		**P**					
627	WHITE-WINGED WIDOWBIRD *Euplectes albonotatus*	G			**P**				
629	FAN-TAILED WIDOWBIRD *Euplectes axillaris*	w		**P**					
651	YELLOW-BACKED WEAVER *Ploceus melanocephalus*	W		**P**	**P**	**1**	**6**	**1**	**2**
705	BRONZE MANNIKIN *Spermestes cucullata*			**P**	**P**			**P**	
706	BLACK-AND-WHITE MANNIKIN *Spermestes bicolor*	f		**P**	**P**			**P**	
732	WESTERN YELLOW WAGTAIL *Motacilla flava*	PwG	PM					**P**	
817	GREY-CAPPED WARBLER *Eminia lepida*	fw	R-RR	**P**		**2**	**4**	**1**	**4**
818	RED-FACED CISTICOLA *Cisticola erythrops*	w						**P**	

Table Att3.3-3 Counts of Waterbirds at the Kafu River, January 2018

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Swamps					
		Habitat	Red List Migrants	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d	Swamp 6e	Swamp 6f
828	WINDING CISTICOLA *Cisticola marginatus*	w		**P**		**1**	**5**	**1**	**4**
829	CARRUTHERS'S CISTICOLA *Cisticola carruthersi*	W	R-RR						**3**
844	RED-WINGED WARBLER *Prinia erythroptera*	F			**P**				
850	WHITE-WINGED SWAMP-WARBLER *Bradypterus carpalis*	W	R-RR	**P**		**1**	**1**	**1**	**1**
866	LESSER SWAMP-WARBLER *Acrocephalus gracilirostris*	W				**2**	**2**		
867	GREATER SWAMP-WARBLER *Acrocephalus rufescens*	W					**3**	**1**	**2**
873	LESSER STRIPED SWALLOW *Cecropis abyssinica*			**P**					
880	BARN SWALLOW *Hirundo rustica*	Pw	PM			**1**	**1**	**1**	
882	ANGOLA SWALLOW *Hirundo angolensis*	w		**P**	**P**				
886	COLLARED SAND MARTIN *Riparia riparia*	Pw	PM				**10**		
914	COMMON BULBUL *Pycnonotus barbatus*	f		**P**	**P**				**2**
911	TORO OLIVE GREENBUL *Phyllastrephus hypochloris*	FF	R-VU, U-NT					**1**	

Table Att3.3-3 Counts of Waterbirds at the Kafu River, January 2018

2016 No.	COMMON NAME *Scientific Name* (Alternative Name)	Ecology	Conservation	Swamps					
		Habitat	Red List Migrants	Swamp 6a	Swamp 6b	Swamp 6c	Swamp 6d	Swamp 6e	Swamp 6f
958	RÜPPELL'S STARLING *Lamprotornis purpuroptera*								**P**
975	SWAMP FLYCATCHER *Muscicapa aquatica*	W		**S**	**P**	**4**	**4**	**1**	**3**
Total species				75					

NOTES: P = present; p = probable; M = many; S = several.
Nonwaterbirds using the wetlands are also included.

Table Att3.3-4 Dates, Times and Other Details of TSCs

Serial	KP	Name	Date 2017	Observers	Start Time	Temp °C	Notable Weather
1/2	289	Ponds, savannah	15-Dec	DEP/MK	1500	35	Hot, sun
1/3	289		16-Dec	DEP/MK	710	22	Cool
3/2	274		16-Dec	DEP/MK	950	23	Cool
3/3	274		17-Dec	DEP/MK	915	28	Sun
3a/1	274	Forest remnant	16-Dec	DEP/MK	1050	26	Mild
3a/2	274	Forest remnant	17-Dec	DEP/MK	1015	28	Dull
5/2[X]	258		17-Dec	DEP/MK	710	22	Mild
5/3	258		17-Dec	DEP/MK	1710	30	Warm, sun
9/2	232	Starling	18-Dec	DEP/MK	820	23	Dull
9/3	232	Starling	18-Dec	DEP/MK	1240	33	Dull
10/2	226	Kivunikidde	18-Dec	DEP/MK	1035	31	Sun
11/2	220	Lwenziga	19-Dec	DEP/MK	825	27	Fine
13/2	210	Kimbejja	19-Dec	DEP/MK	1025	32	Sun
13/3	210	Kimbejja	19-Dec	DEP/MK	1100	32	Sun

Table Att3.3-5 Dates, Times and Other Details of Waterbird Surveys

Serial	KP	Name	Date 2017	Observers	Start time	End time	Temp °C
Airstrip ponds	289	Airstrip ponds	15-Dec	DEP/MK	1210	1430	33
R. Kibale	277	R. Kibale	16-Dec	DEP/MK	835	905	22
6c	37	R. Kafu	20-Dec	DEP/MK	1405	1500	35
6d	37	R. Kafu	21-Dec	DEP/MK	715	810	20
	37	R. Kafu	16-Jan 2018	DEP/MK	1045	1135	30
	37	R. Kafu	17-Jan 2018	DEP/MK	640	730	18

ATTACHMENT A3.4 TSCS WAMBABYA SURVEY DATA

Table Att3.4-1 TSC Data Around Wambabya FR

Atlas No.	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 8/1 (site 29 in May 2017 – Shown for Comparison)	Site 8/2	Site 8/3	Site 8/4	Site 8/5
34	SCALY FRANCOLIN *Pternistis squamatus*	F					**6**	
62	RED-EYED DOVE *Streptopelia semitorquata*	f		**4**		**5**	**6**	**1**
64	LAUGHING DOVE *Streptopelia senegalensis*			**6**	**6**			
66	AFRICAN GREEN PIGEON *Treron calvus*	F		**2**		**2**		**4**
69	BLUE-SPOTTED WOOD-DOVE *Turtur afer*	F		**1**	**6**	**6**	**5**	**6**
70	TAMBOURINE DOVE *Turtur tympanistria*	F		**6**	**6**	**6**	**6**	**5**
104	WHITE-BROWED COUCAL *Centropus superciliosus*			**4**				
106	CHATTERING YELLOWBILL *Ceuthmochares aereus*	F		**3**				**5**
118	RED-CHESTED CUCKOO *Cuculus solitarius*	AF		**6**				**6**
123	GREAT BLUE TURACO *Corythaeola cristata*	F				**5**	**2**	
125	EASTERN PLANTAIN-EATER *Crinifer zonurus*						**5**	

Table Att3.4-1 TSC Data Around Wambabya FR

Atlas No.	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 8/1 (site 29 in May 2017 – Shown for Comparison)	Site 8/2	Site 8/3	Site 8/4	Site 8/5
132	ROSS'S TURACO *Musophaga rossae*	F		**4**			**2**	**5**
148	WHITE-SPOTTED FLUFFTAIL *Sarothrura pulchra* (White-spotted Pygmy-crake)	FW		**2**				
196	HADADA IBIS *Bostrychia hagedash*	w					**P**	
291	PALM-NUT VULTURE *Gypohierax angolensis*			**4**				
299	WESTERN BANDED SNAKE-EAGLE *Circaetus cinerascens*	F	R-VU		**5**			
308	LONG-CRESTED EAGLE *Lophaetus occipitalis*	F			**5**			
331	LITTLE SPARROWHAWK *Accipiter minullus*	f					**4**	
359	SPECKLED MOUSEBIRD *Colius striatus*					**5**		
367	CROWNED HORNBILL *Lophoceros alboterminatus*	f				**1**		
375	BLACK-CASQUED HORNBILL *Ceratogymna atrata*	FF			**6**		**6**	**6**
377	WHITE-THIGHED HORNBILL *Bycanistes albotibialis*	FF		**1**		**4**		**3**
378	BLACK-AND-WHITE CASQUED HORNBILL *Bycanistes subcylindricus*	F		**6**		**6**		

Table Att3.4-1 TSC Data Around Wambabya FR

Atlas No.	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 8/1 (site 29 in May 2017 – Shown for Comparison)	Site 8/2	Site 8/3	Site 8/4	Site 8/5
410	BEARDED WOODPECKER *Chloropicus namaquus*	f						**4**
421	SPECKLED TINKERBIRD *Pogoniulus scolopaceus*	F						**3**
426	YELLOW-RUMPED TINKERBIRD *Pogoniulus bilineatus*	F		**5**	**4**	**6**	**6**	**5**
437	DOUBLE-TOOTHED BARBET *Pogonornis bidentatus*	f		**3**				
441	WHITE-THROATED BEE-EATER *Merops albicollis*	Af	AM		**5**	**5**	**4**	**5**
450	BLUE-BREASTED BEE-EATER *Merops variegatus*	W						**p**
460	AFRICAN PYGMY KINGFISHER *Ispidina picta*	fw			**4**	**4**	**4**	**2**
462	MALACHITE KINGFISHER *Corythornis cristatus*	W				**4**		**3**
468	STRIPED KINGFISHER *Halcyon chelicuti*			**6**				
470	WOODLAND KINGFISHER *Halcyon senegalensis*	A				**1**	**4**	**2**
488	GREY PARROT *Psittacus erithacus*	FF	G-NT,R-NT,U-VU					**3**
506	WESTERN BLACK-HEADED ORIOLE *Oriolus brachyrynchus*	F					**1**	**3**

Table Att3.4-1 TSC Data Around Wambabya FR

Atlas No.	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 8/1 (site 29 in May 2017 – Shown for Comparison)	Site 8/2	Site 8/3	Site 8/4	Site 8/5
518	CHESTNUT WATTLE-EYE *Dyaphorophyia castanea*	FF			**3**	**6**		**3**
521	BROWN-THROATED WATTLE-EYE *Platysteira cyanea* (Common Wattle-eye)	f		**1**				
533	NORTHERN PUFFBACK *Dryoscopus gambensis*	F		**6**	**4**		**6**	
540	SULPHUR-BREASTED BUSH-SHRIKE *Chlorophoneus sulfureopectus* (Orange-breasted Bush-shrike)	f					**2**	**5**
571	RED-BELLIED PARADISE FLYCATCHER *Terpsiphone rufiventer*	F			**P**			**2**
580	GREEN-HEADED SUNBIRD *Cyanomitra verticalis*	F				**4**		
583	OLIVE SUNBIRD *Cyanomitra olivacea* (includes Western Olive Sunbird, *Cyanomitra obscura)*	FF			**2**		**4**	**3**
600	MARICO SUNBIRD *Cinnyris mariquensis* (Mariqua Sunbird)				**5**		**4**	
606	SUPERB COPPER SUNBIRD *Cinnyris superbus*	F						**4**
608	COPPER SUNBIRD *Cinnyris cupreus*	fw			**2**			**3**
631	BAGLAFECHT WEAVER *Ploceus baglafecht*	f						**6**

Table Att3.4-1 TSC Data Around Wambabya FR

Atlas No.	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 8/1 (site 29 in May 2017 – Shown for Comparison)	Site 8/2	Site 8/3	Site 8/4	Site 8/5
646	BLACK-HEADED WEAVER *Ploceus cucullatus* (Village Weaver)				**6**			**6**
647	VIEILLOT'S BLACK WEAVER *Ploceus nigerrimus*	f		**2**	**6**	**6**		**6**
665	RED-BILLED FIREFINCH *Lagonosticta senegala*				**1**			
686	BLACK-CROWNED WAXBILL *Estrilda nonnula*	f		**6**		**6**		
717	NORTHERN GREY-HEADED SPARROW *Passer griseus* (Parrot-billed Sparrow)					**5**	**3**	
742	YELLOW-FRONTED CANARY *Crithagra mozambica*				**1**			
761	AFRICAN BLUE FLYCATCHER *Elminia longicauda*	f						**1**
771	COMMON NICATOR *Nicator chloris*	F					**3**	
788	GREEN CROMBEC *Sylvietta virens*	F		**2**				
814	GREY-BACKED CAMAROPTERA *Camaroptera brachyura*	f					**1**	
882	ANGOLA SWALLOW *Hirundo angolensis*	w						**2**
886	COLLARED SAND MARTIN *Riparia riparia* (Bank Swallow)	PW	PM		**6**	**6**		**6**

Table Att3.4-1 TSC Data Around Wambabya FR

Atlas No.	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 8/1 (site 29 in May 2017 – Shown for Comparison)	Site 8/2	Site 8/3	Site 8/4	Site 8/5
890	YELLOW-THROATED GREENBUL *Atimastillas flavicollis* (Yellow-throated Leaflove)	f		**5**				
891	SPOTTED GREENBUL *Ixonotus guttatus*	FF	R-NT			**3**		
898	YELLOW-WHISKERED GREENBUL *Eurillas latirostris*	F		**1**				
899	LITTLE GREENBUL *Eurillas virens*	F		**5**	**3**	**6**	**2**	**4**
908	WHITE-THROATED GREENBUL *Phyllastrephus albigularis*	FF		**5**				
911	TORO OLIVE GREENBUL *Phyllastrephus hypochloris*	FF	R-VU, U-NT		**5**		**6**	**6**
914	COMMON BULBUL *Pycnonotus barbatus* (Yellow-vented Bulbul)	f		**6**	**6**	**6**	**6**	**6**
923	GREEN HYLIA *Hylia prasina*	F					**4**	**6**
934	BROWN ILLADOPSIS *Illadopsis fulvescens*	FF					**6**	
937	SCALY-BREASTED ILLADOPSIS *Illadopsis albipectus*	FF					**1**	**5**
958	RÜPPELL'S STARLING *Lamprotornis purpuroptera* (Rüppell's Long-tailed Starling)			**4**				

Table Att3.4-1 TSC Data Around Wambabya FR

Atlas No.	COMMON NAME Scientific Name (Alternative Name)	Ecology	Conservation	Site 8/1 (site 29 in May 2017 – Shown for Comparison)	Site 8/2	Site 8/3	Site 8/4	Site 8/5
959	SPLENDID STARLING *Lamprotornis splendidus* (Splendid Glossy Starling)	F			**4**	**3**	**4**	**5**
965	VIOLET-BACKED STARLING *Cinnyricinclus leucogaster* (Plum-coloured Starling)	Af	AM					**4**
971	WHITE-BROWED SCRUB-ROBIN *Cercotrichas leucophrys*			**6**				
996	SNOWY-CROWNED ROBIN-CHAT *Cossypha niveicapilla*	Fw		**3**				
1029	RED-TAILED ANT-THRUSH *Neocossyphus rufus*	FF						**P1**
1031	RUFOUS FLYCATCHER-THRUSH *Stizorhina fraseri*	FF						**1**
1037	AFRICAN THRUSH *Turdus pelios*	f			**6**		**4**	**4**
Number of species per site				**29**	**24**	**24**	**28**	**40**
Total number of species				**76**				

NOTES: P = present outside count time; p = probable

Table Att3.4-2 Dates, Times and Other Details of TSCs for Sites around Wambabya FR

FKP	Way Point	Name	UTM	Date 2018	Observers	Start Time	Temp °C	Notable Weather
8/2		Wambabya FR	36N 0293125 0155360	15-Jan	MK/DK/DP	1425	32	Hot, sun
8/3		Wambabya FR	36N 0293125 0155360	15-Jan	MK/DK/DP	1600	32	Hot, sun
8/4		Wambabya FR	36N 0293125 0155360	16-Jan	MK/DK/DP	705	18	Cool
8/5		Wambabya FR	36N 0293125 0155360	16-Jan	MK/DK/DP	815	21	Mild

Table Att3.4-3 Results of the MCPY Walkover Surveys

COMMON NAME Scientific Name (Alternative Name)	Conservation Status	MCPY4
GREY PARROT *Psittacus erithacus*	IUCN NT, Regionally NT, Uganda VU	p

NOTE: p = probable

Appendix A4: Fauna Biodiversity Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

A	
AGI	aboveground installation
AOI	area of influence
C	
CFR	central forest reserve
CMS	Convention on the Conservation of Migratory Species of Wild Animals, also known as Convention on Migratory Species
D	
DMU	discrete management unit – defined in International Finance Corporation Performance Standard 6 as an area with a definable boundary within which the biological communities or management matters have more in common with each other than they do with those in adjacent areas
E	
ESIA	environmental and social impact assessments (ESIA)
F	
FR	forest reserve
FFI	Fauna & Flora International
G	
GR	game reserve
I	
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
J	
JGI	Jane Goodall Institute
K	
KBA	key biodiversity area, a site that contributes to the global persistence of biodiversity; identified using 11 criteria across five categories
KP	kilometre point
M	
MCPY	main camp pipe yard
P	
PS6	IFC Performance Standard 6
R	
RoW	right-of-way
V	
VEC	valued environmental component

A4 FAUNA BIODIVERSITY BASELINE REPORT

A4.1 Introduction

This report presents the results of the fauna study undertaken for the Uganda export section of the EACOP route. The report describes the fauna biodiversity:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions
  - trends affecting condition and sensitivity to change
  - ecosystem services provided
- key considerations.

A4.2 Area of Influence and Study Area Boundaries

A4.2.1 Area of Influence Boundary

For fauna species of conservation importance, the spatial AOI encompasses the direct project footprint and areas within an ecologically relevant distance of the project to account for potential indirect impacts arising from, for example, facilitated access, edge effects, spread of invasive species and permanent habitat loss and fragmentation. An ecologically relevant distance is defined by the mobility of a species, and the habitat connectivity and the potential impact pathways between the species and the project. Using a precautionary approach, the spatial AOI was generally defined by a 10-km-wide corridor, a broader region, centred on the pipeline route and aboveground installations to account for the mobility of some fauna species.

Most fauna disturbance will occur during and immediately after the construction phase. Any indirect impacts associated with facilitated access and induced development will typically be of much longer duration. The temporal AOI is defined, therefore, as the duration of project construction extended by the time required for the relevant habitat to be re-established to preconstruction condition. For new access roads and parts of construction facilities that may be transferred with the land to a third party when no longer needed for project use, the impacts will be considered permanent.

A4.2.2 Study Area Boundary

The desk-based study area boundary is the same as the AOI. The study area for field surveys was a 2-km-wide corridor centred on the pipeline route, as this provided data over a sufficient area to assess the project's potential impacts. A list of the field sites surveyed during the two field surveys is provided in the methods section and in Figure A4.3-1.

A4.3 Methods

A4.3.1 Secondary Data

Owing to the size and extent of the habitats crossed by the proposed pipeline route, field surveys concentrated on pre-identified survey areas. Secondary data were used to inform survey areas and the most appropriate survey methods based on the potential presence of species listed on the global International Union for Conservation of Nature (IUCN) Red List, endemic or restricted-range species and congregatory or migratory species.

The secondary data sources included the:

- Uganda National Biodiversity Data Bank
- Uganda National Biodiversity Strategy and Action Plan 2 (2015–2025)
- Environmental Sensitivity Atlas for the Albertine Graben (NEMA)
- Strategic Plan for the Northern Albertine Rift of Uganda 2011–2020
- iNaturalist-Afribat project database
- Convention on Migratory Species (CMS) database
- IUCN Red List of Threatened Species
- National Red List for Uganda
- Centre for Biodiversity database at the National Museums of Kenya (houses bat specimens from Uganda, Tanzania and Kenya)
- citation sheets and management plans for protected areas, where available
- environmental and social impact assessments (ESIA) and other technical studies relevant to the AOI
- scientific and grey literature referenced throughout
- stakeholder engagement undertaken for the project, see Appendix C.

Secondary data also enable survey findings to be considered in a wider context and provide an indication as to whether a habitat may support species of conservation importance.

A4.3.2 Site Selection

Proposed survey sites were selected following a review of geographic information system files that identified the proposed pipeline route and existing baseline data. Protected areas were identified and targeted for surveying, as were habitats that may support species of interest such as wetlands and riparian habitats, and potentially important wildlife corridors. The proposed survey sites along the pipeline route were discussed with in-country fauna specialists familiar with the areas through which the proposed route passes. The site surveys targeted areas that were considered to support species of conservation importance and where potential impacts from the scheme could be greatest. This level of survey was sufficient to understand the likelihood or to confirm presence of these species within the habitats.

After the wet season surveys, site selection for the dry season surveys was adjusted according to habitat quality, and some sites were removed or added.

Within each survey site, two or three sampling points were chosen for more detailed survey techniques covering representative samples of habitat in that area.

A4.3.3 Field Surveys

Field surveys were undertaken May–July 2017 for the wet season and December 2017–January 2018 for the dry season, with an additional walkover survey of main camp pipe yard (MCPY) 4 site in August 2018. Undertaking surveys during each season allows for a robust dataset to be gathered in each season to inform the impact assessment. Data considerations for the surveys are provided in Section A4.3.5.

A variety of survey types were used at each site to gather information on a broad array of species. Various ecological habitats (notably woodland, thicket, bushland, riparian, cropland and aquatic) were surveyed for mammals (including bats), reptiles, amphibians and invertebrates following standard biological survey methodologies.

The following methods were used at most sites:

- walked transects or direct observation
- interviews with local community members
- Sherman traps
- camera traps
- visual encounter surveys
- pitfall trapping
- dip netting
- sweep netting
- night-time surveys
- mist netting
- bat activity surveys using handheld and static detectors.

These survey methods are described in Attachment A4.2. Figure A4.3-1 illustrates the locations of each survey site. Identification of herpetofauna followed Schiøtz (1999), Spawls et al. (2002, 2006) and Channing and Howell (2006). The AmphibiaWeb (2015) and The Reptile Database (Uetz, P. and Jirí Hošek (eds.) 2015) were also used. The conservation status of the herpetofauna followed the IUCN Red Listing (IUCN 2017) and the Ugandan Red List (WCS 2016).

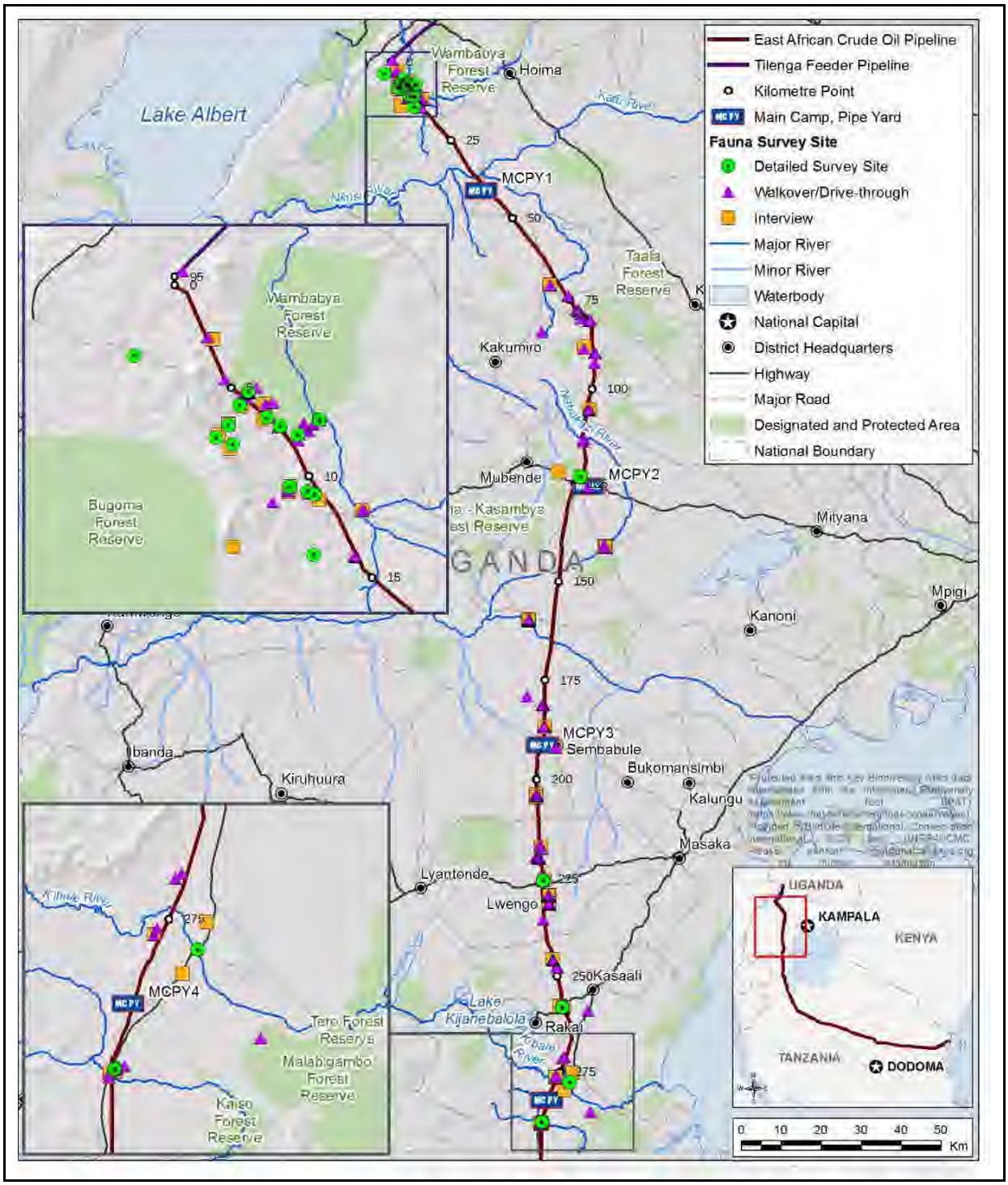

Figure A4.3-1 Field Survey Locations

A targeted chimpanzee (*Pan troglodytes ssp. schweinfurthii*) survey was undertaken in the corridor between the Wambabya and Bugoma Forest Reserve (FR) Key Biodiversity Area (KBA). This survey comprised reconnaissance walks looking for chimpanzee nests and prints, semi-structured interviews with people encountered in the corridor and the deployment of 14 trail cameras on potential chimpanzee pathways. This study was further supplemented by surveys undertaken by Dr Jessica Ganas-Swaray and Dr Sam Mugume Koojo during

October 2017. This study comprised a review of published and unpublished information on chimpanzees around the western-most part of the proposed pipeline route. Additionally, consultations regarding chimpanzee presence were undertaken with organisations involved in chimpanzee conservation and studies in this area. Data from the desk study was used to help guide the areas selected for field work.

During the field survey, one team of four skilled chimpanzee experts collected data from communities and forests in the chimpanzee study areas via community and individual interviews and recce walks in areas of potential chimpanzee habitat and direct walks to known or suspected chimpanzee locations to check for signs of chimpanzees.

A4.3.4 Data Analysis

Information on endemism and conservation status for all fauna species was obtained from the IUCN Red List and the National Red List of Uganda.

All observed butterfly species were assigned to their known ecological habitat preferences (Davenport 1996). These ecotypes include:

- F) forest-dependent species restricted to closed canopy forest habitats
- f) forest nondependent species not infrequently recorded in closed-canopy forest, and also encountered in a variety of forest-edge, degraded forest and woodland habitats
- O) nonforest species characteristic of open habitats such as grassland, open savannah and arid habitats
- M) migratory species that characteristically move over large distances at certain times of year
- W) widespread species, generalists that occur in a variety of forest and nonforest habitats.

Within each valued environmental component (VEC), trends are presented to allow appreciation of changes in condition on a local and or regional scale.

A4.3.4.1 Sensitivity Ranking

The sensitivity of the fauna biodiversity VECs has been ranked according to the fauna biodiversity section of the sensitivity table in Section 8.

A4.3.5 Data Considerations

The surveys were designed to give sufficient understanding of the species at each site for impact assessment purposes, but were limited in duration and so will not have identified all the species likely to be within the study area. This approach was sufficient to assess the likely significance of a particular area or the potential presence of certain key species when combined with the information provided by literature reviews (see Section A4.3.1) and interviews. Where there was doubt regarding the presence of a species, a precautionary approach was taken, in keeping with IFC PS6 and the accompanying Guidance Note.

Camera traps were often found by members of local communities, who visited on several occasions to look at them; this could have altered the behaviour and activity of wild animals using the area.

For many invertebrate groups, there is minimal assessment at a global level, thus making most species qualify as not evaluated. However, because some species are local endemics they would potentially qualify as critically endangered or endangered.

Due to health and safety constraints, some available sampling techniques were not used at some sites. For example, mist netting for bats was only undertaken at sites within a 30-minute drive of the survey team's accommodation due to project restrictions on night-time driving for health and safety reasons.

A4.4 Baseline Conditions

A4.4.1 Fauna Habitats of Conservation Importance

The following sections of this report provide:

- an overview of the fauna habitats in the broader region based on secondary data
- a description of the habitat at the surveyed sites.

A4.4.2 Overview

In 1890, forest cover is estimated as up to 10.8 million ha (53%) of Uganda's land area (USAID 2016). By 1990, this had decreased to 4.9 million ha (24%) through degradation and deforestation. This trend has continued and, by 2015, the forest estate in Uganda was 9% of the land cover (MWE 2016).

Several causes of deforestation continue to threaten Uganda's forest areas, including those under protection such as gazetted FRs. New Vision (2017) reports that 493 of the 506 FRs in Uganda have been encroached. This clearance is for agriculture or industrial expansion (UWS 2005).

About 70% of Uganda's forest cover is on private land. There are high rates of forest clearance on private land for agriculture and charcoal production. Population growth is leading to increased demand for land, food and energy. Demand for energy is primarily met through wood burning, putting severe pressure on timber resources. Ninety percent of the population rely on firewood for cooking.

A4.4.2.1 Wambabya Forest Reserve

Baseline Condition

From kilometre point (KP) 5–9, the EACOP project is within 100 m of the Wambabya FR. The southern part of the reserve supports relatively intact forest. Although only 3420 ha, Wambabya has the highest population density of chimpanzees (IUCN endangered and Uganda endangered) in the Albertine Rift (Lamprey 2015) and is important for plant biodiversity. The dominant habitat of Wambabya forest is closed tropical high forest (Hänni 2010). The area is designated as a FR because of its ecological and environmental importance, and role in protecting the Wambabya River, which is a water source for people and domestic animals.

According to the Sensitivity Atlas (NEMA 2010), it is one of the natural forests that form an important biodiversity corridor connecting the Budongo Central Forest Reserve (CFR), Murchison Falls National Park, Bugoma CFR and Kabwoya Wildlife Reserve. While selective logging is not a major concern, deforestation for small-scale agriculture within the reserve borders and along the rivers running through Wambabya is an increasing threat (Hänni 2010). The Sensitivity Atlas states that encroachment is a big threat to the ecological functions of the forest.

To the south, separated from the Wambabya FR by 3 km, is the much larger Bugoma CFR (39,907 ha). The corridor between the two FRs is public land, with dense settlement and subsistence farming. This area provides perhaps the best opportunity for a viable ecological reconnection of the chain of forests in the northern Albertine Rift (Lamprey 2015). Several narrow riparian corridors and small patches of remnant forest vegetation link the Wambabya and Bugoma FRs. Although somewhat degraded, studies (McLennan 2008; Plumptre et al. 2010; McCarthy et al. 2015) show that these are valuable in terms of wildlife connectivity, particularly for chimpanzees moving between the two FRs.

Aside from chimpanzee, other fauna species of conservation importance recorded in the Wambabya FR include the:

- tree pangolin, *Phataginus tricuspis* (IUCN vulnerable and Uganda vulnerable)
- long-tailed pangolin, *Phataginus tetradactyla* (IUCN vulnerable and Uganda endangered)
- African golden cat, *Caracal aurata* (IUCN vulnerable and Uganda endangered).

These species are described in more detail in Section A4.4.3.

Several butterfly species of conservation importance were also recorded in the Wambabya FR and the surrounding area:

- *Actinote alciope*, Uganda critically endangered
- *Anthene indefinite*, Uganda vulnerable
- *Anthene liodes*, Uganda vulnerable
- *Bebearia laetitioides*, Uganda vulnerable
- *Bicyclus istaris*, Uganada vulnerable
- *Cymothoe egesta*, Uganda, endangered
- *Mylothris rhodope*, Uganda data deficient
- *Neptis nicomedes*, Uganda vulnerable
- *Pentila inconspicua*, Uganda vulnerable
- *Pentila tachyroides*, Uganda critically endangered.

These species are described in more detail in Section A4.4.3.6.

Two dragonfly species of conservation importance were recorded in the Wambabya FR and the surrounding area, including *Chlorocypha victoriae* (IUCN least concern and Uganda vulnerable) and *Neodythemis afra* (IUCN least concern and Uganda critically endangered). More information about these species can be found in Section A4.4.3.6.

Trend in Condition and Sensitivity to Change

The Wambabya FR could become an important part of a proposal to restore and enhance ecological corridors in the broader Albertine Rift landscape being investigated by Ecotrust, the Jane Goodall Insitute (JGI) and Fauna and Flora International (FFI) (Lamprey 2017). Similarly, the Ugandan Wildlife Authority has advised the project of its intention to initiate a revegetation programme in degraded parts of the Wambabya FR. Should these programmes proceed as intended, it is anticipated that the condition of the Wambabya FR would improve. In the absence of these initiatives, it is considered that the condition of the reserve may continue to deteriorate due to illegal tree removal and encroachment for agriculture, which was observed during field surveys.

The Wambabya FR and the corridors of remnant riparian forest linking it to the Bugoma CFR provide important habitat for the chimpanzee (IUCN endangered and Uganda endangered). This area is therefore of very high sensitivity to change.

A4.4.2.2 Taala Forest Reserve

Baseline Condition

The EACOP project traverses the western part of the Taala FR from KP78–82.5. The project is immediately adjacent to a village enclave and the existing land use is mostly agricultural, with some eucalyptus plantations to the north. Field studies suggest that large swathes of natural vegetation have been cleared and that natural vegetation within the Taala FR only exists in the wet valleys. Plantations of eucalyptus and pine, and seasonal crops have replaced the cleared vegetation. The reserve was gazetted for environmental and ecology purposes and protects the drainage system of the Kitumbi and Lugulima Rivers that join and flow north into the Kafu River (NEMA 2010). The Sensitivity Atlas states that it is good for biodiversity, particularly for butterflies, and has formerly supported hippopotamus and African buffalo (NEMA 2010). Natural forests are coming under increasing pressure of encroachment for agriculture and timber plantations. Field studies found eucalyptus plantations and maize fields in the Taala FR and the pipeline route passes through a large village inside the FR. In this location, the FR is already extensively degraded. According to the Sensitivity Atlas, hippopotamus and buffalo populations migrated away from the FR due to human pressures. It also states that 50% of the FR is licensed to commercial tree planting in the private sector.

Nonetheless, the Taala FR retains some biodiversity value, as the spot-necked otter, *Hydrictis maculicollis* (IUCN near threatened, Uganda endangered) was recorded during field surveys. Additional information on this species is provided in Section A4.4.3.2.

Several butterfly species of conservation importance were also recorded in the Taala FR, namely *Actinote pentapolis* and *Prosopalpus styla*, both Uganda vulnerable. Further information on these species is provided in Section A4.4.3.6.

Trend in Condition and Sensitivity to Change

The project team is not aware of any proposals to try to remove the established village from the Taala FR or to restore natural vegetation within the FR. There is no anticipated change in condition of this site.

The Taala FR was originally designated for ecological purposes and now comprises modified habitat that nonetheless has biodiversity value in places. It is considered to have low sensitivity to change.

A4.4.2.3 Kasana–Kasambya Forest Reserve

Baseline Condition

The pipeline right-of-way (RoW) runs very close to the Kasana–Kasambya FR near KP123. This part of the reserve is exclusively commercially harvested pine tree plantations. Field studies suggest that eucalyptus plantations and maize fields are also widely present in the FR.

The Sierra Leone mops bat, *Mops brachypterus* (IUCN least concern, Uganda vulnerable) was recorded during the field survey. Additional information on this species can be found in Section A4.4.3.1.

Pousargues's mongoose, *Dologale dybowskii* (IUCN data deficient) was also recorded. Perhaps rare, it is known only from museum specimens and a handful of sightings. However, recent records from Central African Republic and Uganda suggest the species is more common than first thought and has just been largely undetected. Past confusion with common dwarf mongoose may also explain the apparent paucity of records. Habitats within its known range are relatively stable, and if further research suggests the species is not as rare as once thought, it will be ranked as IUCN least concern (Aebischer et al. 2015).

Three butterfly species of conservation importance were recorded in the Kasana–Kasambaya FR: *Anthene indefinite*, *Anthene liodes* and *Prosopalpus styla*, all Uganda vulnerable species. Additional information on these species can be found in Section A4.4.3.6.

Interviews with local communities suggest that leopard, *Panthera pardus* (IUCN vulnerable and Uganda vulnerable) visits the FR. Further details on this species can be found in Section A4.4.3.2.

Trend in Condition and Sensitivity to Change

As this FR is a commercial plantation, there is no anticipated change in ecological condition, subject to forestry management practices, such as periodic harvesting.

The Kasana–Kasambya FR comprises modified habitat with some biodiversity value. It is considered to have low sensitivity to change.

A4.4.2.4 Disused Airstrip Borrow Pits

Baseline Condition

The pipeline corridor crosses a disused airstrip at KP288 in the Sango Bay area where several former borrow pits have filled with water. However, the RoW footprint

avoids the ponds and is approximately 200 m to the west. These artificial features have been left unused for approximately 40 years and now provide important areas of standing water in a largely dry, agricultural landscape. They offer good quality habitat for amphibians, reptiles and invertebrates. More information on these species is provided in Sections A4.4.3.4, A4.4.3.5 and A4.4.3.6.

One butterfly species of conservation importance, *Uranothauma heritsia* (IUCN not listed and Uganda endangered), one dragonfly species, *Acisoma inflatum* (IUCN least concern, Uganda vulnerable) and one damselfly species, *Azuragrion vansomereni* (IUCN least concern, Uganda data deficient), were recorded here. More information on these species can be found in Section A4.4.3.6.

The Bohor reedbuck, *Redunca redunca* (IUCN least concern, Uganda endangered) was recorded. Further details on this species can be found in Section A4.4.3.2.

Trend in Condition and Sensitivity to Change

The airstrip borrow pits have developed into important ecological features over the last 40 years. Unaltered, it is anticipated that their condition would continue to improve.

The airstrip borrow pits provide important breeding and feeding habitat for reptile, amphibian and invertebrate species, and are therefore considered to have high sensitivity to change.

A4.4.2.5 Wetland and Aquatic Habitats

Baseline Condition

Aquatic habitats within the AOI, including wetlands, ponds and riparian habitats, support species of interest, in particular amphibians and invertebrates. They also act as watering holes and are often a limiting factor in the population ranges of large carnivores and game (Abade et al. 2014). Wetlands of particular sensitivity occur at the following locations:

- KP113 – papyrus swamp associated with the Nabakazi River (first pipeline crossing)
- KP148 – papyrus swamp associated with the Nabakazi River (second pipeline crossing)
- KP165 – papyrus swamp associated with the Katonga River, linking Lake Albert with Lake Victoria
- KP288.5 – disused airstrip borrow pits, see Section A4.4.2.3.

As noted in the Aquatic Biodiversity Baseline report (Appendix A2), Uganda's wetlands are under increasing pressure from agricultural activities, extensive livestock husbandry, agro-chemical and other pollution, reservoir construction, deforestation and mining practices (Dugan 1990). Encroachment is occurring in the Nabakazi wetland due to economic activities such as timber harvesting and charcoal production. This wetland also serves as a water source for domestic and livestock use (NEMA 2004).

Sitatunga, *Tragelaphus spekii* (IUCN least concern, Uganda vulnerable) was recorded around KP106 and KP141 (papyrus swamps associated with the

Nabakazi River) and KP165 (Katonga River papyrus swamp). Further details on this species can be found in Section A4.4.3.2.

Bohor reedbuck (IUCN least concern, Uganda endangered) and Temminck's ground pangolin, *Smutsia temminckii* (IUCN and Uganda vulnerable) were recorded at KP165 (Katonga River). Further details on these species can be found in Section A4.4.3.2.

Evidence of spot-necked otter (IUCN near threatened, Uganda endangered) were found at the Nabakazi River crossing at KP147.5.

Interviews with local communities suggest that leopards are present around the Nabakazi swamp and Katonga River wetlands area. Further details on this species can be found in Section A4.4.3.2.

Trend in Condition and Sensitivity to Change

Degradation of wetlands outside protected areas is anticipated to continue due to land use pressures. While papyrus itself will readily regenerate, any increasing pressure on these wetland systems will likely affect the flora and fauna present.

Wetlands within the project AOI comprise natural habitat that provide important ecological function (including, but not limited to, connectivity) and are therefore considered to have high sensitivity to change.

A4.4.3 Fauna Species of Conservation Importance

Species of conservation importance are defined as those that are listed by the IUCN and Uganda Red Lists as critically endangered, endangered or vulnerable; migratory or congregatory; and range-restricted or endemic.

Keystone species are also considered to be of conservation importance.

IUCN threat categories are defined as:

- critically endangered – when the best available evidence indicates that a species is facing an extremely high risk of extinction in the wild. Critically endangered species are considered to have a very high sensitivity to change
- .endangered – when the best available evidence indicates that a species is facing a very high risk of extinction in the wild. Endangered species are considered to have a very high sensitivity to change.
- vulnerable – when the best available evidence indicates that a species is facing a high risk of extinction in the wild. Vulnerable species are considered to have a high sensitivity to change.
- near threatened – when a species has been evaluated against the criteria and does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. Near threatened species are considered to have a low sensitivity to change.
- least concern – when a species has been evaluated against the criteria and does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant taxa are included in this category. Least concerned species are considered to have a low sensitivity to change.

Listing in the not-evaluated and data-deficient categories indicates that no assessment of extinction risk has been made, though for different reasons. Until an assessment is made, taxa listed in these categories should not be treated as if they were nonthreatened (IUCN 2012).

A4.4.3.1 Bats

Baseline Condition

Of Uganda's 95 documented bat species, the IUCN lists two as threatened.

Three species of bat were recorded during field surveys (Table A4.4-1), one of which is listed as Uganda vulnerable.

Table A4.4-1 Bats Recorded During the Field Surveys

Family and Common Name	Scientific Name	IUCN Status or Uganda Status
Pteropodidae		
Franquet's epauletted fruit bat	*Epomops franqueti*	Least concern or not listed
Molossidae		
Sierra Leone mops bat	*Mops brachypterus*	Least concern or vulnerable
Vespertilionidae		
African yellow bat	*Scotophilus dinganii*	Least concern or not listed

Franquet's Epauletted Fruit Bat

Franquet's epauletted fruit bat is listed as IUCN least concern because of its wide distribution, presumed large population and because it is unlikely to be declining fast enough to qualify for a listing in a more threatened category (Kityo and Nalikka 2016). It is not listed in the Uganda national red list. The species ranges through low to mid elevation forests where it has been recorded in both primary and secondary forests. It has also been found in mosaic habitats of tropical moist forest with woodlands and grasslands (Bergmans 1989). Whilst an adaptable species, it is not found in heavily degraded areas. It roosts in small groups, often close to water. The species was found during the wet season baseline surveys in Wambabya FR.

Sierra Leone Mops Bat

Sierra Leone mops bat is listed as IUCN least concern because of its wide distribution, presumed large population and because it is unlikely to be declining fast enough to qualify for a listing in a more threatened category (Monadjem et al 2017). However, it is listed as vulnerable on the Uganda national red list because of its increasingly fragmented occurrence (less than 10 localities) and continuing decline in area, extent and quality of habitat. This bat appears to be associated with tropical lowland forest and is adaptable, being found roosting in trees, buildings and similar sites. The major threat to the species is deforestation throughout its range, and the conversion of land to agricultural use (Monadjem et al 2017). The species was found during the wet season baseline surveys in Kasana-Kasambaya FR.

African Yellow Bat

African yellow bat is listed as IUCN least concern because of its wide distribution, presumed large population and because it is unlikely to be declining fast enough to qualify for a listing in a more threatened category (Monadjem, A. & Griffin, M. 2017). It is not listed on the Uganda national red list. The species has been recorded from both dry and moist savanna habitats, roosting in hollow trees, roofs and other dark places. They may roost singly but groups up to 30 bats are not uncommon (Kingdon 1974). This species was found during the wet season baseline surveys in the forest fragment near KP 8.

Trend in Condition and Sensitivity to Change

The Sierra Leone mops bat was the only species of conservation importance recorded during field surveys and was found in Kasana–Kasambaya FR (see Section A4.4.2.3). The population trend is unknown, but it is a common species with a wide range; any population decline is not considered sufficient to qualify it for a higher threat category (Monadjem and Griffin 2017).

As a Uganda vulnerable species, Sierra Leone mops bat has moderate sensitivity to change.

A4.4.3.2 Large Mammals

Baseline Condition

During the wet season surveys 21 camera traps were set and during the dry season 13 camera traps were set. Dry season cameras were set between KP0 and KP10 in riverine forest habitats that had the most potential to act as fauna movement corridors between Bugoma and Wambabya FRs. However, in the time between the wet and dry season surveys, many of these riverine habitats had been cleared for agriculture, consequently fewer cameras were set in the dry season than originally intended.

In total, 45 fauna species were recorded during the surveys (Table A4.4-2). The highest number of species during the wet season was found at the Katonga River wetland system around KP165. The Kololo area, at the start of the export pipeline, had the fewest large mammal species.

Table A4.4-2 Large Mammals Recorded During the Field Surveys

Family and Common Name	Scientific Name	IUCN	Uganda Status
Cercopithecus			
Vervet monkey	*Cercopithecus pygerythrus*	Least concern	Not listed
Black and white colobus	*Colobus guereza*	Least concern	Not listed
Olive baboon	*Papio anubis*	Least concern	Not listed

Table A4.4-2 Large Mammals Recorded During the Field Surveys

Family and Common Name	Scientific Name	IUCN	Uganda Status
Red-tailed monkey	*Cercopithecus ascanius*	Least concern	Not listed
Eastern chimpanzee	***Pan troglodytes ssp. schweinfurthii***	Endangered	Endangered
Grey-cheeked mangabey	*Lophocebus albigena*	Least concern	Not listed
Bovidae			
Sitatunga	***Tragelaphus spekii***	Least concern	Vulnerable
African buffalo	*Syncerus caffer*	Least concern	Not listed
Bushbuck	*Tragelaphus scriptus*	Least concern	Not listed
Bohor reedbuck	***Redunca redunca***	Least concern	Endangered
Bush duiker	*Sylvicapra grimmia*	Least concern	Not listed
Blue duiker	*Philantomba monticola*	Least concern	Not listed
Red forest duiker	*Cephalophus natalensis*	Least concern	Not listed
Suidae			
Bushpig	*Potamochoerus larvatus*	Least concern	Not listed
Hippopotamidae			
Hippopotamus	***Hippopotamus amphibious***	Vulnerable	Vulnerable
Leporidae			
African savanna hare	*Lepus victoriae*	Least concern	Not listed
Felidae			
African golden cat	***Profelis aurata***	Vulnerable	Endangered
Serval	*Leptailurus serval*	Least concern	Not listed
Leopard	***Panthera pardus***	Vulnerable	Vulnerable
Canidae			
Black-backed jackal	*Canis mesomelas*	Least concern	Data deficient
Side-striped jackal	*Canis adustus*	Least concern	Not listed

Table A4.4-2 Large Mammals Recorded During the Field Surveys

Family and Common Name	Scientific Name	IUCN	Uganda Status
Procavidae			
Rock hyrax	*Procavia capensis*	Least concern	Not listed
Viverridae			
Servaline genet	*Genetta servalina*	Least concern	Not listed
African civet	*Civettictis civetta*	Least concern	Not listed
Common genet	*Genetta genetta*	Least concern	Not listed
Large-spotted genet	*Genetta maculata*	Least concern	Not listed
Giant forest genet[1]	*Genetta victoriae*	Least concern	Data deficient
Cape genet	*Genetta tigrina*	Least concern	Not listed
Herpestidae			
Banded mongoose	*Mungos mungo*	Least concern	Not listed
Slender mongoose	*Herpestes sanguineus*	Not listed	Not listed
Bushy-tailed mongoose	*Bdeogale crassicauda*	Least concern	Not listed
White-tailed mongoose	*Ichneumia albicauda*	Least concern	Not listed
Marsh mongoose	*Atilax paludinosus*	Least concern	Not listed
Large grey mongoose	*Herpestes ichneumon*	Least concern	Not listed
Pousargues's mongoose	*Dologale dybowskii*	Data deficient	Not listed
Mustelidae			
Honey badger	*Mellivora capensis*	Least concern	Not listed
African clawless otter	***Aonyx capensis***	Near threatened	Vulnerable
Spot-necked otter	***Hydrictis maculicollis***	Near threatened	Endangered

[1] Albertine Rift Endemic

Table A4.4-2 Large Mammals Recorded During the Field Surveys

Family and Common Name	Scientific Name	IUCN	Uganda Status
Hystricidae			
Crested porcupine	*Hystrix cristata*	Least concern	Not listed
African brush-tailed porcupine	*Atherurus africanus*	Least concern	Not listed
Manidae			
Temminck's ground pangolin	***Smutsia temmincki***	Vulnerable	Vulnerable
Tree pangolin	***Phataginus tricuspis***	Vulnerable	Vulnerable
Long-tailed pangolin	***Phataginus tetradactyla***	Vulnerable	Endangered
Orycteropodidae			
Aardvark	*Orycteropus afer*	Least concern	Not listed
Galagidae			
Galago	*Four possible species, two of which reported, all least concern*	Least concern	

Most of the species recorded are common and widespread except the following, which are considered to be of conservation importance:

- sitatunga (*Tragelaphus spekii*), IUCN least concern, Uganda vulnerable
- Bohor reedbuck (*Redunca redunca)*, IUCN least concern, Uganda endangered
- Temminck's ground pangolin (*Smutsia temminckii*), IUCN vulnerable, Uganda vulnerable
- tree pangolin (*Phataginus tricuspis*): IUCN vulnerable, Uganda vulnerable
- long-tailed pangolin (*Phataginus tetradactyla)*, IUCN vulnerable, Uganda endangered
- African golden cat (*Caracal aurata*), IUCN vulnerable, Uganda endangered
- African clawless otter (*Aonyx capensis*), IUCN near threatened, Uganda vulnerable
- hippopotamus (*Hippopotamus amphibious*), IUCN vulnerable, Uganda vulnerable
- spot-necked otter (*Hydrictis maculicollis)*, IUCN near threatened, Uganda endangered
- leopard (*Panthera pardus*), IUCN vulnerable, Uganda vulnerable
- chimpanzee (*Pan troglodytes ssp. schweinfurthii*), IUCN endangered, Uganda endangered.

These species are described in more detail in the sections below.

Sitatunga

A swamp specialist, the sitatunga (IUCN least concern, Uganda vulnerable) is only found in permanent marsh and wetlands. Mostly diurnal, the species is most active in the morning and late afternoon. They usually occur in the swamp's deepest parts, where they wade through channels to feed; in areas with little human disturbance they will also feed along lakeshores or in forest wetlands. Reeds, sedges and grasses form the bulk of their diet. They live alone or in small groups of females, or one male with several females.

The total population is estimated to be approximately 170,000, with 40% in protected areas. The population is becoming increasingly localised in parts of its range due to continued habitat degradation and hunting. Populations may disappear from many areas (East 1999).

The field studies recorded sitatunga at KP106 in the area of a papyrus, KP141 in the Nabakazi swamp and KP165 in swamp (Katonga River).

Bohor Reedbuck

The Bohor reedbuck (IUCN least concern, Uganda endangered) is associated with woodland and floodplain grassland across much of its range. They are effectively water-dependent grazers but show a strong preference for extensive areas of floodplains and open inundated grasslands where access to water may become restricted in the dry season (Kingdon and Hoffmann 2013).

Total numbers are estimated to be around 101,000, although populations are gradually declining except in some East African parks. About 75% of the estimated total occurs in protected areas (East 1999).

Bohor reedbuck is ranked as Uganda endangered as its estimated continuing decline is at least 20% of the population within five years or two generations (whichever is longer). Evidence of the Bohor reedbuck was recorded at KP6, KP165, KP187, KP218–231 and KP289.

Temminck's Ground Pangolin

Temminck's ground pangolin (IUCN vulnerable and Uganda vulnerable) is a predominantly solitary, terrestrial species that inhabits mainly savannah woodland in low-lying regions with moderate to dense scrub. It also occurs in floodplain grassland, rocky slopes and sandveld, but does not inhabit forest or desert. The species occurs widely on well-managed livestock farms where it is afforded protection from human persecution, but is absent from croplands. The most important habitat requirements are a sufficient population of various ant and termite prey species and the availability of dens or aboveground debris in which to shelter. The female gives birth to a single young after a gestation period of approximately 105–140 days (Pietersen et al. 2014).

Temminck's ground pangolin is IUCN vulnerable due to an ongoing and projected population decline of 30–40% over a 27-year period (Pietersen et al. 2014).

The species' main threats are continuing exploitation for traditional medicine and bushmeat throughout its range, and increased intercontinental trade to Asia.

Evidence of this species was recorded at the Katonga River at approximately KP165.

Tree Pangolin

Tree pangolin (IUCN vulnerable and Uganda vulnerable) occurs predominantly in moist tropical lowland forests and secondary growth, but also in dense woodlands, especially along watercourses (Gaubert 2011). There is evidence to suggest that the species can adapt to some habitat modification, as individuals have been caught on abandoned or little-used oil palm trees in secondary growth. The tree pangolin is the most common of the African forest pangolins, reaching relatively high densities in suitable habitat (Kingdon and Hoffman 2013). It is a nocturnal species, which is equally at home on the ground as in trees, and feeds exclusively on ants and termites. They breed year-round.

The species' main threats are ongoing exploitation for traditional medicine and bushmeat throughout its range, and increased intercontinental trade to Asia.

Evidence of this species was found in Wambabya FR.

Long-tailed Pangolin

The long-tailed pangolin (IUCN vulnerable and Uganda endangered) is arboreal, residing in hollow trees or epiphytes. They live in tropical riverine and swamp forests, and rainforests, including agricultural areas within rainforests. Their distribution is localised and always near permanent water sources (Gaubert 2011). Generally restricted to the forest canopy, they prefer to live away from the outer edges of forests. The species is solitary and shy. They feed exclusively on ants and termites.

The species' main threats are ongoing exploitation for traditional medicine and bushmeat throughout its range, increased intercontinental trade to Asia, and habitat loss and degradation.

African Golden Cat

The African golden cat (IUCN vulnerable and Uganda endangered; Figure A4.4-1) occurs mainly in primary, moist equatorial forest, although on the periphery of its range it penetrates savannah regions along riverine forest. It also occurs in montane forest and alpine moorland in the east of its range (Ray and Butynski 2013). They adjust well to areas affected by logging because of the region's dense secondary undergrowth, which is advantageous for camouflaged hunting. Fringe environments, such as waterways leading into savannah woodlands, are sometimes preferred habitat due to their dense populations of rodents. Studies have shown that small mammals are the species' main prey. Infrequently observed in the wild and considered rare, little is known about the reproductive cycle of this species (Bahaa-el-din et al. 2015).

The species' main threats are:

- habit loss and deforestation
- the informal bush meat trade, which reduces the prey base and thus reduces the likely area of occupancy across its range
- wire snares, in some parts of its range, although it is not the target species.

Figure A4.4-1 African Golden Cat, Wambabya Forest Reserve

African Clawless Otter

African clawless otter (IUCN near threatened and Uganda vulnerable) is predominantly aquatic and seldom found far from water. Habitats are diverse and include impoundments, estuaries, mangroves, desert conditions and seasonal or episodic rivers that provide suitable sized pools. They have been found in towns and cities and can occupy rivers with high pollution and eutrophic levels.

Interviews with local community members reported this species using the Kawenda River during the wet season, at KP269, which is a tributary of the Kibale River.

The species' main threats are:

- the declining state of freshwater ecosystems in Africa
- informal hunting for skins and other body parts.

Hippopotamus

The hippopotamus is IUCN vulnerable and Uganda vulnerable. The ecological requirements for hippopotamus include a supply of permanent or seasonal water and adequate grazing on open grassland within a few kilometres of the aquatic habitat. The primary threats to hippopotamus are habitat loss or degradation, and

illegal and unregulated hunting for meat and ivory (from the canine teeth). Their reliance on freshwater habitats often leads to conflict with human land use and freshwater resources (Lewison and Pluháček 2017). The species is known to use the Kibale River which is crossed by the pipeline at KP274 (Uganda Wildlife Authority, pers. comm).

Spot-Necked Otter

The spot-necked otter (IUCN near threatened and Uganda endangered) inhabits freshwater habitats where water is un-silted, unpolluted and rich in small to medium sized fish. In riparian and lacustrine habitats, adequate vegetation in the form of long grass, reeds, dense bushes, overhanging trees and large boulder piles is essential to provide cover during periods of inactivity and for denning. It specialises in hunting fish by sight in clear, deep and flowing waters. It is the most aquatic of the African otter species. If prey is abundant it will form large, social, all-male or juvenile groups; two females with cubs have been known to form loose packs using the same core area simultaneously. They occur in the lakes of Central and East Africa and are also found in streams, rivers and impoundments to altitudes of 2500 m (Yalden et al. 1996). The spot-necked otter is known to use the Nabakazi River which the pipeline crosses at KP147.5.

The species' main threats are:

- the alteration and degradation of freshwater habitats and riparian vegetation. This is often exacerbated by overfishing and agricultural practices that lead to shoreline erosion and denuding of the vegetation cover used by the otter.
- human presence and activity disrupting otter denning, and changing and depleting the otter prey base
- water pollution from agricultural run-off, livestock waste and community wastewater
- being killed for food and skins.

Leopard

Leopards (IUCN vulnerable and Uganda vulnerable) are widely distributed across Africa and Asia, but their populations have become reduced and isolated, and they are now extirpated from large portions of their historic range. Leopards have limited levels of ecological resilience to human-caused habitat fragmentation in Africa, and as a result are more restricted to conservation areas than some other big cats (Stein et al. 2016).

Leopard is considered a keystone species that has a disproportionate effect on its environment relative to its biomass and whose removal initiates significant changes in ecosystem structure and loss of biodiversity (IFC 2012).

Interviews with local communities suggest that leopard are present in the Kasana–Kasambaya FR, around the Katonga River, at KP205 and in the Nabakazi swamp.

Chimpanzee

Chimpanzees are listed as IUCN endangered and Uganda endangered. The chimpanzee is the most abundant and widespread of the great apes. However, population decline is expected to continue. There are four subspecies, the most

abundant being *Pan troglodytes schweinfurthii,* which has an estimated population of 5000 in Uganda.

Chimpanzees are found discontinuously across the forest belt of Africa, occupying primary and secondary moist lowland forest, swamp forest, submontane and montane forest, dry forest, forest galleries in savannah woodland, and farmland (Oates 2011). Eastern chimpanzees are found predominantly in lowland and submontane tropical forests, and forest galleries extending into savannah woodlands. They occur in relatively high densities at 1000–2000 m above sea level. Montane forest at higher altitudes is not good chimpanzee habitat (IUCN 2017).

They live in multimale-multifemale, fission-fusion communities averaging 35 members. The largest known community in Uganda has about 150 members (Mitani and Watts 2005). Across the distribution for the species, annual home ranges are smaller in mixed forest than in woodland forest mosaics: one of the smallest known is 6 km² in the Budongo FR.

Chimpanzees are omnivorous and opportunistic feeders. Fruit forms about half their diet, typically supplemented with terrestrial herbaceous vegetation, leaves, stems, seeds, flowers, bark, pith, honey, mushrooms, resin, eggs, and animal prey such as insects and medium-sized mammals. They are the most carnivorous of the great apes.

The species' main threats are:

- poaching, which is mostly opportunistic; however, they are infrequently targeted for the bushmeat trade (very uncommon in Uganda). Infants of killed adults often become pets or are trafficked internationally for the exotic pet trade.
- intentional killing, when they come into conflict with human populations, by people protecting their crops (Hockings and Hulme 2009). Within the AOI, there is some seasonal conflict outside the Wambabya FR when chimpanzees leave the forest to feed on jackfruit and mango, and within the FR when feeding on honey from community's tended beehives (Ganas-Swaray and Koojo 2017). If the killing of chimpanzees occurs, it often leads to local extinction as population densities are low and reproductive rates are slow.
- habit loss and degradation. Although chimpanzees are opportunistic and will forage on modified land, they remain vulnerable to the conversion of natural habitat to agriculture. Extensive land conversion in western Uganda has destroyed much of the submontane forest used by the species.
- disease. Because chimpanzees and humans are genetically similar, chimpanzees succumb to many diseases that afflict humans. Infectious diseases, including outbreaks of respiratory disease and anthrax, are the main cause of death in several chimpanzee populations that have been habituated to human presence.

In the Wambabya FR, chimpanzees are at their highest population density in the Albertine Rift area (Lamprey 2015). The area between the Wambabya and Bugoma FRs (see Section A4.4.2.1) serves as an important wildlife corridor and provides perhaps the best opportunity for a viable ecological reconnection of the chain of forests in the northern Albertine Rift (Lamprey 2015). Several narrow riparian corridors and small patches of remnant forest vegetation link the Wambabya and Bugoma FRs. Although degraded, studies indicate that these corridors are valuable in terms of wildlife connectivity, particularly for chimpanzees.

An additional study conducted by the project researched the presence of chimpanzee in sections of the area between the Wambabya and Bugoma FRs and to the north and northeast of the Wambabya FR. A map of the findings is presented in Figure A4.4-2. From this additional study, it is concluded that chimpanzee move, probably on a seasonal basis, from the FRs to community lands to find food (fruit and sugar cane) to supplement their diet. This is thought to be due to degradation of the FRs, leading to reduced food supplies, with chimpanzee using the scrub and riparian corridors (preferentially) to move through the landscape.

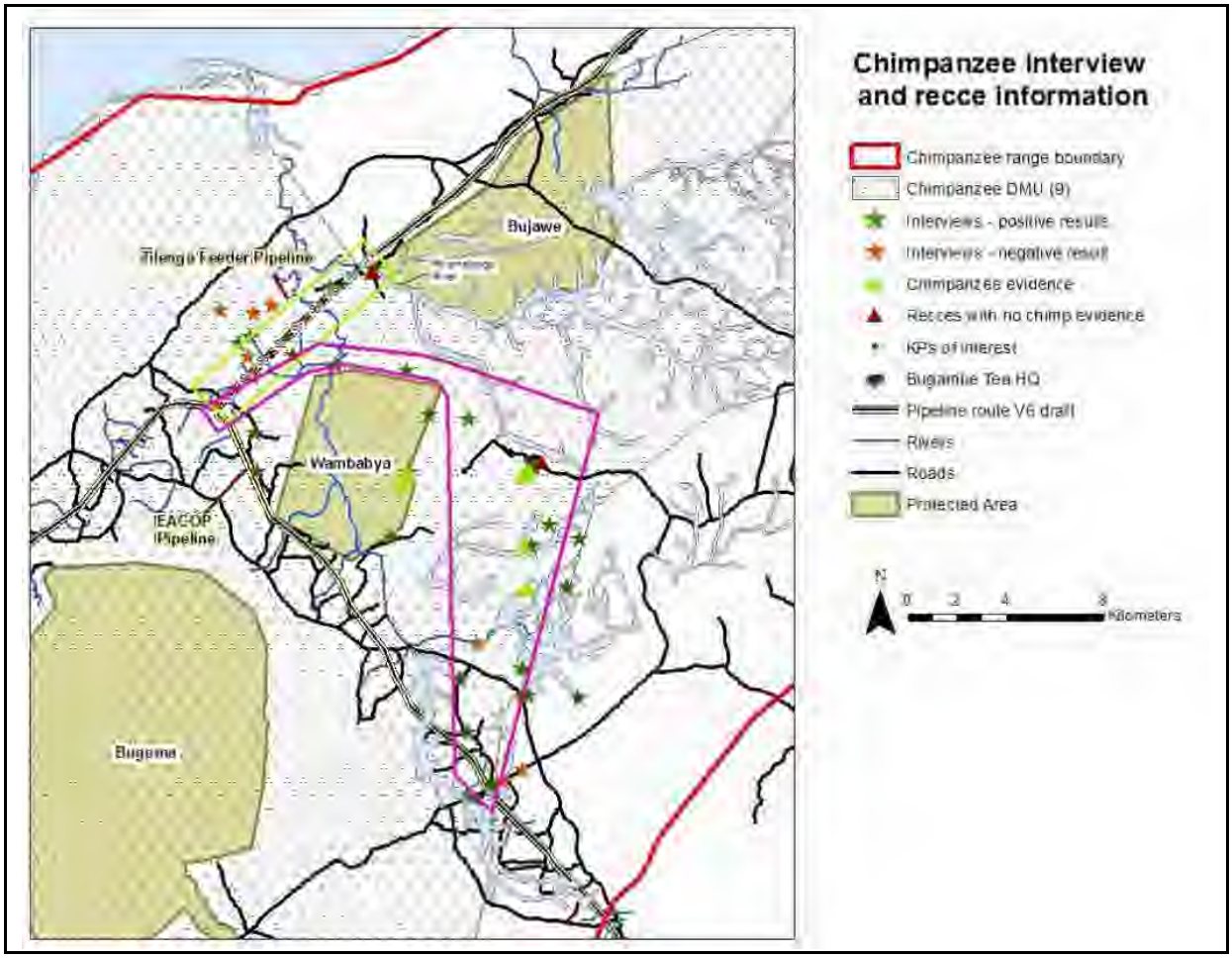

Figure A4.4-2 Interview Results and Recces/Direct Walks[2]

Trend in Condition and Sensitivity to Change

Sitatunga

Increased habitat fragmentation and human presence means that the sitatunga is more accessible to hunters. The ever-increasing loss of wetlands throughout their range has cut off former dispersal routes and many populations are becoming isolated. This is likely to lead to continued population decline.

[2] One chimpanzee evidence point can represent more than one nest. DMU = discrete management unit

Although least concern globally, the sitatunga is vulnerable nationally and thus has a moderate sensitivity to change.

Bohor Reedbuck

Bohor reedbuck has been removed from large parts of its natural range by overhunting and loss of habitat to the encroachment of human settlements and livestock. Its numbers are in gradual decline over most of its remaining range, apart from some protected areas in East Africa (IUCN SSC Antelope Specialist Group 2016).

Although of least concern globally, the Bohor reedbuck is endangered at a national level, and thus has a high sensitivity to change.

Temminck's Ground Pangolin

Exploitation of Temminck's ground pangolin for traditional medicine and bushmeat is likely to continue until greater protection is provided, and its population is projected to continue to decline (Pietersen et al. 2014).

As Temminck's ground pangolin is IUCN vulnerable, it has high sensitivity to change.

Tree Pangolin

Although the most abundant of the African pangolins, the tree pangolin is actively hunted for its scales and for informal bushmeat markets. It is reported that the availability of this species is becoming rarer within markets and thus, it can be inferred that the population is declining (Waterman et al. 2014).

As the tree pangolin is vulnerable both globally and nationally, it has a high sensitivity to change.

Long-tailed Pangolin

This species is threatened by hunting for the local, and increasingly international, traditional medicine and bushmeat markets. Although historically the least often encountered pangolin species in informal markets, a recent increase in its presence suggests a growing reliance on the species to meet demand. Habitat loss and degradation are also significant threats. There is no quantitative data available on densities or abundance, but the population is thought to be declining (Waterman et al. 2014).

As the long-tailed pangolin is globally vulnerable and nationally endangered, it has a high sensitivity to change.

African Golden Cat

The African golden cat's habitat is known to be contracting, its prey populations are in decline through hunting for the bushmeat market, and there are records of its skins appearing in markets (Kingdon 2015). The exacerbation of these threats due to human population increase, projected extractive activities and forest clearance throughout its range is projected to result in a 30% reduction in its area of extent over the next 15 years (Bahaa-el-din 2015).

As the African golden cat is globally vulnerable and nationally endangered, it has a high sensitivity to change.

African Clawless Otter

The main threat to this species is the declining state of freshwater ecosystems throughout its range (Jacques et al. 2015). In some parts of the species' range, they are killed for their skins and other body parts, or because they are considered competition for food, especially in rural areas where fishing is an important source of income.

The African clawless otter is globally near threatened and nationally vulnerable, and thus has a moderate sensitivity to change.

Hippopotamus

Lewison (2007) (reported in Lewison and Pluháček 2017) determined that combinations of habitat loss and even moderate levels of adult mortality from hunting (1% of adults) could lead to relatively high probabilities of population declines over the next 30–40 years.

As the hippopotamus is IUCN vulnerable, it has high sensitivity to change.

Spot-Necked Otter

Although this species is widespread, it is restricted to areas of permanent fresh water with good shoreline cover. Its abundance appears to be dependent on suitable habitat cover (Reed-Smith 2010) and recent studies have shown population declines due to habitat loss, watercourse changes due to drought, increased human populations and increased persecution (either threat based or for consumption or medicinal purposes). Beyond anecdotal evidence identifying the absence of otters from areas where they were seen 10 years ago, there is little data available on the species.

For the above reasons and the lack of effective conservation measures, a continued decline in the overall spot-necked otter population of at least 20% is projected for the next three generations, or 23 years (Pacifici et al. 2013).

As the spot-necked otter is IUCN near threatened and nationally endangered, it has a high sensitivity to change.

Leopard

Evidence suggests that leopard populations have been dramatically reduced because of continued, targeted killing where leopard is in conflict with human communities, habitat fragmentation, increased illegal wildlife trade, excessive hunting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (Stein et al. 2016).

Over the last 20 years, there has been considerable decrease in habitat that is favourable to leopards. Leopard population density across the range of the species is known to track the biomass of principle prey species, medium-size and large wild herbivores. Prey species are increasingly under threat from an unsustainable bushmeat trade, leading to collapses in prey populations across large parts of savannah Africa. A commercialised bushmeat trade has caused an estimated 52%

decline in ungulate populations in East Africa and, as a result, an inferred collapse of leopard population of over 50% (Stein et al. 2016).

Future decline is anticipated unless targeted conservation efforts are taken (Stein et al. 2016).

Leopard is IUCN vulnerable, Uganda vulnerable and a keystone species, and thus has high sensitivity to change.

Chimpanzee

Although some Eastern chimpanzee populations appear to be stable, particularly in well-managed, protected areas east of the Albertine Rift, human population growth, road construction and the conversion of habitat for agriculture will increasingly adversely affect chimpanzees.

The chimpanzee population projection for the period between 1980 and 2055 (three generations) is a decline of over 50%. The prediction of continued decline of Eastern chimpanzee populations is a precautionary approach based on the rapidly-increasing human population in East Africa and the degree of political instability in some range countries (Plumptre et al. 2016).

As the chimpanzee is IUCN endangered and Uganda endangered, it has a very high sensitivity to change.

A4.4.3.3 Small Mammals

Baseline Condition

Eight species were recorded in both the wet and dry season studies. The typical striped grass mouse, *Lemniscomys striatus* (IUCN least concern, Uganda not listed) was the most commonly recorded. In total, 23 species of small mammals were recorded, as listed in Table A4.4-3. The disused airstrip and associated borrow pits at approximately KP288 yielded the highest number of recorded small mammals.

No species of conservation importance were recorded along the pipeline route.

Table A4.4-3 Small Mammal Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	Uganda Status
Natal multimammate rat	*Mastomys natalensis*	Least concern	Not listed
Hinde's rock rat	*Aethomys hindei*	Least concern	Not listed
African marsh rat	*Dasymys incomtus*	Least concern	Not listed
Rusty-bellied brush-furred rat	*Lophuromys sikapusi*	Least concern	Not listed
Yellow-spotted brush-furred rat	*Lophuromys flavopunctatus*	Least concern	Not listed
Southern African vlei rat	*Otomys irroratus*	Least concern	Not listed
Big-eared swamp rat	*Malacomys longipes*	Least concern	Not listed
Northern giant pouched rat	*Cricetomys gambianus*	Least concern	Not listed

Table A4.4-3 Small Mammal Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	Uganda Status
House rat	*Rattus rattus*	Least concern	Not listed
Barbary striped grass mouse	*Lemniscomys barbarus*	Least concern	Not listed
Typical striped grass mouse	*Lemniscomys striatus*	Least concern	Not listed
Jackson's soft furred mouse	*Praomys jacksoni*	Least concern	Not listed
Northern giant pouched rat	*Cricetomys gambianus*	Least concern	Not listed
African giant shrew	Crocidura olivieri	Least concern	Not listed
Naked-tail shrew	*Crocidura littoralis*	Least concern	Not listed
Bicoloured musk shrew	*Crocidura fuscomurina*	Least concern	Not listed
Savanna dwarf shrew	*Crocidura nanilla*	Least concern	Not listed
Woodland dormouse	*Graphiurus murinus*	Least concern	Not listed
African giant squirrel	*Protoxerus stangeri*	Least concern	Not listed
Red-legged sun squirrel	*Heliosciurus rufobrachium*	Least concern	Not listed
Striped ground squirrel	*Xerus erythropus*	Least concern	Not listed
Lesser cane rat	*Thryonomys gregorianus*	Least concern	Not listed
Bunyoro rabbit	*Poelagus marjorita*	Least concern	Vulnerable

Trend in Condition and Sensitivity to Change

One small mammal of conservation importance was identified during the study. Evidence (faeces) of the Bunyoro rabbit was recorded at MCPY4, near KP283.

The Bunyoro rabbit (IUCN least concern and Uganda vulnerable) occurs primarily in moist savanna grasslands, woodlands with rocky outcrops, and less predominantly in forested areas (Duthie and Robertson 1990). They often dwell in rock crevices, dense vegetation and self-made 'scrapes' (Kingdon 2015). It is a nocturnal feeder, foraging on flowers and newly sprouted grasses, herbs and occasionally cultivated crops. They breed throughout the year, with litters of one or two altricial[3] young (Duthie and Robinson 1990).

Little is known to about the threats to the Bunyoro rabbit. Although their preferred grassland habitat might be annually or biannually burnt leaving the rabbit vulnerable to predation, the burning promotes vegetation growth included in the species diet. The species may be hunted for food in some localities, including within the Project AOI.

As the Bunyoro rabbit is Uganda vulnerable, it has a moderate sensitivity to change.

All other small mammal species have low sensitivity to change and are not considered further in the assessment.

[3] Refers to young that are hatched or born in an undeveloped state and require care and feeding by the parents

A4.4.3.4 Reptiles

Baseline Condition

A total of 27 reptile species, belonging to three orders – Chelonii (turtles and tortoises), Suaria (lizards and skinks) and Serpentes (snakes) – were recorded during the dry season surveys.

During the wet season surveys, 32 reptile species were recorded, belonging to four orders – Testudines (tortoises), Sauria, Crocodylia (crocodiles) and Serpentes.

The black-necked agama, *Acanthocercus atricollis* (IUCN least concern, Uganda not listed) was the most common species identified, occurring at 28 of 42 sites in the wet season, and 15 of 41 sites in the dry season.

Table A4.4-4 lists the 39 species recorded over the course of the two surveys, including one nonspecified species belonging to the Colubridae family. All species recorded are IUCN least concern or not evaluated globally and nationally.

No reptile species of conservation importance were recorded.

Table A4.4-4 Reptile Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	National Status
Agamidae			
Common Agama	*Agama agama*	Least concern	Least concern
Common Tree Agama	*Acanthocercus atricollis*	Least concern	Least concern
Chamaeleonidae			
Graceful Chameleon	*Chamaeleo gracilis*	Least concern	Least concern
Smooth Chameleon	*Chamaeleo laevigatus*	Least concern	Least concern
Geckonidae			
Tropical House Gecko	*Hemidactylus mabouia*	Not listed	Least concern
Brooke's House Gecko	*Hemidactylus brookii*	Not listed	Least concern
Chevron-throated Dwarf Gecko	*Lygodactylus guttularis*	Not listed	Least concern
Scincidae			
Speckle-lipped skink	*Trachylepis maculilabris*	Not listed	Not listed
Striped skink	*Trachylepis striata*	Not listed	Not listed
African red-sided skink	*Trachylepis perrotetii*	Not listed	Data deficient
Long-tailed skink	*Trachylepis megalura*	Not listed	Not listed
Testudinidae			
Bell's hinged tortoise	*Kinixys belliana*	Not listed	Not listed

Table A4.4-4 Reptile Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	National Status
Typhlopidae			
Lineolate blind snake	*Afrotyphlops lineolatus*	Not listed	Not listed
Spotted blind snake	*Afrotyphlops punctatus*	Not listed	Not listed
Boidae			
Central African rock python	*Python sebae*	Least concern	Not listed
Colubridae			
Yellow-flanked snake	*Crotaphopeltis degeni*	Not listed	Not listed
White-lipped snake	*Crotaphopeltis hotamboia*	Not listed	Not listed
Emerald snake	*Hapsidophrys smaragdina*	Not listed	Not listed
Angola green snake	*Philothamnus angolensis*	Not listed	Not listed
Ruanda emerald green snake	*Philothamnus ruandae*	Not listed	Not listed
Slender green snake	*Philothamnus heterolepidotus*	Not listed	Not listed
Spotted bush snake	*Philothamnus semivariegatus*	Not listed	Not listed
Elapidae			
Jameson's mamba	*Dendroaspis jamesoni*	Least concern	Not listed
Black mamba	*Dendroaspis polyepis*	Least concern	Not listed
Forest cobra	*Naja melanoleuca*	Not listed	Not listed
Black-necked spitting cobra	*Naja nigricollis*	Not listed	Not listed
Viperidae			
Puff adder	*Bitis arietans*	Not listed	Not listed
Green bush viper	*Atheris squamigera*	Not listed	Not listed
Gaboon viper	*Bitis gabonica*	Not listed	Not listed
Rhinocerous viper	*Bitis nasicornis*	Not listed	Not listed
Lamprophiinae			
Brown house snake	*Lamprophis fuliginosus*	Not listed	data deficient
Red-black striped snake	*Bothrophthalmus lineatus*	Not listed	Not listed
Psammophidae			
Striped sand snake	*Psammophis sibilans*	Not listed	Not listed
Olive grass snake	*Psammophis mossambicus*	Not listed	Not listed
Varanidae			
Nile monitor	*Varanus niloticus*	Not listed	Not listed

Table A4.4-4 Reptile Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	National Status
Pelomedusidae			
Helmeted turtle	Pelomedusa subrufa	Not listed	Not listed
Crocodylidae			
Nile crocodile	*Crocodylus niloticus*	Least concern	Not listed

Trend in Condition and Sensitivity to Change

No reptiles of conservation importance were identified during the study. All species have low sensitivity to change and are not considered further in the assessment.

A4.4.3.5 Amphibians

Baseline Condition

During the wet season survey, 23 amphibian species were identified, all of the order Anura. The disused airstrip and associated borrow pits at KP289 was the most species-rich site, with 14 species. At KP14 and KP49, only four species were found. The Mascarene grass frog, *Ptychadena mascareniensis* (IUCN least concern, Uganda not listed) was the most commonly found species, being identified at 30 of the 40 study sites along the proposed route.

Twenty-one species, all of the order Anura, were identified in the dry season surveys. The most diverse site was again the disused airstrip and associated borrow pits at KP288 with 17 species, while over half of the sites had fewer than three species recorded. The Mascarene grass frog was again the most commonly found species, being identified at 27 of the 40 study sites along the proposed route.

In total, 26 amphibian species were identified over the two surveys, as listed in Table A4.4-5.

One species of conservation importance was recorded at KP187 during the field studies: golden-throated rocket frog (*Ptychadena chrysogaster*), IUCN least concern and Uganda vulnerable.

The golden-throated rocket frog appears to be a dweller of forest edges at higher elevations in the western part of East Africa (Spawls et al. 2002). Little is known about the species.

Table A4.4-5 Amphibian Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	National Status
Buffonidae			
Guttural toad	*Amietophrynus gutturalis*	Least concern	Not listed

Table A4.4-5 Amphibian Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	National Status
African common toad	*Amietophrynus regularis*	Least concern	Not listed
Flat-backed toad	*Amietophrynus maculatus*	Least concern	Not listed
Dicroglossidae			
Crowned bullfrog	*Hoplobatracus occipitalis*	Least concern	Not listed
Hyperoliidae			
Four-lined spiny reed frog	*Afrixalus quadrivittatus*	Least concern	Not listed
Sharp-nosed reed frog	*Hyperolius acuticeps*	Least concern	Not listed
Cinnamon-bellied reed frog	*Hyperolius cinnamomeoventris*	Least concern	Not listed
Kivu reed frog	*Hyperolius kivuensis*	Least concern	Not listed
	Hyperolius viridiflavus bayoni[4]	Least concern	Not listed
	Hyperolius viridiflavus variabilis[2]	Least concern	Not listed
Common reed frog	*Hyperolius viridiflavus viridiflavus*[2]	Least concern	Not listed
Senegal land frog	*Kassina senegalensis*	Least concern	Not listed
Arthroleptidae			
Bocage's tree frog	*Leptopelis bocagei*	Least concern	Not listed
Christy's tree frog	*Leptopelis christyi*	Least concern	Not listed
	Arthroleptis sp	Least concern	Not listed
Ranidae			
White-lipped frog	*Amnirana albolabris*	Least concern	Not listed
Phrynobatrachidae			
Eastern puddle frog	*Phrynobatrachus acridoides*	Least concern	Not listed

[4] Frogs of the *Hyperolius viridiflavus / H. Glandicolor* are part of a species complex still under taxonomic discussion. English names are not widely accepted and many different species are referred to simply as common reed frog.

Table A4.4-5 Amphibian Species Recorded During Field Surveys

Family and Common Name	Scientific Name	IUCN	National Status
East African puddle frog	*Phrynobatrachus mababiensis*	Least concern	Not listed
Natal dwarf puddle frog	*Phrynobatrachus natalensis*	Least concern	Not listed
Phyxichepalidae			
Angola river frog	*Amietia angolensis*	Least concern	Not listed
Ptychadenidae			
Anchieta's ridged frog	*Ptychadena anchietae*	Least concern	Not listed
Golden-throated rocket frog	*Ptychadena chrysogaster*	Least concern	vulnerable
Macarene grass frog	*Ptychadena mascareniensis*	Least concern	Not listed
Sharp-nosed ridged frog	*Ptychadena oxyrhynchus*	Least concern	Not listed
Grassland ridged frog	*Ptychadena porosissima*	Least concern	Not listed
Pipidae			
Lake Victoria clawed frog	*Xenopus victorianus*	Least concern	Not listed

Trend in Condition and Sensitivity to Change

There is insufficient information available to comment on the trend in condition of the golden-throated rocket frog.

The species is nationally vulnerable and hence has moderate sensitivity to change.

A4.4.3.6 Invertebrates

Over both surveys, 228 butterfly and 86 dragonfly species were recorded in Uganda.

For butterflies, the highest number of species was recorded in the forests and woodland areas – in a woodland area near KP275, 58 butterfly species were recorded. However, most species of conservation importance were recorded around the Wambabya FR and larger wetland areas such as the River Kafu wetlands.

Butterfly species of conservation importance found on the export pipeline route are listed in Table A4.4-6.

Table A4.4-6 Butterfly Species Recorded During Field Survey

Species	IUCN Status	Uganda Red List Status	Sites Present	Notes
Acada biseriatus	Not listed	Data deficient	Woodland at KP275	Although globally widespread, the species is often localised with a restricted flight period during the year. This is only the second record in Uganda.
Actinote alciope	Not listed	Critically endangered (due to be revised to endangered due to additional records)	KP6 (Wambabya area)	Previously known from only one forest – Kagombe FR (Kibaale district)
Actinote pharsalus	Not listed	Vulnerable	KP273	Species prefers moist savannah and forest. Habitat loss is inferred from human activities in preferred habitats.
Actinote rahira	Not listed	Vulnerable	KP37 (River Kafu area)	Species preferred habitat has undergone remarkable degradation in Uganda in recent years.
Actinote pentapolis	Not listed	Vulnerable	Taala FR (KP79)	Previous records from Kalinzu–Maramagambo FR, Entebbe botanical gardens
Actinote wigginsi	Not listed	Data deficient	KP42 (MC-PY)	First record of the species in Uganda was during the wet season survey at KP47
Anthene indefinita	Not listed	Vulnerable	KP7, KP123 (Kasana–Kasambya FR), KP147–148	Species prefers moist savannah and forest. It is restricted to eastern Africa, including the Democratic Republic of Congo (DRC).

Table A4.4-6 Butterfly Species Recorded During Field Survey

Species	IUCN Status	Uganda Red List Status	Sites Present	Notes
Anthene liodes	Not listed	Vulnerable	KP7 and KP11 (Wambabya forest area), KP123 (Kasana–Kasambya FR), KP181, KP249, KP255, KP258 and KP262	Only previously recorded in the Budongo FR
Bebearia laetitioides	Not listed	Vulnerable	Wambabya FR (KP7)	Previous records from Semliki National Park, Budongo FR, Bugoma FR, Kagombe FR (Kibaale district) and Wambabya FR
Bicyclus istaris	Not listed	Vulnerable	KP7 (Wambabya FR) and KP11	Species prefers wetter forests and some of the known forest locations are undergoing degradation
Borbo holtzi	Not listed	Vulnerable	KP60 and KP226	Only known from a few localities in Uganda. Males generally establish territories anywhere in the habitat, particularly on the edges of the bush, where they perch on shrubs.
Cymothoe egesta	Not listed	Endangered	Wambabya FR (KP7)	Previously only known from Semliki National Park
Euchrysops subpallida	Not listed	Vulnerable	KP14	The species tends to occur in discrete colonies. Individuals are usually found near the larval food plants, often in shade cast by trees.
Hewitsonia ugandae	Not listed	Data deficient	KP13	This is the first confirmed record of the species in Uganda
Lachnocnema divergens	Not listed	Data deficient	KP275	This is the first confirmed record of the species in Uganda

Table A4.4-6 Butterfly Species Recorded During Field Survey

Species	IUCN Status	Uganda Red List Status	Sites Present	Notes
Metisella willemi	Not listed	Vulnerable	KP261 and KP266	The species has previously been recorded at only three sites; South Nile in Murchison Falls National Park, Budongo FR and Kitechura FR.
Monza alberti	Not listed	Vulnerable	KP275	The species has previously been recorded only at Bugoma and South Busoga FRs; both forests have undergone substantial degradation in recent years.
Mylothris rhodope	Not listed	Data deficient	KP11 and KP12 (Wambabya area)	The species was suspected to occur in Uganda, but this is the first confirmed record
Neptis nicomedes	Not listed	Vulnerable	KP7 (Wambabya FR)	Forests known to support the species are undergoing degradation
Pentila inconspicua	Not listed	Vulnerable	KP11 (Wambabya area)	Previously recorded at Semliki National Park, Kalinzu–Maramagambo FR, Ssese Islands and Sango Bay FR
Pentila tachyroides	Not listed	Critically endangered (due to be revised to endangered) due to additional records	KP11 (Wambabya area)	Previously only known from only Bbale Compartment (Sango Bay FR) until recently when it was recorded in Nabugabo area in a severely degraded forest
Prosopalpus styla	Not listed	Vulnerable	KP55, KP79 (Taala FR), KP123 (Kasana–Kasambya FR), KP165, KP220, MC-258 and KP258, KP261, KP250, KP262, KP264 and KP268 and 269	Species prefers open ground in savannah and forests
Uranothauma heritsia	Not listed	Endangered	Airstrip ponds	Known from a few forests including remnant forest corridor and wetlands in Hoima district

Table A4.4-6 Butterfly Species Recorded During Field Survey

Species	IUCN Status	Uganda Red List Status	Sites Present	Notes
Zenonia zeno	Not listed	Vulnerable	Kanangalo FR	Most of the forests where the species is known to occur are undergoing loss and degradation

All but one dragonfly species recorded along the project route are listed as IUCN least concern, but several species are on the Uganda Red List. Table A4.4-7 presents the dragonfly species that were identified during the surveys.

The most species-rich area for dragonflies was found to be the disused airstrip and associated borrow pits at KP288.5.

Table A4.4-7 Dragonfly Species Recorded During Field Surveys

Species	IUCN Status	Uganda Red List Status	Sites Present	Notes
Acisoma inflatum	Least concern	Vulnerable	KP36–37, KP220, KP248, KP274–277 (R. Kibale), KP280, KP288	Habitat degradation is a possible threat
Acisoma variegatum	Least concern	Vulnerable	KP37 (R. Kafu)	Habitat degradation is a possible threat
Agriocnemis palaeforma	Vulnerable	Endangered	KP16, KP37, KP55, KP113, KP141–148 (R. Nabakazi) and KP261	Uganda–Rwanda endemic that inhabits papyrus swamps. Until recently, species records were scant.
Azuragrion vansomereni	Least concern	Data deficient	KP187 and KP288	There are few records of this species in Uganda
Chlorocypha victoriae	Least concern	Vulnerable	KP6, KP8 (Wambabya), KP9, KP11, KP13, KP16 and KP67	Forests in Uganda have undergone high levels of degradation both in central and western Uganda where the species occurs. Recent records were in Bugoma FR in 2014.
Neodythemis afra	Least concern	Critically endangered	KP06–07 and KP11 (Wambabya) and KP21	Only previously known from Semliki
Pseudagrion (B) torridum	Least concern	Vulnerable	KP13, KP36–37 and KP248	Shoreline habitats are under immense threats in Uganda

Table A4.4-7 Dragonfly Species Recorded During Field Surveys

Species	IUCN Status	Uganda Red List Status	Sites Present	Notes
Platycypha lacustris	Least concern	Vulnerable	River crossing near KP67	Previously recorded in Bugoma FR, Wambabya FR and Albertine Rift escarpment (Hoima district)
Pseudagrion (B) glaucoideum	Least concern	Critically endangered (due to be revised to endangered) due to additional records	KP271 (River Kibale)	Previously recorded only from Semliki National Park

A4.4.4 Ecosystem Services Provided

The habitats discussed in the preceding sections (Wambabya, Taala and Kasana–Kasambaya FRs, the airstrip borrow pits in the Sango Bay area and wetland habitats throughout the AOI), with the species they support, provide a range of ecosystem services as listed below. Further details on the general nature and extent of the provisioning ecosystem services can be found in the land-based livelihoods section of Appendix A11 Socio-economic and Health Baseline Report.

Provisioning services include:

- wood and wood fuel (including collection for charcoal burning). Charcoal burning is illegal in the protected areas listed above.
- food (hunting, gathering and foraging). In some areas these activities are legal, in others they are not.
- collection of medicinal products
- trapping of wildlife for the live trade market.

Cultural services include:

- ethical and biodiversity ‘non-use’ values: in particular, maintaining populations of endangered and endemic species. These values are difficult to determine.
- sense of place and way of life: these locations are likely to provide value to local people living near and using these areas in terms of way of life and through a special connection with such areas
- eco-tourism, particularly in protected areas
- aspects of these locations may provide spiritual, sacred or religious values; inspiration for culture and design; and cognitive development.

A4.4.5 Sensitivity Rankings

Based on the survey, the trend in condition and sensitivity to change, the sensitivity of the VECs has been ranked and is shown in Table A4.4-8.

Table A4.4-8 Fauna Sensitivity Ranking

Fauna VEC	Sensitivity Ranking	Rationale for Ranking
Wambabya FR		
Legally protected, internationally or nationally recognised areas	High (4)	Designated as an FR, originally for ecological purposes
Flora and fauna species of conservation importance	Very high (5)	Wambabya FR and the corridors of remnant riparian forest linking it to Bugoma CFR provide important habitat for the IUCN and Uganda endangered chimpanzee
Fauna habitats of conservation importance	High (4)	Natural habitat (as defined by IFC PS6) and habitat providing important feeding or breeding ground
Taala FR		
Legally protected, internationally or nationally recognised areas	High (4)	Designated as an FR, originally for ecological purposes
Flora and fauna species of conservation importance	High (4)	Supports spot-necked otter, a Uganda endangered species (IUCN near threatened)
Fauna habitats of conservation importance	Low (2)	Comprises modified habitat that has biodiversity value in places
Kasana–Kasambya FR		
Legally protected, internationally or nationally recognised areas	Moderate (3)	Designated as an FR and retains some biodiversity value
Flora and fauna species of conservation importance	Low (2)	Supports several species ranked as IUCN least concern
Fauna habitats of conservation importance	Low (2)	Comprises modified habitat with some biodiversity value
Nabakazi River		
Legally protected, internationally or nationally recognised areas	High (4)	The Ugandan National Policy for the Conservation and Management of Wetlands protects the Nabakazi River wetlands. This includes elements that protect the river as a biodiversity area and as a resource for local communities
Flora and fauna species of conservation importance	High (4)	Supports spot-necked otter, a Uganda endangered species (IUCN near threatened)

Table A4.4-8 Fauna Sensitivity Ranking

Fauna VEC	Sensitivity Ranking	Rationale for Ranking
Fauna habitats of conservation importance	High (4)	The river and associated wetlands can be classified as natural habitat[1] The Nabakazi River provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes
Katonga River		
Legally protected, internationally or nationally recognised areas	Very High (5)	The Katonga River and associated wetlands and tributaries connect with or flow through numerous nationally protected sites The river also connects with Lake George to the west, which is a Ramsar wetland and fKBA
Flora and fauna species of conservation importance	High (4)	Supports hippopotamus, an IUCN vulnerable and Uganda vulnerable species
Fauna habitats of conservation importance	High (4)	The Katonga River is classed as natural habitat[1] It provides connectivity, including riparian corridors and wetlands, which creates ecological linkages between the Albertine Rift Lakes
Disused airstrip borrow pits		
Flora and fauna species of conservation importance	High (4)	Supports Bohor reedbuck, a Uganda endangered species
Fauna habitats of conservation importance	High (4)	Provides important breeding and feeding habitat for several reptile, amphibian and invertebrate species

NOTE: [1] As defined by PS6 and the accompanying Guidance Note.

A4.5 Key Considerations

A4.5.1 Habitats

Based on the outcomes of the fauna biodiversity study, and particularly the known or likely presence of species of conservation importance, the following areas are identified as sensitive VECs:

- Wambabya FR and riparian corridors linking it with the Bugoma CFR to the south
- Taala FR
- disused airstrip borrow pits at KP288
- papyrus wetlands associated with the Nabakazi and Katonga Rivers.

A4.5.2 Fauna

Some species identified during the survey are of conservation importance and are key considerations for the impact assessment. These species (see Table A4.5-1) are important because:

- they are listed as IUCN endangered or vulnerable
- some are endemic to Uganda
- some are of conservation importance in Uganda (i.e., included in species action plans or the national red list) or are listed in the Convention on Migratory Species.

Table A4.5-1 Key Fauna Considerations

Species	Location(s)	Conservation Status
Sitatunga	KP165 (Katonga River), KP141 (Nabakazi swamp) and KP106 in the area of a papyrus swamp	IUCN vulnerable, Uganda vulnerable
Bohor reedbuck	KP6, KP165, KP187, KP218–231 and KP289	IUCN least concern, Uganda endangered
Temminck's ground pangolin	KP165 (Katonga River)	IUCN vulnerable, Uganda vulnerable
Tree pangolin	KP165 (Katonga River)	IUCN vulnerable, Uganda vulnerable
Long-tailed pangolin	Wambabya FR	IUCN vulnerable, Uganda endangered
African golden cat	Wambabya FR	IUCN vulnerable, Uganda endangered
African clawless otter	Wambabya FR	IUCN near threatened, Uganda vulnerable
Hippopotamus	KP165 (Katonga River)	IUCN vulnerable, Uganda vulnerable
Spot-necked otter	KP165 (Katonga River)	IUCN near threatened, Uganda endangered
Leopard	KP165 (Katonga River), KP205	IUCN vulnerable, Uganda vulnerable
Chimpanzee	Wambabya FR and connecting forests	IUCN endangered, Uganda endangered
Bunyoro rabbit	MCPY4, KP283	IUCN least concern, Uganda vulnerable
Sierra Leone mops bat	Kasana–Kasambaya FR	IUCN least concern, Uganda vulnerable
Golden-throated rocket frog	KP187	IUCN least concern, Uganda vulnerable

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ATTACHMENT A4.1 FIELD SURVEY DATA

Table Att4.1-1 Bat Data Species List

Species	Forest Fragment near KP8	Kasana–Kasambya FR (near KP123)	Wambabya Forest near KP06
Epomops franqueti			1
Mops brachypterus		1	
Scotophillus dingani	1		

Table Att4.1-2 Mammal Data

Common Name	Species Name	Survey Area																																
		Airstrip Kyotera	KP288	KP277	KP283 (MCPY4)	KP274	KP269	KP258	KP233	KP249	River Lwemikunya	Kibale river	Potential campsite	Lwengo FR	KP225	KP220	River crossing 217	KP205	KP165-Katonga River	Pump Station, Sembabule	KP187	Nabakazi swamp –141	KP123 Kasana– Kasambya	Taala FR	KP106	Kanangalo FR	KP70 River crossing	Kafu Wetlands	KP47	Kololo area – start of export	Wambabya FR	KP6	KP3
Red-tailed Monkey	*Cercopithecus ascanius*					1																									1		
Vervet Monkey	*Cercopithecus pygerythrus*	1		1		1		1		1	1		1				1		1		1	1	1	1	1	1					1	1	1
Black and White Colobus	*Colobus guereza*																		1			1	1	1		1					1	1	1
Grey-cheeked Mangabey	*Lophocebus albigena*																						1								1		
Chimpanzee	*Pan troglodytes ssp. schweinfurthii*																														1		
Olive baboon	*Papio anubis*																														1	1	1
Common Reedbuck	*Redunca redunca*										1			1	1		1		1		1											1	
Red Forest Duiker	*Cephalophus natalensis*																														1		
Blue Duiker	*Philantomba monticola*																														1		
Bush Duiker	*Sylvicapra grimmia*	1		1		1		1		1	1		1	1	1		1	1	1	1	1	1	1			1					1	1	1
Bushbuck	*Tragelaphus scriptus*					1				1	1			1			1	1	1	1	1	1	1		1	1					1	1	1
Sitatunga	*Tragelaphus spekii*					1								1					1			1			1								
Hippopotamus	*Hippopotamus amphibious*			1		1						1		1					1														
Bushpig	*Potamochoerus larvatus*			1							1								1												1		1

Table Att4.1-2 Mammal Data

Common Name	Species Name	Survey Area																																
		Airstrip Kyotera	KP288	KP277	KP283 (MCPY4)	KP274	KP269	KP258	KP233	KP249	River Lwemikunya	Kibale river	Potential campsite	Lwengo FR	KP225	KP220	River crossing 217	KP205	KP165-Katonga River	Pump Station, Sembabule	KP187	Nabakazi swamp –141	KP123 Kasana– Kasambya	Taala FR	KP106	Kanangalo FR	KP70 River crossing	Kafu Wetlands	KP47	Kololo area – start of export	Wambabya FR	KP6	KP3
African Savanna Hare	*Lepus victoriae*	1		1				1		1	1		1			1	1	1	1	1	1	1	1			1						1	1
Serval	*Leptailurus serval*	1				1					1	1										1	1		1						1	1	1
Leopard	*Panthera pardus*																	1	1			1				1						1	
African Golden Cat	*Profelis aurata*																														1		
Side-stripped Jackal	*Canis adustus*	1		1		1				1	1	1	1		1		1		1		1	1	1			1			1			1	
Black-backed Jackal	*Canis mesomelas*																														1		
Eastern Tree Hyrax	*Dendrohyrax arboreus*																																1
Rock Hyrax	*Procavia capensis*	1		1						1	1		1		1				1		1		1										
African Civet	Civettictis civetta					1											1				1		1							1		1	1
Common Genet	Genetta genetta																						1										
Large-Spotted Genet	Genetta maculata													1																			
Servaline Genet	*Genetta servalina*																														1		
Cape Genet	*Genetta tigrina*																														1		
Giant Genet	*Genetta victoriae*																														1		
Marsh Mongoose	*Atilax paludinosus*	1		1							1			1	1	1	1		1	1			1		1					1	1		
Pousargues's Mongoose	*Dologale dybowskii*																						1										
Large Grey Mongoose	*Herpestes ichneumon*	1		1						1	1		1				1		1		1	1	1		1	1					1	1	1

Table Att4.1-2 Mammal Data

Common Name	Species Name	Survey Area																																
		Airstrip Kyotera	KP288	KP277	KP283 (MCPY4)	KP274	KP269	KP258	KP233	KP249	River Lwemikunya	Kibale river	Potential campsite	Lwengo FR	KP225	KP220	River crossing 217	KP205	KP165-Katonga River	Pump Station, Sembabule	KP187	Nabakazi swamp –141	KP123 Kasana– Kasambya	Taala FR	KP106	Kanangalo FR	KP70 River crossing	Kafu Wetlands	KP47	Kololo area – start of export	Wambabya FR	KP6	KP3
Slender mongoose	*Herpestes sanguineus*								1	1					1				1			1			1	1							
White-tailed Mongoose	*Ichneumia albicauda*	1		1					1	1			1	1					1			1	1						1		1	1	
Banded Mongoose	*Mungos mungo*			1					1				1				1		1		1		1		1	1			1		1		
Honey badger	*Mellivora capensis*																														1		
African Clawless Otter	*Aonyx capensis*					1	1															1									1		
Spot-necked Otter	*Hydrictis maculicollis*	1		1		1	1				1					1	1				1	1		1			1					1	
African Brush-tailed Porcupine	*Atherurus africanus*																														1		
Crested Porcupine	*Hystrix cristata*	1		1						1	1						1		1	1	1	1	1		1							1	1
Long-tailed Pangolin	*Phataginus tetradactyla*																														1		1
Tree Pangolin	*Phataginus tricuspis*																		1												1		
Temminck's Ground Pangolin	*Smutsia temmincki*																		1														
Aardvark	*Orycteropus afer*										1								1	1					1						1		
Galago	*Four possible species, sp. 2*																														1		
Woodland Dormouse	*Graphiurus murinus*												1																				

Table Att4.1-2 Mammal Data

Common Name	Species Name	Survey Area																																
		Airstrip Kyotera	KP288	KP277	KP283 (MCPY4)	KP274	KP269	KP258	KP233	KP249	River Lwemikunya	Kibale river	Potential campsite	Lwengo FR	KP225	KP220	River crossing 217	KP205	KP165-Katonga River	Pump Station, Sembabule	KP187	Nabakazi swamp –141	KP123 Kasana– Kasambya	Taala FR	KP106	Kanangalo FR	KP70 River crossing	Kafu Wetlands	KP47	Kololo area – start of export	Wambabya FR	KP6	KP3
Barbary Striped Grass Mouse	*Lemniscomys barbarus*												1																					
Typical Striped Grass Mouse	*Lemniscomys striatus*	1							1				1			1				1			1											
Jackson's Soft-furred Mouse	*Praomys jacksoni*	1																													1		
Northern Giant Pouched Rat	*Cricetomys gambianus*	1																					1								1		
Hinde's Rock Rat	*Aethomys hindei*																						1								1		
African Marsh Rat	*Dasymys incomtus*	1														1																	
Woodland Thicket Rat	*Grammomys dolichurus*															1																	
Big-eared Swamp Rat	*Malacomys longipes*																														1		
Natal Multimammate Rat	*Mastomys natalensis*								1				1			1				1													
Rusty-bellied Brush-furred Rat	*Lophuromys sikapusi*								1							1				1													
Yellow-spotted Brush-furred Rat	*Lophuromys flavopunctatus*								1																						1		
Southern African Vlei Rat	*Otomys irroratus*	1														1																	
House rat	*Rattus rattus*												1																					

Table Att4.1-2 Mammal Data

Common Name	Species Name	Survey Area																																
		Airstrip Kyotera	KP288	KP277	KP283 (MCPY4)	KP274	KP269	KP258	KP233	KP249	River Lwemikunya	Kibale river	Potential campsite	Lwengo FR	KP225	KP220	River crossing 217	KP205	KP165-Katonga River	Pump Station, Sembabule	KP187	Nabakazi swamp –141	KP123 Kasana– Kasambya	Taala FR	KP106	Kanangalo FR	KP70 River crossing	Kafu Wetlands	KP47	Kololo area – start of export	Wambabya FR	KP6	KP3
Lesser Cane Rat	*Thryronomys gregorianus*	1		1				1		1	1		1			1	1		1		1		1						1				1
Bicoloured Musk Shrew	*Crocidura fuscomurina*		1																															
Naked-tail Shrew	*Crocidura littoralis*																											1						
African Giant Shrew	*Crocidura olivieri*	1																										1						
Boehm's Bush squirrel	*Paraxerus boehmi*																													1				
African Giant squirrel	*Protoxerus stangeri*																		1											1	1			
Red-legged Sun Squirrel	*Heliosciurus rufobrachium*																													1				
Striped Ground Squirrel	*Xerus erythropus*	1		1				1		1	1			1			1	1	1	1	1	1	1			1	1					1	1
Bunyoro Rabbit	*Poelagus marjorita*				1																													

Table Att4.1-3 Amphibian Species List Wet Season

Species/Sites	KP00	KP02	KP07	KP09	KP105	KP113	KP117	KP120	KP13	KP14	KP140	KP150	KP185	KP187	KP195	KP220	KP225	KP226	KP249	KP250	KP26	KP261	KP269	KP271	KP277	KP288	KP289	KP291	KP35	KP36	KP37	KP3a	KP47	KP49	KP53	KP55	KP70	KP74	KP79	KP82	Total
Afrixalus quadrivittatus	1	1	1	1	1	2	1						1	1	1		1	1	1	1		1	1						2	1	2	1				1		1	1		26
Amietia angolensis						1																																			1
Amietophrynus gutturalis					1							1			1										1		1		1	1						1	1		1		10
Amietophrynus regularis	1	1	1		1	1	1	1	1			1	1	1	1		1	1	1			1	1	1			4	1	1	1		1		1	1	1	1	1		1	32
Amnirana albolabris																											1														1
Hoplobatrachus occipitalis	1	1	1									1	1	1	1		1	2	1				1								1	1									14
Hyperolius acuticeps																											1		1												2
Hyperolius cinnamomeoventris	1			1	1	1	1	1	1	1	1		1		1		1	1	1	1	1	1	1	1			3	1	1				1			1	1	2			29
Hyperolius kivuensis		1	1	1	1		1	1		1	1		1	1	1				1	1		1	1	1			2	1	2	1		1	1	1		1	1	1	1		29
Hyperolius viridiflavus bayoni																			1				1				2	1													5
Hyperolius viridiflavus variabilis																											2														2
Hyperolius viridiflavus viridiflavus				1									1	1				1					1			1	4	1													11
Kassina senegalensis																			1																						1
Leptopelis bocagei											1	1	1	1		1												2													7
Leptopelis christyi	1			1	1	1															1												1			1	1	1			9
Phrynobatrachus acridoides																			1						1		1														3
Phrynobatrachus mababiensis													1													1	2	1													5
Phrynobatrachus natalensis		1	1	1	1	1			1				1	1	1			1	1	1		1	1		1		5		1	1	1	1					1		1		26
Ptychadena chrysogaster														1																											1
Ptychadena mascareniensis	1	1	1		1	1	1			1	1	1	1		1		1	1	1	1		1	1		2	1	4	1	2	1		1	1	1		1		2	1	1	36
Ptychadena oxyrhynchus						1																																1		2
Ptychadena porosissima					1					1	1	1	1	1		1	1	1	1			1	1		1		3	1	1	1			1	1		1	1		1	1	25
Xenopus victorianus				1		1							1	1																	1									5
Total	**6**	**6**	**6**	**7**	**9**	**10**	**5**	**3**	**3**	**4**	**5**	**6**	**12**	**10**	**8**	**2**	**6**	**9**	**11**	**5**	**2**	**7**	**10**	**3**	**6**	**3**	**35**	**10**	**12**	**7**	**5**	**6**	**5**	**4**	**1**	**8**	**7**	**8**	**7**	**3**	**282**

Table Att4.1-4 Amphibian Species List Dry Season

	KP147	KP00	KP01	KP03	KP09	KP113	KP12	KP123	KP13	KP150	KP16	KP17	KP19	KP195	KP20	KP220	KP226	KP229/230	KP249	KP250	KP258	KP261	KP266	KP267	KP269	KP271	KP274	KP275	KP277	KP288	KP289	KP35	KP37	KP38	KP42	KP55	KP6	KP70	KP74	KP8	Total
Afrixalus quadrivittatus	1					2		1										1							1					2											8
Amietophrynus guturallis																														2											2
Amietophrynus maculatus											1																														1
Amietophrynus regularis	1		1	1				1		1	1			1		1									1		1			4	2										16
Arthroleptis sp											1																														1
Hoplobatrachus occipitalis		1					1		1	1										1					1		1			3	1	1				1	2				15
Hyperolius acuticeps								1																																	1
Hyperolius cinnamomeoventris	1																								1		1			1											4
Hyperolius kivuensis	1	1	1			2		1								1		1							1		1			1		1								1	13
Hyperolius viridiflavus bayoni																														1											1
Hyperolius viridiflavus variabilis																														1											1
Hyperolius viridiflavus viridiflavus	1					1												1							1		1			1											6
Leptopelis bocagei																													2	1											3
Phrynobatrachus acridoides	1	1		1				1																			1			2	1						1				9
Phrynobatrachus mababiensis	1		1	1																										3				1		1					8
Phrynobatrachus natalensis	1	1		1		2		1		1	2				1		1	1	1						1		2			2	1		1	1		1	1	1	2		26
Ptychadena anchietae		1																																	1		1	2		1	6
Ptychadena mascareniensis	1	2			2	1		2	1	1	2	1		1	2	1		2				1	1	1		1	3		2	6	6		1	2			2	1	2	1	49
Ptychadena oxyrhynchus																														1											1
Ptychadena porosissima	1		1			1		1		1	1		1	1	1		1		3	1	3	2						11		1											31
Xenopus victorianus									1																					1	1										3
Total	10	7	4	4	2	9	1	9	3	5	8	1	1	3	4	3	2	6	4	2	3	3	1	1	7	1	11	11	4	33	12	2	2	4	1	3	7	4	4	3	205

Table Att4.1-5 Reptile Species List Wet Season

Species/ Sites	KP02	KP03	KP07	KP105	KP11	KP117	KP135	KP140	KP141	KP150	KP16	KP177	KP185	KP187	KP188	KP189	KP190	KP191	KP192	KP20	KP205	KP220	KP249	KP25	KP250	KP255	KP258	KP26	KP269	KP27	KP274	KP289	KP32	KP35	KP36	KP42	KP47	KP49	KP55	KP60	KP69	KP82	Total
Acanthocercus atricollis	1	1	1	1	1	1		1	1	1	1	1			1					1	1	1			1	1	1	1	1	1	1	2		1					1	1	1	1	29
Agama agama																								1																				1
Atheris squamigera					1																																					1
Bitis arietans			1	1	1						1														1	3				1	1					1		3				14
Bitis gabonica					1		1																																			2
Bitis nasicornis			1		1																								1						1							4
Chamaeleo gracilis	1				1					1															1																		4
Chamaeleo laevigatus																												1			1											2
Bothrophthalmus lineatus.					1																																					1
Crotaphopeltis degeni						1				1																																2
Crotaphopeltis hotamboia																							1																				1
Dendroaspis jamesonii			1		1																				1					1								1				5
Hapsidophrys smaragdina			1		1															1									1						1		1	1				7
Hemidactylus brookii			1	1	1					1						1				1									1	1					1		1					10
Hemidactylus mabouia			1		1	1	1			1									1	1			1		1				1		1	1									1	13
Knixys belliana					1																																					1
Lamprophis fuliginosus																									2																		2
Lamprophis olivaceous			1																																							1
Naja melanoleuca		1	1	1	1	1				1								1		1			1		1		1		1	1	1	3				1			1		1	1	21
Philopthamnus angolensis				1																								1			1											3
Philopthamnus ruandae																									1	1					1												3
Philopthamnus sp					1															1										1												1	4
Philopthmnus heterolepidotus																																					1	1	1			3
Philopthmnus semivariegatus			1		1	1	1			1									1	1											1							1				9
Psammophis mossambicus																	1								1																		2

Table Att4.1-5 Reptile Species List Wet Season

Species/ Sites	KP02	KP03	KP07	KP105	KP11	KP117	KP135	KP140	KP141	KP150	KP16	KP177	KP185	KP187	KP188	KP189	KP190	KP191	KP192	KP20	KP205	KP220	KP249	KP25	KP250	KP255	KP258	KP26	KP269	KP27	KP274	KP289	KP32	KP35	KP36	KP42	KP47	KP49	KP55	KP60	KP69	KP82	Total
Psammophis sibilans																										1						3											4
Python sebae			1	1	1		1													1					1					1	1					1		2					11
Trachylepis maculilabris	1	1	1		1						1									1													1	1	1							1	10
Trachylepis perrotetti																																						2						2
Trachylepis striata			1	1	1	1	1	1	1	1	1	1	1	1							1	1	1		1	1	1		1		1	3	1	1					1	1			27
Typhlops lineolatus																										1					1	1											3
Varanus niloticus			1	1																									1			1				1				1		6
Total	3	3	14	8	18	6	5	2	2	8	4	2	1	1	1	1	1	1	2	9	2	2	4	1	12	8	3	1	7	8	11	15	2	3	1	7	1	10	7	3	3	5	208

Table Att4.1-6 Reptile Species List Dry Season

Species/Sites	KP8	KP00	KP03	KP04	KP11	KP113	KP123	KP13	KP147	KP150	KP16	KP181	KP185	KP188	KP19	KP195	KP20	KP220	KP258	KP259	KP261	KP264	KP267	KP269	KP271	KP274	KP275	KP288	KP289	KP35	KP37	KP38	KP42	KP47	KP5	KP55	KP6	KP7	KP70	KP74	KP79	Total
Acanthocercus atricollis		1	1	1	1	2			1	1	1				1															1	1	2			1			1		1		17
Agama agama	1																																		1							2
Bitis arietans						1			1						1					1	1	1	1			1	1	1	1	1												12
Chamaeleo gracilis					1	1			1						1															1				1								6
Chamaleo laevigatus																										1																1
Dendroaspis jamesonii									1											1	1					1																4
Dendroaspis polylepis						1																																				1
Hapsidophrys smaragdina							1			1	1					1								1					1					1							1	8
Hemidactylus mabouia																										1								1								2
Kinyxis belliana																1													1												2
Lamprophis fuliginosus																												1													1
Lygodactylus guttularis												1																														1
Naja melanoleuca					1	1			1						1	1					1	1			1	1		2	1	2						1			1	1	17
Naja nigricollis																																			2							2
Pelomedusa subrufa									1						1											1																3
Philothamnus angolensis															1					1						1																3
Philothamnus semivariegatus									2																																	2
Philothamnus sp																1																										1
Psammophis mossambicus					1	1			1													1								1					1							6
Python sebae					1				1		1																1												1	1		6
Trachylepis maculilabris		1		1		1		1		1	1		1		1			1	1		1	1		1				6	1			1			1		1		1		1	25
Trachylepis magalura																												1							1							1
Trachylepis perrotetti																			1																							1
Trachylepis striata						1			1			1	1	1							1					1		1		1	1		1		1				1	1	1	15
Typhlops lineolatus																												2							1							3
Typhlops punctatus																																			1							1
Varanus niloticus						1			1		1				1		1										1												1			7
Total	1	2	1	2	5	10	1	1	12	3	5	2	2	1	8	4	1	1	2	3	5	4	1	2	1	8	3	14	4	8	2	3	1	1	11	1	1	1	4	4	4	150

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Nymphalidae																																																																					
Actinote acerata	W	1									1							1							1	1				1	1																																								
Actinote alciope	F																																																																								
Actinote alicia	W																		

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Amauris echeria	f.																									1																																									
Amauris niavius	W																																																														1				
Amauris tartarea	f.															1									1														1	1			1																							
Apaturopsis cleochares	F																																																											1				
Ariadne enotrea	F															1																	1																											1				
Bebearia cocalia	f.																																																													1				
Bebearia laetitioides	F																																																													1				
Bicyclus anynana	O				1																																																																
Bicyclus funebris	F L																							1																																									1	1				
Bicyclus graueri	F																																																																		1				
Bicyclus istaris	f.																																																																1		1				
Bicyclus mandanes	F																																																																		1				
Bicyclus mollitia	F																																																																		1				
Bicyclus safitza	W				1									1		1	1	1				1	1				1							1				1	1	1	1		1		1				1											1					
Bicyclus sambulos	F																																																																1				
Bicyclus sandace	F																																																																	1				
Bicyclus saussurei	F	1																							1							1	1																															1	1		1				
Bicyclus sophrosyne	f.																																																																	1				
Bicyclus vulgaris	W													1	1	1	1	1				1	1		1	1				1	1	1		1	1			1	1	1	1	1							1	1		1				1	1	1	1	1		1
Byblia anvatara	M															1	1	1					1		1												1	1	1	1				1	1						1				1			1						1		
Catuna crithea	F																																																																	1				
Charaxes brutus	f.																													1																																					
Charaxes castor	W																																																																	1				
Charaxes cynthia	F																																																																	1				

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Charaxes etheocles	F																												1												1																									
Charaxes fulvescens	F L																																																											1					
Charaxes jasius	O																																							1																					1				
Charaxes numenes	f.																																																										1				
Charaxes tiridates	F L																																						1																					1				
Charaxes varanes	W				1											1									1			1	1										1																									
Cymothoe egesta	F L																																																										1				
Cymothoe herminia	F																																																										1				
Cymothoe lurida	F																																																										1				
Danaus chrysippus	M	1			1						1					1										1	1			1				1	1				1		1		1	1	1	1			1		1	1						1					
Euphaedra medon	F																																																												1				
Eurytela dryope	W																					1	1	1	1									1																																
Eurytela hiarbas	f.																																																										1		1				
Gnophodes betsimena	F																																																											1						
Gnophodes chelys	F																																																											1				
Hamanumida daedalus	W																																																													1				
Heteropsis perspicua	O																																																													1				
Hypolimnas anthedon	F																																																																				
Hypolimnas dinarcha	F																																																																				
Hypolimnas misippus	M										1													1																	1																										
Hypolimnas monteironis	F																																																																				

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Hypolimnas salmacis	F																																																											1	1				
Junonia chorimene	O	1			1						1			1	1	1	1	1		1	1	1		1		1	1								1		1		1			1	1	1					1															
Junonia gregorii	f.																																																										1		1				
Junonia hierta	M	1																																				1																												
Junonia oenone	W	1									1					1	1	1		1				1	1		1			1					1	1	1		1	1	1																			1			1
Junonia orithya	M	1			1						1						1					1		1		1				1	1																																	
Junonia sophia	W	1			1									1	1	1	1	1		1			1	1		1	1		1	1			1							1		1	1		1						1			1								
Junonia terea	W				1						1			1	1	1	1	1		1	1		1	1		1	1		1	1	1		1	1	1	1		1		1	1	1	1	1	1			1	1		1		1	1		1	1			
Junonia westermanni	F																																																									1		1				
Melanitis leda	W																																				1																												
Neptidopsis ophione	f.										1					1										1					1																																	
Neptis melicerta	F																																																									1		1				
Neptis metella	f.																																																										1				
Neptis morosa	W																																																															
Neptis nicomedes	f.																																																									1				
Neptis saclava	W																																				1		1																							1		1			1
Neptis serena	W	1													1	1	1	1		1			1	1		1	1				1	1			1	1			1	1	1			1					1	1	1	1	1		1	1				1	
Pardopsis punctatissima	W	1													1	1							1																																										
Phalanta eurytis	M															1																			1																									1			1
Phalanta phalanta	M										1							1		1			1	1					1	1	1		1																	1								1		1		1	1
Precis antilope	O	1																																																														
Precis ceryne	S																																																															
Precis octavia	W	1																																																														
Precis pelarga	f.																																																									1	1		1									1

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Protogoniomorpha parhassus	f.		

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Azanus jesous	M										1					1	1							1			1	1		1											1																								
Azanus mirza	W																																			1									1																				
Azanus moriqua	W										1					1	1				1					1																																									
Azanus natalensis	W	1														1	1																												1																								
Cacyreus lingeus	f.				1						1			1		1					1		1			1		1	1		1				1	1							1																								
Cacyreus palemon	O															1																																																		
Cacyreus virilis	O															1																	1																												1				
Cigaritis mozambica	O																																																																		1	
Citrinophila erastus	F L																																																																1				
Cupidopsis cissus	W															1								1																																											
Cupidopsis jobates	W																1																																																	
Deudorix antalus	W				1											1	1	1						1			1													1				1																						
Eicochrysops hippocrates	W																1			1					1										1									1							1				1		1	1			1			1		
Eresina sp (sp near toroensis)	F																							1																																											
Euchrysops malathana	O									1				1		1				1							1	1				1	1	1		1	1	1																										1
Euchrysops osiris	W																																																																
Euchrysops subpallida																																																															
Hewitsonia ugandae	O																																																															
Hypolycaena liara	F																																																															
Hypolycaena pachalica	O														1										1																																									
Hypolycaena philippus	W				1												1																		1		1																											
Lachnocnema bibulus	W															1						1	1																																											

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Lachnocnema divergens	F	1	1																																1	1	1																	1					1				
Lachnocnema durbani	W																																						1																									
Lampides boeticus	M																1				1																																									1				
Lepidochrysops neonegus	O																																													1																							
Lepidochrysops parsimon	O										1																																																										
Leptotes pirithous	M															1		1						1		1			1	1					1	1		1	1		1									1					1			1	1	1		1
Megalopalpus zymna	F																																																																1			
Oboronia punctatus	F																																																															1			
Pentila inconspicua	F																																																															1			
Pentila pauli	f.	1														1						1																																														
Pentila tachyroides	F																																																															1			
Telipna sp	F																																																																1			
Thermoniphas distincta	F																																		1																																
Uranothauma falkensteini	W																																				1																															
Uranothauma heritsia	F	1																																																																							
Zizeeria knysna	W	1			1						1			1		1	1			1				1			1			1		1				1		1	1												1	1							1		1		1
Zizina antanossa	W	1														1						1	1																																										1			
Zizula hylax	W				1											1	1				1		1		1	1		1	1							1	1																												
Pieridae																																																																					
Afrodryas leda	W																					1			1	1																																										
Appias epaphia	M															1																												1												1										
Belenois aurota	M														1	1				1	1	1	1	1	1	1	1	1	1	1				1	1				1		1	1		1		1									1				1		1		1	1

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Belenois crawshayi	F														1	1				1					1	1			1																														1					
Belenois creona	M	1			1						1					1	1	1		1	1	1	1	1	1	1		1	1	1			1			1	1			1	1		1								1	1					1		1			1	
Belenois solilucis	f.																								1																																					
Belenois theora	f.																																																											1				
Belenois thysa	f.																						1			1																																					
Catopsilia florella	M	1			1						1					1		1		1		1				1				1	1		1		1	1		1	1	1	1		1	1	1	1												1		1		
Colotis antevippe	O	1														1				1				1													1			1	1																								
Colotis aurigineus	W				1						1					1	1			1	1			1																																								
Colotis aurora	O																																			1																								
Colotis euippe	O										1					1	1			1	1			1		1	1		1	1							1	1			1	1																			
Colotis evagore	M	1			1						1							1						1																																						
Colotis ione	O																			1																																									
Dixeia orbona	W				1									1										1																																						
Dixeia pigea	W	1			1						1				1	1	1			1	1				1	1				1		1																						1							
Eronia cleodora	O	1																						1		1																																			
Eurema brigitta	M										1					1	1																																														
Eurema hecabe	M										1				1	1	1			1	1		1	1		1	1	1			1	1	1	1	1		1	1	1	1	1	1	1	1	1	1			1	1	1				1		1	1		1	
Eurema regularis	W	1			1						1			1		1	1	1		1			1	1	1	1			1	1	1				1	1		1				1	1		1							1		1						1	1
Eurema senegalensis	F																																																										1	1	1			
Leptosia alcesta	W	1			1									1	1			1						1							1											1																				
Leptosia nupta	f.															1	1				1		1	1		1																	1																				
Leptosia wigginsi	F															1							1			1																																				
Mylothris chloris																																																																	1
Mylothris rhodope	W																																																											1				
Mylothris rubricosta	S				1												1									1					1			1			1						1																			

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Nepheronia argia	F																																																											1			1			
Nepheronia thalassina	f.																																																												1	1	1				
Hespeiidae																		

Table Att4.1-7 Butterfly Species List

Species	Ecotype	Airstrip Ponds (KP2523–KP2555)	KP275	KP273	River Kabale (KP271)	KP268–269	KP266	KP264	KP262	KP261	MBC3 (KP258)	KP250	KP249	KP246	KP235, KP236)	MCPY3 (Near KP225)	Lwengo Forest	KP229	KP226	KP220	KP218	KP216	KP205	MBC2 (KP181)	KP187	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67	KP64	KP61	KP60	KP56, KP57	KP55	KP49	KP47	KP42 (MCPY)	KP39	KP38	River Kafu (KP37)	KP37	KP36	KP14	KP13	KP11	KP08 (Wambabya)	KP07 (Wambabya)	KP07	KP06	KP03	KP02	PSO (KP0-Kabaale
Osmodes laronia	F																																																													1	
Pardaleodes incerta	F																														1																																			
Pelopidas mathias	M				1						1																															1																								
Prosopalpus styla	f.					1		1	1	1	1	1														1				1		1			1		1		1		1		1									1												
Sarangesa phidyle	O																																			1																												
Sarangesa thecla	F																														1																																		
Spialia diomus	O																												1																																			1
Spialia spio	O																								1						1		1			1			1																											
Tagiades flesus	F																																							1																	1						
Zenonia zeno	f.																																			1																													
Papilionidae																																																																					
Graphium leonidas	M														1																																																							
Graphium policenes	f.																									1																																										
Papilio chrapkowskoides	f.	1														1	1									1				1															1																			1	1		1			
Papilio cynorta	F L																													1																																					
Papilio dardanus	W																							1						1																																		1			
Papilio demodocus	M	1									1				1	1	1	1			1					1				1	1		1			1		1	1		1		1		1		1	1			1			1						1		1		1	
Papilio lormieri	F																																																																		1				
Papilio nireus	f.																													1																																				
Papilio phorcas	F																								1																																					1			1			

Table Att4.1-8 Dragonfly Species List

Species	Airstrip Ponds (2523–2555)	CY KP288.5	KP280	River Kibale (271–)	KP261	MBC3 (KP258)	KP248	KP246	KP235, 236	MCPY3 (Near KP225)	R. Kibale Bridge)	Lwengo Forest	KP229	KP220	KP218	KP216	KP205	KP187	MBC2 (KP181)	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	Kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67 (export)	KP64 export near)	KP61	KP60 (export)	KP06 (near R. Kinywabarogo)	KP56, KP57	KP55	KP54	KP49 (near)	KP47	KP38	KP37 (River Kafu)	KP36	KP21	KP16	KP14	KP13	KP11 (forest near this point)	KP08 (Wambabya)	KP07 (Wambabya)	KP06	KP03	KP02	PSO (KP0-Kabaale
Zygoptera																																																									
Africallagma glaucum	1			1						1		1											1	1									1																										
Africallagma vaginale																																																					1					
Agriocnemis gratiosa																									1	1																																	
Agriocnemis inversa	1			1							1										1		1		1												1					1	1	1														
Agriocnemis maclachlani																					1					1																																	
Agriocnemis palaeforma					1															1	1				1														1						1			1									
Allocnemis Pauli																																														1						1					
Azuragrion nigrodorsum																							1																																			
Azuragrion vansomereni		1																1																																							1
Ceriagron glabrum	1			1						1	1	1		1			1	1		1			1								1	1	1				1	1					1	1						1				1
Ceriagrion suave												1																										1						1											
Ceriagrion whellani											1																																														
Chlorocypha curta																															1																									
Chlorocypha trifaria																																																					1	1				
Chlorocypha victoriae											1																					1																		1		1	1	1	1	1			
Copera nyansana																																																						1				
Elattoneura glauca												1			1			1		1											1	1	1		1		1				1											1	1			1	1
Ishnura senegalensis											1																																														
Lestes dissimulans																				1																																						
Lestes plagiatus																				1																																						
Lestes virgatus											1			1																																												
Phaon irridipenis											1																					1																									
Platycypha caligata																																																							1				
Platycypha lacustris																																																						1				
Pseudagrion (A) hageni				1							1															1	1					1																					1				
Pseudagrion (A) kersteni								1	1												1				1						1																					1	1	1	1			
Pseudagrion (A) spernatum																																1																									
Pseudagrion (B) glaucoideum				1																																																						
Pseudagrion (B) massaicum																							1																																				
Pseudagrion (B) sjoestedti				1																																																					
Pseudagrion (B) sublacteum				1							1				1		1						1															1												1								
Pseudagrion (B) torridum							1																																																			

Table Att4.1-8 Dragonfly Species List

Species	Airstrip Ponds (2523–2555)	CY KP288.5	KP280	River Kibale (271–)	KP261	MBC3 (KP258)	KP248	KP246	KP235, 236	MCPY3 (Near KP225)	R. Kibale Bridge)	Lwengo Forest	KP229	KP220	KP218	KP216	KP205	KP187	MBC2 (KP181)	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	Kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67 (export)	KP64 export near)	KP61	KP60 (export)	KP06 (near R. Kinywabarogo)	KP56, KP57	KP55	KP54	KP49 (near)	KP47	KP38	KP37 (River Kafu)	KP36	KP21	KP16	KP14	KP13	KP11 (forest near this point)	KP08 (Wambabya)	KP07 (Wambabya)	KP06	KP03	KP02	PSO (KP0-Kabaale
Umma saphirina																																																						1				
Anisoptera																																																													
Acisoma inflatum	1		1	1			1				1			1						1									1									1						1	1										1		
Acisoma variegatum																																													1													
Aethriamanta rezia																																						1																			
Anax imperator	1																																																								
Anax tristis																													1																												
Atoconeura kenya																																																							1			
Brachythemis lacustris																				1																1						1														
Brachythemis leucosticta	1			1						1	1			1									1	1												1						1														
Chalcostephia flavifrons											1									1																			1																	
Crocothemis erythraea																							1																																			
Diplacodes deminuta																	1																								1			1													
Diplacodes lefebvrii														1				1																	1									1													
Diplacodes luminans	1																																																								
Gynacantha bullata																																																								1			
Hemistigma albipunctum	1										1	1		1					1											1															1													
Neodythemis afra																																																						1			1		1	1			
Nesciothemis farinosa	1					1																																1	1															1				
Orthetrum abbotti																																																										1
Orthetrum brachiale											1																																															
Orthetrum caffrum																										1																								1							
Orthetrum chrysostigma	1																									1		1							1																		1			
Orthetrum hintzi																																																							1		1	
Orthetrum icteromelas																													1																											1	
Orthetrum julia	1					1											1		1	1			1	1	1	1	1		1	1			1					1			1			1	1					1			1	1
Orthetrum stemmale	1																																																						1	1			
Orthetrum trinacria												1																							1										1										
Palpopleura deceptor														1					1																																							
Palpopleura lucia	1			1		1				1	1	1	1	1			1			1			1	1	1		1	1					1			1	1	1	1		1		1	1	1			1		1		1		1	1
Palpopleura portia	1			1				1				1			1								1			1			1		1	1	1				1			1		1	1	1							1			1	
Pantala flavescens	1			1										1					1																						1			1												1		
Paragomphus elpidius																																																									

Table Att4.1-8 Dragonfly Species List

Species	Airstrip Ponds (2523–2555)	CY KP288.5	KP280	River Kibale (271–)	KP261	MBC3 (KP258)	KP248	KP246	KP235, 236	MCPY3 (Near KP225)	R. Kibale Bridge)	Lwengo Forest	KP229	KP220	KP218	KP216	KP205	KP187	MBC2 (KP181)	KP165	R.Nabakazi (KP141–148)	MCPY2 (KP125)	KP124 (Near Kasana FR)	Kasana FR (KP123)	KP113	KP106	KP91	KP83	Taala FR (KP79)	MBC1 (KP74)	Kanangala FR	KP70	KP67 (export)	KP64 export near)	KP61	KP60 (export)	KP06 (near R. Kinywabarogo)	KP56, KP57	KP55	KP54	KP49 (near)	KP47	KP38	KP37 (River Kafu)	KP36	KP21	KP16	KP14	KP13	KP11 (forest near this point)	KP08 (Wambabya)	KP07 (Wambabya)	KP06	KP03	KP02	PSO (KP0-Kabaale
Paragomphus viridior																																																					1	1			
Parazyxomma flavicans																							1																																				
Rhyothemis semihyalina										1	1																									1																						
Trithemis aconita						1																																																				
Trithemis arteriosa				1							1												1																																			
Trithemis kirbyi											1																																														
Trithemis nuptialis																																1																								1				
Trithemis stictica				1							1																	1																										1				
Trithemis werneri				1																																																						
Trithetrum navasi																								1																																			
Urothemis assignata	1										1			1				1																																										
Urothemis edwardsi	1																																																									

ATTACHMENT A4.2 FIELD SURVEY METHODOLOGIES

Remote Sensing/GIS

Remote sensing and GIS were used before the field surveys to identify sites of potential interest along the route, particularly any water or river crossings.

General Observations

During the initial site appraisal, general observations were made of any animal signs, including scat, burrows and nests, tracks, hairs and feeding remains, while also deciding on a suitable trapline location.

To understand the general habitats and species, surveyors walked predetermined transect routes in pairs. The surveyors were spaced no more than 10 m apart and scanned the ground for 5 m on either side. All animal signs observed along the transects were recorded and a global positioning system (GPS) point and photograph were taken. The principal habitats were identified and described according to Dharani (2002).

Where it was considered safe and appropriate, natural refuges were searched. This type of survey was useful for detecting amphibian and reptile species. Any potential refuge encountered (for example, logs or a pile of leaves among exposed tree roots) were searched using a short-handled rake or hoe. The refuges were turned over and any species were observed and recorded.

Some riparian vegetation and wetlands, ponds and swamps within and immediately outside the proposed project areas were also surveyed, particularly with respect to bats, reptiles and amphibians. Stagnant waterbodies and shallow waters along rivers were checked for amphibian tadpoles.

In addition, animals observed while driving between sites and to and from sites during the morning and evening were noted. For each observation, the species, location (GPS waypoint), date, time, number of individuals and broad habitat type were recorded.

Interviews and Literature Review

Informal interviews were conducted with local people to identify local wildlife types and the areas the wildlife uses for activities such as drinking, feeding and roosting. Informal questions helped to gather information regarding the use of the project area by fauna, for example, crop-raiding, pest species, human–wildlife conflict, hunting, movement corridors and bushmeat.

The analysis of secondary information included a detailed review of the project information and published and unpublished biodiversity literature covering the AOI.

Sherman Traps

Sherman traps were used in habitats likely to be used by small mammals. They were baited with a mixture of maize flour, margarine, peanut butter and silverfish, and left for three days. Forty traps were set each day in suitable habitats.

Pitfall Trapping

At selected sites along the pipeline route, pitfall traps were set up with a drift fence to sample any surface dwelling herpetofauna. Eleven 20-litre plastic buckets were placed at intervals of 8–10 m, and sunk flush to the ground to form a trap line. A piece of plastic sheeting approximately 0.5 m high was erected, pinned on wooden stakes, running on the top and centre of the buckets, channelling animals towards the buckets. The trap line had a total length of 100 m.

Visual Encounter Survey

Visual encounter survey is a well-known and robust method for surveying herpetofauna. Used to document the presence of amphibians, it is suitable in most habitats and for most species that tend to breed in lentic habitats.

The method includes moving through a habitat, turning logs or stones, inspecting retreats and watching out for recording surface-active species. The data gathered provide information on the habitat's species richness. For amphibians, the best results occur when surveys take place after dusk during their most active hours.

Dip Netting

A standardised dip-net was used in aquatic habitats to sample for aquatic (amphibian) species and tadpoles for identification. If specimens were unable to be identified in the field, they were preserved for later identification.

Sweep Netting

Adult butterflies and dragonflies were sampled using sweep nets. A rapid survey method was employed that involved combing through the area and recording all the species encountered to build up a species list. Butterflies were collected using a standard 43-cm diameter sweep net. Individual specimens that were difficult to identify on the wing were taken as voucher specimens for further processing in the laboratory.

Night Time Surveys

Night-time surveys were conducted, where considered safe, to detect those nocturnal species which are active after sunset. This type of survey involved the use of torches to examine habitats and identify animals through eye reflection and visual observation of crepuscular and nocturnal species. Opportunistic observations of amphibians were also made during the nocturnal surveys. These surveys were mainly concentrated at water sources such as ponds and streams because amphibians are mostly active at night and can be identified through males vocalising.

The AR150 bat detector (acoustic survey) was used to observe and record bat activity at sample locations.

Mist Netting

Mist nets were used at some sample sites to provide positive identification of bats and verify the sound analysis results. This survey type could not be undertaken at each site due to restrictions on night-time working. Sites were chosen either around water features or in gaps in vegetation where bats were considered to be actively foraging or commuting. Up to three single-level mist nets were erected at each sampling point an hour before dusk and the nets manned for a two to three hours. Bats flying and trapped in nets were carefully removed by surveyors experienced in this survey technique and identified, were possible, to species level. Once identified, bats were released and nets were removed once the survey was complete.

Camera Traps

Camera traps were deployed in 21 locations and left in the field for approximately two months to collect information on habitat use by medium to large mammals. Cameras were left at locations most likely to encounter wildlife (such as along tracks and near observed field signs). The location of the camera was recorded on a GPS unit.

Appendix A5: Geology and Soil Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
°	degree symbol
>	greater than
<	less than
%	percent
A	
A horizon	surface horizon (topsoil layer) composed of mainly mineral matter with well-incorporated organic matter.
acric	property of ferralsols with very low cation exchange capacity in the subsoil/B horizon
Acric Ferralsol	description of soil classification: Good physical properties, poor fertility, less susceptible to erosion than most other intensely weathered tropical soil. Dominated by low-activity, iron-rich clay
AGI	aboveground installation
AOI	area of influence
Arenosol	description of soil classification: Deep sandy soil, sometimes calcareous, low water and nutrient storage capacity
B	
B horizon	subsurface or originally subsurface horizon in which the original rock or parent material has been mostly or entirely altered by weathering and soil-forming processes.
C	
Calcic Solonetz	dense, strongly structured, clayey subsurface horizon that has a high proportion of adsorbed sodium and, in some cases, magnesium ions. Sodic soil. Often found on flat gently sloping grassland. High pH. Majority land use is grassland
Cambisol	other soils having a cambic B horizon or an umbric A horizon which is more than 25 cm thick.
CEC	cation exchange capacity
Chromic Cambisol	Cambisols are characterised by slight or moderate weathering of the parent material and by the absence of appreciable quantities of illuviated clay, organic matter, aluminium or iron compounds; more common where weathering is slow; make good agricultural land and can be among the most productive soil on Earth. Strongly weathered; dominated by kaolinites and oxides. Cambisols which have a strong brown to red B horizon (rubbed soil has a hue of 7.5YR and a chroma of more than 4, or a hue redder than 7.5YR)
Chromic Luvisol	description of soil classification: higher clay content in subsoil than topsoil; podzolic; common on flat or gently sloping land. Fertile, high silt content and prone to erosion on slopes. Having a strong brown to red B horizon (rubbed soil has a hue of 7,5YR and a chroma of more than 4, or a hue redder than 7,5YR)

D	
Defra	Department of Environment, Food and Rural Affairs
diagnostic horizon	A soil horizon, some or all of whose properties are used for classification purposes in the FAO Soil Legend
Dystric Regosol	description of soil classification: weakly developed, fine grained, extensive on eroded land
E	
EACOP	East African Crude Oil Pipeline
EC	electrical conductivity
ESIA	environmental social impact assessment
F	
FAO	Food and Agriculture Organization
Ferralsol	description of soil classification: strongly weathered soil of the humid tropics with high iron and aluminium oxide contents
G	
GIS	geographic information system
GPS	global positioning system
Gleyic Arenosol	description of soil classification: deep sandy soil, sometimes calcareous, low water and nutrient storage capacity. Wet
Gleysol	description of soil classification: soil saturated with groundwater for long enough periods to develop features of reduction and re-oxidation characterised by grey and rust-coloured mottles
H	
ha	hectare
Haplic Ferralsol	description of soil classification: Ferralsol (see above) with the normal horizon (soil layer) sequence
horizon	See “soil horizon” below
I	
ISO	International Organization for Standardization
K	
KP	kilometre point
L	
Leptosol	description of soil classification: coarse and thin, probably gravelly, maybe thin layer of peat. Common on slopes. Can be fertile but prone to erosion
Luvisol	description of soil classification: higher clay content in subsoil than topsoil. Podzolic. Common on flat or gently sloping land. Fertile, high silt content and prone to erosion on slopes
M	
meq/100 g	milliequivalents per 100 grams
mg/kg	milligrams per kilogram

mg/L	milligrams per litre
mS/m	millisiemens per metre
N	
NA	data not available
NARL	National Agricultural Research Laboratories
NARO	National Agricultural Research Organisation
ND	not detected
Nitisol	description of soil classification: deep, well-drained, red tropical soil with at least 30% clay and moderate to strong angular blocky structure. Rich in iron. Very productive land
P	
Petric Plinthosol	description of soil classification: iron-rich, humus-poor, kaolinitic clay, strongly cemented
pH	power of hydrogen
Planosol	description of soil classification: periodically waterlogged, coarse topsoil over dense slowly permeable clay subsoil. Medium fertility
ppm	parts per million
R	
Rhodic Ferralsol	description of soil classification: strongly weathered tropical soil with a red to dusky red B horizon/subsoil
Rhodic Nitisol	description of soil classification: tropical soil with an accumulation of clay in a red to dusky red B horizon/subsoil with prominent, shiny clay surfaces
RoW	right-of-way
S	
Skeletic Leptosol	description of soil classification: soil that is <50 cm deep or consists of very stony, unconsolidated material and imperfectly weathered rock or rock fragments (>40% of the soil volume is coarse rock fragments)
soil horizon	layer of soil, usually approximately parallel to the soil surface with distinct characteristics produced by soil-forming processes
SU	standard unit
T	
TPH	total petroleum hydrocarbons
U	
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDA	United States Department of Agriculture
UXO	unexploded ordnance
V	
VEC	valued environmental [and social] components

A5 GEOLOGY AND SOIL BASELINE REPORT

A5.1 Introduction

This baseline report describes the geology and soil:

- area of influence (AOI) and study boundaries
- methods
- baseline conditions:
  - characteristics of the soil and geology in the AOI
  - trends in condition and sensitivity to change
  - ecosystem services provided
  - sensitivity rankings
- key considerations.

Although geology is not considered a valued environmental component (VEC), geology information is included in this report because it informs the soil baseline and other aspects of the environmental social impact assessment (ESIA).

A5.2 Area of Influence and Study Boundaries

A5.2.1 Area of Influence

The geology and soil AOIs are based on the project footprint and the construction and operation of the:

- 30-m pipeline right-of-way (RoW)
- aboveground installation (AGI) locations
- construction camps and facilities
- access roads.

Aggregate use is considered in the project description (see Section 2.4.2 of the ESIA).

A5.2.2 Study Boundaries

The study area boundary is the 2-km pipeline corridor (Figure A5.2-1) however in some cases a broader region is considered to give context in respect of mining, earthquakes and landslips.

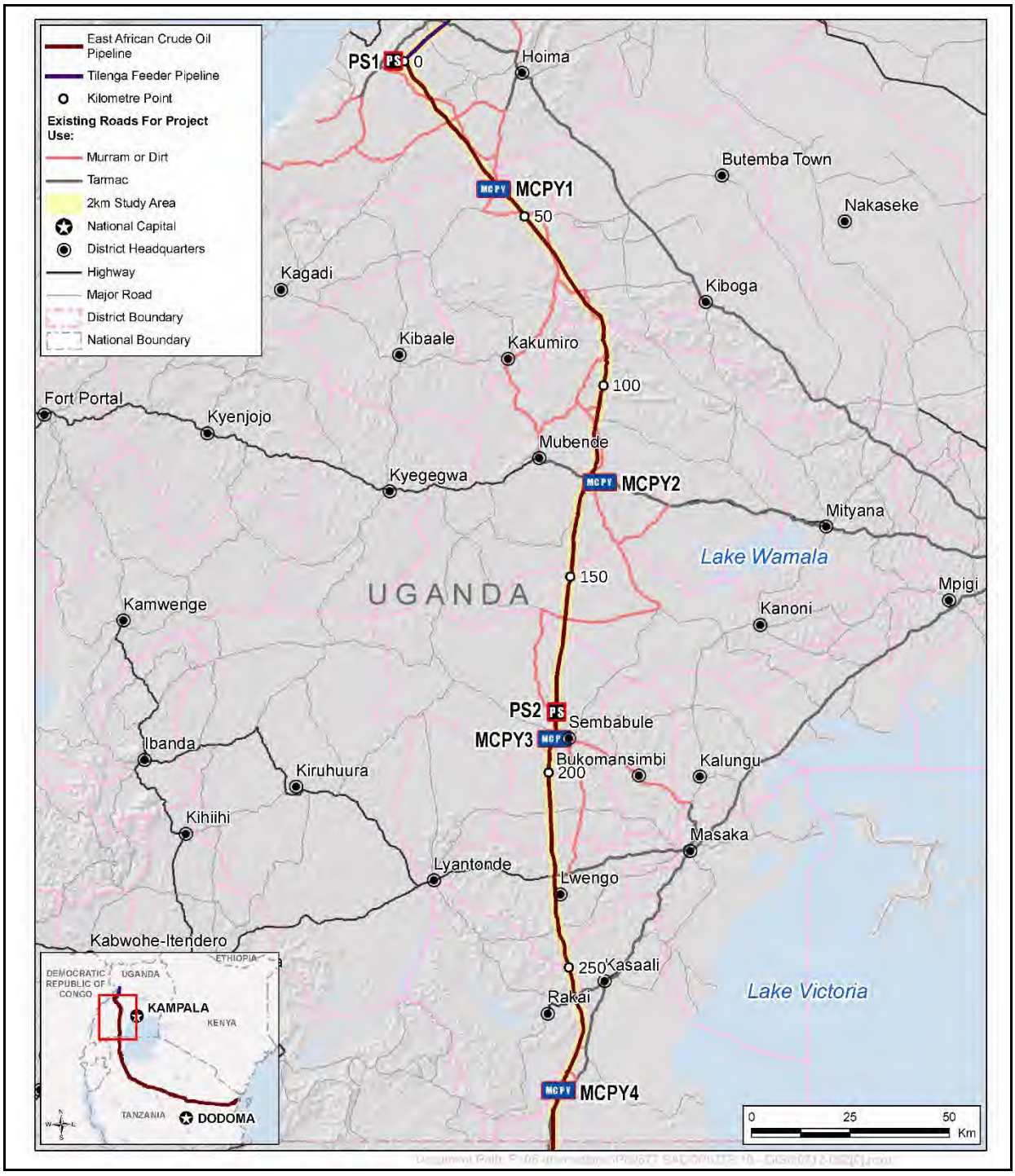

Figure A5.2-1 Study Area Boundary

A5.3 Methods

A5.3.1 Secondary Data

A5.3.1.1 Geology

A review of the following resources was conducted to characterise the geology baseline:

- data collected during the scoping phase of the project (RSK–GIE initial site visit report 2017)
- data on quarrying and mining operations in the study area
- geology maps and reports
- data from the Sustainable Management of Mineral Resources Project: Geological Mapping, Geochemical Surveys and Mineral Resources Assessment in Selected Areas of Uganda (GTK Consortium 2012).

The key resources reviewed during the desktop study include:

- Explanation of the Geology of Sheet 59 (Kiboga), Report No. 7 (Geological Survey of Uganda (Johnson and Williams 1961)
- Geological atlas of Africa with notes on stratigraphy, tectonics, economic geology, geohazards, geosites and geoscientific education of each country (Schlüter 2006).

A5.3.1.2 Soil

A review of national soil maps and reports was conducted to establish existing soil classifications, use and productivity.

The location and nature of potential sources of contamination (e.g., heavy metals and hydrocarbons) were evaluated in a review of information from Internet searches.

Data collected during the scoping phase of the project included data sourced from initial reconnaissance site visits along the route. Information collected during this visit was considered when developing the field survey plan.

Data from Isabirye et al. (2004) and Kaizzi (2017) were plotted in a geographical information system (GIS) to illustrate the soil types being traversed by the pipeline. Soil texture and slope derived from digital elevation data were compared to assess the risk of erosion in the study area. See Appendix G1 of the ESIA for the soil erosion risk assessment report.

For the erosion risk assessment, soil descriptions were transposed into the following classes:

- sandy, light silty soil, peaty
- medium, calcareous
- heavy.

The classes were then cross-compared with the landscape gradients of the area within the study area for the following categories:

- very steep >11°

- steep 7–11°
- moderate 3–7°
- gentle 2–3°
- level ground <2°.

Using the above information, terrain within the study area was categorised to identify areas at high and very high risk of soil erosion. The categorisation was based on the risk assessment in Table A5.3-1, which was developed using the UK Department of Environment, Food and Rural affairs (Defra) manual on controlling soil erosion (Defra 2005) and although based on a UK manual, the categorisation is applicable to the soil types found in the study area.

Table A5.3-1 Erosion Risk Categories

Soil or Slope	Very Steep Slopes >11°	Steep Slopes 7–11°	Moderate Slopes 3–7°	Gentle Slopes 2–3°	Level Ground <2°
Sandy soil Light silty soil Peat soil	Very high	Very high	High Gentle	Moderate	Lower
Medium and calcareous soil	Very high	High	Moderate	Lower	Lower
Heavy soil	Very high	Lower	Lower	Lower	Lower

Sites with a very high erosion risk were screened for the proximity of downslope VECs sensitive to sediment run-off according to the ESIA sensitivity ranking (see Appendix D of the ESIA).

The key resources reviewed include:

- Global yield gap atlas (Kaizzi 2017)
- International soil classification system for naming soil and creating legends for soil maps (FAO 2014).
- Construction code of practice for the sustainable use of soil on construction sites (Defra 2009)
- Control of water pollution from linear construction projects. Technical guidance (CIRIA C648, 2006)
- National Land Use Policy (Ministry of Lands, Housing and Urban Development 2006)
- Controlling soil erosion, A manual for the assessment and management of agricultural land at risk of water erosion in lowland England, PB4093 (Defra 2005).
- Soil resource information and linkages to agricultural production (Isabirye et al. 2004)
- Soil Map of the World (FAO–UNESCO 1988)
- unpublished data from the Ugandan National Agricultural Research Laboratory (NARL).

A5.3.2 Field Surveys

The soil field survey was undertaken during November 2017 to:

- identify soil resources susceptible to compaction in the study area by collecting representative samples of the soil types in the study area
- determine the level of fertility of the soil and any damage or reduction in soil fertility because of, for example, over-fertilisation or overirrigation
- identify soil contamination.

This survey did not incorporate a geological survey.

To provide soil fertility and contamination data linked to soil profile descriptions and land use, a reconnaissance survey was undertaken along the route for which 14 inspection trial pits (1.0 m deep) were excavated at approximately 20-km intervals. This survey was to confirm soil types identified by and to supplement data from Isabirye et al. (2004) and Kaizzi (2004) (see Section A5.3.1).

Trial pit locations were also identified based on:

- obvious physical changes in soil surface characteristics
- noticeable and sudden land use changes
- areas with extensive cultivation
- project infrastructure locations.

Trial pit soil samples were analysed at an ISO 17025 accredited Tanzanian laboratory, SGS, for a suite of parameters indicative of soil fertility and contamination (see Section A5.3.3). Soil horizons were sampled at each trial pit. The sample locations are shown in Table A5.3-2, the soil survey sample locations map is given in Figure A5.3-1 and the field survey data are presented in Attachment A5.1.

Table A5.3-2 Field Survey Sample Locations

Soil Sample Identifier	Sampling Location		Approximate KP	District
	Easting	Northing		
SU006	164348.1218	10161515.53	0 (PS1)	Hoima
SU007	175914.5926	10145650.11	20	Hoima
SU008	188186.2561	10129996.34	40 (MCPY1)	Kakumiro
SU009	201003.3934	10114689.7	60	Kakumiro
SU010	212422.5089	10098435.29	80	Kyankwanzi
SU011	214655.0082	10079839.91	100	Mubende
SU012	209979.3336	10055133.31	126 (MCPY2)	Mubende
SU013	204998.0051	10021819.83	160	Gomba
SU014	202735.7909	9997156.039	180 (PS2)	Sembabule
SU015	200819.6066	9982311.293	200	Sembabule
SU016	201593.2189	9962411.227	220	Lwengo

Table A5.3-2 Field Survey Sample Locations

Soil Sample Identifier	Sampling Location		Approximate KP	District
	Easting	Northing		
SU017	201901.5308	9897089.31	288	Kyotera
SU018	208353.3492	9923120.88	260	Kyotera
SU019	203060.6864	9942731.123	240	Lwengo

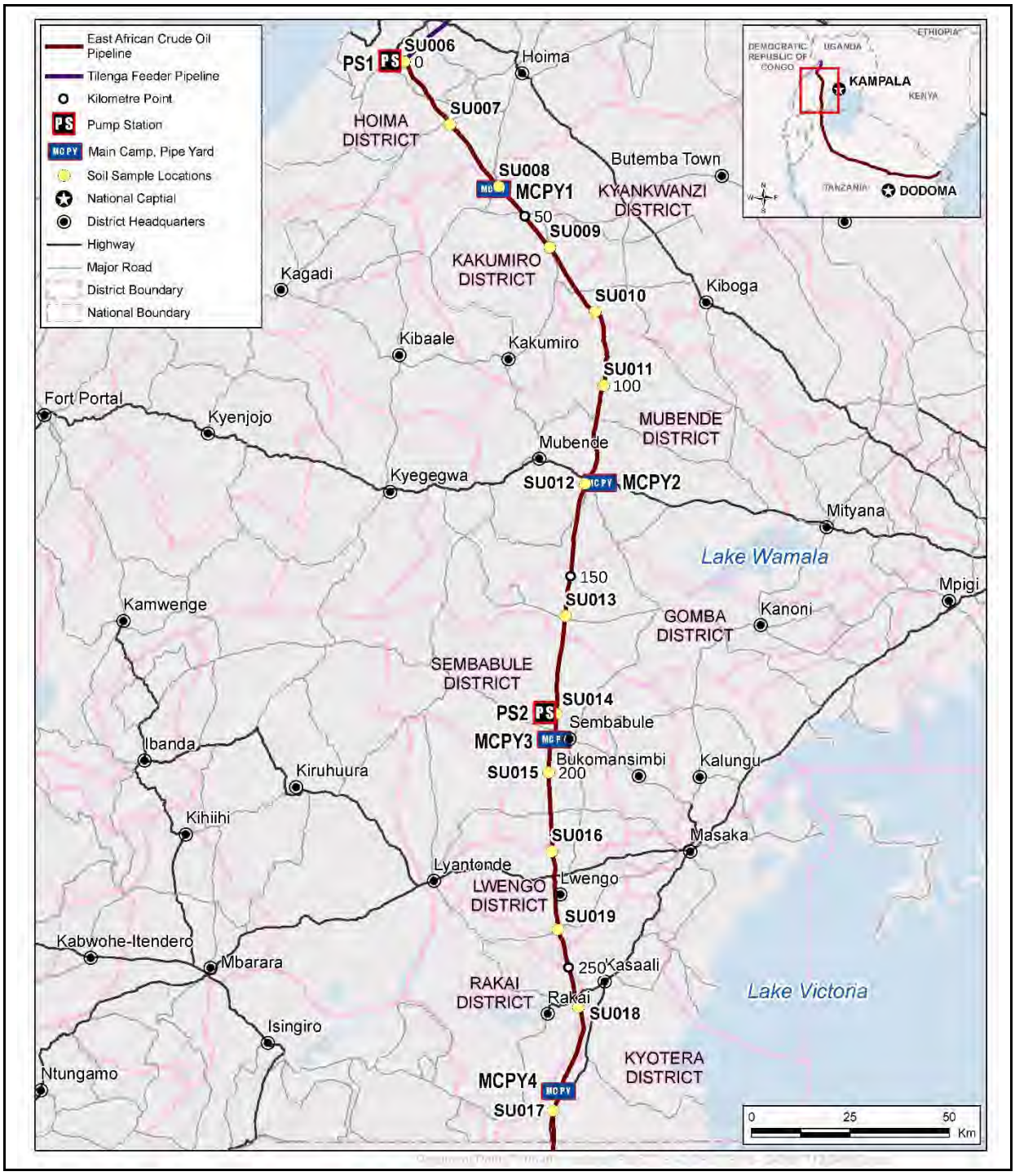

Figure A5.3-1 Soil Survey Sample Locations

A5.3.3 Data Collection and Analysis

The sampling methodology is described in Attachment A5.1. Each location was photographed, and visual and olfactory observations were recorded. The soil horizons at each location were identified, described and provided with a provisional classification based on the Food and Agriculture Organization (FAO) system (FAO 2014). The depth and physical condition of the topsoil layer were recorded at each location.

Soil horizon A is a surface horizon (topsoil layer) composed of mainly mineral matter with well-incorporated organic matter. Soil horizon B (sodic) comprises subsurface or originally subsurface horizons in which the original rock material has been mostly or entirely obliterated by weathering. The soil profile changes with depth, which varies between locations, and was recorded at each inspection pit. Changes in soil colour, texture and structure indicated the boundary of a new horizon. A sodic soil has more sodium than most other soil and is classified in part by poor structure and low permeability. Soil that is highly sodic will disperse in water and is prone to slaking (breakdown in aggregate size).

Bulk soil samples were obtained from the exposed profiles in each inspection pit. The samples were packed securely in cool boxes with ice packs and kept dark before being despatched with a sample chain of custody form to an ISO 17025 accredited laboratory for analysis.

Quality control samples where obtained by duplicate sampling. These samples were submitted for testing with anonymous identifiers that would not indicate whether they were a sample blank or duplicate.

The soil analysis comprised fertility parameters to characterise the soil in terms of their nutrient levels, base status, organic matter status and ability to support crop establishment and growth; and contamination parameters to characterise the level of heavy metal and hydrocarbon contamination from a soil, plant, animal and human health perspective.

The analysis parameters comprised:

- fertility: soil particle size; pH; electrical conductivity (EC); phosphorus, potassium and magnesium contents; cation exchange capacity; exchangeable bases; and total organic matter
- contamination: arsenic, cadmium, hexavalent chromium, lead, manganese, mercury, nickel, selenium, copper, zinc, molybdenum and total petroleum hydrocarbons (TPH).

Where a sodic B horizon was suspected from the soil profile description or land management practices (for example, overirrigation), soil samples from the B horizon were collected and tested for cation exchange capacity and exchangeable bases.

Table A5.3-2 shows the sample analysis suites.

Table A5.3-2 Sample Analysis: Samples SU006–SU019

Soil Sample Identifier	Approximate KP	Fertility Analysis (No. of Samples) (Soil A Horizon)	Contamination Analysis (No. of Samples) (Soil A Horizon)	B Horizon Analysis (Soil B Horizon)
SU006	0	1	1	–
SU007	20	1	1	–
SU008	40	1	1	–
SU009	60	1	1	–

Table A5.3-2 Sample Analysis: Samples SU006–SU019

Soil Sample Identifier	Approximate KP	Fertility Analysis (No. of Samples) (Soil A Horizon)	Contamination Analysis (No. of Samples) (Soil A Horizon)	B Horizon Analysis (Soil B Horizon)
SU010	80	1	1	–
SU011	100	1	1	–
SU012	126	1	1	–
SU013	160	1	1	–
SU014	180	1	1	–
SU015	200	1	1	–
SU016	220	1	1	–
SU017	288	1	1	–
SU018	260	1	1	–
SU019	240	1	1	-

A5.3.4 Data Considerations

While denser field survey sample spacing may have contributed to a more-detailed soil type classification, the data collected are considered sufficient to describe baseline soil conditions in the study area.

In addition to the field survey, Isabirye et al. (2004) and Kaizzi (2017) were also used to map soil resources within the AOI. The soil type classifications resulting from the EACOP baseline soil survey did not always correspond with the mapped soil type reported in Isabirye et al. (2004) and Kaizzi (2017). Isabirye et al. (2004) and Kaizzi (2017) provide consistent and comparable soil data and information in the AOI and broader region, whereas the field survey provides point data relevant to the sampling location only. Soil profile data in Isabirye et al. (2004) and Kaizzi (2017) is sometimes incomplete, which explains why there may be inconsistencies with the field survey classifications. Where inconsistencies exist at individual sample sites, the field survey data have been given preference.

The FAO classification (FAO 2014) uses both topsoil and subsoil diagnostic properties to determine broad soil types. As topsoil physicochemical properties are more important than subsoil properties in determining soil fertility and erodibility (susceptibility to erosion), the focus of the soil survey was on topsoil sampling and analysis. Furthermore, FAO soil type can be determined from topsoil and subsoil morphology without detailed laboratory analysis of subsoil material.

The erosion risk assessment used GIS mapping based on data from Isabirye et al. (2004) and Kaizzi (2017). In a more-detailed assessment, professional judgement would be used to assess each site in situ. However, the GIS mapping assessment of soil erosion is considered sufficient for the purposes of this baseline study. Detailed data considerations related to the erosion risk assessment are presented in Appendix G1 of the ESIA.

A5.4 Baseline Conditions

A5.4.1 Baseline Condition of Geology and Soil

A5.4.1.1 Geology – Secondary Information

In Uganda, Precambrian crystalline rock, including gneiss and granite, constitutes approximately 90% of the land area. The remaining rock types are mostly younger volcanic and sedimentary rocks. The EACOP project traverses Precambrian gneiss and granite complexes up to the Uganda–Tanzania border (Geological Survey of Uganda 1961; Schlüter 2006). Regolith over this crystalline rock varies from rock fragments near the bedrock interface to well-weathered soil and hardened laterite at the surface. This regolith layer varies in thickness, but averages approximately 30 m (British Geological Survey 2001).

Seismicity and Earthquakes

The occurrence of earthquakes in Uganda is associated with the East African Rift system (UNESCO 2013). Uganda lies between two parts of the system; an eastern branch and a more seismically active western branch, neither of which is traversed by the pipeline RoW in Uganda. The western branch mostly overlaps the eastern border of the Democratic Republic of the Congo; the eastern branch runs from southern Tanzania up to northern Kenya.

Other tectonic features that influence earthquake occurrences in Uganda include the:

- Rwenzori Mountains. Tectonic movements cause stress accumulation that is released along the border and boundary faults of the mountains. The faults include Nyamwamba, Kicwamba, Bwamba, Kitimbi–Semuliki, Ruimi–Wasa and Bunyoro–Toro.
- Katonga fault. This fault, which is traversed by the EACOP pipeline at approximately KP170.5 starts in the foothills of the Rwenzori Mountains, traverses Lake Victoria and connects to Winam Gulf in western Kenya and Speke Gulf south of Lake Victoria in Tanzania.
- Aswa shear zone: The shear zone is observed in Uganda from Nimule at the Uganda–Sudan border to where it joins Mount Elgon on the eastern border with Kenya.

This tectonic setting makes Uganda earthquake prone; the country had major earthquakes on:

- 2 October 1929 in the Toro region of western Uganda measuring 5.9 on the Richter scale that triggered landslides
- 18 March 1945 in the Sembabule–Masaka region measuring 6.0 on the Richter scale that killed five people and destroyed buildings in Masaka town
- 20 March 1966 in the Toro region in western Uganda measuring 6.6 on the Richter scale that killed 150 and injured 1300 people, and caused economic losses estimated at $1 million (USD)
- 7 September 1990 in the Lake Victoria region (epicentre at Nakiwogo on the lakeshore) measuring 5.0 on the Richter scale that destroyed semipermanent buildings around the Nakiwogo landing site

- 9 October 1991 in the Lake Albert area (epicentre around Butiaba) measuring 5.3 on the Richter scale and that destroyed semipermanent buildings in and around Butiaba
- 5 February 1994 in Kisomore (Kabarole district), measuring 6.2 on the Richter scale that killed eight people and destroyed property estimated at $61 million (USD)
- 10 September 2016: an earthquake centred at Bukoba, Tanzania, measuring 5.9 on the Richter scale was felt in Uganda.

Figure A5.4-1 shows the presence of six major faults in areas crossed by the study area. The figure also shows historical earthquakes in the region, including the approximate magnitude. At the time of writing, the United States Geological Survey has reported the occurrence of at least 15 earthquakes with a magnitude over 4 Mb in Uganda since July 2013 (*Quake Bulletin* 2018).

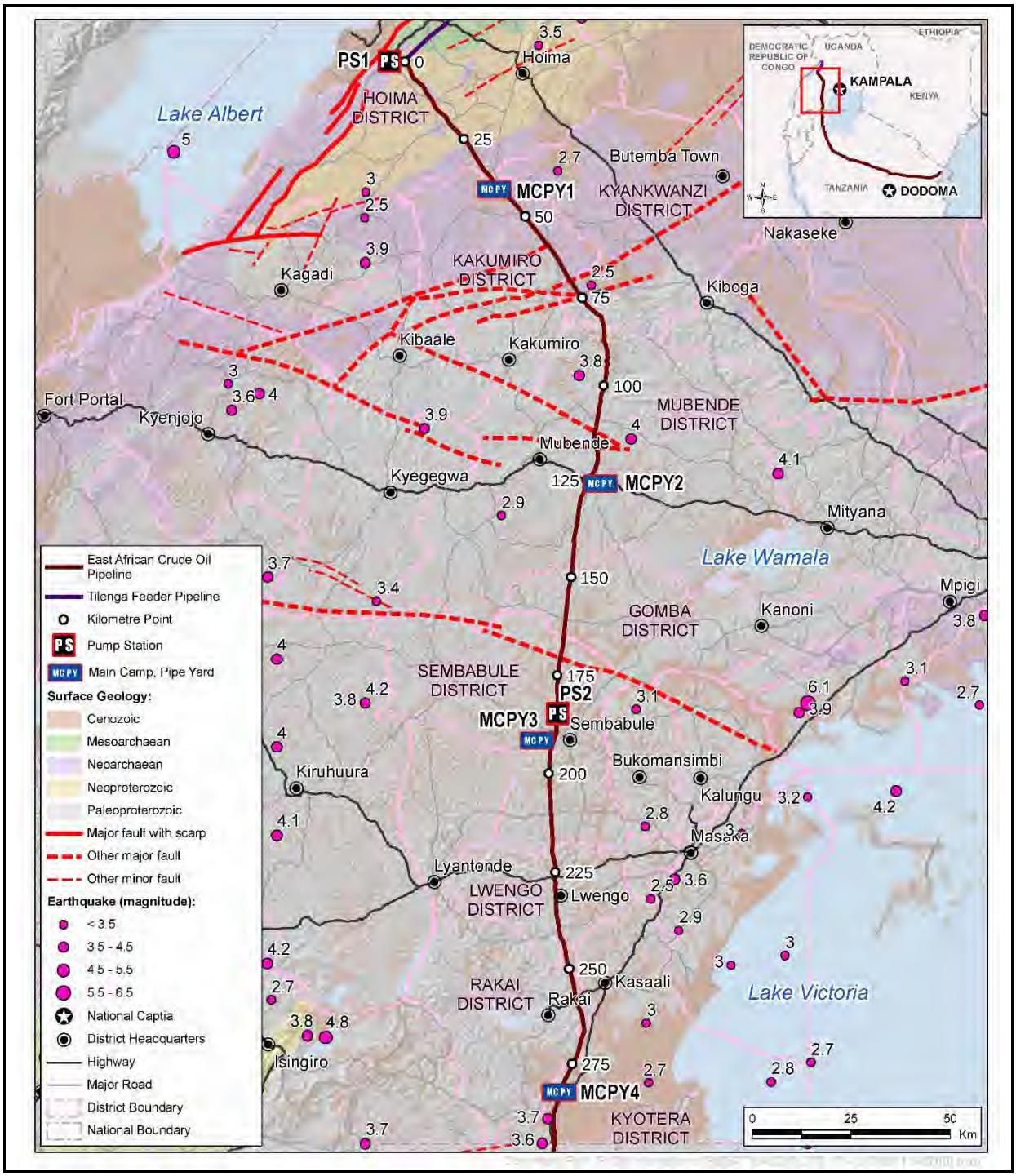

Figure A5.4-1 Geology – EACOP Project

SOURCE: GTK Consortium (2012)

Landslides and Sinkholes

Review of secondary data did not identify any landslides or sinkholes across the AOI and broader region at the time of writing.

Mining and Quarrying

Studies indicate that there may be existing mining and quarrying operations inside the study area; no further information is available at the time of writing.

Artisanal gold mining is prevalent in Mubende. Artisanal and small-scale mining, including unlicensed mining, is described in the Socio-economic and Health Baseline Report (see Appendix A11).

A5.4.1.2 Soil

Soil types within the AOI and broader region are shown in Figure A5.4-2. Table A5.4-1 and Attachment A5.1 present the soil classifications identified during the field survey.

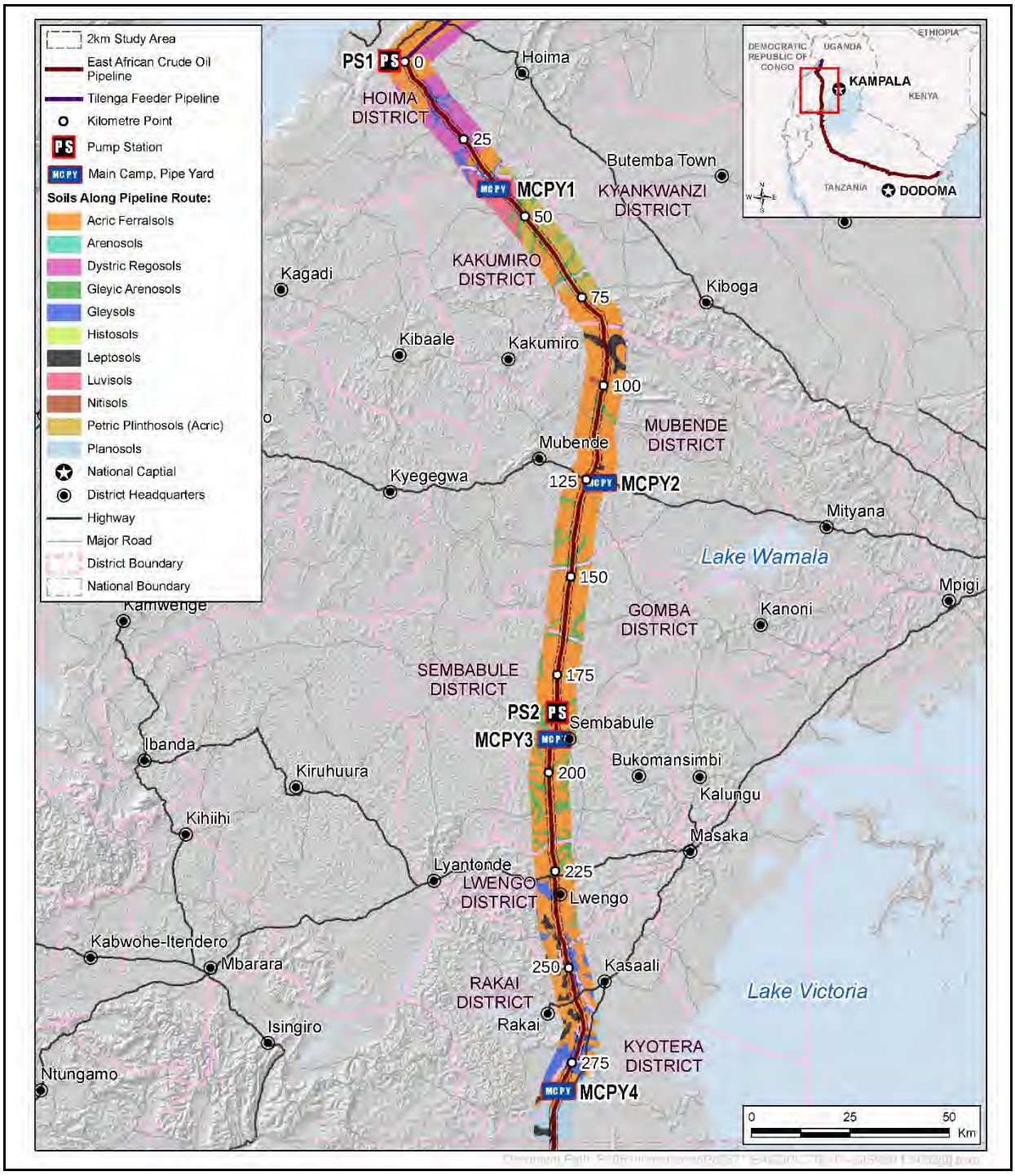

Figure A5.4-2 Soil Types

SOURCE: Isabirye et al. (2004); Kaizzi (2017)

Table A5.4-1 Sampling Point Soil Classifications

KP (Approximate)	Topsoil Depth (cm)	Brief Description	Field Classification (FAO 2014)	Textural Soil Type (USDA 2017)
0 (PS1)	–	All three horizons had dark reddish brown soil with distinct indurations in the lower two horizons	Petric Plinthosol	Clay
20	20	Dark brown clay loam horizon sitting on a red clay loam horizon	Rhodic Ferralsol	Sandy clay loam
40 (MCPY 1)	15	Dark grey loamy sand overlying dark brown loamy sand and brown sand	Arenic Arenosol	Sandy loam
60	30	Black sandy clay loam over yellowish red silty clay loam	Ferralsol	Sandy clay
80	20	Dark reddish brown clay loam in both horizons	Rhodic Nitisol	Clay
100	20	Gravelly sandy loam soil underlain by gravelly sandy clay loam	Skeletic Leptosol	Sandy clay loam
126 (MCPY 2)	40	Very dark grey horizon overlying greenish black horizon	Gleysol	Sandy clay loam
160	30	Very dark grey horizon overlying dark reddish brown horizon	Gleysol	Sandy clay loam
180 (PS2)	–	Very dark grey horizon overlying greenish black horizon	Gleysol	Sandy loam
200	–	Very dark grey sandy clay loam horizon overlying grey sandy clay horizon	Gleysol	Sandy clay
220	20	Dark reddish brown sandy clay loam horizon overlying yellowish red sandy clay loam horizon	Haplic Ferralsol	Sandy clay loam
288	20	Dark grey loamy sand overlying three sandy horizons, all with sand and coloured light brownish grey, white and yellow respectively with increasing depth	Fluvic Arenosol	Sandy loam

Table A5.4-1 Sampling Point Soil Classifications

KP (Approximate)	Topsoil Depth (cm)	Brief Description	Field Classification (FAO 2014)	Textural Soil Type (USDA 2017)
260	25	Very dark grey sandy clay loam horizon overlying strong brown silty clay horizon	Gleysol	Clay loam
240	–	Very dark grey sandy clay loam horizon overlying strong brown silty clay horizon	Gleysol	Sandy clay loam

SOURCE: FAO (2014); USDA (2017)

Figure A5.4-3 presents soil profiles showing some of the representative soil types within the study area.

Soil profile at approximately KP0 (PS1). Soil classification (FAO 2014): Petric Plinthosol. Textural soil classification (USDA 2017): clay	Soil profile at approximately KP40 (MCPY 1). Soil classification (FAO 2014): Arenic Arenosol. Textural soil classification (USDA 2017): Sandy loam
Soil profile at approximately KP80. Soil classification (FAO 2014): Rhodic Nitisol. Textural soil classification (USDA 2017): clay	Soil profile at approximately KP288. Soil classification (FAO 2014): Fluvic Arenosol. Textural soil classification (USDA 2017): sandy loam

Figure A5.4-3 Soil Profile

Soil Structure

Soil texture, a measurement of the relative content of sand, silt and clay particles, has been shown to vary throughout the AOI (see Table A5.4-1). However, soil types with a high sand content, i.e., sandy clay loam and sandy loam, were found along most of the study area and were identified at more than 60% the sample locations.

Soil containing high proportions of sand has been shown to be less vulnerable to dust and silt generation. However, soil with a low sand content was also identified at three of the sample locations (KP0, KP80 and KP260). Furthermore, the potential for dust generation is also greatly influenced by the moisture content of the soil. It is likely that many sections of the route will be prone to dust generation during the dry season.

Sandy soil tends to have a relatively low bulk density owing to its larger particle size, so it will be less sensitive to compaction and will potentially have a higher permeability. Soil comprising primarily silt and clay (for example, at KP0, KP80 and KP260) has a higher bulk density, so will be more sensitive to compaction and potentially less permeable. Silty clay soil also has poor trafficability when wet.

The topsoil depth within the study area was found to range from 15 to 40 cm, though for most of the route the depth was 20–30 cm (Table A5.4-1). Thin topsoil (<5 cm) was not encountered during the field survey, although it is likely that such soil may be present along the route, particularly in areas of steep slopes or where shallow soil is developed on exposed bedrock. Soil horizons were typically well delineated.

Soil Productivity and Nutrient Content

Most soil types within the AOI are characterised as low to medium in productivity and as supporting grazing, commercial farms and plantations, and subsistence farming (Kaizzi 2017). Soil with higher productivity was found at three of the sampled locations: KP5, KP45 and KP280. Table A5.4-2 presents the soil types and characteristics within the study area.

Table A5.4-2 Soil Types and Characteristics

KP	FAO- UNESCO Classification	Description	Land Use	Productivity/ Fertility	Drainage
140.5–144.6; 145.6–146.5; 147.9–164.4; 165.7–170.3	Acric Ferralsol	Brown gravelly loam Toro and basement complex granite parent rock	Cotton, food crops	Low	Well drained
0.1–7.4	Acric Ferralsol	Dark red clay loam occasionally lateritised Karagwe–Ankolean phyllite parent rock	Coffee, maize	Medium to high	Well drained
105.1–105.8;106.1–114.3; 55.4–55.5; 58.4–64.9; 98.2–104.1	Acric Ferralsol	Red gravelly loam underlain by soft laterite Singo batholith granite often porphyritic parent rock	Tobacco, cotton, coffee*	Low to medium	Well drained
75.2–89.1; 91.3–98.2	Acric Ferralsol	Red sandy clay loam with relic murram Toro sandstone parent rock	Cotton, tobacco, Robusta coffee	Low to medium	Well drained
0–0.1; 29.6–31.1; 31.7–33.1; 33.6–35.2	Acric Ferralsol	Reddish and reddish brown gritty clay loam Basement complex granite and gneiss and schist parent rock	Arabica coffee, maize	Low to medium	Well drained
239.2–245.3; 246.4–248.1; 249.8–250.1; 255.5–256.3; 258.4–266.9	Acric Ferralsol	Reddish brown clay loam Karagwe–Ankolean phyllite parent rock	Robusta coffee	Low to medium	Well drained

Table A5.4-2 Soil Types and Characteristics

KP	FAO- UNESCO Classification	Description	Land Use	Productivity/ Fertility	Drainage
170.3–203; 203.9–205; 206.1–214; 217.8–221; 221.7–223.5; 224.1–231.4; 235.2–239.2	Acric Ferralsol	Reddish brown clay loam Karagwe–Ankolean phyllite parent rock	Robusta coffee	Low to medium	Well drained
276.8–284.5; 286.2–287.9	Acric Ferralsol	Yellowish red loam underlain by soft laterite Toro gneiss and granite parent rock	Cotton, Robusta coffee	High	Well drained
114.3–137.8; 138.7–140.5	Acric Ferralsol	Yellowish sand with quartz gravel Toro and basement complex quartz mica schist parent rock	Coffee, cotton, tobacco	Medium to low	Well drained
15–29.6; 7.4–13.6	Dystric Regosol	Yellowish–red clay loam occasionally shallow over phyllite Bunyoro series tillite and phyllite parent rock	Some Robusta coffee	Low to medium	Well drained
104.1–105.1; 105.8–106.1; 137.8–138.7; 144.6–145.6; 146.5–147.9; 164.4–165.7; 203–203.9; 205–206.1; 214–217.8; 221–221.7; 223.5–224.1; 46.1–46.8; 47.8–49.5; 54.3–55.4; 55.5–57.1; 66.1–66.9; 68.3–69.6	Gleyic Arenosol	Pale yellow fine sand Recent alluvium parent rock	Rough grazing	Nil to low	Poorly drained

Table A5.4-2 Soil Types and Characteristics

KP	FAO- UNESCO Classification	Description	Land Use	Productivity/ Fertility	Drainage
13.6–15; 231.4–235.2; 245.3–246.4; 248.1–249.8; 250.1–255.5; 256.3–258.4; 266.9–276.8; 31.1–31.7; 33.1–33.6; 35.2–36; 36–36.2; 36.9–40; 40.6–40.8; 40.8–42.8; 36.2–36.9	Gleysol	Dark brown sandy loam over dark grey clay Recent river alluvium parent rock	Rough grazing	Low to nil	Poorly drained
89.1–91.3	Leptosol	Shallow humose loam over disintegrating laterite Sheet ironstone parent rock	Sparse grazing	Nil	Well drained
40–40.6; 40.8–40.8; 42.8–46.1; 46.8–47.8	Luvisol	Deep red clay loam over laterite Basement complex gneiss and amphibolite parent rock	Cotton	High to low	Well drained
49.5–54.3; 57.1–58.4; 64.9–66.1; 66.9–68.3; 69.6–75.2	Petric Plinthosol (acric)	Red gravelly loam underlain by soft laterite Basement complex granite and gneiss parent rock	Coffee, tobacco, cotton	Medium to low	Well drained
284.5–286.2	Planosol	Sandy/silty over clay	NA	Low	Poorly drained
287.9–295.7	Planosol	Grey coarse sand parent rock	Bambara nuts, rough grazing	Low to nil	Poorly drained

NOTES: *W = well drained, P = poorly drained, NA = data not available

SOURCES: National Agricultural Research Laboratories (NARL, unpublished data); Global yield gap atlas (Kaizzi 2017); Ministry of Lands, Housing and Urban Development (2006)

Phosphorus, potassium and magnesium are macronutrients required by plants that are necessary for the basic biological functions such as growth, photosynthesis and respiration (Singh and Schulze 2015). Deficiencies can negatively affect vegetative growth and yield, and result in increased mortality rates.

Samples SU006, SU009, SU011, SU013, SU014 and SU016 had moderately low levels of magnesium. Except for SU013, these samples were not rich in any other nutrients, so would not be considered fertile. All the samples had very low levels of potassium.

Soil texture along the pipeline ranged from heavy clay to sand.

The soil identified along the pipeline route comprised Arenosol, Rhodic Ferralsol, Skeletic Leptosol, Petroplinthic Plinthosol, Rhodic Nitisol and Gleysol (Table A5.4-2 and glossary). Soil pH ranged from 5.7 to 7.6, which indicated that most of the profiles are within the slightly acidic to moderately alkaline range, so have good agricultural production potential. Most topsoil was of low to medium organic matter content and high base status, which indicates that the soil could be productive if well managed. Most soil had low to very low extractable phosphorus levels; the exception being the Gleysol at SU013.

The results of the soil laboratory tests for parameters potentially indicative of fertility are presented in Table A5.4-3.

Table A5.4-3 Results of Fertility Suite Analysis: Samples SU006–SU019

Parameter	Limit of Detection	Units	Sample Number													
			SU006	SU007	SU008	SU009	SU010	SU011	SU012	SU013	SU014	SU015	SU016	SU017	SU018	SU019
Soil Particle Size (Sand)	–	% separates	34.00	48.00	80.00	50.00	14.00	62.00	62.00	66.00	68.00	46.00	56.00	74.00	27.00	50.00
Soil Particle Size (Silt)	–	% separates	24.00	22.00	8.00	14.00	32.00	14.00	10.00	10.00	14.00	18.00	12.00	16.00	37.00	22.00
Soil Particle Size (Clay)	–	% separates	42.00	30.00	12.00	36.00	54.00	24.00	28.00	24.00	18.00	36.00	32.00	10.00	36.00	28.00
pH	–	–	6.7	6.4	6.5	6.7	7.6	7.0	6.0	7.5	6.8	5.8	6.1	5.7	6.4	5.8
Electrical Conductivity	–	MS/m	11.4	6.4	6.8	10.8	19.8	18.6	4.7	24.4	22.9	4.7	4.6	4.2	15.8	6.9
Phosphorus	–	ppm	1.5	1.4	1.0	1.0	1.1	1.4	16.9	55.5	1.3	1.3	1.2	1.2	1.2	1.4
Potassium	0.002	mg/kg	0.10	ND	0.20	0.32	0.01	0.16	0.22	0.16	0.14	0.15	0.11	0.15	0.16	0.09
Magnesium	0.001	mg/kg	12.99	7.22	3.50	10.14	4.25	14.61	2.09	16.42	12.18	3.69	11.01	0.45	7.41	3.41
CEC	–	meq/100 g soil	16.12	9.08	3.14	12.26	17.18	11.46	7.31	13.52	8.38	10.24	6.33	3.46	8.74	8.06
Exchangeable Bases (Magnesium)	–	meq/100 g soil	2.15	1.06	0.29	1.68	2.39	1.33	0.88	1.95	0.95	1.31	0.71	0.09	1.07	1.02
Exchangeable Bases (Calcium)	–	meq/100 g soil	12.21	5.98	1.67	9.52	13.53	7.55	4.96	11.07	5.41	7.41	4.01	0.49	6.09	5.80
Total Organic Matter	–	%	5.18	4.59	1.26	5.47	6.86	4.02	1.91	4.52	3.29	4.97	2.20	3.92	6.60	5.69

NOTE: ND = not detected

Soil Erosion Risk

Soil erosion risk was categorised in the erosion risk assessment; the full document can be found in Appendix G1 of the ESIA.

The risk of soil erosion within the study area is highly variable, reflecting the change in soil and slopes. There are many high to very high-risk areas in the study area, which are characterised as having steep slopes or specific soil types that are susceptible to erosion (e.g., sandy soils and light silty soils). Table A5.3-2 identifies high-risk areas along the pipeline. In the study area, there are numerous large ridges and moderate hills that increase the risk of erosion because of the increased slope.

Soil in the study area that has been identified as having a very high erosion risk has been included in the sensitivity tables (see Section A5.4.4).

Soil Quality

The results of the soil laboratory tests for parameters potentially indicative of:

- fertility are given in Table A5.4-3
- contamination are given in Table A5.4-4.

Fourteen samples were analysed for parameters indicative of fertility or contamination.

Potential Sodic B Horizons

A sodic B horizon is a subsoil layer in which sodium occupies greater than 15% of the exchange complex (i.e., the exchangeable sodium content is greater than 15% of the cation exchange capacity; by definition, therefore, the combined exchangeable calcium and magnesium content would be less than 85% of the cation exchange capacity). Soils with a high exchangeable sodium content are associated with adverse physical conditions such as slumping/compaction and deflocculation of clay particles, making them more susceptible to erosion. Potential sodic B horizons were not observed during the field survey.

Soil Contamination

The results of the soil laboratory tests for parameters potentially indicative of contamination are presented in Table A5.4-4.

The results of the laboratory analysis included:

- copper in six samples at a maximum of 0.195 mg/kg
- manganese in 11 samples at a maximum of 3.082 mg/kg
- zinc in 14 samples at a minimum of 0.139 mg/kg and a maximum of 1.353 mg/kg.

The above values are within the range of natural background levels typical for soil in Uganda. No arsenic, cadmium, hexavalent chromium, lead, mercury, molybdenum, nickel, selenium or TPH were detected in the samples, which indicates no industry-related contamination at the sampling locations.

The study area traverses land used primarily for grazing and agriculture. At the time of writing, there is no evidence of existing sources of potentially significant contamination such as industrial or commercial centres or heavily populated urban areas within the study area.

Unexploded ordnance (UXO) dating back to the five-month Liberation War in 1978/1979 has been reported on both sides of the Ugandan–Tanzanian border. At the time of writing, the Tanzanian and Ugandan authorities are undertaking a survey to assess the UXO risk in the study area (see Section A5.4.4.4). UXO risk is considered low because of the short duration of the conflict and the high level of agricultural activity in the area. Agricultural activities include digging over of soil, so it is believed that if there was UXO, it would already have been found.

Table A5.4-4 Results of Contamination Suite Analysis: Samples SU006–SU019

Parameter	Limit of Detection	Units	Sample Number													
			SU006	SU007	SU008	SU009	SU010	SU011	SU012	SU013	SU014	SU015	SU016	SU017	SU018	SU019
Arsenic	0.001	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.001	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexavalent Chromium	0.003	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.005	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Manganese	0.001	mg/kg	0.315	0.287	<ND	0.234	0.259	ND	0.425	0.170	3.082	0.866	0.861	ND	1.768	0.539
Mercury	0.001	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	0.004	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.001	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.001	mg/kg	0.08	ND	ND	ND	0.079	ND	0.061	ND	ND	ND	0.195	ND	0.106	0.093
Zinc	0.001	mg/kg	0.301	0.165	0.233	0.226	0.264	0.162	0.545	0.146	0.438	0.380	0.139	0.393	1.353	0.706
Molybdenum	0.003	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TPH	1.000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTE: ND = not detected

A5.4.2 Trend in Condition and Sensitivity to Change

The soil types within the AOI are of reasonable agricultural quality but are vulnerable to differing pressures. External physical (for example, vehicle movements) or chemical (for example, overuse of fertiliser) pressures may reduce soil quality because of nutrient loss, compaction, erosion and contamination. Within this area of Uganda, there has been long-term drought as well as flooding and heavy rainfall at different times; some areas have experienced both drought and flooding during the same year (see climate baseline, Appendix A14). Drought and flooding may exacerbate weathering, make soil more prone to erosion and cause loss of nutrients and organic matter.

Current and future agricultural activities and practices are also likely to affect the soil within the AOI. Animals and farm equipment can diminish protective plant cover and cause structural damage and erosion of soil. In many areas, fertiliser is now required to improve soil fertility. However, if used incorrectly, fertiliser can cause diffuse and point source agricultural pollution to surface and groundwater. In addition, there is increasing evidence of severe soil degradation caused by erosion (mining and deforestation) in Uganda (Lufafa et al. 2003).

Stakeholders engaged as part of the baseline surveys have commented that much of their land is less fertile and productive than it has been in the past. Continuing use of the land within the study area for agriculture and grazing is likely to result in an ongoing trend of soil quality deterioration.

A5.4.3 Ecosystem Services

The soil in the AOI, and their associated micro-organisms, provide a range of ecosystem services as set out below.

Provisioning services:

- quarrying operations for rock and construction aggregate materials.

Regulating services:

- soil quality regulation, nutrient cycling, carbon storage, water storage and flow control.

A5.4.4 Sensitivity Rankings

A5.4.4.1 Fertility

Table A5.4-5 summarises the sensitivity ranking for the fertility of soil, which is based on the sensitivity table in Appendix D. The fertility sensitivity scores are based on soil descriptions in the World Reference Base for Soil Resources (FAO 2014) and the data from Isabirye et al. (2004) and Kaizzi (2017). A location-specific ranking based on the soil classification information collected during the field survey is also provided. This was supported by data gathered by the soil field surveys.

Table A5.4-5 Soil Fertility Sensitivity Ranking

Fertility	Sensitivity Ranking	Rationale for Ranking
13 locations	Very low (1)	No ecosystem or agricultural value
39 locations	Low (2)	Soil with low agricultural productivity
29 locations	Moderate (3)	Soil with moderate agricultural value. May take up to three years to fully recover
7 locations	High (4)	Soil with high agricultural productivity. May take 3–6 years to fully recover
None recorded but may occur locally	Very high (5)	Soil with very high agricultural productivity or ecosystem value

A5.4.4.2 Compaction

Table A5.4-5 summarises the sensitivity ranking for compaction of soil which is based on the sensitivity table in Appendix D. The compaction sensitivity scores are based on soil descriptions in the World Reference Base for Soil Resources (FAO 2014) and the data from Isabirye et al. (2004) and Kaizzi (2017).

Table A5.4-6 Soil Compaction Sensitivity Ranking

Compaction (KP Range)	Sensitivity Ranking	Rationale for Ranking
1 location	Very low (1)	Not susceptible to erosion or compaction
18 locations	Low (2)	Soil will respond well to restoration techniques to mitigate compaction
19 locations	Moderate (3)	Soil will usually respond moderately well to restoration techniques to mitigate compaction. May take up to 3 years to fully recover
None recorded but may occur locally	High (4)	Soil that may need more intensive restoration techniques to mitigate compaction. May take 3–6 years to fully recover
None recorded but may occur locally	Very high (5)	Soil that may be difficult to restore to its former condition

A5.4.4.3 Erosion

Table A5.4-7 summarises KP ranges for soil with sensitivity rankings of very high risk for erosion. The erosion risk assessment focuses on areas of very high sensitivity rankings only. The erosion sensitivity scores are in the erosion risk assessment (Appendix G1 of the ESIA).

Table A5.4-7 Soil Erosion Sensitivity Ranking

KP Range	Sensitivity Ranking	Rationale for Ranking
43 locations	Very high (5)	Soil at very high risk of erosion, according to soil type and slope

A5.4.4.4 Soil Contamination

Throughout the study area, the value of the soil varies. However, contamination was not identified at any of the locations in the study area, so, owing to the predominantly rural nature of the study area, soil contamination is unlikely. Therefore, soil is considered to have a moderate sensitivity to contamination.

UXO may exist in certain areas within the study area, particularly near the Uganda–Tanzania border, although the risk of it being encountered is considered low.

A5.5 Key Considerations

Sensitivity rankings range from very low to very high, depending on the soil type; there is considerable variation along the entire length of the AOI.

Soil is recognised as providing both regulating ecosystem services (e.g., erosion regulation and soil quality regulation) and provisioning ecosystems services (e.g., aggregate for construction).

A5.6 References

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ATTACHMENT A5.1 FIELD SURVEY DATA

Sampling Methodology

The following methods were used at all sampling sites:

- An accessible route was identified and GPS was used to navigate to the predetermined sampling location, or as close as practicably possible. Geological units and vegetation cover types (e.g., eroded and non-eroded land) were used as a guide when choosing pit and profile sites. A typical site was selected on the whole land unit and at least 5 m away from large trees or termite mounts, with the least-disturbed or contaminated area.
- A soil profile pit was excavated at each identified location to a depth of 80–100 cm where possible, or to a depth where the bedrock was encountered. Once excavated, the profile was examined and the main horizons identified.
- The dimension of the pits was approximately 0.5 m wide × 1.2 m long × 1.0 m deep. Where pits were dug on sloping ground, the long axis of pit was orientated down slope. The dominant slope was measured with a clinometer.
- During pit excavation, the topsoil and subsoil were kept separate. The sampling face of the pit was cleared of roots, spills and any spade marks
- Sampling horizon boundaries (including topsoil and subsoil) were marked on the sampling face. A graduation tape (marked at 10 cm intervals) was placed on the face, with pit identification label, before the soil profile was photographed.
- The soil profile was described to 80 cm depth or to a bedrock contact if the latter was encountered above this depth.
- At each site, the description of the soil profile (and soil horizons) was documented in terms of soil texture, colour, mottling, presence and colour of nodules and stoniness using a field reporting template (Brief Soil Profile Description sheet). Once the soil profile had been described, the profile soils were provisionally classified using the FAO (2014) systems.

Soil sampling was undertaken once the soil profile had been documented. Sampling methodology was in accordance with guidelines listed on the Brief Soil Profile Description sheet template and provisional classification in the FAO (2014) systems

Samples were securely packed in cool boxes with ice packs and kept in the dark before being dispatched to the laboratory with a sample chain of custody form. The samples were sent to SGS, an internationally accredited laboratory in Mwanza, Tanzania. In Tanzania, the SGS holds ISO 17025 laboratory accreditation from the South African National Accreditation System.

Samples were submitted to SGS for the following analysis suites:

- soil fertility (A horizon): 14 samples were submitted for analysis.
- potential contamination (A horizon): 14 samples were submitted for analysis.

Table Att5.1-1 Soil Sample Sites and Analysis Suites

Sample Collection Date	Sample Identifier	Easting (UTM_E)	Northing (UTM_N)	KP ID	Laboratory Analysis Suite	District
20-Nov	SU006	164348.1218	10161515.53	0	Fertility, contamination	Hoima
21-Nov	SU007	175914.5926	10145650.11	20	Fertility, contamination	Hoima
21-Nov	SU008	188186.2561	10129996.34	40	Fertility, contamination	Kakumiro
22-Nov	SU009	201003.3934	10114689.7	60	Fertility, contamination	Kakumiro
22-Nov	SU010	212422.5089	10098435.29	80	Fertility, contamination	Kyankwanzi
23-Nov	SU011	214655.0082	10079839.91	100	Fertility, contamination	Mubende
23-Nov	SU012	209979.3336	10055133.31	126	Fertility, contamination	Mubende
24-Nov	SU013	204998.0051	10021819.83	160	Fertility, contamination	Gomba
24-Nov	SU014	202735.7909	9997156.039	180	Fertility, contamination	Sembabule
25-Nov	SU015	200819.6066	9982311.293	200	Fertility, contamination	Sembabule
25-Nov	SU016	201593.2189	9962411.227	220	Fertility, contamination	Lwengo
27-Nov	SU017	201901.5308	9897089.31	288	Fertility, contamination	Kyotera
27-Nov	SU018	208353.3492	9923120.88	260	Fertility, contamination	Kyotera
28-Nov	SU019	203060.6864	9942731.123	240	Fertility, contamination	Kyotera

Table Att5.1-2 Soil Description and Classification with Site Observation for all Samples

Soil Sample Site	KP	Brief Description of Soil Type and Probable Classes[1]	Soil Classification Type (FAO 2014)
SU006	0	All three horizons, topsoil within 0–15 cm and subsoil 15–35 cm and 35–65 cm had dark reddish brown (5YR 2.5/2) with distinct indurations in the lower two horizons (plinthic material). A granular structure in the A and B2 horizon and a subangular blocky structure in the B1 horizon.	Petric Plinthosol
SU007	20	Dark brown (7.5YR 3/2) clay loam horizon from 0 to 20 cm sitting on a red (2.5YR 4/6) clay loam horizon extending from 20 cm and beyond a depth of 70 cm. All the horizons had a subangular blocky structure with strong microstructure development.	Rhodic Ferralsol
SU008	40	Dark grey (7.5YR 3/1) loamy sand with clod structure from 0 to 15 cm over dark brown (7.5YR 3/2) loamy sand from 15 to 60 cm and a brown (7.5YR 5/4) sandy texture from 60 cm extending beyond 90 cm depth. The above two horizons were sitting over a brown sandy horizon with a clod structure. The soil expresses arenic properties with some gleyic properties in the B_g subsurface horizon. The arenic properties were expressed in both the A and B horizons.	Arenic Arenosol
SU009	60	Deeply weathered soil with black colour (5YR 2.5/1) on the top 0–30 cm, well-drained sandy clay loam with granular structure in the first 0–30 cm and yellowish brown colour (5YR 4/6) in the B horizon extending from 30 cm and beyond a depth of 100 cm.	Ferralsol
SU010	80	Deep dark reddish brown (2.5YR 3/3) in the top 0–20 cm and a nitric horizon, (2.5YR 3/4) in the subsurface (strongly developed natty structures with shiny ped faces) with clay loam texture. A nitric horizon is a clay-rich subsurface horizon. Moderately to strongly developed blocky structure breaking to polyhedral, flat-edged or natty elements with many shiny soil aggregate faces.	Rhodic Nitisol
SU011	100	Very gravelly sandy loam in the top 0–20 cm over gravelly sandy clay loam having more than 70% by volume of coarse fragments starting at a depth of 20 cm and extending beyond 70 cm	Skeletic Leptosol
SU012	126	Very dark grey (7.5YR 3/1) top 0–40 cm sandy clay loam with strong brown mottles (7.5YR 4/6) with iron and manganese concretions and overlying greenish black (GLEY12.5/1) gleyed sandy clay and olive brown mottles in the B_g horizon. Strong brown mottles in the A horizon.	Gleysol

Table Att5.1-2 Soil Description and Classification with Site Observation for all Samples

Soil Sample Site	KP	Brief Description of Soil Type and Probable Classes[1]	Soil Classification Type (FAO 2014)
SU013	160	Very dark grey (7.5YR 3/1) sandy clay loam with strong brown mottles (7.5YR 4/6) with observable iron and manganese concretions on the top 0–30 cm overlying dark reddish brown (10YR4/4) gleyed sandy clay in the B_g horizon starting within 30 cm and extending beyond a depth of 80 cm.	Gleysol
SU014	180	Very dark grey (7.5YR 3/1) sandy clay loam 0–30 cm overlying greenish black (GLEY1 2.5/1) sandy clay horizon. Strong brown mottles in the A horizon and gleying in the B_g horizon.	Gleysol
SU015	200	Very dark grey (5YR 3/1) sandy clay loam on the top horizon 0–30 cm overlying grey (7.5YR 5/1) sandy clay horizon with a blocky structure having brown mottles (7.5YR 4/4).	Gleysol
SU016	220	Dark reddish brown (5YR 3/2) sandy clay loam horizon in the top 0–20 cm overlying yellowish red (5YR 4/6) sandy clay loam horizon. All the horizons had a subangular blocky structure.	Haplic Ferralsol
SU017	288	Dark grey (10YR 3/1) loamy sand in the top 0–20 cm overlying three deeper sandy textured horizons showing clear stratifications, all with sand and with light brownish grey (10YR 6/2), white (10YR 8/1) and yellow (10YR 7/6) colours respectively with increased depth. All the horizons consist of single grain structures.	Fluvic Arenosol
SU018	260	Very dark grey (7.5YR 3/1) sandy clay loam horizon on the top 0–25 cm overlying a partly gleyed silty clay horizon extending beyond 100 cm depth showing strong brown (7.5YR 5/6). The A_p and B_g horizons have angular blocky and blocky structures respectively.	Gleysol
SU019	240	Very dark grey (7.5YR 3/1) sandy clay loam horizon 0–30 cm overlying a strong brown silty clay horizon. All the horizons had an angular blocky structure within 30–80> cm.	Gleysol

NOTE: [1]According to WRB (2014)

Appendix A6: Surface Water Baseline Report

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GLOSSARY AND ACRONYMS

Symbols	
%	percent
A	cross-section area of flow in a channel (m^2)
AREA	drainage basin area (km^2) (a parameter used to calculate the mean annual flood)
°C	degrees Celsius
C10–C40	total hydrocarbons
DAMBO	(dimensionless) proportion of the drainage basin covered by wetland (a parameter used to calculate the mean annual flood)
g	acceleration due to gravity (9.81 m/s^2)
MAF	mean annual flood. The mean annual flood has a theoretical statistical return period of 2.3 years.
MAR	mean annual rainfall (mm). (a parameter used to calculate the mean annual flood)
n	roughness factor in the Manning uniform flow equation
P	wetted perimeter of a channel (m)
Q	discharge (m^3/s)
Q_T	peak flood flow with an estimated return period of T years
R	hydraulic radius (m), calculated as the ratio A/P
S1085	slope of the catchment between the 10th and 85th percentiles of the main stream length (m/km) (a parameter used to calculate the mean annual flood)
S_b	channel bed slope (m/m)
S_e	energy slope in a channel (m/m). S_e approximated by the channel bed slope (S_b)
SFREQ	stream frequency calculated as the number of stream junctions on a 1:50,000 scale map divided by AREA (a parameter used to calculate the mean annual flood)
ρ	fluid (water) density (1000 kg/m^3)
Ω	stream power per unit channel length (W/m).
Units	
°C	degrees Celsius
µS/cm	micro-Siemens per centimetre
kg	kilogram
km	kilometre
km^2	square kilometre
L	litre
m	metre

m^3/s	cubic metre per second
masl	metres above sea level
mg	milligram
mg/L	milligram per litre
mL	millilitre
mm	millimetre
NTU	nephelometric turbidity unit
s	second
W	watt
A	
AGI	aboveground installation
AOI	area of influence
APHA	American Public Health Association
Aquaread	trademark multiparameter water quality probe
B	
bankfull discharge, level, width	discharge, water level or width of a river whose flow is just contained within the banks
BOD	biochemical oxygen demand
BS	British Standard
C	
CFU	colony forming units (bacteria)
COD	chemical oxygen demand
D	
DIN	German Institute for Standardisation
DO	dissolved oxygen (mg/L or % saturation)
DWRM	Directorate of Water Resources Management under the Ministry of Water and Environment, Uganda
E	
EACOP	East African Crude Oil Pipeline
EC	electrical conductivity (µS/cm)
ERU	Existing Road Upgrade
ESIA	environmental and social impact assessment
G	
gauged watercourse	watercourse on which a river gauging station is located. A river gauging station is a location where flow and water quality are monitored by hydrologists and environmental scientists.
I	
ISO	International Organization for Standardization

K	
KP	kilometre point
L	
LIDAR	light detection and ranging: an airborne or satellite borne detection system that works on the principle of radar, but uses light from a laser and is used to map topography
M	
MCPY	main camp and pipe yard
MEMD	Ministry of Energy and Mineral Development, Uganda
MWE	Ministry of Water and Environment, Uganda
N	
NEMA	National Environment Management Authority (Uganda)
NWSC	National Water and Sewerage Corporation
P	
PAH	polycyclic aromatic hydrocarbon
PAR	permanent access road
pH	measure of the acidity or alkalinity of a liquid
PS	pumping station
R	
RoW	right of way
return period	average number of years in the long term between hydrometeorological events of a similar magnitude
S	
SGS	African Assay Laboratories Ltd, in Mwanza, Tanzania
T	
TAR	temporary access road
TDS	total dissolved solids (mg/L)
TPH	total petroleum hydrocarbons (mg/L)
TSS	total suspended solids (mg/L)
turbidity	measure of the amount of cloudiness in water (NTU)
V	
VEC	valued environmental and social component
W	
WSC NF	Water & Sewerage Corporation, nonfunctioning water supply schemes
WGS84 TM35E_S	World Geodetic System 1984 Transverse Mercator zone 35 East-South (the EACOP project map projection)

A6 SURFACE WATER BASELINE REPORT

A6.1 Introduction

This baseline report describes the surface water:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions:
  - trend in condition and sensitivity to change
  - ecosystem services provided
  - sensitivity rankings
- key considerations.

A water source study is being conducted concurrently with this environmental and social impact assessment (ESIA). Information obtained by the water source study has been used to inform the surface water baseline and impact assessment. The water source study objective is to investigate and develop:

- water resources to supply construction facilities, permanent aboveground installations (AGI), pipeline construction and hydrostatic pressure testing (hydrotesting) of the constructed pipeline
- a strategy for using surface water as a potential source of supply for hydrotesting. Potential sources, e.g., Lake Albert and Lake Victoria, have been identified, but have yet to be investigated

Baseline surface water investigations for hydrotesting will be included in the Water Use permit application to the Directorate of Water Resources Management (DWRM) with jurisdiction for water abstractions.

Surface water may occur as permanent or ephemeral watercourses (channels and floodplains), wetlands and waterbodies. The term “ephemeral” is used to include those watercourses with seasonal flow and those with flow just following rainfall.

A6.2 Area of Influence and Study Area Boundaries

A6.2.1 Area of Influence Boundary

The AOI for the construction phase includes:

- the project footprint at the location where the pipeline or an access road crosses a watercourse or waterbody
- surface waterbodies downstream of AGIs and construction facilities.

The AOI varies from 2–5 km downstream of pipeline crossing points, access road crossing points, AGIs or construction facilities, depending on the extant quantity of water and its quality, including sediment concentrations and turbidity, in the watercourse and the quantity and quality of any water discharged.

The AOI also includes surface waterbodies that will be used to supply water to the project. At the time of writing, surface water is considered a potential water

resource for hydrotesting, while water for other needs (construction) will be sourced from groundwater.

The temporal AOI for construction is the period that includes abstraction and discharge and a short recovery period of less than one year.

The spatial AOI for operation is 2–5 km downstream of watercourses and waterbodies and the temporal AOI for operation is the life of the project, approximately 25 years.

A6.2.2 Study Area Boundary

A6.2.2.1 Introduction

The study area comprises the upstream catchment areas of the watercourses crossed by the pipeline, access roads or discharge points and downstream to key valued environmental and social components (VEC). This is because land use in catchments upstream of the project influences the flow and water quality regimes at the crossing points and downstream VECs.

Water scarcity for communities was assessed within a 2-km corridor study area along the pipeline, along project roads and near construction facilities and AGIs.

A6.2.2.2 Pipeline Crossings

The pipeline route crosses many watercourses, but most are minor tributaries with relatively small catchment areas. The route crosses 10 major watercourses, which are the focus of this section. Table A6.2-1 lists the watercourses, crossing point locations and their catchment areas upstream of the pipeline crossing. All 10 watercourses have permanent flow regimes. The watercourses and their upstream catchments are shown in Attachment A6.1. Images of the rivers at pipeline crossing points are shown in Attachment A6.3.

Table A6.2-1 Pipeline–Major Watercourse Crossings and Upstream Catchments

Watercourse	KP	Upstream Catchment Area (km^2)	Basin
Upper Wambabya River	15.4	90	Lake Albert
Kafu River	36.5	710	Victoria Nile
Kafu tributary 1	54.7	61	Victoria Nile
Kafu tributary 2	69.5	315	Victoria Nile
Nabakazi tributary 1	105	73	Lake Victoria
Nabakazi tributary 2	112.6	71	Lake Victoria
Nabakazi River	147.5	1024	Lake Victoria
Katonga River	164.7	6543	Lake Victoria
Kibale River	274.1	6874	Lake Victoria
Jemakunya River	289.3	168	Lake Victoria

A6.2.2.3 Road Crossings

Assessed project road watercourse crossings comprise:

- new temporary access roads
- new permanent access roads
- existing access roads upgraded by the project.

Table A6.2-2 presents the project access roads and the watercourses they cross. All are minor ephemeral headwater watercourses with catchment areas of 2.2 km^2 or less. Maps showing project access road watercourse crossings are presented in Attachment A6.4.

Table A6.2-2 Project Access Road–Watercourse Crossings

Pipeline KP	Road ID	VEC Location (Road KP)[1]	Catchment Area (km^2)	Basin
0	PAR–PS1	2.5	0.4	Lake Albert
		4.8	2.2	
40	TAR–MCPY1	No crossing	–	Victoria Nile
125	TAR–MCPY2	0.42	0.10	Lake Victoria
126	ERU–MCPY2	1.0	0.9	
185	ERU–PS2	0.5	0.5	
185	PAR–PS2	No crossing	–	
191	ERU–MCPY3	No crossing	–	
191	TAR–MCPY3	No crossing	–	
283	TAR–MCPY4	No crossing	–	

NOTES: [1]Distance from start of road. The start of road is assumed the junction with a national or district road.
ERU = existing road upgrade. PAR = permanent access road. TAR = temporary access road

A6.2.2.4 Construction Facilities and Aboveground Installations

Table A6.2-3 presents the construction facilities and AGIs along the pipeline and the watercourses that are located nearby. Attachment A6.4 presents maps of project facilities and nearby watercourses.

Table A6.2-3 Construction Facilities and Permanent Aboveground Installations: Watercourses Nearby

Pipeline KP	Facility	Watercourse Type	Distance to Watercourse/VEC from Facility (m)	Catchment Area (km^2)	Basin
0	PS1	Ephemeral watercourse	650 m (east)	7.8	Lake Albert
		Ephemeral watercourse	200 m (south)	0.1	
		Ephemeral watercourse	300 m (northwest)	3.9	
40	MCPY1[1]	Ephemeral floodplain	70 m (east)	4.5	Victoria Nile
125	MCPY2[1]	Ephemeral watercourse	Within site	0.3	Lake Victoria
185	PS2[2]	Ephemeral watercourse with livestock watering points downstream	70 (southwest) 70 and 400 m (watering points)	0.5	
191	MCPY3[1]	Ephemeral watercourse with livestock watering point downstream	300 m (northeast) 800 m (watering point)	0.6	
		Ephemeral watercourse	500 m (southwest)	0.2	
283	MCPY4[1]	Ephemeral floodplain	400 m (southeast)	2.1	

NOTES: [1]Construction facility; [2]Permanent AGI

A6.2.3 Survey Area Boundary

The survey area for the water quality survey was the proposed pipeline watercourse crossing point or the nearest accessible location (see Section A6.3.2). Water quality samples collected were considered representative of both pipeline and road crossings.

A6.3 Methods

A6.3.1 Secondary Data

The following secondary data were used when preparing this report:

- Satellite imagery was used to inspect watercourses and their catchment areas.
- Satellite imagery and light detection and ranging (LIDAR) data were used to estimate watercourse dimension and channel capacity at crossings.
- Historical river flow records were acquired from the DWRM for selected river gauging stations in Western Uganda to characterise flow regime at watercourse crossings.
- A published flood study for Southwestern Uganda (MWE 2010) was used to estimate flood flows at watercourse crossings.
- The Uganda Water Supply Atlas (MWE 2017c) was used for assessing community water scarcity.
- Several reports and scientific publications were reviewed (see Section A6.6).

A6.3.2 Field Surveys

A6.3.2.1 Water and Sediment Quality

Pipeline Crossings

Water Quality

Baseline surface water quality sampling surveys were undertaken during the dry and wet seasons in 2017 on selected rivers that are crossed by the EACOP Uganda export pipeline to characterise their basic physical, chemical and microbiological water quality. Table A6.3-1 lists the survey dates.

Table A6.3-1 Water and Sediment Survey Dates

Survey	Start	End
Dry season	2 July 2017	4 July 2017
Wet season	14 November 2017	16 November 2017

Sampling sites were determined beforehand and were located at pipeline crossing points or at the nearest accessible location. Table A6.3-2 lists the locations of the sampling sites. The locations are also shown in Attachment A6.2. Photographs of the sampling sites are presented in Attachment A6.5.

Table A6.3-2 Rivers Sampled for Water and Sediment Quality

River	KP	Sampling Location (WGS84 TM35E_S)		Elev. (masl)	Location of Sampling Site
		Easting	Northing		
Kafu	36.5	186980	10133593	1070	Hoima–Kibale road bridge 1.4 km downstream of pipeline crossing
Katonga	164.7	198896	10021907	1171	Kyai village 8.9 km upstream of pipeline crossing
Kibale	274.1	209030	9906701	1152	Masaka–Mutukula road bridge 4.7 km downstream of pipeline crossing
Jemakunya	289.3	201765	9896295	1162	Masaka–Mutukula road bridge 0.6 km upstream of pipeline crossing

Water sampling was conducted in accordance with BS EN ISO 5667-6:2016: Guidance on sampling rivers and streams. Global positioning system coordinates of sampling locations were recorded and samples were collected using a clean, empty sample bottle as a single-use bailer. Where this was impractical, a bucket with rope was used. The collected water was transferred to a labelled sample bottle. The bottles and bucket were washed in the river water three times before sampling to reduce the risk of cross-contamination.

The samples were packed securely in cool boxes with ice packs and kept dark before and during transit for analysis. The samples were analysed by the Environment and Oils Laboratory of African Assay Laboratories Ltd (SGS) in Mwanza, Tanzania, an internationally accredited laboratory. SGS holds ISO/IEC 17025 laboratory accreditation issued by the Canadian Association for Laboratory Accreditation Inc.

Onsite measurements of water quality and laboratory analyses on water samples are described in Section A6.3.3.

Sediment Quality

A baseline sediment-quality survey was conducted during the wet season water sampling campaign (Table A6.3-1 and Table A6.3-2). The sediment survey collected a sample of riverbed sediment from each of the water quality sampling sites. These sites were judged sensitive sediment areas.[1]

At each sampling site, two sediment subsamples were taken from the riverbed on opposite sides of the river by driving a length of sampling tube (50-mm-diameter polyvinyl chloride pipe) 0.1–0.2 m into the riverbed below the water surface. The subsamples were homogenised then placed in a glass jar and ziplock bag. Where one side of the river was inaccessible, a second subsample was taken elsewhere on the same side of the river.

Onsite observations of sediment quality and laboratory analyses on sediment samples are described in Section A6.3.3.

[1]A sensitive sediment area is characterised by erodible sediment that, if mobilised by flowing water, may be transported and deposited downstream, thereby redistributing the mobilised sediment.

A6.3.3 Data Analysis

A6.3.3.1 Flow and Flood Regimes

Pipeline Crossings

Flow Regime

The flow regime of rivers crossed by the pipeline route is represented here by the median or 50-percentile monthly flow at the crossing point.[2] The median flow was calculated in preference to the mean monthly flow because the mean can be influenced by extreme values. It is expected that 50% of monthly flows will exceed the median and 50% will be lower.

The Wambabya, Katonga and Kibale rivers are gauged (Table A6.3-3, Figure A6.3-1). Daily flow records for selected stations on these rivers and for the Nkusi River, whose hydrological regime was assumed similar to that of the Kafu River, were acquired for the periods given in Table A6.3-3.

Table A6.3-3 Available Daily Flow Data

River Gauging Station	Area of Catchment (km^2)	Record Period
81233 Kibale River at Kalungi	6798	1970–1979
81262 Katonga River at Nkonge Road Bridge	3968	1970–1979
85212 Nkusi River at Kyenjojo–Hoima Road Bridge	1823	1970–1979
85214 Wambabya River at Buseruka	780	1970–1979

NOTES: [1]Data acquired from DWRM.

Figure A6.3-1 shows the daily flow records.

[2]The median or 50-percentile flow is the middle flow value in a list of flow values arranged in order from smallest to largest.

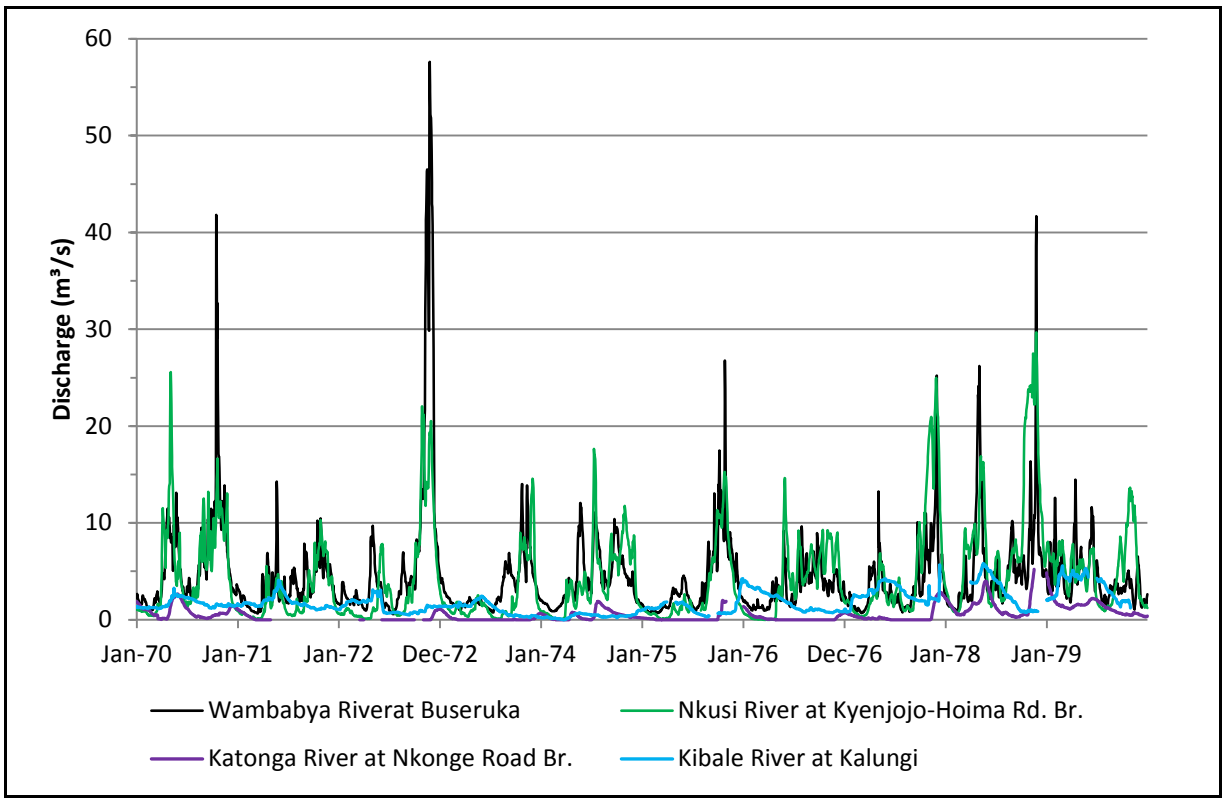

Figure A6.3-1 Wambabya, Nkusi, Katonga and Kibale Rivers, Daily Flows, 1970–1979

The daily flow records were processed to obtain monthly mean flows. For each "target" river crossed by the pipeline, a donor station was selected based on geographical proximity. The monthly record at the donor station was transposed to the target rivers to generate an estimated monthly mean flow record on the target river at the pipeline crossing. Table A6.3-4 presents the donor stations and the target rivers.

Table A6.3-4 Transposition of Flow Records to Rivers at Pipeline Crossings

Donor River and Gauge Station	Area of Catchment (km^2)	Target River at Pipeline Crossing	KP	Area of Catchment (km^2)
85214 Wambabya River at Buseruka	780	Upper Wambabya	KP15.4	90
85212 Nkusi River at Kyenjojo–Hoima Road Bridge	1823	Kafu River	KP36.5	710
85212 Nkusi River at Kyenjojo–Hoima Road Bridge	1823	Kafu tributary 1	KP54.7	61
85212 Nkusi River at Kyenjojo–Hoima Road Bridge	1823	Kafu tributary 2	KP69.5	315
85212 Nkusi River at Kyenjojo–Hoima Road Bridge	1823	Nabakazi tributary 1	KP105	73
85212 Nkusi River at Kyenjojo–Hoima Road Bridge	1823	Nabakazi tributary 2	KP112.6	71

Table A6.3-4 Transposition of Flow Records to Rivers at Pipeline Crossings

Donor River and Gauge Station	Area of Catchment (km^2)	Target River at Pipeline Crossing	KP	Area of Catchment (km^2)
85212 Nkusi River at Kyenjojo–Hoima Road Bridge	1823	Nabakazi River	KP147.5	1024
81262 Katonga River at Nkonge Road Bridge Nabakazi River at KP147.5	3968 1024	Katonga River	KP164.7	6543
81233 Kibale River at Kalungi	6798	Kibale River	KP274	6874
81262 Katonga River at Nkonge Road Bridge	3968	Jemakunya River	KP289.3	168

The transpositions were made by multiplying each monthly gauged flow value by the ratio of the target river catchment area to the donor river catchment area. Median monthly flows were then calculated from the estimated monthly flow record. In the case of the Katonga River at KP164.7, estimated monthly flows in the Nabakazi River at KP147.5 were added to flows transposed from the Katonga River at the Nkonge Road Bridge. The estimated median monthly flows at the pipeline crossing points are presented in Section A6.4.

Flood Regime and Floodplain Flows

A quantitative assessment of the magnitude and frequency of floods and floodplain flows was conducted using available data for the major watercourses draining across the pipeline route. The regional flood estimation method used was developed specifically for Southwestern Uganda (MWE 2010). For each major watercourse, the mean annual flood (MAF) was estimated at the pipeline crossing using the following equation:

$$MAF = 10^{-1.705005} \cdot AREA^{0.53849} \cdot S1085^{0.381989} \cdot SFREQ^{0.231968} \cdot (1+DAMBO)^{-7.707848} \cdot MAR^{0.389604}$$

where:

MAF is the mean annual flood (m^3/s)

AREA is the catchment area upstream of the crossing point (km^2)

S1085 is the slope of the catchment between the 10th and 85th percentiles of the main stream length between the crossing point and the catchment boundary in the headwater area (m/km)

SFREQ is the stream frequency calculated as the number of stream junctions on a 1:50,000 scale map divided by AREA

DAMBO is the (dimensionless) proportion of the catchment covered by wetland

MAR is the mean annual rainfall (mm).

Catchment-specific values of the parameter's AREA, S1085, DAMBO and MAR were derived for the pipeline crossings (Table A6.3-5). A region-average value of SFREQ was calculated from the values for the 17 catchments given in MWE (2010)

and was used for all rivers except the Upper Wambabya, which was assigned a value given in MWE (2010) for the Wambabya catchment. Table A6.3-5 presents the values of AREA, S1085, DAMBO and MAR used in the analysis.

Table A6.3-5 Parameter Values for Watercourses at Pipeline Crossings

KP	Watercourse	Area (km^2)	S1085 (m/km)	SFREQ	DAMBO	MAR (mm)
15.4	Upper Wambabya River	90	6.4	0.29	0.012	1375
36.5	Kafu River	710	2.4	0.42	0.043	1175
54.7	Kafu tributary 1	61	3.1	0.42	0.261	1175
69.5	Kafu tributary 2	315	4.3	0.42	0.010	1175
105	Nabakazi tributary 1	73	7.5	0.42	0.015	1175
112.6	Nabakazi tributary 2	71	7.4	0.42	0.035	1175
147.5	Nabakazi River	1024	1.3	0.42	0.077	1175
164.7	Katonga River	6543	0.2	0.42	0.137	900
274.1	Kibale River	6874	0.8	0.42	0.157	900
289.3	Jemakunya River	168	8.5	0.42	0.166	900

The estimates of mean annual flood at the pipeline crossing points on all the main rivers are presented in Section A6.4.

Peak flood flows with return periods[3] (T) of T= 5, 10, 20, 50 and 100 years were estimated at the same pipeline crossings using the following equation:

$Q_T = MAF \cdot (Q(T)/MAF)$

where:

Q_T	is the peak flood flow with an estimated return period of T years
(Q(T)/MAF)	is the ratio of the T-year flood to the mean annual flood. Values for (Q(T)/MAF) for different return periods are given in Table A6.3-6.

[3] Return period, also known as the recurrence interval, is the average number of years in the long term between events of a similar magnitude. It is a measure of the likelihood of occurrence of an extreme event.

Table A6.3-6 Flood Frequency Factors for Southwestern Uganda

Return Period T (y)	Flood Frequency Factor (Q(T)/MAF)
5	1.416
10	1.893
20	2.419
50	3.199
100	3.856

SOURCE: MWE (2010)

Estimates of MAF and Q_T for the major watercourses at pipeline crossing points are presented in Section A6.4.

The occurrence of floodplain flows was estimated at the major watercourse crossings. The bankfull flow capacity of each river channel at the crossing point was estimated and compared with the estimate of MAF and Q_T. Satellite imagery and LIDAR data were used to estimate the width, depth, cross-sectional area, hydraulic radius and slope of the river channel at bankfull discharge level at each crossing. These parameters were entered into the Manning uniform flow formula to estimate the bankfull flow capacity of the channel. The Manning equation is given by:

$Q = (A \cdot R^{(2/3)} \cdot S_b^{0.5})/n$

where:

Q is the flow (m^3/s)

A is the cross-section area of flow (m^2)

R is the hydraulic radius (m), calculated as the ratio A/P, where P is the wetted perimeter (m)

S_b is the channel bed slope (m/m)

n is a roughness factor. Values of n used in the analysis were obtained from Chow (1959).

Channel dimensions, values of n and estimated capacities are presented in Attachment A6.6. The assessment of the flood regime and the occurrence of floodplain flow are presented in Section A6.4.

Road Crossings and Project Facilities

Flow and flood regimes in watercourses crossed by project roads and in watercourses that receive drainage from project facilities were not quantified, as it was inappropriate to transpose flow records from the river gauging stations in Table A6.3-3 to the ephemeral channels owing to the differences in scale of catchment area and flow processes.

A6.3.3.2 River Channel Morphology and Stability

Pipeline Crossings

Qualitative assessments were made of river channel morphology and stability at and downstream of pipeline crossings. Using satellite imagery, the river channel planform was categorised as straight, sinuous, meandering or braided. The materials comprising the bed and banks, and riparian vegetation were assessed using a combination of satellite imagery and observations made during the sediment quality survey (see Section A6.3.3.3). Stream power per unit channel length was calculated at the pipeline crossings.

Stream power is defined as "the rate of energy supply at the channel bed that is available for overcoming friction and transporting sediment" (McEwen 1994 cited in Barker et al. 2009). Stream power is considered a measure of the energy available to drive fluvial geomorphological change (Barker et al. 2009).

For each major watercourse, stream power per unit channel length was estimated at the mean annual flood. The mean annual flood has a theoretical return period of 2.3 years. Stream power is expressed by:

$\Omega = \rho \cdot g \cdot Q \cdot S_e$

where:

- Ω is the stream power per unit channel length (W/m)
- ρ is the fluid (water) density (1000 kg/m^3)
- g is the acceleration due to gravity (9.81 m/s^2)
- Q is the flow, here the mean annual flood, MAF (m^3/s)
- S_e is the energy slope (m/m). S_e is approximated by the channel bed slope (S_b).

Calculations of stream power are presented in Attachment A6.7. The assessment of river channel morphology and stability is presented in Section A6.4.

Road Crossings

Valley floors crossed by project roads will be the VECs of road drainage. As flood flows were unavailable, stream power could not be calculated reliably. Consequently, assessment of the stability (potential for enhanced erosion) of the receptor of road drainage, valley floor soil, was qualitative. Receptor stability assessment results for road crossings are presented in Section A6.4.

Construction Facilities and Permanent AGIs

Project facilities will drain to adjacent watercourses or hill slopes. As flood flows were unavailable, stream power could not be calculated reliably. Consequently, assessment of the stability (potential for enhanced erosion) of the receptor of facility drainage, valley floor or hill slope soil, was qualitative. Receptor stability assessment results for project facilities are presented in Section A6.4.

A6.3.3.3 Water and Sediment Quality and Sensitivity to Contamination

Pipeline Crossings

Water Quality

At all sites, a calibrated portable digital multiparameter water quality sonde (Aquaprobe) was used to measure:

- water temperature
- electrical conductivity (EC)
- total dissolved solids (TDS)[4]
- pH
- dissolved oxygen (DO)
- turbidity.

Field tests of total coliforms and *E. coli* were undertaken at all sites using a portable DelAgua single incubator water testing kit. Samples were incubated on CHROMagar ECC broth for 24 h at 44°C.[5]

Observations were made at all the sites of:

- odour
- gas bubbles
- algae
- iridescence
- bacterial aggregates
- precipitates
- colour.

Attachment A6.8 presents the onsite measurements taken at each sampling location during the dry and wet seasons.

For every water sampling location, the following laboratory analyses were performed:

- total suspended solids (TSS)
- chloride
- biochemical oxygen demand (BOD)
- total petroleum hydrocarbons (TPH).

The following analyses were conducted on one sample taken from the Katonga River during the wet season (the Katonga River was selected because it is considered the major river crossing for the pipeline route):

- chemical oxygen demand (COD)

[4] TDS was calculated internally by the Aquaprobe based on the equation TDS = EC·0.65.

[5]Using CHROMagar ECC broth enabled simultaneous analysis of total coliforms and *E. coli*. The prescribed incubation temperature for both types of bacteria is 37°C. However, it was impossible to adjust the incubation temperature of the particular test kit used in this survey. Incubation at 44°C favours the growth of *E. coli* relative to total coliforms. As the presence of *E. coli* is an indicator of faecal contamination and total coliform bacteria are ubiquitous in natural waters, this was not considered to affect the conclusions.

- total hydrocarbons (C_{10}–C_{40})
- polycyclic aromatic hydrocarbons (PAH)
- dissolved metals (arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, silver, vanadium, zinc)
- sulphate
- calcium.

Sampling quality control procedures were implemented at all sampling sites and are reported in Attachment A6.16.

Analytical methods used by SGS were those specified by:

- Standard Methods for Examination of Water and Wastewater (American Public Health Association (APHA) 2012)
- German Institute for Standardisation (DIN).

SGS' water analysis methods and limits of detection are presented in Attachment A6.9.

The results of laboratory analyses performed on water samples from each sampling location are presented in Attachment A6.10. Laboratory reports of water analyses for the dry season survey are shown in Attachment A6.11 and for the wet season survey in Attachment A6.12.

The baseline condition of water quality is described in Section A6.4.

Sediment Quality

The following observations were made of sediment at each sampling location:

- texture
- colour
- odour
- presence of biota
- presence of detritus
- depth of sediment sampled.

The following laboratory analyses were performed on liquid leached from the sediment samples using deionised water and, in the case of the metals analyses, using mixed acid:

- pH
- chloride
- TPH
- total phenols
- sulphides
- metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, vanadium and zinc.

Sampling quality control procedures were implemented at all sampling sites and are reported in Attachment A6.16.

The analytical methods used by SGS were those specified by APHA (2012). SGS' sediment analysis methods and limits of detection are presented in Attachment A6.13.

The results of onsite observations of the sampled sediment and of the laboratory analyses performed on sediment samples are shown in Attachment A6.14. Laboratory reports of analyses on sediment samples are shown in Attachment A6.15. The baseline condition of sediment quality is described in Section A6.4.

Sensitivity of Watercourses to Potential Contamination

Based on the water and sediment quality survey results and the assessment of catchment areas using satellite imagery, qualitative assessments were conducted for the surveyed watercourses and the main watercourses that were not surveyed. The existing contamination and sensitivity to potential future contamination of watercourses at pipeline and road crossings, and watercourses adjacent to construction facilities and permanent AGIs were determined. The assessments considered the protected status of land, land use, the presence of wetlands up- and downstream of crossings, the nature of human settlement, and the likely users or VECs of the watercourses at and downstream of crossings. The sensitivity of watercourses to potential contamination was ranked according to the table for water quality sensitivity in Appendix D of the ESIA.

Attachment A6.17 shows the assessment for the 10 major watercourses crossed by the pipeline. Attachment A6.18 shows the assessment for watercourse crossings along access roads. Attachment A6.19 shows the assessment for watercourses near construction facilities and AGIs.

A6.3.3.4 Water Scarcity and Accessibility for Community Use

Relative water scarcity was assessed for communities along the pipeline, new temporary and permanent access roads and existing roads to be upgraded by the project, and adjacent to construction facilities and permanent AGIs.

The concept of relative scarcity of water has several dimensions. The balance between rainfall and evaporation primarily controls water scarcity. This can affect whether flows in watercourses are permanent or ephemeral. In addition, scarcity is controlled by the provision of, for example, wells, boreholes and irrigation diversion weirs in order to supply water to communities and their economic activities with a degree of reliability. Water resources can be over-exploited. Over-exploitation can lead to scarcity for users nearby or located downstream. In addition, water quality also has a bearing on water scarcity in relation the uses for which water is required.[6] Contamination of water can cause scarcity, for example, of drinking water.

The assessment of water scarcity was undertaken at two levels: at the level of districts and subcounties, and within 2 km of project facilities. The *Uganda Water Supply Atlas* (MWE 2017c) was used for the district and subcounty level assessment. For the districts and subcounties through which the pipeline route passes, the percentage of the population without access to safe water supplies and

[6]The uses of water considered in this assessment included domestic, livestock watering, irrigation and industrial.

the percentage of nonfunctioning water points were obtained from the atlas' percentages for the population with access to water and for functioning water points.

Water scarcity was assessed within a 2-km corridor along the pipeline, along project roads and near project facilities. The information below was used to assess water scarcity:

- the distribution of homesteads, watercourses and boreholes
- the settlement pattern: nucleated or dispersed, based on the interpretation of satellite imagery
- likely livelihood activities based on the interpretation of satellite imagery
- the likely uses of water by the community
- the water resource exploited: surface water or groundwater
- the source of water supply, e.g., shallow well, deep borehole or surface watercourse. Here, data from the baseline field groundwater survey of wells and boreholes and social surveys provided details of actual sources of water.
- the average distance to the water source estimated where possible using satellite imagery
- the likely reliability of the source during the dry season and drought
- the likely existing contamination concerns taking into account the findings of the surface water and groundwater quality surveys (see Section A6.3.3 and Groundwater Baseline Report).
- the sensitivity of the source to contamination. The categorisation of sensitivity followed the assessments of sensitivity to contamination of groundwater (see Groundwater Baseline Report) and surface water (see Section A6.4).
- any water-related concerns identified at the villages surveyed during the social survey.

Water scarcity was categorised as high, moderate or low (Table A6.3-7) depending on the:

- possible distance to the water source (a measure of the human effort needed to obtain water)
- likely reliability of supply (a measure of water quantity and its temporal availability)
- likely sensitivity of the source to contamination (a measure of water quality and the consequence of future contamination).

The traffic-light highlighting is repeated in the assessment tables and is intended to assist interpretation of results.

Table A6.3-7 Categories of Relative Water Scarcity

Indicator	Relative Water Scarcity		
	Low	Moderate	High
Distance to water source (km)	0–0.5	0.5–1	>1
Reliability of supply	Reliable (supply always available during the dry season)	Variable (supply may or may not be available during the dry season)	Unreliable (supply always unavailable during the dry season)
Sensitivity to contamination	High (e.g., shallow well or borehole with a hand pump or a motorised pump that is an important source of good quality water)	Moderate (e.g., a surface watercourse or shallow well without a hand pump that is unprotected against microbiological contamination)	Low (e.g., a heavily contaminated waterbody or a waterbody with naturally poor water quality)

The assessment of water scarcity for communities along the pipeline is presented in Attachment A6.20. The assessment of water scarcity for communities along access roads is presented in Attachment A6.21. The assessment of water scarcity for communities near construction facilities and AGIs is presented in Attachment A6.22.

A6.3.4 Data Considerations

A6.3.4.1 Flow and Flood Regimes

Flow Regime

Data record length (i.e., the representativeness of the range of flows in the long term) and record completeness are key data considerations with respect to flow regime. Synchronous daily flow records for the 10-year period 1970–1979 were acquired for the Wambabya, Katonga and Kibale rivers from the DWRM. The pipeline crosses all three rivers. A 10-year record for the Nkusi River was acquired for the period 1970–1979. These records are considered adequate for characterising flow regimes for impact assessment. The records for the Wambabya and Kibale rivers were substantially complete, as shown in Figure A6.3-1. The Katonga record had some gaps, but the data were sufficient for the study.

The generation of estimated flow records at locations that are not gauged relies extensively on the physiographic similarity of the target catchment to the donor catchment. Although the Nkusi River is not crossed by the pipeline, its catchment is similar to the Kafu and Nabakazi rivers, so its records were used to generate flow records for these rivers and their tributaries at their crossing points.

The catchment of the Jemakunya River is relatively small. It was decided to transpose the flow record of the Katonga River at Nkonge Road Bridge to the crossing on the Jemakunya River, as it was inappropriate to use the record for the

Kibale River, although they are geographically close, owing to Lake Kijanebalola being in the Kibale River's catchment.

Overall, the records synthesised at the river crossings are considered representative of their flow regimes and can be used to inform the impact assessment.

Flood Regime

The equation used to estimate the MAF in rivers at pipeline crossings (see Section A6.2.3) was developed by MWE (2010) from an analysis of flood records and map-derived catchment characteristics from 17 gauged catchments in Southwestern Uganda. As the equation is being used in the same region for which it was developed, its estimates for the MAF are considered accurate enough characterising baseline conditions.

Satellite imagery and LIDAR data were used to estimate the dimensions of river channels at pipeline crossings on the Kibale and Jemakunya Rivers. Although not as accurate as field-surveyed data, the estimates of bankfull flow at each crossing are considered sufficiently accurate characterising baseline conditions. Crossings on the other rivers contained swamp vegetation across the width of the floodplain. Channel dimensions and channel capacity at bankfull level at these crossings could not be determined. Consequently, channel capacity could not be compared with flood estimates for these crossings to determine the likely frequency of floodplain flow.

A6.3.4.2 River Channel Morphology and Stability

Using satellite imagery, supported by field observations during the sediment sampling survey, to assess bed and bank materials in channels at crossing points is considered to provide sufficient information characterising baseline conditions.

A6.3.4.3 Water and Sediment Quality and Sensitivity to Contamination

Water and Sediment Quality

Several sampling quality control procedures were implemented to ensure that accurate and reliable survey data were collected. The quality control procedures used are described and duplicate sample results are compared with the original sample results in Attachment A6.16. Overall, the quality control analysis shows that the data collected are sufficiently accurate to enable a reliable assessment of water quality at the time of sampling and for the parameters analysed and can be used to inform baseline conditions.

Sensitivity of Watercourses to Potential Contamination

Although a limited number of watercourses were sampled for water and sediment quality, the results indicate the likely water quality status of watercourses not surveyed at pipeline crossings. Using satellite imagery to assess the nature of catchments is considered a powerful aid to understanding the potential influences on surface water quality. Consequently, the results of the assessment are considered to provide a reliable picture of existing contamination and sensitivity to potential change and can be used to inform baseline conditions.

A6.3.4.4 Water Scarcity and Accessibility for Community Use

The qualitative assessment of relative water scarcity for community use was based largely on inspection of satellite imagery and experience of planning and developing rural water supplies in Africa. Although the distribution of homesteads within the 2-km pipeline corridor was available and field water quality surveys, albeit of a relatively limited number of village boreholes and watercourses, had been undertaken, no detailed survey and inventory data were available on water sources for homesteads, their yields, water quality and seasonal reliability. The analysis was, therefore, necessarily qualitative and based on three indicators: distance to water source (where known), reliability of supply and sensitivity to contamination (Table A6.3-7). Where the combination of indicators could lead to different assessments of relative scarcity, the final categorisation was based on a subjective decision. Despite being qualitative and partly subjective, the results of the assessment are considered to provide a reliable picture of relative water scarcity along the pipeline and can be used to inform baseline conditions.

A6.4 Baseline Conditions

The baseline condition of surface water is described below in terms of:

- flow and flood regimes at pipeline and project road crossings and near construction facilities and permanent AGIs
- river channel morphology and stability
- water and sediment quality and potential for contamination
- water scarcity for communities along the pipeline and project roads and near construction facilities and permanent AGIs.

A6.4.1 Baseline Condition of VEC

A6.4.1.1 Flow and Flood Regimes

Pipeline Crossings

Table A6.4-1 and Figure A6.4-1 present the estimated flow regimes (median monthly flows) at the main river crossings. A bimodal flow distribution is evident in most rivers, with higher flows in April and May and in October and November reflecting the rainfall maxima in these months and a dry season between December and March and a secondary dry spell in June and July. The Kibale River, which flows out of Lake Kijanebalola, has a different regime from the other rivers. Flow in the river increases and decreases as the lake level fluctuates in response to the balance between inflow and outflow. Due to delays introduced by lake storage, the river has a minor peak in February following the October–November rains and a larger peak in May following the April–May rains. There is then a slow recession to a minimum flow in October–November when other rivers are experiencing their maximum flows.

Estimates at watercourse crossings of the MAF and floods with return periods of 5, 10, 20, 50 and 100 years are presented in

Table A6.4-2 along with estimates of the flow capacity of the river channels at bankfull level and a qualitative assessment of the frequency of floodplain flow. This was possible only for the Kibale and Jemakunya rivers, where river channels were identifiable. Relatively minor and frequent floods in the Kibale and Jemakunya rivers may be expected to burst their banks and flow across their floodplains.

At all other crossings, channels were not identifiable because the floodplains contained aquatic vegetation. Channels in floodplains dominated by aquatic vegetation may be silted up and relatively small. As channels may be small, flow may occur across the floodplain under non-flood conditions.

Table A6.4-1 Estimated Median Monthly Flows at Main Watercourse Crossings, m^3/s

KP	Watercourse	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
15.4	Wambabya tributary	0.23	0.15	0.19	0.42	0.6	0.31	0.35	0.46	0.59	0.78	0.85	0.4	0.41
36	Kafu River	0.35	0.23	0.18	0.88	1.52	1.12	0.73	0.66	2.17	3.81	3.38	1.48	1.00
54	Kafu tributary 1	0.03	0.02	0.02	0.08	0.13	0.10	0.07	0.06	0.19	0.33	0.29	0.13	0.09
69	Kafu tributary 2	0.16	0.11	0.08	0.39	0.67	0.50	0.33	0.29	0.96	1.69	1.50	0.66	0.44
105	Nabakazi tributary 1	0.04	0.02	0.02	0.10	0.16	0.12	0.08	0.07	0.23	0.39	0.35	0.15	0.11
112	Nabakazi tributary 2	0.04	0.02	0.02	0.09	0.16	0.12	0.08	0.07	0.22	0.38	0.34	0.15	0.10
147	Nabakazi River	0.50	0.33	0.26	1.27	2.18	1.61	1.05	0.94	3.13	5.49	4.88	2.14	1.44
164	Katonga River	1.83	0.74	0.56	1.35	2.91	2.32	1.87	1.77	3.49	5.86	5.48	3.01	2.09
274	Kibale River	1.4	1.81	1.735	2.02	2.64	2.24	1.58	1.275	1.225	0.895	0.98	1.27	1.49
289	Jemakunya River	0.04	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.04	0.01

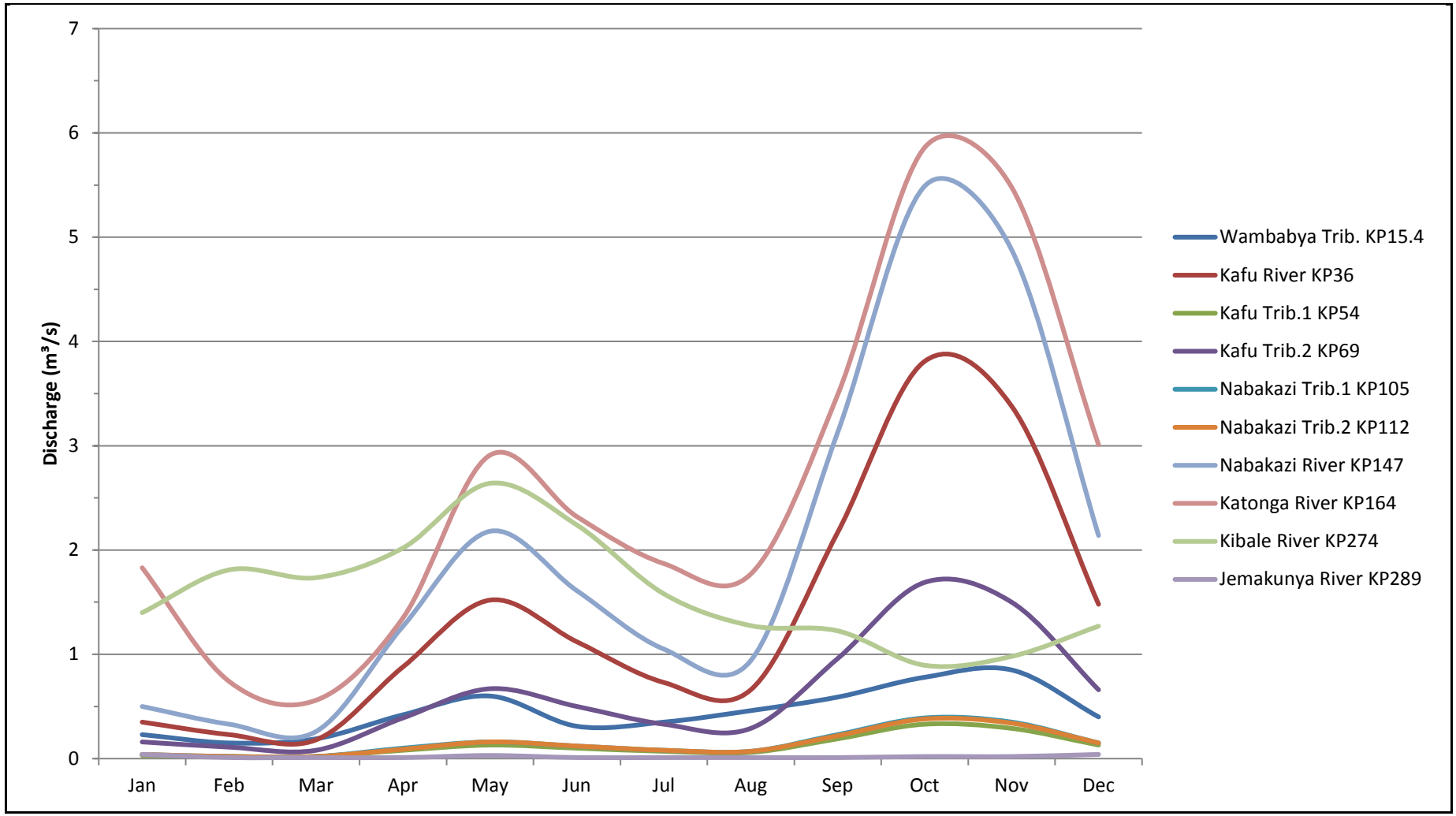

Figure A6.4-1 Streamflow Regime at Watercourse Crossings

Table A6.4-2 Flood Frequency Estimates at Main Watercourse Crossings and Occurrence of Floodplain Flow

KP	Watercourse	MAF[1] (m^3/s)	Estimated Flood Flow QT (m^3/s)[1] with Return Period T (years)					Estimated Bankfull Flow Capacity (m^3/s)	Assessment of Frequency of Floodplain Flow at Pipeline Crossings
			T=5	T=10	T=20	T=50	T=100		
15.4	Upper Wambabya River	5	7	10	12	16	20	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
36.5	Kafu River	8	11	15	19	25	30	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
54.7	Kafu tributary 1	0.6	0.8	1.1	1.4	1.9	2.3	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
69.5	Kafu tributary 2	9	13	17	22	29	35	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
105	Nabakazi tributary 1	5	7	9	12	16	19	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
112.6	Nabakazi tributary 2	4	6	8	10	13	16	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
147.5	Nabakazi River	7	9	12	16	21	25	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
164.7	Katonga River	5	7	10	13	17	20	ND	Channel not identifiable owing to swamp vegetation. Frequency of floodplain flow indeterminable
274.1	Kibale River	8	11	15	19	25	31	10	Bankfull capacity may contain MAF and floods up to T=5 years. Floodplain flow may occur for T>5 years
289.3	Jemakunya River	2	4	5	6	8	10	2	Bankfull capacity may contain ~MAF. Floodplain flow may occur for T>MAF

NOTES: [1]Flows are rounded to the nearest integer.

Road Crossings

All watercourses crossed by project roads (Table A6.4-3) are ephemeral and most lack defined channels. Flow and floods at the road crossings may be characterised as surface runoff occurring for short periods, perhaps only for minutes, during and after storm rainfall.

Table A6.4-3 Project Roads: Watercourse Crossings Receiving Road Drainage

KP	Road ID	VEC Location (Road KP)[1]	Watercourse Type	Approximate Catchment Area to Crossing (km^2)	Observations
0	PAR–PS1	2.5	Ephemeral	0.4	Dry valley. Channel marks course of ephemeral flow
		4.8	Ephemeral	2.2	Dry valley. Riparian vegetation marks the course of ephemeral flow
125	TAR–MCPY2	0.42	Ephemeral	0.1	Dry valley. Riparian vegetation marks the course of ephemeral flow
126	ERU–MCPY2	1.0	Ephemeral	0.9	Dry valley. Neither channel nor riparian vegetation mark the course of ephemeral flow
185	ERU–PS2	0.5	Ephemeral	0.5	Dry valley. Neither channel nor riparian vegetation mark the course of ephemeral flow

NOTES: [1]Distance from start of road. The start of road is assumed the junction with a national or district road.
ERU = existing road upgrade. PAR = permanent access road. TAR = temporary access road

Construction Facilities and Aboveground Installations

All watercourses adjacent to project facilities (Table A6.4-4) are ephemeral and most lack defined channels. Flow and floods in the watercourses may be characterised as surface runoff occurring for short periods, perhaps only for minutes, during and after storm rainfall.

Table A6.4-4 Construction Facilities and AGIs: Watercourses Nearby

KP	Facility	Nearest Watercourse Type	Approximate Catchment Area (km^2)	Observations
0	PS1	Ephemeral watercourse	7.8	Ephemeral watercourse 650 m to the east of site at base of cultivated hill slope
		Ephemeral watercourse	0.1	Ephemeral watercourse 200 m to south of site at base of cultivated hill slope
		Ephemeral watercourse	3.9	Ephemeral watercourse 300 m to northwest of site at base of cultivated hill slope
40	MCPY1	Ephemeral floodplain	4.5	Seasonally flooded wooded grassland 70 m to east of site. Channel absent
125	MCPY2	Ephemeral watercourse	0.4	Ephemeral watercourse within site. Scrub vegetation. Channel absent
185	PS2	Ephemeral watercourse	0.5	Ephemeral watercourse 70 m to south of site. Channel absent. Livestock watering points present 70 m and 400 m from PS2
191	MCPY3	Ephemeral watercourse	0.6	Ephemeral watercourse 300 m to the northeast of site at base of hill slope with scrub vegetation. Channel absent. Livestock watering point present 800 m from MCPY3
		Ephemeral watercourse	0.2	Ephemeral watercourse 500 m to the southwest of site at base of hill slope with scrub vegetation. Channel absent
283	MCPY4	Ephemeral floodplain	2.1	Seasonally flooded grassy floodplain 400 m to southeast of site. Channel absent. Catchment area is approximate

A6.4.1.2 River Channel Morphology and Stability

Pipeline Crossings

Table A6.4-5 presents estimates of stream power and assesses stream channel stability based on stream power, channel planform, bed and bank materials, and riparian vegetation.

With the exception of the Kibale and Jemakunya rivers, most floodplains listed in Table A6.4-5 are incised into the landscape and have well-defined boundaries marked by the limits of swamp vegetation. Where swamp vegetation grows across the width of a floodplain, the river channel was undetectable using satellite imagery and LIDAR data. The stream power is relatively low for these watercourses and

varies from 7 W/m^2 for Kafu tributary 1 to 521 W/m^2 for the Upper Wambabya River. The vegetation and low energy during floods render these floodplains stable with very limited potential for channel change.

The Kibale River has an open channel flowing within an incised floodplain. The channel is lined with thick riparian vegetation, which makes the channel stable with limited potential for change.

The channel of the Jemakunya River is formed in alluvial and lacustrine sediments on a wide floodplain bordering Lake Victoria. Although stream power is low and riparian vegetation offers some protection to the channel banks from erosion, its meandering planform suggests the channel is potentially unstable.

Table A6.4-5 Main Pipeline Crossings: Assessment of River Channel Morphology and Stability

Watercourse	KP	Stream Power (W/m)[1]	Estimated Floodplain Width (m)	Channel Bankfull Width (m)	Channel Planform	Channel Bed Materials	Channel Bank Materials	Riparian Vegetation	Stable or Unstable Channel
Upper Wambabya	15.4	521	180, incised	ND	Sinuous (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kafu	36.5	85	500, incised	ND	Sinuous (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kafu tributary 1	54.7	7	100, incised	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kafu tributary 2	69.5	276	100, incised	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Nabakazi tributary 1	105	125	250, incised	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Nabakazi tributary 2	112.6	45	100, incised	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Nabakazi River	147.5	32	300, incised	ND	Sinuous (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Katonga River	164.7	56	200, incised	ND	Straight (floodplain)	Sand, silt	Sand, silt	Swamp vegetation	Stable
Kibale River	274.1	187	30, incised	15	Sinuous (floodplain)	Silt, clay	Silt, clay	Riparian vegetation	Stable
Jemakunya River	289.3	64	400, not incised	4	Meandering	Silt, clay	Silt, clay	Riparian vegetation	Potentially unstable

NOTES: [1]Stream power is calculated at the MAF (see Attachment A6.7).

Table A6.4-6 Road Crossings: Assessment of Stability of Road Drainage VECs

KP	Road ID	Location (Road KP)[1]	Channel Present ?	Nature of Road Drainage VEC	Likely Nature of VEC Soil	Evidence of Existing Erosion	Stable or Unstable VEC
0	PAR–PS1	2.5	Yes	Minor stream channel. Cultivated fields on floor of valley with ephemeral flow	Loam	None	Stable
		4.8	Yes	Minor stream channel. Riparian vegetation floor of valley with ephemeral flow	Silty-clay	None	Stable
125	TAR–MCPY2	0.42	No	Dry valley with scrub and rainfed cultivation delivers runoff into existing road drain alongside Kampala–Mubende tarmac road	Sandy	Sheet erosion of soil	Potentially unstable
		0	Yes	Existing road drain alongside Kampala–Mubende tarmac road	Sandy	None	Stable
126	ERU–MCPY2	1.0	No	Scrub	Sandy	Sheet erosion of soil	Potentially unstable
185	ERU–PS2	0.5	No	Grassland	Silty-clay	Sheet erosion of soil	Stable

NOTES: [1]Distance from start of road. The start of road is assumed the junction with a national or district road. ERU = existing road upgrade. PAR = permanent access road. TAR = temporary access road

Table A6.4-7 Project Facilities: Assessment of Stability of Watercourses Nearby

KP	Project Facility	Drainage VEC	Distance to Watercourse/VEC from Facility (m)	Land Cover	Likely Nature of VEC Soil	Evidence of Existing Erosion	Stable or Unstable Receptor
0	PS1	Ephemeral w/c	650 m (east)	Cultivated land	Loam	None	Stable
		Ephemeral w/c	200 m (south)	Cultivated land	Loam	None	Stable
		Ephemeral w/c	300 m (northwest)	Cultivated land	Loam	None	Stable
40	MCPY1	Ephemeral floodplain	70 m (east)	Wooded grassland	Silty-clay	None	Stable
125	MCPY2	Ephemeral w/c	Within site	Cultivated land and wooded scrub	Sandy	Sheet erosion of soil	Potentially unstable
185	PS2	Ephemeral w/c	70 m (southwest)	Scrub	Sandy	Sheet erosion of soil	Potentially unstable
191	MCPY3	Ephemeral w/c	300 m (northeast)	Scrub	Sandy, silty	Sheet erosion of soil	Potentially unstable
		Ephemeral w/c	500 m (southwest)	Scrub	Sandy, silty	Sheet erosion of soil	
283	MCPY4	Ephemeral floodplain	400 m (southeast)	Wooded grassland	Silty-clay	None	Stable

NOTE: w/c = watercourse

Road Crossings

Table A6.4-6 presents an assessment of the stability of the road drainage VECs at road crossings. Most of the VECs are valley floors that lack defined channels and in which flow is ephemeral. The VECs along the temporary access road at MCPY2 and along the existing road to be upgraded from MCPY2 to the right-of-way (RoW) are assessed as potentially prone to erosion.

Construction Facilities and Aboveground Installations

Table A6.4-7 presents an assessment of the stability of watercourses near project facilities. Flows are ephemeral at all potential VECs.. The VECs at MCPY2, PS2 and MCPY3 are assessed as potentially prone to erosion.

A6.4.1.3 Water Quality, Sediment Quality and Sensitivity to Contamination

Water Quality

The results of the onsite measurements, microbiological analyses and observations made at sampling points on the Kafu, Katonga, Kibale and Jemakunya Rivers in relation to national potable water quality standards, on which project standards are based, are presented in Attachment A6.8. Attachment A6.10 gives the results of laboratory analyses in relation to national potable water standards. The results exceeding these standards are printed in **bold**. The survey results are summarised below.

Physical Water Quality

- Water temperatures at the times of sampling were relatively high, ranging 19.3 to 23.8°C during the dry season and 20.8 to 22.7°C during the wet season. A consistent seasonal pattern is not evident from the data.
- Turbidity values ranged from 0 to 15 NTU during the dry season and from 0 to 14.8 NTU during the wet season. The wet season values are relatively low in relation to the flow variation. The aquatic vegetation choking the river channels controls turbidity and sediment transport. Turbidity may or may not exceed national drinking water standards in both seasons.
- TSS concentrations were low at the times of sampling, ranging from 9.3 to 21 mg/L. This is consistent with the presence of swamp vegetation in the rivers and the low calculated values of stream power.
- The water colour at the time of sampling during the wet season was grey in the Kafu and Jemakunya rivers, dark brown in the Katonga River and light brown in the Kibale River. Water colour was not observed during the dry season.
- The water tested had an organic smell (in the case of the Kafu River, of hydrogen sulphide) when sampling during the dry season. Odour was mostly absent when sampling during the wet season.
- There were gas bubbles in the water at the sampling sites at the Kafu, Katonga and Jemakunya rivers, whose channels are choked with aquatic vegetation. Gas bubbles were absent at the Kibale River sampling site.
- Iridescence was present in water at the sites sampled during both the wet and the dry seasons. For the Kibale River, this was due to localised iron precipitates at the river's edge close to the road bridge. For the Katonga River, iridescence

was considered to be at least partially due to contamination by vehicles that collect water.

Chemical Water Quality

- pH values were variable in the rivers sampled. In the Kafu and Katonga rivers, whose channels are choked with swamp vegetation, the pH was slightly acidic (pH 5.7– 6.3) during both seasons and outside the lower limit prescribed for natural water by the national potable water standards. In the Kibale River, the pH was circumneutral during both seasons and within the range prescribed by national potable water standards. In the Jemakunya River, the dry season pH was circumneutral, but the wet season pH value was 8.7, which is outside the upper limit prescribed by national potable water standards.
- The river water tested was relatively lightly mineralised and within national drinking water standards for EC and for TDS, which are calculated from EC. There is no consistent seasonal difference in the collected EC and TDS data.
- Chloride concentrations ranged from <0.2 to 43 mg/L when sampling during the dry season and from 3 to 47.6 mg/L during the wet season. Chloride concentrations were consistently higher during the wet season, but well within national potable water standards.
- An iron concentration of 6.8 mg/L was measured in the Katonga River during the wet season, which is well above the national potable water standards for natural and treated water of 0.3 mg/L. This may have a geological cause, due to the relative abundance of iron in the geology of Western Uganda. Only one sample was analysed for dissolved metals. With the exception of barium, all the other metals analysed were below the laboratory detection limit.
- TPH concentrations were below the detection limit, as were total hydrocarbons (C_{10}–C_{40}).
- Total PAH concentrations were above the detection limit at the sampling point in the Katonga River at 0.00006 mg/L. Two PAHs were detected: phenanthrene (0.00001 mg/L) and naphthalene (0.00005 mg/L). The sampling point was downstream of where vehicles collect water from the river. Only one sample was analysed for PAHs.
- DO concentrations were relatively high at the sampling sites, mostly between 44 and 92% DO saturation. A relatively low value of 20% DO saturation was observed in the Kafu River during the dry season. A consistent seasonal pattern is not evident from the data.
- BOD results during the wet season ranged from 23 to 60 mg/L. A single COD result indicated a demand of 107 mg/L. These results suggest a high rate of biological activity in the rivers, which is consistent with the presence of dense aquatic vegetation and cannot be interpreted as indicating anthropogenic organic pollution. Very low BOD and COD levels were observed for the dry season samples. These are considered erroneous and unrepresentative.

Microbiological Water Quality

- Microbiological water quality was poor in all the rivers with total coliform and *E. coli* levels exceeding national potable water standards. This is consistent with the observation that the rivers are used by cattle for watering and by people for domestic purposes.
- The levels of algae and bacterial aggregates were variable between rivers and seasons and no consistent seasonal pattern was recorded.

The onsite and laboratory analytical results suggest that water quality in the rivers at the times of sampling was good and the level of anthropogenic contamination was low. Exceedances of national water quality standards were observed for:

- iron: one exceedance of the limit for natural and treated water
- total coliforms and *E. coli:* exceedances in all samples.

For pollution by hydrocarbons, only a single sample taken in the Katonga River downstream of a bridge where vehicles collect water showed the presence of PAHs. All other hydrocarbon analyses in the Katonga and other rivers were below the detection limits at the times of sampling.

Overall, the water quality results are consistent with river water in catchments with dispersed rural settlement, frequent use by livestock and people for domestic purposes and in which there is an abundance of swamp vegetation and high rates of biological activity.

Sediment Quality

The results of onsite observations and laboratory analyses of sediment are presented in Attachment A6.14. The analytical laboratory reports are presented in Attachment A6.15.

At all sites, the results show that:

- the pH was circum-neutral
- hydrocarbon, phenol and sulphide levels were below the detection limit
- chloride was present.

Several metal concentrations were above the detection limit at sites where the sample had been taken downstream of a road. The Kibale River sample recorded arsenic, chromium, copper, nickel and zinc concentrations above the detection limits. The presence of metals may reflect runoff from roads. The sample taken from the bed of the Jemkunya River upstream of the road recorded no metal concentrations above the detection limit.

In summary, sediment quality may reflect the presence of nearby roads. Contamination by hydrocarbons and phenols was, however, absent.

Sensitivity of Watercourses to Potential Contamination

Pipeline Crossings

The assessment of the sensitivity of watercourses to potential contamination is presented in Attachment A6.17. With the exception of the Kibale and Katonga rivers, all the watercourses were assessed as having a moderate sensitivity to contamination. Their catchment areas support relatively dense, dispersed rural populations engaged largely in rainfed subsistence agriculture with some livestock rearing. The natural vegetation has mostly been removed leaving narrow bands of riparian vegetation along drainage lines. The main watercourses are wetlands and contain aquatic vegetation. These rivers have been shown to be contaminated by livestock and people using them for domestic purposes.

The rural population density is lower in the northern part of the Katonga River catchment and in the Kibale River catchment as rainfall decreases southwards and pastoralism becomes the predominant activity. Because of their sparse rural populations, the predominance of rangeland and wetlands in floodplains, the Katonga and Kibale rivers are considered to have a high sensitivity to contamination. The survey results suggest evidence of minor contamination of the Katonga River with PAHs by vehicles collecting water, but this is not considered to affect the sensitivity ranking of the river.

Road Crossings

The sensitivity assessment of watercourses crossed by project roads to potential contamination is presented in Attachment A6.18. All the watercourses crossed by project roads are ephemeral and most lack defined stream channels. The watercourses crossed by the permanent access road to PS1, the existing road to be upgraded from MCPY2 to the RoW and the access road to PS2 are assessed as having a high sensitivity to contamination. Their catchment areas are rural and sparsely populated; water quality at time of flow is likely to be very good.

The watercourses crossed by the temporary access road to MCPY2 were considered to have a low sensitivity to contamination. Although their catchment areas are rural and sparsely populated during periods of flow, the watercourses will discharge into the nearby existing roadside drain alongside the Kampala–Mubende tarmac road. The access road drainage will mix with main road drainage thereby reducing its quality and sensitivity to contamination.

Construction Facilities and Aboveground Installations

The assessment of the sensitivity to potential contamination of watercourses nearby project facilities is presented in Attachment A6.19. All the watercourses adjacent to project facilities are ephemeral and most lack defined channels. Due to their rural, sparsely populated catchments, most of the watercourses are likely to have very good water quality and were assessed as having a high sensitivity to contamination. The watercourse at MCPY2 was assessed as having a low sensitivity to contamination, as water will mix with runoff from the Kampala–Mubende tarmac road during periods of flow, which is likely to reduce water quality and reduce the sensitivity to contamination.

A6.4.1.4 Water Scarcity and Accessibility for Community Use

Project Districts and Subcounties

Water scarcity was considered at two levels: the districts and subcounties through which the pipeline passes, and at a more focused level within 2 km of the pipeline and project facilities (see Section A6.3.3.4). Table A6.4-8 provides water scarcity information for districts and subcounties in terms of the official percentage of the population without access to safe water supplies and the official percentage of nonfunctioning water sources (MWE 2017c). The locations of the districts are shown in Attachment A6.1.

Table A6.4-8 Rural Non-Access to Safe Water Supplies by District and Subcounty

District/ Subcounty (SC)	Population (people/km^2)	Non-Access to Safe Water (%)	Source Nonfunctionality (%)	Reasons for Nonfunctionality
Hoima district (population 642,584)	101–250	34	16	Low yield 20% Tech. breakdown 60% Water quality 20%
Buseruka SC	100–250	58	21	
Kiziranfumbi SC	100–250	5	13	
Kibaale district (population 911,178)	101–250	49	17	Low yield 22.2% Tech. breakdown 29.2% Water quality 13.9% WSC NF 13.9% Leaking 2.8% Alternative nearby 2.8% Vandalism 6.9% Other 8.3%
Kisiita SC	250–500	79	26	
Mpasaana SC	100–250	79	59	
Nkooko SC	100–250	75	37	
Kyankwanzi district (population 242,734)	51–100	46	16	Low yield 17.4% Tech. breakdown 30.4% Water quality 21.7% WSC NF 4.3% Alternative nearby 13% Vandalism 13%
Gayaza SC	100–250	20	26	
Ntwetwe SC	100–250	17	15	
Mubende district (population 767,201)	101–250	68	14	Low yield 5.9% Tech. breakdown 55.9% Water quality 8.8% WSC NF 11.8% Alternative nearby 2.9% Vandalism 11.8% Other 2.9%
Butoloogo SC	100–250	75	7	
Maduddu SC	100–250	54	3	
Kitenga SC	100–250	ND	ND	

Table A6.4-8 Rural Non-Access to Safe Water Supplies by District and Subcounty

District/ Subcounty (SC)	Population (people/km^2)	Non-Access to Safe Water (%)	Source Nonfunctionality (%)	Reasons for Nonfunctionality
Gomba district (population 166,940)	101–250	21	24	Low yield 15.0% Tech. breakdown 40.0% Water quality 15.0% WSC NF 2.5% Leaking 2.5% Alternative nearby 5.0% Vandalism 5.0% Other 15.0%
Maddu SC	0–50	44	15	
Kabulasoke SC	100–250	24	28	
Sembabule district (population 273,060)	101–250	63	14	Low yield 20.0% Tech. breakdown 47.5% Water quality 7.5% Leaking 5.0% Vandalism 12.5% Other 7.5%
Lugusulu SC	0–50	78	27	
Mijwala SC	100–250	76	4	
Lwebitakuli SC	100–250	78	6	
Lwengo district (population 283,711)	251–500	24	21	Low yield 24.6% Tech. breakdown 20.0% Water quality 20.0% Leaking 6.2% Alternative nearby 3.1% Vandalism 15.4% Other 10.8%
Lwengo SC	100–250	48	16	
Ndagwe SC	250–500	8	18	

Table A6.4-8 Rural Non-Access to Safe Water Supplies by District and Subcounty

District/ Subcounty (SC)	Population (people/km^2)	Non-Access to Safe Water (%)	Source Nonfunctionality (%)	Reasons for Nonfunctionality
Rakai district (population 547,915)	101–250	55	22	Low yield 17.0% Tech. breakdown 52.6% Water quality 11.1% WSC NF 3.0% Silted 0.7 Leaking 0.7% Alternative nearby 6.7% Vandalism 4.4% Other 3.7%
Nabigasa SC	250–500	ND	ND	
Lwanda SC	100–250	11	24	
Kasasa SC	100–250	ND	ND	
Kifamba SC	100–250	34	41	
Kakuuto SC	100–250	ND	ND	

SOURCE: MWE (2017c)

Despite considerable differences in district population numbers, the population density in subcounties along the pipeline is relatively uniform at 100–250 people/km^2. Lack of access to safe water supplies varies between districts from 21% in Gomba to 68% in Mubende. The highest non-access rates are found in Mubende and Sembabule districts in the central section of the pipeline, which is known as the cattle corridor, and in Rakai district at the southern end of the pipeline. However, even within the cattle corridor, there is significant variation: Gomba and Lwengo districts record non-access rates of 21% and 24% respectively, whereas a rate of 63% is recorded by Sembabule district. Variation in non-access rates also occurs at the subcounty level. The highest non-access rates of 54–79% occur in the subcounties within the Kibaale, Mubende and Sembabule districts in the central section of the pipeline. The lowest non-access rates occur at the northern end in Hoima district and at the southern end of the pipeline in Rakai district.

Water source nonfunctionality (e.g., a broken down handpump) is relatively uniform along the pipeline. At district level, nonfunctionality rates vary from 14% in Mubende and Sembabule districts to 24% in Gomba district. At subcounty level, nonfunctionality rates are generally lowest in the central districts of Mubende, Gomba and Sembabule, where rates range from 3% in Maduddu subcounty to 7% in Butoloogo subcounty, both in Mubende district. Maximum nonfunctionality rates are recorded in Mpasaana subcounty, Kibaale district (59%) and in Kifamba subcounty, Rakai district (41%) towards the northern and southern ends of the pipeline respectively.

In summary, there is a pattern of lower non-access rates but higher nonfunctionality at the northern and southern ends of the pipeline and higher but variable non-

access rates and lower nonfunctionality along the central portion of the pipeline. Nonfunctionality is dominated by technical breakdown (20–60%) and, to a lesser extent, low yield (15–20%), in all districts. Water quality is a cause of nonfunctionality in the Hoima, Kyankwanzi and Lwengo districts.

Pipeline Corridor

Water scarcity varies along the pipeline corridor. From KP0 to about KP150, the mean annual rainfall typically varies from 1200 to 1450 mm (MWE 2017a). The mean annual potential evapotranspiration varies from about 1400 to 1500 mm (MWE 2013b), which is about equivalent to the rainfall on an annual timescale. For short periods, however, rainfall exceeds evaporation, which results in water availability manifested as more frequent streamflow and springs. From KP150 to about KP250, annual rainfall decreases to 900–1050 mm through the cattle corridor, which results in greater water scarcity. From KP250 to the end of the pipeline in Uganda at KP296, water scarcity decreases as rainfall increases.

Access to groundwater via shallow wells and deep boreholes ameliorates the scarcity of surface water resources. The assessment of water scarcity for the communities presented in Attachment A6.20 and shown in Attachment A6.2 considers access to groundwater as well as to surface water, as communities use both. The assessment shows that water scarcity is relatively low at the northern end of the pipeline, increases through the cattle corridor and reduces again at the southern end of the pipeline, mainly due to the types and numbers of water supply infrastructure and their functionality.

From KP0 to about KP80, water scarcity is assessed to be moderate. This is mainly due to a higher frequency of streams for livestock watering and boreholes with hand pumps for community water supply. However, on a village basis, water scarcity can vary from low to high, depending on the water sources available.

From about KP80 to KP250, through the cattle corridor, water scarcity is assessed as high because there are fewer boreholes in this zone. Groundwater is mainly available from shallow wells that are often unprotected and, therefore, at risk from microbiological contamination. People also obtain water from valley dams and floodplains that they share with livestock. These sources are often contaminated and ephemeral, drying up during the dry season and drought. Within this zone, water scarcity can be moderate or even low on a local scale, as exemplified at Mjjunwa (KP128.4) where there is an operating borehole with a hand pump.

From about KP250 to KP296, water scarcity is assessed to be moderate through increased numbers of boreholes with hand pumps and greater functionality. Locally, water scarcity is low where there are multiple boreholes or sources of water.

Project Roads

The assessment of water scarcity for communities along project roads is presented in Attachment A6.21. The project roads cover relatively short distances. The assessment shows that water scarcity for roads is most often high, sometimes moderate and occasionally low. Water scarcity may be locally variable for any one road. Near the temporary access road at MCPY1, water scarcity is assessed to vary from high to low depending on the water sources available for the villages of

Kisenyi (high), Kasambya (moderate) and the boreholes at Our Lady of Fatima and Nyamigamba (low). Water scarcity along roads at MCPY2 (KP125) is moderate to low. Water scarcity along roads at PS2 and MCPY3 is high. There are few boreholes at these locations and people share valley dams with cattle.

Construction Facilities and Aboveground Installations

The assessment of water scarcity for communities within 2 km of project facilities is presented in Attachment A6.22. The assessment shows that water scarcity at facilities is most often high and occasionally moderate or low. At PS1 (KP0) and at MCPY1 (KP40), water scarcity varies locally from high to low. At MCPY2 (KP125), PS2 (KP185) and MCPY3 (KP191), water scarcity is mainly high due to the absence of functioning boreholes, which causes people to share surface water sources with livestock. At the southern end of the pipeline, at MCPY4 (KP283) water scarcity is moderate to low, mainly owing to the greater functionality of boreholes.

A6.4.2 Trend in Condition and Sensitivity to Change

A6.4.2.1 Flow and Flood Regimes

A review of Ugandan government reports suggests that several environmental changes have taken place in Uganda. Land cover has undergone rapid change because of increasing population pressure on land. Human activities such as logging, clearing land for agriculture, settlement and overgrazing have affected the natural vegetation cover and resulted in deforestation, encroachment on wetlands and land degradation (Ministry of Energy and Mineral Development (MEMD) 2013; Government of Uganda 2016). Soil productivity has declined and soil erosion is a major cause of river siltation (National Environment Management Authority (Uganda) (NEMA) 2009). Increased pressure is also evident in the rangelands of the cattle corridor. Higher numbers of livestock have led to overgrazing of savannah, reduced groundcover and increased soil erosion. These processes are likely to intensify in future.

Water resources along the watercourses crossed by the pipeline are relatively undeveloped; they are used mainly for livestock watering and domestic purposes. People collecting water from the rivers takes place on a relatively small scale, but, as populations grow and agriculture intensifies, the pressure to pump water from the rivers for public water supply and agricultural and commercial uses will increase, which is likely to lead to reduced flows downstream. The sensitivity to change depends, therefore, on current levels of use in relation to available resources and likely future development pressure.

As agriculture intensifies and soil degrades, flood volumes and peak flows may be expected to increase. Wetlands and swamps in floodplains tend to attenuate floods; water velocities slow, which delays and reduces peak flows. Where there is a trend for wetland encroachment and conversion to farmland, a corresponding trend for increased flooding and flood risk may be expected. It is presently unclear whether this is occurring in the rivers crossed by the pipeline.

A6.4.2.2 River Channel Morphology and Stability

Floods deliver water and sediment to river channels. Siltation in floodplains is set to continue at an increasing rate as soil erosion intensifies. Continuing siltation will maintain the stability of the river channels, providing the aquatic vegetation cover remains. Over time, continuing siltation may cause water levels during floods to rise and possibly cause increasing flooding of infrastructure situated in floodplains.

A6.4.2.3 Water and Sediment Quality and Sensitivity to Contamination

Water quality is coming under increasing pressure from growing populations and intensified human activities. The increased use of pesticides and fertilisers by farmers and urbanisation in the agricultural catchments crossed by the pipeline threaten water supplies and associated ecosystems in the long term. As water quality deteriorates, sensitivity to potential contamination is likely to fall.

A6.4.3 Ecosystem Services Provided

The watercourses and waterbodies in the AOI described herein provide the following ecosystem services and support.

Provisioning services:

- for both local people in rural communities, their livestock and agricultural activities. Water is also collected from rivers by entrepreneurs using vehicles and pumps to sell to people in urban areas
- for hydroelectricity generation at the Kabalega hydroelectric power station on the Wambabya River in Hoima district about 25 km downstream of the pipeline crossing
- sources of water and food for visiting wild animals and birds.

Regulating services:

- floodplains regulate floods by slowing water velocities; storing water on their surfaces and transmitting water relatively slowly downstream and reducing peak flows
- wetlands along watercourses regulate water quality by acting as filters causing reduction of suspended sediment and associated metals, and local water purification through microbial breakdown of organic matter.

Habitat and species support:

- waterbodies provide habitat and support for aquatic and terrestrial species.

Cultural services

- benefits to people from the watercourses in terms of cultural services, such as for recreation or being of spiritual value, were not identified during the study.

A6.4.4 Sensitivity Rankings

A6.4.4.1 Flow Regime

Pipeline Crossings

Based on the trend in condition and the sensitivity to change, the sensitivity of the 10 watercourses (VECs) with respect to their flow regimes and uses within the AOI are shown in Table A6.4-9. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-9 Surface Water Flow Sensitivity Rankings – Pipeline Crossings

Watercourse/VEC	KP	Sensitivity Ranking	Rationale for Ranking[1]
Upper Wambabya River	15.4	Moderate (3)	Provides water directly for rural communities and hydropower generation downstream. Water demand will rise.
Kafu River	36.5	Low (2)	Provides water directly for rural communities. Water demand will rise.
Kafu tributary 1	54.7		
Kafu tributary 2	69.5		
Nabakazi tributary 1	105		
Nabakazi tributary 2	112.6		
Nabakazi River	147.5		
Katonga River	164.7		
Kibale River	274.1		
Jemakunya River	289.3		

NOTE: [1]Rationale relates to the situation at the time of writing. Species and habitats of conservation concern have been considered within the biodiversity VEC in Section 8.2.

Road Crossings

The sensitivity of the watercourses crossed by project roads with respect to their flow regimes is shown in Table A6.4-10. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-10 Surface Water Flow Sensitivity Rankings – Road Crossings

KP	Road ID	VEC Location (Road KP)[1]	Sensitivity Ranking	Rationale for Ranking[2]
0	PAR–PS1	2.5	Low (2)	Waterbody provides a source of water supply for rural communities and livestock
		4.8		
125	TAR–MCPY2	0.42	Very low (1)	Waterbody does not provide a source of water supply for rural communities and livestock
		0		
126	ERU–MCPY2	1.0		
185	ERU–PS2	0.5	Low (2)	Waterbody provides a source of water supply for rural communities and livestock

NOTES: [1]Distance from start of road. The start of road is assumed the junction with a national or district road. [2]Rationale relates to the situation at the time of writing. ERU = existing road upgrade. PAR = permanent access road. TAR = temporary access road

Construction Facilities and Aboveground Installations

The sensitivity of the flow regime to change in watercourses that will receive drainage from project facilities is presented in Table A6.4-11. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-11 Surface Water Flow Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse/Distance from Facility	Sensitivity Ranking	Rationale for Ranking[1]
0	PS1	Ephemeral watercourse (650 m east)	Low (2)	Watercourses potentially provides sources of water for rural communities and livestock
		Ephemeral watercourse (200 m south)		
		Ephemeral watercourse (300 m northwest)		
40	MCPY1	Ephemeral floodplain (70 m east)		
125	MCPY2	Ephemeral watercourse within site	Very low (1)	Watercourse does not provide a source of water for rural communities and livestock
185	PS2	Ephemeral watercourse (70 m southwest)	Low (2)	Watercourse provides a source of water for rural communities and livestock at livestock watering points 70 m and 400 m from PS2

Table A6.4-11 Surface Water Flow Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse/Distance from Facility	Sensitivity Ranking	Rationale for Ranking[1]
191	MCPY3	Ephemeral watercourse (300 m northeast)	Low (2)	Watercourse provides a source of water for rural communities and livestock at livestock watering point 800 m from MCPY3
		Ephemeral watercourse (500 m southwest)	Very low (1)	Waterbody does not provide a source of water for rural communities and livestock
283	MCPY4	Ephemeral floodplain (400 m southeast)	Low (2)	Waterbody provides a seasonal source of water for rural communities and livestock

NOTES: [1]Rationale relates to the situation at the time of writing

A6.4.4.2 River Channel Morphology and Stability

Pipeline Crossings

Based on the trend in condition and the sensitivity to change, the sensitivity of the ten watercourses (VECs) with respect to their flow regimes and uses within the AOI is shown in Table A6.4-12. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-12 River Channel Morphology and Stability Sensitivity Rankings – Pipeline Crossings

Watercourse/VEC	KP	Sensitivity Ranking	Rationale for Ranking
Upper Wambabya River	15.4	Low (2)	River channel is formed in uncohesive materials (sand, silt) with thick continuous swamp vegetation in the floodplain
Kafu River	36.5		
Kafu tributary 1	54.7		
Kafu tributary 2	69.5		
Nabakazi tributary 1	105		
Nabakazi tributary 2	112.6		
Nabakazi River	147.5		
Katonga River	164.7		
Kibale River	274.1	Low (2)	River channel is formed in cohesive materials (silt, clay) with thick continuous riparian vegetation along the river channel
Jemakunya River	289.3	Moderate (3)	River channel is formed in cohesive materials (silt, clay) with a narrow zone of continuous riparian vegetation along the riverbanks

Road Crossings

The sensitivity of watercourses (VECs) crossed by project roads with respect to their morphology and stability is presented in Table A6.4-13. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-13 River Channel Morphology and Stability Sensitivity Rankings – Road Crossings

KP	Road ID	VEC Location (Road KP)[1]	Sensitivity Ranking	Rationale for Ranking
0	PAR–PS1	2.5	Low (2)	Minor stream channel formed in cohesive materials with a good cover of riparian vegetation on floor of ephemeral valley
		4.8		
125	TAR–MCPY2	0.42	Moderate (3)	Ephemeral valley floor with uncohesive soil materials but a cover of scrub vegetation and rainfed cultivation
		0	Low (2)	Existing road drain alongside Kampala–Kiwumulo tarmac road
126	ERU–MCPY2	1.0	High (4)	Ephemeral valley floor with uncohesive soil materials with a cover of scrub vegetation
185	ERU–PS2	0.5	High (4)	Ephemeral valley floor with uncohesive soil materials with a cover of scrub vegetation

NOTES: [1]Distance from start of road. The start of road is assumed the junction with a national or district road. ERU = existing road upgrade. PAR = permanent access road. TAR = temporary access road.

Construction Facilities and Aboveground Installations

The sensitivity of watercourses (VECs) that will receive drainage from project facilities with respect to their morphology and stability is presented in Table A6.4-14. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-14 River Channel Morphology and Stability Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse/ Distance from Facility	Sensitivity Ranking	Rationale for Ranking
0	PS1	Ephemeral watercourse (650 m east)	Low (2)	Watercourse in loam soil with cover of scrub vegetation and rainfed cultivation
		Ephemeral watercourse (200 m south)		
		Ephemeral watercourse (300 m northwest)		
40	MCPY1	Ephemeral floodplain (70 m east)		Floodplain in cohesive materials with cover of wooded grassland
125	MCPY2	Ephemeral watercourse within site	Moderate (3)	Watercourse in uncohesive materials and wooded scrub-vegetation cover
185	PS2	Ephemeral watercourse (70 m south west)	High (4)	Watercourse in uncohesive materials with cover of scrub-vegetation
191	MCPY3	Ephemeral watercourse (300 m northeast)		Watercourse in uncohesive materials with cover of scrub vegetation
		Ephemeral watercourse (500 m southwest)		
283	MCPY4	Ephemeral floodplain (400 m southeast)	Low (2)	Floodplain with cohesive materials with cover of wooded grassland

A6.4.4.3 Water and Sediment Quality and Sensitivity to Contamination

Pipeline Crossings

Based on the trend in condition and the sensitivity to change, the assessment of the sensitivity of the main watercourses to potential contamination is shown in Attachment A6.17. The results are summarised in Table A6.4-15. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-15 Water and Sediment Quality and Sensitivity to Contamination Sensitivity Rankings – Pipeline Crossings

KP	Watercourse/VEC	Sensitivity Ranking	Rationale for Ranking
15.4	Upper Wambabya River	Moderate (3)	Rural catchment, densely settled with rainfed cultivation, some plantation agriculture with swamp vegetation along floodplain
36.5	Kafu River		Rural catchment, densely settled with rainfed cultivation with swamp vegetation along floodplain
54.7	Kafu tributary 1		
69.5	Kafu tributary 2		
105	Nabakazi tributary 1		
112.6	Nabakazi tributary 2		
147.5	Nabakazi River		
164.7	Katonga River	High (4)	Rural catchment, sparsely settled with rainfed cultivation with swamp vegetation along floodplains. Only minor contamination from vehicles collecting water
274.1	Kibale River		Rural catchment, sparsely settled with lakes and swamp vegetation along floodplains
289.3	Jemakunya River	Moderate (3)	Rural catchment, densely settled river valleys

Road Crossings

The assessment of the sensitivity of watercourses (VECs) crossed by project roads to potential contamination is presented in Attachment A6.18. The results are summarised in Table A6.4-16. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-16 Sensitivity to Contamination Sensitivity Rankings – Road Crossings

KP	Road ID	VEC Location (Road KP)[1]	Sensitivity Ranking	Rationale for Ranking
0	PAR–PS1	2.5	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow
		4.8		
125	TAR–MCPY2	0.42	Low (2)	Runoff with good quality from natural catchment will mix with road drainage water of poor quality
		0	Very low (1)	Water quality in existing road drain may be poor
126	ERU–MCPY2	1.0	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow
185	ERU–PS2	0.5	High (4)	Rural catchment, sparsely settled with livestock rearing. Water quality likely to be very good during periods of flow

NOTES: [1]Distance from start of road. The start of road is assumed the junction with a national or district road.
ERU = existing road upgrade. PAR = permanent access road. TAR = temporary access road

Construction Facilities and Aboveground Installations

The sensitivity of watercourses (VECs) to potential contamination is presented in Attachment A6.19. The results are summarised in Table A6.4-17. Sensitivity has been ranked according to the table for surface water flow sensitivity in Appendix D of the ESIA.

Table A6.4-17 Sensitivity to Contamination Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse/VEC	Sensitivity Ranking	Rationale for Ranking
0	PS1	Ephemeral watercourse (650 m east)	Moderate (3)	Rural catchment, densely settled with subsistence cultivation and livestock rearing. Water quality likely to be reasonably good during periods of surface runoff
		Ephemeral watercourse (200 m south)		
		Ephemeral watercourse (300 m northwest)		

Table A6.4-17 Sensitivity to Contamination Sensitivity Rankings – Project Facilities

KP	Project Facility	Watercourse/VEC	Sensitivity Ranking	Rationale for Ranking
40	MCPY1	Ephemeral floodplain (70 m east)	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of surface runoff
125	MCPY2	Ephemeral watercourse within site		
185	PS2	Ephemeral watercourse (70 m southwest)		
191	MCPY3	Ephemeral watercourse (300 m northeast)		
		Ephemeral watercourse (500 m southwest)		
283	MCPY4	Ephemeral floodplain (400 m southeast)		

A6.5 Key Considerations

A6.5.1 Introduction

Key considerations for surface water VECs are summarised below for:

- flow in watercourses
- river channel morphology and stability
- water and sediment quality and sensitivity to contamination.

A6.5.2 Flow in Watercourses

Flow in watercourses crossed by the pipeline and project roads near project facilities is considered to have a low or very low sensitivity to change. This is because there are relatively few uses of the watercourses other than providing water for a dispersed rural population and livestock. Present and likely future demand, based on available information, are relatively low. The exception is the Wambabya River, which is used for hydroelectricity generation at the Kabalega hydroelectric power station in Hoima district approximately 25 km downstream of the pipeline crossing. The Wambabya River is considered to have a moderate sensitivity to change in flow.

The sensitivity to change in flow is also low or very low at road crossings and near project facilities since the watercourses either provide water to a rural population and livestock by means of a livestock watering point or seasonal floodplain or are assessed as not providing water.

A6.5.3 River Channel Morphology and Stability

The morphology and stability of the watercourses that have been assessed in this report are mostly considered to have a low sensitivity to change. This is because the floodplains contain aquatic vegetation that limits flow velocities, inhibits erosion and makes these watercourses very stable. The exception is the Jemakunya River, which is considered to have a moderate sensitivity to change. This river has a relatively narrow zone of riparian vegetation along its channel that increases the risk of instability.

Of the watercourses crossed by project roads, two are considered to have a high sensitivity to change:

- the watercourse at road KP1.0 on the existing road to be upgraded from MCPY2 (KP126) to the pipeline RoW
- the watercourse at KP0.5 on the access road to PS2 (KP185).

These watercourses are valley floors with uncohesive materials and scrub vegetation; defined channels are absent.

Of the watercourses near project facilities, four are considered to have a high sensitivity to change:

- the watercourse at PS2 (KP185)
- the ephemeral watercourses draining to the northeast of MCPY3 (KP191)
- the ephemeral floodplain at MCPY4 (KP283).

The watercourse at PS2 and MCPY3 are formed in uncohesive and easily erodible materials and have a cover of scrub vegetation.

A6.5.4 Water and Sediment Quality and Sensitivity to Contamination

Most of the watercourses assessed for sensitivity to contamination were considered to have a high or moderate sensitivity to change. This is because catchments are predominantly rural with relatively few sources of contamination. Water quality is considered, therefore, relatively good and thus sensitive to change.

The following watercourses crossed by the pipeline are considered to have a high sensitivity to change:

- Katonga River
- Kibale River.

Their catchments are sparsely settled rural areas; land cover is predominantly rangeland. Sources of pollution are limited to livestock and people using the rivers.

For the same reasons, the following watercourses crossed by project roads are considered to have a high sensitivity to contamination:

- the watercourse at road KP2.5 on the permanent access road at PS1 (KP0)
- the watercourse at road KP1 on the existing road to be upgraded from MCPY2 (KP126) to the pipeline RoW
- the watercourse at road KP0.5 on the existing road to be upgraded to PS2 (KP185).

Similarly, the following watercourses adjacent to project facilities that might receive site drainage are considered to have a high sensitivity to contamination:

- ephemeral floodplain east of MCPY1 (KP40)
- ephemeral watercourse southwest of PS2 (KP185)
- ephemeral watercourse northeast of MCPY3 (KP191)
- ephemeral watercourse southwest of MCPY3 (KP191)
- ephemeral floodplain southeast of MCPY4 (KP283).

A6.6 References

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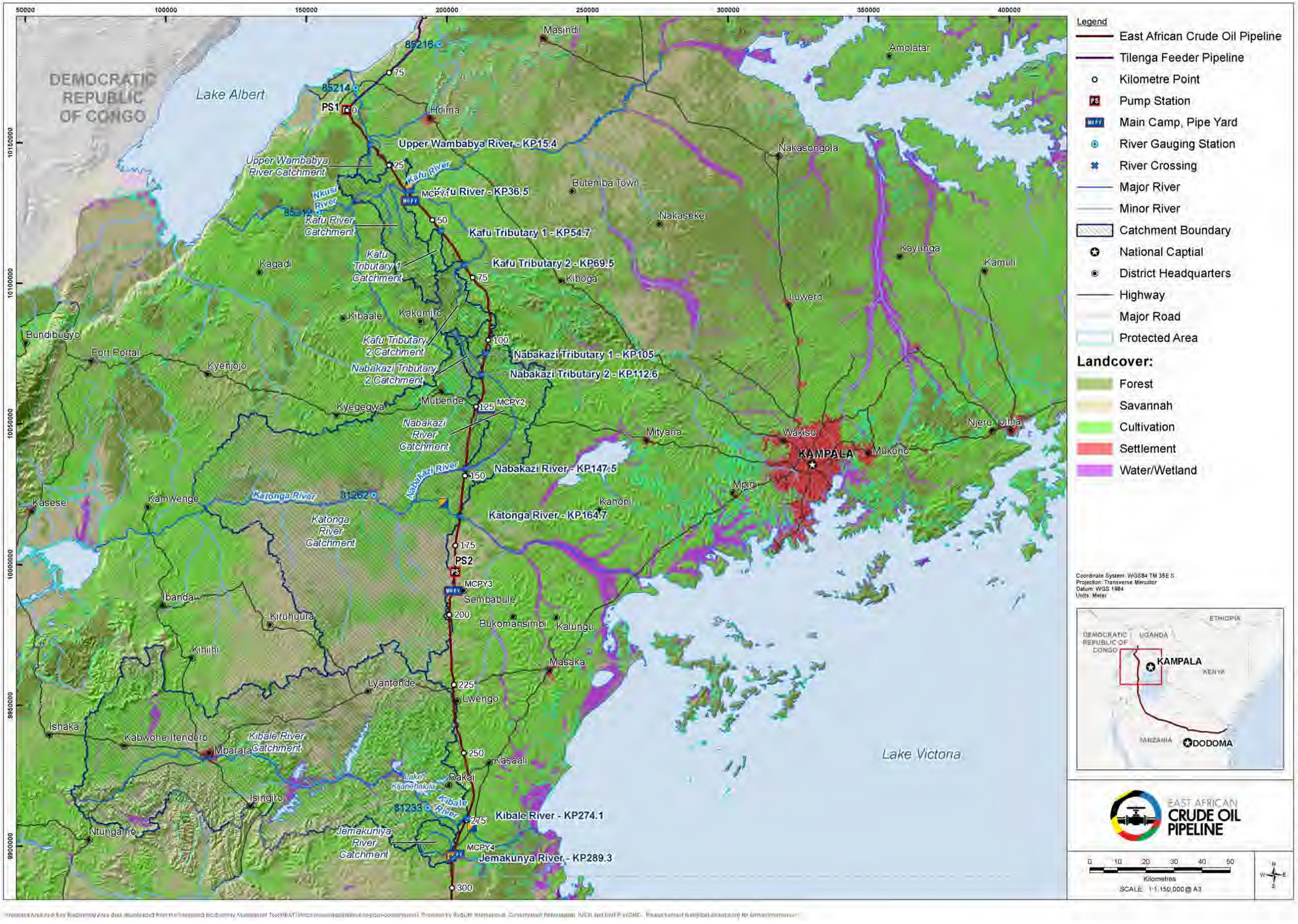
ATTACHMENT A6.1 MAIN WATERCOURSES AND UPSTREAM CATCHMENTS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Lake Victoria
Masindi
Amolatar
Hoima
Upper Wambabya River - KP15.4
Upper Wambabya River Catchment
Kafu River
Nkusi River
Kafu River - KP36.5
Kafu River Catchment
Kafu Tributary 1 - KP54.7
Kafu Tributary 1 Catchment
Kafu Tributary 2 - KP69.5
Kafu Tributary 2 Catchment
Nabakazi Tributary 1 - KP105
Nabakazi Tributary 2 - KP112.6
Nabakazi Tributary 2 Catchment
Nabakazi River Catchment
Nabakazi River - KP147.5
Katonga River
Katonga River - KP164.7
Katonga River Catchment
Kibale River Catchment
Jemakunya River - KP289.3
Jemakunya River Catchment
Kibale River - KP274.1
Nakasongola
Butemba Town
Nakaseke
Kayunga
Kamuli
Luwero
Kiboga
Kagadi
Kibaale
Kakumiro
Bundibugyo
Fort Portal
Kyenjojo
Kyegegwa
Mubende
Mityana
Wakiso
KAMPALA
Mukono
Njeru
Jinja
Mpigi
Kanoni
Kasese
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Kiruhuura
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Kabwohe-Itendero
Mbarara
Ntungamo
Kihihi
PS1
PS2
MCPY1
MCPY2
MCPY3
MCPY4
Legend
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Pump Station
Main Camp, Pipe Yard
River Gauging Station
River Crossing
Major River
Minor River
Catchment Boundary
National Captial
District Headquarters
Highway
Major Road
Protected Area
Landcover:
Forest
Savannah
Cultivation
Settlement
Water/Wetland
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Projection: Transverse Mercator
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Units: Meter
ETHIOPIA
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KENYA
TANZANIA
DODOMA
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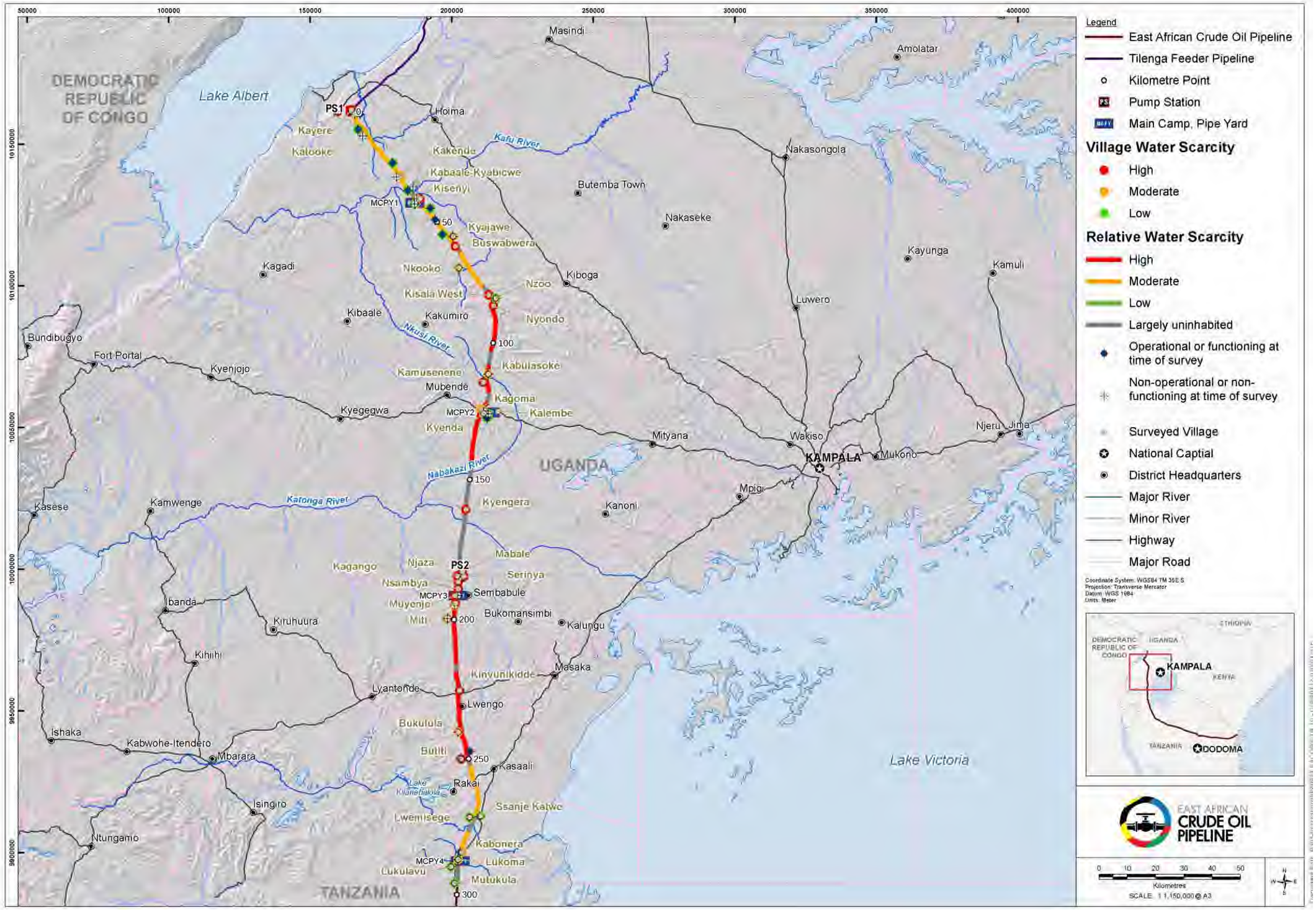
ATTACHMENT A6.2 WATER SCARCITY ALONG THE PIPELINE


DEMOCRATIC REPUBLIC OF CONGO
Lake Albert
UGANDA
TANZANIA
Lake Victoria
PS1
PS2
MCPY1
MCPY2
MCPY3
MCPY4
Masindi
Amolatar
Hoima
Kayere
Kalooke
Kakende
Kafu River
Kabaale-Kyabicwe
Kisenyi
Nakasongola
Butemba Town
Nakaseke
Kyajawe
Buswabwera
Kayunga
Kamuli
Kagadi
Nkooko
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Kyenda
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Kamwenge
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Kanoni
Mabale
Kagango
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Kihiihi
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Lyantonde
Lwengo
Bukulula
Ishaka
Kabwohe-Itendero
Mbarara
Butiti
Kasaali
Rakai
Lake Kijanebalola
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Lwemisege
Ntungamo
Kabonera
Lukoma
Lukulavu
Mutukula
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50
100
150
200
250
300
Legend
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Pump Station
Main Camp, Pipe Yard
Village Water Scarcity
High
Moderate
Low
Relative Water Scarcity
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Moderate
Low
Largely uninhabited
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District Headquarters
Major River
Minor River
Highway
Major Road
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Units: Meter
ETHIOPIA
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KENYA
TANZANIA
DODOMA
EAST AFRICAN CRUDE OIL PIPELINE
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Kilometres
SCALE: 1:1,150,000 @ A3

ATTACHMENT A6.3 KEY WATERCOURSES AT PIPELINE CROSSINGS

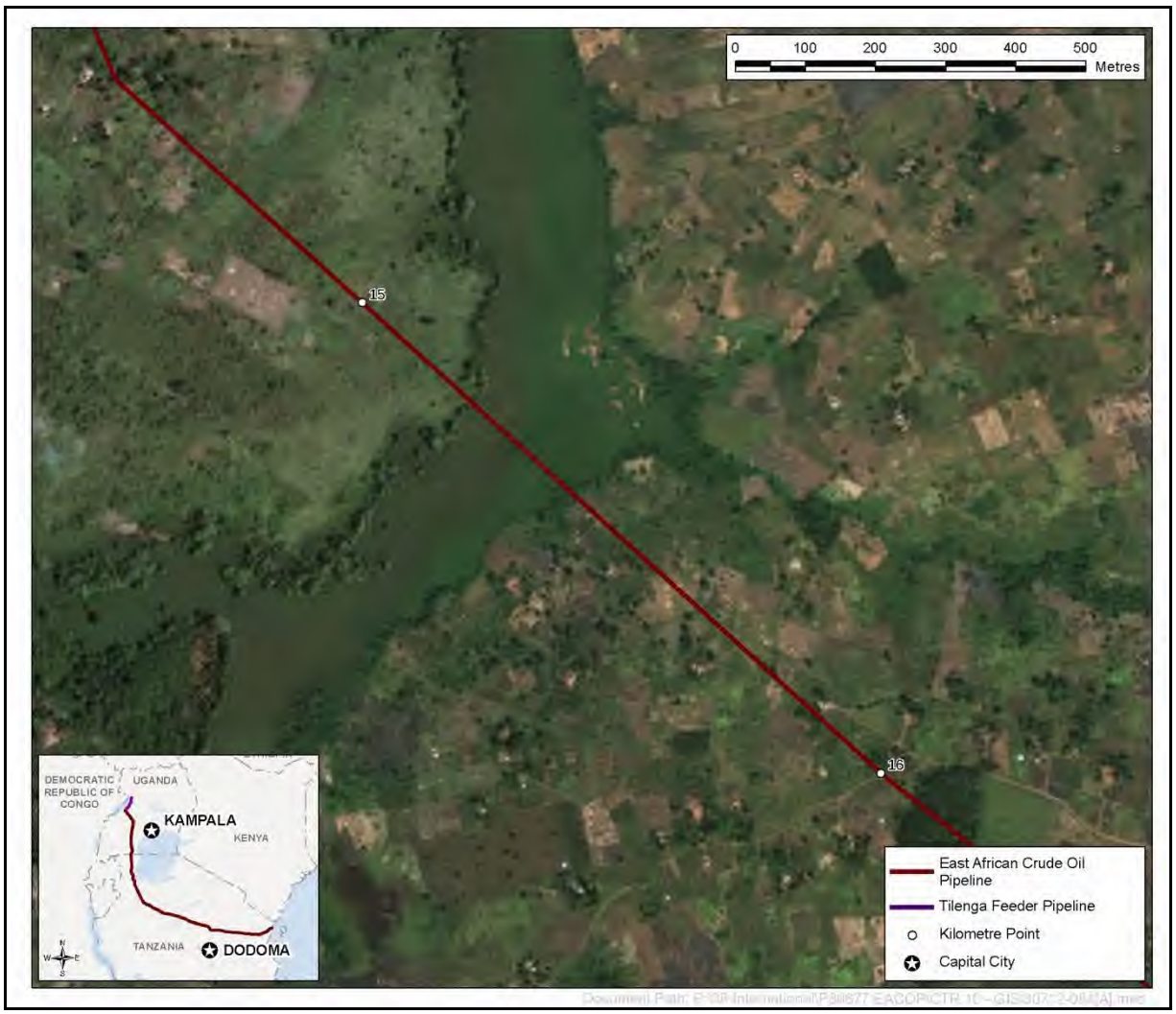

Figure Att6.3–1 Wambabya Tributary at KP15.4

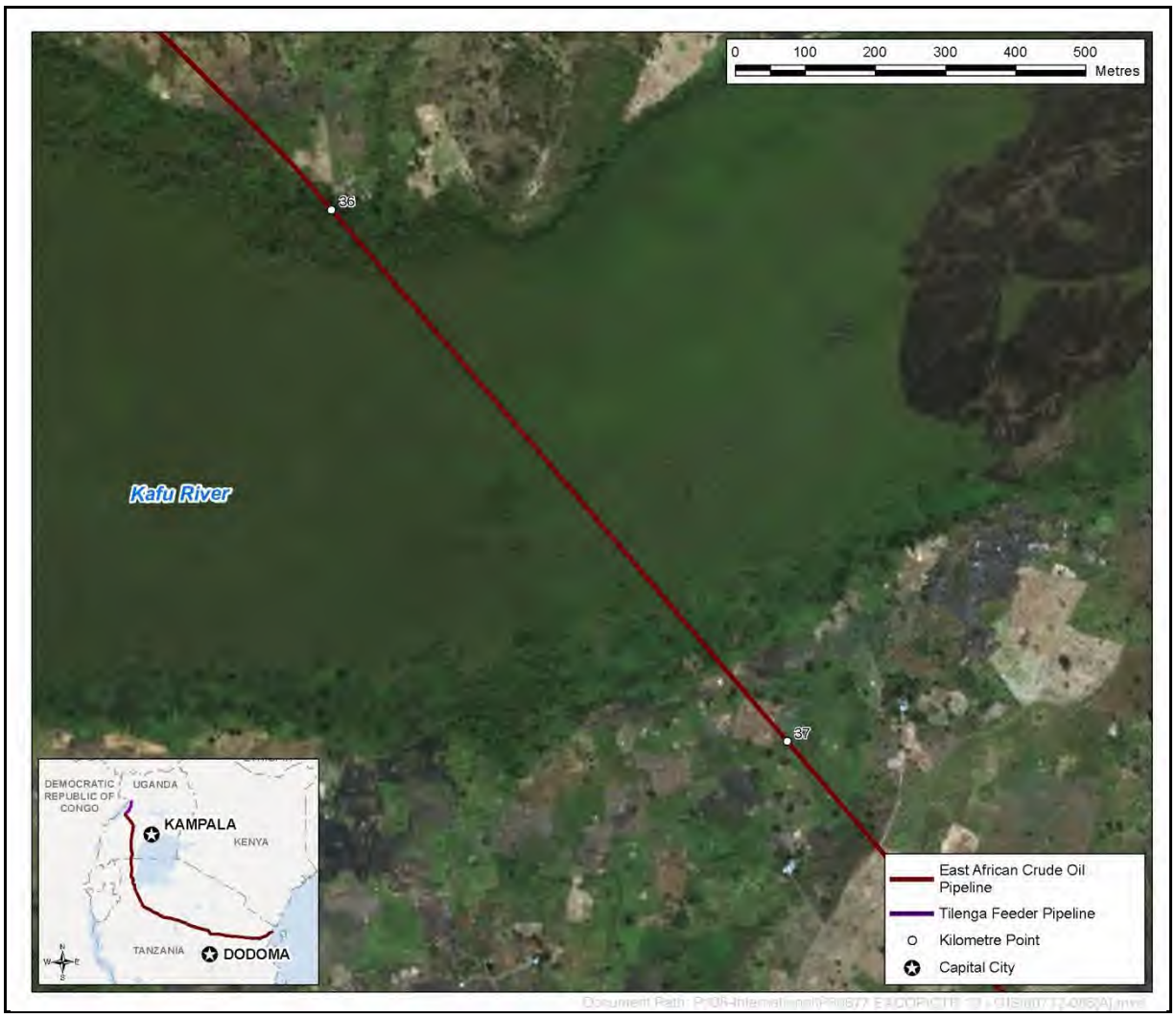

Figure Att6.3–2 Kafu River at KP36.5

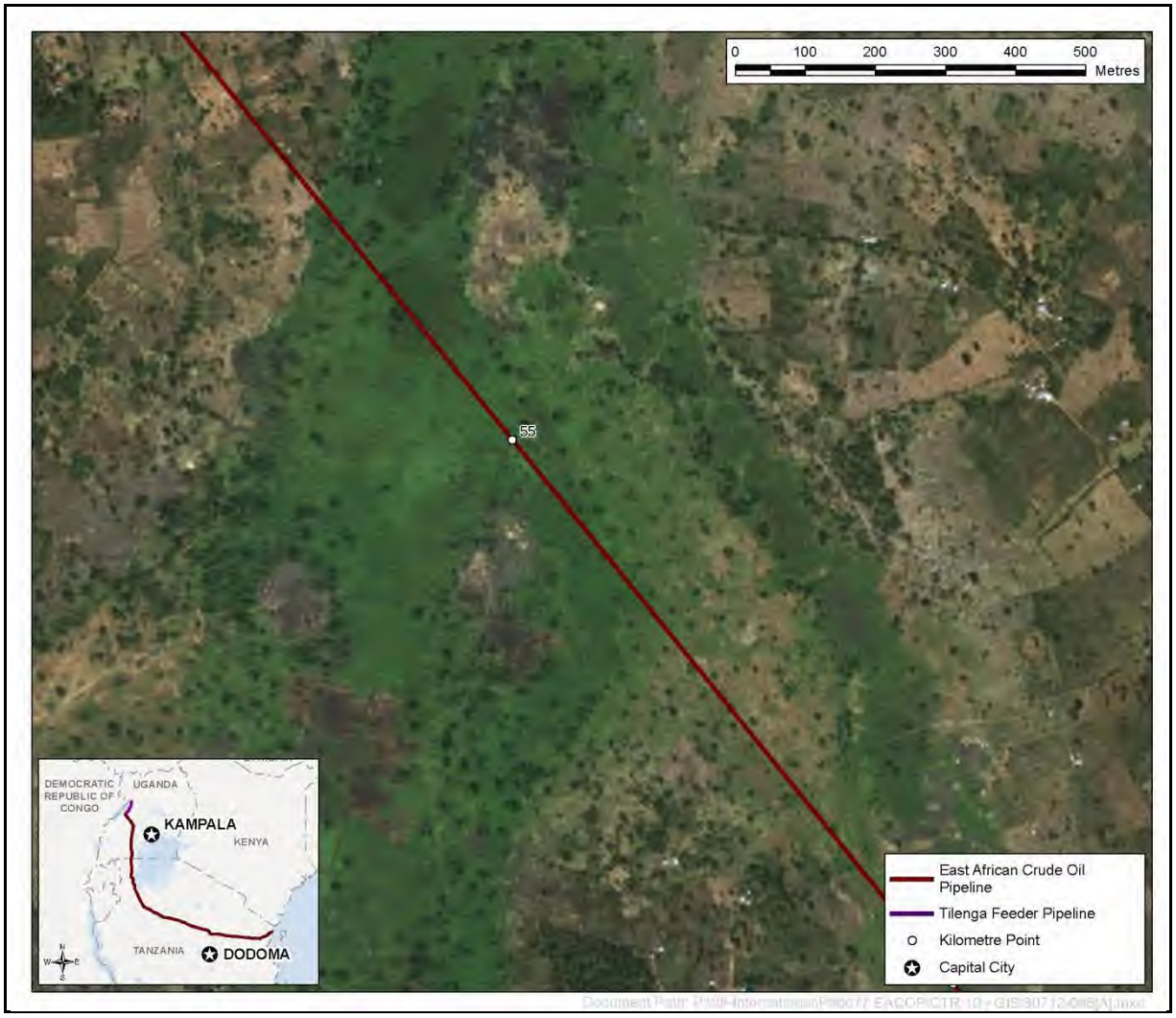

Figure Att6.3–3 Kafu Tributary 1 at KP54.7

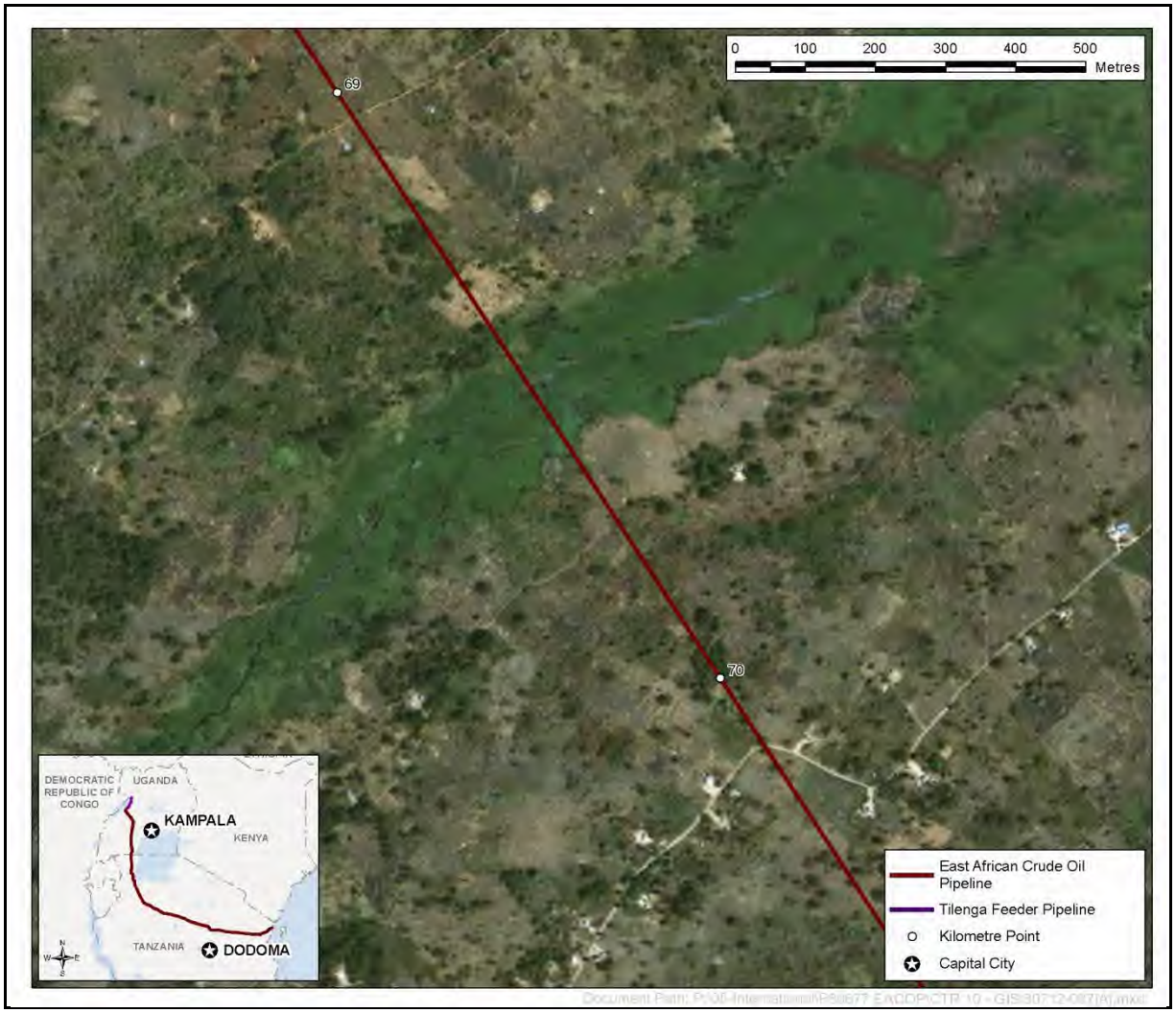

Figure Att6.3–4 Kafu Tributary 2 at KP69.5

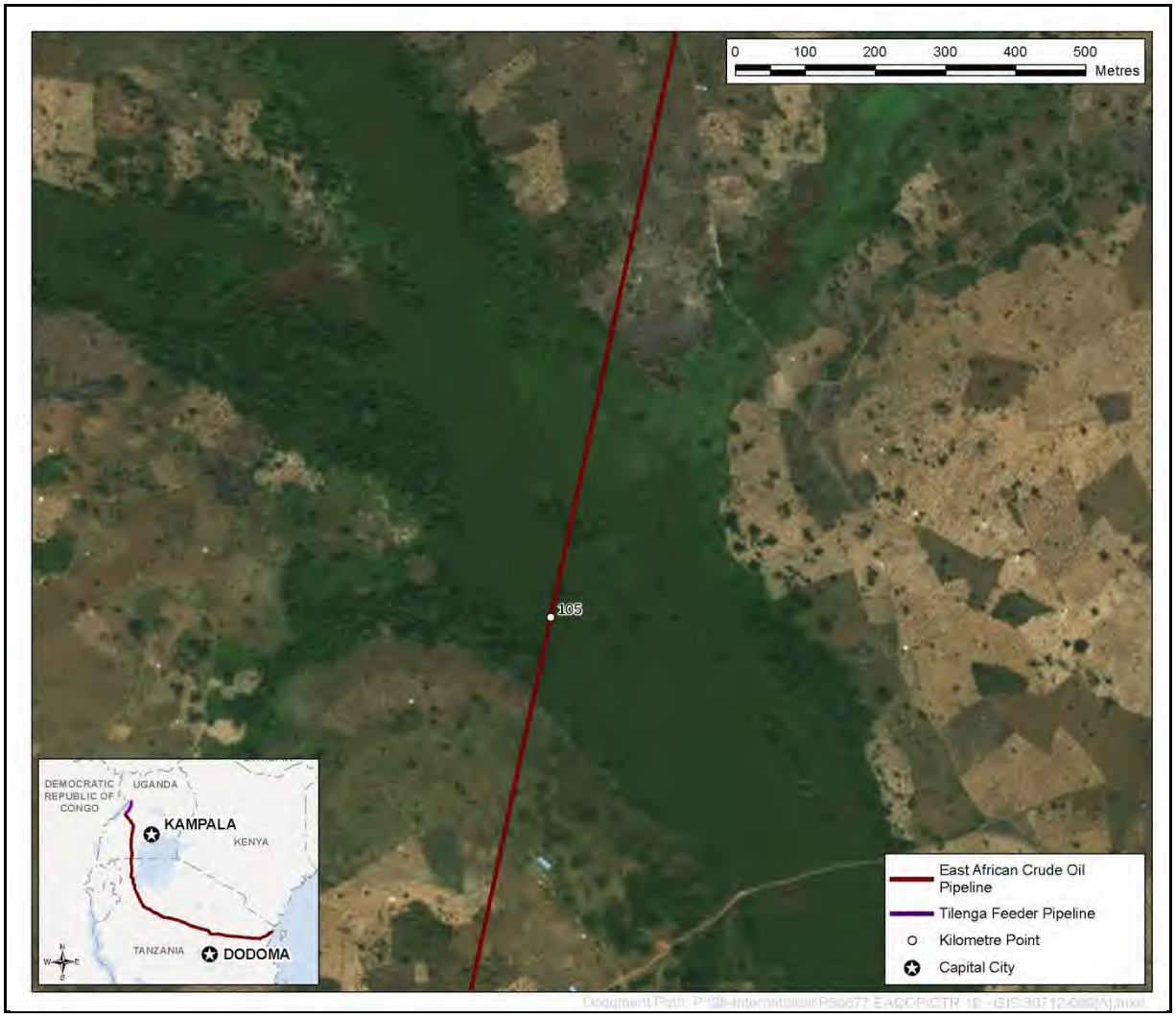

Figure Att6.3–5 Nabakazi Tributary 1 at KP105

Figure Att6.3–6 Nabakazi Tributary 2 at KP112.6

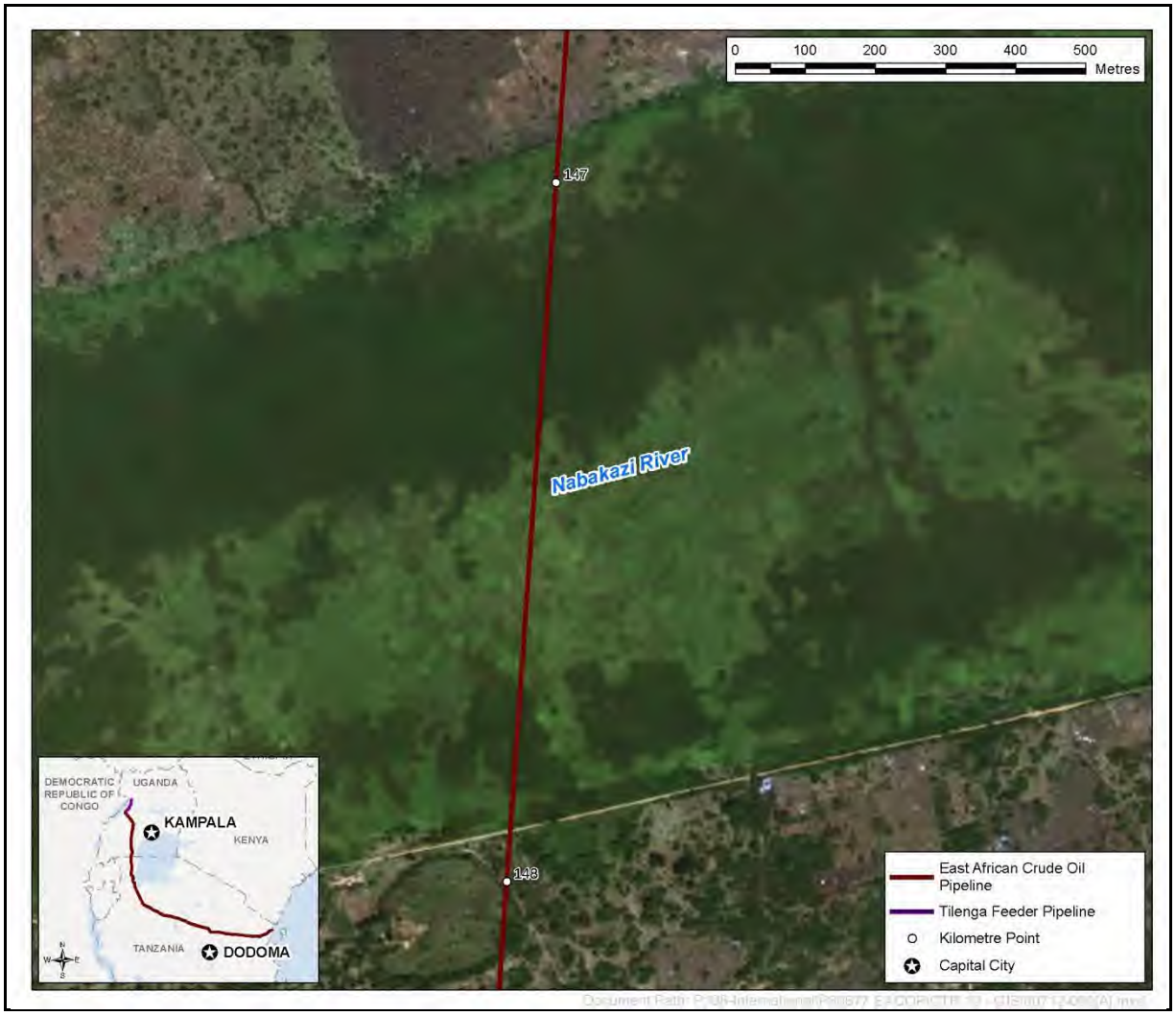

Figure Att6.3–7 Nabakazi River at KP147.5

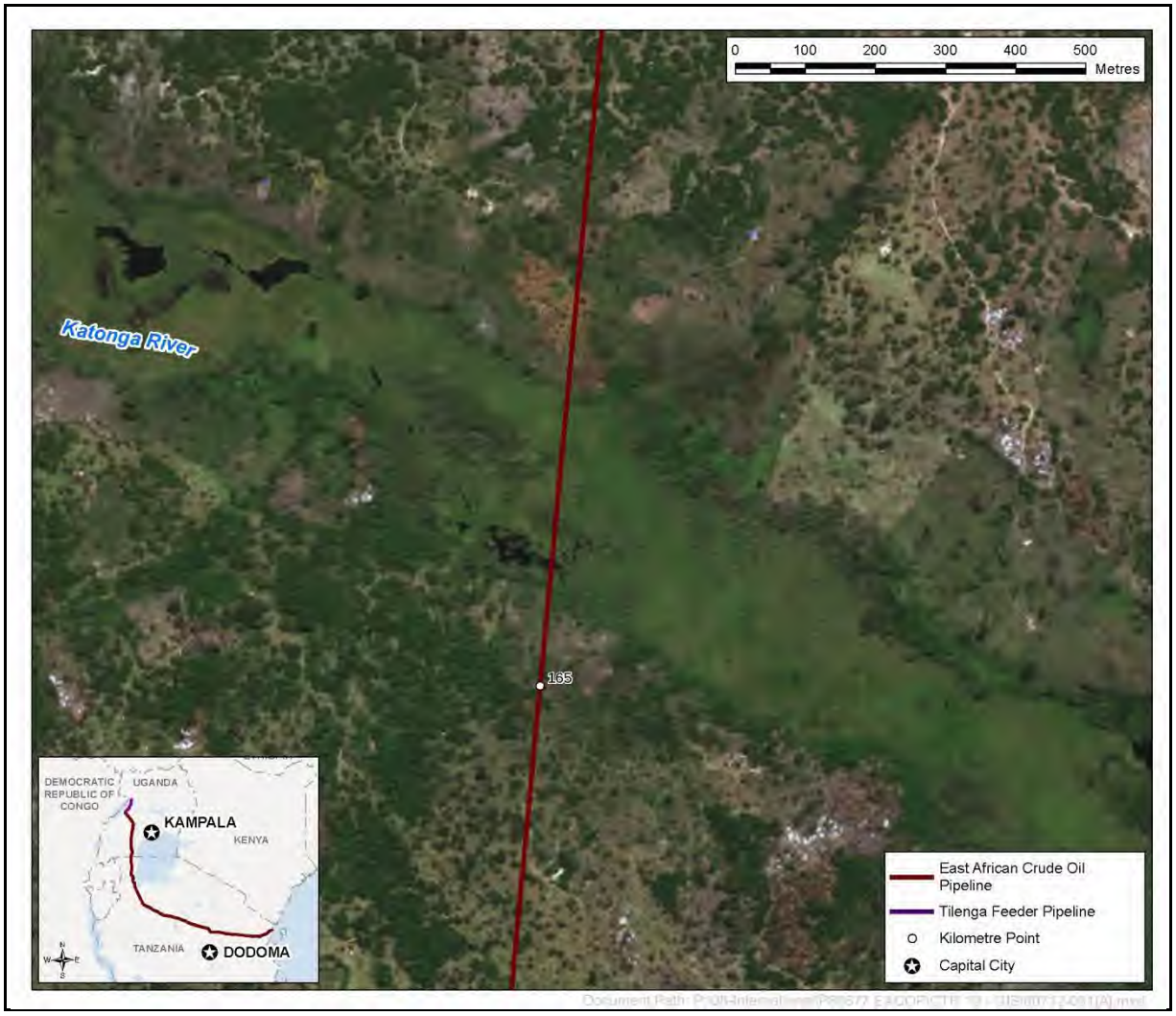

Figure Att6.3–8 Katonga River at KP164.7

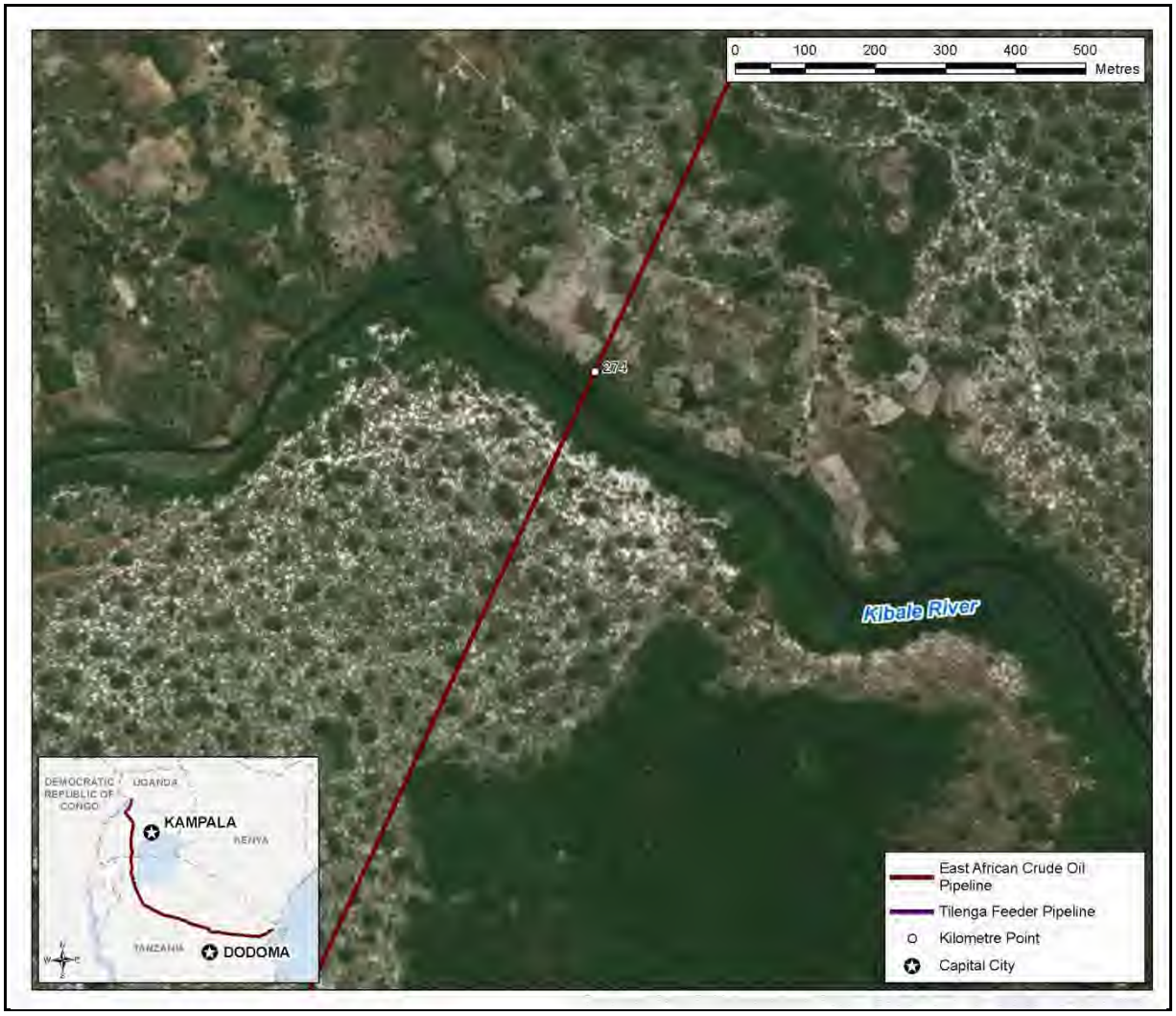

Figure Att6.3–9 Kibale River at KP274.1

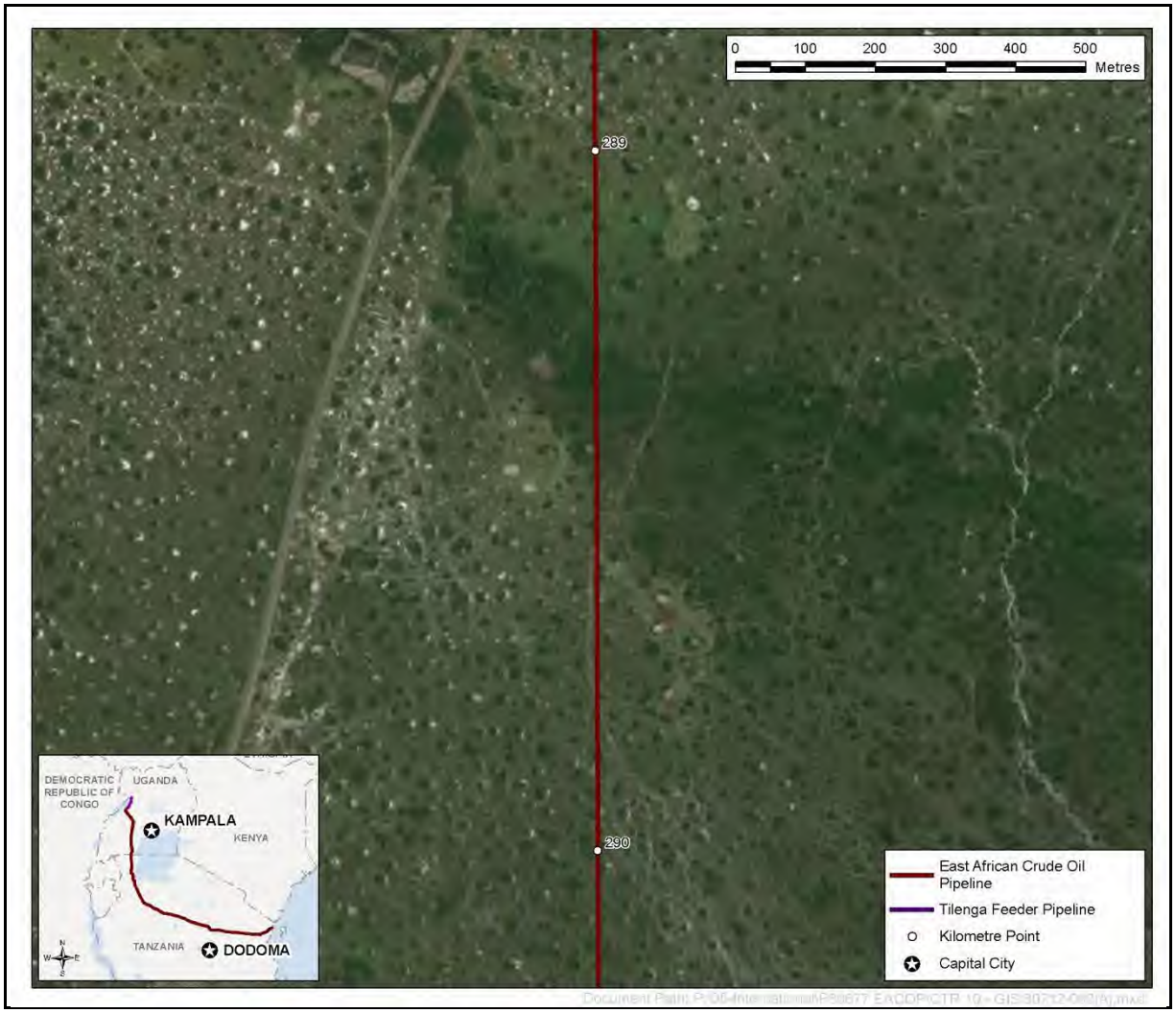

Figure Att6.3–10 Jemakunya River at KP289.3

ATTACHMENT A6.4 MAPS OF WATERCOURSES AND COMMUNITY WATER SUPPLIES ALONG PROJECT ACCESS ROADS AND NEAR PROJECT FACILITIES

Figure Att6.4–1 Project Road PAR–PS1 and Project Facility PS1

Figure Att6.4–2 Project Road TAR–MCPY1 and Project Facility MCPY1

Figure Att6.4–3 Access Road to the RoW and Project Facility MCPY2

Figure Att6.4–4 Access Road and Project Facility PS2

Figure Att6.4–5 Project Access Roads and Project Facility MCPY3

Figure Att6.4–6 Access Road to the RoW and Project Facility MCPY4

ATTACHMENT A6.5 PHOTOGRAPHS OF WATER AND SEDIMENT SAMPLING SITES

Figure Att6.5–1 Kafu River: View Upstream from the Sampling Site

Figure Att6.5–2 Kafu River: View Downstream from the Sampling Site

Figure Att6.5–3 Katonga River: View Upstream from the Sampling Site

Figure Att6.5–4 Katonga River: View Downstream from the Sampling Site

Figure Att6.5–5 Katonga River: Vehicle Collecting Water

Figure Att6.5–6 Katonga River: Water Collection Vehicles

Figure Att6.5–7 Kibale River: View Upstream from the Sampling Site

Figure Att6.5–8 Kibale River: View Downstream from the Sampling Site

Figure Att6.5–9 Jemakunya River: View Upstream from the Sampling Site

Figure Att6.5–10 Jemakunya River: View Downstream from the Sampling Site

ATTACHMENT A6.6 ESTIMATED RIVER CHANNEL DIMENSIONS AND FLOW CAPACITY AT BANKFULL LEVEL

KP	River	Estimated Bankfull Width (m)	Estimated Bankfull Depth (m)	Cross-Sectional Area A (m^2)	Wetted Perimeter P (m)	Hydraulic Radius R (A/P) (m)	Estimated Channel Slope (m/m)	Roughness Factor n	Estimated Bankfull Velocity (m/s)	Estimated Bankfull Flow (m^3/s)
15.4	Upper Wambabya	ND	ND	ND	ND	ND	ND	ND	ND	ND
36.5	Kafu	ND	ND	ND	ND	ND	ND	ND	ND	ND
54.7	Kafu tributary 1	ND	ND	ND	ND	ND	ND	ND	ND	ND
69.5	Kafu tributary 2	ND	ND	ND	ND	ND	ND	ND	ND	ND
105	Nabakazi tributary 1	ND	ND	ND	ND	ND	ND	ND	ND	ND
112.6	Nabakazi tributary 2	ND	ND	ND	ND	ND	ND	ND	ND	ND
147.5	Nabakazi	ND	ND	ND	ND	ND	ND	ND	ND	ND
164.7	Katonga	ND	ND	ND	ND	ND	ND	ND	ND	ND
274.1	Kibale	15	1	15	17	0.9	0.0024	0.070[1]	0.9	10
289.3	Jemakunya	4	1	4	6	0.7	0.0026	0.100[2]	0.4	2

NOTES: [1]Value of n given by Chow (1959) for minor streams on plain (top width T flood stage <30 m); sluggish reaches, weedy, deep pools.

[2]Value of n given by Chow (1959) for minor streams on plain (top width T flood stage <30 m); very weedy reaches, deep pools.

ND = No data. Channel dimensions could not be determined under the cover of swamp vegetation.

ATTACHMENT A6.7 ESTIMATION OF STREAM POWER AT MEAN ANNUAL FLOOD

River	KP	MAF (m^3/s)	Channel Slope (m/m)	Stream Power (W/m)
Upper Wambabya	15.4	5	0.0103	521
Kafu	36.5	8	0.0011	85
Kafu tributary 1	54.7	0.6	0.0012	7
Kafu tributary 2	69.5	9	0.0031	276
Nabakazi tributary 1	105	5	0.0026	125
Nabakazi tributary 2	112.6	4	0.0011	45
Nabakazi	147.5	7	0.0005	32
Katonga	164.7	5	0.0011	56
Kibale	274.1	8	0.0024	187
Jemakunya	289.3	2	0.0026	64

ATTACHMENT A6.8 RESULTS OF ONSITE WATER QUALITY MEASUREMENTS AND OBSERVATIONS

Parameter	Uganda Standard Limit Level[1]		River							
	Treated	Natural	Kafu		Katonga		Kibale		Jemakunya	
KP			**KP36.5**		**KP164.7**		**KP274**		**KP289.3**	
Season			**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**
Sample Date, dd/mm/yy			**05/07/17**	**17/11/17**	**02/07/17**	**16/11/17**	**03/07/17**	**14/11/17**	**03/07/2017**	**15/11/17**
Time, hh:mm			**11:45**	**12:45**	**10:15**	**11:55**	**10:00**	**15:34**	**15:00**	**10:20**
Sample No.			**1004**	**1013**	**1001**	**1012**	**1002**	**1009**	**1003**	**1011**
Flow (est.)[2] (m^3/s)			3.4	23.1	0.07–0.14	10.8–21.4	0.6–0.9	2.7–3.0	0	0
Physical Water Quality										
Temperature (°C)	–	–	20.3	21.3	19.3	20.8	19.4	22.7	23.8	21.8
Turbidity (NTU)	5	25	3	7.0	0	0	3.0	6.5	15	14.8
Chemical Water Quality										
pH	6.5–8.5	5.5–9.5	5.7	6.3	5.7	5.9	7.4	7.1	6.6	8.7
EC (µS/cm)	1500	2500	135	126	277	262	535	428	147	203
TDS** (mg/L)	500	1500	85	81	177	172	349	278	95	131
DO (mg/L)	–	–	1.6	5.2	5.1	6.6	3.6	6.9	3.8	6.9
DO (%)	–	–	20	67	63	85	44	92	NR	90

Parameter	**Uganda Standard Limit Level[1]**		**River**							
	Treated	**Natural**	**Kafu**		**Katonga**		**Kibale**		**Jemakunya**	
KP			**KP36.5**		**KP164.7**		**KP274**		**KP289.3**	
Season			**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**
Sample Date, dd/mm/yy			**05/07/17**	**17/11/17**	**02/07/17**	**16/11/17**	**03/07/17**	**14/11/17**	**03/07/2017**	**15/11/17**
Time, hh:mm			**11:45**	**12:45**	**10:15**	**11:55**	**10:00**	**15:34**	**15:00**	**10:20**
Sample No.			**1004**	**1013**	**1001**	**1012**	**1002**	**1009**	**1003**	**1011**
Microbiological Water Quality										
Total coliforms (sample/duplicate) (CFU/100 mL)	Absent	Absent	**36/46**	ND	**62/78**	ND	**120/150**	ND	**16/44**	ND
E. coli (sample/duplicate) (CFU/100 mL)	Absent	Absent	**118/104**	**14/10**	**56/54**	**8/4**	**182/120**	**16/40**	**464/532**	**216**/ND
Observations										
Odour	Odour-less	Odour-less	**Present (hydrogen sulphide)**	**Present (organic)**	**Present (organic)**	ND	Absent	**Present (ammonia)**	**Present**	Absent
Gas bubbles	–	–	Present	Absent	Present	Present	Absent	Absent	Present	Present
Algae	–	–	Present	Absent	Present	Present	Present	Absent	Absent	Present
Iridescence	–	–	Present	Absent	Present	Present	Present	Present	Absent	Present
Bacterial aggregates	–	–		Absent	Present	Present	Absent	Absent	Absent	Present
Precipitates	–	–	Unclear	Absent	Absent	Present	Present	Absent	Absent	Present
Colour	15 TCU	50 TCU	ND	Grey	ND	Dark brown	ND	Light brown	ND	Grey

Parameter	Uganda Standard Limit Level[1]		River							
	Treated	Natural	Kafu		Katonga		Kibale		Jemakunya	
KP			KP36.5		KP164.7		KP274		KP289.3	
Season			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Sample Date, dd/mm/yy			05/07/17	17/11/17	02/07/17	16/11/17	03/07/17	14/11/17	03/07/2017	15/11/17
Time, hh:mm			11:45	12:45	10:15	11:55	10:00	15:34	15:00	10:20
Sample No.			1004	1013	1001	1012	1002	1009	1003	1011
Weather	–	–	Warm, dry and sunny	Clear and sunny	Warm, dry and sunny	Bright and sunny	Warm, dry and sunny	Sunny	Warm, dry and sunny	Clear and sunny
General	–	–	Papyrus swamp vegetation fills Kafu channel	Water level and flow higher than in the dry season	Papyrus swamp vegetation fills Katonga channel. Water collection point used by vehicles and local people	Water level and flow higher than in the dry season	Watering point for cattle and local community	Some floating weeds and other macro-phytes	Channel is overgrown with emergent vegetation	Channel is over-grown with emergent vegetation

NOTES: – No standard available.

[1]Standards expressed as upper limit for treated and natural waters (Uganda Standard, US EAS 12: 2014, Potable water – Specification). Ugandan standards have been incorporated into the EACOP project standards.

[2]Flow was estimated by visually estimating the width (m), mean depth (m) and mean velocity (m/s) and calculating the flow using Flow = width × depth × velocity.

ND = No data.

ATTACHMENT A6.9 SGS' METHODS OF WATER ANALYSIS AND LIMITS OF DETECTION

Parameter	Analytical Method	Limit of Detection (mg/L)
TSS	EW APHA 2540D	1
Chloride	EW APHA 4500CL	0.2
Sulphate	EW APHA 4500SO4E	0.02
Calcium	EW APHA 3111D CA ICP	0.01
BOD	EW APHA 5210B	0.1
COD	EW APHA 5220D COD	0.1
TPH	EW APHA 5520F	1
Total hydrocarbons (C_{10}–C_{40})	DIN EN ISO 9377-2 HE	0.1
Total PAH	DIN 38407-39 HE	0.00001
Arsenic dissolved (by hydride)	EW APHA 3114B DHYD	0.001
Barium dissolved	EW APHA 3111B DMET_I	0.002
Cadmium dissolved	EW APHA 3111B DMET I	0.001
Chromium dissolved	EW APHA 3111B DMET I	0.001
Copper dissolved	EW APHA 3111B DMET I	0.001
Iron dissolved	EW APHA 3111B DMET I	0.001
Lead dissolved	EW APHA 3111B DMET I	0.005
Mercury dissolved (by cold vapour)	EW APHA 3114B DHYD	0.001
Nickel dissolved	EW APHA 3111B DMET I	0.004
Silver Ag dissolved	EW APHA 3111B DMET	0.01
Vanadium dissolved	EW APHA 3111B DMET I	0.001
Zinc dissolved	EW APHA 3111B DMET I	0.001

SOURCE: SGS

ATTACHMENT A6.10 RESULTS OF LABORATORY ANALYSES ON WATER SAMPLES

Parameter	Uganda Standard Limit Level[1]		River							
	Treated	Natural	Kafu		Katonga		Kibale		Jemakunya	
KP			KP36.5		KP164.7		KP274		KP289.3	
Season			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Sample Date (dd/mm/yy)			05/07/17	17/11/17	02/07/17	16/11/17	03/07/17	14/11/17	03/07/2017	15/11/17
Time (hh:mm)			12:50	12:45	12:00	11:55	11:00	15:34	15:00	10:20
Sample No.			1004	1013	1001	1012	1002	1009	1003	1011
Physical Water Quality										
TSS (mg/L)	–	–	10.4	9.3	14.5	13.0	11.4	11.5	13.8	21.1
Chemical Water Quality										
Chloride (mg/L)	250	250	2.1	4.6	5.5	20.4	43	47.6	<0.20	3.0
Sulphate (mg/L)	400	400	7.8	5.1		9.8		10.8		2.7
Calcium (mg/L)	150	150	3.7	3.2		14.9		30.0		8.3
BOD (mg/L)	–	–	1	40.0	<0.10	48.0	2	60.0	<0.10	23.0
COD (mg/L)	–	–				107				
TPH (mg/L)	–	–	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total hydrocarbons (C_{10}–C_{40}) (mg/L)	–	–				<0.10				

Parameter	Uganda Standard Limit Level[1]		River							
	Treated	Natural	Kafu		Katonga		Kibale		Jemakunya	
KP			KP36.5		KP164.7		KP274		KP289.3	
Season			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Sample Date (dd/mm/yy)			05/07/17	17/11/17	02/07/17	16/11/17	03/07/17	14/11/17	03/07/2017	15/11/17
Time (hh:mm)			12:50	12:45	12:00	11:55	11:00	15:34	15:00	10:20
Sample No.			1004	1013	1001	1012	1002	1009	1003	1011
Total PAH (mg/L)	–	–				0.00006				
Naphthalene (PAH) (mg/L)	–	–				0.00005				
Acenaphthylene (PAH) (mg/L)	–	–				<0.00001				
Acenaphthene (PAH) (mg/L)	–	–				<0.00001				
Fluorene (PAH) (mg/L)	–	–				<0.00001				
Phenanthrene (PAH) (mg/L)	–	–				0.00001				
Anthracene (PAH) (mg/L)	–	–				<0.00001				
Fluoranthene (PAH) (mg/L)	–	–				<0.00001				
Pyrene (PAH) (mg/L)	–	–				<0.00001				
Benz[a]anthracene (PAH) (mg/L)	–	–				<0.00001				

Parameter	Uganda Standard Limit Level[1]		River							
	Treated	Natural	Kafu		Katonga		Kibale		Jemakunya	
KP			KP36.5		KP164.7		KP274		KP289.3	
Season			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Sample Date (dd/mm/yy)			05/07/17	17/11/17	02/07/17	16/11/17	03/07/17	14/11/17	03/07/2017	15/11/17
Time (hh:mm)			12:50	12:45	12:00	11:55	11:00	15:34	15:00	10:20
Sample No.			1004	1013	1001	1012	1002	1009	1003	1011
Chrysene (PAH) (mg/L)	–	–				<0.00001				
Benzo[b]fluoranthene (PAH) (mg/L)	–	–				<0.00001				
Benzo[k]fluoranthene (PAH) (mg/L)	–	–				<0.00001				
Benzo[a]pyrene (PAH) (mg/L)	0.0007[2]	0.0007[2]				<0.00001				
Dibenz[a,h]anthracene (PAH) (mg/L)	–	–				<0.00001				
Benzo(g,h,i)perylene (PAH) (mg/L)	–	–				<0.00001				
Indeno(1,2,3-c,d)pyrene (PAH) (mg/L)	–	–				<0.00001				
Arsenic dissolved (mg/L)	0.01	0.01				<0.001				
Barium dissolved (mg/L)	0.7	0.7				0.031				

Parameter	Uganda Standard Limit Level[1]		River							
	Treated	Natural	Kafu		Katonga		Kibale		Jemakunya	
KP			**KP36.5**		**KP164.7**		**KP274**		**KP289.3**	
Season			**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**
Sample Date (dd/mm/yy)			**05/07/17**	**17/11/17**	**02/07/17**	**16/11/17**	**03/07/17**	**14/11/17**	**03/07/2017**	**15/11/17**
Time (hh:mm)			**12:50**	**12:45**	**12:00**	**11:55**	**11:00**	**15:34**	**15:00**	**10:20**
Sample No.			**1004**	**1013**	**1001**	**1012**	**1002**	**1009**	**1003**	**1011**
Cadmium dissolved (mg/L)	0.003	0.003				<0.001				
Chromium dissolved (mg/L)	0.05	0.05				<0.001				
Copper dissolved (mg/L)	1	1				<0.001				
Iron dissolved (mg/L)	0.3	0.3				**6.8**				
Lead dissolved (mg/L)	0.01	0.1				<0.005				
Mercury dissolved (mg/L)	0.001	0.001				<0.001				
Nickel dissolved (mg/L)	0.02	0.02				<0.004				
Silver dissolved (mg/L)	–	–				<0.01				
Vanadium dissolved (mg/L)	–	-				<0.001				
Zinc dissolved (mg/L)	5	5				<0.001				

NOTES:

– No standard available.

[1]Standards expressed as upper limit for treated and natural waters (Uganda Standard, US EAS 12: 2014, Potable water – Specification). Ugandan standards have been incorporated into the EACOP project standards.

[2]0.0007 mg/L is equivalent to 0.7 µg/L as stated in Uganda Standard, US EAS 12: 2014, Potable water – Specification.

ATTACHMENT A6.11 JULY 2017 DRY SEASON WATER QUALITY SURVEY: LABORATORY REPORTS

SGS

sanas Testing Laboratory

T0337

Report number: EL170164R

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Lab Ref:	EL170164R
Client Ref:	**P0269241**
Project:	
Received:	08/07/2017
Reported:	24/08/2017
Samples:	3
First Sample:	1001
Last Sample:	1003
Pages:	2

FINAL REPORT

Notes

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Lab Ref EL170164R
Client Ref **P0269241**
Project
Reported 24/08/2017
Status Final
Page 2 of 2

ANALYTICAL REPORT

Sample Ident	*TSS*	*Chloride*	*BOD**	*Total Petroleum**
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1001 Date(dd-mm-yy): 02/07/2017 Time(24hr): 12:00 Sample Type: River water	14.5	5.5	<0.10	<1.0
1002 Date(dd-mm-yy): 03/07/2017 Time(24hr): 11:00 Sample Type: River water	11.4	43.0	2.0	<1.0
1003 Date(dd-mm-yy): 03/07/2017 Time(24hr): 15:00 Sample Type: River water	13.8	<0.20	<0.10	<1.0
Method	*TSS*	*Chloride*	*BOD*	*troleum Hydro*
Detection Limit	*1.0*	*0.20*	*0.10*	*1.0*
Method Uncertainity	*±0.76*	*±0.17*	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

END OF REPORT

SGS

sanas Testing Laboratory

T0337

Report number: EL170168

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Lab Ref: EL170168
Client Ref: **P0269241**
Project:
Received: 11/07/2017
Reported: 04/08/2017

Samples: 1
First Sample:
Last Sample: 1004
Pages: 2

FINAL REPORT

Notes

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Tech. Signatory (Chem.)

James Amos
Tech. Signatory (ICP)

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Lab Ref EL170168
Client Ref **P0269241**
Project
Reported 04/08/2017
Status Final
Page 2 of 2

ANALYTICAL REPORT

Sample Ident	*Chloride*	*Sulphate*	*Ca*	*TSS*	*BOD**	*Total Petroleum Hydrocarbon**
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1004 Date(dd-mm-yy): 05/07/2017 Time(24hr): 12:50 Sample type:	2.1	7.8	3.7	10.4	1.0	<1.0
Method	*Chloride*	*Sulphate*	*Cations*	*TSS*	*BOD*	*etroleum Hydrocarbons*
Detection Limit	*0.20*	*0.02*	*0.01*	*1.0*	*0.10*	*1.0*
Method Uncertainity	*±0.17*	*±0.078*	*±0.097*	*±0.76*	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accrediled # - subcontracted TNTC - too numerous to count T.F. to follow*

END OF REPORT

ATTACHMENT A6.12 NOVEMBER 2017 WET SEASON WATER QUALITY SURVEY: LABORATORY REPORTS

SGS

sanas Testing Laboratory

T0337

Report number: EL170284

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Lab Ref:	EL170284
Client Ref:	**PO272595**
Project:	
Received:	20/11/2017
Reported:	17/01/2018
Samples:	4
First Sample:	1009 (Water) 14-Nov-17 15:34
Last Sample:	1012 (Water) 16-Nov-17 12:30
Pages:	8

FINAL REPORT

Notes

Enquiries: TZ.Environment@sgs.com

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Lab Ref	EL170284
Client Ref	**PO272595**
Project	
Reported	17/01/2018
Status	Final
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ANALYTICAL REPORT

Sample Ident	*Chloride*	*TSS*	*Sulphate**	*Ca*	*BOD**	*COD*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1009 (Water) 14-Nov-17 15:34	47.6	11.5	10.8	30.0	60.0	N.A
1010 (Water) 14-Nov-17 15:34	49.1	11.9	10.8	30.5	19.0	N.A
1011 (Water) 15-Nov-17 10:20	3.0	21.1	2.7	8.3	23.0	N.A
1012 (Water) 16-Nov-17 12:30	20.4	13.0	9.8	14.9	48.0	107

Method	*Chloride*	*TSS*	*Sulphate*	*Cations*	*BOD*	*COD*
Detection Limit	*0.20*	*1.0*	*0.02*	*0.01*	*0.10*	*0.10*
Method Uncertainity	*±0.17*	*±0.76*	*±0.078*	*±0.097*	-	*±0.024*

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

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Lab Ref EL170284
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ANALYTICAL REPORT

Sample Ident	Total Petroleum Hydrocarbon*	As	Hg	Ba	Cd	Cr
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1009 (Water) 14-Nov-17 15:34	<1.0	N.A	N.A	N.A	N.A	N.A
1010 (Water) 14-Nov-17 15:34	<1.0	N.A	N.A	N.A	N.A	N.A
1011 (Water) 15-Nov-17 10:20	<1.0	N.A	N.A	N.A	N.A	N.A
1012 (Water) 16-Nov-17 12:30	<1.0	<0.001	<0.001	0.031	<0.001	<0.001

Method	troleum Hydro	D_Hydrides	D_Hydrides	issolved Metal	issolved Metal	issolved Metals
Detection Limit	1.0	0.001	0.001	0.002	0.001	0.001
Method Uncertainity	-	±0.0008	±0.0015	±0.020	±0.044	±0.027

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

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Lab Ref	EL170284
Client Ref	**PO272595**
Project	
Reported	17/01/2018
Status	Final
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ANALYTICAL REPORT

Sample Ident	*Cu*	*Fe*	*Pb*	*Ni*	*Ag*	*V*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1009 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1010 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1011 (Water) 15-Nov-17 10:20	N.A	N.A	N.A	N.A	N.A	N.A
1012 (Water) 16-Nov-17 12:30	<0.001	6.8	<0.005	<0.004	<0.01	<0.001
Method	)issolved Metal	)issolved Metal	)issolved Metal	)issolved Metal	)issolved Metal	)issolved Metals
Detection Limit	*0.001*	*0.001*	*0.005*	*0.004*	*0.01*	*0.001*
Method Uncertainity	*±0.016*	*±0.050*	*±0.012*	*±0.023*	*±0.001*	*±0.026*

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

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Lab Ref EL170284
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Project
Reported 17/01/2018
Status Final
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ANALYTICAL REPORT

Sample Ident	*Zn*	*Polycyclic Aromatic Hydrocarbonms (PAH) #*				
		Naphthalene	*Acenaphthylene*	*Acenaphthene*	*Fluorene*	*Phenanthrene*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1009 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1010 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1011 (Water) 15-Nov-17 10:20	N.A	N.A	N.A	N.A	N.A	N.A
1012 (Water) 16-Nov-17 12:30	<0.001	0.00005	<0.00001	<0.00001	<0.00001	0.00001

Method	*Dissolved Metal IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 HE*
Detection Limit	*0.001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*
Method Uncertainity	*±0.040*	-	-	-	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	*Polycyclic Aromatic Hydrocarbonms (PAH) #*					
	Anthracene	*Fluoranthene*	*Pyrene*	*Benz(a)anthracene*	*Chrysene*	*Benzo(b)fluoranthene*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1009 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1010 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1011 (Water) 15-Nov-17 10:20	N.A	N.A	N.A	N.A	N.A	N.A
1012 (Water) 16-Nov-17 12:30	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Method	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 HE*
Detection Limit	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*
Method Uncertainity	-	-	-	-	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	Polycyclic Aromatic Hydrocarbonms (PAH) #					
	Benzo(k)fluoranthene	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene	Indeno(1,2,3-c,d)pyrene	Total PAH
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1009 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1010 (Water) 14-Nov-17 15:34	N.A	N.A	N.A	N.A	N.A	N.A
1011 (Water) 15-Nov-17 10:20	N.A	N.A	N.A	N.A	N.A	N.A
1012 (Water) 16-Nov-17 12:30	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00006
Method	IN 38407-39 H	IN 38407-39 H	IN 38407-39 H	IN 38407-39 H	IN 38407-39 H	IN 38407-39 HE
Detection Limit	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Method Uncertainity	-	-	-	-	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

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Lab Ref	EL170284
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ANALYTICAL REPORT

Sample Ident	*Total Hydrocarbons (C10-C40)#*
Units	*mg/l*
1009 (Water) 14-Nov-17 15:34	N.A
1010 (Water) 14-Nov-17 15:34	N.A
1011 (Water) 15-Nov-17 10:20	N.A
1012 (Water) 16-Nov-17 12:30	<0.10

Method	*EN ISO 9377-2 HE*
Detection Limit	*0.10*
Method Uncertainity	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

END OF REPORT

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sanas testing Laboratory

T0337

Report number: EL170288

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Cheshire, WA6 OAR, UK

Lab Ref:	EL170288
Client Ref:	**PO272595**
Project:	
Received:	23/11/2017
Reported:	17/01/2018
Samples:	1
First Sample:	1013 (Water) 17-Nov-17 12:45
Last Sample:	
Pages:	8

FINAL REPORT

Notes

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Lab Ref EL170288
Client Ref **PO272595**
Project
Reported 17/01/2018
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Page 2 of 8

ANALYTICAL REPORT

Sample Ident	Chloride	TSS	Sulphate	Ca	BOD*	Total Petroleum Hydrocarbon*
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1013 (Water) 17-Nov-17 12:45	4.6	9.3	5.1	3.2	40.0	<1.0

Method	Chloride	TSS	Sulphate	Cations	BOD	troleum Hydrocarbons
Detection Limit	0.20	1.0	0.02	0.01	0.10	1.0
Method Uncertainity	±0.17	±0.76	±0.078	±0.097	-	-

NA - not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received

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Lab Ref EL170288
Client Ref **PO272595**
Project
Reported 17/01/2018
Status Final
Page 3 of 8

ANALYTICAL REPORT

Sample Ident	*COD*	*As*	*Hg*	*Ba*	*Cd*	*Cr*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1013 (Water) 17-Nov-17 12:45	N.A N.A	N.A	N.A	N.A	N.A	N.A

Method	*COD*	*D_Hydrides*	*D_Hydrides*	*)issolved Metal*	*)issolved Metal*	*)issolved Metals*
Detection Limit	*0.10*	*0.001*	*0.001*	*0.002*	*0.001*	*0.001*
Method Uncertainity	*±0.024*	*±0.0008*	*±0.0015*	*±0.020*	*±0.044*	*±0.027*

NA - not analysed | – element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

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Lab Ref	EL170288
Client Ref	**PO272595**
Project	
Reported	17/01/2018
Status	Final
Page	4 of 8

ANALYTICAL REPORT

Sample Ident	*Cu*	*Fe*	*Pb*	*Ni*	*Ag*	*V*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1013 (Water) 17-Nov-17 12:45	N.A	N.A	N.A	N.A	N.A	N.A

Method	*)issolved Metal*	*)issolved Metal*	*)issolved Metal*	*)issolved Metal*	*)issolved Metal*	*)issolved Metals*
Detection Limit	*0.001*	*0.001*	*0.005*	*0.004*	*0.01*	*0.001*
Method Uncertainity	*±0.016*	*±0.050*	*±0.012*	*±0.023*	*±0.001*	*±0.026*

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F to follow*

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Lab Ref	EL170288
Client Ref	**PO272595**
Project	
Reported	17/01/2018
Status	Final
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ANALYTICAL REPORT

Sample Ident	*Zn*	*Polycyclic Aromatic Hydrocarbonms (PAH) #*				
		Naphthalene	*Acenaphthylene*	*Acenaphthene*	*Fluorene*	*Phenanthrene*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1013 (Water) 17-Nov-17 12:45	N.A	N.A	N.A	N.A	N.A	N.A

Method	*Dissolved Metal*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39 HE*
Detection Limit	*0.001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*
Method Uncertainity	*±0.040*	-	-	-	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

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Lab Ref EL170288
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ANALYTICAL REPORT

Sample Ident	*Polycyclic Aromatic Hydrocarbonms (PAH) #*					
	Anthracene	*Fluoranthene*	*Pyrene*	*Benz(a)anthracene*	*Chrysene*	*Benzo(b)fluoranthene*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1013 (Water) 17-Nov-17 12:45	N.A	N.A	N.A	N.A	N.A	N.A

Method	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39 HE*
Detection Limit	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*
Method Uncertainity	-	-	-	-	-	-

NA - not analysed | *-- element not determined* | *I.S. insufficient sample* | *L.N.R. listed not received*

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	*Polycyclic Aromatic Hydrocarbonms (PAH) #*					
	Benzo(k)fluoranthene	*Benzo(a)pyrene*	*Dibenzo(a,h)anthracene*	*Benzo(g,h,i)perylene*	*Indeno(1,2,3-c,d)pyrene*	*Total PAH*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
1013 (Water) 17-Nov-17 12:45	N.A	N.A	N.A	N.A	N.A	N.A

Method	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39*	*HIN 38407-39 HE*
Detection Limit	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*
Method Uncertainty	-	-	-	-	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

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ANALYTICAL REPORT

Sample Ident	*Total Hydrocarbons (C10-C40)#*
Units	*mg/l*
1013 (Water) 17-Nov-17 12:45	N.A

Method	*EN ISO 9377-2 HE*
Detection Limit	*0.10*
Method Uncertainity	-

NA - not analysed | — element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

END OF REPORT

ATTACHMENT A6.13 SGS' METHODS OF SEDIMENT ANALYSIS AND LIMITS OF DETECTION

Parameter	Analytical Method	Limit of Detection (mg/kg)
pH	EW APHA 4500H	–
Chloride	EW APHA 4500CL	0.20
TPH	EW APHA 5520F	1.0
Total phenols	EW APHA 5530C	0.002
Sulphides	EW APHA 4500S_2F	0.1
Arsenic (by hydride)	EW APHA 3114B DHYD	0.001
Cadmium	EW APHA 3111B DMET I	0.001
Chromium	EW APHA 3111B DMET I	0.001
Copper	EW APHA 3111B DMET I	0.001
Lead	EW APHA 3111B DMET I	0.005
Mercury (by cold vapour)	EW APHA 3114B DHYD	0.001
Nickel	EW APHA 3111B DMET I	0.004
Silver	EW APHA 3111B DMET I	0.01
Vanadium	EW APHA 3111B DMET I	0.001
Zinc	EW APHA 3111B DMET I	0.001

SOURCE: SGS

ATTACHMENT A6.14 RESULTS OF ONSITE OBSERVATIONS AND LABORATORY ANALYSES ON SEDIMENT SAMPLES

Parameter	**River**			
	Kafu	**Katonga**	**Kibale**	**Jemakunya**
KP	**KP36.5**	**KP164.7**	**KP274**	**KP289.3**
Sample Date (dd/mm/yy)	**17/11/2017**	**16/11/2017**	**14/11/2017**	**15/11/2017**
Time (hh:mm)	**13:30**	**14:20**	**16:20**	**12:25**
Sample No.	**1013-SED**	**1012-SED**	**1009-SED**	**1011-SED**
Sample Location	**Downstream side of the Hoima–Kibale road bridge 1.4 km downstream of the pipeline crossing**	**Downstream side of the Kyai road bridge 9.8 km upstream of the pipeline crossing**	**Downstream side of the Masaka–Mutukula road bridge 4.7 km downstream of the pipeline crossing**	**Upstream side of the Masaka–Mutukula road bridge 0.6 km upstream of the pipeline crossing**
Observations				
Texture	Murram (soil mixed with small aggregate)	Coarse sand	Largely fine, sticky, clayey sediment	Clay and some loam soil. Slippery with clods
Colour	Brown	Greyish brown	Light brown	Light brown
Odour	Soil odour	Smell of oil	Soil odour	Soil odour
Presence of biota	Not readily visible	Not readily visible	Not readily visible	Not readily visible
Presence of detritus	Plant matter	Plant roots	Absent	Plant matter
Depth of water (m)	0.5	0.5	0.3	0.3–0.4
Depth of sediment sampled (m)	0.15	0.15	0.15	0.15
Other	ND	Coarse sand observed on road bridge	Sediment at river edge mainly clayey with some stones	Stagnant water, no flow
Weather	Sunny	Sunny	Sunny	Rainy

Parameter	River			
	Kafu	**Katonga**	**Kibale**	**Jemakunya**
KP	**KP36.5**	**KP164.7**	**KP274**	**KP289.3**
Sample Date (dd/mm/yy)	**17/11/2017**	**16/11/2017**	**14/11/2017**	**15/11/2017**
Time (hh:mm)	**13:30**	**14:20**	**16:20**	**12:25**
Sample No.	**1013-SED**	**1012-SED**	**1009-SED**	**1011-SED**
Sample Location	**Downstream side of the Hoima–Kibale road bridge 1.4 km downstream of the pipeline crossing**	**Downstream side of the Kyai road bridge 9.8 km upstream of the pipeline crossing**	**Downstream side of the Masaka–Mutukula road bridge 4.7 km downstream of the pipeline crossing**	**Upstream side of the Masaka–Mutukula road bridge 0.6 km upstream of the pipeline crossing**
Laboratory Analyses				
pH	7.2	6.0	6.5	6.4
Chloride (mg/kg)	30.5	31.3	54.0	21.9
TPH (mg/kg)	<1.0	<1.0	<1.0	<1.0
Total phenols (mg/kg)	<0.002	<0.002	<0.002	<0.002
Sulphides (mg/kg)	<0.10	<0.10	<0.10	<0.10
Arsenic (by hydride) (mg/kg)	<0.001	<0.001	0.014	<0.001
Cadmium (mg/kg)	<0.001	<0.001	<0.001	<0.001
Chromium (mg/kg)	<0.001	<0.001	0.654	<0.001
Copper (mg/kg)	<0.001	<0.001	0.425	<0.001
Lead (mg/kg)	<0.005	<0.005	<0.005	<0.005
Mercury (by cold vapour) (mg/kg)	<0.001	<0.001	<0.001	<0.001
Nickel (mg/kg)	<0.004	0.063	0.257	<0.004
Silver (mg/kg)	<0.01	<0.01	<0.01	<0.01
Vanadium (mg/kg)	0.086	<0.001	0.859	<0.001
Zinc (mg/kg)	0.644	0.211	1.471	<0.001

NOTES: ND = No data.

ATTACHMENT A6.15 SEDIMENT QUALITY SURVEY: LABORATORY REPORTS

SGS

sanas Testing Laboratory

T0337

Report number: EL170281

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Cheshire, WA6 OAR, UK

Lab Ref: EL170281
Client Ref: **PO272595**
Project:
Received: 20/11/2017
Reported: 09/02/2018

Samples: 4
First Sample: 1009 (SED) 14-Nov-17 16:20
Last Sample: 1012 (SED) 16-Nov-17 14:20
Pages: 4

FINAL REPORT

Notes

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Authorised:

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James Amos
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Project
Reported 09/02/2018
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ANALYTICAL REPORT

Sample Ident	*pH*	*Chloride*	*Total Petroleum Hydrocarbon**	*Total Phenols**	*Sulphide**	*As*
Units	*SU*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*
1009 (SED) 14-Nov-17 16:20	6.5	54.0	<1.0	<0.002	<0.10	0.014
1010 (SED) 14-Nov-17 16:20	6.3	51.2	<1.0	<0.002	<0.10	0.012
1011 (SED) 15-Nov-17 12:25	6.4	21.9	<1.0	<0.002	<0.10	<0.001
1012 (SED) 16-Nov-17 14:20	6.0	31.3	<1.0	<0.002	<0.10	<0.001

Method	*pH in water*	*Chloride*	*troleum Hydro*	*Phenols*	*Sulphide*	*D_Hydrides*
Detection Limit	-	0.20	1.0	0.002	0.10	0.001
Method Uncertainity	±0.012	±0.17	-	-	-	±0.0008

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	*Hg*	*Cd*	*Cr*	*Cu*	*Pb*	*Ni*
Units	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*
1009 (SED) 14-Nov-17 16:20	<0.001	<0.001	0.65	0.43	<0.005	0.26
1010 (SED) 14-Nov-17 16:20	<0.001	<0.001	0.47	0.28	<0.005	0.24
1011 (SED) 15-Nov-17 12:25	<0.001	<0.001	<0.001	<0.001	<0.005	<0.004
1012 (SED) 16-Nov-17 14:20	<0.001	<0.001	<0.001	<0.001	<0.005	0.063
Method	*D_Hydrides*	*)issolved Metal*	*Dissolved Metal*	*Dissolved Metal*	*Dissolved Metal*	*Dissolved Metals*
Detection Limit	*0.001*	*0.001*	*0.001*	*0.001*	*0.005*	*0.004*
Method Uncertainity	*±0.0015*	*±0.044*	*±0.027*	*±0.016*	*±0.012*	*±0.023*

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F to follow*

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ANALYTICAL REPORT

Sample Ident	*Ag*	*V*	*Zn*
Units	*mg/Kg*	*mg/Kg*	*mg/Kg*
1009 (SED) 14-Nov-17 16:20	<0.01	0.86	1.5
1010 (SED) 14-Nov-17 16:20	<0.01	0.67	1.5
1011 (SED) 15-Nov-17 12:25	<0.01	<0.001	<0.001
1012 (SED) 16-Nov-17 14:20	<0.01	<0.001	0.21

Method	*)issolved Metal*	*)issolved Metal*	*)issolved Metals*
Detection Limit	*0.01*	*0.001*	*0.001*
Method Uncertainity	*±0.001*	*±0.026*	*±0.040*

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

END OF REPORT

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Testing Laboratory
T0337

Report number: EL170289

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Lab Ref: EL170289
Client Ref: **PO272595**
Project:
Received: 23/11/2017
Reported: 09/02/2018

Samples: 1
First Sample: 1013 (SED) 17-Nov-17 13:30
Last Sample:
Pages: 4

FINAL REPORT

Notes

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Lab Ref EL170289
Client Ref **PO272595**
Project
Reported 09/02/2018
Status Final
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ANALYTICAL REPORT

Sample Ident	pH	Chloride	Total Petroleum Hydrocarbon*	Total Phenols *	Sulphide*	As
Units	SU	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1013 (SED) 17-Nov-17 13:30	7.2	30.5	<1.0	<0.002	<0.10	<0.001

Method	pH in water	Chloride	troleum Hydro	Phenols	Sulphide	D_Hydrides
Detection Limit	-	0.20	1.0	0.002	0.10	0.001
Method Uncertainity	±0.012	±0.17	-	-	-	±0.0008

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

*non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow

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Lab Ref	EL170289
Client Ref	**PO272595**
Project	
Reported	09/02/2018
Status	Final
Page	3 of 4

ANALYTICAL REPORT

Sample Ident	*Hg*	*Cd*	*Cr*	*Cu*	*Pb*	*Ni*
Units	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*	*mg/Kg*
1013 (SED) 17-Nov-17 13:30	<0.001	<0.001	<0.001	<0.001	<0.005	<0.004

Method	*D_Hydrides*	*)issolved Metal*	*)issolved Metal*	*)issolved Metal*	*)issolved Metal*	*)issolved Metals*
Detection Limit	*0.001*	*0.001*	*0.001*	*0.001*	*0.005*	*0.004*
Method Uncertainity	*±0.0015*	*±0.044*	*±0.027*	*±0.016*	*±0.012*	*±0.023*

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	*Ag*	*V*	*Zn*
Units	*mg/Kg*	*mg/Kg*	*mg/Kg*
1013 (SED) 17-Nov-17 13:30	<0.01	0.086	0.64

Method	*)issolved Metal*	*)issolved Metal*	*)issolved Metals*
Detection Limit	*0.01*	*0.001*	*0.001*
Method Uncertainity	*±0.001*	*±0.026*	*±0.040*

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

**non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow*

END OF REPORT

ATTACHMENT A6.16 QUALITY CONTROL PROCEDURES

Introduction

Several quality control procedures were implemented to ensure that accurate and reliable data were collected, including:

- duplicate water and sediment samples
- daily calibration checks on the Aquaprobe multiparameter probe
- single-use bailer for water sampling
- using nitrile gloves while sampling water and sediment
- standard operating procedures.

Duplicate Water and Sediment Samples

A single duplicate water and sediment sample were taken to check the reproducibility of the analytical results. Table Att6.16-1 lists the quality control samples taken.

Table Att6.16-1 Quality Control Samples

Sample Medium	Sample ID	Sample Type	Analysis Suite
Water	1010	Duplicate of sample 1009	Laboratory measurements: BOD, chloride, TPH, TSS
Sediment	1010-SED	Duplicate of sample 1009-SED	Laboratory measurements: pH, chloride, TPH, total phenols, sulphides, metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, vanadium and zinc)

The results of the quality control samples are presented in Table Att6.16-2. Duplicate data are presented along with those of the original sample for direct comparison.

Table Att6.16-2 Quality Control Data

Parameter	Water		Sediment	
	Duplicate	**Original**	**Duplicate**	**Original**
Sample date	**14/11/17**	**14/11/17**	**14/11/17**	**14/11/17**
Time	**15:34**	**15:34**	**16:20**	**16:20**
Sample no.	**1010**	**1009**	**1010-SED**	**1009-SED**
Sample location	**Kibale River KP274. Upstream side of the Masaka–Mutukula road bridge 4.7 km downstream of the pipeline crossing**		**Kibale River KP274. Downstream side of the Masaka–Mutukula road bridge 4.7 km downstream of the pipeline crossing**	
Water				
TSS (mg/L)	11.9	11.5		
Chloride (mg/L)	49.1	47.6		
BOD (mg/L)	19.0	60.0		
TPH (mg/L)	<1.0	<1.0		
Sediment				
pH			6.3	6.5
Chloride (mg/kg)			51.2	54.0
TPH (mg/kg)			<1.0	<1.0
Total phenols (mg/kg)			<0.002	<0.002
Sulphides (mg/kg)			<0.10	<0.10
Arsenic (by hydride) (mg/kg)			0.012	0.014
Cadmium (mg/kg)			<0.001	<0.001
Chromium (mg/kg)			0.468	0.654
Copper (mg/kg)			0.283	0.425
Lead (mg/kg)			<0.005	<0.005
Mercury (by cold vapour) (mg/kg)			<0.001	<0.001
Nickel (mg/kg)			0.242	0.257
Silver (mg/kg)			<0.01	<0.01
Vanadium (mg/kg)			0.674	0.859
Zinc (mg/kg)			1.496	1.471

With the exception of the BOD results for water, the results for the water and sediment duplicates show close agreement with those of the original samples. It is concluded that, with the exception of BOD, the laboratory results are reproducible. BOD analyses are prone

to variation when there is an appreciable transit time to the laboratory, as is the case here: the samples are taken in Uganda and the laboratory is in Tanzania.

Daily Calibration Checks

The calibration of the multiparameter Aquaprobe was checked at the start of each sampling day to maximise the accuracy of the results.

Single-Use Bailers

Using single-use bailers prevents cross-contamination of samples. Where possible, single-use bailers (clean 1-L sample bottles) were used to collect water from the river. These bottles were marked and not used again during the survey.

Where use of single-use bailers was impractical, a bucket and a rope were used for collecting water. Before sample collection, the bucket was washed thoroughly with the water to be sampled, thereby reducing the risk of cross contamination.

Nitrile Gloves

The sampling team wore nitrile gloves during sampling to reduce the risk of contaminating samples. The gloves were discarded after use at each site.

Standard Operating Procedures

Standard operating procedures were provided for the samplers to following during training and during the survey:

- surface water hydrochemical sampling
- Aquaread multiparameter probe calibration
- surface water field parameters
- preparation of CHROMagar ECC broth (culture medium for microbiological testing)
- river sediment sampling.

Using standard procedures ensured, as far as possible, uniformity in calibration, sampling and measurement so that any differences in results were due to the water or sediment sampled and not to the sampling or measurement technique.

ATTACHMENT A6.17 PIPELINE WATERCOURSE CROSSING LOCATIONS: AN ASSESSMENT OF EXISTING CONTAMINATION AND SENSITIVITY TO POTENTIAL CHANGE IN WATER QUALITY

KP	Watercourse at Pipeline Crossing	Flow Regime (Permanent or Ephemeral)	Protected Status of Catchment Area	Land Cover or Use	Wetlands	Settlement	Use of Watercourse Upstream of Crossing	Users or VECs at Crossing and Downstream	Assessment of Existing Contamination Concerns	Baseline Sensitivity of Watercourse to Change in Water Quality	Rationale for Ranking
15.4	Upper Wambabya River	Permanent	Contains minor forested area (reserve?)	Rainfed cultivation	Swamp vegetation along floodplain	Dense dispersed and nucleated rural settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock Kabalega hydroelectric power station Lake Albert	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with rainfed cultivation, some plantation agriculture with swamp vegetation along floodplain
36.5	Kafu River	Permanent	Unprotected	Rainfed cultivation	Swamp vegetation along floodplain	Dense dispersed and nucleated rural settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock Victoria Nile Lake Albert	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with rainfed cultivation with swamp vegetation along floodplain
54.7	Kafu tributary 1	Permanent	Unprotected	Rainfed cultivation	Swamp vegetation along floodplain	Dense dispersed and nucleated rural settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock Kafu River	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with rainfed cultivation with swamp vegetation along floodplain
69.5	Kafu tributary 2	Permanent	Unprotected	Rainfed cultivation	Swamp vegetation along floodplain	Dense dispersed and nucleated rural settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock Kafu River	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with rainfed cultivation with swamp vegetation along floodplain
105	Nabakazi tributary 1	Permanent	Unprotected	Rainfed cultivation	Swamp vegetation along floodplain	Dense dispersed and nucleated rural settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock Nabakazi River	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with rainfed cultivation with swamp vegetation along floodplain
112.6	Nabakazi tributary 2	Permanent	Unprotected	Rainfed cultivation	Swamp vegetation along floodplain	Dense dispersed and nucleated rural settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock Nabakazi River	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with rainfed cultivation with swamp vegetation along floodplain
147.5	Nabakazi River	Permanent	Unprotected	Some rainfed cultivation Wooded grassland	Along floodplain	Dispersed and nucleated rural settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock Katonga River	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with rainfed cultivation with swamp vegetation along floodplains

KP	Watercourse at Pipeline Crossing	Flow Regime (Permanent or Ephemeral)	Protected Status of Catchment Area	Land Cover or Use	Wetlands	Settlement	Use of Watercourse Upstream of Crossing	Users or VECs at Crossing and Downstream	Assessment of Existing Contamination Concerns	Baseline Sensitivity of Watercourse to Change in Water Quality	Rationale for Ranking
164.7	Katonga River	Permanent	Contains two forest reserves	Some rainfed cultivation Wooded grassland	Along floodplain	Dispersed rural settlement Some nucleated settlement	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock. Wetlands on margin of Lake Victoria Lake Victoria	Elevated total coliforms and *E. coli* Presence of PAHs	High (4)	Rural catchment, sparsely settled with rainfed cultivation with swamp vegetation along floodplains. Only minor contamination from vehicles collecting water
274.1	Kibale River	Permanent	Unprotected	Wooded grassland Lakes	Along floodplain	Dispersed rural settlement in river valleys and along roads	Livestock watering and small-scale collection of domestic water supplies	Communities along river Livestock. Wetlands on margin of Lake Victoria Lake Victoria	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with lakes and swamp vegetation along floodplains
289.3	Jemakunya River	Permanent	Unprotected	Wooded grassland Grassland	None upstream of crossing	Dispersed rural settlement in river valleys and along roads	Livestock watering and small-scale collection of domestic water supplies	Livestock Floodplain and wetlands on margin of Lake Victoria Lake Victoria	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled river valleys

ATTACHMENT A6.18 PROJECT ROAD WATERCOURSE CROSSINGS: AN ASSESSMENT OF EXISTING CONTAMINATION AND SENSITIVITY TO POTENTIAL CHANGE IN WATER QUALITY

Pipeline KP	Road	Location (Road KP)[1]	Protected Status of Catchment Area	Land Cover or Use	Wetlands	Settlement	Use of Watercourse Upstream of Crossing	Users or VECs at Crossing and Downstream	Assessment of Existing Contamination Concerns	Baseline Sensitivity of Watercourse to Change in Water Quality	Rationale for Ranking
0	PAR–PS1	2.5	Unprotected	Rainfed subsistence cultivation Livestock rearing	Absent	Sparse dispersed rural settlement	Livestock watering. Manual watering of fields during periods of flow	Collection of water for domestic use Rainfed cultivation Livestock	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow
		4.8	Unprotected	Rainfed subsistence cultivation Livestock rearing	Absent	Sparse dispersed rural settlement	Livestock watering. Manual watering of fields during periods of flow	Collection of water for domestic use Rainfed cultivation Livestock	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow
185	ERU–PS2	0.5	Unprotected	Rainfed cultivation	Absent	Sparse dispersed rural settlement	None	Livestock watering Collection of water for domestic use	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with livestock rearing. Water quality likely to be very good during periods of flow

NOTES: [1]Distance from start of road. The start of road is assumed the junction with a national or district road.

ATTACHMENT A6.19 PROJECT CONSTRUCTION FACILITIES AND ABOVEGROUND INSTALLATIONS: AN ASSESSMENT OF EXISTING CONTAMINATION IN NEARBY WATERCOURSES AND SENSITIVITY TO POTENTIAL CHANGE IN WATER QUALITY

Pipeline KP	Project Facility	Watercourse/Distance from Facility (m)	Protected Status of Catchment Area	Land Cover or Use	Wetlands	Settlement	Use of Watercourse Upstream of Site	Users or VECs of Watercourse Downstream of Site Drainage	Assessment of Existing Contamination Concerns	Baseline Sensitivity of Watercourse to Change in Water Quality	Rationale for Ranking
0	PS1	Ephemeral watercourse (650 m east of site)	Unprotected	Rainfed cultivation	Absent	Dense dispersed rural settlement	Collection of water for domestic use and livestock watering during periods of flow	Rural communities Livestock	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with subsistence cultivation and livestock rearing. Water quality likely to be reasonably good during periods of flow
		Ephemeral watercourse (200 m south of site)	Unprotected	Rainfed cultivation	Absent	Dense dispersed rural settlement	Collection of water for domestic use and livestock watering during periods of flow	Rural communities Livestock	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with subsistence cultivation and livestock rearing. Water quality likely to be reasonably good during periods of flow
		Ephemeral watercourse (300 m northwest of site)	Unprotected	Rainfed cultivation	Absent	Dense dispersed rural settlement	Collection of water for domestic use and livestock watering during periods of flow	Rural communities Livestock	Elevated total coliforms and *E. coli*	Moderate (3)	Rural catchment, densely settled with subsistence cultivation and livestock rearing. Water quality likely to be reasonably good during periods of flow

Pipeline KP	Project Facility	Watercourse/Distance from Facility (m)	Protected Status of Catchment Area	Land Cover or Use	Wetlands	Settlement	Use of Watercourse Upstream of Site	Users or VECs of Watercourse Downstream of Site Drainage	Assessment of Existing Contamination Concerns	Baseline Sensitivity of Watercourse to Change in Water Quality	Rationale for Ranking
40	MCPY1	Ephemeral floodplain (70 m east of site)	Unprotected	Wooded grassland	Seasonal floodplain	Sparse dispersed rural settlement	Livestock grazing and watering	Livestock	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with subsistence cultivation and livestock rearing. Water quality likely to be very good during periods of flow
122	MCPY2	Ephemeral watercourse (400 m north of site)	Unprotected	Rainfed cultivation and wooded scrub	Absent	Sparse dispersed rural settlement	None	Livestock	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with livestock rearing. Water quality likely to be very good during periods of flow
		Ephemeral watercourse (700 m south of site)	Unprotected	Rainfed cultivation and wooded scrub	Absent	Sparse dispersed rural settlement	None	Livestock	Elevated total coliforms and *E. coli*		
185	PS2	Ephemeral watercourse (70 m south of site)	Unprotected	Scrub	Absent	Sparse dispersed rural settlement	Livestock watering	Livestock	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with livestock rearing. Water quality likely to be very good during periods of flow
191	MCPY3	Ephemeral watercourse (300 m north of site)	Unprotected	Scrub	Absent	Sparse dispersed rural settlement	None	Livestock	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with livestock rearing. Water quality likely to be very good during periods of flow
		Ephemeral watercourse (500 m west of site)	Unprotected	Scrub	Absent	Sparse dispersed rural settlement	None	Livestock	Elevated total coliforms and *E. coli*		
283	MCPY4	Ephemeral floodplain (400 m southeast of site)	Unprotected	Wooded grassland	Seasonal floodplain	Sparse dispersed rural settlement	Livestock watering	Livestock	Elevated total coliforms and *E. coli*	High (4)	Rural catchment, sparsely settled with livestock rearing. Water quality likely to be very good

ATTACHMENT A6.20 ASSESSMENT OF RELATIVE WATER SCARCITY FOR COMMUNITIES ALONG THE PIPELINE

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
0	Kayere village, 0.2 km west of pipeline route (Buseruka subcounty, Hoima district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water Surface water	Two boreholes (not functioning) Wambabya River Wambabya River	ND 1.3 km 1.3 km	Unreliable Reliable Reliable	None Microbiological Turbidity Microbiological Turbidity	High Moderate Moderate	Both boreholes are not functioning. One of the boreholes had not functioned for seven years. “It [water] is sufficient…they have made a dam (a hole in the ground next to the river). However, cattle also drink from the river so they get illnesses such as worms from the water.”	High
0	Kibaale T/C borehole, 4.4 km west of KP0 (Hoima district)	ND	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole (not functioning) Roadside pond	ND 1 km	Unreliable Unreliable	High iron concentration Microbiological Turbidity	Moderate High	Borehole DWD 30204 not operating; sign of iron precipitates nearby.	High
1.5	Katooke village, 1.9 km east of pipeline route (Buseruka subcounty, Hoima district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water Surface water	Four shallow wells One public borehole Wambabya River Wambabya River	0–1 km 0.1 km 2.5 km 2.5 km	Reliable Reliable Reliable	None None Microbiological Turbidity	High High Moderate Moderate	Water sources are “sufficient to meet local demand.”	Low
0–35	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow wells Boreholes with hand pumps Streams and floodplains	ND ND 0–1 km	ND ND Unreliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	ND	Moderate

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
7	Kyakatemba borehole, 1.4 km west of pipeline route (Hoima district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Streams	0.2 km 0.3 km	Reliable Unreliable	None? Microbiological Turbidity	High Moderate	Operating borehole DWD33457; very clear water	Low
10	Kihangi borehole, 1.5 km west of pipeline route (Hoima district)	Nucleated	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Streams	ND 0.3–0.7 km	Reliable Unreliable	None? Microbiological Turbidity	High Moderate	DWD 51337	Low
24	Bulimya borehole, 0.9 km east of pipeline route. (Hoima district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Stream	0.2 km 0.8 km	Reliable Unreliable	None? Microbiological Turbidity	High Moderate	Borehole operating at time of visit	Low
29–29.5	Kakende village, 0.6 km east of pipeline route (Kiziranfumbi subcounty, Hoima district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Several unprotected shallow wells Two boreholes Two rivers	ND ND 0.2–1.6 km	Unreliable Unreliable Unreliable	Microbiological None? Microbiological Turbidity	High High Moderate	Water was described as “not good” – unreliable in cleanliness (possibly due to animals sharing it). However, they said some of the boreholes have totally dried up and others are seasonal	High
29.5–39.5	Virtually uninhabited												
35	Kiryanga borehole, 0.3 km southwest of pipeline route (Hoima district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Kafu River	0.3–0.5 km 0.8 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	Borehole DWD35528 operating at time of visit	Low
35	Hanga borehole, 1.8 km northeast of pipeline route (Hoima district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Kafu River	0.2 km 1 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	Borehole DWD37907 operating at time of visit	Low

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
39.5	Kisenyi village, 1 km northeast of pipeline route (Kisiita subcounty, Kakumiro district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One shallow well One borehole with hand pump Kafu River Tributary of Kafu Floodplain	ND ND 2.7 km 1.5 km 2.7 km	Unreliable Unreliable Unreliable Unreliable Unreliable	Microbiological None? Microbiological Microbiological Microbiological	High High Moderate Moderate Moderate	ND	High
39.5–59	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow wells Boreholes with hand pumps Watercourses and floodplains	ND ND 0–1 km	Unreliable Variable Unreliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	ND	Moderate
39	Kasambya borehole, 0.15 km northeast of pipeline route (Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Kafu River	0.6–0.9 km 3.5 km	ND Unreliable	ND Microbiological Turbidity	ND Moderate	Borehole not operating	Moderate
39.5	Our Lady of Fatima and Nyamigamba boreholes, 1.3 km southwest of pipeline route (Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Boreholes with hand pumps Kafu River	0.3 km 4.7 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	Our Lady of Fatima borehole DWD 58280 was operating at time of visit. Nyamigamba borehole DWD 35597 was not operating.	Low
45	Kitahemba borehole, 1.4 km northeast of pipeline route (Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Watercourse	0.3 km 2.2 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	Borehole DWD18609 was operating at time of visit.	Low

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
53.5	Kyenda 1 borehole, 1.2 km northeast of pipeline route (Mpasaana subcounty, Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Watercourse	0.8 km 0.8 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	ND	Low
55	Kyamajara borehole, 1 km southwest of pipeline route (Mpasaana subcounty, Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Watercourse	0.5 km 1 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	ND	Low
56	Kyenda 2 borehole, 2.4 km southwest of borehole route (Mpasaana subcounty, Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Watercourse	0.2 km 0.9 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	Borehole was operating at time of visit	Low
57	Kyajawe village, 1.5 km east of pipeline route (Mpasaana subcounty, Kakumiro district)	Nucleated	Yes	Rainfed cultivation Irrigated cultivation Livestock farming	Domestic Irrigation Livestock watering	Groundwater Surface water	Several community wells One borehole with hand pump Mabengere River and floodplain	0.5 km 0.5 km 1.7 km	Variable Reliable Reliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	Community wells dry up during the dry season. “People carry their water in jerry cans on bicycles and motorcycles to the fields”. Pumps and pipes are unavailable. “There are insufficient water points to draw water for animals.”	Moderate
59–63.5	Virtually uninhabited												
61	Buswabwera village, 0.2 km southwest of pipeline route (Mpasaana subcounty, Kakumiro district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water only	Mabengere and Balibona rivers	1.5 km	Reliable	Microbiological Turbidity	Moderate	ND	High

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
63.5–78	ND	Dispersed	No	Rainfed cultivation Irrigated cultivation Livestock farming	Domestic Irrigation Livestock watering	Groundwater Surface water	Unprotected wells Boreholes with hand pumps Watercourses and floodplains	ND ND	Variable Reliable Reliable	Microbiological None? Microbiological, Turbidity	High High Moderate	ND	Moderate
68	Nkooko trading centre, 3 km southwest of pipeline route (Nkooko subcounty, Kakumiro district)	Nucleated	Yes	Rainfed cultivation Irrigated cultivation Livestock farming	Domestic Irrigation Livestock watering	Groundwater Surface water Surface water	Several unprotected wells. Two boreholes with hand pumps Kanangalo River and floodplain	ND 1.2 km	Reliable Reliable Reliable	Microbiological None? Microbiological Turbidity	High High Moderate	“There is a farmer with small scale irrigation farming, using plastic water pipes and a generator for pumping water to crops in the gardens.” “Water sources are near our homes.”	Moderate
78–80.5	Virtually uninhabited												
80.5–103	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow wells Occasional boreholes with hand pumps Valley dams Watercourses and floodplains	ND ND ND ND	Unreliable Reliable Unreliable Unreliable	Microbiological None? Microbiological Turbidity Microbiological Turbidity	Moderate High Low Moderate	ND	High

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
82.5	Kisala West village, 1 km west of pipeline route (Gayaza subcounty, Kyankwanzi district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow well Watercourses and floodplains	ND 1.1 km	Unreliable Reliable	Microbiological Microbiological Turbidity	Moderate Moderate	ND	High
84	Nzoo village, 1.1 km east of pipeline route (Ntwetwe subcounty, Kyankwanzi district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering Livestock watering	Groundwater Surface water	Kayanja community well One public borehole One private borehole Bottled water (drinking) River Kitumbi–Kakomago floodplain	0–1 km 0–1 km ND 0–2 km 0.8 km	Reliable Reliable Reliable Reliable Reliable	Microbiological None None None Microbiological Turbidity	High High High High Moderate	Kayanja community well is reported to have poor water quality	Low
86	Nyondo village, (Butoloogo subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water only	Floodplains of Kanena and Nakasenyi rivers	1–2 km	Reliable	Microbiological Turbidity	Moderate	ND	High
103–108	Virtually uninhabited												
108–118	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow wells Occasional boreholes with hand pumps Valley dams Watercourses and floodplains	ND ND ND	Unreliable Reliable Unreliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	ND	High
111	Kabulasoke village, 0.5 km east of pipeline route (Maduddu subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One shallow well Three boreholes Several valley dams Floodplain of Kiyiyi stream	ND ND ND 3.2 km	Unreliable Reliable Unreliable Reliable	Microbiological None? Microbiological Microbiological	Moderate High Moderate Moderate	Water is carried 3.2 km from floodplain to water crops during dry season (tiresome and time consuming)	Moderate

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
114	Kamusenene village, 1 km west of pipeline route (Kitenga subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One public borehole (not functioning) Three private boreholes Valley dam Floodplain of Kiyiyi and Serunjabi streams	ND ND ND 1–2 km	ND ND ND Reliable	ND ND Microbiological Turbidity Microbiological Turbidity	High High Moderate Moderate	"The distances are far from the area." "Population is high." "The well is shallow and should be extended (deepened)."	High
118–121	Virtually uninhabited												
121–146.5	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow wells Occasional boreholes with hand pumps Valley dams Watercourses and floodplains	ND ND ND ND	Unreliable Reliable Unreliable Unreliable	Microbiological None? Microbiological, Turbidity Microbiological Turbidity	Moderate High Low Moderate	ND	High
124.5	Kagoma village, 0.3 km west of pipeline route (Kitenga subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Many unprotected wells Three valley dams	ND ND	Unreliable Unreliable	Microbiological Microbiological Turbidity	Moderate Low	There are reported to be "many unprotected wells." "There are sources of water because of drought within the cattle corridor." "Over population within the area." "There is no public dam in Kagoma."	Moderate

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
126	Kyenda village, 1.2 km east of pipeline route (Kitenga subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Many unprotected wells One borehole (not functioning Two boreholes (functioning) Piped groundwater scheme with standpipes (NWSC[1]) Three valley dams	ND ND 0.6–1.5 km ND ND	Unreliable Unreliable Reliable Reliable Unreliable	Microbiological None? None? None? Microbiological Turbidity	Moderate High High High Low	Sources of water are reported to be “Insufficient: dry up during the dry season and used by humans and animals.” One of Kyenda’s boreholes is DWD17049.	Moderate
128.5	Mujjunwa	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Mujjunwa borehole and hand pump ND	0.5 km ND	Reliable ND	None? ND	High ND	Borehole DWD51675 was operating at time of visit.	Low
146.5–184	Virtually uninhabited												
160	Kyengera village, 0.13 km east of pipeline route (Maddu subcounty, Gomba district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water Surface water	Two valley dams Katonga River	0.8 km 4.2	Unreliable Reliable	Microbiological Turbidity Microbiological Turbidity	Low Moderate	“People share valley dams with animals.” Valley dams dry up during dry season. Water quality is poor. “Cattle keepers are forced to take the animals to the government dam which is ever difficult.”	High
182.5	Mabale village, 0.13 km east of pipeline route (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	Valley dams	1–2 km	Unreliable	Microbiological Turbidity	Low	“People share valley dams with animals.” Valley dams dry up during dry season. Water quality is poor.	High

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
184–215.5	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow wells Occasional boreholes with hand pumps Valley dams Watercourses and floodplains	ND ND ND ND	Unreliable Reliable Unreliable Unreliable	Microbiological None? Microbiological Turbidity Microbiological Turbidity	Moderate High Low Moderate	ND	High
184.5	Njaza village, 0.8 km southwest of pipeline route (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	Three valley dams	1–2 km	Unreliable	Microbiological Turbidity	Low	People share valley dams with animals. Valley dams dry up during dry season Water quality is poor Borehole DWD 6664 exists at Njaza	High
184.5	Serinya village, 1.5 km northeast of pipeline route (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Domestic Livestock watering	Groundwater Surface water	One borehole (not functioning) Two valley dams	ND 1–2 km	Unreliable Unreliable	None? Microbiological Turbidity	High Low	The only borehole is not functioning People share valley dams with animals. Valley dams dry up during dry season Water quality is poor	High
186.5	Kagango village, 1.5 km northeast of pipeline route (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	One communal valley dam One private valley dam	ND	Unreliable	Microbiological Turbidity	Low	People share valley dams with animals. Valley dams dry up during dry season Water quality is poor	High

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
189	Nsambya village, 1.5 km northeast of pipeline route (Mijwala subcounty, Sembabule district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Domestic Livestock watering	Groundwater Surface water	One borehole (not functioning) Two valley dams	ND ND	Unreliable Unreliable	None? Microbiological Turbidity	High Low	The only borehole is not functioning People share valley dams with animals. Valley dams dry up during dry season Water quality is poor	High
192	Muyenje village, 0.8 km southwest of pipeline route (Mijwala subcounty, Sembabule district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater	Six unprotected shallow wells One borehole with hand pump (not functioning	ND	Unreliable	Microbiological	Moderate High	The borehole WDD 6337 with hand pump was not functioning at the time of survey	High
194	Miti village, 0.3 km east of pipeline route (Mijwala subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	Valley dams	1–2 km	Unreliable	Microbiological Turbidity	Low	People share valley dams with animals. Valley dams dry up during dry season Water quality is poor “The swamp is 3 miles (5 km) outside Miti and we must walk there to access it. The swamp is shared with livestock, so it is not safe, but we have no other choice.”	High
195	Muwala 2 borehole, 0.05 km east of pipeline route, near Miti village (Mijwala subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater	Borehole with hand pump	ND	Variable	None?	High	No information on functioning of Muwala 2 borehole WDD 6331	Moderate
199.5	Muwala 1 borehole, 2.3 km west of pipeline route (Mijwala subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater	Borehole with hand pump	ND	Variable	None?	High	No information on functioning of Muwala 1 borehole WDD 6338	Moderate
215.5–218.5	Virtually uninhabited												

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
218.5–249	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Unprotected shallow wells Occasional boreholes with hand pumps Valley dams Watercourses and floodplains	ND ND ND ND	Unreliable Reliable Unreliable Unreliable	Microbiological None? Microbiological Turbidity Microbiological Turbidity	Moderate High Low Moderate	ND	High
225	Kinvunikidde village, 0.4 km east of pipeline route (Lwengo subcounty, Lwengo district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater	Seven unprotected shallow wells Two boreholes with hand pumps (not functioning)	ND	Unreliable	Microbiological	Moderate	Two boreholes with hand pumps are not functioning “There is only one borehole which also dries at times and water from the pond is shared by both human beings and livestock.”	High
240	Bukulula village, 1 km west of pipeline route (Ngadwe subcounty, Lwengo district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Four unprotected shallow wells One borehole with hand pump (not functioning) Kyanamirira stream and floodplain	ND ND 0.7 km	Unreliable Unreliable Unreliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	One borehole with hand pump was not functioning at time of survey	Moderate
247.5	Kibonzi village, 1.3 km east of pipeline route (Nabigasa subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One unprotected shallow well Two private boreholes with hand pumps Lwenjovu stream and floodplain	ND ND 0.5 km	Unreliable Unreliable Unreliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	ND	High

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
249.5	Butiti village, 2.5 km west of pipeline route (Lwanda subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Four shallow wells Three boreholes with hand pumps Butiti–Kamulabba stream	ND ND 0.3 km	Unreliable Unreliable Unreliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	“At times the borehole dries and then people resort to fetching water in the same area where livestock drinks.”	High
249–252.5	Virtually uninhabited												
252.5–271	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Shallow wells Valley dams Streams and floodplains	ND ND	Variable Unreliable	Microbiological Microbiological Turbidity	Moderate Moderate	ND	Moderate
270.5	Ssanje Katwe village, 1.9 km east of pipeline route (Kasasa subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Three unprotected shallow wells Seven boreholes with hand pumps One NWSC[1] water storage tank Kawenda and Bukoola streams and floodplains	ND ND ND 2 km	Variable Reliable Reliable Unreliable	Microbiological None? None? Microbiological Turbidity	Moderate High High Moderate	“There is not enough of a supply. There are no specific months when it is a problem, but there is not enough water.” A borehole at Ssanje was operating at time of survey	Low
271.5	Lwemisege village, 1.7 km west of pipeline route (Kifamba subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Seven boreholes with hand pumps One NWSC[1] water storage tank (not functioning) Lutemye and Bukoola ephemeral streams Kibale River	ND ND 1.5 km 2.3 km	Variable Unreliable Unreliable Reliable	None? None? Microbiological Turbidity Microbiological Turbidity	High Moderate Moderate Moderate	“Supply is reliable for the most part as water always available in the River Kibale.”	Low
271–277	Virtually uninhabited												

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
277–288	ND	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Shallow wells Valley dams Streams and floodplains	ND ND	Variable Unreliable	Microbiological Microbiological Turbidity	Moderate Moderate	ND	Moderate
284.5	Kabonera village, 0.4 km east of pipeline route (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Shallow well Borehole Jemakunya River and floodplain	ND ND 1.9 km	Variable Variable Reliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	Borehole was functioning at time of survey. Borehole was well maintained “Water quantity is insufficient when the borehole breaks down.”	Moderate
287.5	Lukoma village, 0.2 km east of pipeline route (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One unprotected shallow well One shallow well with hand pump One borehole with hand pump Jemakunya River and floodplain	ND ND ND 0.8 km	Variable Variable Reliable Reliable	Microbiological None? None? Microbiological, Turbidity	Moderate High High Moderate	“Lack of water is one of the main challenges in the village. This is due to existence of only two watering points and increased number of nomadic pastoralists in the area.”	Moderate
290	Lukulavu village, 1.0 km west of pipeline route (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One unprotected shallow well Three boreholes with hand pump Built watering holes (ponds) Jemakunya River and floodplain	ND ND ND 2.1 km	Variable Variable Unreliable Reliable	Microbiological None? Microbiological Turbidity Microbiological Turbidity	Moderate High Low Moderate	Two of the three boreholes were functional at the time of survey. “Water supply is sufficient however in some dry seasons water dries up. There are few water points in the village.”	Low
288–296	Virtually uninhabited												

KP	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-related Concerns and Observations	Relative Water Scarcity (Low, Moderate, High)
296	Mutukula township (border town), 1 km west of pipeline route (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation	Domestic	Groundwater	Several unprotected shallow wells	0–0.5 km	Reliable	Microbiological	Moderate	Drinking water supplies in Mutukula are reported to be “sufficient.”	Low
							Several boreholes with hand pumps	0–0.5 km	Reliable	None?	High		
							Piped water scheme with standpipes		Unreliable	None?	High		
				Irrigated cultivation	Irrigation	Groundwater	Shallow wells	ND	ND	None?	Moderate	Pastoralists’ ponds are prone to drying up during dry season	
				Livestock farming	Livestock watering	Surface water	Built watering holes (ponds)	ND	Unreliable	Microbiological Turbidity	Low		

NOTES: [1]NWSC – National Water and Sewerage Corporation.

ATTACHMENT A6.21 ASSESSMENT OF RELATIVE WATER SCARCITY FOR COMMUNITIES NEAR PROJECT ROADS

Pipeline KP or Project Road ID	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-Related Concerns or Observations	Relative Water Scarcity (Low, Moderate, High)
KP0 PAR–PS1	Kayere village, 0.7 km northwest of Road KP5.7 at PS1 (Buseruka subcounty, Hoima district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water Surface water	Two boreholes (not functioning) Wambabya River Wambabya River	ND 1.3 km 1.3 km	Unreliable Reliable Reliable	None Microbiological Turbidity Microbiological Turbidity	High Moderate Moderate	Both boreholes are not functioning. One of the boreholes has not functioned for seven years “It [water] is sufficient…they have made a dam (a hole in the ground next to the river). However, cattle also drink from the river, so they get illnesses such as worms from the water.”	High
KP40 TAR–MCPY1	Kasambya borehole, 0.15 km northeast of pipeline route (Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Kafu River	0.6–0.9 km 3.5 km	ND Unreliable	ND Microbiological Turbidity	ND Moderate	ND	Moderate
	Kisenyi village, 1 km northeast of pipeline route (Kisiita subcounty, Kakumiro district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One shallow well One borehole with hand pump Kafu River Tributary of Kafu Floodplain	ND ND 2.7 km 1.5 km 2.7 km	Unreliable Unreliable Unreliable Unreliable Unreliable	Microbiological None? Microbiological Microbiological Microbiological	High High Moderate Moderate Moderate	ND	High
	Our Lady of Fatima and Nyamigamba boreholes, 1.3 km southwest of pipeline route (Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Kafu River	0.3 km 4.7 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	Our Lady of Fatima borehole was operating at time of visit. Nyamigamba borehole ND	Low

Pipeline KP or Project Road ID	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-Related Concerns or Observations	Relative Water Scarcity (Low, Moderate, High)
KP125 TAR–MCPY2	Kyenda borehole, 0.8 km west of TAR–MCPY2 and Mujjunwa borehole, 1.9 km southwest of TAR–MCPY2	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Mujjunwa borehole and hand pump ND	0.5 km ND	Reliable ND	None? ND	High ND	Borehole DWD51675 (Mujjunwa) was operating at time of visit	Low
KP126 ERU–MCPY2	Kagoma village, 1.7 km north of access road to RoW from MCPY2 (Kitenga subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Many unprotected wells Three valley dams	ND ND	Unreliable Unreliable	Microbiological Microbiological Turbidity	Moderate Low	There are reported to be “many unprotected wells.” “There are sources of water because of drought within the cattle corridor.” “Overpopulation within the area.” “There is no public dam in Kagoma.”	Moderate
	Kyenda village, at KP0 on access road to RoW from MCPY2 (Kitenga subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Many unprotected wells One borehole (not functioning Two boreholes (functioning) Piped groundwater scheme with standpipes (NWSC[1]) Three valley dams	ND ND 0.6–1.5 km ND ND	Unreliable Unreliable Reliable Reliable Unreliable	Microbiological None? None? None? Microbiological Turbidity	Moderate High High High Low	Sources of water are reported to be “Insufficient: dry up during the dry season and used by humans and animals.” One borehole “Kyenda” is 0.7 km north of Road KP0	Moderate
KP185 PAR–PS2	Njaza village, 0.6 km north of Road KP0 (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	Three valley dams	1–2 km	Unreliable	Microbiological Turbidity	Low	People share valley dams with animals. Valley dams dry up during dry season Water quality is poor Borehole WDD 6664? exists at Njaza, at KP0.5 along PAR–PS2	High

Pipeline KP or Project Road ID	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-Related Concerns or Observations	Relative Water Scarcity (Low, Moderate, High)
KP185 ERU–PS2	Serinya village, 1.2 km east of Road KP0 (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Domestic Livestock watering	Groundwater Surface water	One borehole (not functioning) Two valley dams	ND 1–2 km	Unreliable Unreliable	None? Microbiological Turbidity	High Low	The only borehole is not functioning People share valley dams with animals Valley dams dry up during dry season Water quality is poor	High
KP191.5 ERU–MCPY3	Nsambya village, 1.9 km northwest of Road KP0 (Mijwala subcounty, Sembabule district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Domestic Livestock watering	Groundwater Surface water	One borehole (not functioning) Two valley dams	ND ND	Unreliable Unreliable	None? Microbiological Turbidity	High Low	The only borehole is not functioning People share valley dams with animals Valley dams dry up during dry season Water quality is poor	High
KP191.5 TAR–MCPY3	Muyenje village, 1.2 km west of TAR–MCPY3 (Mijwala subcounty, Sembabule district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater	Six unprotected shallow wells One borehole with hand pump (not functioning)	ND	Unreliable	Microbiological	Moderate High	The borehole WDD 6337 with hand pump was not functioning at the time of survey	High
KP288 ERU–MCPY4	Lukoma village, 0.8 km north of RoW access from MCPY4 (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One unprotected shallow well One shallow well with hand pump One borehole with hand pump Jemakunya River and floodplain	ND ND ND 0.8 km	Variable Variable Reliable Reliable	Microbiological None? None? Microbiological Turbidity	Moderate High High Moderate	“Lack of water is one of the main challenges in the village. This is due to existence of only two watering points and increased number of nomadic pastoralists in the area.”	Moderate

ATTACHMENT A6.22 ASSESSMENT OF RELATIVE WATER SCARCITY FOR COMMUNITIES NEAR PROJECT CONSTRUCTION FACILITIES AND ABOVEGROUND INSTALLATIONS

Pipeline KP or Facility	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-Related Concerns or Observations	Relative Water Scarcity (Low, Moderate, High)
KP0 PS1	Kayere village, 0.5 km north of PS1 (Buseruka subcounty, Hoima district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water Surface water	Two boreholes (not functioning) Wambabya River Wambabya River	ND 1.3 km 1.3 km	Unreliable Reliable Reliable	None Microbiological Turbidity Microbiological Turbidity	High Moderate Moderate	Both boreholes are not functioning. One of the boreholes has not functioned for seven years “It [water] is sufficient…they have made a dam (a hole in the ground next to the river). However, cattle also drink from the river so they get illnesses such as worms from the water.”	High
	Katooke village, 1.7 km southwest of PS1 (Buseruka subcounty, Hoima district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water Surface water	Four shallow wells One public borehole Wambabya River Wambabya River	0–1 km 0.1 km 2.5 km 2.5 km	Reliable Reliable Reliable	None None Microbiological Turbidity	High High Moderate Moderate	Water sources are “sufficient to meet local demand.”	Low
KP40 MCPY1[1]	Kisenyi village, 1 km northeast of pipeline route (Kisiita subcounty, Kakumiro district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One shallow well One borehole with hand pump Kafu River Tributary of Kafu Floodplain	ND ND 2.7 km 1.5 km 2.7 km	Unreliable Unreliable Unreliable Unreliable Unreliable	Microbiological None? Microbiological Microbiological Microbiological	High High Moderate Moderate Moderate	ND	High
	Katikara village, 2 km south of MCPY1 (Kisiita subcounty, Kakumiro district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater	One borehole with hand pump One piped groundwater supply	ND ND	Reliable ND	None? ND	High ND	Borehole was operational at time of visit. Village is waiting commissioning of piped water scheme. No surface water sources were reported, but village is 5 km south of Kafu River, a likely source of water for livestock	Low

Pipeline KP or Facility	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-Related Concerns or Observations	Relative Water Scarcity (Low, Moderate, High)
	Kasambya borehole, 1.4 km northeast of MCPY1 (Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Kafu River	0.6–0.9 km 3.5 km	ND Unreliable	ND Microbiological Turbidity	ND Moderate	ND	Moderate
	Our Lady of Fatima and Nyamigamba boreholes, 0.2 km south of MCPY1 (Kakumiro district)	Dispersed	No	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Borehole with hand pump Kafu River	0.3 km 4.7 km	Variable Unreliable	None? Microbiological Turbidity	High Moderate	Our Lady of Fatima borehole was operating at time of visit. Nyamigamba borehole ND	Low
KP122 MCPY2	Kalembe village, 5 km southeast of MCPY2 (Kitenga subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One borehole (not functioning) Watering ponds Stream	ND ND	Unreliable Unreliable	None? Microbiological Turbidity	Moderate Low	The borehole was not functioning at time of visit. People “share watering ponds with animals.”	High
	Kyenda village, 3.6 km south of MCPY2 (Kitenga subcounty, Mubende district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Many unprotected wells One borehole (not functioning Two boreholes (functioning) Piped groundwater scheme with standpipes (NWSC[1]) Three valley dams	ND ND 0.6–1.5 km ND ND	Unreliable Unreliable Reliable Reliable Unreliable	Microbiological None? None? None? Microbiological Turbidity	Moderate High High High Low	Sources of water are reported to be “Insufficient: dry up during the dry season and used by humans and animals.”	Moderate

Pipeline KP or Facility	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-Related Concerns or Observations	Relative Water Scarcity (Low, Moderate, High)
KP185 PS2	Mabale village, 1.9 km northeast of PS2 (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	Valley dams	1–2 km	Unreliable	Microbiological Turbidity	Low	"People share valley dams with animals." Valley dams dry up during dry season Water quality is poor	High
	Njaza village, 0.8 km southwest of pipeline route (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	Three valley dams	1–2 km	Unreliable	Microbiological Turbidity	Low	People share valley dams with animals. Valley dams dry up during dry season Water quality is poor Borehole WDD 6664? exists at Njaza	High
	Serinya village, 1.5 km northeast of pipeline route (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Domestic Livestock watering	Groundwater Surface water	One borehole (not functioning) Two valley dams	ND 1–2 km	Unreliable Unreliable	None? Microbiological Turbidity	High Low	The only borehole is not functioning People share valley dams with animals Valley dams dry up during dry season Water quality is poor	High
	Kagango village, 1.5 km northeast of pipeline route (Lugusulu subcounty, Sembabule district)	Dispersed	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Surface water	One communal valley dam One private valley dam	ND	Unreliable	Microbiological Turbidity	Low	People share valley dams with animals Valley dams dry up during dry season Water quality is poor	High

Pipeline KP or Facility	Community Name[1]	Settlement Pattern (Nucleated or Dispersed)[2]	Social Baseline Survey?	Main Livelihood Activities	Water Uses	Groundwater or Surface Water	Possible Sources of Water	Average Distance to Water Source	Potential Reliability of Source	Likely Existing Contamination Concerns	Sensitivity to Contamination (Low, Moderate, High)	Water-Related Concerns or Observations	Relative Water Scarcity (Low, Moderate, High)
KP191 MCPY3[1]	Nsambya village, 2.2 km north of MCPY3 (Mijwala subcounty, Sembabule district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Domestic Livestock watering	Groundwater Surface water	One borehole (not functioning) Two valley dams	ND ND	Unreliable Unreliable	None? Microbiological Turbidity	High Low	The only borehole is not functioning People share valley dams with animals Valley dams dry up during dry season Water quality is poor	High
	Muyenje village, 1 km west of MCPY3 (Mijwala subcounty, Sembabule district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater	Six unprotected shallow wells One borehole with hand pump (not functioning	ND	Unreliable	Microbiological	Moderate High	The borehole WDD 6337 with hand pump was not functioning at the time of survey	High
KP283 MCPY4	Kabonera village, 1.8 km south of MCPY4 (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	Shallow well Borehole Jemakunya River and floodplain	ND ND 1.9 km	Variable Variable Reliable	Microbiological None? Microbiological Turbidity	Moderate High Moderate	Borehole was functioning at time of survey. Borehole was well maintained. “Water quantity is insufficient when the borehole breaks down.”	Moderate
	Lukoma village, 4.8 km southwest of MCPY4 (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One unprotected shallow well One shallow well with hand pump One borehole with hand pump Jemakunya River and floodplain	ND ND ND 0.8 km	Variable Variable Reliable Reliable	Microbiological None? None? Microbiological Turbidity	Moderate High High Moderate	“Lack of water is one of the main challenges in the village.” This is due to existence of only two watering points and increased number of nomadic pastoralists in the area.	Moderate
	Lukulavu village, 7.7 km southwest of MCPY4 (Kakuuto subcounty, Rakai district)	Nucleated	Yes	Rainfed cultivation Livestock farming	Domestic Livestock watering	Groundwater Surface water	One unprotected shallow well Three boreholes with hand pump Built watering holes (ponds) Jemakunya River and floodplain	ND ND ND 2.1 km	Variable Variable Unreliable Reliable	Microbiological None? Microbiological Turbidity Microbiological Turbidity	Moderate High Low Moderate	Two of the three boreholes were functional at the time of survey “Water supply is sufficient however in some dry seasons water dries up. There are few water points in the village.”	Low

NOTES: [1]NWSC = National Water and Sewerage Corporation

Appendix A7: Groundwater Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

Symbols and units	
%	percent
<	less than
>	greater than
°C	degrees Celsius
CFU/100 mL	colony forming units (unit of measurement of abundance of coliform bacteria) per 100 millilitres
µg/L	micrograms per litre (1 mg/L = 1000 µg/L)
µS/cm	microsiemens per centimetre: a unit of electrical conductivity
m^3	cubic metres
m^3/h	cubic metres per hour
mbgl	metre below ground level
mg/L	milligrams per litre
A	
AGI	aboveground installation
AOI	area of influence
aquifer	stratum or zone below the earth's surface capable of producing water for human use
B	
BOD	biochemical oxygen demand
C	
COD	chemical oxygen demand
D	
DIN	German Institute for Standardisation
DO	dissolved oxygen
DWD	Directorate of Water Development
DWO	district water officer
DWRM	Directorate of Water Resources Management
E	
E. coli	*Escherichia coli* (bacteria)
EACOP	East African Crude Oil Pipeline
EC	electrical conductivity (µS/cm)
ESIA	environmental and social impact assessment
F	
fractures	breaks in rocks due to intense folding or faulting

G	
GPS	global positioning system
K	
KP	kilometre point
L	
LDL	laboratory detection limits
M	
MCPY	main camp and pipe yard
MWE	Ministry of Water and Environment, Uganda
N	
NTU	nephelometric turbidity units
P	
PAH	polycyclic aromatic hydrocarbon
pH	numeric scale used to specify the acidity or basicity of an aqueous solution: pH1 is extremely acidic, pH14 is extremely alkaline and pH7 is neutral
PS	pumping station
S	
SGS	African Assay Laboratories Ltd, in Mwanza, Tanzania
SOP	standard operating procedures
T	
TDS	total dissolved solids (mg/L)
TPH	total petroleum hydrocarbons (mg/L)
TSS	total suspended solids.
turbidity	measure of relative clarity of a liquid. It is an optical characteristic of water and an expression of the amount of light that is scattered by material in the water when a light is shined through the water sample.
V	
VEC	valued environmental and social component
VOC	volatile organic compound or compounds
W	
WGS84	World Geodetic System, established in 1984. It is currently the reference system being used by global positioning systems
WHO	World Health Organization

A7 GROUNDWATER BASELINE REPORT

A7.1 Purpose and Scope of Report

This baseline report describes the groundwater:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions:
  - trend in condition and sensitivity to change
  - ecosystem services provided
- key considerations.

A7.2 Area of Influence and Study Area Boundaries

A7.2.1 Area of Influence Boundary

The groundwater AOI during the project construction and operational phase will encompass aquifers:

- affected by project groundwater abstraction
- that may be affected by planned discharges, spills and leaks of fuels and chemicals by the project.

During construction, the AOI will include aquifers crossed by the right-of-way and aquifers from which groundwater will be abstracted for the main camps and other construction activities. During the operational phase, the AOI will include aquifers crossed by the right-of-way.

A7.2.2 Study Area Boundaries

The study area and AOI boundaries are the same. The field baseline survey included sampling of existing water supply boreholes and wells within a 5-km corridor either side of the pipeline, a sufficient distance for assessing baseline groundwater quality.

A7.3 Methods

A7.3.1 Secondary Data

The groundwater baseline data included a review of secondary data sources from:

- the Ministry of Water and Environment (MWE)
- the national hydrocensus database
- the Directorate of Water Resources Management's (DWRM) national database
- geological maps and reports
- published scientific papers.

Meetings and discussions were also held with local consultants and the DWRM in Entebbe to obtain information on groundwater use and aquifer conditions.

The review provided the foundation for field survey design and identified aquifer characteristics, listed below:

- depth to the water table
- aquifer systems (location, thickness, aquifer conditions, sources of recharge, flow direction)
- aquifer vulnerability and sensitivity, existing contamination, number and type of users and abstraction points. This was evaluated by collecting data on the depth to the water table, the permeability of the soil or rock above the water table and the quality of groundwater in the aquifer(s).
- groundwater–surface water interaction, specific to surface water bodies that rely on groundwater such as shallow unconsolidated aquifers. This was achieved by studying hydrogeology maps, collecting data on surface waterbodies (depth, flow) and interpreting data to identify losing or gaining[1] streams.

The following baseline studies were also reviewed:

- the social and health baseline study, providing information on access to drinking water and water supply infrastructure that was used to inform the assessment of trend and sensitivity below
- the surface water baseline study, information on surface water and wetlands that was used to evaluate potential surface water and groundwater interactions. This study also includes an assessment of water scarcity.
- soil and geology baseline study, providing information on soil characteristics and geological formations that was used for determining aquifer lithology and aquifer vulnerability.

A7.3.2 Field Survey

The groundwater baseline survey was conducted during November 2017 to characterise the baseline groundwater quality by sampling existing abstraction boreholes and wells within a 5-km corridor either side of the pipeline.

Abstraction boreholes were identified from the DWRM national database and visited for sampling. Where boreholes were found abandoned (see Attachment A7.2), local authorities were consulted about alternative boreholes and were asked for permission to sample them. The existing local boreholes and wells were fitted with pumps that could not be removed to collect data on borehole depth and static water level.

Sampling was undertaken at a total of 11 locations during the field survey. These boreholes were sampled using the hand pump in place. Table A7.3-1 lists the boreholes visited and indicates whether they were sampled. Figure A7.3-1 indicates the locations of sampled boreholes.

[1]A losing stream is a stream or river that loses water as it flows downstream. The water infiltrates the ground recharging the local groundwater, because the water table is below the bottom of the stream channel. A gaining stream increases in water volume further downstream as it gains water from the local aquifer.

Table A7.3-1 Boreholes Included in the Field Survey

BH or Well ID, No. or Name	Sampling Date	Closest KP Along Pipeline	District	Sampling Location (WGS84 TM35E_S)		Borehole or Well Type	Current Use of Borehole or Well	Sample Number
				Easting	Northing			
Kabaale T/C DWD 30204	No sample collected	0	Hoima	282684	161428	Not operating	Domestic use	No sample collected
Kyakatemba DWD33457	24.11.2017	7	Hoima	289806	154950	Drinking well	Domestic use	GWU-007
Kihangi P.S. DWD 51337	No sample collected	10.5	Hoima	291417	152695	Not operating	Not used	No sample collected
Bulimya	24.11.2017	24	Hoima	301961	143179	Drinking well	Domestic use	GWU-008
Bulimya	No sample collected	30	Hoima	138535	305001	Not operating	Not used	No sample collected
Kiryanga DWD35528	25.11.2017	35	Kibaale	307294	133432	Drinking well	Domestic use	GWU-009
Hanga DWD37907	No sample collected	35	Kibaale	309116	134661	Not operating	Not used	No sample collected
Kitahemba DWD18609	25.11.2017	45.5	Kibaale	315316	127204	Drinking well	Domestic use	GWU-010
Kyamajara	25.11.2017	55.5	Kakumiro	319556	118009	Drinking well	Domestic use	GWU-011
Kisiita West B CD1464	25.11.2017	49	Kakumiro	316915	123181	Drinking well	Domestic use	GWU-012
Kasambya	No sample collected	49	Kakumiro	310500	130555	Not operating	Not used	No sample collected

Table A7.3-1 Boreholes Included in the Field Survey

BH or Well ID, No. or Name	Sampling Date	Closest KP Along Pipeline	District	Sampling Location (WGS84 TM35E_S)		Borehole or Well Type	Current Use of Borehole or Well	Sample Number
				Easting	Northing			
Our Lady of Fatma DWD 58280	26.11.2017	49	Kakumiro	309964	128834	Drinking well	Domestic use	GWU-013
Nyamigamba DWD 35597	No sample collected	54	Kakumiro	309753	128743	Not operating	Not used	No sample collected
DWD 35477	No sample collected	54	Mubende	320523	120516	Not operating	Not used	No sample collected
DWD 35476	No sample collected	56	Mubende	319169	116362	Not operating	Not used	No sample collected
Mujjunwa DWD51675	27.11.2017	128.5	Mubende	335363	53363	Drinking well	Domestic use	GWU-014
Kyenda DWD17049	No sample collected	129	Mubende	347701	116103	Not operating	Not used	No sample collected
Muwala 1 WDD 6338	No sample collected	165.5	Sembabule	321322	9982676	Not operating	Not used	No sample collected
Muwala 2 WDD 6331	No sample collected	170.5	Sembabule	323880	9987199	Not operating	Not used	No sample collected
Muyenje WDD 6337	No sample collected	173.5	Sembabule	325103	9990758	Not operating	Not used	No sample collected
Njaza WDD 6664?	No sample collected	180	Sembabule	325521	9997190	Not operating	Not used	No sample collected

Table A7.3-1 Boreholes Included in the Field Survey

BH or Well ID, No. or Name	Sampling Date	Closest KP Along Pipeline	District	Sampling Location (WGS84 TM35E_S)		Borehole or Well Type	Current Use of Borehole or Well	Sample Number
				Easting	Northing			
Mbuye Village WDD5735	No sample collected	190	Rakai	333044	9997190	Not operating	Not used	No sample collected
Kijanebalola	No sample collected	190	Rakai	322714	9921446	Not operating	Not used	No sample collected
Kitaasa	29.11.2017	278	Rakai	322706	9918479	Drinking well	Domestic use	GWU-015
Rakai Dispensary	No sample collected	280	Rakai	322360	9921147	Not operating	Not used	No sample collected
Lumbugu	No sample collected	280	Rakai	324047	9924534	Not operating	Abandoned	No sample collected
Kabonera	29.11.2017	280	Rakai	325850	9900320	Drinking well	Domestic use	GWU-016
Sanje	29.11.2017	288	Rakai	332707	9912921	Drinking well	Domestic use	GWU-017

NOTES: DWD – Directorate of Water Development; KP – kilometre point

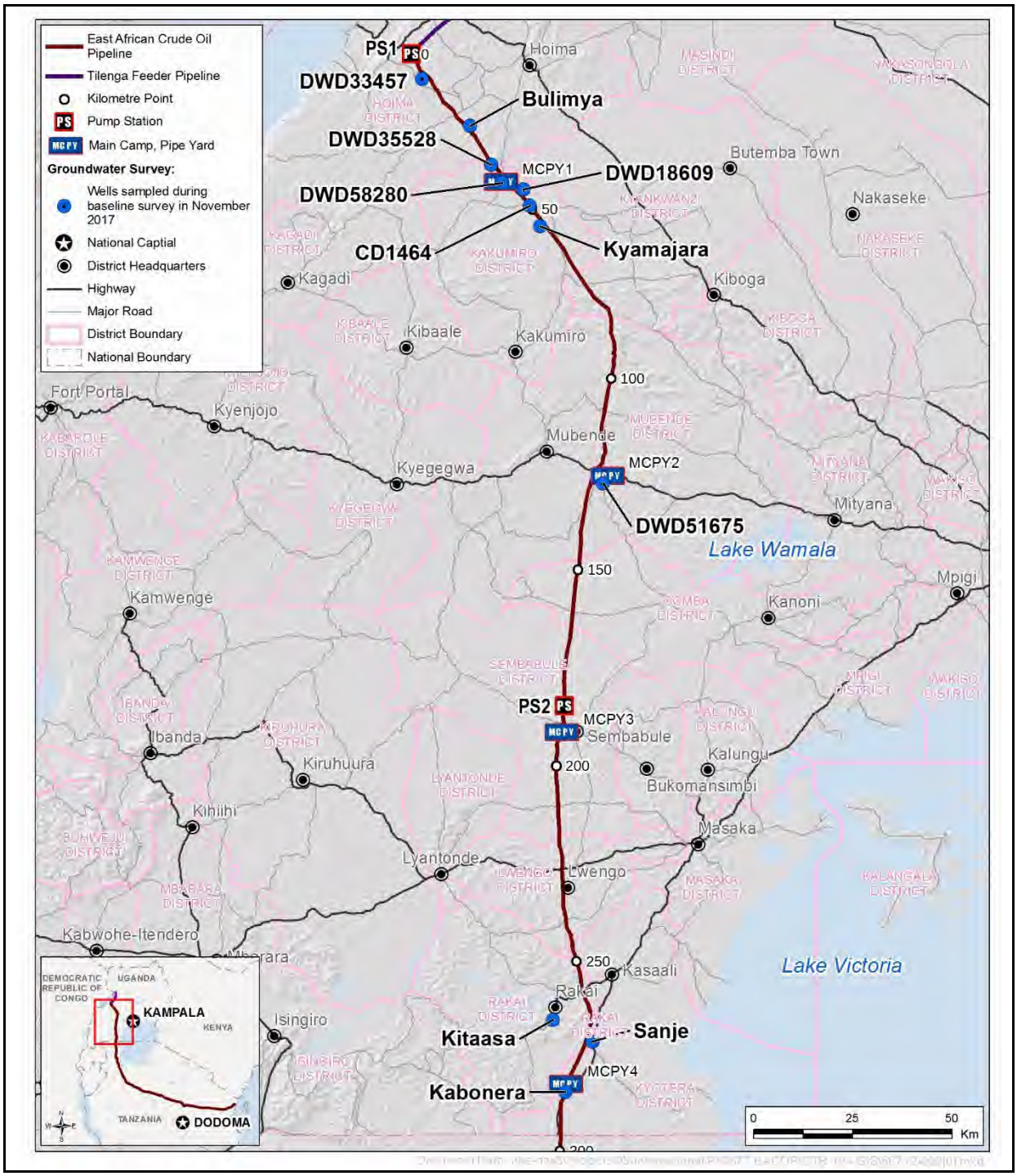

Figure A7.3-1 Boreholes and Wells Sampled During the Field Survey

The sampling methodology was in accordance with industry best practice (ISO 5667-11:2009 Water quality – Sampling – Part 11: Guidance on sampling of groundwaters). The global positioning system (GPS) coordinates of the sampling locations were recorded. Samples were packed securely in cool boxes with ice packs and kept dark before being despatched with a sample chain of custody form to the ISO 17025-accredited SGS laboratory in Mwanza.

Attachment A7.1 describes the detailed survey methodology.

A7.3.3 Data Collection and Analysis

A7.3.3.1 Water Quality

The survey comprised onsite water-quality measurements and observations, and sample collection for laboratory analysis.

At all sites, a calibrated portable digital multiparameter water quality sonde (Aquaprobe) was used to measure:

- water temperature (°C)
- electrical conductivity (EC)
- total dissolved solids (TDS)
- pH
- dissolved oxygen (DO)
- turbidity.

Field tests for total coliforms and *E. coli* were undertaken at all sites using a portable DelAgua single incubator water-testing kit. Samples were incubated on CHROMagar ECC broth for 24 hours at 44°C.[2] Observations were made at all sites of water odour, iridescence, precipitates and colour.

The samples were tested at the laboratory for parameters listed below:

- total petroleum hydrocarbons (TPH)
- polycyclic aromatic hydrocarbons (PAH)
- dissolved metals (arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, silver, vanadium, zinc)
- total suspended solids (TSS)
- chemical oxygen demand (COD)
- biochemical oxygen demand (BOD)
- sulphates, calcium, chloride.

Section A7.4.1.2 describes the test results.

A7.3.3.2 Sensitivity Ranking

Groundwater sensitivity has been ranked according to the groundwater section of the sensitivity table in Appendix D of the environmental and social impact assessment (ESIA).

[2] Using the CHROMagar ECC broth allowed the simultaneous analysis of total coliforms and *E. coli*. The prescribed incubation temperature for both types of bacteria is 37°C. However, it was not possible to adjust the incubation temperature of the particular test kit used in this survey. Incubation at 44°C favours the growth of *E. coli* relative to total coliforms. As the presence of *E. coli* is an indicator of faecal contamination and total coliform bacteria are ubiquitous in natural waters, this was not considered to affect the conclusions reached.

A7.3.4 Data Considerations

Most borehole locations in the DWRM national database were found to be either not operating or abandoned. However, as noted earlier, this matter was addressed by identifying other boreholes in the area with the assistance of the local authorities.

Through the identification and addition of alternative sampling locations (Section A7.3.2), the collected data is sufficient to describe groundwater conditions in the AOI.

A7.4 Baseline Conditions

A7.4.1 Baseline Condition

A7.4.1.1 Aquifers

Both unconsolidated and basement aquifers have been identified within the AOI (see Table 4.4-1).

Unconsolidated and Sedimentary Aquifers

Unconsolidated aquifers are typically Quaternary or Tertiary in age and are generally found along existing river channels or palaeochannels in which fluvial gravel, sand and silt have been deposited. Unconsolidated aquifers can be unconfined or semiconfined (leaky) and more than 50 m thick where there are significant palaeochannel deposits. Associated borehole depths are variable but may be to 60 m when drilled into palaeochannels (BGS 2017). The fluvial deposits provide significant yields.

The interaction between groundwater and surface water occurs mainly in the fluvial deposits. The surface water baseline report (Appendix A6) describes the catchments in detail, but in summary there are papyrus-filled wetlands in both the uplands and lowlands, incised deeply by channels to the extent that they are fed by groundwater. The wetlands also receive surface water inflows from upstream catchments, and watercourses supported by groundwater may be permanent or ephemeral. In dry periods, watercourses dry up and switch from being gaining streams to losing streams.

Basement Aquifers

The basement complex generally forms discrete aquifers of limited spatial extent. They occur in the unconsolidated weathered regolith (saprolite) or underlying fissured bedrock (saprock). Bedrock permeability is greatest close to the saprock–saprolite interface and may increase with the presence of fractures before eventually decreasing with depth. The number, distribution and connectivity of fissures and fractures control the permeability. The permeability of the saprolite is highly variable but is an important source of groundwater storage.

The basement aquifers are generally semiconfined or leaky and typically between 20 and 45 m thick. Associated boreholes are generally drilled to depths of 45–70 m (BGS 2017). Table A7.4-2 summarises the hydrogeological conditions of the main aquifers in the AOI. Yield values for main aquifers have been categorised by MacDonald et al. (2010) as defined in Table A7.4-1 below.

Table A7.4-1 Aquifer Productivity

Aquifer Productivity	Yield Range (m^3/h)
Very high	>72
High	18–72
Moderate	7.2–18
Low to moderate	1.8–7.2
Low	0.36–1.8
Very low	<0.36

Table A7.4-2 Summary of Aquifer Geology and Characteristics

District, Approximate KP Range and Project Facilities or AGIs	Geological Formations and Aquifer Lithology	Soil Description[1]	Main Water Strike[2] (mbgl) (Average)	Static Water Level (mbgl) (Mean Value)[3]	Vulnerability[4]	Yield (m^3/h) and Recharge[5]
Hoima KP0–40 PS1 near KP0 MCPY1 near KP40	Regolith and fluvial sediments (palaeochannels); Tertiary–Quaternary sediments within the Rift Valley system predominantly sandstones, siltstones, claystones and shales	Clay loams (petric plinthosols)	52	17	High	Yield: 6.3 Recharged by rainfall
	Precambrian basement (weathered and fractured crystalline bedrock): shales, arkoses and quartzites; undifferentiated gneisses and granulite facies rocks		43	19		Yield: 4.1 Recharged by rainfall
Kakumiro/ Kyankwanzi KP40–100	Precambrian basement (weathered and fractured crystalline bedrock): phyllites and schists with basal quartzites and amphibolites; undifferentiated gneisses and granulite facies rocks	Loamy sand; sandy/silty clay loam	38	27	High	Yield: 1.75 Recharged by rainfall

Table A7.4-2 Summary of Aquifer Geology and Characteristics

District, Approximate KP Range and Project Facilities or AGIs	Geological Formations and Aquifer Lithology	Soil Description[1]	Main Water Strike[2] (mbgl) (Average)	Static Water Level (mbgl) (Mean Value)[3]	Vulnerability[4]	Yield (m^3/h) and Recharge[5]
Mubende KP100–160 MCPY2 near KP126	Precambrian basement (weathered and fractured crystalline bedrock): undifferentiated gneisses and in the north granulite facies rocks; Buganda-Toro Series: argillites (phyllites and schists) with basal quartzites and amphibolites	Gravelly sandy loam	47	23	High	Yield: 2.38 Recharged by rainfall Poor yields owing to deep water table causing wells to often break down; DWO is considering installing piped groundwater systems to facilitate access for communities
Sembabule KP180–220 PS2 near KP180 MCPY3 near KP191	Precambrian basement (weathered and fractured crystalline bedrock): undifferentiated acid and basic gneisses; Buganda-Toro system: mica schist, quartz mica schist and undifferentiated schist and acid gneisses	Sandy clay loam	64	36	Low	Yield: 1.78 Recharged by rainfall Poor yields owing to deep water table causing wells to often break down; DWO is considering installing piped groundwater systems to facilitate access for communities

Table A7.4-2 Summary of Aquifer Geology and Characteristics

District, Approximate KP Range and Project Facilities or AGIs	Geological Formations and Aquifer Lithology	Soil Description[1]	Main Water Strike[2] (mbgl) (Average)	Static Water Level (mbgl) (Mean Value)[3]	Vulnerability[4]	Yield (m^3/h) and Recharge[5]
Rakai KP240–290 MCPY4 near KP283	Precambrian basement rocks (weathered and fractured crystalline bedrock): undifferentiated acid and basic gneisses	Sandy clay loam	45	34	Moderate	Yield: 2.1 Recharged by rainfall
	Precambrian Buganda-Toro system: mica schist, quartz mica schist and undifferentiated schist and acid gneisses			24	Moderate	
	Precambrian Karagwe-Ankolean system: quartzites, quartzose sandstones sandstones, conglomerates and some shales and phyllites			18	High	

SOURCE: From district groundwater reports provided by DWRM (2012a, 2012b)

NOTES: KP = kilometre point; AGI = aboveground installation; MCPY = main camp and pipe yard; PS = pumping station; DWO = district water officer

[1]Based on field observations during the baseline survey in November 2017

[2]Main water strike is the level at which groundwater is first encountered during drilling

[3] Static water level refers to the level of water in a well under normal, undisturbed, no-pumping conditions

[4] Recharge data from BGS (2017); qualitative information on yield was obtained during the field survey; average airlift yields from district groundwater reports provided by DWRM (2008a, 2008b; 2012a, 2012b, 2012c)

[5] Sensitivity of a valued environmental and social component (VEC) as a function of the vulnerability based on the ground conditions (permeability) and depth to the water table.

A7.4.1.2 Groundwater Quality

A review of MWE published data (2008a, 2008b, 2012a, 2012b, 2012c) indicates that groundwater quality is generally good in all districts. Table A7.4-4 presents the available data on groundwater quality.

Field Sampling Results

The field sampling results are presented in detail in Attachment A7.2. Table A7.4-3 summarises the data and indicates the following:

- EC values were relatively low, ranging from 51 to 875 µS/cm, and TDS ranging from 33 to 568 mg/L. All EC values were within national water quality standards.
- pH values were circumneutral, ranging from 5.03 to 7.45. All pH values were within the national drinking water standard range for pH (5.5–8.5). Some boreholes recorded pH values slightly lower than the lower national pH limit of 6.5 for natural drinking waters.
- DO concentrations ranged from 1.04 to 4.29 mg/L (13.6–72.8% saturation). The lowest DO value (1.04 mg/L) was recorded from the borehole near KP7.
- Turbidity values ranged from 0.1 to 19.2 nephelometric turbidity units (NTU). Several values exceed the treated national drinking water standard range for turbidity (5 NTU).
- Total coliform counts (indicative of contamination by general bacteria) ranged from 02 CFU/100 mL to 36 CFU/100 mL. *E. coli* counts (indicative of faecal bacteria contamination) ranged from 00 CFU/100 mL to 38 CFU/100 mL. Several values exceed national drinking water standards for total coliforms and *E. coli*.
- No exceedances of the national water quality standards for the parameters tested in the laboratory were identified (see parameter list in Section A7.3.3.1).

Table A7.4-3 Summary of Field Measurements

Parameter	Maximum	Minimum
Temp (°C)	25.4	22.3
EC (µS/cm)	875	51
TDS (mg/L)	5687.45	33
pH	7.45	5.03
DO (mg/L)	4.29	1.04
DO (% saturation)	72.8	13.6
Turbidity (NTU)	19.2	0.1
Coliform (CFU/100 mL)	36	02
E. coli	38	00

A7.4.1.3 Laboratory Analyses

All the laboratory results are presented in Attachment A7.1 in tables that include the Ugandan and project standards for drinking water quality.

No concentrations above the laboratory detection limits (LDL) were detected for the following parameters:

- acenaphthene
- acenaphthylene
- anthracene
- arsenic (As)
- benz(a)anthracene
- benzo(a)pyrene
- benzo(b)fluoranthene
- benzo(g,h,i)perylene
- benzo(k)fluoranthene
- cadmium (Cd)
- chromium (Cr)
- Chrysene
- copper (Cu)
- dibenzo(a,h)anthracene#
- fluorene
- indeno(1,2,3-c,d)pyrene#
- lead (Pb)
- mercury (Hg)
- nickel (Ni)
- silver (Ag)
- TPH
- vanadium (V).

A7.4.1.4 Groundwater Use

Groundwater is the most important source of public water supply in the AOI. Shallow wells and boreholes are the primary source of water for over 60% of the population in all districts (MWE 2017). Table A7.4-4 presents the available data on groundwater use. No significant industrial groundwater users were identified in the study area.

Table A7.4-4 Groundwater Use and Quality

District	Wells and Boreholes as Source of Water for Population (%)	Groundwater Quality[1]
Hoima	68	Generally meets national potable water standards
Kakumiro/Kyankwanzi	92	Generally meets national potable water standards

Table A7.4-4 Groundwater Use and Quality

District	Wells and Boreholes as Source of Water for Population (%)	Groundwater Quality[1]
Mubende	87	Generally meets national potable water standards with isolated occurrences of elevated levels of iron, sulphate and fluoride and pH
Gomba	84	No data from DWRM
Sembabule	96	Generally meets national potable water standards with isolated occurrences of elevated iron
Lwengo	87	No data from DWRM
Rakai	87	Generally meets national potable water standards along the route's 5-km corridor, although elevated levels of iron are common; very poor in other areas

SOURCE: From district groundwater reports: MWE (2008a, 2008b; 2012a, 2012b and 2012c).
NOTE: [1]Groundwater quality data from the field survey was used to complement secondary data where appropriate.

A7.4.2 Groundwater Scarcity

An assessment of relative water scarcity for communities along the pipeline route is included in the surface water baseline study, see Table A7.4-5 for a summary.

Table A7.4-5 Summary of Water Scarcity Near the Route

KP	Relative Water Scarcity (Low, Moderate, High)
0 PS1	High
1.5–24	Low
29–29.5	High
35	Low
39.5 MCPY1	High
39.5–56	Low
57	Moderate
61	High
63.5–78	Moderate

Table A7.4-5 Summary of Water Scarcity Near the Route

KP	Relative Water Scarcity (Low, Moderate, High)
80.5–82.5	High
84	Low
86–118	High
111	Moderate
114–121	High
124.5-126 MCPY2	Moderate
128.5	Low
160–194 PS2 MCPY3	High
195–199.5	Moderate
218.5–225	High
240	Moderate
247.5–249.5	High
252.5–270	Moderate
270.5–271.5	Low
277–283 MCPY4	Moderate
290–296	Low

NOTES: KP = kilometre point; PS = pumping station; MCPY = main camp and pipe yard

A7.4.3 Trend in Condition and Sensitivity to Change

Groundwater will continue to be a primary source of water for the population in all districts. Population growth is likely to increase the reliance of local communities on groundwater for domestic use. Data on past groundwater quality and water levels were unavailable to establish trends; however, available information was considered sufficient to support the assessment. Groundwater in both the sedimentary and basement aquifers is considered highly sensitive to change based on this trend.

A7.4.4 Ecosystem Services Provided

Groundwater is an important provisioning ecosystem service, supplying freshwater for community use. Groundwater also plays an important habitat support role for aquatic and riparian habitats and wildlife, both directly (where groundwater feeds wetlands) and indirectly (where groundwater maintains surface water flows).

Groundwater therefore also supports a wide range of ecosystem services in the wetlands linked to the AOI.

A7.4.5 Sensitivity Ranking

Table A7.4-6 summarises the sensitivity ranking for groundwater.

Table A7.4-6 Sensitivity of Groundwater VECs

District	VEC	Sensitivity of VEC[1]	Rationale for Ranking
Hoima	Sedimentary and basement aquifers	High (4)	Quality of the groundwater is good and it is the primary source of water for 68% of the population Vulnerability is high owing to high permeability of overlying deposits and depth to the water table Boreholes and wells at the time of writing this report are between 500 m and 1 km from the pipeline route
Kakumiro/ Kyankwanzi	Basement aquifers	Moderate (3)	Although quality of the groundwater is good and vulnerability is high owing to high permeability of overlying deposits and depth to the water table, at the time of writing this report the boreholes and wells are more than 1 km from the pipeline
Mubende	Basement aquifers	Moderate (3)	Quality of the groundwater is good and vulnerability is high owing to high permeability of overlying deposits and depth to the water table Boreholes and wells at the time of writing this report are between 500 m and 1 km from the pipeline route; however, yields are poor owing to a deep water table
Gomba	Basement aquifers	High (4)	No data on quality is available from DWRM
Sembabule	Basement aquifers	Very high (5)	Vulnerability is low owing to low permeability of overlying deposits and depth to the water table; however, quality of the groundwater is good Boreholes and wells at the time of writing this report are between 500 m and 1 km from the pipeline route; however, yields are poor owing to a deep water table Groundwater is the primary source of water for a very high percentage (96%) of the population

Table A7.4-6 Sensitivity of Groundwater VECs

District	VEC	Sensitivity of VEC[1]	Rationale for Ranking
Lwengo	Basement aquifers	High (4)	Quality of the groundwater is good and vulnerability due to the permeability of overlying deposits and depth to the water table varies from moderate to high; it is the primary source of water for a very high percentage (87%) of the population
Rakai	Basement aquifers	High (4)	Quality of the groundwater is good and vulnerability due to the permeability of overlying deposits varies from moderate to high Boreholes and wells at the time of writing this report are between 500 m and 1 km from the pipeline route

NOTE: [1] Based on sensitivity grading for groundwater quality and quantity in the impact assessment tables

A7.5 Key Considerations

The key groundwater considerations are that:

- the sensitivity rankings of groundwater vary between moderate to very high
- groundwater provides an important ecosystem service.

A7.6 References

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ATTACHMENT A7.1 LABORATORY TESTING RESULTS

Table Att7.1-1 Results of Groundwater Laboratory Tests: GWU-007, GWU-008 and GWU-009 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-007 24/11/17	GWU-008 24/11/17	GWU-009 25/11/17
Chloride	250	250	-	-	0.20	mg/L	5.5	2.1	2.0
Ca	150	150	-	100	0.01	mg/L	<0.001	<0.001	<0.001
TSS	-	-	-	-	1.0	mg/L	5.8	1.6	2.3
BOD	-	-	-	6	0.10	mg/L	<0.10	<0.10	<0.10
COD	-	-	-	-	0.10	mg/L	<0.001	<0.001	<0.001
Sulphate	400	400	-	400	0.02	mg/L	<0.10	2.7	<0.10
TPH	-	-	-	-	1.0	mg/L	<1.0	<1.0	<1.0
As	0.01	0.01	0.01	0.01	0.001	mg/L	<0.001	<0.001	<0.001
Hg	0.001	0.001	0.006	0.001	0.001	mg/L	<0.005	<0.005	<0.005
Cd	0.003	0.003	0.003	0.003	0.001	mg/L	<0.004	<0.004	<0.004
Cr	0.05	0.05	0.05	0.05	0.001	mg/L	<0.01	<0.01	<0.01
Cu	1	1	2	1	0.001	mg/L	<0.001	<0.001	<0.001
Pb	0.01	0.01	0.01	0.01	0.005	mg/L	**0.029**[2]	**0.19**[2]	**1.9**[2]
Ni	0.02	0.02	0.07	0.02	0.004	mg/L	**0.027**[2]	**0.95**[2]	**1.1**[2]

Table Att7.1-1 Results of Groundwater Laboratory Tests: GWU-007, GWU-008 and GWU-009 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-007 24/11/17	GWU-008 24/11/17	GWU-009 25/11/17
Ag	-	-	-	-	0.01	mg/L	<0.002	0.031	0.068
V	-	-	-	-	0.001	mg/L	26.0	2.7	8.6
Zn	5	5	-	5	0.001	mg/L	<0.001	<0.001	<0.001
Ba	0.7	0.7	-	0.7	0.002	mg/L	<0.001	<0.001	<0.001
Fe	0.3	0.3	-	0.3	0.001	mg/L	<1.0	<1.0	<1.0
Naphthalene	-	-	-	-	0.00001	mg/L	0.00002	0.00003	0.00001
Acenaphthylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Acenaphthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluorene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Phenanthrene	-	-	-	-	0.00001	mg/L	0.00001	0.00006	0.00005
Anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	0.00004	<0.00001
Pyrene	-	-	-	-	0.00001	mg/L	<0.00001	0.00002	<0.00001
Benz(a)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Chrysene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(b)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(k)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001

Table Att7.1-1 Results of Groundwater Laboratory Tests: GWU-007, GWU-008 and GWU-009 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-007 24/11/17	GWU-008 24/11/17	GWU-009 25/11/17
Benzo(a)pyrene	0.7 µg/L[1]	0.7 µg/L[1]	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Dibenzo(a,h)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(g,h,i)perylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Indeno(1,2,3-c,d)pyrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Total PAH	-	-	-	-	0.00001	mg/L	0.00003	0.00015	0.00006

NOTES: Source of standards: Uganda Standard – Potable Water (2014)

- no standards; WHO = World Health Organization

[1]Unspecified polynuclear aromatic hydrocarbon

[2]Values are not reliable due to long standing time

Table Att7.1-2 Results of Groundwater Laboratory Tests: GWU-010, GWU-011 and GWU-012 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-010	GWU-011	GWU-012
Chloride	250	250	-	-	0.20	mg/L	16.5	12.8	11.3
Ca	150	150	-	100	0.01	mg/L	<0.001	<0.001	<0.001
TSS	-	-	-	-	1.0	mg/L	7.6	5.7	4.9
BOD	-	-	-	6	0.10	mg/L	3.0	<0.10	<0.10
COD	-	-	-	-	0.10	mg/L	<0.001	<0.001	<0.001
Sulphate	400	400	-	400	0.02	mg/L	8.7	<0.10	<0.10
Total petroleum hydrocarbons	-	-	-	-	1.0	mg/L	<1.0	<1.0	<1.0
As	0.01	0.01	0.01	0.01	0.001	mg/L	<0.001	<0.001	<0.001
Hg	0.001	0.001	0.006	0.001	0.001	mg/L	<0.005	<0.005	<0.005
Cd	0.003	0.003	0.003	0.003	0.001	mg/L	<0.004	<0.004	<0.004
Cr	0.05	0.05	0.05	0.05	0.001	mg/L	<0.01	<0.01	<0.01
Cu	1	1	2	1	0.001	mg/L	<0.001	<0.001	<0.001
Pb	0.01	0.01	0.01	0.01	0.005	mg/L	**0.074**[2]	**0.95**[2]	**0.15**[2]
Ni	0.02	0.02	0.07	0.02	0.004	mg/L	**0.52**[2]	**0.52**[2]	**0.20**[2]
Ag	-	-	-	-	0.01	mg/L	0.037	<0.002	<0.002
V	-	-	-	-	0.001	mg/L	44.6	9.1	27.7
Zn	5	5	-	5	0.001	mg/L	<0.001	<0.001	<0.001

Table Att7.1-2 Results of Groundwater Laboratory Tests: GWU-010, GWU-011 and GWU-012 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-010	GWU-011	GWU-012
Ba	0.7	0.7	-	0.7	0.002	mg/L	<0.001	<0.001	<0.001
Fe	0.3	0.3	-	0.3	0.001	mg/L	**2.3**[2]	<1.0	<1.0
Naphthalene	-	-	-	-	0.00001	mg/L	<0.00001	0.00001	<0.00001
Acenaphthylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Acenaphthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluorene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Phenanthrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Pyrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benz(a)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Chrysene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(b)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(k)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(a)pyrene	0.7 µg/L[1]	0.7 µg/L[1]	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Dibenzo(a,h)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(g,h,i)perylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001

Table Att7.1-2 Results of Groundwater Laboratory Tests: GWU-010, GWU-011 and GWU-012 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-010	GWU-011	GWU-012
Indeno(1,2,3-c,d)pyrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Total PAH	-	-	-	-	0.00001	mg/L	<0.00001	0.00001	<0.00001

NOTES: Source of standards: Uganda Standard – Potable Water (2014)

- no standards; WHO = World Health Organisation

[1]Unspecified polynuclear aromatic hydrocarbon

[2]Values are not reliable owing to the abnormally long standing time before laboratory testing

Table Att7.1-3 Results of Groundwater Laboratory Tests: GWU-013, GWU-014 and GWU-015 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-013 26/11/17 DWD 58280	GWU-014 27/11/17 Mujjunwa, DWD51675	GWU-015 29/11/17 Kitaasa
Chloride	250	250	-	-	0.20	mg/L	6.1	15.8	73.1
Ca	150	150	-	100	0.01	mg/L	<1.0	<1.0	3.3
TSS	-	-	-	-	1.0	mg/L	<0.10	<0.10	<0.10
BOD	-	-	-	6	0.10	mg/L	<1.0	<1.0	<1.0
COD	-	-	-	-	0.10	mg/L	1.3	9.7	48.2
Sulphate	400	400	-	400	0.02	mg/L	4.4	22.9	91.8
Total petroleum hydrocarbons	-	-	-	-	1.0	mg/L	<0.10	3.2	<0.10
As	0.01	0.01	0.01	0.01	0.001	mg/L	<0.001	<0.001	<0.001
Hg	0.001	0.001	0.006	0.001	0.001	mg/L	<0.001	<0.001	<0.001
Cd	0.003	0.003	0.003	0.003	0.001	mg/L	<0.001	<0.001	<0.001
Cr	0.05	0.05	0.05	0.05	0.001	mg/L	<0.001	<0.001	<0.001
Cu	1	1	2	1	0.001	mg/L	<0.001	<0.001	<0.001
Pb	0.01	0.01	0.01	0.01	0.005	mg/L	<0.005	<0.005	<0.005
Ni	0.02	0.02	0.07	0.02	0.004	mg/L	<0.004	<0.004	<0.004
Ag	-	-	-	-	0.01	mg/L	<0.01	<0.01	<0.01
V	-	-	-	-	0.001	mg/L	<0.001	<0.001	<0.001

Table Att7.1-3 Results of Groundwater Laboratory Tests: GWU-013, GWU-014 and GWU-015 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-013 26/11/17 DWD 58280	GWU-014 27/11/17 Mujjunwa, DWD51675	GWU-015 29/11/17 Kitaasa
Zn	5	5	-	5	0.001	mg/L	<0.001	0.062	<0.001
Ba	0.7	0.7	-	0.7	0.002	mg/L	0.041	0.11	0.058
Fe	0.3	0.3	-	0.3	0.001	mg/L	0.11	0.025	<0.001
Naphthalene	-	-	-	-	0.00001	mg/L	0.00003	<0.00001	0.00003
Acenaphthylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Acenaphthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluorene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Phenanthrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Pyrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benz(a)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Chrysene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(b)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(k)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(a)pyrene	0.7 µg/L[1]	0.7 µg/L[1]	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Dibenzo(a,h)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001

Table Att7.1-3 Results of Groundwater Laboratory Tests: GWU-013, GWU-014 and GWU-015 Samples

Parameter	Ugandan Standard Limit Level		WHO Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-013 26/11/17 DWD 58280	GWU-014 27/11/17 Mujjunwa, DWD51675	GWU-015 29/11/17 Kitaasa
Benzo(g,h,i)perylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Indeno(1,2,3-c,d)pyrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Total PAH	-	-	-	-	0.00001	mg/L	0.00003	<0.00001	0.00003
Total VOCs	-	-	-	-					

NOTES: Source of standards: Uganda Standard – Potable Water (2014)

- no standards; WHO = World Health Organization; VOC = volatile organic compounds

[1]Unspecified polynuclear aromatic hydrocarbon

[2]Values are not reliable owing to the abnormally long standing time before laboratory testing

Table Att7.1-4 Results of Groundwater Laboratory Tests: GWU-016, GWU-017 and GWU-018 Samples

Parameter	Ugandan Standard Limit Level		WHO Drinking Water Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-016 29/11/17 Kabonera	GWU-017 29/11/17 Sanje	GWU-018 29/11/17 Duplicate QC Sample
Chloride	250	250	-	-	0.20	mg/L	40.0	7.9	85.4
Ca	150	150	-	100	0.01	mg/L	3.6	<1.0	1.6
TSS	-	-	-	-	1.0	mg/L	<0.10	<0.10	2.0
BOD	-	-	-	6	0.10	mg/L	<1.0	<1.0	<1.0
COD	-	-	-	-	0.10	mg/L	2.4	2.1	2.4
Sulphate	400	400	-	400	0.02	mg/L	1.8	2.0	0.25
TPH	-	-	-	-	1.0	mg/L	<0.10	1.2	6.3
As	0.01	0.01	0.01	0.01	0.001	mg/L	<0.001	<0.001	<0.001
Hg	0.001	0.001	0.006	0.001	0.001	mg/L	<0.001	<0.001	<0.001
Cd	0.003	0.003	0.003	0.003	0.001	mg/L	<0.001	<0.001	<0.001
Cr	0.05	0.05	0.05	0.05	0.001	mg/L	<0.001	<0.001	<0.001
Cu	1	1	2	1	0.001	mg/L	<0.001	<0.001	<0.001
Pb	0.01	0.01	0.01	0.01	0.005	mg/L	<0.005	<0.005	<0.005
Ni	0.02	0.02	0.07	0.02	0.004	mg/L	<0.004	<0.004	<0.004
Ag	-	-	-	-	0.01	mg/L	<0.01	<0.01	<0.01
V	-	-	-	-	0.001	mg/L	<0.001	<0.001	<0.001
Zn	5	5	-	5	0.001	mg/L	<0.001	0.074	<0.001

Table Att7.1-4 Results of Groundwater Laboratory Tests: GWU-016, GWU-017 and GWU-018 Samples

Parameter	Ugandan Standard Limit Level		WHO Drinking Water Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-016 29/11/17 Kabonera	GWU-017 29/11/17 Sanje	GWU-018 29/11/17 Duplicate QC Sample
Ba	0.7	0.7	-	0.7	0.002	mg/L	<0.002	<0.002	<0.002
Fe	0.3	0.3	-	0.3	0.001	mg/L	0.17	0.094	<0.001
Naphthalene	-	-	-	-	0.00001	mg/L	0.00002	0.00005	0.00002
Acenaphthylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Acenaphthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluorene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Phenanthrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Pyrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benz(a)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Chrysene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(b)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(k)fluoranthene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(a)pyrene	0.7 µg/L[1]	0.7 µg/L[1]	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Dibenzo(a,h)anthracene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Benzo(g,h,i)perylene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001

Table Att7.1-4 Results of Groundwater Laboratory Tests: GWU-016, GWU-017 and GWU-018 Samples

Parameter	Ugandan Standard Limit Level		WHO Drinking Water Standard	Project Standard	Limit of Detection	Units	Sample Number, Date and Location		
	Treated	Natural					GWU-016 29/11/17 Kabonera	GWU-017 29/11/17 Sanje	GWU-018 29/11/17 Duplicate QC Sample
Indeno(1,2,3-c,d)pyrene	-	-	-	-	0.00001	mg/L	<0.00001	<0.00001	<0.00001
Total PAH	-	-	-	-	0.00001	mg/L	0.00002	0.00005	0.00002
Total VOCs	-	-	-	-					

NOTES: Source of standards: Uganda Standard – Potable Water (2014)

- no standards; WHO = World Health Organization; VOC – volatile organic compounds

[1]Unspecified polynuclear aromatic hydrocarbon

[2]Values are not reliable owing to the abnormally long standing time before laboratory testing

ATTACHMENT A7.2 FIELD SURVEY REPORT

Introduction

A baseline water quality sampling survey was undertaken along the pipeline route in Uganda. The survey started on 21 November and ended on 29 November 2017. The survey was undertaken by Robert Naguyo and Mark Olokotum, consultants employed by ECO & Partner in Kampala. The objective of the survey was to characterise the quality of groundwater and to identify any contamination.

Sampling Sites

The sampling sites were determined before the fieldwork and aimed to sample existing drinking water wells based on locations listed in a DWRM database. Several of these wells were found to be either not used or not operating owing to other reasons. Table Att7.2-1 lists all the locations visited with notes on wells that were not operating. Photographs taken at sampling sites are presented below.

Table Att7.2-1 Boreholes Included in the Survey

Well ID (Name and Database Number)	Nearest Approx. KP	District	Sampling Location (WGS84 TM35E_S)		Observations and Sample Number
			Easting	Northing	
Kabaale T/C DWD 30204	0	Hoima	282684	161428	Borehole not operating; sign of iron precipitates nearby; rehabilitated borehole; no water sample taken
Kyakatemba DWD33457	7	Hoima	289806	154950	Operating borehole; clear water; water sample GWU007 collected
Kihangi P.S. DWD 51337	10.5	Hoima	291417	152695	Borehole not operating
Bulimya	24	Hoima	301961	143179	Operating borehole, visited by several people during the sampling period; sample GWU008 collected
Bulimya	30	Hoima	138535	305001	Borehole not operating; the alternative location above was identified

Table Att7.2-1 Boreholes Included in the Survey

Well ID (Name and Database Number)	Nearest Approx. KP	District	Sampling Location (WGS84 TM35E_S)		Observations and Sample Number
			Easting	Northing	
Kiryanga DWD35528	35	Kibaale	307294	133432	Operating borehole; sample GWU009 collected
Hanga DWD37907	35	Kibaale	309116	134661	Borehole not operating; the alternative location above was identified
Kitahemba DWD18609	45.5	Kibaale	315316	127204	Operating borehole, surrounded by vegetation and rice paddies; sample GWU010 collected
Kyamajara	55.5	Kakumiro	319556	118009	Operating borehole, visited by several people; adjacent to a maize farm; sample GWU011 collected
Kisiita West B CD1464	49	Kakumiro	316915	123181	Operating borehole; production well for Kisiita; sample GWU012 collected
Kasambya	49	Kakumiro	310500	130555	Borehole not operating; the alternative location below was selected
Our Lady of Fatma DWD 58280	49	Kakumiro	309964	128834	Operating borehole, adjacent to a maize farm; sample GWU013 collected
Nyamigamba DWD 35597	54	Kakumiro	309753	128743	Borehole not operating
DWD 35477	54	Mubende	320523	120516	Borehole not operating
DWD 35476	56	Mubende	319169	116362	Borehole not operating
Mujjunwa DWD51675	128.5	Mubende	335363	53363	Operating borehole; sample GWU014 collected
Kyenda DWD17049	129	Mubende	347701	116103	Borehole not operating
Muwala 1 WDD 6338	165.5	Sembabule	321322	9982676	Borehole not operating
Muwala 2 WDD 6331	170.5	Sembabule	323880	9987199	Borehole not operating

Table Att7.2-1 Boreholes Included in the Survey

Well ID (Name and Database Number)	Nearest Approx. KP	District	Sampling Location (WGS84 TM35E_S)		Observations and Sample Number
			Easting	Northing	
Muyenje WDD 6337	173.5	Sembabule	325103	9990758	Borehole not operating
Njaza WDD 6664?	180	Sembabule	325521	9997190	Borehole not operating
Mbuye village WDD5735	190	Rakai	333044	9997190	Borehole not operating
Kijanebalola	190	Rakai	322714	9921446	Borehole not operating
Kitaasa	278	Rakai	322706	9918479	Operating borehole; sample GWU015 collected
Rakai Dispensary	280	Rakai	322360	9921147	Borehole not operating
Lumbugu	280	Rakai	324047	9924534	Borehole not operating and abandoned
Kabonera	280	Rakai	325850	9900320	Operating borehole, regularly used by locals and well maintained; sample GWU016 collected
Sanje	288	Rakai	332707	9912921	Operating shallow well; sample GWU017 collected

NOTES: KP = kilometre point

Survey Methodology

Onsite measurements were made using a calibrated portable digital multiparameter water quality sonde (Aquaprobe) of water temperature, EC, TDS[3], pH, DO and turbidity.

Field tests for total coliforms and *E. coli* were undertaken at all sites using a portable DelAgua single incubator water-testing kit. Samples were incubated on CHROMagar ECC broth for 24 hours at 44°C.[4] Observations of water odour, iridescence, precipitates and colour were made at all sites.

[3] TDS was calculated internally by the Aquaprobe based on the equation TDS = EC·0.65.

[4] Using the CHROMagar ECC broth allowed the simultaneous analysis of total coliforms and *E. coli*. The prescribed incubation temperature for both types of bacteria is 37°C. However, it was not possible to adjust the incubation temperature of the particular test kit used in this survey. Incubation at 44°C favours the growth of *E. coli* relative to total coliforms. As the presence of *E.coli* is an indicator of faecal contamination and total coliform bacteria are ubiquitous in natural waters, this was not considered to affect the conclusions reached.

The laboratory samples were tested for the following parameters:

- TPH
- PAH
- dissolved metals (arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, silver, vanadium, zinc)
- TSS
- COD
- BOD
- sulphates, calcium, chloride.

The sampling methodology was in accordance with industry best practice (ISO 5667-11:2009 Water quality – Sampling – Part 11: Guidance on sampling of groundwaters). GPS coordinates of the sampling locations were recorded. All samples were collected using the hand pump installed at each well. Samples were packed securely in cool boxes with ice packs and kept in the dark before being despatched to the laboratory with a sample chain of custody form. The samples were sent to SGS, a laboratory in Mwanza, Tanzania that has ISO 17025 laboratory accreditation.

Analytical methods used by SGS were those specified by:

- Standard Methods for Examination of Water and Wastewater (APHA 2012)
- German Institute for Standardisation (DIN).

Table Att7.2-2 lists SGS' analysis methods and limits of detection.

Table Att7.2-2 SGS Methods of Analysis and Limits of Detection

Parameter	Analytical Method	Limit of Detection (mg/L)	Method Uncertainty (mg/L)
TSS	EW_APHA_2540D	1	±0.76
Chloride Cl	EW_APHA_4500CL	0.2	±0.17
Sulphate SO_4	EW_APHA_4500SO4E	0.02	±0.078
Calcium Ca	EW_APHA_3111D_CA_ICP	0.01	±0.097
BOD	EW_APHA_5210B	0.1	-
COD	EW_APHA_5220D_COD	0.1	±0.024
TPH	EW_APHA_5520F	1	-
TPH speciated to aromatics & aliphatics	-	-	-
PAH Total	DIN 38407-39 HE	0.00001	-
Arsenic As-dissolved by Hydride	EW_APHA_3114B_DHYD	0.001	±0.0008
Barium Ba-dissolved	EW_APHA_3111B_DMET_I	0.002	±0.020
Cadmium Cd-dissolved	EW_APHA_3111B_DMET_I	0.001	±0.044

Table Att7.2-2 SGS Methods of Analysis and Limits of Detection

Parameter	Analytical Method	Limit of Detection (mg/L)	Method Uncertainty (mg/L)
Chromium Cr-dissolved	EW_APHA_3111B_DMET_I	0.001	±0.027
Copper Cu-dissolved	EW_APHA_3111B_DMET_I	0.001	±0.016
Iron Fe-dissolved	EW_APHA_3111B_DMET_I	0.001	±0.050
Lead Pb-dissolved	EW_APHA_3111B_DMET_I	0.005	±0.012
Mercury Hg-dissolved by Cold Vapour	EW_APHA_3114B_DHYD	0.001	±0.0015
Nickel Ni-dissolved	EW_APHA_3111B_DMET_I	0.004	±0.023
Silver Ag-dissolved	EW_APHA_3111B_DMET	0.01	±0.001
Vanadium V-dissolved	EW_APHA_3111B_DMET_I	0.001	±0.026
Zinc Zn-dissolved	EW_APHA_3111B_DMET_I	0.001	±0.040

The above analyses were performed at each sampling location.

Survey Results

Table Att7.2-3 presents the results of the on-site measurements, microbiological analyses and observations in relation to national drinking water standards. Results exceeding national drinking water standards are bold.

Table Att7.2-3 Results of Onsite Measurements and Observations

Closest KP	Sample No.	Date	Temp (°C)	EC (µS/cm)	TDS* (mg/L)	pH	DO (mg/L)	DO (%)	Turbidity (NTU)	Total Coliforms Duplicate1/ Duplicate2 (CFU/100 mL)	*E. coli* Duplicate1/ Duplicate2 (CFU/100 mL)	Odour
National drinking water standards		***Treated***	**-**	**1500**	**500**	***5.5–8.5***	**-**	**-**	**5**	**Absent**	**Absent**	**Odourless**
		Natural	**-**	**2500**	**1500**	**6.5–8.5**	**-**	**-**	**25**			
Project standards			**-**	**-**	**-**	**6.5–8.5**	**-**	**-**	**5**	**Absent**	**Absent**	**Odourless**
KP07	GWU007	24/11/17	22.7	342	221	6.18	1.04	13.6	4.5	00	00	No odour
KP24	GWU008	24/11/17	23.6	51	33	5.36	2.49	33.7	**8.6**	00 02 00	00 00 00	No odour
KP35	GWU009	25/11/17	25.4	178	117	5.94	4.29	58.5	**15.4**	00	00	No odour
KP45.5	GWU010	25/11/17	24.1	532	345	7.45	1.92	26.2	2.2	00 02 00	00 00 00	No odour
KP50.5	GWU012	25/11/17	23.4	378	245	6.66	2.2	28.2	0.1	00	00	No odour
KP55	GWU011	25/11/17	22.9	255	165	6.09	32.1	2.42	**11.9**	00 06 00	00 00 00	No odour
KP49	GWU013	26/11/17	23.7	142	92	5.91	4.06	72.8	**16.4**	00	00	No odour
KP120	GWU014	27/11/17	23.5	400	260	6.29	2.3	31.8	**19.2**	00	00	No odour
KP278	GWU015	29/11/17	22.3	875	568	7.07	3	39.8	**5.4**	00	00	No odour
KP280	GWU016	29/11/17	25.2	64	41	5.03	1.64	23.1	**9.3**	00	00	No odour

Table Att7.2-3 Results of Onsite Measurements and Observations

Closest KP	Sample No.	Date	Temp (°C)	EC (µS/cm)	TDS* (mg/L)	pH	DO (mg/L)	DO (%)	Turbidity (NTU)	Total Coliforms Duplicate1/ Duplicate2 (CFU/100 mL)	*E. coli* Duplicate1/ Duplicate2 (CFU/100 mL)	Odour
National drinking water standards		***Treated***	**-**	**1500**	**500**	***5.5–8.5***	**-**	**-**	**5**	**Absent**	**Absent**	**Odourless**
		Natural	**-**	**2500**	**1500**	**6.5–8.5**	**-**	**-**	**25**			
Project standards			**-**	**-**	**-**	**6.5–8.5**	**-**	**-**	**5**	**Absent**	**Absent**	**Odourless**
KP288	GWU017	29/11/17	24.3	88	57	5.07	1.65	22.8	**8.1**	**36** **40** **28**	**22** **36** **38**	No odour

NOTES: *Observations of TDS (total dissolved solids, mg/L) are calculated using the formula TDS = EC x 0.65

NR = not recorded; KP = kilometre point

Quality Control Procedures

Introduction

Several quality control procedures were implemented to ensure that accurate and reliable data were collected. These included:

- blank and duplicate samples
- detailed standard operating procedures (SOP)
- daily calibration checks on the AquaProbe multi-parameter probe.

Blank and Duplicate Samples

Blank and duplicate samples were taken. Table Att7.2-4 lists the quality control samples taken on the survey.

Table Att7.2-4 Quality Control Samples

Sample ID	Sample Type	Analysis Suite
GWU018	Blank (de-ionised water)	On-site measurements Lab measurements: Cl, SO_4, Ca, TSS, BOD, COD, TPH, PAHs, dissolved metals
GWU005	Duplicate of sample GWU004	Lab measurements: Cl, SO_4, Ca, TSS, BOD, COD, TPH, PAHs, dissolved metals

Blank and duplicate samples were given unique identifiers that would not indicate their nature as a sample blank or as a duplicate. The duplicate samples were taken immediately after the respective original sample. The duplicate samples are a measure of the reproducibility of the sampling. The results of the quality control samples are presented in the baseline report, with duplicate data presented along with those of the original sample allowing direct comparison. Overall, the quality control analysis shows that the data collected are sufficiently accurate to enable a reliable assessment of water quality at the time of sampling and for the parameters analysed and can be used to inform the baseline.

Standard Operating Procedures

SOP were provided for the samplers to following during training and during the survey:

- groundwater hydrochemical sampling
- Aquaread multi-parameter probe calibration
- preparation of CHROMagar ECC broth (culture medium for microbiological testing).

The use of standard procedures ensured as far as possible uniformity in calibration, sampling and measurement, causing any differences in results to be due to the water sampled and not the sampling or measurement technique.

Daily Calibration Checks

The calibration of the AquaRead multiparameter Aquaprobe was checked at the start of each day to maximise the accuracy of results.

Onsite Observations

The results of the on-site observations indicate:

- The nonfunctional boreholes encountered during the survey were sometimes abandoned by the community owing to “bad water quality”, characterised by salty water and a very brown “iron” colour of the water. In case of mechanical failure of boreholes, the community repairs it.
- Almost all the deep boreholes along the route had very mild microbial contamination unlike for the shallow well sampled along the East African Crude Oil Pipeline (EACOP).
- The districts of Mubende and Sembabule have the least coverage of water sources along the pipeline owing to limited groundwater potential in these areas.
- The occurrence of broken down boreholes as a result of installing pumps at great depths rendered sampling from these boreholes using the hand pumps impossible. Most of the communities have resorted to local sources such as water holes as alternative sources owing to poorly performing and broken down boreholes. In some of the lowlands of Mubende, shallow wells do occur but to a limited extent.
- In the districts of Mubende and Sembabule, water supply systems have been set up to cater for the lack of groundwater availability in the towns of Sembabule and Mubende including the surrounding villages and trading centres.
- Hydrocensus data referred to for the survey lacked coordinates, making it difficult to trace some of the existing sources along the pipeline despite efforts made to contact local communities and their leaders.
- The districts of Rakai, Hoima, and Kibaale generally have good groundwater potential in terms of quantity and quality. Shallow groundwater potential is also common in these areas rendering them vulnerable to contamination.
- Generally, salinity is high along the shores of Lake Albert leading to corroded pipes and frequent breakdowns of boreholes, and in some instances abandonment. This is however, not always the case with some boreholes within short distances having lower salinity.
- West of Rakai district, the level of mineralisation is extremely high leading to abandoned and broken down boreholes.

ATTACHMENT A7.3 FIELD SURVEY PHOTOGRAPHS

11/24/2017	KABAALE T/C	Hoima	KP0	DWD 30204	
11/24/2017	KYAKATEMBA	Hoima	KP7.5	DWD33457	
11/24/2017	KIHANGI P.S	Hoima	KP10.5	DWD 51337	
	KIKUMBA B	Hoima	KP24	DWD44332	
11/24/2017	BULIMYA	Hoima	KP24 ALT	NO NUMBER	
	BULIMYA	Hoima	KP30	NO NUMBER	

11/25/2017	KIRYANGA	Kibaale	KP35.5	DWD35528	
	HANGA	Kibaale	KP35.5	DWD37907	
11/25/2017	KITAHEMBA	Kibaale	KP45.5	DWD18609	
11/25/2017	KYAMAJARA	Kakumiro	KP55.5	NO NUMBER	
11/25/2017	KISIITA WEST B	Kakumiro	KP49	CD1464	
11/26/2017	KASAMBYA	Kakumiro	KP39.5	NO NUMBER	

11/26/2017	OUR LADY OF FATMA	Kakumiro	KP41.5	DWD 58280	
11/26/2017	NYAMIGAMBA	Kakumiro	KP41.5	DWD35597	
11/26/2017		Mubende		DWD35477	
11/26/2017		Mubende		DWD35476	
11/27/2017	KYENDA	Mubende		SHALLOW WELL	

11/27/2017	KYENDA	Mubende		DWD?	
11/27/2017	MUJJUNWA	Mubende	KP128.5	DWD51675	
11/27/2017	KYENDA	Mubende		DWD17049	
11/28/2017	MUWALA 1	Sembabule	KP165.5	WDD 6338	
11/28/2017	MUWALA 2	Sembabule	KP170.5	WDD 6331	

11/28/2017	MUYENJE	Sembabule	KP173.5	WDD 6337	
11/28/2017	NJAZA	Sembabule	KP175.5	WDD 6664?	
11/28/2017	MBUYE VILLAGE	Rakai	KP190	NO NUMBER	
11/29/2017	KIJANEBALOLA	Rakai	KP262.5	WDD5735	
11/29/2017	KITAASA	Rakai	KP265.5	NO NUMBER	

11/29/2017	RAKAI DISPENSARY	Rakai	KP262.5	NO NUMBER	
11/29/2017	LUMBUGU	Rakai	KP259	NO NUMBER	

11/29/2017	KABONERA	Rakai	KP285.5	NO NUMBER	
11/29/2017	SANJE	Rakai	KP271	SHALLOW WELL	

NOTES: KP = kilometre point

ATTACHMENT A7.4 LABORATORY REPORTS

SGS

CALA

Report number: EL180073

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Tim Newton
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Lab Ref:	EL180073
Client Ref:	**P.O. 275206**
Project:	
Received:	07/04/2018
Reported:	07/05/2018
Samples:	9
First Sample:	GWU-004 (Water) 23/11/2017 23:20
Last Sample:	GWU-012 (Water) 25/11/2017 16:40
Pages:	7

FINAL REPORT

Notes:

Enquiries: TZ.Environment@sgs.com

Authorised:

Peter Kpelly
Laboratory Manager

Bismark Sarkodie
Technical Signatory (Chem)

James Amos
Technical Signatory (ICP)

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Client Ref **P.O. 272997**
Project
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ANALYTICAL REPORT

Sample Ident	*Chloride*	*Sulphate*	*BOD**	*COD*	*Total Petroleum Hydrocarbon**	*Cd*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
GWU-007 (Water) 24/11/2017 12:15	5.5	5.8	<0.10	<0.10	<1.0	<0.001
GWU-008 (Water) 24/11/2017 15:30	2.1	1.6	<0.10	2.7	<1.0	<0.001
GWU-009 (Water) 25/11/2017 10:25	2.0	2.3	<0.10	<0.10	<1.0	<0.001
GWU-010 (Water) 25/11/2017 12:40	16.5	7.6	3.0	8.7	<1.0	<0.001
GWU-011 (Water) 25/11/2017 15:20	12.8	5.7	<0.10	<0.10	<1.0	<0.001
GWU-012 (Water) 25/11/2017 16:40	11.3	4.9	<0.10	<0.10	<1.0	<0.001
Method	*Chloride*	*Sulphate*	*BOD*	*COD*	*etroleum Hydro*	*issolved Metals*
Detection Limit	*0.20*	*0.02*	*0.10*	*0.10*	*1.0*	*0.001*
Method Uncertainity	*±0.17*	*±0.078*	*-*	*±0.024*	*-*	*±0.044*

NA - not analysed | *-- element not determined* | *I.S. insufficient sample* | *L.N.R. listed not received*

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	*Cr*	*Cu*	*Pb*	*Ni*	*Ag*	*V*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
GWU-007 (Water) 24/11/2017 12:15	<0.001	<0.001	<0.005	<0.004	<0.01	<0.001
GWU-008 (Water) 24/11/2017 15:30	<0.001	<0.001	<0.005	<0.004	<0.01	<0.001
GWU-009 (Water) 25/11/2017 10:25	<0.001	<0.001	<0.005	<0.004	<0.01	<0.001
GWU-010 (Water) 25/11/2017 12:40	<0.001	<0.001	<0.005	<0.004	<0.01	<0.001
GWU-011 (Water) 25/11/2017 15:20	<0.001	<0.001	<0.005	<0.004	<0.01	<0.001
GWU-012 (Water) 25/11/2017 16:40	<0.001	<0.001	<0.005	<0.004	<0.01	<0.001
Method	)issolved Metal	Dissolved Metal	Dissolved Metal	Dissolved Metal	Dissolved Metal	Dissolved Metals
Detection Limit	*0.001*	*0.001*	*0.005*	*0.004*	*0.01*	*0.001*
Method Uncertainity	*±0.027*	*±0.016*	*±0.012*	*±0.023*	*±0.001*	*±0.026*

NA - not analysed | *– element not determined* | *I.S. insufficient sample* | *L.N.R. listed not received*

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	*Zn*	*Fe*	*Ba*	*Ca*	*As*	*Hg*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
GWU-007 (Water) 24/11/2017 12:15	0.029	0.027	<0.002	26.0	<0.001	<0.001
GWU-008 (Water) 24/11/2017 15:30	0.19	0.95	0.031	2.7	<0.001	<0.001
GWU-009 (Water) 25/11/2017 10:25	1.9	1.1	0.068	8.6	<0.001	<0.001
GWU-010 (Water) 25/11/2017 12:40	0.074	0.52	0.037	44.6	<0.001	<0.001
GWU-011 (Water) 25/11/2017 15:20	0.95	0.52	<0.002	9.1	<0.001	<0.001
GWU-012 (Water) 25/11/2017 16:40	0.15	0.20	<0.002	27.7	<0.001	<0.001
Method	)issolved Metal	Dissolved Metal	Dissolved Metal	*Cations*	*D_Hydrides*	*D_Hydrides*
Detection Limit	*0.001*	*0.001*	*0.002*	*0.01*	*0.001*	*0.001*
Method Uncertainity	*±0.040*	*±0.050*	*±0.020*	*±0.097*	*±0.0008*	*±0.0015*

NA - not analysed | *– element not determined* | *I.S. insufficient sample* | *L.N.R. listed not received*

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	*TSS*	*Polycyclic Aromatic Hydrocarbonms (PAHs) #*				
		Naphthalene	*Acenaphthylene*	*Acenaphthene*	*Fluorene*	*Phenanthrene*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
GWU-007 (Water) 24/11/2017 12:15	<1.0	0.00002	<0.00001	<0.00001	<0.00001	0.00001
GWU-008 (Water) 24/11/2017 15:30	<1.0	0.00003	<0.00001	<0.00001	<0.00001	0.00006
GWU-009 (Water) 25/11/2017 10:25	<1.0	0.00001	<0.00001	<0.00001	<0.00001	0.00005
GWU-010 (Water) 25/11/2017 12:40	2.3	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
GWU-011 (Water) 25/11/2017 15:20	<1.0	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
GWU-012 (Water) 25/11/2017 16:40	<1.0	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Method	*TSS*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 HE*
Detection Limit	*1.0*	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*
Method Uncertainity	*±0.76*	-	-	-	-	-

NA - not analysed | *-- element not determined* | *I.S. insufficient sample* | *L.N.R. listed not received*

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

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ANALYTICAL REPORT

Sample Ident	Polycyclic Aromatic Hydrocarbonms (PAHs) #					
	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
GWU-007 (Water) 24/11/2017 12:15	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
GWU-008 (Water) 24/11/2017 15:30	<0.00001	0.00004	0.00002	<0.00001	<0.00001	<0.00001
GWU-009 (Water) 25/11/2017 10:25	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
GWU-010 (Water) 25/11/2017 12:40	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
GWU-011 (Water) 25/11/2017 15:20	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
GWU-012 (Water) 25/11/2017 16:40	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Method	IN 38407-39 H	IN 38407-39 H	IN 38407-39 H	IN 38407-39 H	IN 38407-39 H	IN 38407-39 HE
Detection Limit	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Method Uncertainity	-	-	-	-	-	-

NA - not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

*non-accredited # - subcontracted TNTC - too numerous to count T.F. to follow

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Lab Ref EL180073
Client Ref **P.O. 272997**
Project
Reported 07/05/2018
Status Final
Page 7 of 7

ANALYTICAL REPORT

Sample Ident	*Polycyclic Aromatic Hydrocarbonms (PAHs) #*					
	Benzo(k)fluoranthene	*Benzo(a)pyrene*	*Dibenzo(a,h)anthracene*	*Benzo(g,h,i)perylene*	*Indeno(1,2,3-c,d)pyrene*	*Total PAH*
Units	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*	*mg/l*
GWU-007 (Water) 24/11/2017 12:15	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00003
GWU-008 (Water) 24/11/2017 15:30	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00015
GWU-009 (Water) 25/11/2017 10:25	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00006
GWU-010 (Water) 25/11/2017 12:40	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
GWU-011 (Water) 25/11/2017 15:20	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001
GWU-012 (Water) 25/11/2017 16:40	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Method	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 H*	*IN 38407-39 HE*
Detection Limit	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*	*0.00001*
Method Uncertainity	-	-	-	-	-	-

NA - not analysed | *-- element not determined* | *I.S. insufficient sample* | *L.N.R. listed not received*

**non-accredited* *# - subcontracted* *TNTC - too numerous to count* *T.F. to follow*

END OF REPORT

Appendix A8: Landscape Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
km	kilometre
m	metre
mm	millimetre
A	
AGI	aboveground installation
AOI	area of influence
K	
kraal	livestock enclosure
M	
masl	metres above sea level
MCPY	main camp and pipe yard
P	
PS	pumping station
R	
RoW	right-of-way

A8 LANDSCAPE BASELINE REPORT

A8.1 Introduction

This baseline report describes the landscape:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions
  - baseline condition of the landscape
  - trends affecting the condition of the landscape and views and sensitivity to change
  - ecosystem services
  - sensitivity rankings
- key considerations.

A8.2 Area of Influence and Study Area Boundaries

A8.2.1 Area of Influence Boundary

The project components included in the AOI are PS1 and PS2. Other project components such as other aboveground installations (AGI), main camp and pipe yard (MCPY) and the RoW were screened out during scoping as they are considered unlikely to have a major impact on visual receptors. This was confirmed during the landscape field survey.

The PS1 and PS2 landscape AOIs were set provisionally at a 5-km radius, based on an initial desktop study using engineering information and satellite images to identify the location of potential receptors.

The field survey confirmed that most PS1 and PS2 views will be restricted to within 1 km, and to 3 km for the remaining views except for a few vantage points from higher hills that extend the AOI in some directions to a 5-km radius.

The pumping stations are permanent and will remain operational over the lifetime of the project, so the temporal AOI will be approximately 25 years.

The AOIs are illustrated on Figure A8.2-1 and Figure A8.2-2.

A8.2.2 Study Area Boundaries

The study area boundaries are the same as the AOI.

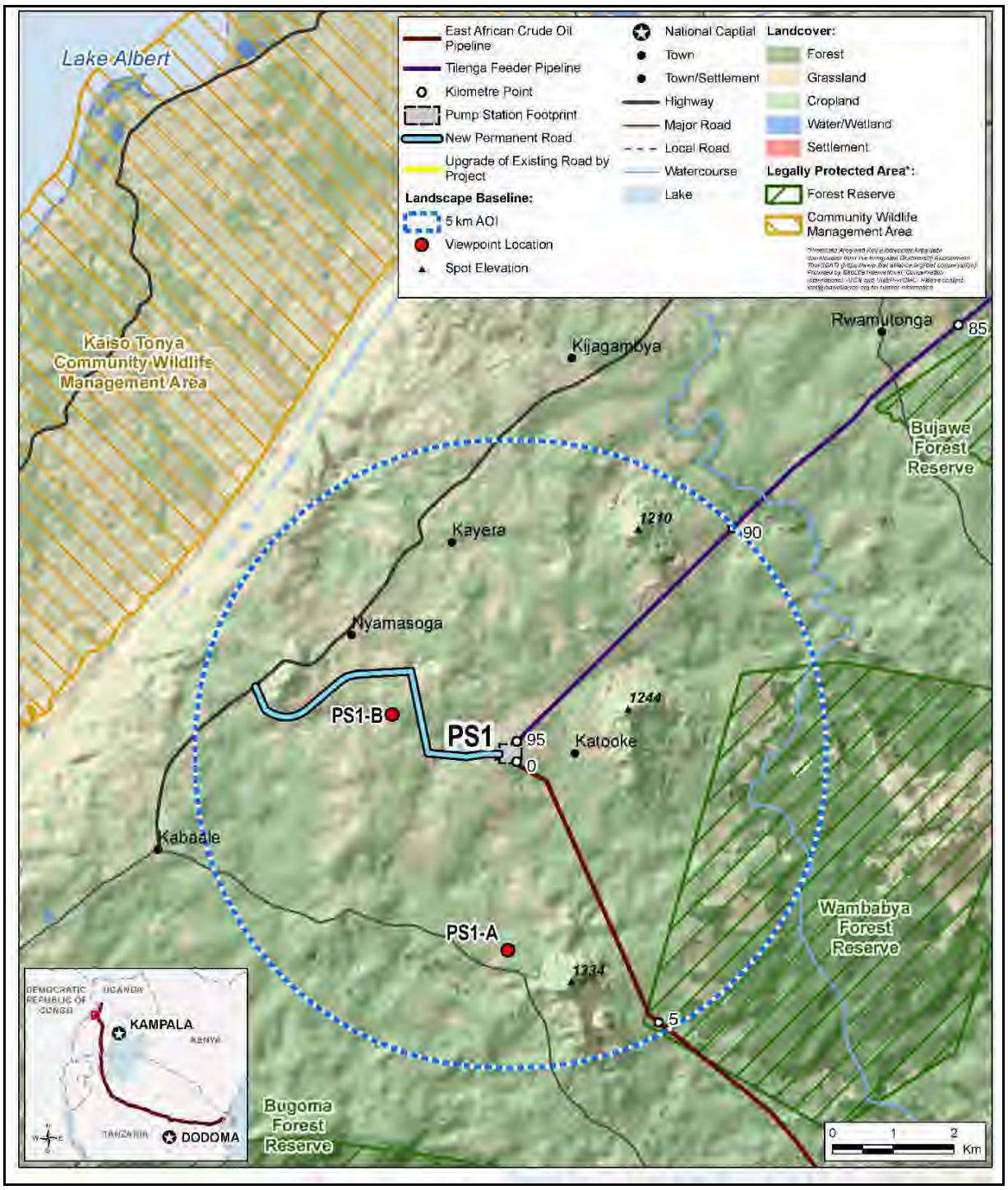

Figure A8.2-1 Area of Influence and Pumping Station 1 Viewpoint Photograph Locations

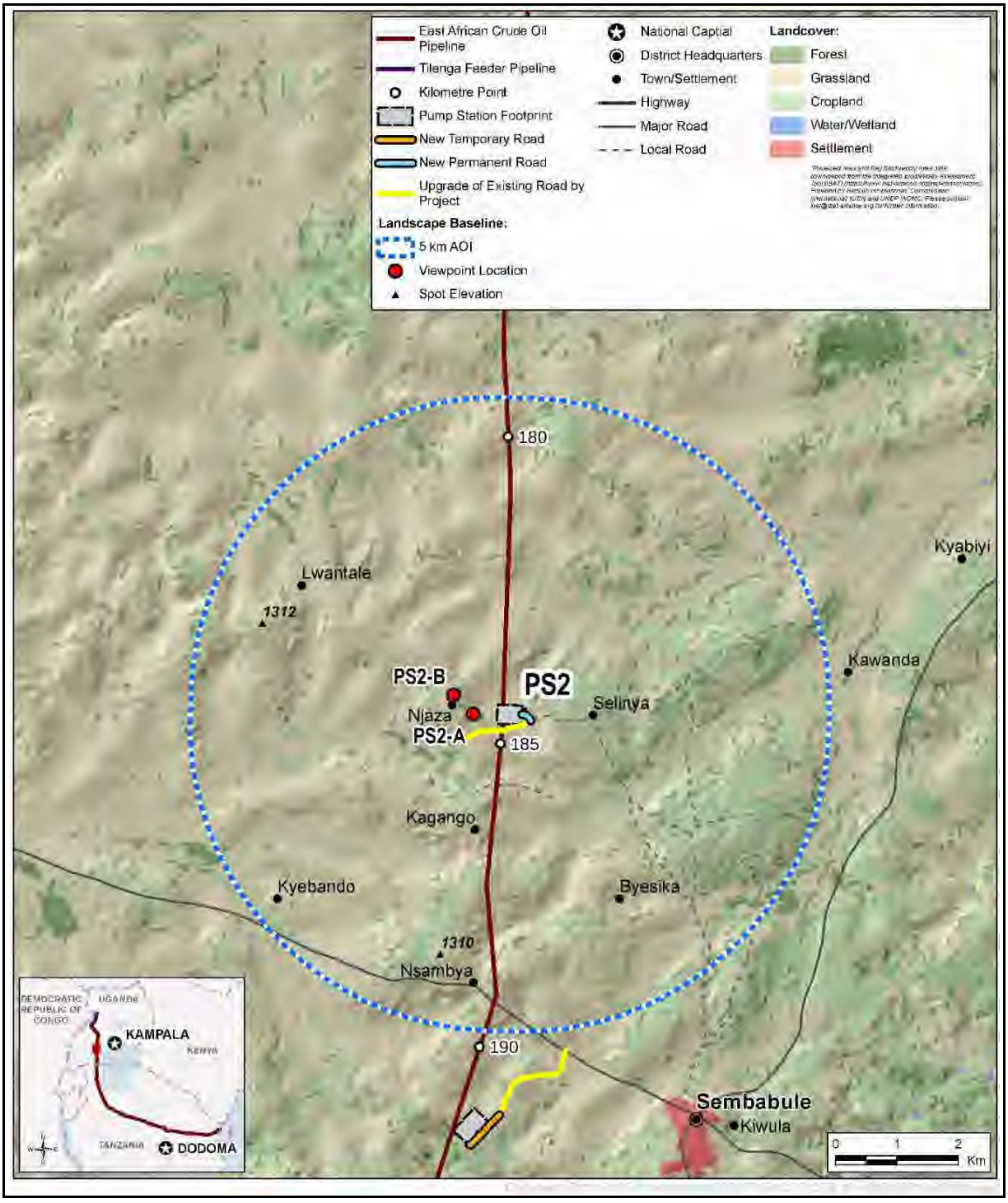

Figure A8.2-2 Area of Influence and Pumping Station 2 Viewpoint Photograph Locations

A8.3 Methods

A8.3.1 Secondary Data

A review of land cover maps and satellite images was used to identify potential impacts on the landscape character and visual impacts to be assessed in the field. The information was also used to determine viewpoints from which photographs representative of the landscape character and views of the pumping stations would be taken.

A8.3.2 Field Survey

The landscape field survey was conducted on 12–14 November 2017 using field survey data sheets developed during the desktop review. The survey objectives were to:

- identify potential visual receptors
- describe the landscape character
- consider potential trends affecting the landscape within the AOIs, such as changes in land use, land cover or settlement patterns.

Viewpoints were selected for photographs to illustrate the baseline landscape character and views towards PS1 and PS2. Photographs were taken using a:

- Garmin GPSMAP 64S, Canon EOS 550D digital SLR camera with a Sigma 30-mm F1.4 lens
- Manfrotto camera tripod with panoramic head and levelling plates.

The landscape team used field survey forms to record site information such as direction of view, landform and land/vegetation cover (see Attachment A8.1).

Information was also gathered during the social and biodiversity baseline surveys. During the social baseline survey, people were shown illustrations of typical project infrastructure and their responses recorded. Owners of tourist accommodation and Uganda Wildlife Authority officials were interviewed to identify tourist locations, as tourism may be linked to aesthetic interest, but none were identified.

Survey data for areas of biodiversity value were assessed, as these areas may be associated with features of higher landscape sensitivity, such as having a greater degree of naturalness and an absence of modern infrastructure.

For more information on the social and biodiversity surveys, see Appendix A1 Botany Biodiversity Baseline Report and Appendix A11 Socio-economic and Health Baseline Report.

A8.3.3 Data Analysis

The sensitivity of the landscape and visual receptors has been ranked according to the table for landscape and viewer sensitivity, see Appendix D.

A8.3.4 Data Considerations

The secondary data review, field survey and social and biodiversity surveys have provided sufficient information to accurately describe the landscape, and identify and characterise viewers of PS1 and PS2.

A8.4 Landscape Baseline Conditions

The baseline condition of PS1 and PS2 AOIs is described below in terms of:

- landscape character of PS1 and PS2
- potential viewers of PS1 and PS2.

A8.4.1 Baseline Condition of the Landscape

A8.4.1.1 Introduction

The AOI traverses a mixed landscape of gently undulating grasslands and farmland, hills with open plateaus and bare rocky outcrops, forested areas, wetlands and, near the border with Tanzania, a drier, more sparsely vegetated landscape. Most of the AOI is in an area of low biodiversity significance except for a few sections that are in or close to forest reserves. Areas of high biodiversity value are often linked to sensitive landscapes, as they can possess valued or rare natural scenic features. However, the areas traversed by the AOI have been affected by farming and grazing and are of low landscape sensitivity.

A8.4.1.2 Pumping Station 1

Landscape Character

The PS1 AOI consists of undulating to hilly terrain, which rises from approximately 650 m above sea level (masl) in the west to over 1300 masl in the southeast. PS1 is on a slightly elevated area (1083 masl) of an escarpment that includes some pronounced hills.

The landscape is characterised by farmland, comprising grazing (grassland) and mixed cropland dominated by maize and sugar cane, interspersed with clusters of trees and scrubland. Field patterns are typically irregular with field boundaries usually defined by changes in crop type or land use, although simple fencing made of tree branches strung with wire or scrub hedges demarcate some of the plots.

A section of the Wambabya Forest Reserve is within the AOI, 3 km to the east of PS1, and remains mostly intact, but field observations show some encroachment by farming and logging for charcoal (see Appendix A1 Botany Biodiversity Baseline Report). There is no marked change in landscape character between the wet and dry seasons, although groundcover (e.g., grasses) will become dry and sparse during the dry season.

There are two quiet, small, mainly agricultural settlements along a sealed main road that traverses the AOI north to south, parallel to Lake Albert:

- Nyamasoga, 3.3 km to the northwest
- Kayera, 3.8 km to the north.

There are small trading centres within these settlements, where there is a slight increase in activity, although this is restricted to relatively small areas.

Another quiet, small agricultural settlement, Katooke, is in the AOI, 1 km to the east.

Other areas of habitation are limited to smaller agricultural settlements and isolated farms surrounded by cultivated land, all accessed by local unsealed roads. Although a predominantly rural, agricultural landscape, the main road and a telecommunication mast are indicators of limited development within the AOI.

Most of the landscape within the AOI has been modified by human activity. Although rural in nature, the landscape has lost most of its natural vegetation, except for the forest remaining in Wambabya Forest Reserve. The Wambabya Forest Reserve was identified to have biodiversity value in the biodiversity baseline study (see Appendix A1 Botany Biodiversity Baseline Report); it contains intact forest that would increase landscape sensitivity due to its natural scenic value. However, there are no views of PS1 from the reserve and is therefore not considered further within the baseline.

Views of Pumping Station 1 Location

Figure A8.4-1 and Figure A8.4-2 show the views toward the PS1 location from viewpoints PS1-A and PS1-B. The landscape is typical of this AOI.

Views of PS1 are limited, mostly restricted to locations within a 1 km radius. Visual receptors comprise users of local unsealed roads, and people working on farms and living in small settlements. Hills and vegetation screen most views. Visibility of PS1 is summarised as:

- 0–1-km radius – some views of PS1, but often screened by hills and vegetation.
- 1–3-km radius – views limited to the taller elements of PS1, such as the communications antenna.
- 3–5-km radius – views limited to the taller elements of PS1 from hilltops.

Stakeholders did not perceive the proposed project infrastructure as a negative visual intrusion in the landscape, and no tourist attractions were identified (see Appendix C Stakeholder Engagement and Appendix A11 Socio-economic and Health Baseline Report). Visibility is not affected by season, as screening is provided by topography and dense scrub and trees, which do not change markedly between the wet and dry seasons, although some leaf cover may be lost.

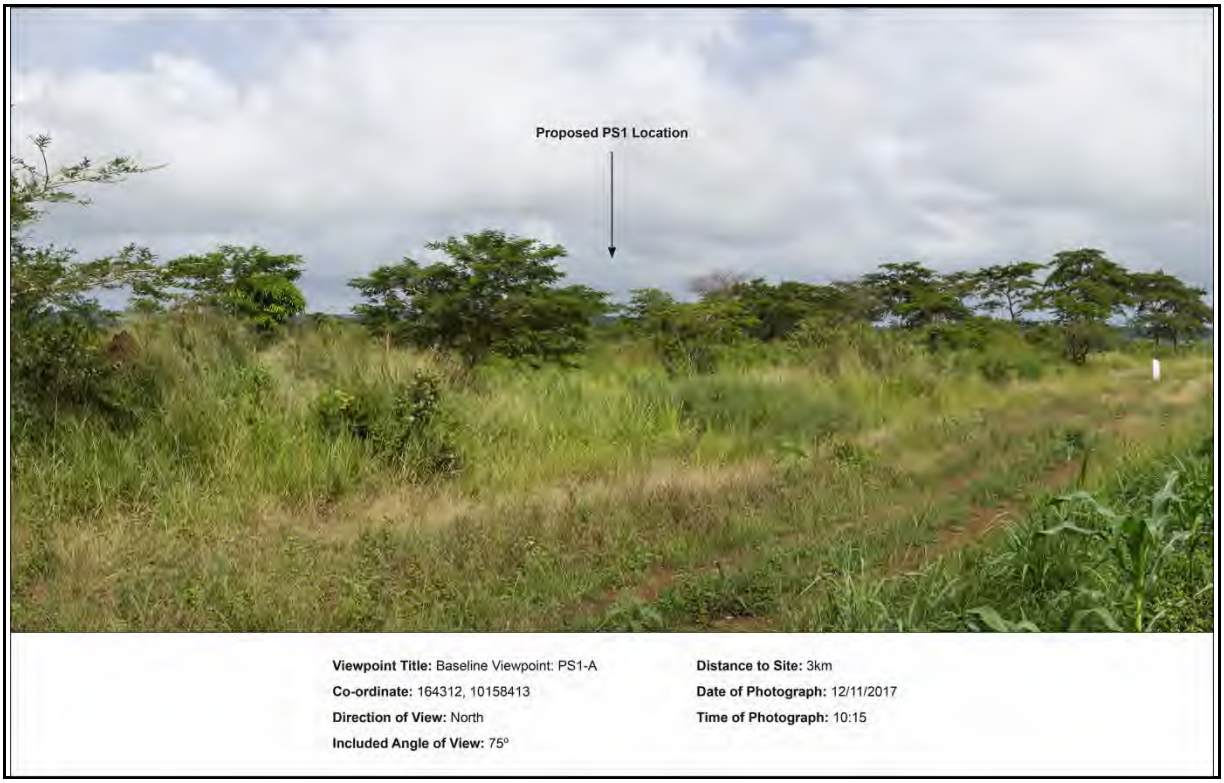

Figure A8.4-1 Pumping Station 1 Viewpoint PS1-A Photograph

Figure A8.4-2 Pumping Station 1 Viewpoint PS1-B Photograph

A8.4.1.3 Pumping Station 2

Landscape Character

The PS2 AOI consists of undulating terrain, with several hills rising to over 1300 masl, separated by seasonally inundated, low-lying areas.

The landscape is characterised by grazing land interspersed by scrub and some trees. There is little evidence of farming, other than small gardens directly adjacent to dwellings. Simple fencing made of tree branches strung with wire or scrub hedges demarcate grazing plots. A few tree plantations, predominantly fir and eucalyptus, are within the AOI. The landscape illustrated in Figure A8.4-3 and Figure A8.4-4 shows lush vegetation following seasonal rains. There is no marked change in landscape character between the wet and dry seasons, although groundcover (e.g., grasses) will become dry and sparse during the dry season.

The area is remote, with a widely dispersed population. There are four quiet, small agricultural settlements along an unsealed main road that traverses the AOI north to south:

- Njaza, 0.8 km to the west
- Kagango, 1.9 km to the south
- Lwantale, 3.8 km to the northwest
- Nsambya, 4.2 km to the south.

Four similar small settlements are distributed along local unsealed roads in the AOI:

- Selinya, 1.3 km to the east
- Mbale, 1.8 km to the northeast
- Byesika, 3.5 km to the southeast
- Kyebando, 4.6 km to the southwest.

There is a small trading centre within one of the settlements, Selinya, where there is a slight increase in activity, although this is restricted to a relatively small area. Other than these settlements, occasional livestock farms with associated kraal[1] dot the landscape.

Although remote, this is not a wild or particularly scenic landscape, as human activities have altered it over time. There are no areas of biodiversity value within the AOI that would increase landscape sensitivity owing to valued or rare natural scenic features.

Views of Pumping Station 2 Location

Figure A8.4-3 and Figure A8.4-4 show the view towards the PS2 location from viewpoints PS2-A and PS2-B. The landscape shown is typical of this AOI. There are views of PS2 within 1 km, although the tree and scrub vegetation limit these views. Visual receptors are limited to users of unsealed roads, farm workers and people living in small settlements. Hills and vegetation screen most views. Visibility of PS2 is summarised as:

[1] Livestock enclosure

- 0–1-km radius – some views of PS2, but often screened by hills and vegetation.
- 1–3-km radius – views limited to the taller elements of PS2, primarily the proposed communications antenna.
- 3–5-km radius – views limited to the taller elements of PS2, primarily the proposed communications antenna from hilltops.

Stakeholders did not perceive the proposed project infrastructure as a negative visual intrusion in the landscape, and no tourist attractions were identified (see Appendix C Stakeholder Engagement and Appendix A11 Socio-economic and Health Baseline Report). Visibility is not affected by season, as screening is provided by topography and dense scrub and trees, which does not change markedly between the wet and dry seasons, although some leaf cover may be lost.

Figure A8.4-3 Pumping Station 2 Viewpoint PS2-A Photograph

Figure A8.4-4 Pumping Station 2 Viewpoint PS2-B Photograph

A8.4.2 Trend in Condition and Sensitivity to Change

A8.4.2.1 Pumping Station 1

PS1 is in an area that, over time, has been converted from a mixture of grassland and scrub to farmland. This trend is predicted to continue, maintaining the rural landscape character of the AOI.

The sealed main road to the west of the study area has not resulted in increased development, but this may change if oil industry related activities, such as those relating to a refinery, are developed. The landscape is expected to be able to tolerate further similar change or modification without changes to its present character, so is not regarded as sensitive to change.

A8.4.2.2 Pumping Station 2

PS2 is in an area that has seen gradual conversion from grassland and scrub to predominantly grazing land, which is sparsely settled. This trend appears to be continuing. The landscape is expected to be able to tolerate further similar change or modification with changes to its present character, so is not regarded as sensitive to change.

A8.4.3 Ecosystem Services Provided

Landscape provides the following ecosystem services:

Cultural services:

- nonmaterial benefits from the sense of wellbeing and value provided to people by living in an attractive environment.

However, stakeholders did not identify elements of high aesthetic, cultural or religious importance or tourist attractions (see Appendix C Stakeholder Engagement and Appendix A11 Socio-economic and Health Baseline Report).

Consideration of the ecosystems and local context suggest that landscape values at these two locations are limited: The sites are remote, the local environments comprise highly modified habitat, and there is minimal current or potential tourism in the area.

A8.4.4 Sensitivity Rankings

A8.4.4.1 Pumping Station 1

Based on the survey, engagement with stakeholders and the trend in condition and sensitivity to change, the sensitivity of the landscape character and visual receptors within the PS1 AOI have been ranked and are shown below in Table A8.4-1.

Table A8.4-1 Pumping Station 1: Landscape Receptor Sensitivity Ranking

Landscape Receptor	Sensitivity Ranking	Rationale for Ranking
Farmland landscape	Low (2)	Agricultural landscape tolerant of further similar change
Small settlements, farms and users of unsealed roads	Low (2)	Stakeholders did not perceive the proposed project infrastructure as a negative visual intrusion in the landscape.

A8.4.4.2 Pumping Station 2

Based on the survey and engagement with stakeholders and the trend in condition and sensitivity to change, the sensitivity of the landscape character and visual receptors within the PS2 AOI have been ranked and are shown below in Table A8.4-2.

Table A8.4-2 Pumping Station 2: Landscape Receptor Sensitivity Ranking

Landscape Receptor	Sensitivity Ranking	Rationale for Ranking
Grazing land, grassland and scrub	Low (2)	Agricultural landscape tolerant of further similar change
Small settlements, farms and users of unsealed roads	Low (2)	Stakeholders did not perceive the proposed project infrastructure as a negative visual intrusion in the landscape.

A8.5 Key Considerations

For the PS1 AOI, most of the landscape has been modified by human activity. Although rural in nature, the landscape has lost most of its natural scenic value and is of low landscape sensitivity.

Although remote, the landscape sensitivity of the AOI for PS2 is low: it is not a wild or particularly scenic landscape, as human activities have altered it.

Stakeholders did not perceive the proposed project infrastructure as a negative visual intrusion in the landscape, and no tourist attractions were identified.

A8.6 References

Total East Africa Midstream BV. 2017. EACOP Environmental and Social Impact Assessment Scoping Report for Approval. Submitted to National Environment Management Authority, July.

ATTACHMENT A8.1 FIELD SURVEY DATA

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Viewpoint No	PS-1A	**Location**	3km South of PS-1			
Date & Time	12-11-17 10:15am	**Grid Reference**	1.42985, 31.086435			
Assessor		**Weather**	Overcast			
Visibility	V. Poor <1km	Poor 1-4km	Moderate 4-10km ✓	Good 10-20km	V. Good 20-40km	Excellent 40km>
Direction of View	North					
Visual Receptor Type/s	Track South of site		**Receptor Sensitivity**	Low		
Views						
Long Distant	Medium distant	Short Distant ✓	Panoramic	Framed		
Focused/directed	Direct	Oblique	Prolonged	Intermittent		
Brief	Uninterrupted	Interrupted	Other			
Description of View Frames 0001 - 0027	Dense farmland & Scrubland vegetation. Very difficult to find an open view of the site due to the level of vegetation cover. Photo taken from track adjacent to the site, highest point nearby, with some opening of vegetation. Maize appears to be the dominant crop. Also a lot of scrub.					

Night-time Light Pollution

Negligible ✓	Slight	Moderate	Substantial

Landscape Type

Farmland ✓	Forestry/Woodland	Industrial	Commercial
Residential	Natural eg Savannah	Transportation	Mineral working
Military	Leisure/recreation	Mangrove	

Landform

Flat	Floodplain	Gently undulating	Undulating ✓
Rolling Lowland Hills	Steep Slopes	Gentle slopes	High Hills/Mountains ✓
Narrow Valley	Broad Valley	Shallow Valley	Deep Valley
Escarpment	Cliffs	Plateau	Rugged/Complex terrain
Smooth/simple terrain	Other		

Land/Vegetation Cover

Woodland/Forest - natural	Woodland/forest - cultivated	Mixed Woodland	Shelterbelt
Scrub ✓	Marsh	Mangrove	Isolated Trees
Pastoral	Rough Grassland	Grassland/Meadow	Arable ✓
Other			

Field Pattern/Boundaries

Banks	Ditches	Fence	Hedgerow
Small	Medium	Large	Regular
Irregular ✓	Rectilinear	Sinuous	Other

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Other Elements

Motorway	Poles and wires	Industrial Workings	River
Main Road	Chimneys	Industrial Features	Stream
Rural Road / Lane	Farm Buildings	Industrial Buildings	Reservoir
Track ✓	Telecom Masts	Commercial buildings	Dry Valley
Telegraph Poles	Fortifications	Place of Worship	Pond
Footpath	Ruins		Lake
Railway			Drainage ditch
Pylons			Irrigation Channel
Key landmarks			
Other Features	Mobile phone mast on top of hill due south of photo.		

Settlement Pattern

Urban	Suburban	Urban Fringe
Rural ✓	Dispersed ✓	Nucleated
Linear	City	Town
Village	Other	

Aesthetic and Perceptual Qualities

Scale				
Intimate	Small	Medium ✓	Large	Vast
There are attractive views				
Within	Into	Out	Both in and out ✓	Neither in or out
There are detractive views				
Within	Into	Out	Both in and out	Neither in or out
Enclosure				
Exposed	Open	Semi-enclosed ✓	Enclosed	Confined
Variety				
Complex	Varied ✓	Simple	Uniform	
Texture				
Smooth	Textured ✓	Rough	Very Rough	
Colour				
Monochrome	Muted ✓	Colourful	Garish	
Movement				
Remote	Vacant	Peaceful ✓	Active	
Unity				
Unified ✓	Interrupted	Fragmented	Chaotic	
Balance				
Harmonious	Balanced ✓	Discordant	Chaotic	
Tranquillity				
Remote	Peaceful ✓	Interrupted	Noisy	
Naturalness				
Undisturbed	Restrained ✓	Tamed	Disturbed	
Security				
Intimate	Comfortable	Safe ✓	Unsettling	Threatening
Pleasure				
Unpleasant	Neutral	Pleasant ✓	Attractive	Beautiful

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Viewpoint No	PS-18	**Location**	2.1km WNW of PS1			
Date & Time	12-11-17 10.55am	**Grid Reference**	1.464833, 31.069303			
Assessor		**Weather**	Overcast			
Visibility	V. Poor <1km	Poor 1-4km	Moderate 4-10km ✓	Good 10-20km	V. Good 20-40km	Excellent 40km>
Direction of View	ESE.					
Visual Receptor Type/s	Track / Permanent access to PS1		**Receptor Sensitivity**	Low		
Views						
Long Distant	Medium distant	Short Distant ✓	Panoramic	Framed		
Focused/directed	Direct	Oblique	Prolonged	Intermittent		
Brief	Uninterrupted	Interrupted	Other			
Description of View Frames 0028 - 0054	Dense farmland & scrubland vegetation again, difficult to see the site, because views screened by vegetation. Views to hill in the distance to the east - mobile phone mast on top of the hill.					

Night-time Light Pollution

Negligible ✓	Slight	Moderate	Substantial

Landscape Type

Farmland ✓	Forestry/Woodland	Industrial	Commercial
Residential	Natural eg Savannah	Transportation	Mineral working
Military	Leisure/recreation	Mangrove	

Landform

Flat	Floodplain	Gently undulating	Undulating ✓
Rolling Lowland Hills	Steep Slopes	Gentle slopes	High Hills/Mountains ✓
Narrow Valley	Broad Valley	Shallow Valley	Deep Valley
Escarpment	Cliffs	Plateau	Rugged/Complex terrain
Smooth/simple terrain	Other		

Land/Vegetation Cover

Woodland/Forest - natural	Woodland/forest - cultivated	Mixed Woodland	Shelterbelt
Scrub ✓	Marsh	Mangrove	Isolated Trees
Pastoral	Rough Grassland	Grassland/Meadow	Arable ✓
Other			

Field Pattern/Boundaries

Banks	Ditches	Fence	Hedgerow
Small	Medium	Large	Regular
Irregular ✓	Rectilinear	Sinuous	Other

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Other Elements

Motorway	Poles and wires	Industrial Workings	River
Main Road	Chimneys	Industrial Features	Stream
Rural Road / Lane	Farm Buildings	Industrial Buildings	Reservoir
Track ✓	Telecom Masts ✓	Commercial buildings	Dry Valley
Telegraph Poles	Fortifications	Place of Worship	Pond
Footpath	Ruins		Lake
Railway			Drainage ditch
Pylons			Irrigation Channel
Key landmarks			
Other Features			

Settlement Pattern

Urban	Suburban	Urban Fringe
Rural ✓	Dispersed ✓	Nucleated
Linear	City	Town
Village	Other	

Aesthetic and Perceptual Qualities

Scale				
Intimate	Small	Medium ✓	Large	Vast
There are attractive views				
Within	Into	Out	Both in and out ✓	Neither in or out
There are detractive views				
Within	Into	Out	Both in and out	Neither in or out
Enclosure				
Exposed	Open	Semi-enclosed ✓	Enclosed	Confined
Variety				
Complex	Varied ✓	Simple	Uniform	
Texture				
Smooth	Textured ✓	Rough	Very Rough	
Colour				
Monochrome	Muted ✓	Colourful	Garish	
Movement				
Remote	Vacant	Peaceful ✓	Active	
Unity				
Unified ✓	Interrupted	Fragmented	Chaotic	
Balance				
Harmonious	Balanced ✓	Discordant	Chaotic	
Tranquillity				
Remote	Peaceful ✓	Interrupted	Noisy	
Naturalness				
Undisturbed	Restrained ✓	Tamed	Disturbed	
Security				
Intimate	Comfortable	Safe ✓	Unsettling	Threatening
Pleasure				
Unpleasant	Neutral	Pleasant ✓	Attractive	Beautiful

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Viewpoint No	PS-2A	**Location**	Track 600m WSW of PS2			
Date & Time	14-11-17 10.30am	**Grid Reference**	E:0020234 2 N:0999747 0			
Assessor		**Weather**	Cloudy with sore breaks			
Visibility	V. Poor <1km	Poor 1-4km	Moderate 4-10km ✓	Good 10-20km	V. Good 20-40km	Excellent 40km>
Direction of View	ENE					
Visual Receptor Type/s	Track		**Receptor Sensitivity**	Low		
Views						
Long Distant	Medium distant ✓	Short Distant	Panoramic	Framed		
Focused/directed	Direct	Oblique	Prolonged	Intermittent		
Brief	Uninterrupted	Interrupted	Other			
Description of View Frames 0055-0082	Track is enclosed on both sides by predominantly high vegetation which considerably restricts views. Photo taken from an opening within the vegetation although the view of site is still restricted. Undulating landform also restricts views. Fences provide enclosure adjacent to tracks, otherwise no obvious sign of field boundaries					

Night-time Light Pollution

Negligible ✓	Slight	Moderate	Substantial

Landscape Type

Farmland ✓	Forestry/Woodland	Industrial	Commercial
Residential	Natural eg Savannah	Transportation	Mineral working
Military	Leisure/recreation	Mangrove	

Landform

Flat	Floodplain	Gently undulating	Undulating ✓
Rolling Lowland Hills	Steep Slopes	Gentle slopes	High Hills/Mountains ✓
Narrow Valley	Broad Valley	Shallow Valley	Deep Valley
Escarpment	Cliffs	Plateau	Rugged/Complex terrain
Smooth/simple terrain	Other		

Land/Vegetation Cover

Woodland/Forest - natural	Woodland/forest - cultivated	Mixed Woodland	Shelterbelt
Scrub ✓	Marsh	Mangrove	Isolated Trees
Pastoral/Grazing ✓	Rough Grassland	Grassland/Meadow	Arable
Other			

Field Pattern/Boundaries

Banks	Ditches	Fence ✓ some	Hedgerow
Small	Medium	Large	Regular
Irregular ✓	Rectilinear	Sinuous	Other

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Other Elements

Motorway	Poles and wires	Industrial Workings	River
Main Road	Chimneys	Industrial Features	Stream
Rural Road / Lane	Farm Buildings	Industrial Buildings	Reservoir
Track ✓	Telecom Masts	Commercial buildings	Dry Valley
Telegraph Poles	Fortifications	Place of Worship	Pond
Footpath	Ruins		Lake
Railway		N/A	Drainage ditch
Pylons			Irrigation Channel
Key landmarks			
Other Features			

Settlement Pattern

Urban	Suburban	Urban Fringe
Rural ✓	Dispersed ✓	Nucleated
Linear	City	Town
Village	Other	

Aesthetic and Perceptual Qualities

Scale				
Intimate	Small	Medium ✓	Large	Vast
There are attractive views				
Within	Into ✓	Out	Both in and out	Neither in or out
There are detractive views				
Within	Into	Out	Both in and out	Neither in or out ✓
Enclosure				
Exposed	Open	Semi-enclosed ✓	Enclosed	Confined
Variety				
Complex	Varied ✓	Simple	Uniform	
Texture				
Smooth	Textured ✓	Rough	Very Rough	
Colour				
Monochrome	Muted ✓	Colourful	Garish	
Movement				
Remote	Vacant	Peaceful ✓	Active	
Unity				
Unified	Interrupted ✓	Fragmented	Chaotic	
Balance				
Harmonious	Balanced ✓	Discordant	Chaotic	
Tranquillity				
Remote	Peaceful ✓	Interrupted	Noisy	
Naturalness				
Undisturbed	Restrained ✓	Tamed	Disturbed	
Security				
Intimate	Comfortable	Safe ✓	Unsettling	Threatening
Pleasure				
Unpleasant	Neutral	Pleasant ✓	Attractive	Beautiful

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Viewpoint No	PS-213	**Location**	Track 900m W of PS2, adjacent to farmstead.			
Date & Time	14-11-17 10.45am	**Grid Reference**	E:0020201 N:0999774			
Assessor		**Weather**	Cloudy with some breaks			
Visibility	V. Poor <1km	Poor 1-4km	Moderate 4-10km ✓	Good 10-20km	V. Good 20-40km	Excellent 40km>
Direction of View	E					
Visual Receptor Type/s	Track/farmstead	**Receptor Sensitivity**	Low			
Views						
Long Distant	Medium distant ✓	Short Distant	Panoramic	Framed		
Focused/directed	Direct	Oblique	Prolonged	Intermittent		
Brief	Uninterrupted	Interrupted	Other			
Description of View FRAMES 0083-0109	Track again predominantly enclosed by vegetation on both sides, with photo taken from an opening. Undulating landform and vegetation restrict views of the site. Farmstead located adjacent to the track.					

Night-time Light Pollution

Negligible ✓	Slight	Moderate	Substantial

Landscape Type

Farmland ✓	Forestry/Woodland	Industrial	Commercial
Residential	Natural eg Savannah	Transportation	Mineral working
Military	Leisure/recreation	Mangrove	

Landform

Flat	Floodplain	Gently undulating	Undulating ✓
Rolling Lowland Hills	Steep Slopes	Gentle slopes	High Hills/Mountains ✓
Narrow Valley	Broad Valley	Shallow Valley	Deep Valley
Escarpment	Cliffs	Plateau	Rugged/Complex terrain
Smooth/simple terrain	Other		

Land/Vegetation Cover

Woodland/Forest - natural	Woodland/forest - cultivated	Mixed Woodland	Shelterbelt
Scrub ✓	Marsh	Mangrove	Isolated Trees
Pastoral/Grazing ✓	Rough Grassland	Grassland/Meadow	Arable
Other			

Field Pattern/Boundaries

Banks	Ditches	Fence	Hedgerow
Small	Medium	Large	Regular
Irregular ✓	Rectilinear	Sinuous	Other

Landscape and Visual Impact Assessment
EACOP – Field Survey Form

Other Elements

Motorway	Poles and wires	Industrial Workings	River
Main Road	Chimneys	Industrial Features	Stream
Rural Road / Lane	Farm Buildings ✓	Industrial Buildings	Reservoir
Track ✓	Telecom Masts	Commercial buildings	Dry Valley
Telegraph Poles	Fortifications	Place of Worship	Pond
Footpath	Ruins		Lake
Railway			Drainage ditch
Pylons			Irrigation Channel
Key landmarks			
Other Features			

Settlement Pattern

Urban	Suburban	Urban Fringe
Rural ✓	Dispersed	Nucleated
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Scale				
Intimate	Small	Medium ✓	Large	Vast
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Within	Into ✓	Out	Both in and out	Neither in or out
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Within	Into	Out	Both in and out	Neither in or out ✓
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Monochrome	Muted ✓	Colourful	Garish	
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Remote	Vacant	Peaceful ✓	Active	
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Balance				
Harmonious	Balanced ✓	Discordant	Chaotic	
Tranquillity				
Remote	Peaceful ✓	Interrupted	Noisy	
Naturalness				
Undisturbed	Restrained ✓	Tamed	Disturbed	
Security				
Intimate	Comfortable	Safe ✓	Unsettling	Threatening
Pleasure				
Unpleasant	Neutral	Pleasant ✓	Attractive	Beautiful

Appendix A9: Air Quality Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
µ	micro – one millionth, 10^{-6}
µg/m^3	micrograms per cubic metre
A	
AGI	aboveground installation
AOI	area of influence
B	
BTEX	benzene, toluene, ethylbenzene and xylene
C	
CO	carbon monoxide
D	
diffusion tube	plastic monitoring tubes for inorganic compounds – they work by molecular diffusion, with compounds moving from an area of high concentration (air) to an area of low concentration (tube), where the compounds collect on the absorbent at the end of the tube.
E	
EAC	East African Community
EACOP	East African Crude Oil Pipeline
H	
H_2S	hydrogen sulphide
N	
NO_x	nitrogen oxides: a generic term for the nitrogen oxides that are most relevant for air pollution, namely nitric oxide (NO) and nitrogen dioxide (NO_2). Calculated as the sum of the volumetric concentrations of these substances and, when in mass terms, reported as NO_2
NO_2	nitrogen dioxide
O	
O_3	ozone
P	
PES	project environmental standard
PM	particulate matter
PM_{10}	particulate matter less than 10 µm in diameter
$PM_{2.5}$	particulate matter less than 2.5 µm in diameter
PS	pumping station
S	
SO_2	sulphur dioxide

U	
UKAS	United Kingdom Accreditation Service
V	
VEC	valued environmental and social component
VOC	volatile organic compound or compounds
W	
WHO	World Health Organization

A9 AIR QUALITY BASELINE REPORT

A9.1 Introduction

This baseline report describes the air quality:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions:
  - trend in condition and sensitivity to change
  - ecosystem services provided by the valued environmental and social component (VEC)
- key considerations

Baseline concentrations of the following substances that can affect air quality were measured in the AOI:

- nitrogen oxides (NO_x)
- nitrogen dioxide (NO_2)
- ozone (O_3)
- sulphur dioxide (SO_2)
- volatile organic compounds (VOC)
- particulate matter (PM) less than 10 and 2.5 µm in diameter (PM_{10} and $PM_{2.5}$)
- carbon monoxide (CO).

The scoping report proposed measurement of hydrogen sulphide (H_2S) levels. However, as there will be negligible H_2S emissions from project activities, baseline H_2S levels were not measured.

A9.2 Area of Influence and Study Area Boundaries

A9.2.1 Area of Influence Boundary

The project's air quality AOI is based primarily on the location of the major emission sources. The main sources of project emissions will be at the pumping stations (PS) PS1 and PS2, where changes in substance concentrations due to project emissions may be measurable within a few kilometres of these aboveground installations (AGIs). The AOI for emissions from construction activities and project vehicles will be no more than a few hundred metres from each source.

Optimisation during front-end engineering and design resulted in the removal from the design of all EACOP power generation from PS1 and PS2. Though the pumping stations in Uganda will not generate power during normal operation, they may generate emissions from bulk heaters, which may not be operated until later in the project life.

The pumping stations are permanent and will remain operational over the lifetime of the project, so the AOI temporal boundary is approximately 25 years. The AOI for construction and decommissioning activities lasts for the length of time of those

activities. For the pipeline, the AOI is transient, moving as the construction activity moves along the right-of-way.

A9.2.2 Study Area Boundaries

Locations were surveyed where air quality is most likely to be affected for the life of the project. These locations are described in Section A9.3.1. Data from the surveyed locations are representative of conditions throughout the AOI.

A9.3 Methods

This section describes the monitoring survey locations, periods and techniques used.

A9.3.1 Monitoring Locations

Four locations within the AOI of each pumping station were selected to characterise the baseline air quality that will be affected when the wind blows in different directions. Other factors that were taken into account in selecting the locations were:

- access and security
- the presence of nearby receptors
- the presence of nearby emission sources, for example, roads, to give a mix of sites close to and remote from existing emission sources.

Table A9.3-1 details the monitoring locations. Figure A9.3-1 and Figure A9.3-2 show the locations for PS1 and PS2 respectively.

Table A9.3-1 Monitoring Locations

Monitoring Site Reference	Monitoring Site Location	Easting	Northing
PS1 AOI			
PS1-1	Kyabalendere–Kabaale police stop	158562	10160134
PS1-2	South of PS1	164717	10160497
PS1-3	East of PS1	164730	10161605
PS1-4	North of PS1	164436	10161921
PS2 AOI			
PS2-1	Northwest of PS2, approximately 150 m from Sembabule–Lwendale Road (SLR)	201357	9998568
PS2-2	South of PS2, close to access road	202920	9997194
PS2-3	Southwest of PS2, by the SLR	202028	9997566
PS2-4	West of PS2, by the SLR	202266	9996755

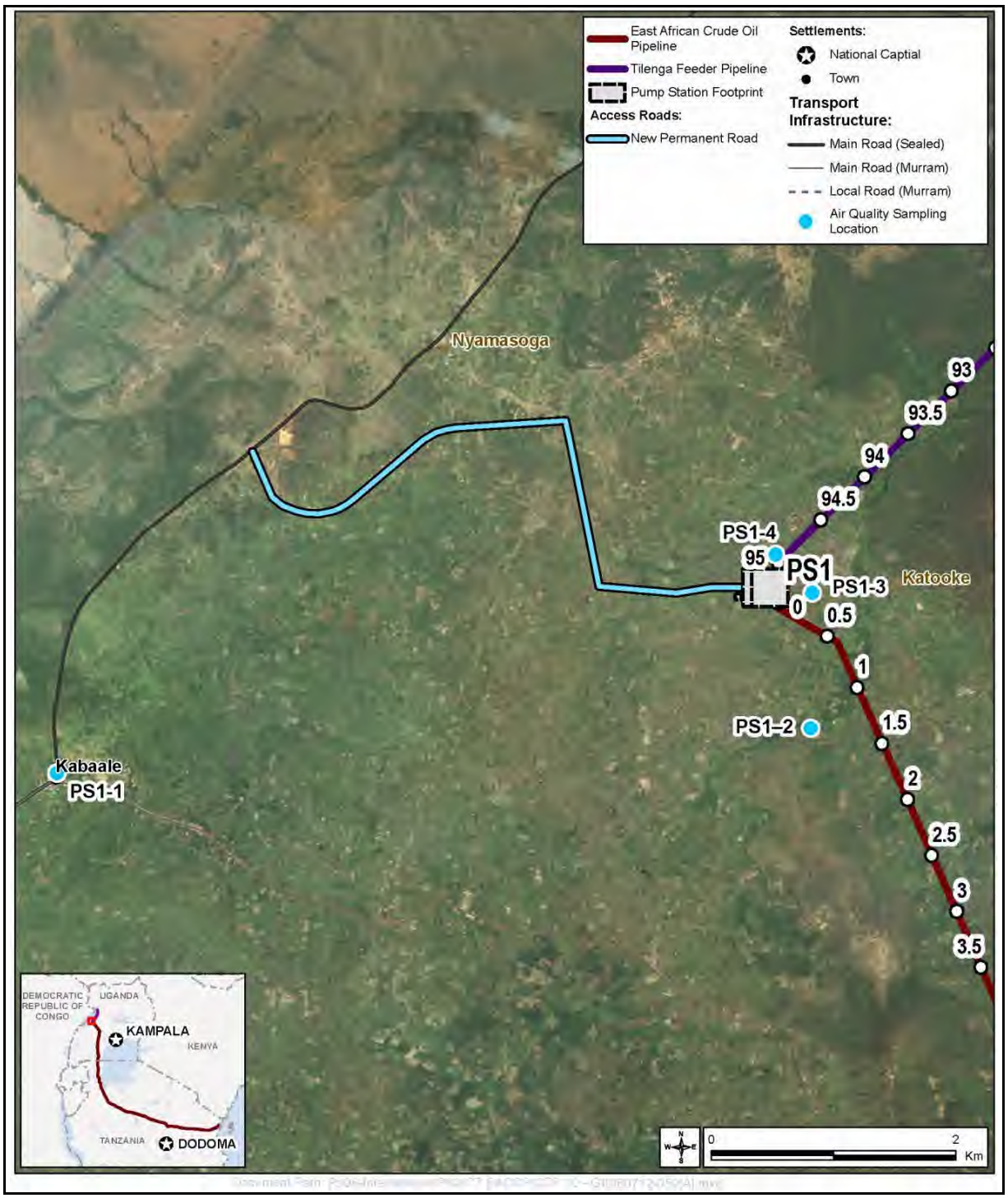

Figure A9.3-1 Monitoring Locations, PS1

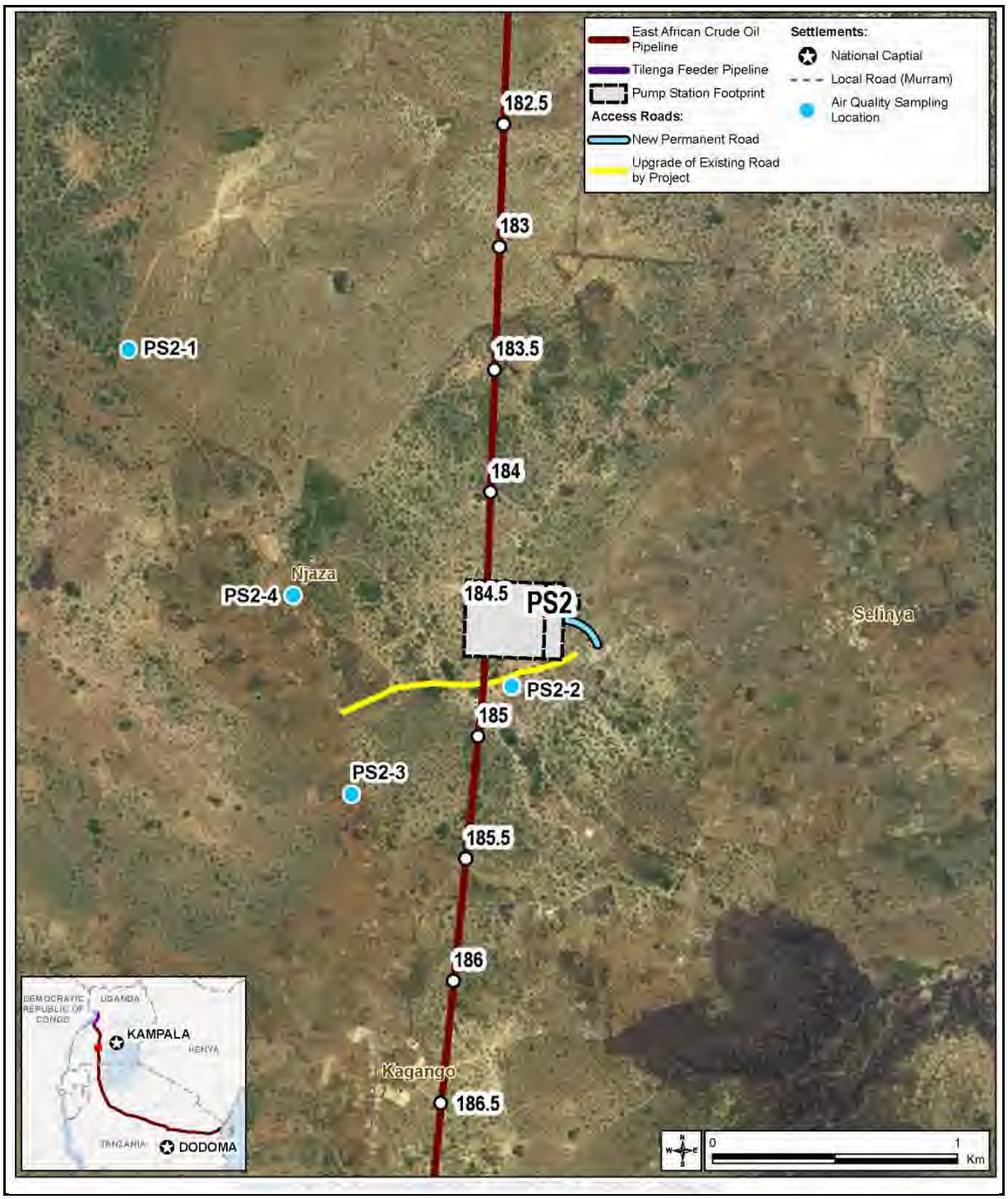

Figure A9.3-2 Monitoring Locations, PS2

A9.3.2 Monitoring Periods

Monitoring was conducted in three rounds of surveys, the dates of which are shown in Table A9.3-2. The monitoring periods provided sufficient time for the result to be representative of a long-term average but were short enough to remain below the tubes' substance absorption capacity.

.

Table A9.3-2 Dates of Sulphur Dioxide, Nitrogen Dioxide, Nitrogen Oxides, Ozone and Volatile Organic Compound Monitoring with Diffusion Tubes

Site	Round 1	Round 2	Round 3
PS1	31 October or 1 November to 30 November 2017	30 November to 19 December 2017	20 January to 12 February 2018
PS2	2 or 3 November to 2 December 2017	2 December to 21 December 2017	22 January to 14 February 2018

The PM and CO spot monitoring survey coincided with the deployment and collection of the diffusion tubes. Table A9.3-3 shows the dates for individual surveys throughout the monitoring period.

Table A9.3-3 Dates of Particulate Matter and Carbon Monoxide Spot Monitoring

Site	Round 1	Round 2	Round 3	Round 4	Round 5
PS1	31 October and 1 November 2017	30 November 2017	19 December 2017	20 January 2018	12 February 2018
PS2	2 and 3 November 2017	2 December 2017	21 December 2017	22 January 2018	14 February 2018

A9.3.3 Monitoring Techniques

A9.1.1.1 Diffusion Tubes

SO_2, NO_2, NO_x, O_3 and VOC monitoring was conducted using diffusion tubes. The tubes were deployed 1.5–2 m above ground level, and at least 1 m from obstructions such as buildings and trees to avoid air flow perturbations.

The tubes were supplied and analysed by Gradko International Ltd, a United Kingdom Accreditation Service (UKAS) certified laboratory. Sets of tubes were exposed for three periods (see Table A9.3-2).

Field blanks were deployed and laboratory blanks maintained for quality control and quality assurance purposes as per UK government guidance (AEA 2008). Benzene, toluene, ethylbenzene and xylene (BTEX) compounds were quantitatively analysed and the next top 10 VOC were analysed on a semi-quantitative basis.

A9.1.1.2 Particulate Matter

The fine PM fractions (PM_{10} and $PM_{2.5}$) were monitored at each of the eight locations using a TSI DustTrak real-time light scattering instrument. The instrument was calibrated before deployment. The TSI DustTrak provides near real-time continuous data that capture peak concentrations related to short-term events. The PM_{10} and $PM_{2.5}$ monitoring periods were approximately 1 hour at each site for each visit.

A9.1.1.3 Carbon Monoxide

Carbon monoxide levels were logged using a calibrated direct reading, near real-time TSI Q-Trak indoor air quality instrument. The CO monitoring period was approximately 1 hour at each monitoring site for each site visit.

A9.3.4 Air Quality Standards

The air quality standards for the EACOP project have been derived as the most stringent from a review of the guidelines identified by the World Health Organization (WHO), East African Community (EAC), Ugandan legislative or draft legislative standards. Table A9.3-4 shows the project environmental standards (PES) for the project, and Appendix F shows their derivation.

Table A9.3-4 Project Environmental Standards for Ambient Air Quality

Substance	Averaging Period	Project Environmental Standard – Ambient Air Concentration (µg/m^3)
NO_2	Annual	40
	24 h	150
	8 h	120
	1 h	200
SO_2	Annual	50
	24 h	20
	10 min	500
CO	8 h	10,000
	1 h	30,000
	30 min	60,000
	15 min	100,000
PM_{10}	Annual	20
	24 h	50
	1 h	200
$PM_{2.5}$	Annual	10
	24 h	25
O_3	8 h, maximum daily	100
VOC	24 h	6,000

A9.3.5 Data Considerations

The main assumption associated with the diffusion tube data is that the data collected over a three-month period, when averaged, will represent long-term baseline conditions.

Diffusion tube monitoring has bias, which can cause tubes to under- or over-measure concentrations by up to 20%. Errors can be caused by practices in the laboratory during preparation and analysis and from changes in pressure and temperature during transport.

Airborne PM_{10} and $PM_{2.5}$ concentrations were monitored using a TSI DustTrak nephelometer. Nephelometers are not equivalent to reference methods for the determination of concentrations of airborne particles; however, they provide near continuous or short-term averaged indicative data.

A9.4 Air Quality Baseline Conditions

A9.4.1 Nitrogen Dioxide and Nitrogen Oxides

Table A9.4-1 summarises the NO_2 and NO_x concentrations measured. The monitoring site notes included in Table A9.3-1 include factors that may have influenced the monitoring results, such as close to a road or a police stop point.

Table A9.4-1 Measured Nitrogen Dioxide and Nitrogen Oxides Concentrations

Monitoring Location	NO_2 Concentrations (µg/m^3)				NO_x (as NO_2) Concentrations (µg/m^3)			
	R1	R2	R3	Mean	R1	R2	R3	Mean
PS1-1	6	9	12	9	8	9	12	10
PS1-2	1	2	9	4	5	2	9	5
PS1-3	3	2	7	4	4	2	7	4
PS1-4	1	–	7	4	3	–	7	5
PS2-1	1	2	3	2	4	2	3	3
PS2-2	2	3	5	3	5	3	5	4
PS2-3	4	9	5	6	4	9	5	6
PS2-4	3	3	4	3	3	3	4	3
PES	40 (annual average)				None			

NOTES: R1, R2 and, R3 indicate rounds 1–3 of sampling. Dashes indicate no result owing to a missing tube on collection. In Rounds 2 and 3, all nitric oxide concentrations were found to be below the limit of detection, therefore the NO_x concentrations are equal to the NO_2 results.

A9.4.2 Ozone and Sulphur Dioxide

Table A9.4-2 summarises the O_3 and SO_2 concentrations measured.

Table A9.4-2 Measured Ozone and Sulphur Dioxide Concentrations

Monitoring Location	O_3 Concentrations (µg/m^3)				SO_2 Concentrations (µg/m^3)			
	R1	R2	R3	Mean	R1	R2	R3	Mean
PS1-1	57	62	76	65	<0.94	<0.94	<0.79	<0.9
PS1-2	40	54	133	76	<0.94	<0.94	0.8	<0.9
PS1-3	53	71	155	93	<0.94	–	<0.79	<0.9
PS1-4	53	68	156	92	<0.94	<0.94	<0.79	<0.9
PS2-1	60	59	91	70	<0.94	<0.94	1.3	<1.1
PS2-2	52	–	144	98	<0.94	<0.94	1.2	<1.0
PS2-3	47	68	77	64	<0.94	<0.94	<0.79	<0.9
PS2-4	48	62	121	77	<0.94	<0.94	<0.79	<0.9
PES	100 (8-hour average, maximum daily)				50 (annual average)			

NOTES: R1, R2 and R3 indicate rounds 1–3 of sampling. Dashes indicate no result owing to a missing tube on collection

Of the 23 SO_2 diffusion tubes collected, 20 absorbed a mass below the laboratory detection limit, indicated by the “less than” (<) results in the table.

A9.4.3 Volatile Organic Compounds

The benzene and total VOC concentrations measured are summarised in Table A9.4-3.

Table A9.4-3 Measured Volatile Organic Compound Concentrations

Monitoring Location	Benzene Concentrations (µg/m^3)				Total VOC Concentrations (µg/m^3)			
	R1	R2	R3	Mean	R1	R2	R3	Mean
PS1-1	1.8	–	4.3	3.1	68	158	398	208
PS1-2	1.1	1.1	5.3	2.5	120	61	273	151

Table A9.4-3 Measured Volatile Organic Compound Concentrations

Monitoring Location	Benzene Concentrations (µg/m³)				Total VOC Concentrations (µg/m³)			
	R1	R2	R3	Mean	R1	R2	R3	Mean
PS1-3	1.0	1.1	4.8	2.3	37	78	132	82
PS1-4	0.5	–	3.7	2.1	11	80	170	87
PS2-1	0.7	1.1	1.9	1.2	30	145	210	128
PS2-2	0.6	0.8	1.9	1.1	13	53	148	71
PS2-3	0.6	0.9	2.3	1.3	18	43	380	147
PS2-4	0.6	–	2.1	1.4	18	–	64	41
PES	None				6000 (24-hour average)			

NOTES: R1, R2, R3 refer to successive rounds of sampling, as defined in Section A9.3.2.
Dashes indicate no result owing to a missing tube on collection.

A9.4.4 Particulate Matter

Table A9.4-4 summarises the PM_{10} and $PM_{2.5}$ concentrations recorded by the nephelometer.

Table A9.4-4 Measured Particulate Matter Concentrations

Location	PM_{10} Concentrations (µg/m³)						$PM_{2.5}$ Concentrations (µg/m³)					
	R1	R2	R3	R4	R5	Mean	R1	R2	R3	R4	R5	Mean
PS1-1	33	57	83	135	138	89	31	56	78	119	123	81
PS1-2	24	19	55	80	70	50	22	17	53	74	66	46
PS1-3	18	21	39	89	58	45	16	17	37	84	55	42
PS1-4	12	17	36	86	55	41	11	19	34	80	51	39
PS2-1	10	17	12	32	26	19	13	16	13	30	23	19
PS2-2	12	19	11	40	23	21	10	17	10	38	21	19
PS2-3	35	39	36	75	64	50	24	28	33	64	51	40
PS2-4	24	66	34	55	42	44	18	56	28	44	35	36
PES	20 (annual average) 50 (24-hour average) 200 (1-hour average)						10 (annual average) 25 (24-hour average)					

NOTES: R1, R2 and R3 indicated rounds 1–3 of sampling.

A9.4.5 Carbon Monoxide

The CO concentrations recorded were all below the detection limit, displaying as zero. No test was completed at PS2-4 in Round 1, but tests were completed in Round 1 at the other seven locations and at all eight locations in Rounds 2 and 3.

A9.4.6 Summary of Baseline Condition

The measured concentrations are summarised in Table A9.4-5.

Table A9.4-5 Summary of Measured Substance Concentrations

Substance	Concentration (µg/m^3)				As Percentage of Standard (%)			
	Max Location		Mean, All Locations		Max Location		Mean, All Locations	
	PS1	PS2	PS1	PS2	PS1	PS2	PS1	PS2
NO_2	9	6	5	4	22	15	13	9
NO_x	10	6	6	4	N/A (no standard)			
O_3	93	98	81	77	93	98	81	77
SO_2	<1	<1	<1	<1	<2	<2	<2	<2
Benzene	3.1	1.4	2.5	1.2	N/A (no standard)			
Total VOC	208	147	132	97	3	2	2	2
PM_{10}	89	50	56	34	178[1]	100[1]	113[1]	67[1]
$PM_{2.5}$	81	40	52	29	326[1]	160[1]	225[1]	114[1]
CO	0	0	0	0	0	0	0	0

NOTES: Mean results presented in this summary table are the means of all the sampling periods or individual surveys.

[1] PM results are expressed relative to the 24-hour average standards.

The following observations and conclusions can be made from the ambient air quality monitoring results:

- Concentrations of NO_2, NO_x and VOC are low at all locations and show variation high degree of uniformity between the two pumping stations.
- At all locations and in all the surveys, CO measurements were below the limit of detection of the technique used
- Of 23 SO_2 measurements, 20 recorded results below the limit of detection of the technique used
- Ground-level O_3 concentrations are moderate and consistent across the locations. This uniformity is expected, as ozone is not a directly emitted substance, but is formed by reactions in the atmosphere and, therefore, changes are normally seen at a regional scale and are not sensitive to local emission sources.

- Particulate concentrations are high and, in some cases, exceed project environmental standards.
- The surveys undertaken for this study focussed on the pumping stations. However, it is reasonable to assume that the levels of substances found in these areas will be representative of the air quality for the majority of the project's AOI throughout Uganda.
- A marked increase in the Round 3 concentrations of all parameters relative to the first two rounds was recorded at all diffusion tube locations. In the case of the PM spot monitoring, an increase was seen in the Round 4 tests (completed at the deployment of the Round 3 tubes) and Round 5 (completed at the collection of the Round 3 tubes).
- NOx, VOC and PM concentrations at the measuring location PS1-1, in the small settlement of Kyabalendere, are higher than those measured at the more isolated stations around PS1. This is likely to be a result of the greater traffic and general activity close to the sampling location.
- Around PS2, the roadside locations PS2-3 and PS2-4 show consistently higher PM concentrations than the nonroadside sites. PS2-3 shows a similarly higher NOx level, but PS2-4 does not.
- Substance levels recorded within small settlements and at the side of typical roads were measured to be greater than at other locations

A9.4.7 Trend in Condition and Sensitivity to Change

Air quality is sensitive to change, reacting to emission sources that are usually associated with human activity. These activities can include vehicles; nonroad machinery for construction, industry or agriculture; and burning for agriculture, waste disposal, cooking or heating.

The substances covered in this study will be emitted during project activities, affect the air quality within a limited distance of the source and disperse to background levels a short time after the activity has ceased.

Sensitivity to change is related to how close the baseline levels are to the standards. The baseline survey has shown the VEC to have a low level of sensitivity to NO_x, VOC, CO or SO_2 emissions, and that sensitivity to changes in PM is greater as the baseline levels are moderate to high. NO_x and VOC are the primary precursors of low-level ozone, which had moderate baseline levels. As such, emissions of NO_x and VOC are important in the control of ozone formation at a regional scale.

No historical air quality data for identifying trends in development and activity in the AOI have been identified, so air quality trends were not established.

A9.4.8 Ecosystem Services Provided

This VEC does not have any ecosystem services associated with it.

A9.4.9 Sensitivity Rankings

Based on the air quality surveys, engagement with stakeholders, trend in condition and sensitivity to change, the sensitivity of the air quality related receptors within the AOI has been ranked. The sensitivity is determined by two primary factors:

- the quantity and nature (including likely exposure patterns) of receptors (predominantly people) that are sensitive to air quality
- the baseline levels of substances present, relative to project environmental standards, which determines the environment's capacity to contain new emission sources without substance levels becoming potentially harmful.

Table A9.4-6 shows the sensitivity rankings.

Table A9.4-6 Air Quality Receptor Sensitivity Ranking

Receptor and Specific Sensitivity	Sensitivity Ranking[1]	Rationale
Sensitivity to dust	Very low (1) to moderate (3)	Dust sensitivities are highly transient and geographically variable, and therefore it is inappropriate to apply rankings at a large scale and impracticable to identify small-scale variations in advance. Most of the AOI for dust will be sparsely occupied by people. Where the AGIs will be constructed, the areas are of low ecological value. The AOI will occasionally include buildings, crops and animals of moderate sensitivity.
Sensitivity to gaseous emissions	Moderate (3)	Baseline concentrations of NO_2, SO_2 and CO are <15% of PES but ozone concentrations are 50–85%[1]. Long-term exposure to ozone must be assumed, as the AOI is regional.
Sensitivity to airborne fine PM	Low (2) to very high (5)	Baseline concentrations are moderate to high, with exceedances of standards[2]. The range reflects the variability of public presence.
Sensitivity to hydrocarbon vapour – refuelling sites' AOIs	Very low (1)	Impacts of this activity will be highly localised and members of the public are highly unlikely to be present within the area of impact.

NOTE: [1]The definitions of sensitivity are described in the VEC sensitivity tables included in Appendix D.
[2]All comparisons of baseline concentrations are indicative owing to differences in sampling periods and averaging periods of standards.

A9.5 Key Considerations

High levels of airborne fine PM, above standard levels, were consistently detected by the baseline survey.

Much of the project's AOI is sparsely populated and infrequently occupied.

There is capacity in the environment for gaseous emissions without harmful levels being reached. However, ground-level ozone concentrations were found to be moderately high.

A9.6 References

Literature Cited

AEA Energy and Environment. 2008. Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users - A Report for DEFRA and the Devolved Administrations. AEAT/ENV/R/2504 - Issue 1a, February 2008.

Internet Sites

Air Pollution Information Service (APIS). 2014. “Ecosystem Services and air pollution impacts”. Available at: http://www.apis.ac.uk/ecosystem-services-and-air-pollution-impacts. Accessed March 2018.

ATTACHMENT A9.1 PHOTOGRAPHS

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Figure Att9.1-3 Monitoring Location PS1-3 (2 of 2)

Figure Att9.1-4 Monitoring Location PS1-4

Figure Att9.1-5 Monitoring Location PS2-1

Figure Att9.1-6 Monitoring Location PS2-2

Figure Att9.1-7 Monitoring Location PS2-4

Appendix A10: Acoustics Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
km	kilometre
m	metre
mm	millimetre
dB	decibel
dB(A)	A-weighted decibel
$L_{eq(T)}$	sound level in decibels equivalent to the total sound energy measured over a stated period of time
$L_{90(T)}$	noise level exceeded for 90% of the time of the measurement duration, often taken to represent the ambient or background noise level
$L_{10(T)}$	noise level exceeded for 10% of the time of the measurement duration, often taken to represent traffic related noise
L_{max}	root mean squared maximum level of a noise source or given environment
h	hour
min	minute
A	
AGI	aboveground installation
AOI	area of influence
B	
bomas	livestock enclosure
M	
masl	metres above sea level
MCPY	main camp and pipe yard
P	
PS	pumping station
R	
RoW	right-of-way

Please note all times are provided in 24 h format.

A10 ACOUSTIC BASELINE REPORT

A10.1 Purpose and Scope of Report

This baseline report describes the acoustics:

- area of influence (AOI) and study area boundaries
- methods
- baseline conditions
  - trend in condition and sensitivity to change
  - ecosystem services provided
- key considerations.

A10.2 Area of Influence and Study Area Boundaries

A10.2.1 Area of Influence Boundary

An AOI has been set for existing, planned new and upgraded construction access roads, pumping station (PS) 1 and 2, main camp pipe yard (MCPY) 1–4 and the pipeline right-of-way (RoW).

The AOI was set at a 500-m radius, based on review of engineering information and satellite images taking into consideration likely noise emission levels and to identify the location of potential receptors.

The planned PSs are permanent and will remain operational over the lifetime of the project, so the temporal AOI will be approximately 25 years. For the temporary construction access roads and MCPYs, the temporal AOI is the period of construction.

A10.2.2 Study Area Boundary

The study area boundary for PS1 and 2 is larger than the 500 m radius AOI, and is set at 1 km. This is because some impacts have the potential to be noticed beyond the AOI where environmental conditions assist with the propagation of sound or where the baseline environment is exceptionally quiet.

The study area boundary is the same as the AOI boundary for the MCPYs and construction access roads as the potential acoustic impacts will be negligible beyond the 500-m AOI.

Figure A10.2-1 shows the baseline noise monitoring locations.

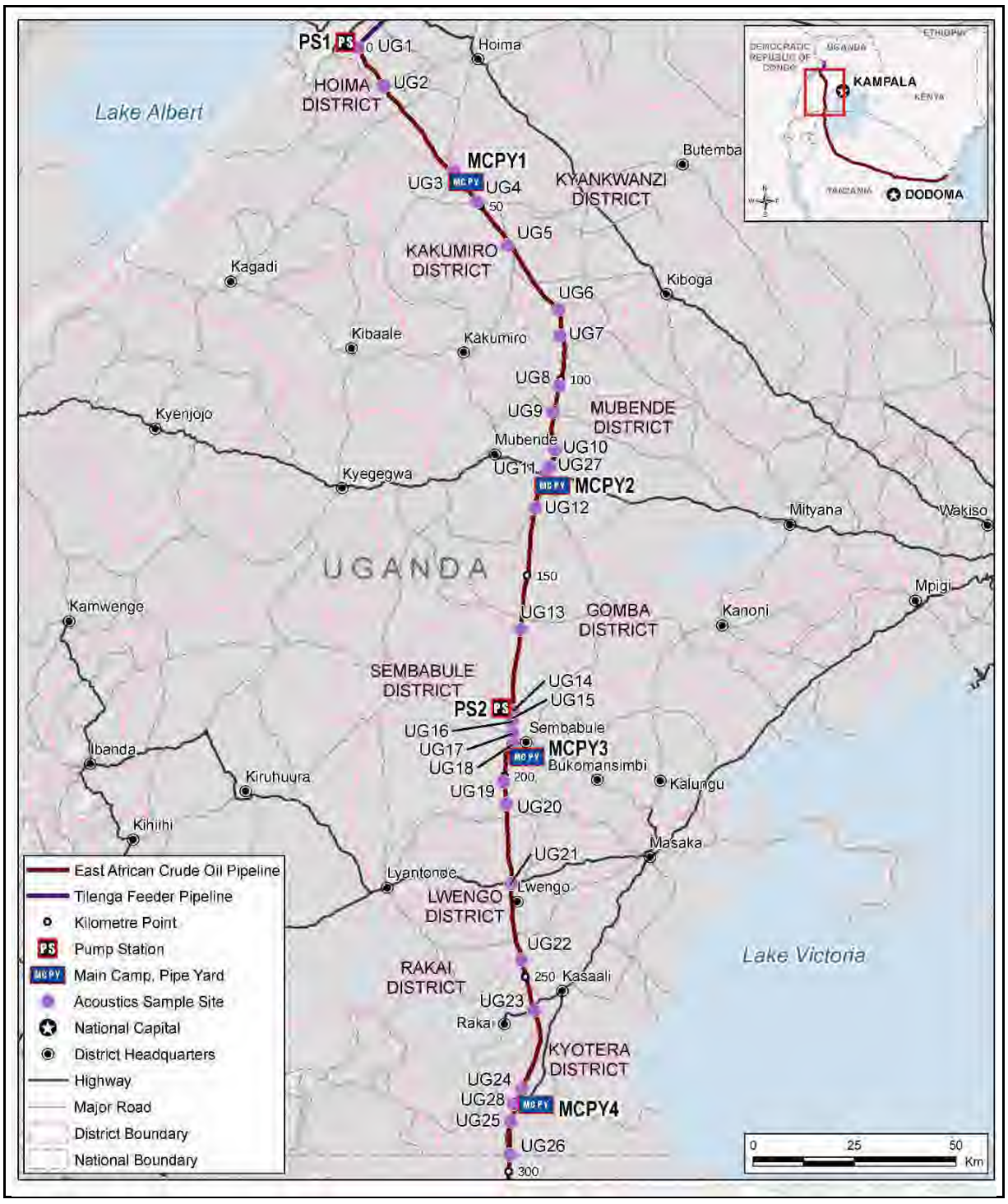


Figure A10.2-1 Location of Baseline Noise Monitoring

A10.3 Methods

A10.3.1 Secondary Data

Land cover maps and satellite images were used initially to identify noise and vibration sensitive receptors near project components during construction and operation. The information was also used to identify monitoring locations from

which data representative of the existing noise environment across the AOI could be collected.

A10.3.2 Field Survey

The first phase of the noise field survey was conducted between Tuesday 12 December and Monday 18 December 2017 using field survey data sheets developed during the desktop review. A second phase was conducted in early February 2018 to capture data at locations which could not be accessed during the first phase of the survey. A third phase was undertaken between Wednesday 15 August and Thursday 23 August 2018. The survey objectives were to:

- identify potential sensitive receptors near permanent aboveground installations (AGI)
- characterise the baseline acoustic environment in the AOI
- quantify the day and night noise environment
- quantify the likely baseline noise environment throughout the AOI
- consider potential trends affecting the acoustic environment throughout the AOI.

In the absence of national guidelines on monitoring methods, the survey was conducted in accordance with *British Standard BS 7455-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures*.

A10.3.2.1 Equipment

In the absence of national guidelines, the equipment used for the survey consisted of Class 1 Sound Level Meters and a field calibrator (Table A10.3-1). The equipment used conformed to the requirements of *British Standard BS EN 61672:-1:2003 Electroacoustics. Sound level meters. Specifications.*

Table A10.3-1 Noise Monitoring Equipment

Type	Model	Serial No	Calibration Date*
Class 1 Sound Level Meter	Rion NL-32	01013661	12/06/2017
Class 1 Sound Level Meter	Rion NL-32	00503254	07/09/2016
Field Calibrator	Rion NC-74	34378202	24/11/2017

NOTE: * The equipment used has a calibration history that is traceable to a certified calibration institution. Under British Standard BS EN 61672-1, sound level meters are required for calibration every two years, with acoustic calibrators requiring calibration annually.

A10.3.2.2 Macro-Siting

Monitoring locations were chosen throughout the AOI to provide a general understanding of the noise environment across different types of land use and are suitable for assessing both fauna and human impacts. Around PS1 and 2, locations were chosen so that they were representative of the noise environment at the closest sensitive receptors.

Owing to the length of the RoW and the temporary nature of noise emissions which may be experienced along the RoW during construction, it is considered appropriate to conduct monitoring at locations representative of a wider receiver area. Data has therefore been collected from areas directly around the monitoring point and from other areas along the RoW which are considered to have a similar noise environment (as inferred by proximity to similar noise sources and presence of similar vegetation).

Monitoring was conducted at 28 locations along the RoW. These are labelled UG1–28. All 28 locations are shown on Figure A10.2-1, and maps showing each location in relation to the local environment are in Attachment A10.1. Of these, 7 locations were for PSs or construction facilities and the RoW, and 21 are representative of the RoW only. UG27 and UG28 were added as part of the third monitoring phase to account for slight changes to the location of MCPY2 and MCPY4:

- UG1 is representative of the noise environment around PS1
- UG14 and UG15 are representative of the noise environment at PS2
- UG3 is representative of noise surrounding MCPY1
- UG11 is representative of noise surrounding MCPY2
- UG18 is representative of noise surrounding MCPY3
- UG28 is representative of noise surrounding MCPY4.

All 28 monitoring locations are representative of the noise environment in the AOI for the RoW and construction roads.

A10.3.2.3 Micro-Siting

Although the main vicinity for monitoring locations was chosen from aerial imagery and other secondary and field data, the final siting of each microphone was chosen while onsite to be as close as practically possible to the location chosen during the macro-siting process while avoiding locations where local factors would adversely affect the results. Final locations were:

- close to habitation where the intent was to gather data representative of human-based receptors
- 1.2–1.5 m aboveground
- a minimum of 3 m away from any vertical surfaces (e.g., buildings, walls and other structures)
- away from dominant plant (i.e., generators, pumps or air handling units)
- away from dominant vehicles (i.e., idling traffic or cattle trucks)
- away from dominant watercourses
- away from vegetation likely to cause substantial noise under moderate wind speeds
- away from abnormal or ad-hoc events such as markets, festivals or sporting events.

At each monitoring location, a record of the specific site position and conditions was made, which included photographs of the noise meter in situ. These records are contained in Attachment A10.1.

A10.3.2.4 Monitoring Parameters and Durations

Across all positions, broadband acoustic indices were recorded. This included $L_{eq,T}$, $L_{90,T}$, $L_{max,}$ $L_{10,T}$, with all data recorded under A-weighting.

At all locations, the monitoring duration was a minimum of 1 h during daytime periods (06:00–22:00).

Initially during monitoring phase 1, locations close to PSs included an hour of monitoring during night-time periods (22:00–06:00) to allow for 24-h operations. During the phase 3, additional data were collected at PS1 and 2. This included up to 24 h of attended monitoring (covering all periods within a complete day, not necessarily consecutively) to better estimate the diurnal noise environment.

A10.3.3 Data Analysis

The acoustic sensitivity of the landscape has been ranked according to the table for acoustic receptor sensitivity in Section 8 of the environmental and social impact assessment (ESIA).

A10.3.4 Data Considerations

The desk-based assessment, field survey, and social and biodiversity surveys provided sufficient information to accurately describe the acoustic landscape, and identify and characterise receptors within the acoustic AOI.

A10.3.5 Vibration

The baseline environment for vibration is rarely quantified at the ESIA stage unless there are substantial vibration sources identified during the scoping exercise.

The scoping exercise did not identify vibration sources in the study area with the potential to be discernible above natural background vibration levels. Substantial vibration sources usually consist of heavy mining activities, industrial operation (with heavy reciprocating or percussive plant) or heavy construction (piling, high-impact compaction or drilling). In addition, vibration is usually assessed in line with absolute thresholds rather than by comparison to baseline.

Therefore, vibration has not been further considered as part of this baseline report.

A10.4 Noise Baseline Conditions

The AOI baseline condition is described in terms of:

- observed noise character
- measured noise levels.

The term ‘noise’ is used rather than ‘acoustic’ as the following sections purely focus on noise rather than acoustics (noise and vibration). Vibration is discussed in Section A10.3.5.

A10.4.1 Baseline Condition of the Noise Environment

Sections A10.4.1.1–A10.4.1.4 describe the baseline condition of:

- PS1 and 2
- MCPY1–4
- the RoW and construction access roads.

The field survey sheets containing data on each noise monitoring location are presented in Attachment A10.1.

A10.4.1.1 Pumping Station 1

The PS1 AOI consists of undulating to hilly terrain. The landscape is characterised by farmland interspersed with clusters of trees and scrubland. Crops such as maize and sugar cane dominate farming.

The closest settlement, Katooke, is outside the AOI, 1 km to the east. Other areas of habitation are present in the AOI, but limited to small habitations and isolated farms surrounded by cultivated land, all accessed by local murram roads. Although a predominantly agricultural landscape, the main road and a telecommunication mast indicate limited development within the AOI.

Most of the landscape within the AOI has been modified by human activity and has lost most of its natural vegetation.

The dominant noise sources surrounding the AOI are farming (hand tools), wind through vegetation, bird song and occasional local vehicle movements. Neither the field survey nor other data sources suggest the presence of industrial or commercial noise sources.

Table A10.4-1 shows quantitative data describing the noise environment in the PS1 AOI. The representative monitoring location for PS1 is position UG1, <100 m to the east of the PS1 boundary. The table includes the Phase 1 (December 2017) day and night data, and the 24[1]-hour Phase 3 (August 2018) data.

Table A10.4-1 Pumping Station 1 – Noise Monitoring Data UG1

Monitoring Phase	Date	Period	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
1	Sunday 17 December 2017	Day	12:39–13:39	47.9	40.1	44.4	90.4
1	Sunday 17 December 2017	Night	23:01–00:01	35.7	26.1	36.6	63.7
3	Wednesday 22 August 2018	Night	00:00–01:00	51.0	43.6	55.1	63.4

[1] Up to 24 hours of monitoring, although not necessarily consecutive hours.

Table A10.4-1 Pumping Station 1 – Noise Monitoring Data UG1

Monitoring Phase	Date	Period	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
3	Wednesday 22 August 2018	Night	01:00–02:00	49.9	46.3	52.6	61.7
3	Wednesday 22 August 2018	Night	02:00–03:00	52.8	46.8	56.3	64.0
3	Wednesday 22 August 2018	Night	03:00–04:00	52.0	46.3	55.8	64.3
3	Wednesday 22 August 2018	Night	04:00–05:00	50.4	45.0	53.1	63.3
3	Wednesday 22 August 2018	Night	05:00–06:00	44.2	40.2	46.9	67.0
3	Wednesday 22 August 2018	Night	06:00–07:00	46.2	41.3	47.9	64.9
3	Wednesday 22 August 2018	Day	07:00–08:00	46.2	42.6	47.9	65.8
3	Sunday 19 August 2018	Day	08:46–09:46	47.8	39.0	48.2	71.9
3	Sunday 19 August 2018	Day	09:46–10:46	46.3	39.3	49.5	66.7
3	Sunday 19 August 2018	Day	10:46–11:46	45.6	37.0	45.9	67.8
3	Sunday 19 August 2018	Day	11:46–12:46	42.6	34.2	46.3	64.3
3	Sunday 19 August 2018	Day	12:46–13:46	40.1	32.2	42.3	60.0
3	Sunday 19 August 2018	Day	13:46–14:46	42.9	32.8	42.1	73.5
3	Monday 20 August 2018	Day	15:37–16.37	46.1	37.7	48.2	68.6
3	Monday 20 August 2018	Day	16:37–17.37	43.1	36.6	45.0	67.3
3	Monday 20 August 2018	Day	17:37–18.37	42.4	36.5	45.0	61.3
3	Monday 20 August 2018	Day	18:37–19.37	49.8	37.8	54.0	65.4

Table A10.4-1 Pumping Station 1 – Noise Monitoring Data UG1

Monitoring Phase	Date	Period	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
3	Monday 20 August 2018	Day	19:37–20.37	55.6	54.7	58.7	62.4
3	Monday 20 August 2018	Day	20:37–21.37	50.2	46.5	52.3	80.1
3	Monday 20 August 2018	Day	21:37–22.37	50.0	46.7	52.6	59.0
3	Monday 20 August 2018	Night	22:37–23.37	50.6	47.4	52.6	58.3
3	Monday 20 August 2018/Tuesday 21 August 2018	Night	23:37–00.37	50.0	47.0	52.1	58.1
Statistics				$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
Highest recorded hour		Day		55.6	54.7	58.7	90.4
Lowest recorded hour		Day		40.1	32.2	42.1	59.0
Mean		Day		48.5	39.6	48.2	68.2
Mode		Day		46.0	37.0	48.0	67.0
Range		Day		40.1–55.6	32.2–54.7	42.1–58.7	59.0–90.4
Highest recorded hour		Night		52.8	47.4	56.3	67.0
Lowest recorded hour		Night		35.7	26.1	36.6	58.1
Mean		Night		50.5	45.3	52.3	66.8
Mode		Night		50.0	47.0	53.0	64.0
Range		Night		35.7–52.8	26.1–47.4	36.6–56.3	58.1–67.0

The noise levels are as would be expected in such an environment and are characterised by a generally low noise environment with very few, but very high short-term noise events such as a truck movement.

The noise environment at night, when compared with daytime, has a lower minimum value but higher average (mean and mode). This is a result of an increase

in insect noise, and a slight increase in wind[2] during the night-time measurement period.

A10.4.1.2 Pumping Station 2

The PS2 AOI consists of undulating terrain. The landscape is characterised by grazing land interspersed by scrub and some trees. There is little evidence of farming, other than small gardens directly adjacent to dwellings. The area is remote, with a widely dispersed population. There are four small settlements along a murram main road that traverses the AOI north to south. All are outside the AOI, with the closest of these (Njaza) being 0.8 km to the west. Other than these settlements, occasional livestock farms with associated *bomas*[3] dot the landscape.

Most of the landscape within the AOI has been modified by human activity and has lost most of its natural vegetation.

The dominant noise sources surrounding the AOI are limited to farming (mainly cattle grazing), wind through vegetation, bird song and occasional local vehicle movements. Neither the field survey nor other data sources suggest the presence of industrial or commercial noise sources.

Table A10.4-2 presents quantitative data describing the noise environment in the PS2 AOI. The representative locations for PS2 are positions UG14 (700 m to the north) and UG15 (700 m to the south). The table includes both the Phase 1 (December 2017) day and night data for UG14 and UG15, and the 24 hour[4] Phase 3 (August 2018) data measured at UG15.

Table A10.4-2 Pumping Station 2 – Noise Monitoring Data UG15 (Unless Otherwise Stated)

Monitoring Phase	Date	Period	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
1	Thursday 14 December 2017 (recorded at UG14)	Day	17:23–18:23	41.3	28.7	40.9	73.1
1	Thursday 14 December 2017	Day	12:25–13:25	52.8	32.7	48.6	78.5
1	Thursday 14 December 2017	Day	21:07–22:07	41.6	35.1	43.1	79.6
1	Thursday 14 December 2017	Night	23:11–00:11	36.4	31.2	37.9	63.1
3	Thursday 16 August 2018	Night	00:00–01:00	45.0	31.4	39.6	69.8

[2] Approximately 1 m/s increase over daytime but still below 5 m/s

[3] Livestock enclosure

Up to 24 hours of monitoring, although not necessarily consecutive hours. Data not collected for 06:00–08:00 or 16:00–18:00.

Table A10.4-2 Pumping Station 2 – Noise Monitoring Data UG15 (Unless Otherwise Stated)

Monitoring Phase	Date	Period	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
3	Thursday 16 August 2018	Night	01:00–02:00	38.1	31.6	41.7	55.9
3	Thursday 16 August 2018	Night	02:00–03:00	34.5	29.6	38.3	62.4
3	Thursday 16 August 2018	Night	03:00–04:00	34.8	29.0	38.2	59.4
3	Thursday 16 August 2018	Night	04:00–05:00	42.3	28.9	43.2	70.7
3	Thursday 16 August 2018	Night	05:00–06:00	52.3	34.8	48.2	84.2
3	Wednesday 22 August 2018	Day	08:08–09:08	53.0	31.5	46.9	83.6
3	Wednesday 22 August 2018	Day	09:08–10:08	48.9	30.7	44.3	82.4
3	Wednesday 22 August 2018	Day	10:08–11:08	45.1	33.0	45.5	71.9
3	Wednesday 22 August 2018	Day	11:08–12:08	47.0	29.9	42.9	79.8
3	Wednesday 22 August 2018	Day	12:08–13:08	49.2	29.9	43.7	80.4
3	Wednesday 22 August 2018	Day	13:08–14:08	48.6	31.7	43.8	78.6
3	Wednesday 22 August 2018	Day	14:08–15:08	46.5	30.3	42.5	77.9
3	Wednesday 22 August 2018	Day	15:08–16:08	47.9	32.1	45.3	71.3
3	Wednesday 22 August 2018	Day	18:00–19.00	50.1	34.4	44.0	80.9
3	Wednesday 22 August 2018	Day	19:00–20.00	50.3	41.6	53.7	69.7
3	Wednesday 22 August 2018	Day	20:00–21.00	50.9	44.6	52.2	81.4

Table A10.4-2 Pumping Station 2 – Noise Monitoring Data UG15 (Unless Otherwise Stated)

Monitoring Phase	Date	Period	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
3	Wednesday 22 August 2018	Day	21:00–22.00	48.1	40.5	46.6	81.8
3	Wednesday 22 August 2018	Day	22:00–23.00	43.4	36.5	42.1	75.3
3	Wednesday 22 August 2018	Night	23:00–24.00	43.1	33.4	39.8	70.9
Statistics				$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
Highest recorded hour		Day		53.0	44.6	53.7	83.6
Lowest recorded hour		Day		41.3	28.7	40.9	69.7
Mean		Day		47.8	34.0	45.4	77.9
Mode		Day		49.0	32.0	44.0	80.0
Range		Day		41.3–53.0	28.7–44.6	40.9–53.7	69.7–83.6
Highest recorded hour		Night		52.3	43.1	48.2	84.2
Lowest recorded hour		Night		34.5	28.9	33.4	39.8
Mean		Night		40.5	32.5	40.1	63.2
Mode		Night		35.0	31.0	38.0	71.0
Range		Night		34.5–52.3	28.9–43.1	33.4–48.2	39.8–84.2

The daytime noise environment was found to vary between the measured locations within the PS2 AOI from 29 to 45 dB(A) $L_{90,1hr}$. The night-time noise level range is almost the same between 29 and 43 dB(A) $L_{90,1hr.}$ These levels are as expected for the environment around the monitoring location.

A10.4.1.3 Main Camps and Pipe Yards

As for the PSs, noise measurements have been undertaken at the closest sensitive receptors to the MCPYs. However, as these facilities are expected to operate only during the day and through the construction phase, only daytime measurements have been recorded. As for the RoW and access road AOI, the levels measured across the wider acoustic AOI are also relevant (see Section A10.4.1.4).

Main Camp and Pipe Yard 1

Measurement location UG3 is less than 1.5 km to the northeast of MCPY1.

At MCPY1, the terrain is varied with vegetation consisting of small and larger scale banana and maize plantations. The largest settlement is Nyarweyo, approximately 3 km to the south. However, there are small isolated habitations in the area immediately surrounding MCPY1. The Mpongo River is less than 2 km to the north, but noise from moving water was not observed or likely to be audible in the MCPY1 AOI.

Most of the landscape within the AOI for each of the MCPYs has been modified by human activity and has lost most of its natural vegetation.

The dominant noise sources surrounding the AOI are limited to farming (mainly manual labour farming), wind through vegetation, bird song and occasional local vehicle movements (with a high percentage of small-engine motorbikes). No industrial or commercial noise sources were observed during the field noise survey. Neither the field survey nor other data sources suggest the presence of industrial or commercial noise sources.

Table A10.3-1 shows quantitative data describing the noise environment in the MCPY1.

Table A10.4-3 Main Camp and Pipe Yard 1 – Daytime Noise Monitoring Data (UG3)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG-3	Friday 15 December 2017	07:55–08:55	44.6	37.3	47.4	66.6

The noise environment around the MCPYs is consistent with what would be expected in an environment away from major industrial noise sources.

Main Camp and Pipe Yard 2

Measurement location UG11 is less than 2 km to the northwest of MCPY2.

The vegetation and habitat are similar to that of MCPY1, but with more maize.

MCPY2 is approximately 8 km to the southeast of Mubende which is the largest settlement in the area. Kitenga is less than 2 km to the south. No large-scale settlements are present, but there are noise sensitive receptors in the form of isolated habitations and farms within the 500-m AOI.

Most of the landscape within the AOI for each of the MCPYs has been modified by human activity and has lost most of its natural vegetation.

The dominant noise sources surrounding the AOI are limited to farming (mainly manual labour farming), wind through vegetation, bird song and occasional local vehicle movements (with a high percentage of small-engine motorbikes). Although the Kampala to Mubende Fort Portal Highway is within 200 m of MCPY2, during the survey the traffic noise from its use was not a major contributor to the noise

environment. Neither the field survey nor other data sources suggest the presence of industrial or commercial noise sources.

Table A10.4-4 shows quantitative data describing the noise environment in the MCPY2 AOI.

Table A10.4-4 Main Camp and Pipe Yard 2 – Daytime Noise Monitoring Data (UG11)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG-11	Thursday 14 December 2017	15:10–16:10	54.8	39.3	55.8	84.6

The noise environment around the MCPYs is consistent with what would be expected in an environment away from major industrial noise sources.

Main Camp and Pipe Yard 3

Measurement location UG18 is less than 400 m to the east of MCPY3.

MCPY3 is approximately 3 km to the west of the settlement of Sembabule. The terrain is undulating and the vegetation is a mix of scrub and crops (small and larger scale maize and banana plantations). Although away from large settlements, a school is less than 2 km south of MCPY3 and there are smaller settlements and isolated habitations very close to the proposed camp location and within the MCPY3 AOI.

Most of the landscape within the AOI for each of the MCPYs has been modified by human activity and has lost most of its natural vegetation.

The dominant noise sources surrounding the AOI are limited to farming (mainly manual labour farming), wind through vegetation, bird song and occasional local vehicle movements (with a high percentage of small-engine motorbikes). Neither the field survey nor other data sources suggest the presence of industrial or commercial noise sources.

Table A10.4-5 shows quantitative data describing the noise environment in the MCPY3 AOI.

Table A10.4-5 Main Camp and Pipe Yard 3 – Daytime Noise Monitoring Data (UG18)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG-18	Thursday 14 December 2017	08:54–09:54	46.5	33.1	48.1	71.6

The noise environment around the MCPYs is consistent with what would be expected in an environment away from major industrial noise sources.

Main Camp and Pipe Yard 4

The MCPY4 AOI consists of undulating to hilly terrain, with MCPY4 being toward the higher elevations in the area. The landscape is characterised by farmland interspersed with clusters of trees and scrubland. The main road passes less than 1 km to the west. It is sealed and runs from Masaka to Mutukula on the Tanzanian border. The Mutukula airstrip is to the southeast.

The closest village, Lukima, is outside the AOI, less than 1 km to the north. Small habitations and isolated farms are present in the AOI. These are surrounded by cultivated land and accessed by murram roads. Observation and available information suggests the airstrip is infrequently used, and neither the field survey nor other data sources suggest the presence of industrial or commercial noise sources.

The dominant noise sources surrounding the AOI are limited to farming (hand tools), wind through vegetation, bird song and occasional local vehicle movements. Traffic (mainly trucks) moving along the sealed Masaka to Mutukula road can be heard occasionally to the east of the monitoring position.

Table A10.4-6 presents quantitative data describing the noise environment in the MCPY4 AOI. The representative location for the MCPY4 is position UG27, approximately 400 m to the west of the facility boundary, on the western side of the Masaka to Mutukula road.

Table A10.4-6 Main Camp and Pipe Yard 4 – Noise Monitoring Data (UG28)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG-28	Wednesday 15 August 2018	15:48–16:48	48.4	40.6	50.8	77.4

The noise levels are as would be expected in such an environment. However, it is noted that during the noise monitoring period no aircraft used the airstrip, and a temporary increase in noise can be expected during periods when it is used.

A10.4.1.4 Right-of-Way and Construction Access Roads

Within the RoW AOI, background noise measurements were made at 26 locations (UG1–UG26), including those described above relating to permanent AGIs and MCPYs.

These noise data represent baseline conditions in the RoW and construction access road AOI and are presented in this section. They provide a general indication of the background noise environment across the entire AOI of the project.

Anecdotal information gathered from local consultants, stakeholders and other field surveys supports field observations made during the noise monitoring that the range of noise sources are relatively consistent across the RoW and access road AOI. Typical background noise sources encountered are:

- road traffic (with a high proportion of small-engine motorbikes, particularly across murram roads, and a high percentage of truck movements across sealed roads). Traffic flows, even across sealed roads, are considered relatively low.
- human interactions, including domestic and low-level commercial farming, mainly with manual labour, community events, school noise, manual brick making, and general talking and play
- fauna (bird song, mammal movement, amphibian and insect calls) and domestic animals (livestock and dogs)
- some local plant (mechanical pumps and generators)
- some local and short-term construction noise (mostly manual labour, but some plant including road upgrade plant)
- wind through vegetation.

Given the above and considering the large AOI, the noise levels recorded at the 26 monitoring locations are considered together to indicate the range of noise levels for the baseline environment rather than a specific value per location. This is considered valid due to the presence of similar noise sources throughout, and the short-term nature of the measurements.

Table A10.4-7 summarises the daytime noise data and Table A10.4-8 summarises night-time noise data. Attachment A10.1 presents the field survey sheets.

Table A10.4-7 Daytime Noise Monitoring Data (Locations UG1 to UG28)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG1	Sunday 17 December 2017	12:39–13:39	47.9	40.1	44.4	90.4
UG2	Sunday 17 December 2017	11:06–12:06	41.5	32.2	44.1	60.2
UG3	Friday 15 December 2017	07:55–08:55	44.6	37.3	47.4	66.6
UG4	Tuesday 6 February 2018	07:20–08:20	44.4	35.7	45.4	77.0
UG5	Friday 15 December 2017	17:22–18:22	41.9	34.4	44.4	71.6
UG6	Friday 15 December 2017	15:19–16:19	41.5	32.2	42.4	67.1
UG7	Friday 15 December 2017	13:27–14:27	54.8	35.8	48.1	88.1
UG8	Friday 15 December 2017	11:27–12:27	52.4	38.7	51.4	80.4
UG9	Friday 15 December 2017	10:44–11:44	56.9	42.4	57.9	85.5
UG10	Friday 15 December	16:27–17:27	51.0	27.1	44.7	85.9
UG11	Thursday 14 December 2017	15:10–16:10	54.8	39.3	55.8	84.6

Table A10.4-7 Daytime Noise Monitoring Data (Locations UG1 to UG28)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG12	Thursday 14 December 2017	11:02–12:02	51.7	32.1	43.3	86.5
UG13	Thursday 14 December 2017	14:59–15:59	45.4	29.3	51.0	55.8
UG14	Thursday 14 December 2017	17:23–18:23	41.3	28.7	40.9	73.1
UG15	Thursday 14 December 2017	12:25–13:25	52.8	32.7	48.6	78.5
UG16	Thursday 14 December 2017	11:17–12:17	58.7	35.2	55.2	92.0
UG17	Thursday 14 December 2017	10:09–11:09	48.8	29.2	44.7	76.9
UG18	Thursday 14 December 2017	08:54–09:54	46.5	33.1	48.1	71.6
UG19	Wednesday 13 December 2017	14:50–15:50	48.2	31.2	44.8	89.1
UG20	Wednesday 13 December 2017	13:19–14:19	44.1	30.1	48.6	65.3
UG21	Wednesday 13 December 2017	10:53–11:53	46.3	37.0	49.4	72.5
UG22	Wednesday 13 December 2017	16.02–17:02	58.1	35.6	57.6	85.5
UG23	Wednesday 13 December 2017	14:19–15:19	50.1	35.1	49.0	82.9
UG24	Wednesday 13 December 2017	12:28–13:28	56.0	37.3	52.8	89.9
UG25	Wednesday 13 December 2017	11:10–12:10	47.2	39.4	48.7	76.7
UG26	Wednesday 13 December 2017	9:55–10:55	47.2	39.4	48.7	76.7
UG27	Friday 17th August 208	15:12–16:12	53.8	40.9	54.8	82.4
UG28	Wednesday 15 August 2018	15:48–16:48	48.4	40.6	50.8	77.4

Table A10.4-7 Daytime Noise Monitoring Data (Locations UG1 to UG28)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
Highest recorded hour			58.7	42.4	57.9	92.0
Lowest recorded hour			41.3	27.1	40.9	55.8
Mean			49.0	34.6	48.4	78.1
Mode			41.5	32.2	44.4	71.6
Range			41.3–58.7	27.1–42.4	40.9–57.9	55.8–92.0

The daytime data presented across the acoustic RoW and access road AOI show a general range of around 15–17 dB for indices normally used to represent ambient and baseline noise environments (L_{eq} and L_{90}). This is as would be expected at a single location throughout a daytime period and therefore gives confidence that the data range is representative of the wider AOI.

The data also show that there is no diurnal pattern to when the lowest or highest levels occur. This is an indication of the nonstandard variance of noise source contributions throughout a typical day across the acoustic AOI. This is often observed in areas which are less built up or developed and are not characterised by fixed working regimes. These levels are also similar to those recorded in other areas in eastern Africa.

Table A10.4-8 Night Noise Monitoring Data (Locations UG1 and UG15)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG1	Sunday 17 December 2017	23:01–00:01	35.7	26.1	36.6	63.7
UG1	Wednesday 22 August 2018	00:00–01:00	51.0	43.6	55.1	63.4
UG1	Wednesday 22 August 2018	01:00–02:00	49.9	46.3	52.6	61.7
UG1	Wednesday 22 August 2018	02:00–03:00	52.8	46.8	56.3	64.0
UG1	Wednesday 22 August 2018	03:00–04:00	52.0	46.3	55.8	64.3
UG1	Wednesday 22 August 2018	04:00–05:00	50.4	45.0	53.1	63.3
UG1	Wednesday 22 August 2018	05:00–06:00	44.2	40.2	46.9	67.0
UG1	Wednesday 22 August 2018	06:00–07:00	46.2	41.3	47.9	64.9

Table A10.4-8 Night Noise Monitoring Data (Locations UG1 and UG15)

Location	Date	Start and End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)
UG1	Monday 20 August 2018/ Tuesday 21 August 2018	23:37–00.37	50.0	47.0	52.1	58.1
UG15	Thursday 14 December 2017	21:07–22:07	41.6	35.1	43.1	79.6
UG15	Thursday 14 December 2017	23:11–00:11	36.4	31.2	37.9	63.1
UG15	Thursday 14 December 2017	23:11–00:11	45.0	31.4	39.6	69.8
UG15	Thursday 16 August 2018	00:00–01:00	38.1	31.6	41.7	55.9
UG15	Thursday 16 August 2018	01:00–02:00	34.5	29.6	38.3	62.4
UG15	Thursday 16 August 2018	02:00–03:00	34.8	29.0	38.2	59.4
UG15	Thursday 16 August 2018	03:00–04:00	42.3	28.9	43.2	70.7
UG15	Thursday 16 August 2018	04:00–05:00	52.3	34.8	48.2	84.2
UG15	Thursday 16 August 2018	05:00–06:00	45.0	31.4	39.6	69.8
UG15	Wednesday 22 August 2018	23:00–24.00	43.1	33.4	39.8	70.9
Highest recorded hour			52.8	47	56.3	84.2
Lowest recorded hour			34.5	26.1	36.6	55.9
Mean			45.8	38.8	47.5	65.6
Range			34.5–52.8	26.1–47.0	36.6–56.3	55.9–84.2

The night-time data presented across the acoustic AOI show a general range of 18–21 dB for indices normally used to represent ambient and baseline noise environments (L_{eq} and L_{90}). This is as would be expected through a night-time period.

In general, noise levels are lower than the daytime measurements. However, the lowest recorded values are similar for day- and night-time periods. In the given environment this is expected as the noise environment in the daytime can often be similar to the night time, as noise sources are similar and there is an absence of substantial noise emitting source across the AOI.

These background levels are similar to those recorded by RSK across other areas in eastern Africa where the environment and noise sources are similar. This gives confidence that the data range is representative of the wider AOI.

A10.4.2 Trend in Condition and Sensitivity to Change

A10.4.2.1 Pumping Station 1

Although classed as rural, within the eastern African context, the area has been developed over time and there are settlements and signs of basic infrastructure including murram roads, clay brick structures and power cables. However, there are no signs of fixed industrial or mechanical plant noise nearby.

The recent introduction of a sealed main road to the west of the study area has not in increased development, but this may change if oil industry related activities, such as a refinery, are developed.

The current noise environment around PS1 ranges from around 55 dB(A) $L_{90,1hr}$ daytime and 26 dB(A) $L_{90,T}$ night time and is characterised by natural noises (bird song, wind through trees and weather), manual human interactions and vehicle noise.

The current noise environment is not subject to constant plant noise. Currently, the area is exposed to intermittent, but regular high noise events from road traffic, and often these can be perceived as more intrusive than a steady noise source. Therefore, the introduction of a steady noise source (assuming the absence of disturbing characters such as impulsive or tonal features) into the area will not necessarily be highly sensitive. Therefore, the AOI has the potential to tolerate changes to the existing noise environment.

A10.4.2.2 Pumping Station 2

Although classed as rural, within the eastern African context, the area has been developed over time and there are settlements and signs of basic infrastructure, including murram roads, clay brick structures and some power cables. However, there are no signs of fixed industrial or mechanical plant noise nearby.

The current noise environment around PS2 ranges from around 45 dB(A) $L_{90,1hr}$ daytime and 29 dB(A) $L_{90,T}$ night time and is characterised by natural noises (bird song, wind through trees and weather), manual human interactions and vehicle noise. Although the daytime levels were measured to be lower during the field exercise, it is expected that this will not always be the case.

The current environment is not subject to constant plant noise. Currently, the area is exposed to intermittent but regular high noise events resulting from road traffic, and often these can be perceived as more intrusive than a steady noise source. Therefore, an introduction of a steady noise source (assuming the absence of disturbing characters such as impulsive or tonal features) into the area will not necessarily be highly sensitive as the baseline noise levels are relatively low.

A10.4.2.3 Right-of-Way, Main Camps and Pipe Yards and Access Road Areas of Influence

The noise environment throughout the wider acoustic AOI, particularly around human habitations and settlements have been exposed to road construction using heavy plant, and although vehicle movements have the potential to increase, the character of the noise source is not new to most of the areas.

Therefore, given the temporary nature of the noise emissions associated with the wider acoustic AOI, and the experience of similar noise emissions, the tolerance to change is considered relatively high. This will depend on actual magnitude of emissions.

A10.4.3 Ecosystem Services Provided

This VEC does not have any ecosystem services associated with it.

A10.4.4 Sensitivity Rankings

Based on the survey, engagement with stakeholders and trend in condition and sensitivity to change, the sensitivity of the acoustic environment for AGIs, construction facilities, RoW and access roads across the AOI has been ranked (Table A10.4-9). The sensitivity ranking is reasonably generic across the AOI.

Table A10.4-9 Acoustic Receptor Sensitivity Ranking – Presence in Areas of Influence

Project Component	Receptor				
	Very Low	Low	Moderate	High	Very High
PS1	-	X	X	X	-
PS2	-	X	X	X	-
MCPY1	-	X	X	X	-
MCPY2	-	X	X	X	-
MCPY3	-	X	X	X	-
MCPY4	-	X	X	X	-
RoW	X	X	X	X	-
Construction access roads	X	X	X	X	-

NOTES: Very low – No human receptors other than project workforce and visitors to the project. Area is not considered frequented or used by fauna.
Low – Locations used for recreation and industrial activities, such as industrial units and workshops. Workers outside the project site or not engaged in project work (i.e., not part of the project workforce). Fauna has the potential to pass through the area but not a common occurrence. Area not known to be used for breeding, feeding, habitation or migration of fauna.
Moderate – Locations used for work requiring concentration, such as offices. Area known to be used regularly by fauna for regular movement.
High – Locations used for rest and sleep such as residential properties. Educational establishments and places of worship. Area known to be used for regular feeding or migration of fauna.
Very high – Locations used by vulnerable people such as hospitals and homes for the elderly. Area used to be known for fauna habitation or breeding.

A10.5 Key Considerations

The acoustic baseline study did not identify sensitive receptors classed as very high anywhere in the acoustic AOI, although very low to high sensitivity receptors were identified across the RoW, MCPY and PS AOIs.

The noise environment for the majority of the AOIs, particularly around PSs is dominated by human induced sources such as road traffic, farming and general human interactions. There is an absence of industrial and commercial noise throughout the RoW AOI.

A10.6 References

BSI. 2003a. *British Standard BS 7455-1:2003. 'Description and measurement of environmental noise. Guide to quantities and procedures.*

BSI. 2003b. *British Standard BS EN 61672:-1:2003. Electroacoustics. Sound level meters. Specifications.*

Total East Africa Midstream BV. 2017. EACOP Environmental and Social Impact Assessment Scoping Report for Approval. Submitted to National Environment Management Authority, July.

ATTACHMENT A10.1 FIELD SURVEY DATA

Project Name	East African Crude Oil Pipe Line – PHASE 1 Monitoring					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Sunday	**Date**	17/ 12 /2017	**Location**	EACOP_UG1	
Co-ordinates:	02870257mE, 0161236mN					
Monitoring Personnel	Abraham Ochola					

Photos

North

East

South

West

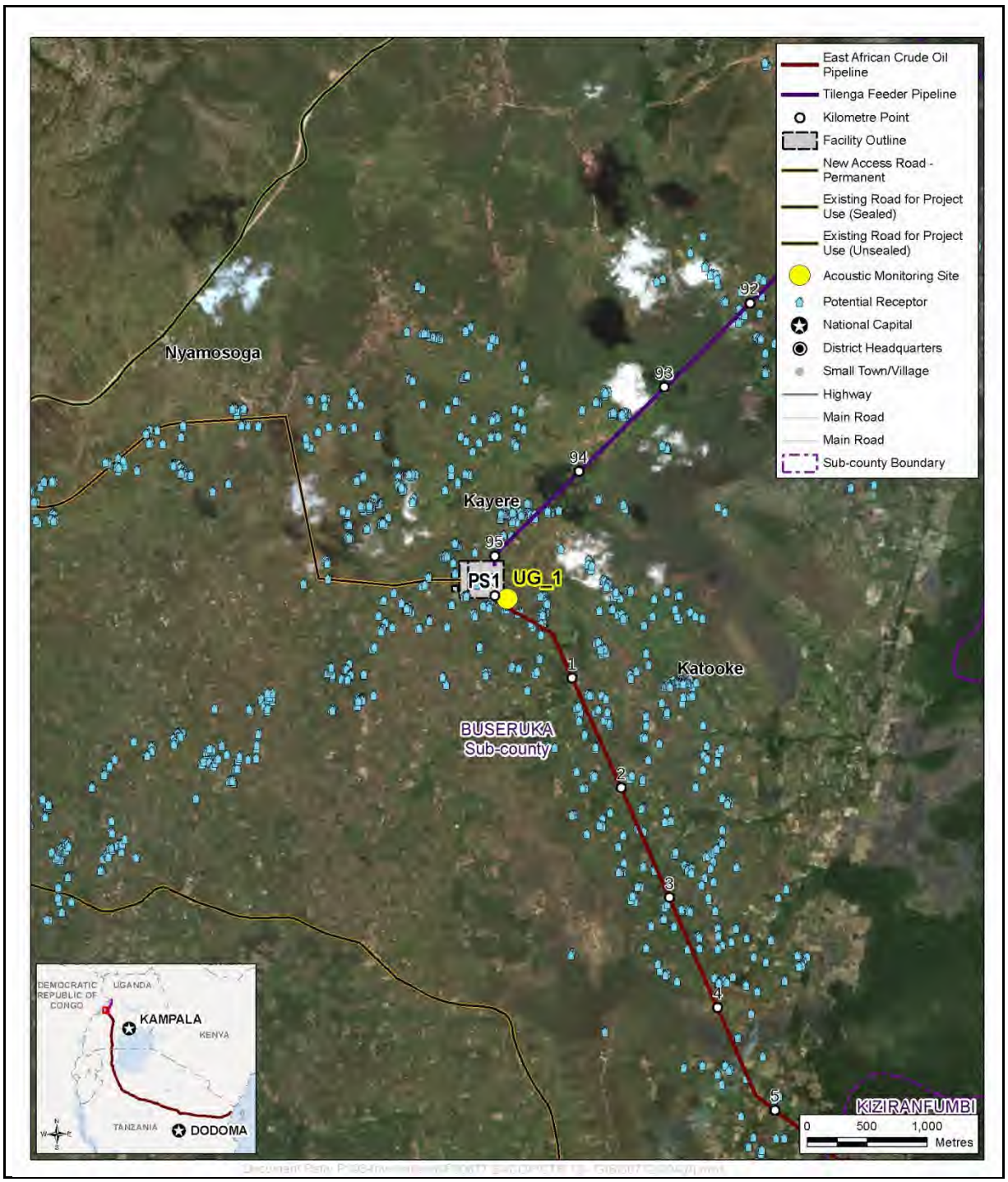
Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0018	12:39	13:39	47.9	40.1	44.4	90.4	Wind Cattle Birds Excavators
Night	0016	23:01	00:01	35.7	26.1	36.6	63.7	Wind

Additional Notes:
30°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover

Project Name	East African Crude Oil Pipe Line – PHASE 3 Monitoring						
Project No.	80712	**Pipeline**	EACOP (Uganda)				
Day of Week	Sun - Wed	**Date**	19/08/18 – 22/08/18	**Location**	EACOP_UG1		
Co-ordinates:	02870257mE, 0161236mN						
Monitoring Personnel	Deo Okure						

Period	**File Ref:**	**Start Time**	**End Time**	**$L_{eq,1hr}$, dB(A)**	**$L_{90,1hr}$, dB(A)**	**$L_{10,1hr}$, dB(A)**	**L_{max}, dB(A)**	**Notes/sources**
Night	015	00:00	01:00	51.0	43.6	55.1	63.4	Wind Birds Motorbikes Cars
Night	015	01:00	02:00	49.9	46.3	52.6	61.7	
Night	015	02:00	03:00	52.8	46.8	56.3	64.0	
Night	015	03:00	04:00	52.0	46.3	55.8	64.3	
Night	015	04:00	05:00	50.4	45.0	53.1	63.3	
Night	015	05:00	06:00	44.2	40.2	46.9	67.0	
Night	015	06:00	07:00	46.2	41.3	47.9	64.9	
Day	015	07:00	08:00	46.2	42.6	47.9	65.8	Wind Cattle Birds Motorbikes Cars
Day	016	08:46	09:46	47.8	39.0	48.2	71.9	
Day	016	09:46	10:46	46.3	39.3	49.5	66.7	
Day	016	10:46	11:46	45.6	37.0	45.9	67.8	
Day	016	11:46	12:46	42.6	34.2	46.3	64.3	
Day	016	12:46	13:46	40.1	32.2	42.3	60.0	
Day	016	13:46	14:46	42.9	32.8	42.1	73.5	
Day	017	15:37	16.37	46.1	37.7	48.2	68.6	
Day	017	16:37	17.37	43.1	36.6	45.0	67.3	
Day	017	17:37	18.37	51.0	43.6	55.1	63.4	
Day	017	18:37	19.37	49.9	46.3	52.6	61.7	
Day	017	19:37	20.37	52.8	46.8	56.3	64.0	
Day	017	20:37	21.37	52.0	46.3	55.8	64.3	
Day	017	21:37	22.37	50.4	45.0	53.1	63.3	
Night	017	22:37	23.37	44.2	40.2	46.9	67.0	Wind Birds Motorbikes Cars
Night	017	23:37	00.37	46.2	41.3	47.9	64.9	Wind Birds Motorbikes Cars

Additional Notes:
Daytime 22–30°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover
Night time 11–22°C temperature, <3 ms^{-1} wind speed, northerly wind direction, 20% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Permanent
Existing Road for Project Use (Sealed)
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
District Headquarters
Small Town/Village
Highway
Main Road
Main Road
Sub-county Boundary
Nyamosoga
Kayere
Katooke
BUSERUKA Sub-county
KIZIRANFUMBI
PS1
UG_1
92
93
94
95
1
2
3
4
5
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Sunday	**Date**	17 /12 / 2017	**Location**	EACOP_UG2
Co-ordinates:	0293740mE, 0151740mN				
Monitoring Personnel	Abraham Ochola				

Photos

North

East

South

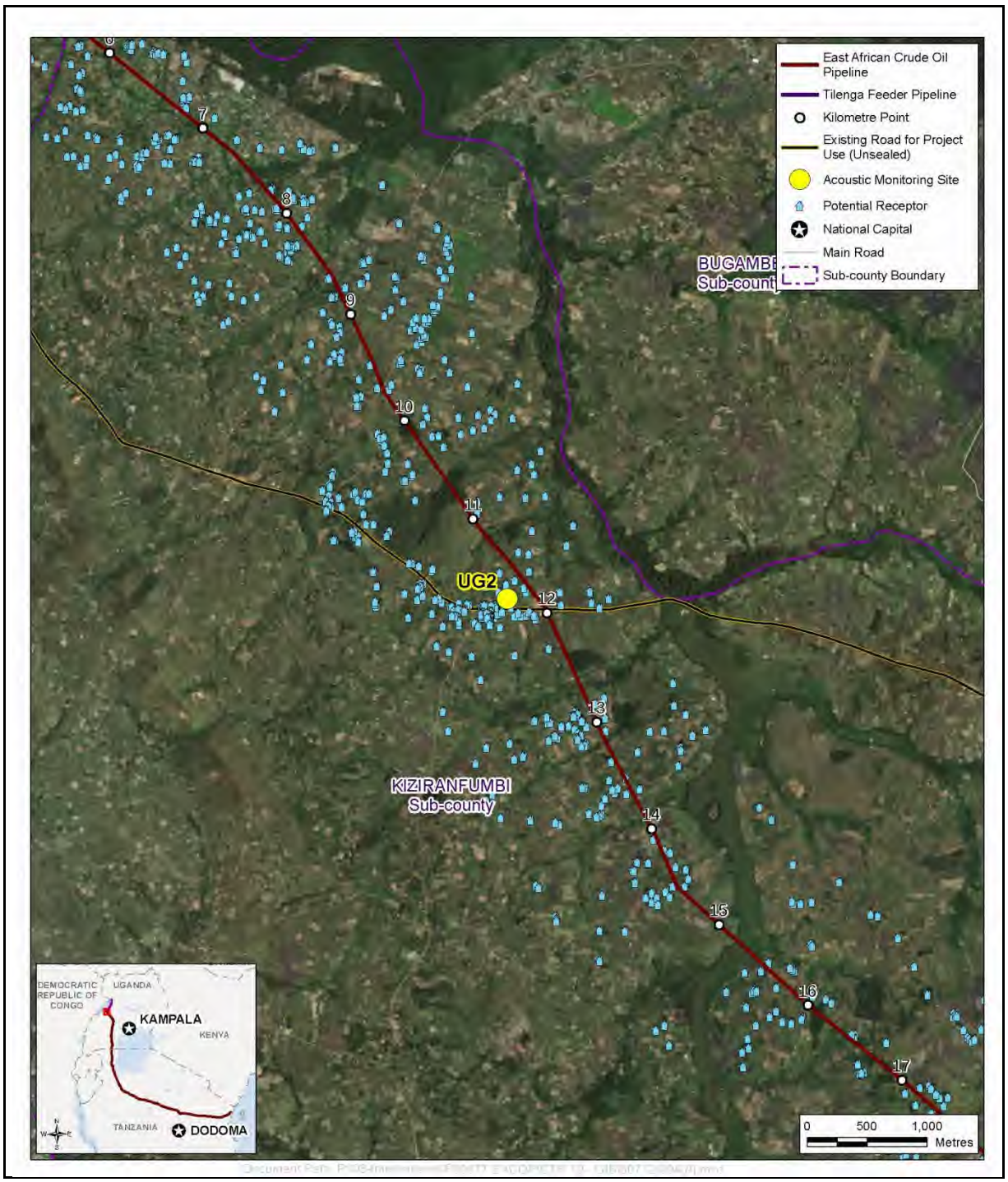
West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0017	11:06	12:06	41.5	32.2	44.1	60.2	People praying at God's Assembly Church Occasional motorists

Additional Notes:

Situated within a maize plantation near Kabale–Bugambe road

30°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Main Road
Sub-county Boundary
BUGAMBE
Sub-count
UG2
KIZIRANFUMBI
Sub-county
7
8
9
10
11
12
13
14
15
16
17
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Friday	**Date**	15/ 12/ 2017	**Location**	EACOP_UG3
Co-ordinates:	0310838mE, 0130808mN				
Monitoring Personnel	Abraham Ochola				

Photos

North

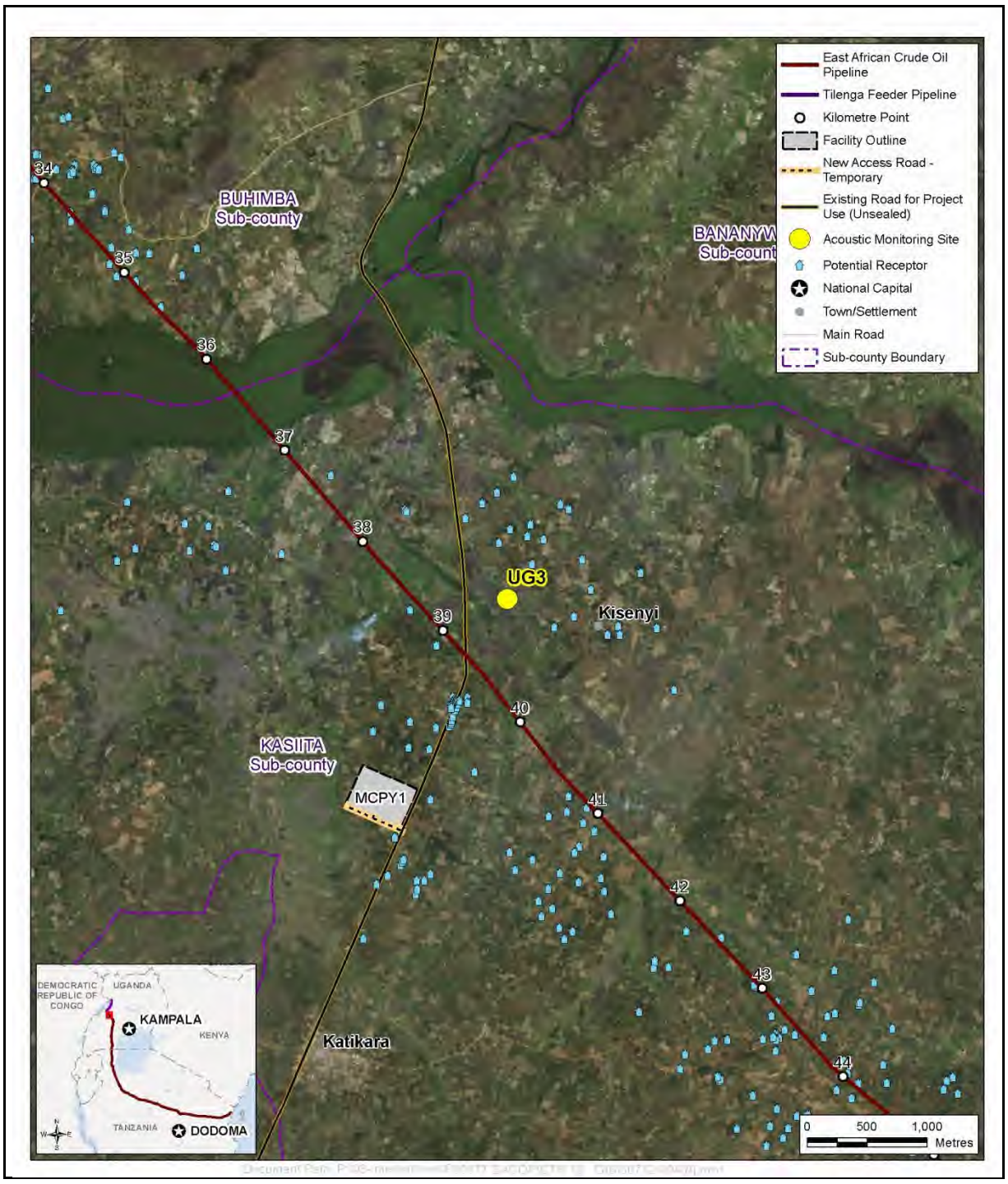
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0015	07:55	08:55	44.6	37.3	47.4	66.6	Birds People Wind

Additional Notes:
31°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 40% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Temporary
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Main Road
Sub-county Boundary
34
35
36
37
38
39
40
41
42
43
44
BUHIMBA Sub-county
BANANYV
Sub-count
UG3
Kisenyi
KASIITA Sub-county
MCPY1
Katikara
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Saturday	**Date**	6/ 2 / 2018	**Location**	EACOP_UG4
Co-ordinates:	316658, 123356				
Monitoring Personnel	Abraham Ochola				

Photos

North

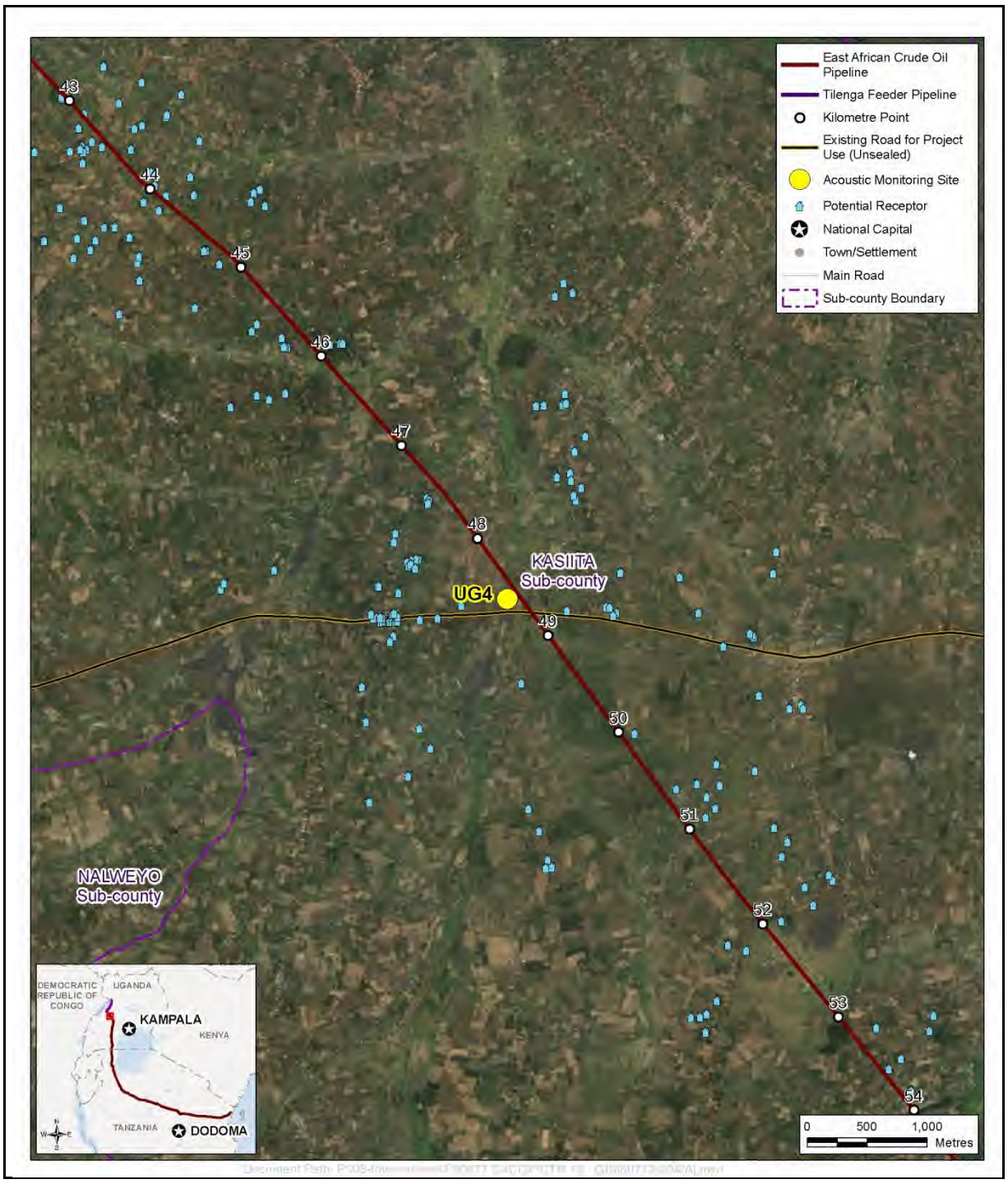
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0021	07:20	08:20	44.4	35.7	45.4	77.0	Wind Cattle Birds

Additional Notes:
28°C temperature, <2 ms^{-1} wind speed, north-westerly wind direction, 20% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Main Road
Sub-county Boundary
43
44
45
46
47
48
49
50
51
52
53
54
KASIITA Sub-county
UG4
NALWEYO Sub-county
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Friday	**Date**	15 /12 / 2017	**Location**	EACOP_UG5
Co-ordinates:	0324122mE, 0112607mN				
Monitoring Personnel	Abraham Ochola				

Photos

North

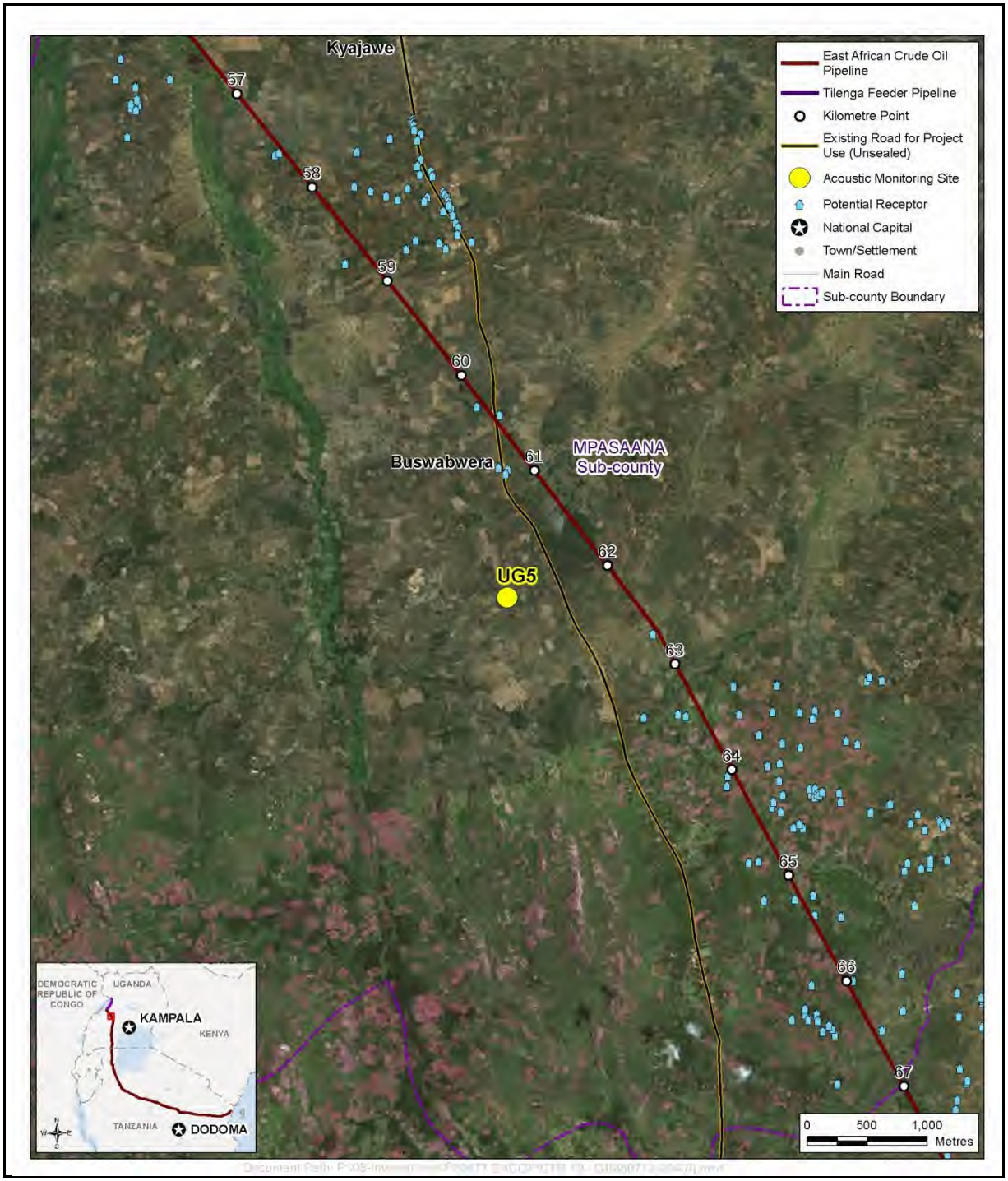
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0014	17:22	18:22	41.9	34.4	44.4	71.6	Crickets Birds People wind

Additional Notes:
31°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


Kyajawe
57
58
59
60
61
62
63
64
65
66
67
Buswabwera
MPASAANA
Sub-county
UG5
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Main Road
Sub-county Boundary
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Friday	**Date**	15/ 12 / 2017	**Location**	EACOP_UG6
Co-ordinates:	0336678mE, 096892mN				
Monitoring Personnel	Abraham Ochola				

Photos

North

East

South

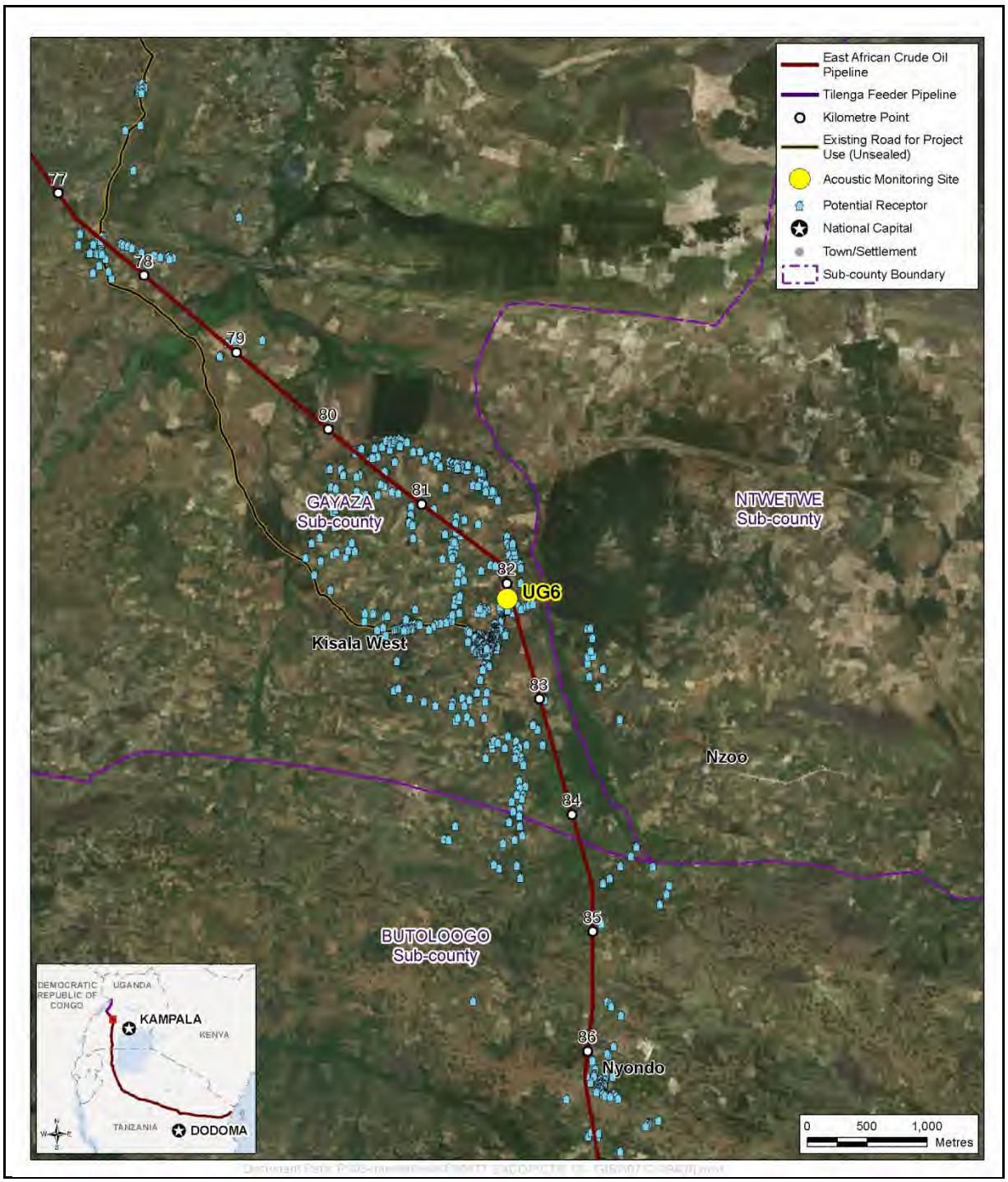
West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0013	15:19	16:19	41.5	32.2	42.4	67.1	People Occasional motorists Birds

Additional Notes:

Situated approximately 700 m from Tala forest reserve

31°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 40% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Sub-county Boundary
77
78
79
80
81
82
83
84
85
86
UG6
GAYAZA Sub-county
NTWETWE Sub-county
Kisala West
Nzoo
BUTOLOOGO Sub-county
Nyondo
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Friday	**Date**	15/12 / 2017	**Location**	EACOP_UG7	
Co-ordinates:	36 N 0337206 0091860					
Monitoring Personnel	Daniel Clare					

Photos

North

East

South

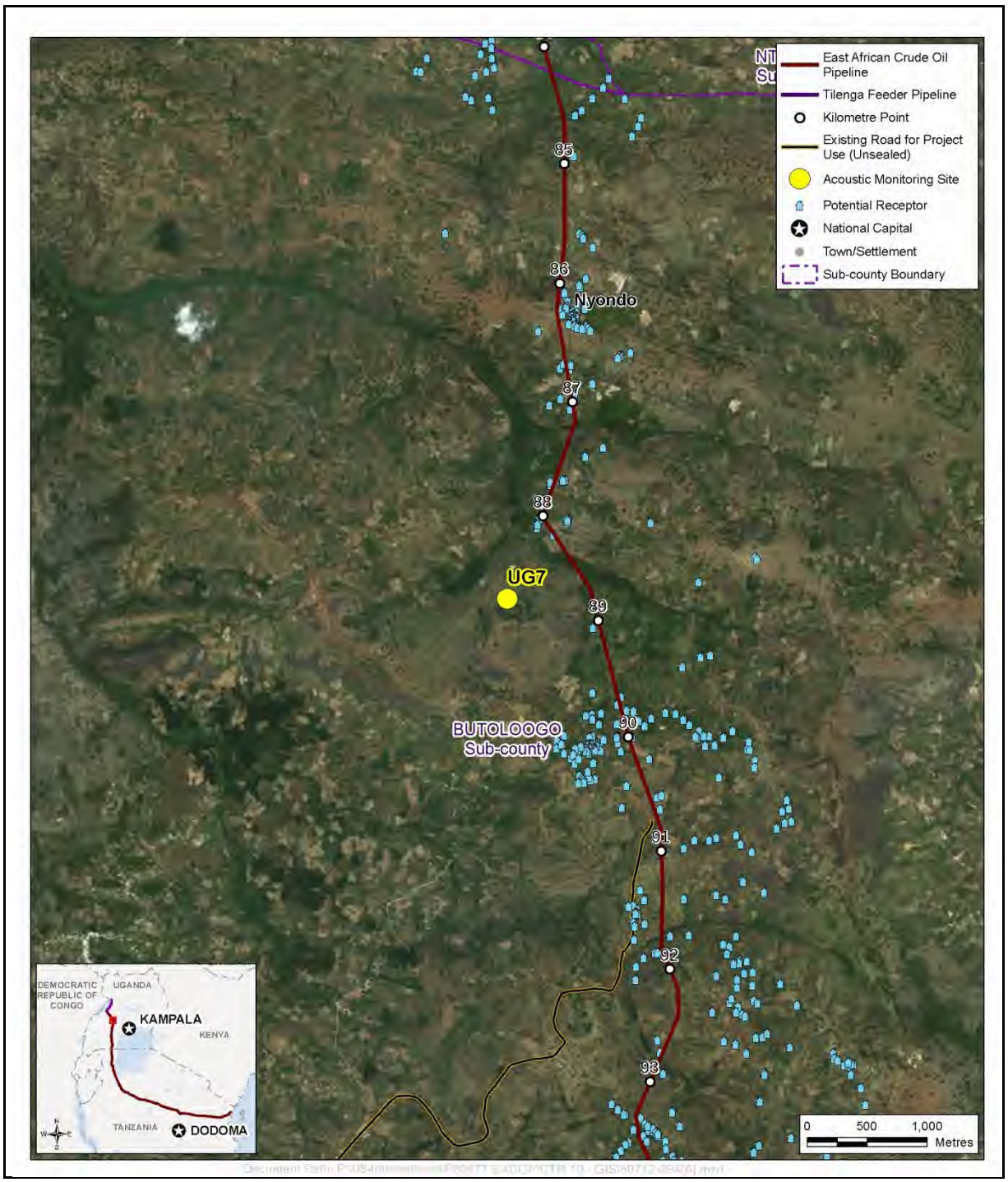
West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_014	13.27	14.27	54.8	35.8	48.1	88.1	Leaf rustle Motorbikes People Birds

Additional Notes:

30°C temperature, 2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover

Open area – no real population


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Sub-county Boundary
85
86
Nyondo
87
88
UG7
89
BUTOLOOGO Sub-county
90
91
92
93
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Friday	**Date**	15/12 / 2017	**Location**	EACOP_UG8
Co-ordinates:	36N 0336671 0078744				
Monitoring Personnel	Daniel Clare				

Photos

North

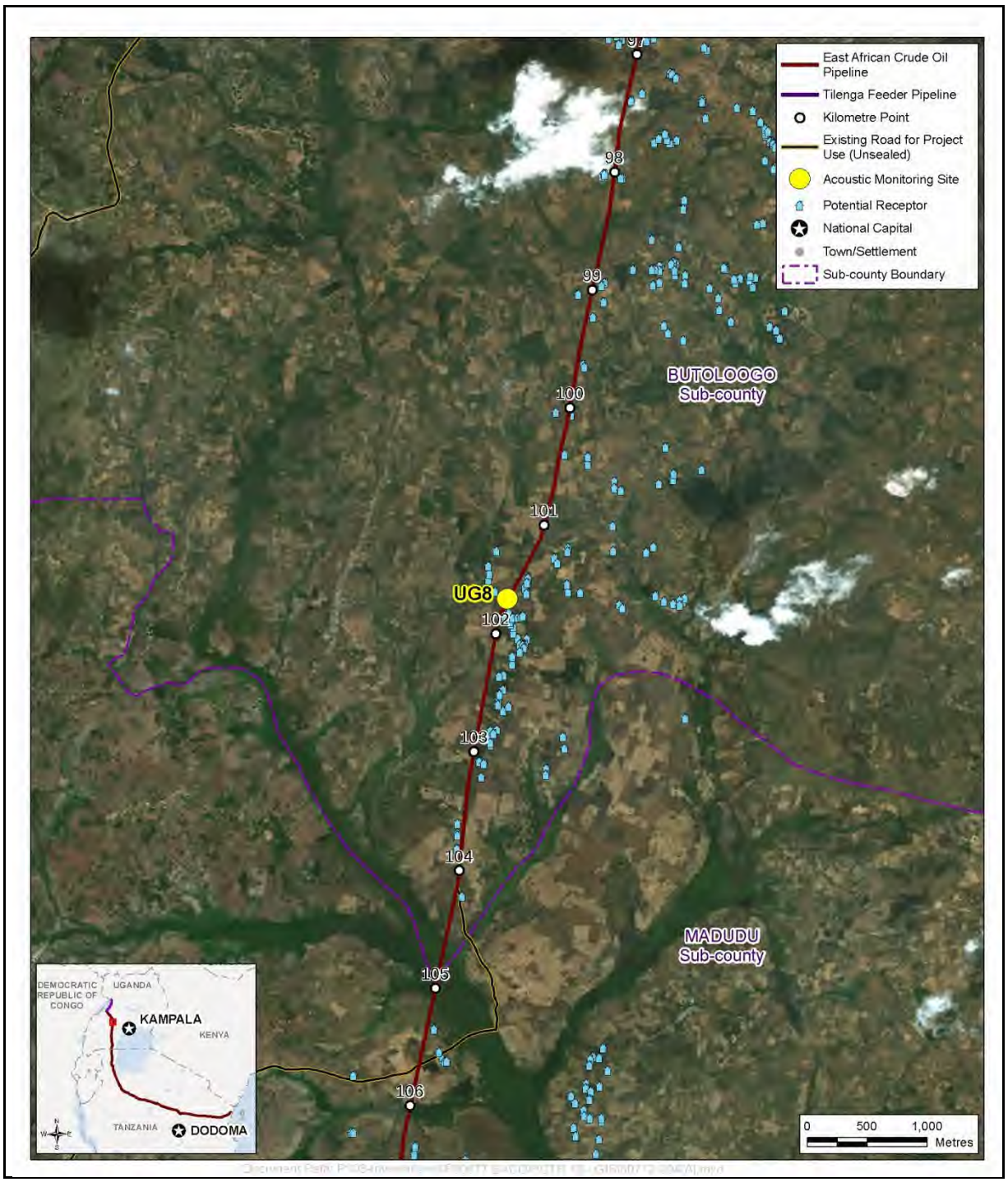
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_013	11:27	12:27	52.4	38.7	51.4	80.4	Occasional motorbike Leaf rustle Cockerel People

Additional Notes:
32°C temperature, 2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Sub-county Boundary
97
98
99
100
101
102
103
104
105
106
UG8
BUTOLOOCO Sub-county
MADUDU Sub-county
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Friday	**Date**	15/12 / 2017	**Location**	EACOP_UG9
Co-ordinates:	36N 0334651 0071689				
Monitoring Personnel	Daniel Clare				

Photos

North

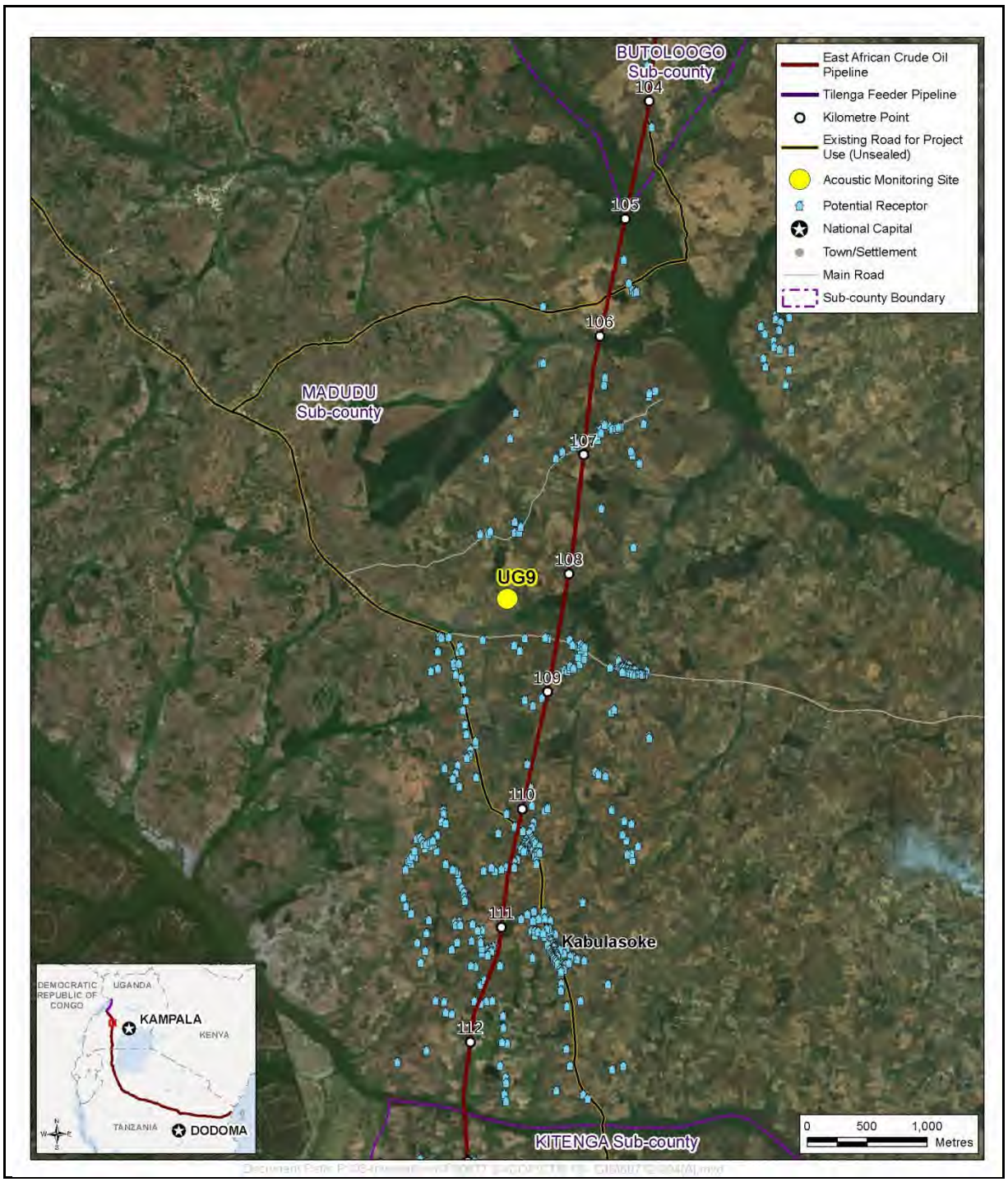
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_012	10:44	11:44	56.9	42.4	57.9	85.5	Leaf rustle Motorbikes People Birds

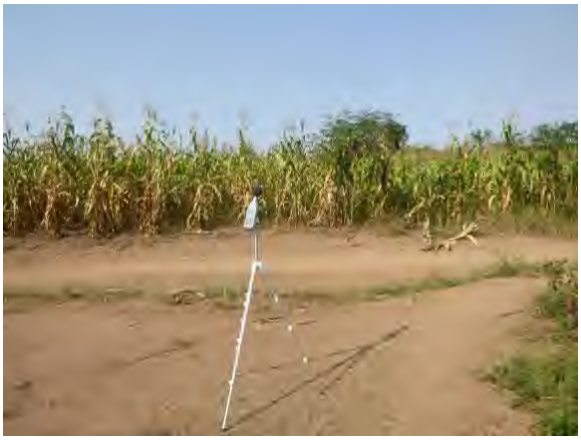
Additional Notes:
32°C temperature, 2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


BUTOLOOGO
Sub-county
104
105
106
MADUDU
Sub-county
107
108
UG9
109
110
111
Kabulasoke
112
KITENGA Sub-county
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Main Road
Sub-county Boundary
0
500
1,000
Metres
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Friday	**Date**	15 /12/ 2017	**Location**	EACOP_UG10	
Co-ordinates:	36N 0335911 0062321					
Monitoring Personnel	Daniel Clare					

Photos

North



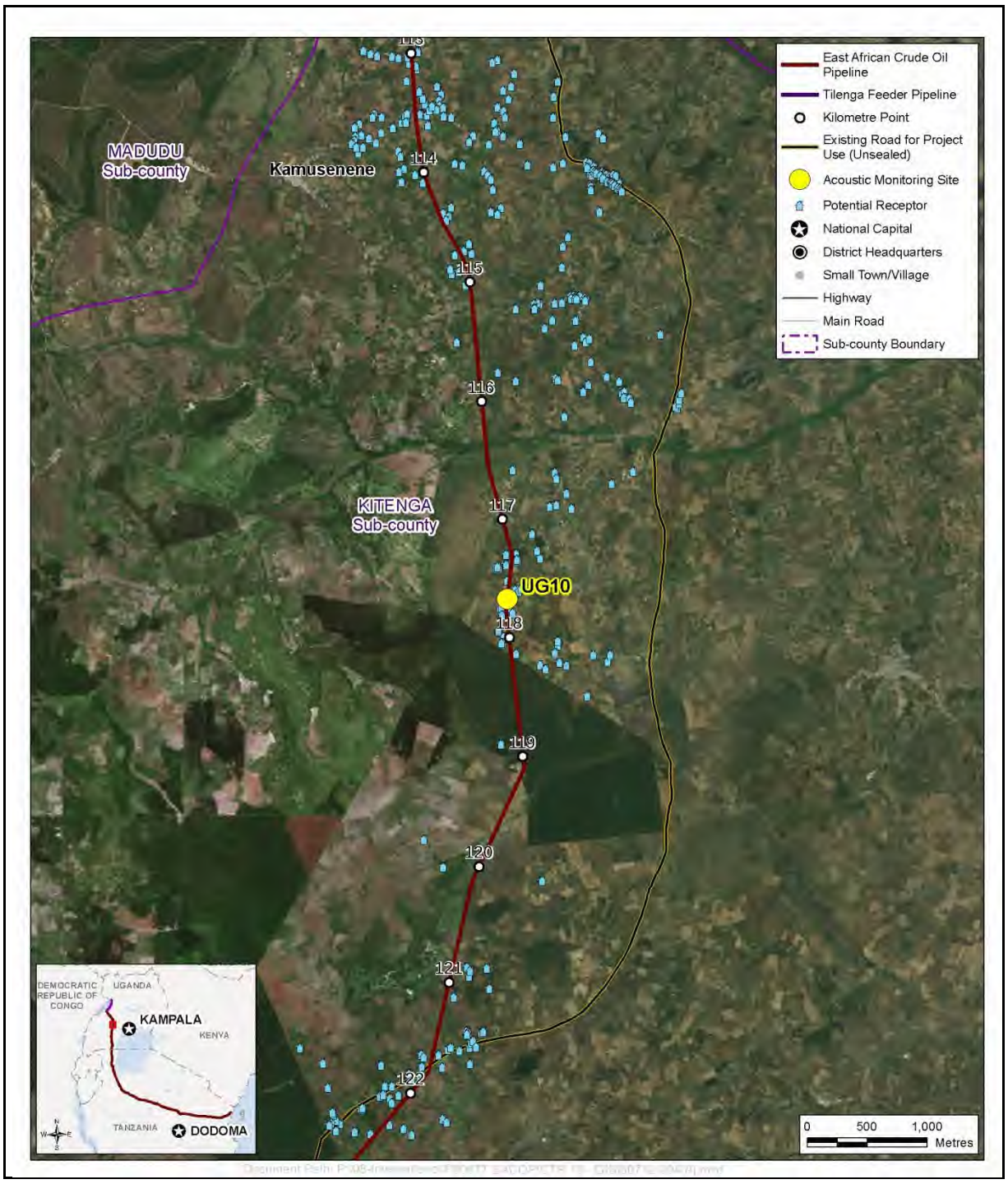
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_011	16:27	17:27	51.0	27.1	44.7	85.9	Leaf rustle Motorbikes (very few) People Bird

Additional Notes:
33°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
District Headquarters
Small Town/Village
Highway
Main Road
Sub-county Boundary
MADUDU Sub-county
Kamusenene
KITENGA Sub-county
114
115
116
117
UG10
118
119
120
121
122
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Thursday	**Date**	14 /12/ 2017	**Location**	EACOP_UG11
Co-ordinates:	36N 0333832 0057674				
Monitoring Personnel	Daniel Clare				

Photos

North

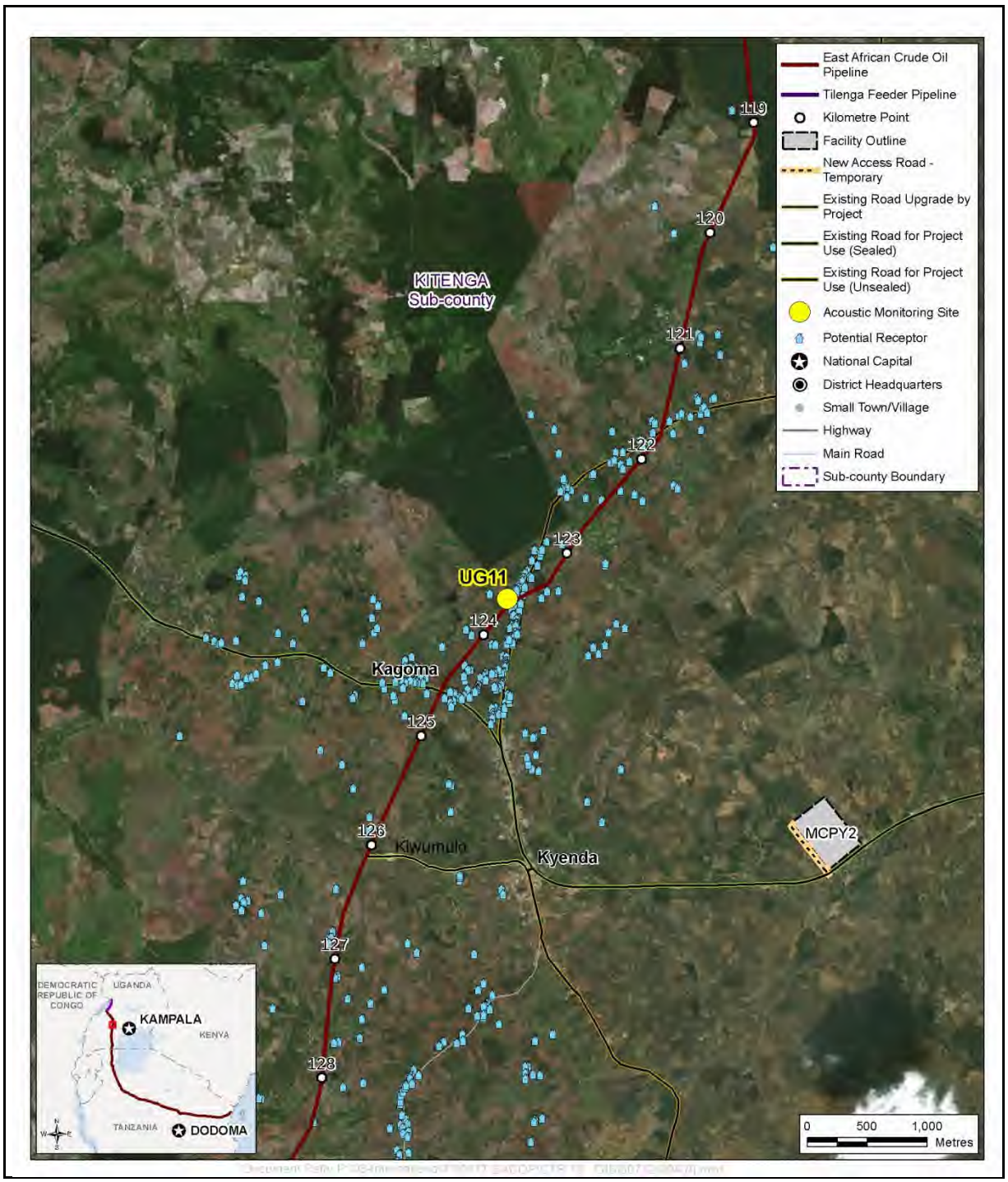
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_011	15.10	16.10	54.8	39.3	55.8	84.6	Motorbikes Birds People

Additional Notes:
33°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Temporary
Existing Road Upgrade by Project
Existing Road for Project Use (Sealed)
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
District Headquarters
Small Town/Village
Highway
Main Road
Sub-county Boundary
KITENGA Sub-county
UG11
MCPY2
Kagoma
Kiwumulo
Kyenda
119
120
121
122
123
124
125
126
127
128
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Thursday	**Date**	14/ 12 / 2017	**Location**	EACOP_UG12
Co-ordinates:	0256330, 03485760				
Monitoring Personnel	Abraham Ochola				

Photos

North

East

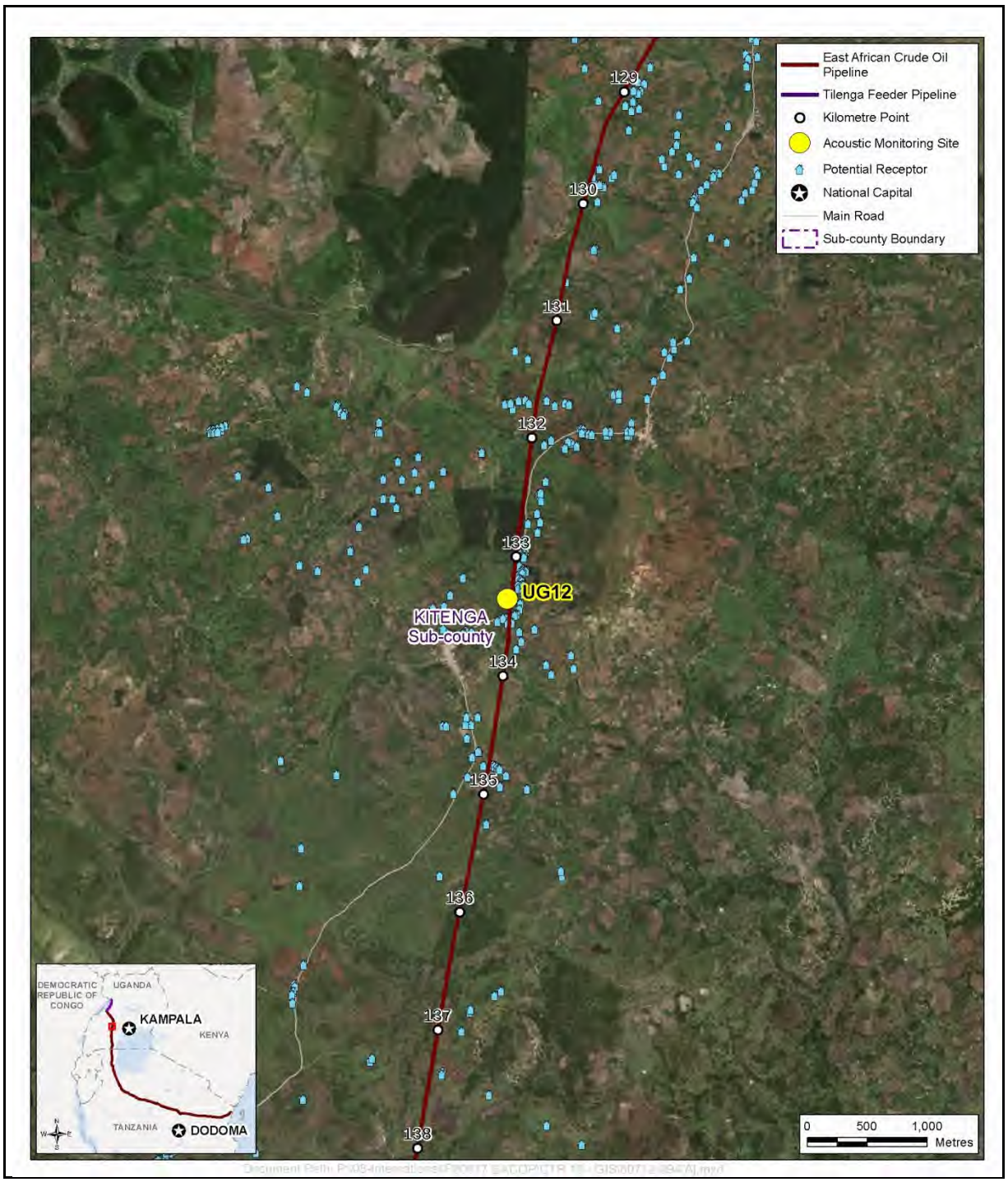
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0008	11:02	12:02	51.7	32.1	43.3	86.5	Wind Birds Occasional motorists

Additional Notes:

30°C temperature, <1 ms^{-1} wind speed, northerly wind direction, 20% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Acoustic Monitoring Site
Potential Receptor
National Capital
Main Road
Sub-county Boundary
129
130
131
132
133
134
135
136
137
138
UG12
KITENGA
Sub-county
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Thursday	**Date**	14 /12 / 2017	**Location**	EACOP_UG13	
Co-ordinates:	0230944, 03482612					
Monitoring Personnel	Abraham Ochola					

Photos

North

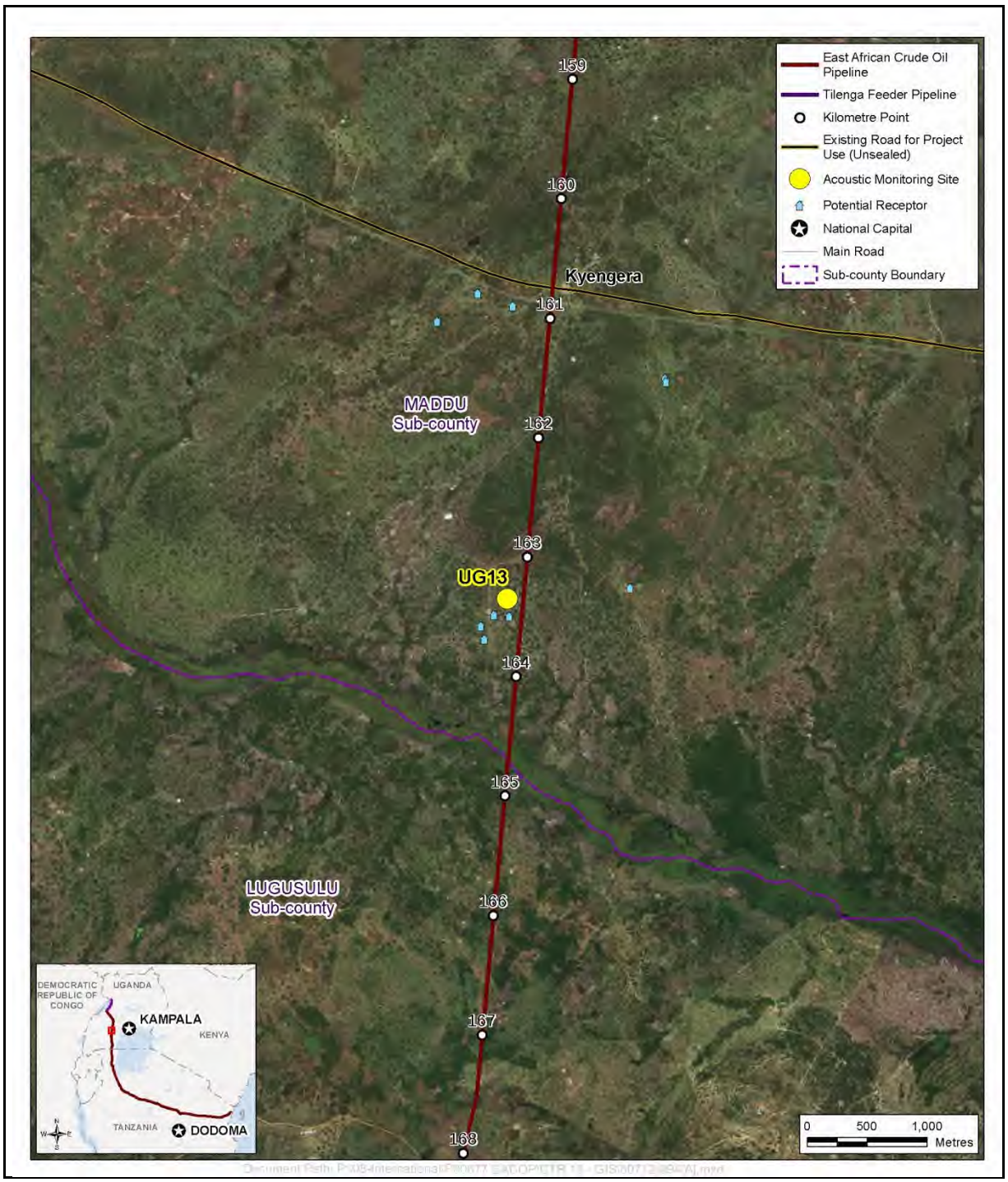
East

South

West

Period	File Ref:	Start Time	End Time	L_{Aeq} dB	L_{A90} dB	L_{A10} dB	L_{AFMax} dB	Notes/sources
Day	0009	14:59	15:59	45.4	29.3	51.0	55.8	Wind Cattle Birds Crickets

Additional Notes:
30°C temperature, <1 ms^{-1} wind speed, northerly wind direction, 20% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Main Road
Sub-county Boundary
159
160
161
162
163
164
165
166
167
168
Kyengera
MADDU Sub-county
UG13
LUGUSULU Sub-county
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Thursday	**Date**	14 /12/ 2017	**Location**	EACOP_UG14	
Co-ordinates:	31.432 Long. 0.0139 Lat					
Monitoring Personnel	Abraham Ochola					

Photos

North

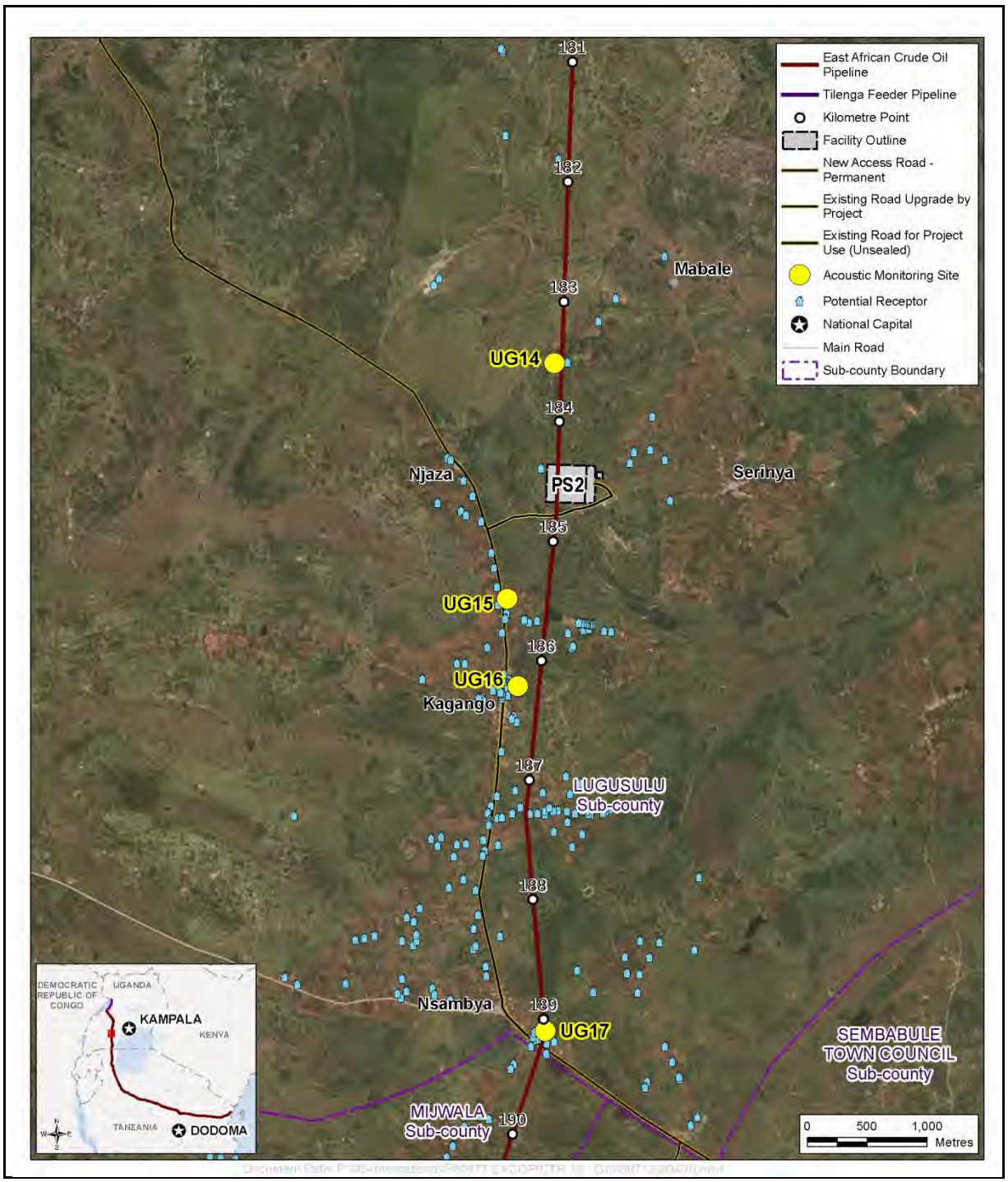
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0010	17:23	18:23	41.3	28.7	40.9	73.1	Wind Cattle Birds People talking

Additional Notes:
The measurements were within a cattle grazing area
30°C temperature, <1 ms^{-1} wind speed, northerly wind direction, 20% cloud cover


181
182
183
184
185
186
187
188
189
190
Mabale
Njaza
PS2
Serinya
UG14
UG15
UG16
Kagango
LUGUSULU
Sub-county
Nsambya
UG17
SEMBABULE
TOWN COUNCIL
Sub-county
MIJWALA
Sub-county
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Permanent
Existing Road Upgrade by Project
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Main Road
Sub-county Boundary
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line – PHASE 1 MONITORING					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Thursday	**Date**	14 /12/ 2017	**Location**	EACOP_UG15	
Co-ordinates:	36M 0324994 996916					
Monitoring Personnel	Daniel Clare / Abraham Ochola					

Photos

North

East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_009	12.25	13.25	52.8	32.7	48.6	78.5	Insects Bird song Cars, trucks and motorbikes (1 every 5 minutes) People
Day	00011	21:07	22:07	41.6	35.1	43.1	79.6	Crickets Occasional motorists People talking

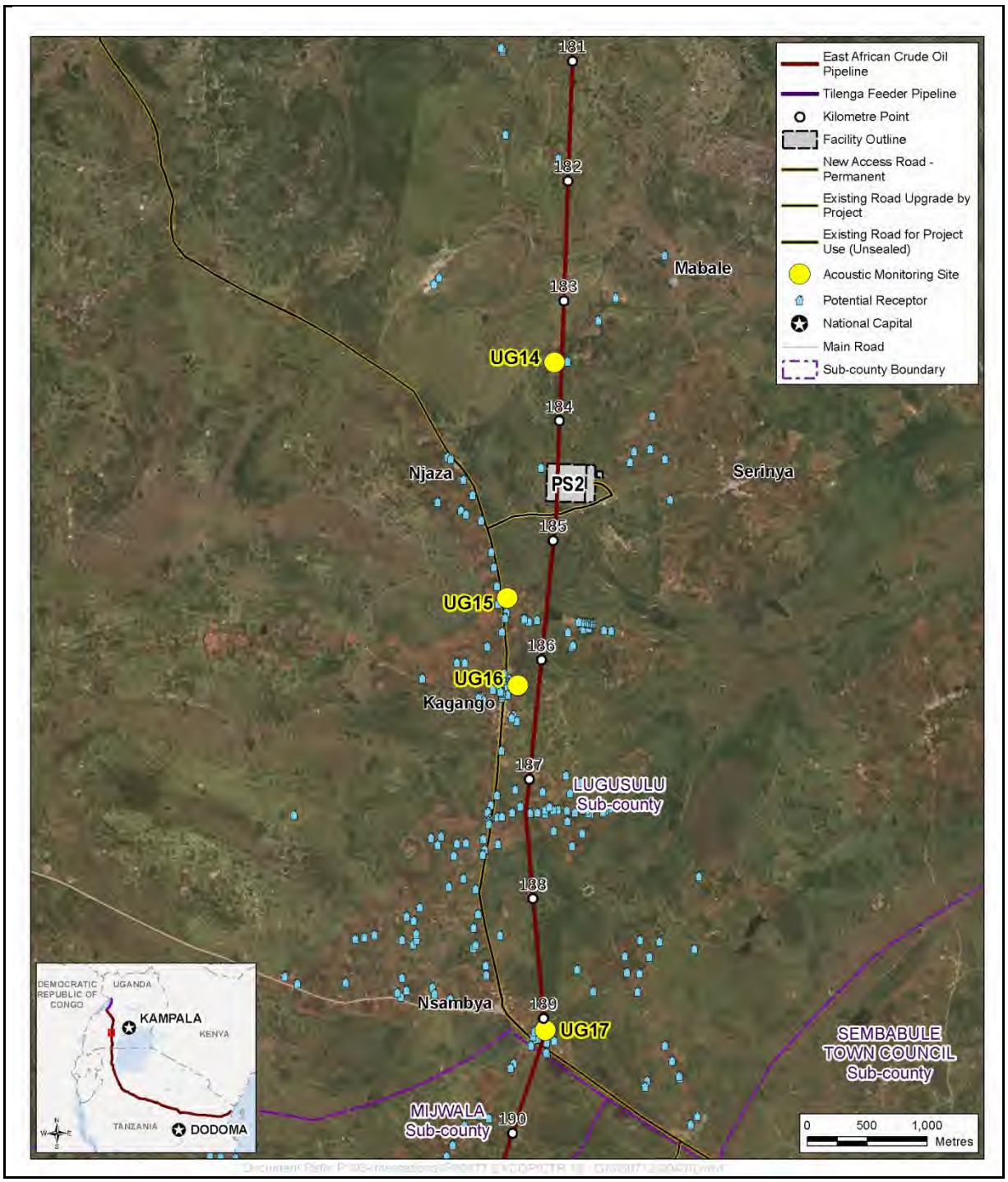
Night	0012	11:11pm	00:11am	36.4	31.2	37.9	63.1	Crickets Occasional motorists

Additional Notes:
30°C temperature, <1 ms^{-1} wind speed, southerly wind direction, 70% cloud cover

Project Name	East African Crude Oil Pipe Line – PHASE 3 Monitoring				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Wed - Thur	**Date**	15/08/18 – 16/08/18	**Location**	EACOP_UG15
Co-ordinates:	02870257mE, 0161236mN				
Monitoring Personnel	Deo Okure				

Period	**File Ref:**	**Start Time**	**End Time**	**$L_{eq,1hr}$, dB(A)**	**$L_{90,1hr}$, dB(A)**	**$L_{10,1hr}$, dB(A)**	**L_{max}, dB(A)**	**Notes/sources**
Night		00:00	01:00	45.0	31.4	39.6	69.8	Wind Birds Motorbikes Cars
Night		01:00	02:00	38.1	31.6	41.7	55.9	
Night		02:00	03:00	34.5	29.6	38.3	62.4	
Night		03:00	04:00	34.8	29.0	38.2	59.4	
Night		04:00	05:00	42.3	28.9	43.2	70.7	
Night		05:00	06:00	52.3	34.8	48.2	84.2	
Day		08:08	09:08	53.0	31.5	46.9	83.6	
Day		09:08	10:08	48.9	30.7	44.3	82.4	Wind Cattle Birds Motorbikes Cars
Day		10:08	11:08	45.1	33.0	45.5	71.9	
Day		11:08	12:08	47.0	29.9	42.9	79.8	
Day		12:08	13:08	49.2	29.9	43.7	80.4	
Day		13:08	14:08	48.6	31.7	43.8	78.6	
Day		14:08	15:08	46.5	30.3	42.5	77.9	
Day		15:08	16:08	47.9	32.1	45.3	71.3	
Day		18:00	19.00	50.1	34.4	44.0	80.9	
Day		19:00	20.00	50.3	41.6	53.7	69.7	
Day		20:00	21.00	50.9	44.6	52.2	81.4	
Day		21:00	22.00	48.1	40.5	46.6	81.8	
Day		22:00	23.00	43.4	36.5	42.1	75.3	
Night		23:00	24.00	43.1	33.4	39.8	70.9	Wind Birds Motorbikes Cars

Additional Notes:
Daytime 18–32°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 40% cloud cover
Night time 11–18°C temperature, <1 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


181
182
183
184
185
186
187
188
189
190
Mabale
Njaza
PS2
Serinya
UG14
UG15
UG16
Kagango
LUGUSULU
Sub-county
Nsambya
UG17
SEMBABULE
TOWN COUNCIL
Sub-county
MIJWALA
Sub-county
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Permanent
Existing Road Upgrade by Project
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Main Road
Sub-county Boundary
0 500 1,000
Metres
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Thursday	**Date**	14 /12/2017	**Location**	EACOP_UG16
Co-ordinates:	36M 0325026 996223				
Monitoring Personnel	Daniel Clare				

Photos

North

East

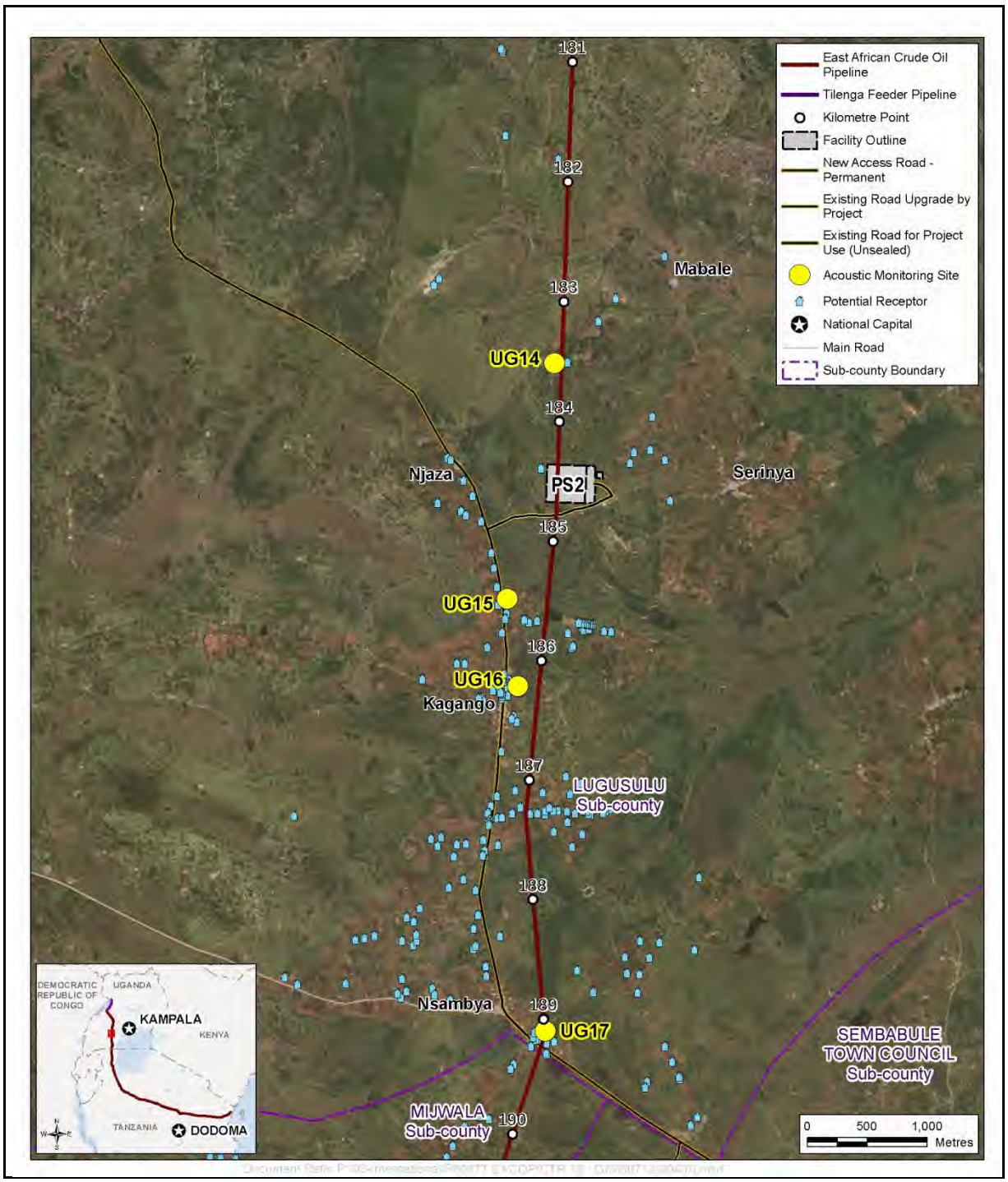
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_008	11.17	12.17	58.7	35.2	55.2	92.0	Insects Bird song Occasional motorbikes People Children playing

Additional Notes:

30°C temperature, <1 ms^{-1} wind speed, southerly wind direction, 70% cloud cover


181
182
183
184
185
186
187
188
189
190
Mabale
Njaza
PS2
Serinya
UG14
UG15
UG16
Kagango
LUGUSULU
Sub-county
Nsambya
UG17
SEMBABULE
TOWN COUNCIL
Sub-county
MIJWALA
Sub-county
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Permanent
Existing Road Upgrade by Project
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Main Road
Sub-county Boundary
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Thursday	**Date**	14 /12/2017	**Location**	EACOP_UG17
Co-ordinates:	36M 03295189 9993066				
Monitoring Personnel	Daniel Clare				

Photos

North

East

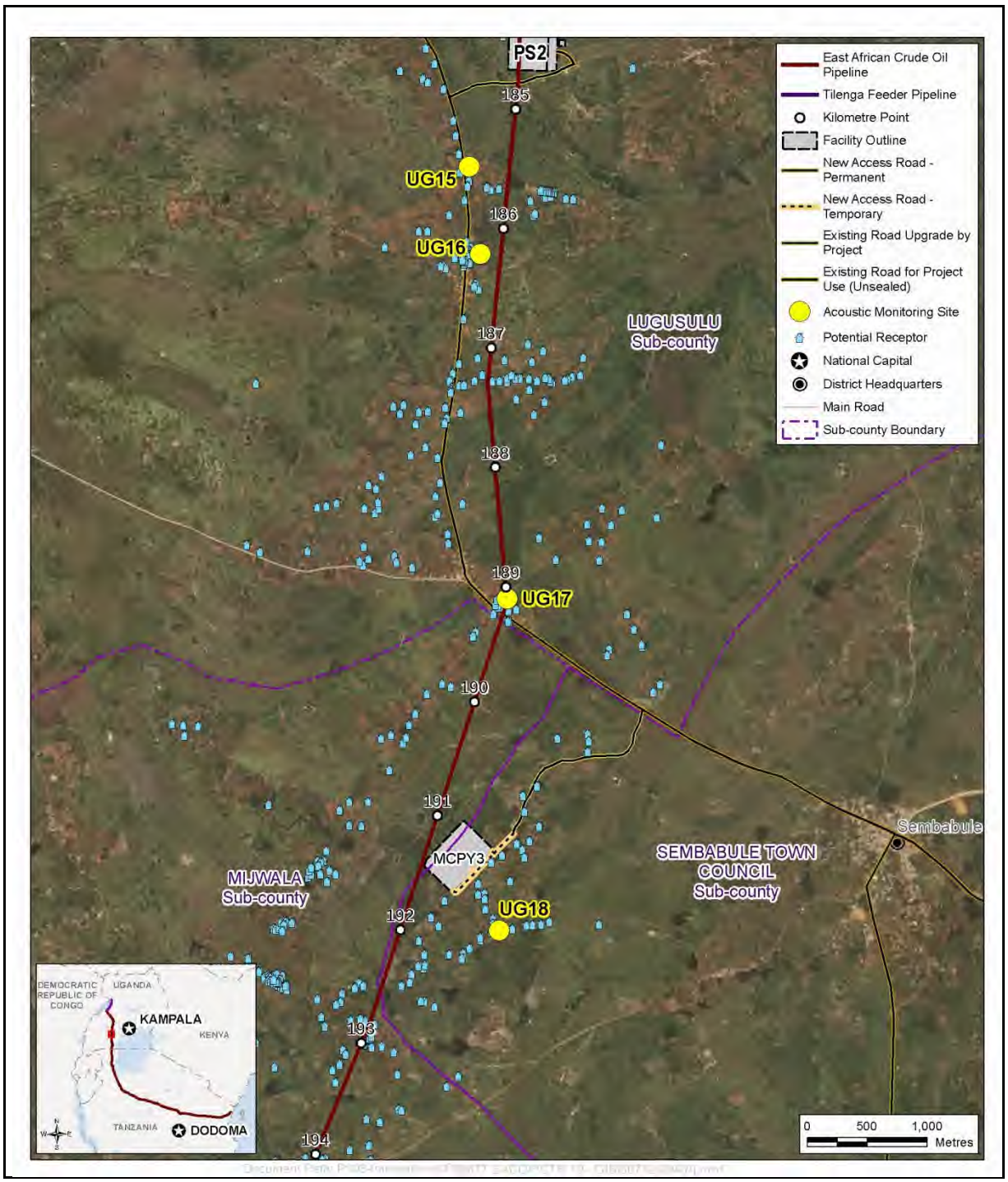
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_007	10:09	11:09	48.8	29.2	44.7	76.9	Insects Bird song Occasional motorbikes People Livestock loading Manual Agricultural

Additional Notes:

30°C temperature, <1 ms^{-1} wind speed, southerly wind direction, 70% cloud cover


PS2
185
UG15
186
UG16
187
LUGUSULU
Sub-county
188
189
UG17
190
191
MCPY3
MIJWALA
Sub-county
192
UG18
193
194
SEMBABULE TOWN
COUNCIL
Sub-county
Sembabule
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Permanent
New Access Road - Temporary
Existing Road Upgrade by Project
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
District Headquarters
Main Road
Sub-county Boundary
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Thursday	**Date**	14 /12/2017	**Location**	EACOP_UG18
Co-ordinates:					
Monitoring Personnel	Daniel Clare				

Photos

North

East

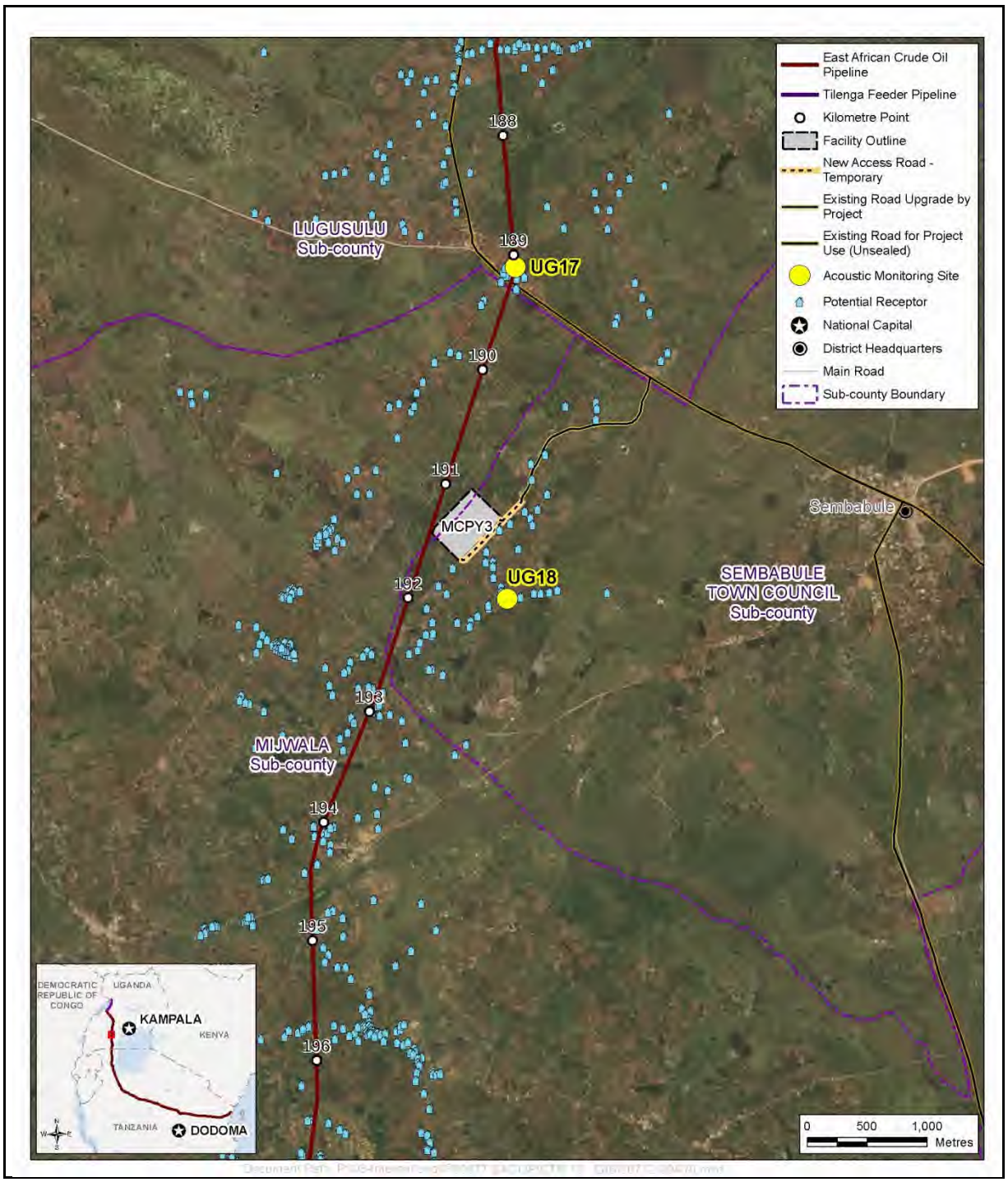
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_006	08:54	09:54	46.5	33.1	48.1	71.6	Insects Bird song Occasional motorbikes People

Additional Notes:

30°C temperature, <1 ms^{-1} wind speed, southerly wind direction, 70% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Temporary
Existing Road Upgrade by Project
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
District Headquarters
Main Road
Sub-county Boundary
188
189
190
191
192
193
194
195
196
UG17
UG18
MCPY3
LUGUSULU Sub-county
MIJWALA Sub-county
SEMBABULE TOWN COUNCIL Sub-county
Sembabule
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/ 2017	**Location**	EACOP_UG19	
Co-ordinates:	0323140mE, 9981058mN					
Monitoring Personnel	Abraham Ochola					

Photos

North

East

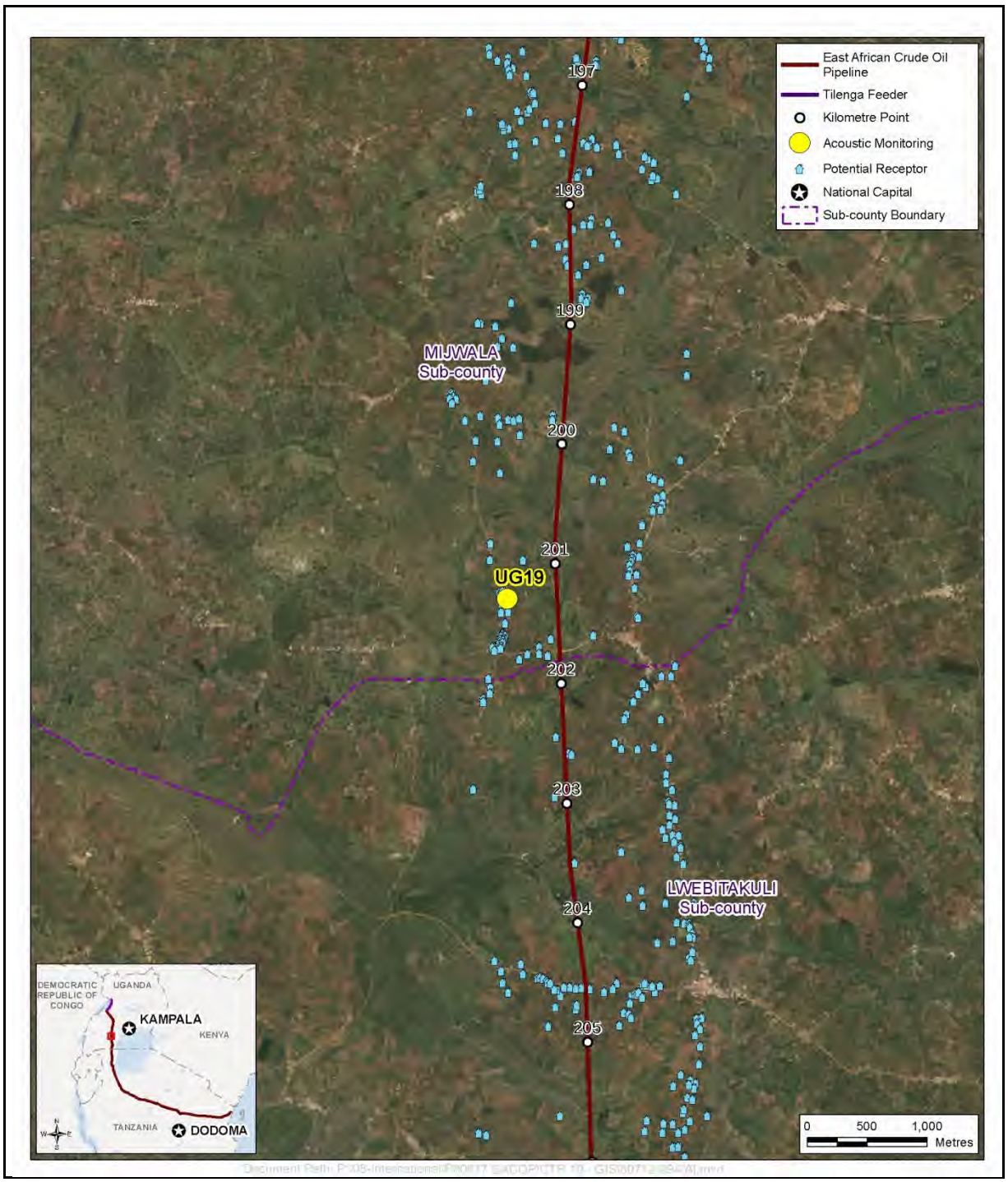
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0007	14:50	15:50	48.2	31.2	44.8	89.1	Wind People passing by Birds

Additional Notes:

28°C temperature, <1 ms^{-1} wind speed, southerly wind direction, 75% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder
Kilometre Point
Acoustic Monitoring
Potential Receptor
National Capital
Sub-county Boundary
197
198
199
200
201
202
203
204
205
MIJWALA Sub-county
LWEBITAKULI Sub-county
UG19
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/ 2017	**Location**	EACOP_UG20	
Co-ordinates:	0323911mE, 9975574mN					
Monitoring Personnel	Abraham Ochola					

Photos

North

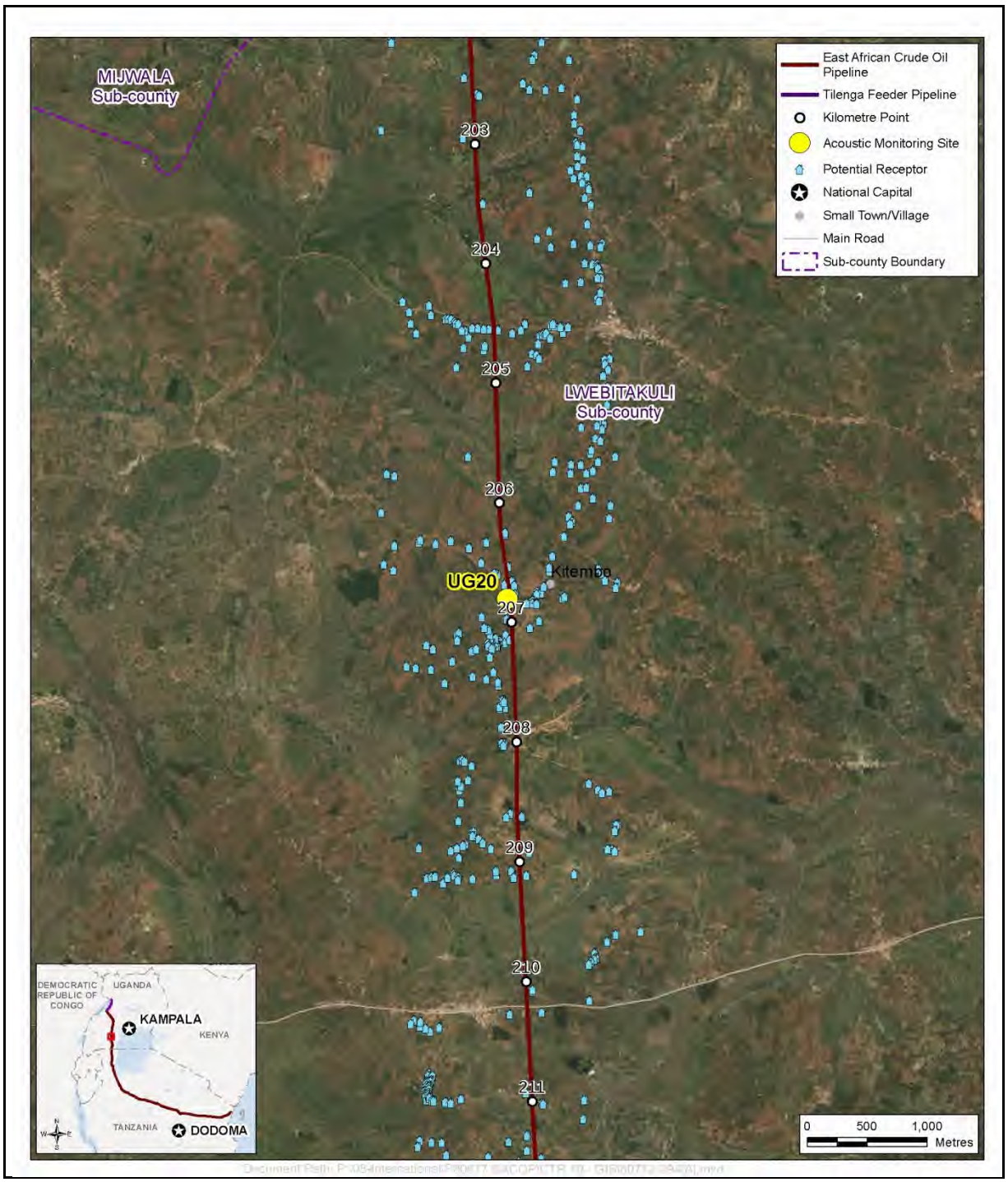
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0006	13:19	14:19	44.1	30.1	48.6	65.3	Wind Birds

Additional Notes:
30°C temperature, <3 ms^{-1} wind speed, southerly wind direction, 30% cloud cover


MIJWALA
Sub-county
LWEBITAKULI
Sub-county
Kitemba
UG20
203
204
205
206
207
208
209
210
211
East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Acoustic Monitoring Site
Potential Receptor
National Capital
Small Town/Village
Main Road
Sub-county Boundary
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/ 2017	**Location**	EACOP_UG21	
Co-ordinates:	0325066mE, 9956119mN					
Monitoring Personnel	Abraham Ochola					

Photos

North

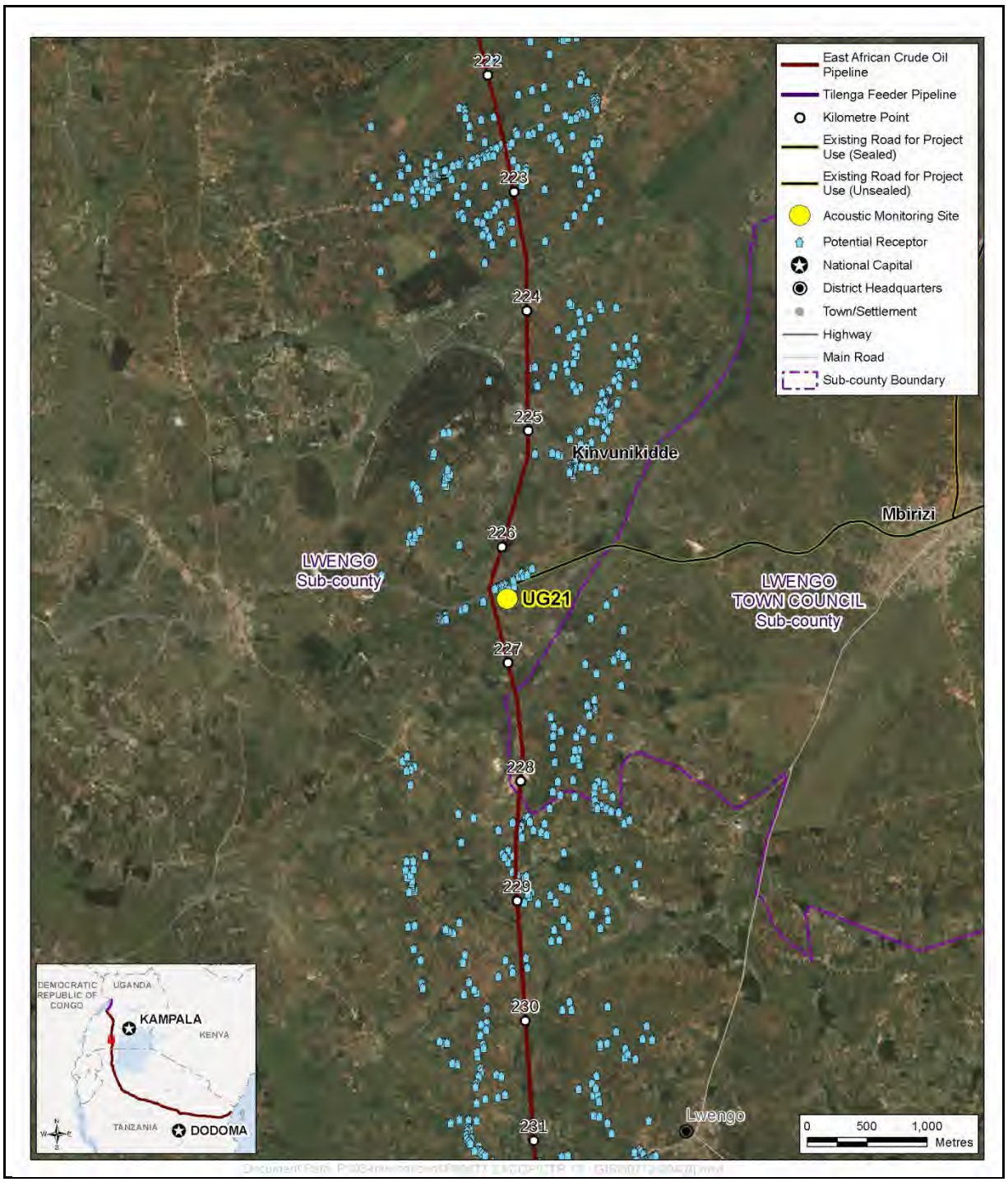
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	0005	10:53	11:53	46.3	37	49.4	72.5	Occasional motorists People Noise Background road traffic

Additional Notes:
28°C temperature, <1 ms^{-1} wind speed, southerly wind direction, 75% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Sealed)
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
District Headquarters
Town/Settlement
Highway
Main Road
Sub-county Boundary
222
223
224
225
226
227
228
229
230
231
Kinvunikidde
Mbirizi
LWENGO Sub-county
LWENGO TOWN COUNCIL Sub-county
UG21
Lwengo
0 500 1,000
Metres
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/ 2017	**Location**	EACOP_UG22	
Co-ordinates:	36M 0327527 9937801					
Monitoring Personnel	Daniel Clare					

Photos

North

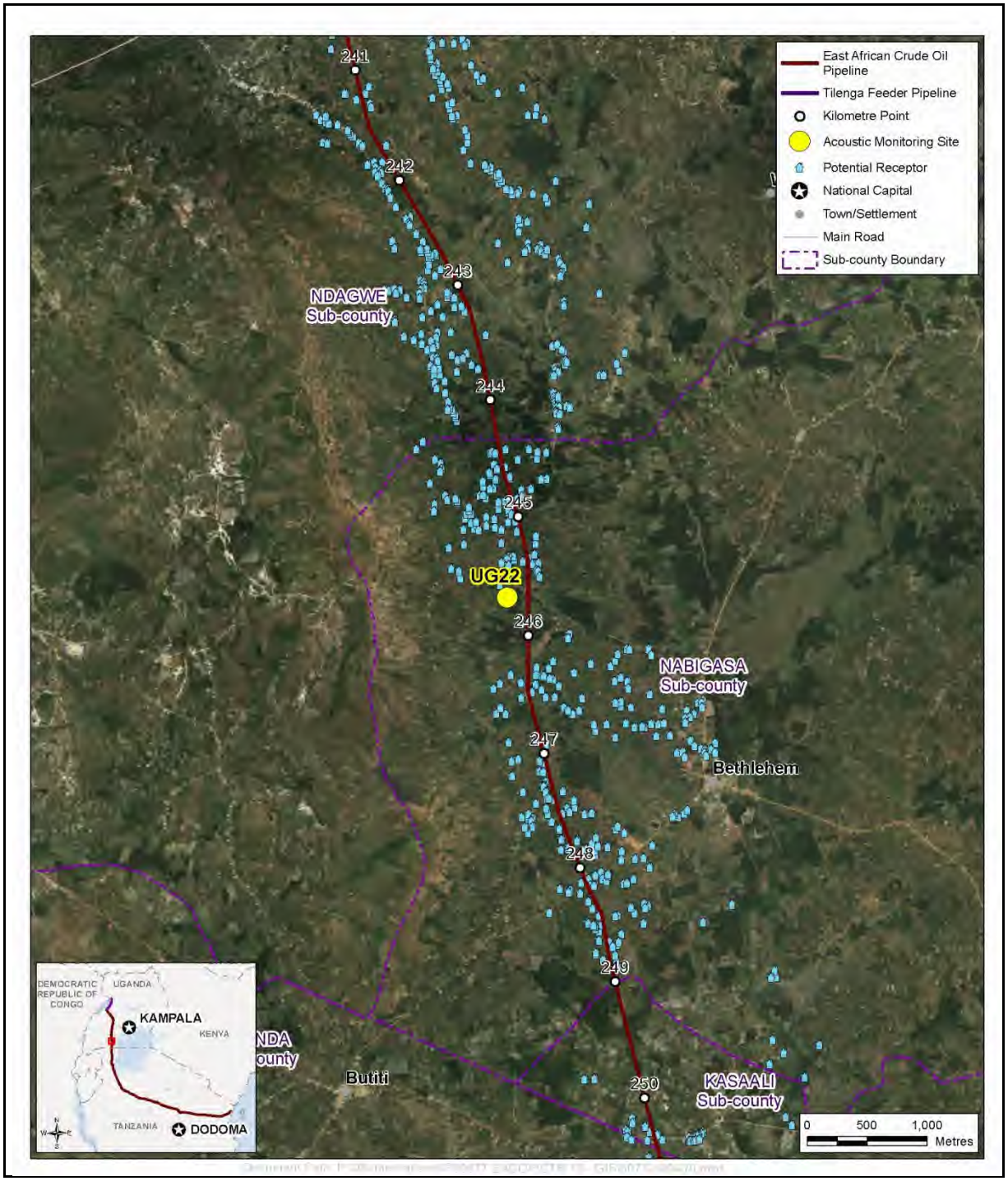
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_005	16:02	17:02	58.1	35.6	57.6	85.5	Insects Birds Occasional motorbike and traffic People Noise Slight tree rustle

Additional Notes:
32°C temperature, <1 ms^{-1} wind speed, westerly wind direction, 75% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Main Road
Sub-county Boundary
241
242
243
244
245
246
247
248
249
250
UG22
NDAGWE Sub-county
NABIGASA Sub-county
KASAALI Sub-county
Bethlehem
Butiti
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0 500 1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/ 2017	**Location**	EACOP_UG23	
Co-ordinates:	36M 0330573 9925346					
Monitoring Personnel	Daniel Clare					

Photos

North

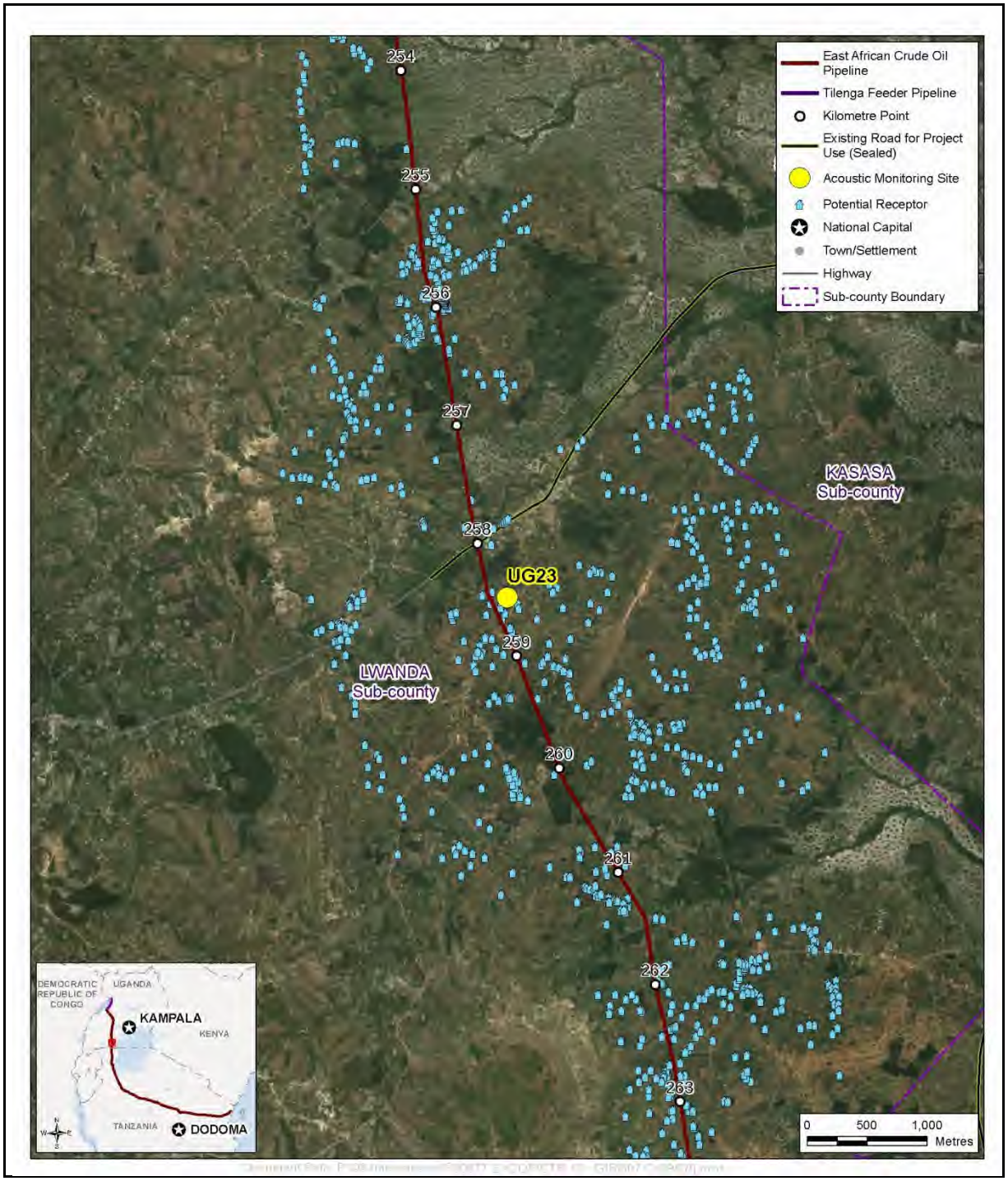
East

South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	AU_004	14:19	15:19	50.1	35.1	49.0	82.9	Insects Birds Occasional motorbike People Noise Slight tree rustle

Additional Notes:
32°C temperature, <2 ms^{-1} wind speed, westerly wind direction, 75% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Sealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Highway
Sub-county Boundary
254
255
256
257
258
259
260
261
262
263
UG23
KASASA Sub-county
LWANDA Sub-county
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0 500 1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/ 2017	**Location**	EACOP_UG24	
Co-ordinates:	36M 0327622 9906029					
Monitoring Personnel	Daniel Clare					

Photos

North

East

No Photo

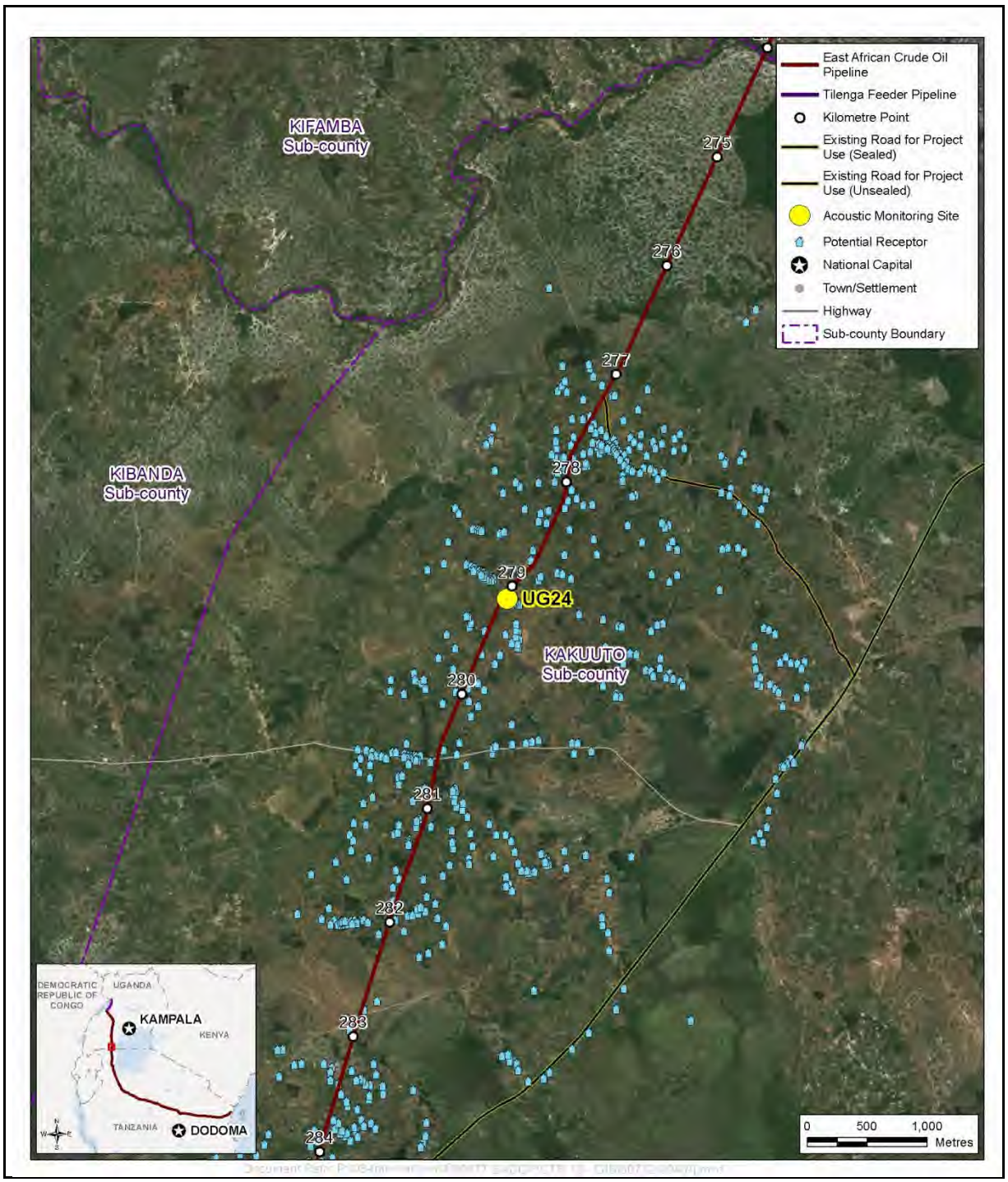
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	Au_003	12.28	13:28	56.0	37.3	52.8	89.9	Insects Birds Occasional motorbike People noise Slight tree rustle Background road traffic

Additional Notes:

32°C temperature, <1 ms^{-1} wind speed, westerly wind direction, 75% cloud cover

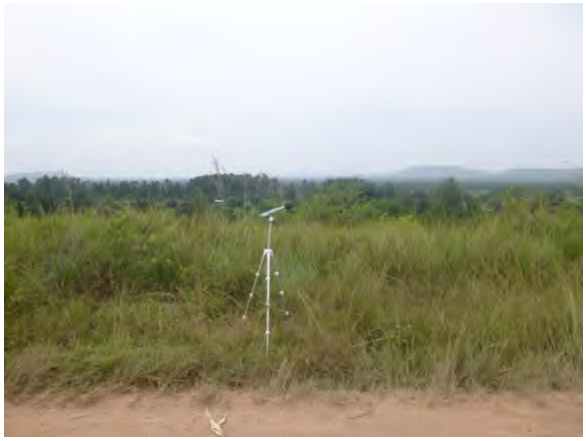

East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Sealed)
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Highway
Sub-county Boundary
KIFAMBA Sub-county
KIBANDA Sub-county
KAKUUTO Sub-county
275
276
277
278
279
UG24
280
281
282
283
284
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0 500 1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/ 2017	**Location**	EACOP_UG25	
Co-ordinates:	36M 0324776 9898369					
Monitoring Personnel	Daniel Clare					

Photos

North

East



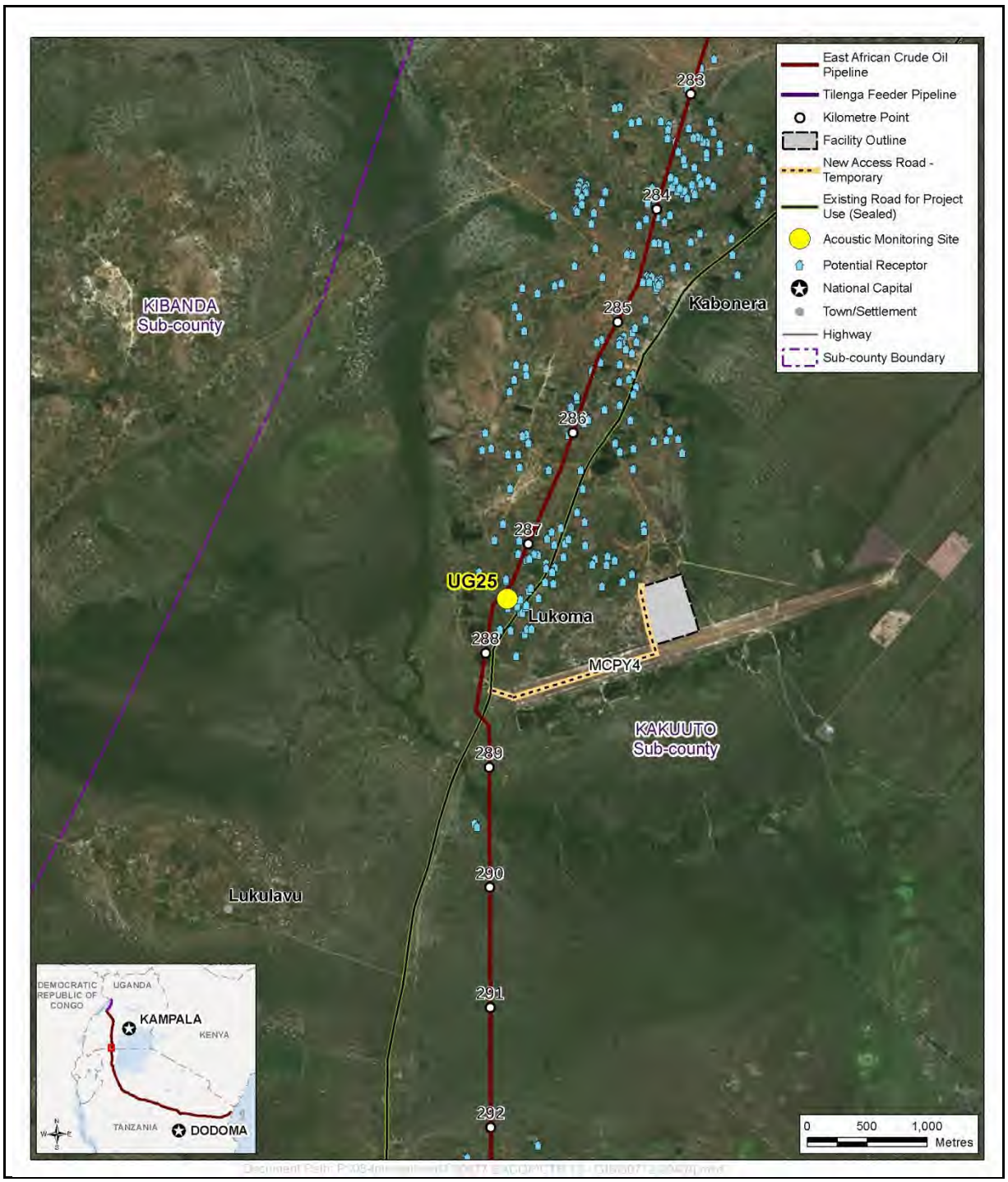
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	Au_002	11.10	12.10	47.2	39.4	48.7	76.7	Insects Birds Occasional motorbike and traffic People Noise Slight tree rustle Agricultural hand tools

Additional Notes:

32°C temperature, <1 ms^{-1} wind speed, westerly wind direction, 75% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
New Access Road - Temporary
Existing Road for Project Use (Sealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Highway
Sub-county Boundary
283
284
285
286
287
288
289
290
291
292
KIBANDA Sub-county
Kabonera
UG25
Lukoma
MCPY4
KAKUUTO Sub-county
Lukulavu
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0 500 1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Wed	**Date**	13 /12/2017	**Location**	EACOP_UG26	
Co-ordinates:	UTMS UPS 36M 0324198 9890362					
Monitoring Personnel	Daniel Clare					

Photos

North

East

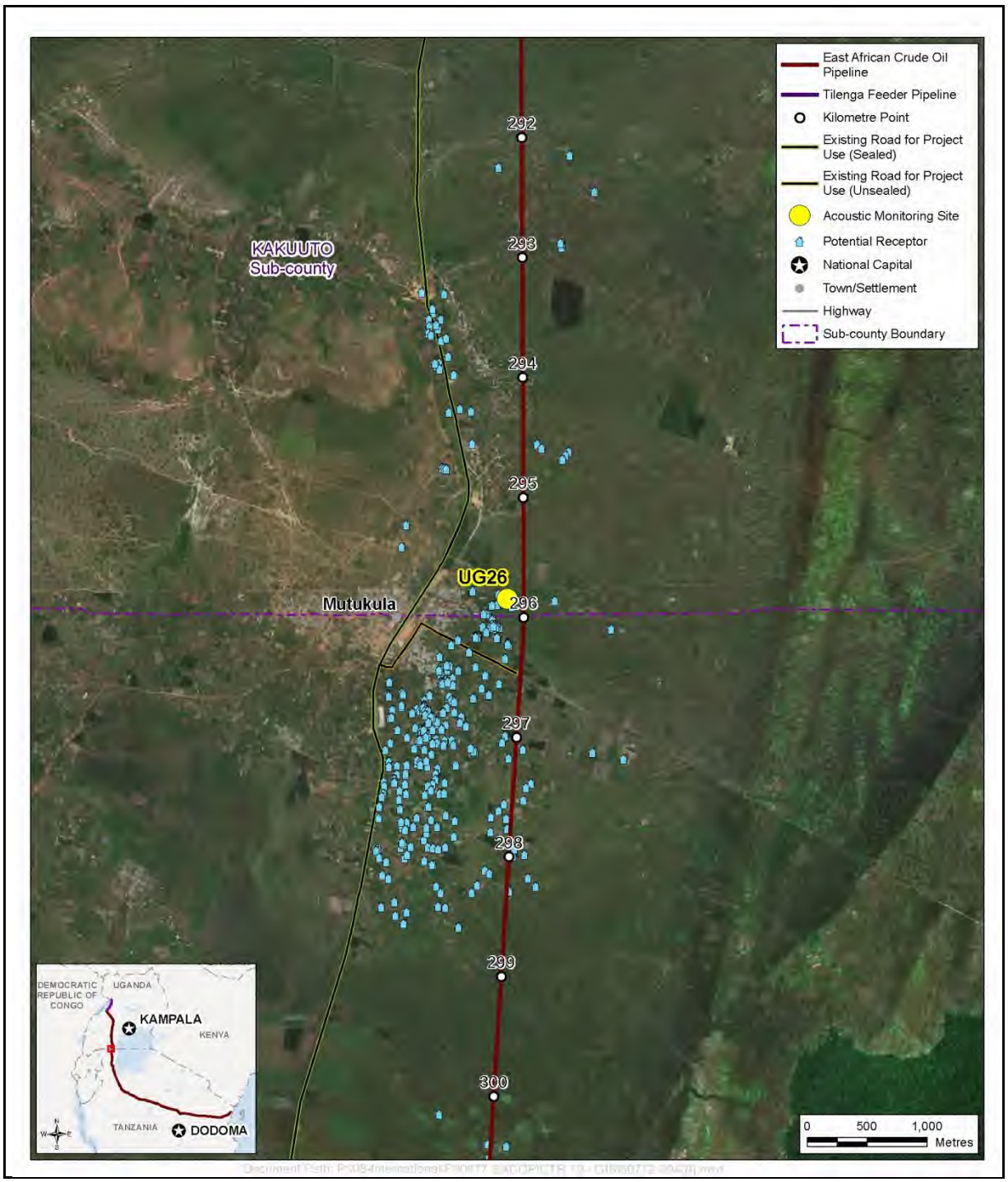
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	Au_001	09:55	10:55	47.2	39.4	48.7	76.7	Insects, Birds Occasional motorbike Slight tree rustle Background road traffic Distant generator from truck park

Additional Notes:

32°C temperature, <1 ms^{-1} wind speed, westerly wind direction, 75% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Existing Road for Project Use (Sealed)
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Highway
Sub-county Boundary
292
293
294
295
296
297
298
299
300
KAKUUTO Sub-county
Mutukula
UG26
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0 500 1,000
Metres

Project Name	East African Crude Oil Pipe Line					
Project No.	80712	**Pipeline**	EACOP (Uganda)			
Day of Week	Friday	**Date**	17 /08/2018	**Location**	EACOP_UG27	
Co-ordinates:	UTMS UPS 36M 0324198 9890362					
Monitoring Personnel	Daniel Clare					

Photos

North

East

No Photograph available

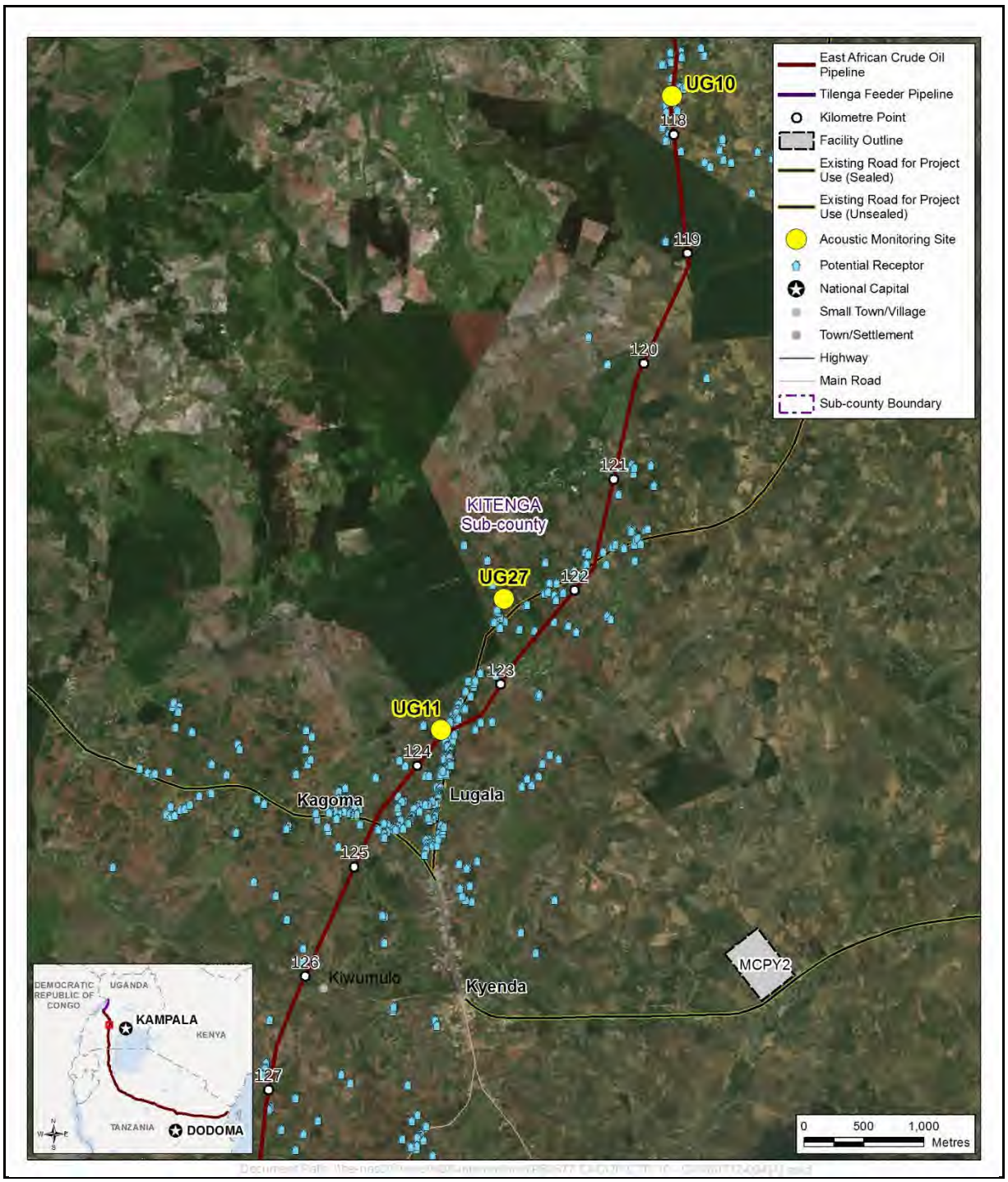
South

West

Period	File Ref:	Start Time	End Time	$L_{eq,1hr}$, dB(A)	$L_{90,1hr}$, dB(A)	$L_{10,1hr}$, dB(A)	L_{max}, dB(A)	Notes/sources
Day	Au_012	15:12	16:12	53.8	40.9	54.8	82.4	Insects, Birds Occasional motorbike Slight tree rustle

Additional Notes:

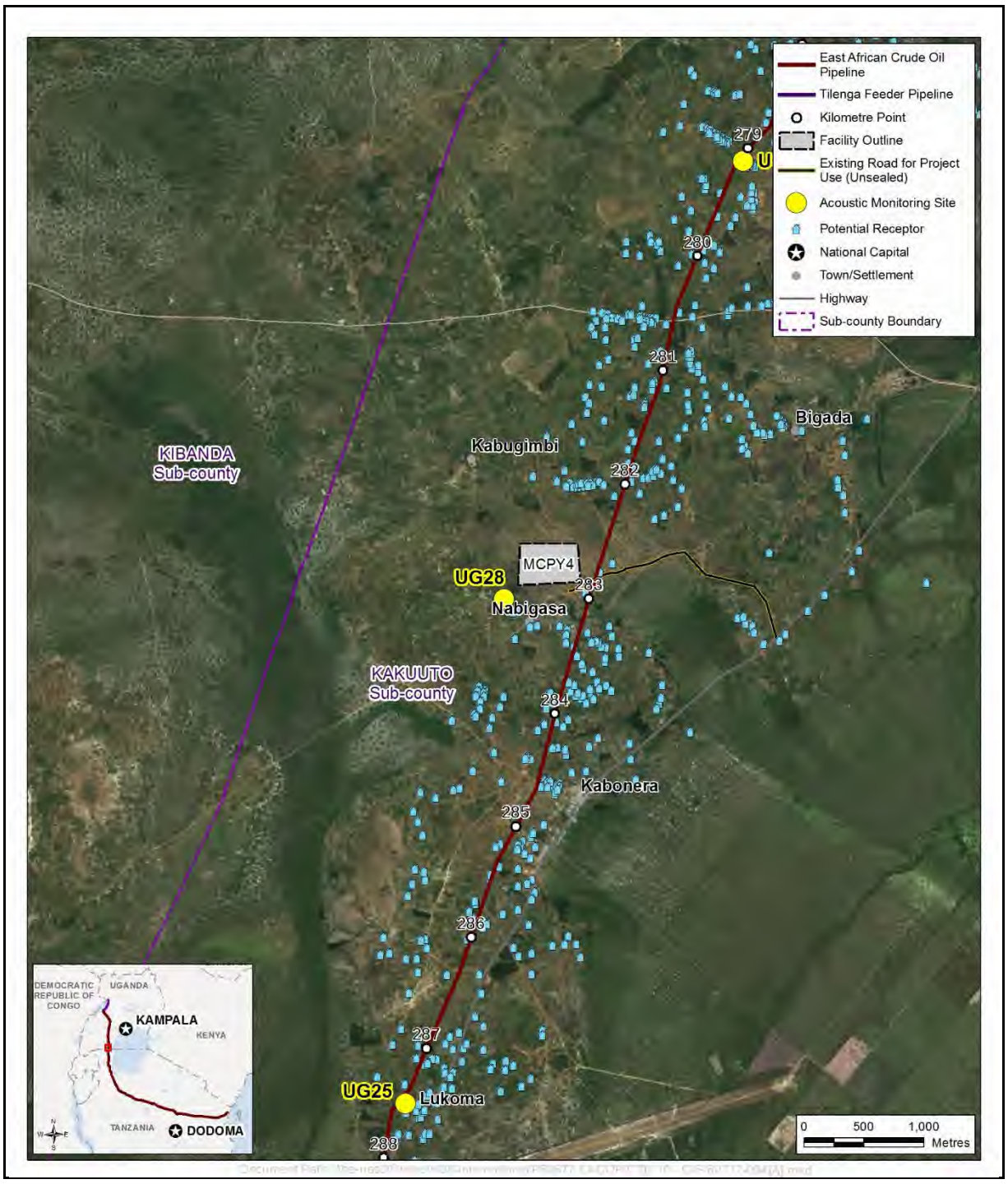
28°C temperature, <3 ms^{-1} wind speed, westerly wind direction, 25% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
Existing Road for Project Use (Sealed)
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Small Town/Village
Town/Settlement
Highway
Main Road
Sub-county Boundary
UG10
118
119
120
121
KITENGA Sub-county
UG27
122
123
UG11
124
Kagoma
Lugala
125
126
Kiwumulo
Kyenda
MCPY2
127
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Project Name	East African Crude Oil Pipe Line				
Project No.	80712	**Pipeline**	EACOP (Uganda)		
Day of Week	Wed	**Date**	15 /08/2018	**Location**	EACOP_UG28
Co-ordinates:	UTMS UPS 36M 0324198 9890362				
Monitoring Personnel	Daniel Clare				
Photos					
North No Photograph available			East No Photograph available		
South No Photograph available			West No Photograph available		

Period	**File Ref:**	**Start Time**	**End Time**	**$L_{eq,1hr}$, dB(A)**	**$L_{90,1hr}$, dB(A)**	**$L_{10,1hr}$, dB(A)**	**L_{max}, dB(A)**	**Notes/sources**
Day	Au_001	15:48	16:48	48.4	40.6	50.8	77.4	Insects, Birds Occasional motorbike Slight tree rustle People movement/talking

Additional Notes:
29°C temperature, <2 ms^{-1} wind speed, northerly wind direction, 30% cloud cover


East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Facility Outline
Existing Road for Project Use (Unsealed)
Acoustic Monitoring Site
Potential Receptor
National Capital
Town/Settlement
Highway
Sub-county Boundary
279
U
280
281
Bigada
Kabugimbi
KIBANDA Sub-county
282
MCPY4
UG28
283
Nabigasa
KAKUUTO Sub-county
284
Kabonera
285
286
287
UG25
Lukoma
288
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
500
1,000
Metres

Appendix A11: Socio-economic and Health Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

A	
ACT	artemisinin-based combination therapy
AGI	aboveground installation
AIDS	acquired immune deficiency syndrome
AOI	area of influence
ACEMP	African Centre for Energy and Mineral Policy
ACODE	Advocates Coalition on Development and Environment
ANARDE	Advocates for Natural Resources and Development
ARI	acute respiratory infection
ASM	artisanal and small-scale mining
B	
BBL/D	barrels per day
BCG	Bacillus Calmette-Guerin
BCC	behaviour change communication
BID	background information document
BMU	beach management unit
BOD	burden of disease
BTVET	business, technical and vocational education and training
BLB	Buganda Land Board
C	
CAO	chief administrative officer
CBOs	community-based organisations
CCO	Certificate of Customary Ownership
CDO	community development officer
CLA	Communal Land Association
CLTS	community-led total sanitation
CNOOC	China National Offshore Oil Corporation
COMESA	Common Market for Eastern and Southern Africa
CSCO	Civil Society Coalition for Oil and Gas
CVD	cardiovascular disease
D	
DDP	district development plan
DGSM	Directorate of Geological Survey and Mines
DHMT	district health management team

DHO	district health officer
DLB	district land board
DLO	district land office
DOTS	directly observed treatment short-course
DRC	Democratic Republic of Congo
DSIP	development strategy and investment plan
E	
EAC	East African Community
EACOP	East African Crude Oil Pipeline
ECO	Ecological Christian Organisation
EHA	environmental health area
ESIA	environmental and social impact assessment
F	
FGD	focus group discussion
FDI	foreign direct investment
G	
GBV	gender-based violence
GDP	gross domestic product
GH	general hospital
GOU	Government of Uganda
H	
HAT	human African trypanosomiaisis
HC	health centre
HDI	Human Development Index
HH	household
HHI	household interview
HIA	health impact assessment
HIPC	heavily indebted poor countries
HIV	human immunodeficiency virus
HMIS	health management and information system
HODIFA	Hoima District Farmers Association
HRT	human rights team
HSB	health-seeking behaviour
HT	health team
I	
IAP	International Accountability Project
IFC	International Finance Corporation

ILO	International Labour Organisation
IRS	indoor residual spraying
ITN	insecticide treated bed net
K	
KET	key employment terms
KII	key informant interview
KP	kilometre point
L	
LGDPs	local government development plans
LRA	Lord's Resistance Army
M	
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MMR	maternal mortality rate
MCPY	main camp and pipe yard
MDA	ministries, departments and agencies
MDG	Millennium Development Goals
MDRI	Multilateral Debt Relief Initiative
MEMD	Ministry of Energy and Minerals Development
MGLSD	Ministry of Gender, Labour and Social Development
MLHUD	Ministry of Land, Housing and Urban Development
MoU	Memorandum of Understanding
MTWA	Ministry of Tourism, Wildlife and Antiquities
MDR-TB	multidrug-resistant tuberculosis
MWE	Ministry of Water and Environment
N	
NAADS	National Agricultural Advisory Services
NAP	national action plan
NAPE	National Association of Professional Environmentalists
NCD	noncommunicable disease
NEMA	National Environment Management Authority
NER	net enrolment ratio
NFA	National Forestry Authority
NGO	nongovernmental organisation
NDP	National Development Plan
NDPII	Second National Development Plan
NSSF	National Social Security Fund
NRH	national referral hospital

NTD	neglected tropical disease
NTLP	National TB and Leprosy Programme
O	
OPM	Office of Prime Minister
ODF	open defecation free
OSH	occupational safety and health
OTI	other tertiary institutions
P	
PACs	potentally affected communities
PAGI	permanent aboveground installation
PAU	Petroleum Authority of Uganda
PFM	public financial management
PFP	private-for-profit
PIIM	project-induced in-migration
PNFP	private-not-for-profit
PPG	public and publically guaranteed
PS	pump station
PSA	Production Sharing Agreement
R	
RAP	resettlement action plan
RDC	resident district commissioner
REA	Rural Electrification Agency
RESP-2	rural electrification strategy and plan
RRH	regional referral hospitals
RoW	right-of-way
S	
SC	subcounty
SEDAF	Sembabule Farmers Association
SGI	small group interviews
SIP	sector investment plans
ST	social team
STI	sexually transmitted infection
T	
TAGI	temporary aboveground installation
TB	tuberculosis
TEPU	Total E&P Uganda
TIs	tertiary institutions

TM	traditional medicine
TC	town council
U	
UAE	United Arab Emirates
UBOS	Uganda Bureau of Statistics
UBC	Uganda Broadcasting Corporation
UCA	Uganda Census of Agriculture
UEDCL	Uganda Electricity Distribution Company Limited
UEGCL	Uganda Electricity Generation Company Limited
UETCL	Uganda Electricity Transmission Company Limited
UDHS	Ugandan Demographic Health Survey
UNRA	Uganda National Roads Authority
UGX	Ugandan shilling
UNDSS	United Nations Department for Safety and Security
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNOC	Ugandan National Oil Company
USD	US dollar
UWA	Uganda Wildlife Authority
UWEP	Uganda Women Entrepreneurship Programme
V	
VAT	value added tax
VEC	valued environmental component
VHF	viral haemorrhagic fever
VHT	village health team
W	
WHO	World Health Organization
Y	
YLP	Youth Livelihood Programme
YF	yellow fever

A11 SOCIO-ECONOMIC AND HEALTH BASELINE REPORT

A11.1 Introduction

This baseline report describes the social:

- area of influence (AOI) and study area boundaries
- method
- baseline conditions:
  - trend in condition and sensitivity to change
  - ecosystem services provided
  - sensitivity ranking
- key considerations.

Baseline conditions are described for the following valued environmental (and social) components (VEC):

- economy
- local economy (non land-based livelihoods)
- land-based livelihoods
- river and lake-based livelihoods
- land and property
- workers' health, safety and welfare
- social infrastructure and services
- community health
- community safety, security and welfare.

The report also includes an overview of governance, demography and education.

A11.2 Area of Influence and Study Area Boundaries

A11.2.1 Area of Influence Boundary

The spatial AOI for the construction, operation and decommissioning phases of the project is identified at three levels:

- national and regional
- district (including the subdivisions of districts: county, subcounty and parish) through which the pipeline passes, in which project facilities are located or which could be associated with other project activities such as transportation
- potentially affected communities (PACs). PACs include hamlets, villages, trading centres and towns within a geographical boundary defined by project land take requirements, construction and operation activities. Based on the adopted methodology of purposive sampling (see Sections A11.3 and A11.3.2.2), the geographical boundary was determined as approximately 4 km on either side of the pipeline and 4 km around construction facilities and aboveground installations (AGIs) where PACs were identified to potentially

experience a range of direct and indirect impacts, such as air and noise pollution, land take and influx.

There are nine districts, 41 parishes, 22 subcounties, 4 town councils (TCs) and an estimated 172 villages and hamlets traversed and passed by the project.

The AOI for the PACs is dependent on the VEC, see Table A11.2-1.

Table A11.2-1 Area of Influence for the VECs at Potentially Affected Community Level

VEC	AOI for the VECs at PAC Level
National economy	**Construction, operation and decommissioning phases**[1] This is not assessed at PAC level.
Local economy (nonland-based livelihoods)	**Construction, operation and decommissioning phases** Hamlets, villages, trading centres and towns approximately 4 km from the construction facilities, aboveground installations (AGIs) and access roads which may benefit from employment, local purchasing and use of services
Land-based livelihoods	**Construction, operation and decommissioning phases** Households, hamlets and villages directly and indirectly affected by the land take for EACOP, in the adjacent area, including pastoralists traversing the project area
River and lake-based livelihoods	**Construction and construction decommissioning phases** Hamlets, villages and towns using rivers and lakes for fishing directly or indirectly affected by the EACOP construction activities **Operation and decommissioning phases** Not applicable
Land and property	**Construction, operation and decommissioning phases** Households, hamlets and villages directly or indirectly affected by EACOP land take
Workers' health, safety and welfare	**Construction, operation and decommissioning phases** EACOP project and EACOP contractor employees
Social infrastructure and services	**Construction phase** Hamlets, villages, trading centres and towns from EACOP construction facilities, associated roads **Operation phase** Hamlets, villages, trading centres and towns from EACOP permanent access roads **Construction decommissioning phase** Hamlets, villages, trading centres and from EACOP construction facilities, AGIs and associated roads

[1] Decommissioning phases refers to both the construction facilities and project decommissioning phases unless otherwise indicated.

Table A11.2-1 Area of Influence for the VECs at Potentially Affected Community Level

VEC	AOI for the VECs at PAC Level
Community health	**Construction and construction decommissioning phase** Hamlets, villages, trading centres and towns from construction facilities, AGIs and access routes **Operations and decommissioning phase** Hamlets, villages, trading centres and towns from AGIs and access routes
Community safety security and welfare	**Construction and construction decommissioning phase** Hamlets, villages, trading centres and towns within from construction facilities, AGIs and access routes **Operation and decommissioning phases** Hamlets, villages, trading centres and towns within from AGIs and access roads

A11.2.2 Study Area Boundary

The national level study boundaries are Uganda's borders.

The district level study boundary includes all the districts, including counties and subcounties, traversed by the AOI (see Figure A11.2-1).

The PAC level study boundary is approximately 4 km either side of the pipeline and 4 km around construction facilities and AGIs.

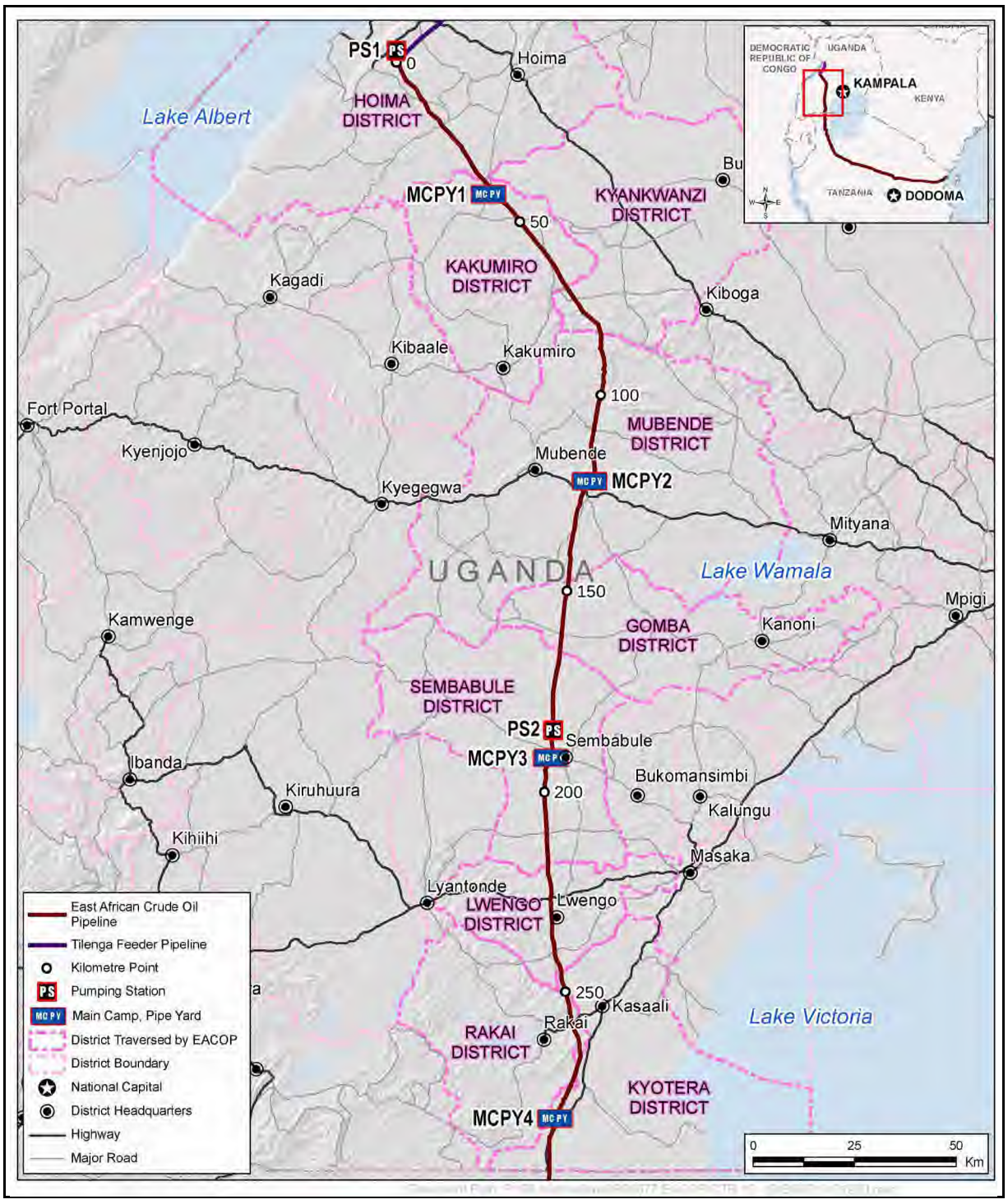


Figure A11.2-1 District Level Study Area Boundary

A11.3 Methods

Three teams performed the study – a social team, a health team and a human rights team – and collaborated to develop the socio-economic and health baseline.

The screening report and scoping stakeholder engagement report conducted by the social and health teams between 19 April and 1 June 2017 at national, district and PAC levels provided primary and secondary data on the main socio-economic and health characteristics relevant to the project and enabled the identification and initial description of the VECs (see scoping report for details on the stakeholder engagement). During the scoping phase, 82 meetings were held and 1848 people were reached.

Further secondary and primary data were collected at national and district levels by the social, health and human rights teams during the baseline studies between 26 October and 15 December 2018. This enabled further descriptions of the VECs.

Based on this data, PACs were identified that were deemed representative of the range of socio-economic and health baseline conditions in the AOI (see Section A11.3.2.2 for selection criteria for PACs).

In-depth data collected at PAC level were embedded in the district and national context to ensure both depth and breadth. The PAC data provided qualitative and quantitative elaborations on the district data.

A purposive sampling strategy (selecting PACs based on their socio-economic characteristics) was used to select the PACs. This ensured that information was collected on the range of socio-economic and health concerns and covered all the affected districts.

This methodology was adopted because a statistical random sampling approach was not appropriate because of the initial lack of reliable data on the number and location of PACs in the AOI and the linear nature of the project (296 km). In addition, statistical sampling could have led to a sample of PACs that did not necessarily include all socio-economic characteristics.

The social team collected socio-economic data at national, district and PAC levels. The human rights team collected human rights data at national, district and PAC levels, which ensured that basic human rights were covered in the baseline. The health team conducted meetings with the district health management teams and assessments of district health facilities.

A11.3.1 Secondary Data

The social and health teams undertook a review of the following sources:

- annual reports from the district health management teams (DHMTs)
- district development plans (DDPs)
- subcounty development plans
- national population and housing census reports by Uganda Bureau of Statistics (UBOS)

- study reports related to the Albertine Graben, including environmental and social impact statements by oil and gas operators and the Albertine Graben Sensitivity Atlas
- annual health sector performance reports
- National Development Plan 2015/16–2019/20 (NDPII)
- The Uganda Poverty Assessment Report 2016
- World Bank, World Health Organization (WHO) and nongovernmental organisation (NGO) reports.

A11.3.2 Field Surveys

Primary data were collected from individuals and small groups from all three levels of the AOI between 26 October and 15 December 2017. Some additional data were collected at PAC level between 20 and 31 August 2018.

A11.3.2.1 National and District Level

Key informant interviews (KIIs) were held by the social and human rights teams[2] at national level with:

- international NGOs:
  - Action Aid Uganda (HRT)
  - Minority Rights Group International (HRT)
  - International Accountability Project (IAP) (HRT)
- national NGOs:
  - Advocates for Natural Resources and Development (ANARDE) (HRT)
  - Civil Society Coalition for Oil and Gas (CSCO) (HRT)
  - Global Rights Alert (HRT)
  - Ecological Christian Organisation (ECO) (HRT)
  - National Association of Professional Environmentalists (NAPE) (HRT)
  - National Association of Women Organisations in Uganda (HRT)
  - Green Watch Uganda (HRT)
- national government:
  - Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)
  - Ministry of Gender, Labour and Social Development (MGLSD)
  - Ministry of Lands, Housing and Urban Development (MLHUD)
  - Ministry of Tourism, Wildlife and Antiquities (MTWA)
  - Ministry of Water and Environment (MWE)
  - National Environment Management Authority (NEMA)
  - National Forestry Authority (NFA)
  - Office of the Prime Minister (OPM)
  - Petroleum Authority of Uganda (PAU)
  - Ministry of Energy and Minerals Development (MEMD)
  - Uganda Electricity Transmission Company Limited (UETCL)

[2] Meetings held by the human rights team are indicated with (HRT)

  - Uganda National Oil Company (UNOC)
  - Uganda National Roads Authority (UNRA)
  - Uganda Wildlife Authority (UWA)
  - Uganda Chamber of Mines and Petroleum
  - Uganda Human Rights Commission (UHCR) (HRT)
- other:
  - Advocates Coalition on Development and Environment (ACODE) (HRT)
  - African Centre for Energy and Mineral Policy (ACEMP) (HRT)
  - Makerere University School of Law (HRT)
  - Uganda Consortium on Corporate Accountability (HRT)
  - United Nations Department for Safety and Security (UNDSS).

The social team held KIIs and small group interviews (SGIs) at district level with:

- district technical planning committees
- chief administrative officers (CAO) and deputy chief administrative officers
- district community development officers
- district education officers
- district police commanders and internal security officials
- district economists
- district labour officers
- district planners
- district land experts
- district land boards
- district environmental officers
- district natural resource officers
- district entomology officers
- district agriculture experts and officers
- district livestock experts
- district fisheries officers and experts
- district veterinary officers
- kingdom representatives
- health service providers
- NGOs.

The human rights team conducted 10 KIIs with district officials across different districts (see Table A11.3-1 and Figure A11.3-1 and Figure A11.3-2 for sample sites). This aimed at understanding the human rights baseline situation at the district level.

The health team conducted eight SGIs with health service providers, including the district health management teams, across the districts traversed by the AOI (see Table A11.3-2 and Figure A11.3-1 and Figure A11.3-2 for health sample sites). The aim was to access quantitative and qualitative data on the main health concerns in the district, and to assess the capacity of district health facilities. The guide used for the interviews was based on the health management and information system

(HMIS) and ensured that the environmental health areas (EHA) framework required by the IFC performance standards was followed. In addition, 13 district health services were assessed using the service availability and readiness assessment (SARA) tool. The SARA results are in Attachment A11.4.

A11.3.2.2 Potentially Affected Community Level

To develop a sample of PACs for inclusion in the social study, the following process was undertaken.

Sites (areas) within 4 km of construction facilities, the pipeline route, AGIs and access roads were identified using a purposive sampling strategy. The following criteria were used to identify the sites:

- In each district and subcounty traversed by the AOI, at least one site was identified.
- Sites within 4 km of planned EACOP facilities and activities were included.
- Sites representing all the characteristics listed below were included:
  - different levels of urbanisation: urban (town), rural (village, hamlet, trading centre)
  - different levels of isolation (remote and well connected)
  - different density of agricultural land parcels (dense and dispersed parcels)
  - presence of grazing land
  - presence of tourism facilities
  - presence of mining activities
  - presence of fishing activities (lake, river)
  - natural habitats (protected and designated areas)
  - vicinity of access roads.

Thirteen sites were identified, which formed the sample sites for the data collection. In each of those sites, the PACs were identified. One to three PACs were selected per site based on the above-mentioned criteria.

Figure A11.3-1 and Figure A11.3-2 show the sample sites and sample PACs for the social, health and human rights baseline studies.

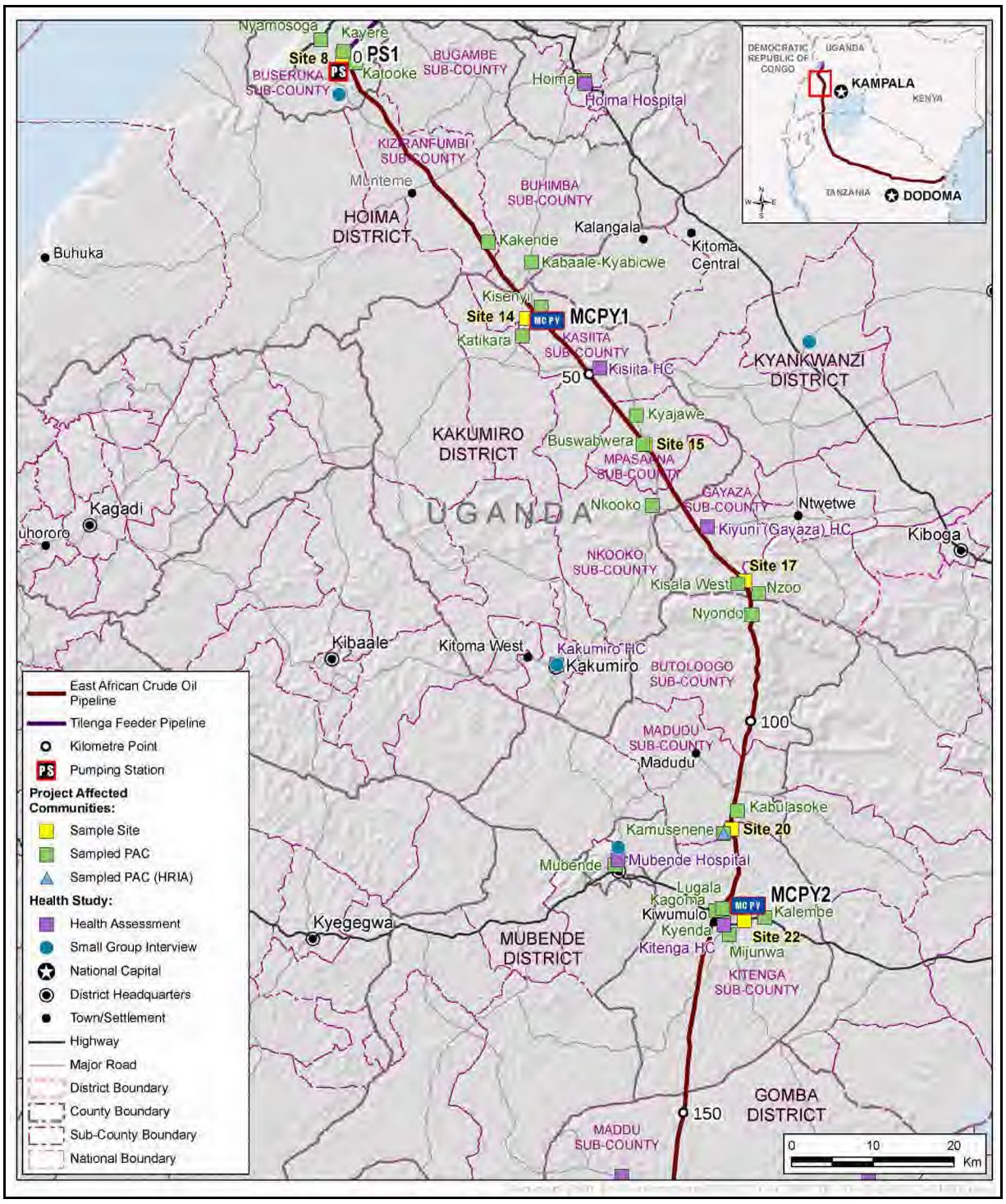


Figure A11.3-1 Sample Sites and Potentially Affected Communities – North

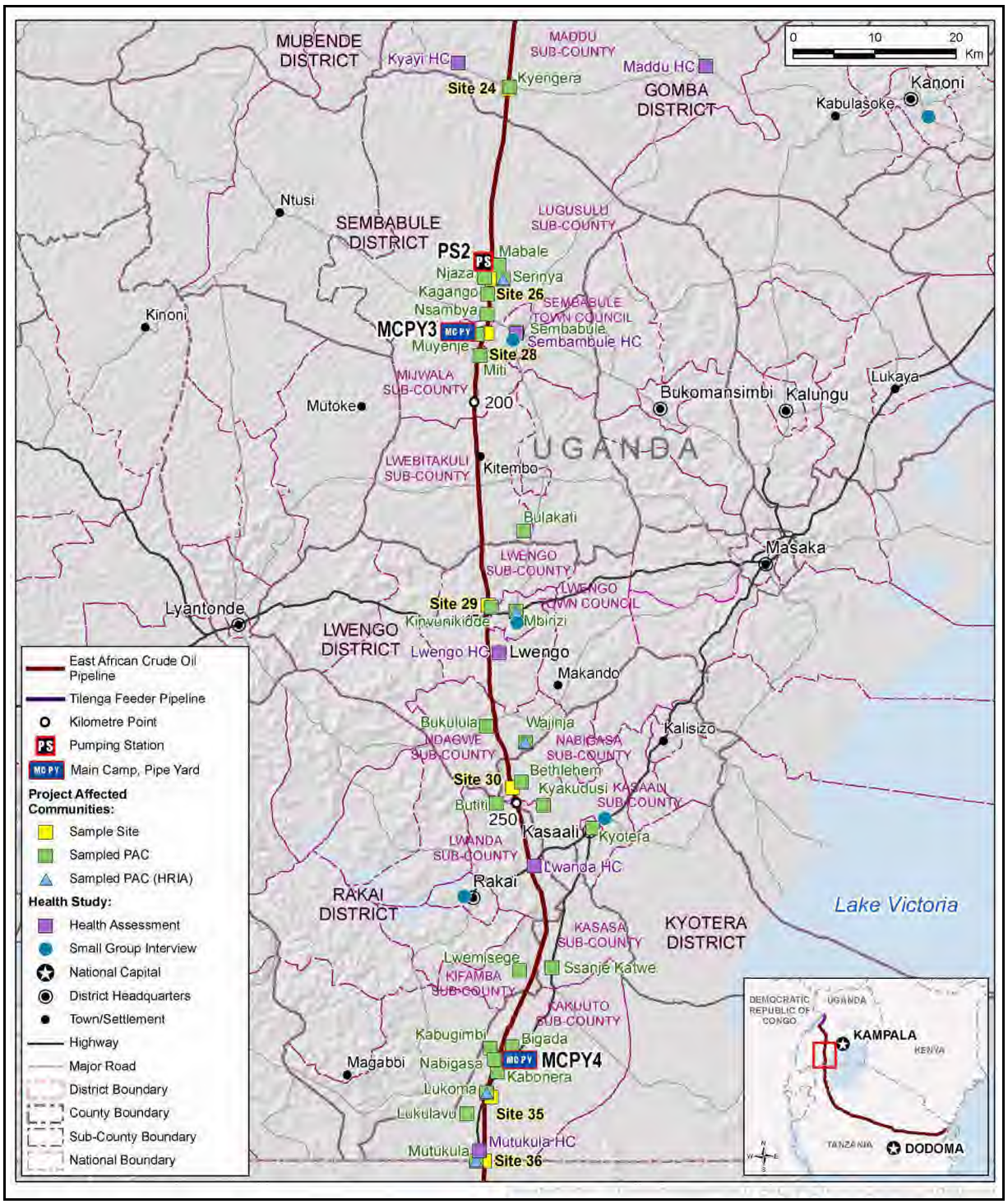


Figure A11.3-2 Sample Sites and Potentially Affected Communities – South

Primary data collection at sample site and sample PAC level included various steps, outlined below.

Step 1: Compilation of Factsheets

Based on satellite imagery, a factsheet was created for each sample site that provided initial information on the site. It shows the project components relevant to

the sample site, the administrative entities in which it is located, the main socio-economic features of the project footprint, the PAC in the sample site, initial secondary data available for the sample site and a preliminary indication of the data collection tools to be used for baseline data collection.

Step 2: Reconnaissance Site Visits

Reconnaissance site visits were conducted to the sample sites and PACs during 26 October–21 November 2017 that included:

- a meeting with the village leaders, parish leaders and villagers to inform them about the ESIA and social baseline study. Posters and background information documents (BID) were used to explain the project and the ESIA study (see Attachment A11.1). Concerns and questions of stakeholders were recorded and, where possible, responses provided. This is reported in Section 7 (Stakeholder Engagement) of the ESIA.
- verifying and enhancing the data from the factsheet and developing a better understanding of the site and the PACs
- conducting a transect walk on the project footprint (AGI, construction facility) to document land use features
- compiling a community socio-economic resources inventory through discussion with village leaders and field observation
- arranging the focus group discussions (FGD), SGIs, KIIs and household interviews (HHI) to be conducted during the social baseline survey.

The information obtained was used to update the factsheets.

Step 3: Main Baseline Survey

The main survey, which was conducted between 2 November and 7 December 2017, and some additions between 20 and 31 August 2018, included:

- FGDs, which were open discussions based on discussion guides with village community leaders, women and youth to obtain group knowledge, perceptions and attitudes about village livelihoods and to identify vulnerable groups in the community. The women's groups included widows, single mothers and women engaged in business activities. Based on the discussions, PAC profiles were developed (see Attachment A11.2). Figure A11.3-3 shows a photograph of an FGD. Two FGDs were organised in each sample PAC: one with women and one with community leaders (which also included some women).
- participatory mapping with the village community leaders and women's focus group participants, which involved drawing a map of infrastructure and land use in and around their village. The mapping facilitated discussion of village activities, local decision making and local community concerns.
- drawing a historical timeline of the important events in the village and discussing the changes these have brought about in the village over the years. The timelines are included in the PAC profiles.
- KIIs, which included interviews with informants with a particular expertise or knowledge. These included:
    - business owners
    - community health practitioners
    - commercial and subsistence farmers

  - health workers
  - kingdom representatives
  - traditional healers (herbalists)
  - representatives of micro-finance providers
  - military personnel
  - commercial motorcyclists
  - nongovernmental organisations (NGOs)
  - community-based organisations (CBOs)
  - pastoralists
  - religious leaders
  - sex workers
  - commuter taxi drivers
  - teachers
  - chairmen of Local Council I (LC1) and Local Council II (LC2)
  - vulnerable groups (including widows and personnel at orphanage centres)
- SGIs to understand different livelihood strategies with:
  - crop farmers
  - fishermen
  - natural resource users (beekeepers, sand miners and shell collectors)
  - pastoralists

Additional SGIs and KIIs were conducted in the PACs for additional social and human rights data when considered necessary. The human rights data collection focus was on access to land, security and labour matters. Baseline information was also collected from:

- a community observation walk along a predetermined route, accompanied by community leaders, to gather information on community life, community infrastructure, land use types and patterns, and natural resources use
- HHIs to provide information on household-level socio-economic features. A purposive sampling strategy was used to ensure inclusion of households with different livelihood strategies and vulnerable households, including pastoralists, the very poor, widows, elderly and people with disabilities. A total 176 HHIs were held across the different PACs. No statistical validity was attempted, as the resettlement action plan (RAP) team will conduct a full household survey. The HHIs served to enhance understanding of concerns related to vulnerable households and livelihoods.

Figure A11.3-3 Focus Group Discussion and Participatory Mapping with Women in Miti, Sembabule District (KP194)

Figure A11.3-4 shows the number of different data collection tools used in the PACs and the districts by the three teams.

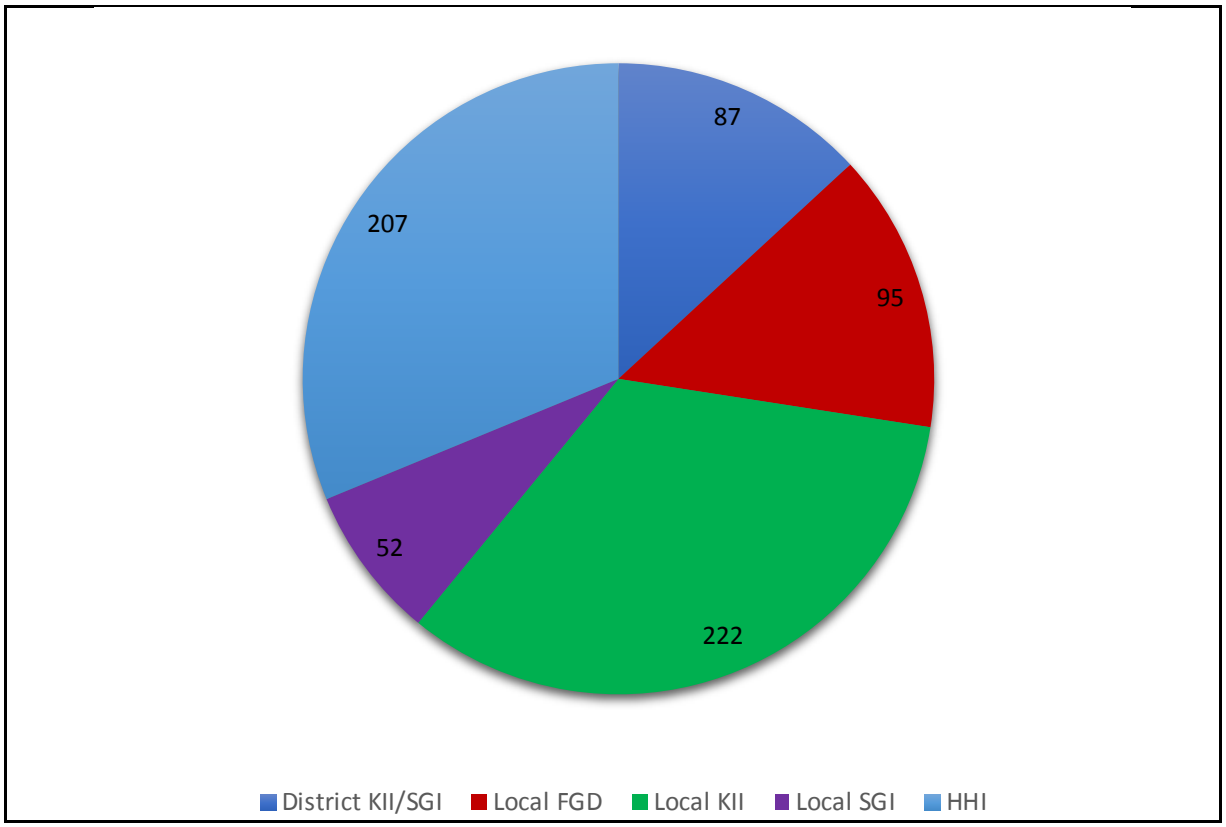


Figure A11.3-4 Data Collection at District and Potentially Affected Community Level

The number of people included in the baseline data collection by the social team was approximately 1157. This included:

- 299 people in FGDs with PAC leaders (local)
- 405 people in FGDs with PAC women (local)
- 110 people in PAC SGIs (local)
- 348 people in PAC KIIs (local)
- 70 people in KIIs and SGIs (district level)
- 207 people in HHIs (local).

Attachment A11.3 includes the data collection tools (FGD, KII, SGI and HHI guides) used for data collection.

Table A11.3-1 provides details of the number of data collection activities (per data collection tool) executed at the different districts during the baseline phase. Note that the meetings held during the scoping phase are not included here; these were reported on in the scoping report.

Table A11.3-1 Data Collection at District Level

District	KIIs (Social Team, ST)	KIIs (Human Rights Team, HRT)	SGIs (Health Team, HT) [3]	Health Facility Assessment (HT)
Hoima	11	0	1	2
Kakumiro	11	0	1	2
Kyankwanzi	7	0	1	1
Mubende	5	4	1	2
Gomba	7	1	0	2
Sembabule	5	1	1	1
Lwengo	7	2	1	1
Rakai	10	2	1	0
Kyotera	6	0	1	2

Table A11.3-2 provides details of the number of data collection activities (per data collection tool) undertaken at the PAC level.

Table A11.3-2 Data Collection at Potentially Affected Community Level

Subcounty	Nearest KP	PAC ID	PAC Name	FGDs (ST)	KIIs (ST)	SGIs (ST)	HHIs (ST)	FGDs (HRT)	Village Admin (HRT)
Hoima District									
Buseruka	0	8-1	Kayere	2	1	3			
Buseruka	0	8-2	Nyamasoga	2	2	1	10		
Buseruka	1.5	8-3	Katooke	2	5	3	10		
Kahoora Division	22	8-4	Hoima municipality[4]	0	9	0			
Kiziranfumbi	29.5	14-1	Kakende	2	2	2	3		
Buhimba	35	14-2	Kabaale-Kyabicwe	2	2	2			

[3] In Gomba district, the health team visited the district health officer (DHO) but the DHO and DHMT was not available for an SGI. Secondary data was requested.

[4] Primary data collected by AECOM during November 2016 (a total of 13 interviews) was drawn upon to complement baseline data collected in Hoima municipality.

Table A11.3-2 Data Collection at Potentially Affected Community Level

Subcounty	Nearest KP	PAC ID	PAC Name	FGDs (ST)	KIIs (ST)	SGIs (ST)	HHIs (ST)	FGDs (HRT)	Village Admin (HRT)
Kakumiro District									
Katikara	40	14-3	Kisenyi	2	2	2	6		
Katikara	41	14-4	Katikara Trading Centre	2	10	2	6		
Mpasaana	57.5	15-3	Kyajawe	2	8	2			
Mpasaana	61	15-2	Buswabwera	2	5	1			
Nkooko	68	15-1	Nkooko Trading Centre	2	12	3			
Kyankwanzi District									
Gayaza	81.5	17-2	Kisala West	2	11	0			
Ntwetwe	84	17-1	Nzoo	2	8	3			
Mubende District									
Butoloogo	86.5	17-3	Nyondo	2	9	4			
Madudu	111	20-1	Kabulasoke	2	6	1	7		
Kitenga	114	20-2	Kamusenene	2	2	0	7	2	1
Kitenga	121.5	22-5	Lugala	2	3	2	7		
Kitenga	122	22-2	Kalembe	2	4	1	7		
Kitenga	122.5	22-6	Mijunwa	2	1	2	7		
Kitenga	124.5	22-1	Kagoma	2	3	0	7		
Mubende TC	124.5	22-4	Mubende municipality	0	5	0			
Kitenga	125.5	22-3	Kyenda	2	6	0	15	2	1
Gomba District									
Maddu	160.5	24-1	Kyengera	2	6	1	6		
Sembabule District									
Lugusulu	183	26-1	Mabale	2	2	1	7		
Lugusulu	184.5	26-3	Serinya	2	3	0	7	2	1
Lugusulu	184.5	26-2	Njaza	1	3	1	6		
Lugusulu	186.5	26-4	Kagango	1	4	0	8		
Mijwala	189	28-2	Nsambya	1	4	1	8		
Sembabule TC	190	28-4	Sembabule Market Zone	2	5	0	7	1	
Mijwala	192	28-3	Muyenje	2	2	0	6		

Table A11.3-2 Data Collection at Potentially Affected Community Level

Subcounty	Nearest KP	PAC ID	PAC Name	FGDs (ST)	KIIs (ST)	SGIs (ST)	HHIs (ST)	FGDs (HRT)	Village Admin (HRT)
Mijwala	194	28-1	Miti	2	5	3	8		
Lwebitakuli	216	29-3	Bulakati	2	1	0			
Lwengo District									
Lwengo	225	29-1	Kinvunikidde	2	3	1			
Lwengo TC	225	29-2	Mbirizi	2	7	0			
Ndagwe	240	30-1	Bukulula	2	6	0			
Rakai District									
Lwanda	249.5	30-2	Butiti	1	4	0			
Kifamba	272	35-2	Lwemisege	1	3	0	6		
Kyotera District									
Nabigasa	247.5	30-4	Bethlehem	2	3	1			
Kasaali	251	30-3	Kyakudusi	1	3	0			
Kyotera TC	255	36-2	Kyotera town	0	2	0	1		
Kasasa	270.5	35-1	Ssanje Katwe	2	6	0	6		
Kakuuto	281.5	35-8	Bigada	2	3	1	7		
Kakuuto	282	35.6	Kabugimbi	2	4	2	3		
Kakuuto	283.5	35.7	Nabigasa	2	3	2	7		
Kakuuto	284.5	35-5	Kabonera	2	7	0	10		
Kakuuto	287.5	35-4	Lukoma	2	2	1	6	2	1
Kakuuto	290	35-3	Lukulavu	2	2	1	6		
Kakuuto	295.5	36-1	Mutukula town	2	13	2		2	

A11.3.3Data Capture

Table A11.3-3 describes the data collection tools used in the study.

Table A11.3-3 Data Collection Tools

Data Collection Method	Data Capture Tool
Transect walk Community observation walk	GIS co-ordinates, photographs of socio-economic features and notes entered into tablets with collector mobile application
Household survey	Responses entered into tablets and subsequently entered into a database
Community meetings, FGDs KIIs (local, district and national) SGIs	Field notes entered into an electronic template and subsequently entered into a database
Participatory mapping Timeline	Drawn on paper and captured on tablets with collector mobile application

A11.3.4Data Analysis

The following data analysis was conducted:

- Data collected through KIIs, FGDs and SGIs were collated, tabulated, compared and triangulated for each VEC.
- Quantitative secondary and primary data were submitted to descriptive statistical analysis including averages and percentages.
- Historical data and data at the time of writing were compared with future projections to identify trends.

Main VECs were identified and their sensitivity ranked in accordance with the sensitivity tables for the socio-economic VECs in Appendix D.

The following were prepared:

- sample site profiles and sample PAC profiles (see Attachment A11.2)
- maps showing locations of the VECs which are described in the text

A11.3.5Data Considerations.

Several data considerations, many of them common to social baseline surveys, were encountered and managed.

- Data provided by informants may be affected by translation. Triangulation was used to reduce this potential problem.
- The baseline is compiled from a multitude of sources collected by a large team of researchers using a diversity of tools. There is a risk of disparities in interpretations between team members and data loss in the data processing. The team was trained before the field visit. A rigorous data management process, using databases, team meetings and multiple verification exercises was used to avoid disparities, data loss and variations in interpretation.
- Data collected may not capture seasonal changes. Interviewers were aware of this and aimed to cover the full range of seasonal changes when holding interviews and FGDs.

- Vulnerable groups were addressed in the KIIs, SGIs, FGDs and HHIs but it is possible that some groups were not captured; identification of vulnerable groups is ongoing through the RAP process.
- Data received from the national Health Management and Information System (HMIS) may not accurately determine the actual burden of disease (BOD) in the sample PACs due to challenges associated with system utilisation and data management. The data are, however, considered sufficiently accurate in tracking disease trends at a district and health facility level.
- Community level data for livestock markets was not obtained owing to a livestock movement prohibition imposed by the MAAIF that was in place during the field surveys. Data relating to markets were therefore collected at district level.
- The spelling of the names of some villages and towns differed according to information source. Names identified during fieldwork have been used in the baseline.
- The boundaries of administrative entities are inconsistent between information sources, possibly because of a recent re-organisation of district boundaries. Where this was encountered, the ambiguity is highlighted in the text.
- Information relating to artisanal and small-scale mining (ASM) of gold was sourced from district natural resource officers and secondary sources as interviews with miners was not possible owing to the seasonal, transient and informal nature of their activities.
- The most recent agricultural and livestock census coordinated by UBOS and the MAAIF is 2008. Supplementary information was therefore sought from district veterinary officers.

The data considerations have not materially affected the baseline data gathered, which has provided sufficient information to describe and characterise the socio-economic and health conditions and assess their sensitivity.

A11.4 Socio-economic and Health Baseline Conditions

A11.4.1 Governance and Administration

The President of the Republic of Uganda is both Head of State and Head of Government.

The Government of Uganda (GOU) has three branches:

- the executive, comprising the President, Vice President, Prime Minister and Cabinet. The President is responsible for implementing and enforcing the laws written by Parliament and appoints the Cabinet.
- the legislative, comprising Parliament that passes laws and reviews government policy and administration
- the judiciary, comprising the Magistrates' Courts, High Court, Court of Appeals (Constitutional Court) and the Supreme Court. The role of the judiciary is to administer justice by resolving disputes between citizens and between the State and citizens, contribute to the enforcement of law and order, and protect the human rights of individuals and groups.

The government structure of Uganda consists of six levels, see Figure A11.4-1. Through this structure, power and decision-making at the national level is decentralised.

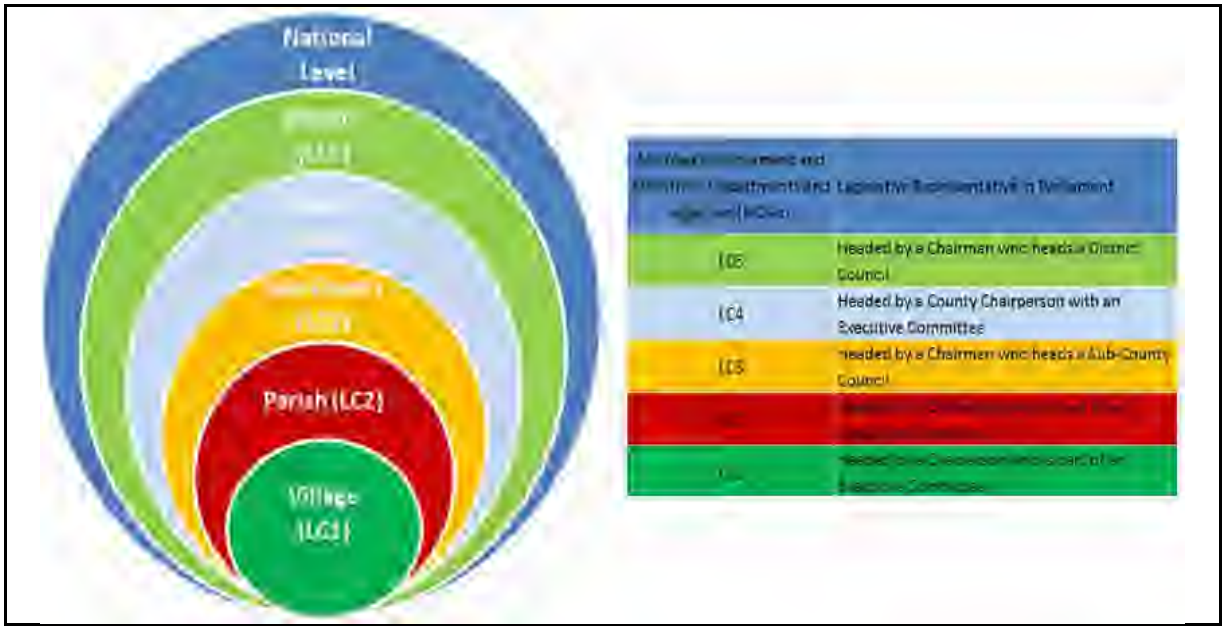


Figure A11.4-1 Government Structure of Uganda

SOURCE: Modified from Total E&P Uganda (2014)

Devolution of powers to local administration/government, leading to the emergence of more districts, subcounties and town councils, has been observed during the study period.

A11.4.1.1 District and Subcounty Government

The structure of local government differs between urban and rural settings. In urban settings, there are cities, municipal divisions or towns, wards and cell councils (CLGF 2016). In rural settings, there are district councils (Local Council (LC)5) which are subdivided into counties, subcounty councils, parish councils and village councils (MOLG 2017). The role of the local government agencies is to implement and monitor government programmes and resolve disputes at the respective levels (UBOS 2016a).

In each district, there is a Resident District Commissioner (RDC) appointed by the President. The office of the RDC received its mandate as stipulated by the Constitution and the Local Governments Act 1997. Article 203 of the 1995 Constitution provides for the establishment of the office of the RDC and the roles include monitoring the implementation of central and local government services in the district, to act as Chairperson of the district security committee and to perform other functions as may be assigned by the President or prescribed by Parliament (GOU 1995). The RDC is the main contact between the local and central government systems (CLGF 2016).

Every district has an elected Chairperson who is supported by a District Council consisting of technical personnel and subcounty representatives. In every District

Council, at least one of the secretaries and one third of all Councillors must be female (CLGF 2016). The District Council is the planning authority of the district that prepares a comprehensive and integrated development plan, incorporating plans of lower level local governments, for submission to the national planning authority (GOU 1997).

A District Technical Planning Committee chaired by the CAO includes heads of departments of that district, including:

- a District Natural Resource Officer mandated to promote and ensure sustainable natural resource use and management. The natural resources include land, water or wetlands, savannah woodland and plantation and forest in specific reserves.
- a District Environmental Officer, responsible for environmental matters including monitoring and review of the ESIA process at the district level
- a District Lands Management Officer, who provides technical services to the district administration and district land board
- a DHMT, led by a District Health Officer (DHO), responsible for planning and implementing health programmes and overseeing service delivery
- a District Community Development Officer, responsible for planning and implementing community projects, stakeholder engagement and community sensitisation.

There are 1403 subcounties (LC3) in Uganda (Electoral Commission 2016, Internet site). Subcounty governments are led by subcounty councils (headed by elected chairmen) and are responsible for service delivery and local economic development within their areas. Like the district administration, a team of technical personnel coordinates the activities and functions of the subcounty. Service departments include health, works and technical services, production and marketing, education, gender and community services, finance and natural resources.

A11.4.1.2 Local Governance and Decision-Making

Each subcounty comprises parishes, which divide further into villages. Parish councils have elected executive committees comprising a Chairperson, Vice-Chairperson, General Secretary and secretaries for information, education, security, finance, production and environmental protection. At the village level, all village citizens aged 18 years and above are members of the Council.

Community Governance

Ancient traditional kingdoms, also known as cultural institutions, are a key feature of Ugandan society. Within the project area, there are three cultural institutions:

- the Buganda Kingdom
- the Bunyoro-Kitara Kingdom
- the Kooki Chiefdom.

Cultural institutions are not mandated to engage directly in the administrative roles of the local or central governments but can be instrumental in ensuring that government programmes succeed at the local level (John Paul II Justice and Peace

Centre 2013). Representatives of cultural institutions play an active role in local communities by:

- assisting with the development of community infrastructure
- generating business opportunities (KIIs with kingdom representatives)
- undertaking community sensitisation and awareness campaigns (KIIs with kingdom representatives)
- preserving history (crafts, sites), cultural norms and identity.

Community Leaders

Governance in the sample PACs is based on inclusive community participation, with matters addressed in a consultative process, often without involving formal authorities other than those within the community. The Village Council (LC1), which consists of the Village Chairperson, the Vice Chairperson, secretary and other prominent leaders such as village elders and elected leaders representing youth, women and religious leaders, are pivotal in making decisions at community level. An elected Chairperson and Vice Chairperson head Village Councils. The responsibilities of Chairperson and Vice Chairperson are to:

- represent the village at the subcounty level
- organise and chair village meetings
- make decisions on behalf of the community
- ensure village security and safety of residents
- resolve disputes between village members; disputes that cannot be resolved by Village Chairmen are referred to higher levels of government (i.e., the subcounty and district).

Table A11.4-1 describes the various community leaders and their specific roles.

Table A11.4-1 Community Governance

Community Leader	Role of Leader in the Community
Village Chairperson, Vice-Chairperson and secretary (LC1)	Representing village at subcounty level Public administration of village Organising, chairing and recording village meetings Mobilising residents Providing advice to community members Decision-making on behalf of community Resolving conflicts between community members Ensuring village security and safety of residents Overseeing civil matters within the community
Elders	Resolving conflicts, particularly over land Providing advice and other forms of support to community members, including the village chairperson and vice-chairperson Calling village meetings

Table A11.4-1 Community Governance

Community Leader	Role of Leader in the Community
Religious leaders	Providing advice and other forms of support to the community Organising and leading religious services and ceremonies Resolving conflicts between religious groups and community members Spiritual mentoring and counselling Community sensitisation, i.e., preventing the spread of HIV and AIDS, and gender-based violence
Agricultural leaders	Representing farmers and pastoralists at village meetings Presenting interests and needs of farmers and pastoralists to the village council Mobilising farmers and pastoralists for meetings Providing advice and other forms of support to farmers and pastoralists, (i.e., on veterinary services in local area and how to increase crop yield Resolving conflicts, i.e., between farmers and pastoralists
Women's leaders	Representing women at village meetings Presenting women's interests and needs to the village council Mobilising women for meetings Providing advice and other forms of support to women, i.e., regarding healthcare and education of children Resolving conflicts between women and other family members, i.e., spouses, or community members
Youth leaders	Representing young people at village meetings Presenting youths' interests and needs to the village council Mobilising youths for meetings Providing advice and other forms of support to young people, i.e., on training and employment opportunities Resolving conflicts between young people and other youths or community members
Disability leaders	Representing disabled people at village meetings Presenting disabled peoples' interests and needs to the village council Mobilising disabled people for meetings Providing advice and other forms of support to disabled people, i.e., on specific services available to them Resolving conflicts involving disabled people and other family or community members
Community members	Participating in decision-making Attending village meetings Providing support to fellow community members Reporting problems to the village council

SOURCE: FGDs with community leaders

A11.4.2 Demographics

A11.4.2.1 Baseline Condition of Demographics

National Level

The population of Uganda grew by 3% annually between 2002 and 2014, reaching 34.6 million in 2014 (UBOS 2016a). The population size projection for 2018 is approximately 38.8 million (UBOS 2016b). Females and males represent 51% (17.7 million) and 49% (16.9 million) of the population, respectively.

Figure A11.4-2 shows the age structure of the population in Uganda.

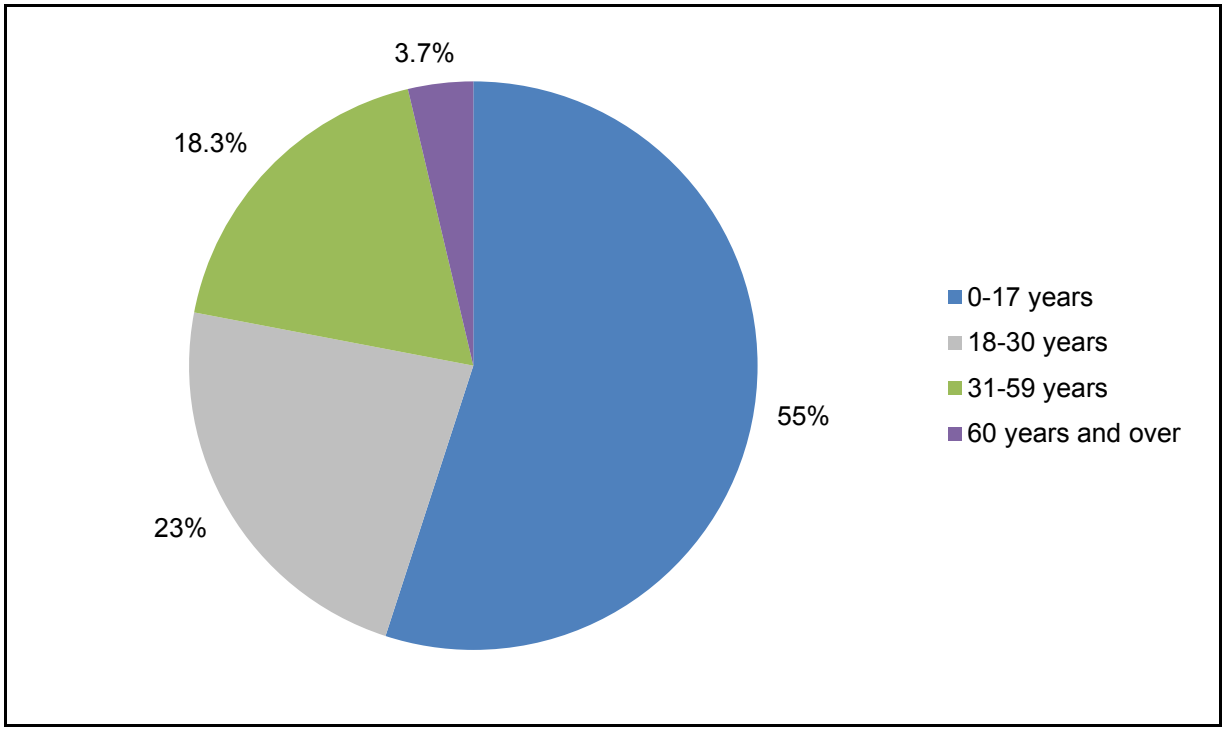


Figure A11.4-2 Age Profile
SOURCE: UBOS (2016a)

As shown in the figure, Uganda's population is predominantly young, with 0–17-year-olds constituting more than half of the total population.

Uganda's population is predominantly rural, representing 79% of the overall population (MOLG 2017). However, the urban population has increased by 23% since the 2010 census (UBOS 2016a). This trend has been driven largely by rural–urban migration (World Bank 2015a, Internet site).

In 2014, the population density was 173 persons per km^2 and the national average household size was 4.7 persons.

Uganda consists of more than 40 different ethnic groups and languages, each with their own cultural identity and customs. The largest ethnic group are the Baganda which consists of 16.9% of the population, followed by Banyankole (9.5%), Basoga (8.4%), Bakiga (6.9%), Iteso (6.4%), Langi (6.1%), Acholi (4.7%), Bagisu (4.6%)

and Lugbara (4.2%). Those identified as others account for 32.3% (World Atlas 2018, Internet site).

While there is great ethnic and linguistic diversity, intermarriage, rural–urban migration and other migratory movements including transborder migration has meant that the different ethnicities, along with their cultural traditions, have intermingled to create a mixed multicultural nation.

There are at least 40 native languages in Uganda, grouped into three main language families: Bantu, Central Sudanic and Nilotic. English was adopted during colonisation as the common language and remains an official language. Swahili, which has regional significance, is also an official language, and Luganda is a commonly spoken language of a large proportion of the Ugandan population, particularly in the central region.

The wide variety of languages spoken in Uganda creates challenges for everyday communication and information exchange. Teachers face challenges when teaching children from other language groups; similarly, traders face challenges when selling goods to customers from other districts (KII with teachers and business owners). In the spirit of regional integration, Swahili is being promoted and recently became a compulsory subject in secondary schools (The Africa Report 2016, Internet site).

International Migration

Uganda experiences both in and out migration. Migration to Uganda has been driven by civil war and political instability in the Democratic Republic of Congo (DRC), Rwanda and South Sudan (Danish Refugee Council 2016). At the time of writing, more than 800,000 refugees and asylum seekers are accommodated in the country's northern, southern and southwestern regions (Refuge & Hope International 2017, Internet site). Since the beginning of 2018, roughly 34,000 Congolese refugees have crossed Lake Albert to Uganda, driven by renewed violence in the DRC (UNHCR 2018, Internet site). Most refugees have entered Uganda through Kaiso and Sebagoro landing sites on the shores of Lake Albert in Hoima district (ReliefWeb 2018, Internet site).

It is common for Ugandan doctors and nurses to emigrate to North African countries, the Middle East and the Caribbean, which has generated personnel shortages in local healthcare services (United Nations 2017, Internet site).

Internal Migration

Internal migration has occurred throughout Uganda's history and is driven mainly by employment. Internal movements are mostly towards urban centres or regions of high economic activity, such as plantation areas (IOM 2015) or locations where transient employment opportunities are available such as infrastructure developments. Evidence of migration for family and marital reasons has also been found in some regions and is more common among females (Nakiganda 2013).

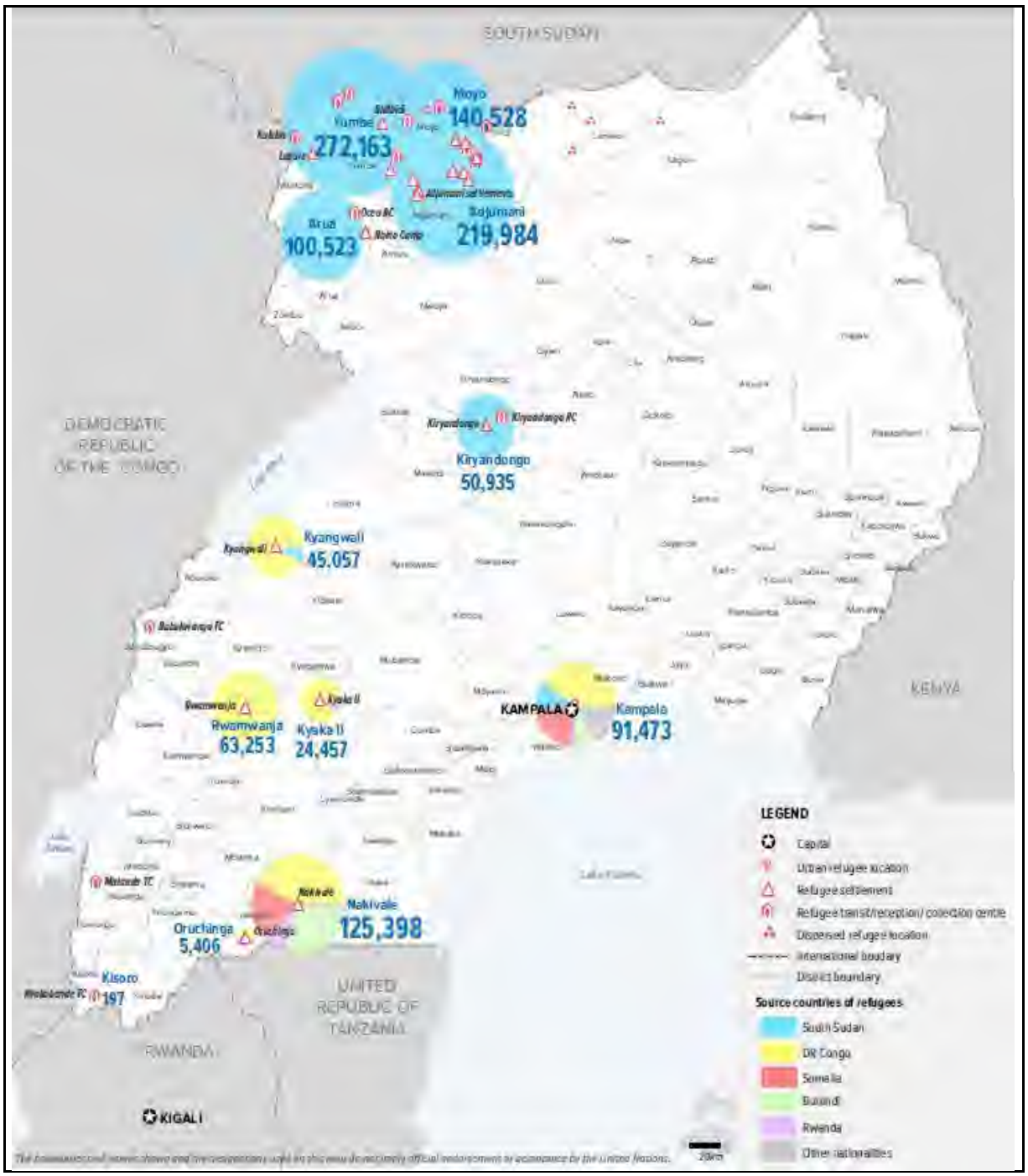


Figure A11.4-3 Location of Refugee Settlements

SOURCE: UNHCR 2017

District Level

Table A11.4-2 provides the demographic characteristics of the districts traversed by the AOI. Data from the Rakai DDP are relied upon for Kyotera because many of its subcounties were carved out of Rakai district when Kyotera became a district in July 2017.

High fertility rates, improved health services and in-migration (due to employment opportunities) were identified as the main reasons behind population growth in the districts (KIIs with district officials).

Table A11.4-2 Demographic Data, 2014

District	Population Size			Population Density (/km^2)	Growth Rate Per Annum (2002-2014)	Average Household Size
	Total	Male (%)	Female (%)			
Hoima	573,903	49.9	50.1	158.9	4.3	4.5
Kakumiro	293,108	50.2	49.8	184	3	4.7
Kyankwanzi	213,267	51.7	48.3	91.6	4.7	4.4
Mubende	688,819	50.3	49.7	148	4.1	4.5
Gomba	160,075	50.9	49.1	180	2.9	4.5
Sembabule	252,994	49.6	50.4	79	2.8	4.5
Lwengo	275,450	48	52	192	3.1	5
Rakai/ Kyotera	518,002	48.9	51.1	159.4	2.1	4.4

SOURCE: DDPs for 2015/16–2019/20

Figure A11.4-4 shows the age composition of the districts traversed by the AOI.

The figure shows that the districts traversed by the AOI have young populations with over half of the population below the age of 17.

The population in the districts traversed by the AOI is predominantly rural. Over 95% of people in Kakumiro, Kyankwanzi and Lwengo live in rural areas (DDPs 2015). However, consistent with national trends, the districts experience urbanisation. Hoima municipality grew by 10.7% between 2002 and 2014 (Hoima DDP 2015). In Lwengo district, the urban centres Mbirizi and Kinoni have become attractive to rural migrants owing to employment and business opportunities and relatively better infrastructure (Lwengo DDP 2015).

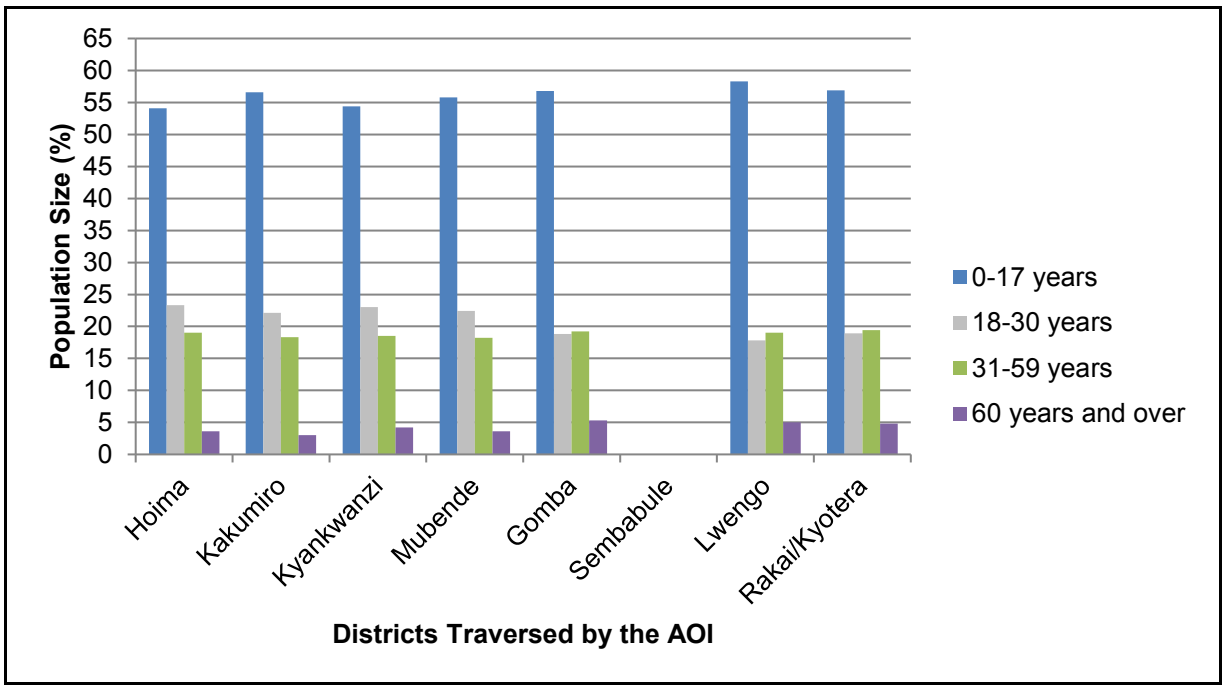


Figure A11.4-4 Age Profile by District, 2014

SOURCE: UBOS (2016c)

NOTE: No data available from UBOS (2016c) for Sembabule district

Ethnicity

Table A11.4-3 shows the main ethnic groups in the districts traversed by the AOI. The main ethnic groups found in the districts in the southern part of the AOI are the Baganda and Banyankole. In the northern part of the AOI, the main ethnic group is the Banyoro. The PAC level ethnicity and religion data is presented in Table A11.4-5.

Table A11.4-3 Main Ethnic Groups by District

District	Main Ethnic Groups
Hoima	Banyoro
Kakumiro	Banyoro
	Bakiga
Kyankwanzi	Baganda
	Banyarwanda
Mubende	Baganda
	Banyoro
Gomba	Banyankole
	Banyarwanda
	Bafumbira

Table A11.4-3 Main Ethnic Groups by District

District	Main Ethnic Groups
Sembabule	Banyankole
	Baganda
Lwengo	Baganda
	Banyankole
Rakai/Kyotera	Baganda
	Banyankole
	Bakiga

SOURCE: DDPs for 2015/16–2019/20, FGD with community leaders

Indigenous People

According to International Finance Corporation (IFC) Performance Standard 7 (IFC 2012), the term 'indigenous people' refers to a distinct social and cultural group with the following characteristics in varying degrees:

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others
- collective attachment, i.e., whose identity as a group or community is linked, to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories
- customary cultural, economic, social or political institutions that are separate from those of the dominant society or culture
- an indigenous language, often different from the official language of the country or region in which they reside.

IFC Performance Standard 7 recognises that indigenous peoples may be more vulnerable to the adverse impacts of a project than other communities (or non-indigenous communities). Ethnic groups in Uganda that may fulfil international definitions for indigenous peoples include the traditional hunter–gatherer Batwa and Benet communities, the Basongora and Banyabindi and pastoralist groups such as the Ik and Karamojong. These ethnic groups are not within the AOI. The project does not traverse lands traditionally owned by, or under the customary use of, any of these ethnic groups. Furthermore, the government does not officially recognise these groups as indigenous (ILO 2009). The Uganda Constitution refers to indigenous groups as vulnerable and marginalised, adopting the term "Vulnerable and Marginalised Groups" in place of "Indigenous Peoples" (GOU 2015).

Local Level

The populations of the subcounties traversed by the AOI are diverse. The settlements near the start of the pipeline route at KP0 in Hoima district are sparsely populated and poorly connected, with as few as 100 residents living in villages such as Kakende (Kiziranfumbi subcounty, KP29.5). The population gradually increases as the AOI traverses southwards through the districts of Kakumiro and Kyankwanzi, with as many as 2000 people living in settlements such as Kisala West (Gayaza

subcounty, KP81.5). Continuing southwards through the districts of Gomba and Sembabule, population levels are lower owing to the expansive rangeland of the cattle corridor. Population levels remain generally low throughout the districts of Lwengo, Rakai and Kyotera except for urbanised settlements such as Kyotera town (KP255) and Mutukula town (KP295.5), which are among the largest and most densely populated settlements along the pipeline route. Increased availability of goods and services, improved infrastructure and economic opportunities has stimulated considerable in-migration to these areas in recent years.

Table A11.4-4 shows the variations of size and gender in the sample PACs. The household survey conducted in the sample PACs revealed large variations in household size ranging from 1 to 17 people.

Evidence of migration can be observed in some of the sample PACs, particularly among young people. During FGDs with youths, it was reported that:

- in Miti village (KP194), Ssanje Katwe village (KP270) and Nkooko Trading Centre (KP68), young people have migrated to urban areas in search of employment opportunities
- in Njaza village (KP184.5), a small number of young men had previously emigrated to Afghanistan and Iraq to work as private security guards on short-term contracts.

Table A11.4-4 Population in Sample Potentially Affected Communities

District	Subcounty	Sample PAC	KP	Population Size	Male (%)	Female (%)
Hoima	Kiziranfumbi	Kakende	29.5	100	70	30
Kakumiro	Katikara	Katikara Trading Centre	41	900	44.4	55.6
	Mpasaana	Buswabwera	61	350	42.9	57.1
	Nkooko	Nkooko Trading Centre	68	1,500	NA	NA
Kyankwanzi	Gayaza	Kisala West	81.5	2,000	NA	NA
	Ntwetwe	Nzoo	84	1,033	62.7	37.3
Mubende	Butoloogo	Nyondo	86.5	720	44.4	55.6
	Madudu	Kabulasoke	111	1,000	40	60
	Kitenga	Lugala	121.5	1,200	40	60
	Kitenga	Kalembe	122	800	56.3	43.7
	Kitenga	Kagoma	124.5	1,000	40	60
Gomba	Maddu	Kyengera	160.5	900	33.3	66.7

Table A11.4-4 Population in Sample Potentially Affected Communities

District	Subcounty	Sample PAC	KP	Population Size	Male (%)	Female (%)
Sembabule	Lugusulu	Mabale	183	253	40.7	59.3
	Lugusulu	Serinya	184.5	1,000	40	60
	Lugusulu	Njaza	184.5	300	NA	NA
	Lugusulu	Kagango	186.5	1,000	40	60
	Mijwala	Nsambya	189	500	40	60
	Sembabule TC	Sembabule Market Zone	190	400	67.5	32.5
	Mijwala	Miti	194	400	37.5	62.5
	Lwebitakuli	Bulakati	216	400	37.5	62.5
Lwengo	Lwengo	Kinvunikidde	225	1,200	40.8	59.2
	Lwengo	Mbirizi	225	2,065	NA	NA
	Ndagwe	Bukulula	240	380	44.7	55.3
Rakai	Lwanda	Butiti	249.5	1,000	45	55
	Kifamba	Lwemisege	272	480	49.2	50.8
Kyotera	Kasaali	Kyakudusi	251	1,200	41.6	58.4
	Kakuuto	Bigada	281.5	1,800	40	60
	Kakuuto	Kabugimba	282	1,235	40	60
	Kakuuto	Nabigasa	283.5	664	40	60
	Kakuuto	Kabonera	284.5	500	49.6	50.4
	Kakuuto	Lukoma	287.5	600	33.3	66.7
	Kyotera	Mutukula town	295.5	30,000	56.6	43.4

SOURCE: KIIs with village chairmen

Ethnicity and Religion

A wide range of ethnic groups is present in the sample PACs. Table A11.4-5 shows the range of ethnicities identified in the sample sites based on HHIs.

Table A11.4-5 Ethnicities in the Sample Potentially Affected Communities

Sample Site	Ethnicity of Household Heads Interviewed in Household Survey
Katooke, Nyamasoga, Kayere KP0 PS1	Acholi, Alur, Bafumbira, Baganda, Bagisu, Bakiiga, Banyankole, Banyarwanda, Banyoro, Basoga, Iuo, Karamojo, Lendu, Lugbaras, Nilotics
Katikara Trading Centre, Kisenyi, Kakende KP40 MCPY1	Abakojo, Abaruru, Alur, Bagisu, Bakiiga, Bakonjo, Baganda, Banyarwanda, Banyoro, Basoga, Batoro, Congolese nationals, Lendu
Buswabwera, Kyajawe, Nkooko Trading Centre KP61	Alur, Bafumbira, Bakiiga, Banyankole, Banyarwanda, Lugbaras
Nzoo, Kisala West, Nyondo, KP80–82	Abakiga, Bafumbira, Baganda, Bagwere, Bakiiga, Banyankole, Banyarwanda, Banyoro, Barundi, Batoro, Rwandese Nationals
Kabulasoke, Kamusenene KP111–114	Bakiiga, Banyoro, Batoro, Bafumbira, Banyarwanda, Baganda, Banyankole, Bakonjo
Lugala, Mijunwa KP121.5–122.5	Bafumbira, Baganda, Bakiiga, Banyankole, Banyarwanda, Banyoro
Kagoma, Kalembe, Kyenda, KP122–125 MCPY2	Bafumbira, Baganda, Bakiiga, Banyankole, Banyarwanda, Banyoro
Kyengera KP161	Bafumbira, Baganda, Bahima, Bakiiga, Banyankole, Banyarwanda
Mabale, Serinya, Njaza KP183–185 PS2	Baganda, Bahima, Bakiiga, Banyankole, Banyarwanda
Miti KP194 MCPY3	Bafumbira, Baganda, Bakiiga, Banyankole, Banyarwanda, Barundi, Basoga
Kinvunikidde, Mbirizi, Bulakati KP225	Bafumbira, Baganda, Bakiiga, Banyankole, Banyarwanda, Barundi, Basoga
Butiti KP249.5	Baganda, Bakiiga, Banyankore, Banyarwanda, Basoga, Tanzanian nationals
Bigada, Kabugimbi, Nabigasa KP281.5–283.5 MCPY4	Baganda, Banyankole, Banyarwanda, Barundi, Baziba, Bakiga, Basoga, Burundian nationals
Lwemisege, Lukoma, Kabonera, Lukulavu, Ssanje Katwe KP288	Baganda, Banyankole, Banyarwanda, Barundi, Basamya, Baziba, Rwandese nationals
Mutukula town KP295.5	Baganda, Tanzanian nationals

SOURCE: HHIs

The main languages spoken among the PACs are:

- Alur
- Runyoro (western districts)
- Luganda (central districts)
- Runyankore-Rukiga (central districts)
- Kinyarwanda (central districts).

Religion is important in the sample PACs. HHIs and KIIs with religious leaders indicated that:

- Christianity is the predominant religion in the study area, followed by Islam
- traditional beliefs are also practiced, often in combination with Christianity and Islam.

Trends in Condition and Sensitivity to Change

Demographic trends are important as a context for understanding trends in the VECs. Demographic trends are as follows:

- Uganda's population is growing rapidly and is projected to reach 130 million by 2050 (World Watch Institute 2018, Internet site). Population growth rates in the districts traversed by the AOI are 4.5–5.3% per year, above the world average of 1.2% (DDPs 2015).
- Uganda's population is predominantly rural, but the prevailing trend is urbanisation. Growth in urban areas may accelerate in line with the national vision to transform Uganda from a peasant to modern and prosperous society within 30 years (GOU 2013a). Under this vision, planned improvements in urban infrastructure and public service facilities may strengthen the appeal of towns and cities (GOU 2013a). Job opportunities in urban areas may also increase as industry and services become more prominent economic sectors.
- Uganda remains an important host country for refugees from neighbouring countries. Conflict and instability, if unresolved, may sustain the in-migration of large numbers into the country. The 2006 Refugee Act, one of the most progressive and generous in the world (World Bank 2016a, Internet site), supports the entry of refugees into Uganda.

A11.4.2.2 Key Considerations

Key considerations are:

- there is a large young labour pool
- PIIM may cause added stress to infrastructure and social services
- migrants often stay in locations they have moved to for work opportunities in the hope of further work opportunities rather than returning to an agricultural income.

A11.4.3 Education

A11.4.3.1 Baseline Condition of Education

National Level

Education is a right enshrined in the constitution of the Republic of Uganda and is compulsory for 6–13-year-olds (NUFFIC 2016). The education system comprises three years of nursery school, seven years of primary school, six years of secondary school and at least three years of higher education.

Figure A11.4-5 shows the national literacy rates.

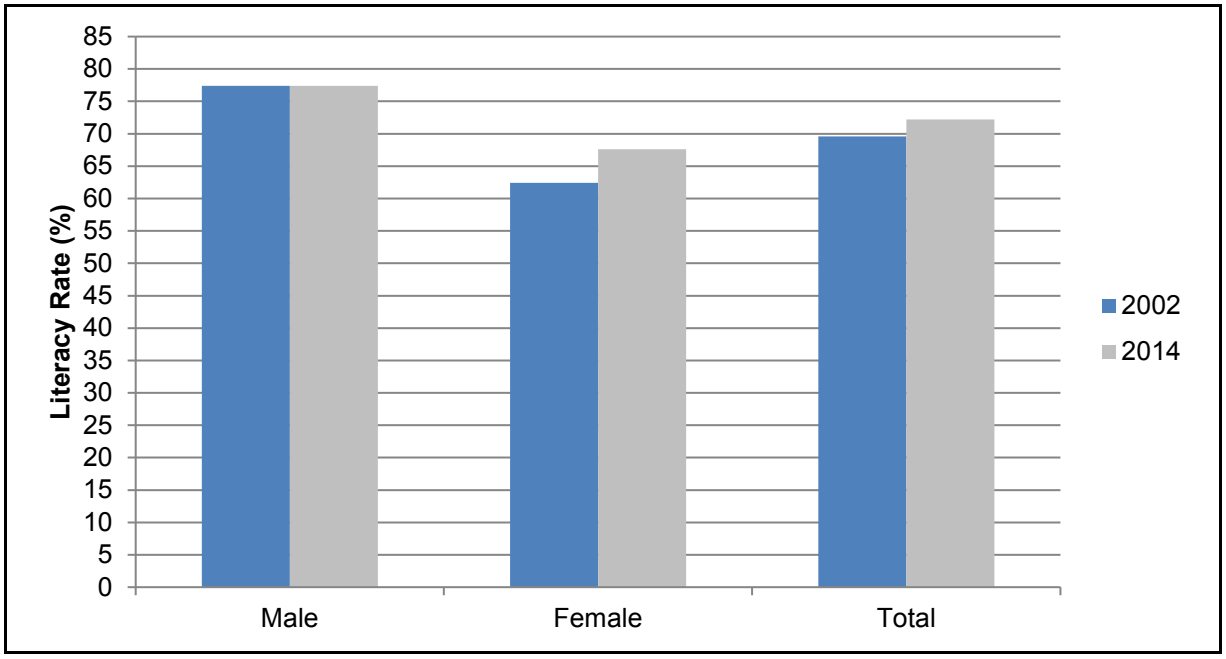


Figure A11.4-5 Literacy Rates for Persons Aged 10 Years and Above, 2002–2014

SOURCE: UBOS (2016a)

National school attendance at primary and secondary level is 81% and 17% respectively (DHS 2011). The disparity in school attendance between males and females at the primary level is minimal in most regions. At the secondary school level, the disparity (fewer females than males) widens in the north and Kampala regions (DHS 2011).

The Annual School Census 2015 found that Uganda has 18,889 primary schools and 2685 secondary schools (Ministry of Education and Sports 2015) of which 63.8% of primary schools and 38.1% of secondary schools are government-funded. The remainder are privately owned (Ministry of Education and Sports 2015).

There are three categories of tertiary institutions (TI) in Uganda:

- universities
- other degree-awarding institutions
- other tertiary institutions (Uganda Higher Education Council 2014).

Figure A11.4-6 shows the prominence of these institutions as a percentage of overall tertiary student enrolment.

In 2016, a total of 186,412 students were enrolled at university; 56% were male and 44% were female (UBOS 2017a). There are 40 universities in Uganda; over half of these (56%) are in the central region followed by 19% in the western region. The Uganda Higher Education Council (2014) reports that most students (66%) study arts and humanities courses with fewer students (34%) studying science and technology.

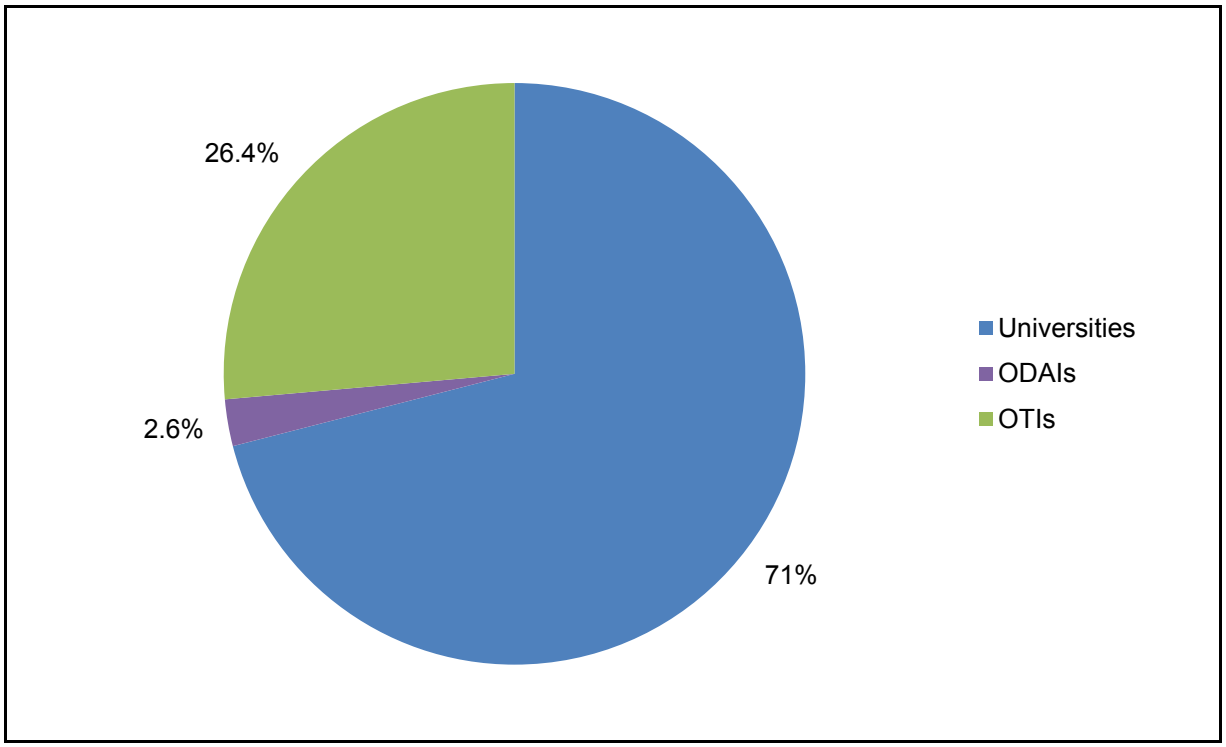


Figure A11.4-6 Higher Education Institutions as a Percentage of Overall Students Enrolled

SOURCE: Uganda Higher Education Council (2014)

There is a shortage of appropriately skilled and qualified workers in Uganda, particularly in sectors such as construction (Ministry of Education and Sports 2013). The mismatch between existing graduate qualifications and the skills required by industry results in high graduate unemployment and high levels of personnel turnover and retraining costs for companies. The business, technical and vocational education and training (BTVET) sector aims to address the technical skills gap in the country. There are 129 BTVET institutions in which 63,209 students are enrolled (UBOS 2017a).

The central government has recently invested in education infrastructure (Ministry of Education and Sports 2015). Despite government efforts, 31% of schools lack access to safe drinking water, emphasising the need for continued investment (Ministry of Education and Sports 2015).

District Level

Figure A11.4-7 shows adult literacy rates for persons 18 and above in the districts traversed by the AOI with literacy rates ranging between 66.1% and 76%.

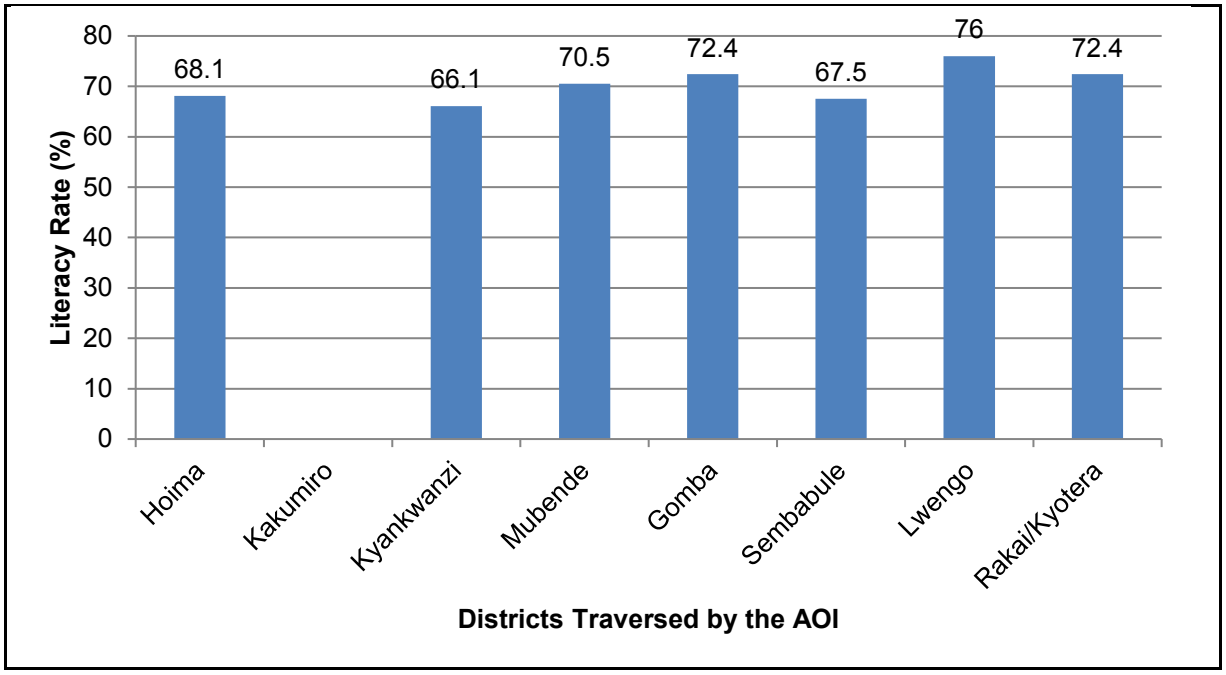


Figure A11.4-7 Literacy Rates for Persons Aged 18 Years and Above, 2014

SOURCE: DDPs for 2015/16–2019/20

Note: No data available from Kakumiro DDP for Kakumiro district

Table A11.4-6 shows the school attendance rates in the districts traversed by the AOI. Key points include:

- primary school attendance ranges between 79.4% and 79.6%
- secondary school attendance ranges from 22% to 26.2%
- boys have slightly higher attendance rates compared to girls at primary school level
- girls have slightly higher attendance rates compared to boys at secondary school level in some districts.

Table A11.4-6 School Attendance Rates by District, 2014

District	Attending Primary School (6–12 Years) (%)			Attending Secondary School (13–18 Years) (%)		
	Total	Male	Female	Total	Male	Female
Hoima	79.4	51.1	48.9	26.2	50.3	49.6
Kakumiro	NAD	NAD	NAD	No available data (NAD)	NAD	NAD

Table A11.4-6 School Attendance Rates by District, 2014

District	Attending Primary School (6–12 Years) (%)			Attending Secondary School (13–18 Years) (%)		
	Total	Male	Female	Total	Male	Female
Kyankwanzi	79.3	50.5	49.5	24.7	50.7	49.3
Mubende	81.7	51	49	26.8	50.3	49.7
Gomba	85.5	51.2	48,8	30	47.3	52.7
Sembabule	82.1	50.6	49.4	24.9	48.2	51.8
Lwengo	82.2	51	49	33.1	46.2	53.8
Rakai/Kyotera	81.2	50.7	49.3	27.5	47.4	52.6

SOURCE: UBOS 2016b

Consistent with the national level, substantial skills gaps are present in the districts traversed by the AOI. Recognising the importance of human capital development, the DDPs place emphasis on increasing the skill level and productivity of the workforce through vocational training programmes (DDPs 2015).

Figure A11.4-8 shows diversity in pupil–teacher ratios across the districts. However, in all districts, the ratio is considered high.

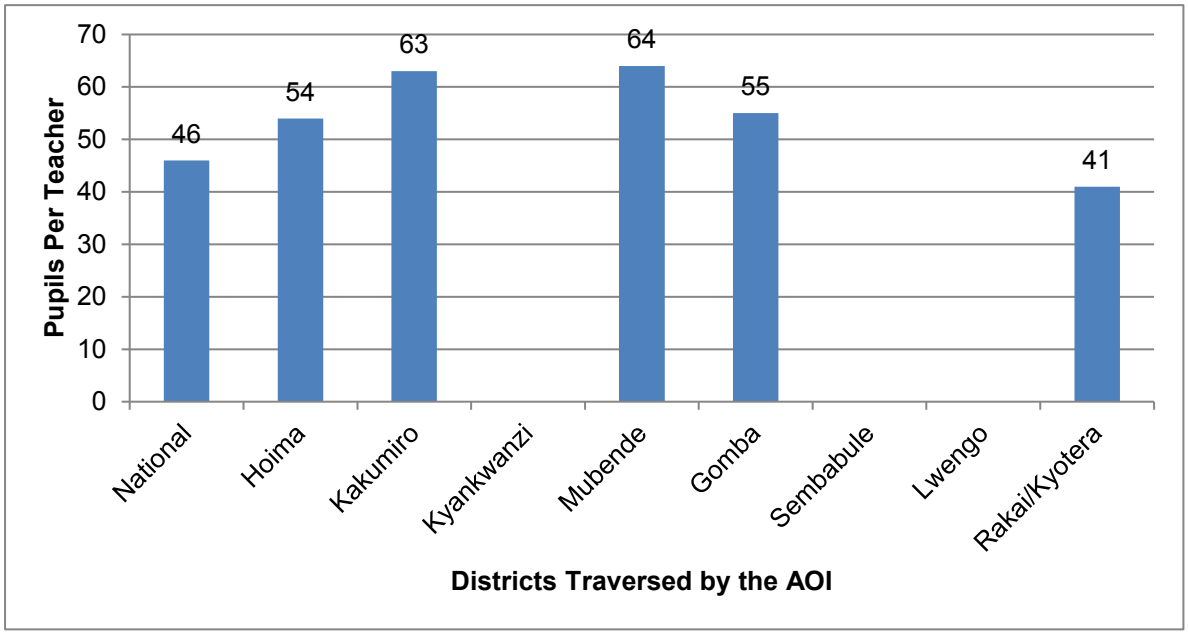


Figure A11.4-8 Ratio of Pupils per Teachers at the Primary School Level by District, 2014

SOURCES: UBOS (2016a), DDPs for 2015/16–2019/20

Note: No data available for Kyankwanzi, Sembabule and Lwengo districts

The DDPs highlight numerous challenges for district education departments including:

- personnel shortages
- inadequate infrastructure. In Sembabule, there is a shortage of school facilities despite the recent construction of 800 new classrooms (Sembabule DDP 2015)
- high drop-out rates among girls due to early marriages, teenage pregnancies and domestic chores (Kakumiro, Gomba and Lwengo DDPs 2015)

A small number of TIs are in the districts traversed by the AOI. These include:

- the Buhimba Technical Institute and the Kitakara Institute of Commerce, Media and Vocational Studies in Hoima. These institutions offer courses in business administration, health care, information and communication technology, carpentry, welding and metal fabrication, plumbing and petroleum technology (BTVET Uganda 2018, Internet site and New Vision 2016a, Internet site)
- three private and three government-aided TIs in Mubende, including the National Teachers College (DDP 2015); this institution offers courses in primary and secondary education and local languages
- two TIs in Sembabule (DDP 2015) including the St Charles Lwanga Technical Institute, which offers courses in construction, electrical installation and repair and automotive mechanics (BTVET Uganda 2018, Internet site)
- three TIs in Rakai including the Kiteredde Vocational Institute and the Salaama Vocational Education Centre. These institutions offer courses in building construction, electrical installation and repair, woodwork technology and automotive mechanics (BTVET-Uganda 2018, Internet site and SVEC 2015, Internet site)
- the Kyotera College of Business Studies in Kyotera, which offers courses in tailoring, metal fabrication, hairdressing, management and accountancy (UGAPRIVI 2017, Internet site)
- one government-aided and two private TIs in Kakumiro (DDP 2015).

PAC Level

The literacy rate of the population in the PACs varies considerably. Interviews with PAC teachers reported literacy rate estimates ranging from 30–40% in sample PACs such as Kabulasoke village (KP111) to 70–80% in others (Muyenje village, KP192).

Female literacy rates were mostly estimated to be below 40% (FGDs with women in all PACs). Low literacy rates among women were often attributed to the historical preference by parents of educating boys over girls. However, in 12 of the sample PACs, female literacy rate estimates of 70% and above were reported. In these PACs, it was stated that “all children deserve education” (Lukulavu village, KP290) and that “schooling is equally important for boys and girls” (Mbirizi village, KP225).

Figure A11.4-9 shows the percentage of children attending primary school in sample PACs where teachers were interviewed.

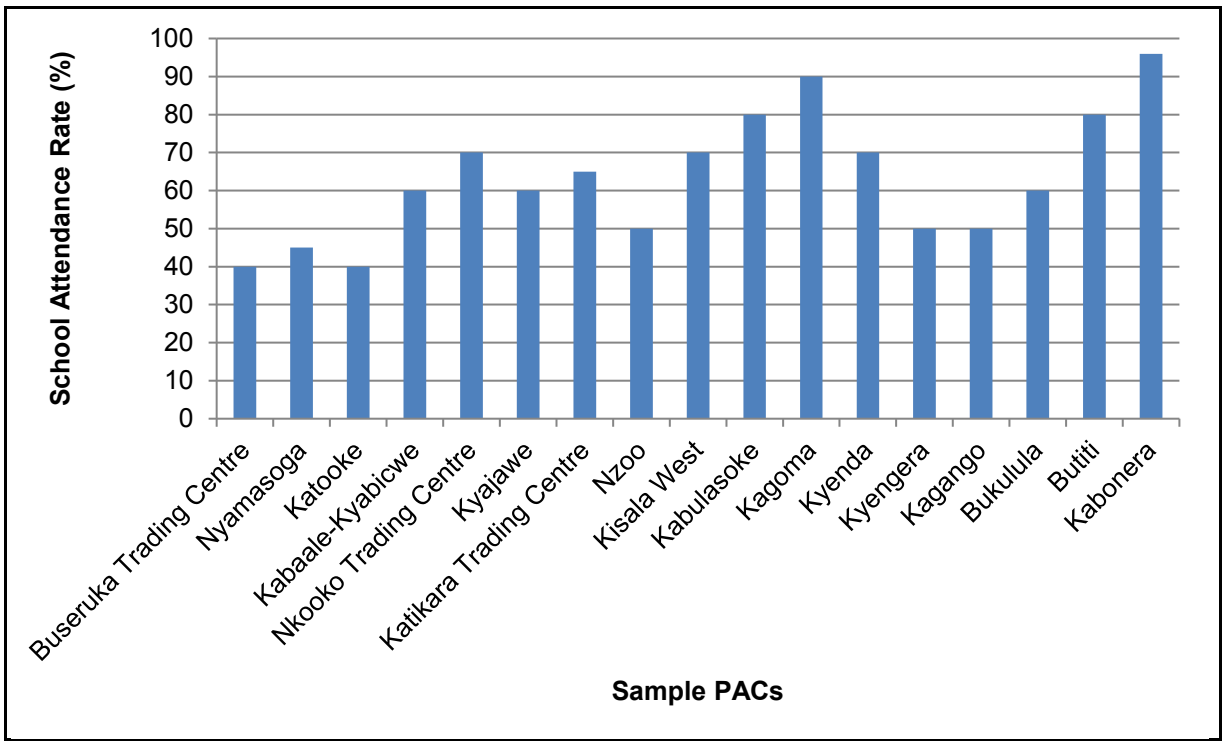


Figure A11.4-9 Percentage of Children Attending Primary School in Sample Potentially Affected Communities

SOURCE: KIIs with primary school teachers

Figure A11.4-9 shows that the percentage of children estimated to be attending primary school ranges from 40% to 96%. These findings differ from national and district level secondary data, which reports average primary school attendance rates of 79% and 86%.

Teachers reported domestic chores, long travel distances from home to school and the low value attributed to education by children and parents as reasons for low attendance rates.

In some sample PACs (Katooke, KP1.5; Kagoma, KP124.5; and Kyengera, KP160.5), attendance rates were found to be lower for boys than girls. This was attributed to peer pressure and the engagement of boys with income-generating activities. In other PACs (Kyajawe, KP57.5; Hoima municipality, KP22; and Mutukula town, KP295.5), attendance rates were found to be lower among girls. Reasons reported for low school attendance by girls include:

- lack of sanitary pads during menstrual periods
- bullying and sexual abuse
- household's inability to afford school fees
- distances needed to travel to access schools
- lack of security of schools (no fences around peripheries)
- teenage pregnancy
- early marriage.

Most teachers in the PACs interviewed reported that their classrooms were not adequately equipped, lacking desks, science kits and textbooks. Other concerns reported include low wages for teachers relative to the cost of living, lack of accommodation for teachers, and lack of food for teachers and students during the school day. Figure A11.4-10 shows a typical school building.

Figure A11.4-10 Mary Star Primary School in Kyenda, Mubende District (KP125.5)

Human Rights

The following human rights laws apply to education:

- Universal Declaration of Human Rights, article 26; International Covenant on Economic, Social and Cultural Rights, article 13; Convention on the Rights of the Child, article 28: Right to education.

Uganda has ratified all these declarations.

Trend in Condition and Sensitivity to Change

Education trends are as follows:

- Education remains a key development priority in Uganda, and the districts traversed by the AOI make provisions for investment in education infrastructure and resources in the DDPs. However, the extent of improvements at the district level will be influenced by the financial and human resources available.

- High graduate unemployment and complaints from the private sector have increased the attention paid to Uganda's skills gap. At the national level, the Business Technical Vocational Education Training Strategic Plan 2011–2020 seeks to create employable skills and competencies relevant to the job market. At the district level, some DDPs outline plans to increase enrolment in tertiary institutions and offer vocational training programmes to citizens (Hoima DDP 2015).

Sensitivity Rating

Table A11.4-7 presents the sensitive VECs for education identified during the social baseline study.

Table A11.4-7 Education VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Unemployed graduates	Positive	Unemployed graduates may benefit from the training opportunities and work experience with the project.
Children of primary and secondary school age	Moderate (3)	Attendance rates of children may fall due to jobs or opportunities indirectly created by the project.

A11.4.3.2 Key Considerations

Key considerations are:

- Uganda lacks skills in particular sectors, i.e., construction, and enrolment in science and technology programmes. Labour recruited for pipeline construction is likely to require considerable training and capacity building.
- TIs in the districts traversed by the AOI may be a potential source of construction labour for pipeline construction
- opportunities such as temporary work on construction sites and informal service industry (roadside shops and kiosks) may reduce school attendance by both girls and boys, affecting their human right to education.

A11.4.4Economy

A11.4.4.1 Baseline Condition of the Economy

East African Regional Level

East Africa is the fastest growing economic region in Africa with recorded regional growth estimated at 6–7% for 2016 and 2017. Growth has been primarily driven by the service, construction and industry sectors as well as public investment programmes and agriculture. The region also benefits from large foreign direct investment (FDI) inflows (AfDB et al. 2016).

While inflation has been higher in East Africa (12–19% in 2007–2014) than in other African regions, it is expected to reduce to the African average of 7–8% in the upcoming years. Before 2016, the East African region ran persistent fiscal and

current account deficits. However, predicted East African fiscal deficits of around 4% of gross domestic product (GDP) and current account deficits of around 7% in 2016 and 2017 are like African average deficits (AfDB et al. 2016).

Uganda, as a member of the East African Community (EAC) since 2010, shares a common market with Kenya, Tanzania, Burundi and Rwanda. Uganda's GDP is approximately 60% of Kenya's GDP (the largest economy in the EAC), placing it behind Tanzania and just ahead of Rwanda (AfDB et al. 2016). The EAC is economically more diverse than other regional African communities because it is less dependent on extractive industries.

Trade within the EAC, as a percentage of total trade, increased from 17.7% in 2000 to 18.6% in 2010, after which it fluctuated slightly to 18.4% in 2014. The EAC market remains constrained by nontariff barriers (IMF 2016, Internet site). However, the EAC is in the process of implementing a single customs territory system. The objective of this system is to harmonise and electronically connect members' customs clearance systems to reduce clearance delays at borders, thereby reducing business costs (IMF 2017a, Internet site).

National Level

Gross Domestic Product

Uganda's economy experienced strong growth between 1962 and 1970 but collapsed during the 1970s and 1980s due to political uncertainty and ongoing civil war (Byrnes 1990). Since then, the government has acted to rehabilitate the economy and economic reforms have ushered in a period of solid economic growth and lower inflation. Nevertheless, overall productivity remains hampered by supply-side constraints including underinvestment and high production costs in the agricultural sector (CIA 2017, Internet site).

Average annual growth slowed to 4.5% from 2010–2011 to 2015–2016, compared to the 7% achieved during the 1990s and early 2000s. Growth was initially driven by a rapidly expanding urban population (with increased participation in the formal economy). The economic slowdown starting in 2010 was driven by several factors including adverse weather affecting agriculture, unrest in South Sudan and private-sector credit constraints. Uganda is considered one of the poorest nations in the world (IFAD 2012, Internet site).

Economic Structure and Sector Contribution

The Ugandan economy is characterised by formal and informal economic activity with the informal sector accounting for approximately 45% of all economic activity (UBOS 2016a). The informal economy refers to a diverse set of economic activities, enterprises, jobs and workers that are not regulated or protected by the state.

The service industry typically contributes most to the formal economy and comprises 54.5% of GDP in 2016 (CIA 2017, Internet site), up from 38% in the early 1990s (Wiegratz 2009).

Community services, wholesale and retail trade (predominantly at micro-scale) were the most important service subsectors, followed by transport and

communication (Wiegratz 2009). Services sector growth in Uganda is dominated by telecommunications, tourism and financial services (UN 2011).

Tourism is one of the fastest growing service sectors in the Ugandan economy and is the largest foreign exchange earner. Tourism contributes approximately 9% to GDP and employs around 8% of the national workforce (Deloitte 2016).

Agriculture has traditionally been a major economic activity comprising 24.5% of GDP in 2016 (CIA 2017, Internet site) down from 48.6% in the early 1990s (Wiegratz 2009).[5] The decreased contribution to GDP is primarily because of growth in other sectors such as manufacturing. Major crops include coffee, tea, cotton, tobacco, cassava, potatoes, maize, millet and pulses (CIA 2017, Internet site).

The industrial sector is relatively small but has recorded high growth rates over the past three decades. It accounted for 21% of GDP in 2016 (CIA 2017, Internet site), up from 13.4% in the early 1990s (Wiegratz 2009). The sector is dominated by manufacturing and construction, while electricity production and supply, water supply and mining also contribute to GDP (Wiegratz 2009).

However, the industrial sector is dependent on imported equipment and energy (oil) and is constrained by poor infrastructure, high energy costs and low levels of private investment.

Table A11.4-8 presents the formal economic sector contribution and growth.

Table A11.4-8 Economic Sector Contribution and Growth

Sector	1990–1995	1995–2000	2000, 2001–2004 and 2005	2015 and 2016*
Average Share of GDP (%)				
Agriculture	48.6	42.3	38.7	24.5
Industry	13.4	17.8	18.2	21.0
Services	38.0	39.9	40.2	54.5
Average Annual Growth (%)				
Agriculture	4.0	3.8	2.9	n/a
Industry	11.4	11.2	7.9	n/a
Services	8.2	7.0	7.0	n/a

SOURCE: Wiegratz (2009), CIA (2017, Internet site)

[5]Deloitte (2016) notes that the agricultural sector contributes 5.5% to the formal and 47% to the informal economy.

Oil and Gas Sector

Uganda's first major oil discoveries were confirmed in 2006. In 2007, the government placed a moratorium on further licensing in order to develop a regulatory and fiscal framework. The National Oil and Gas Policy was established in 2008, and the Petroleum Exploration, Development and Production Act (replacing the Petroleum Exploration and Production Act of 1985), and the Petroleum Refining, Conversion, Transmission and Midstream Storage Act were promulgated in 2013. In February 2015, the moratorium was lifted with the announcement of Uganda's first competitive licensing round for six blocks (IMF 2017b, Internet site).

At the time of writing, Uganda estimates overall crude reserves discovered in the Albertine Graben at 6.5 billion barrels, while recoverable reserves are estimated at between 1.4 and 1.7 billion barrels (IMF 2017b, Internet site). The recorded rate of exploration success has been extraordinarily high at more than 85% (the Ministry of Energy and Minerals Development reports that hydrocarbons were encountered in 102 of 116 deep wells drilled in the Albertine Graben by 2015) (IMF 2017b, Internet site).

In 2014, the GOU identified three major commercialisation processes, formalised in a Memorandum of Understanding (MoU) with licensed upstream oil companies in Uganda (Tullow Oil, TEPU and CNOOC) (MEMD 2017a, Internet site), namely:

- production of crude oil and gas for power generation in the short to medium term
- establishment of a 60,000-barrels-per-day (bbl/d) refinery
- export of crude oil through a pipeline or any other viable option.

In 2015, the Petroleum Regulatory Authority was established to oversee the oil sector. The Public Financial Management (PFM) Act of 2015 requires all oil revenue to be deposited in a Petroleum Fund (IMF 2017a, Internet site). The Minister of Finance, Planning and Economic Development is responsible for the overall management of the Petroleum Fund and oversees all transfers into and disbursements from the fund. Withdrawals from the fund can be made to the Consolidated Fund to support the annual budget or to the Petroleum Revenue Investment Reserve for Investments (Bank of Uganda 2016, Internet site).

Production sharing agreements (PSAs) govern tax arrangements for upstream oil production between the government and joint venture partners that provide for royalties, distribution of 'profit oil'[6] between the government and the joint venture partners, corporate income tax (30%) and state participation (IMF 2017a, Internet site).

Inflation

Uganda has experienced generally low and stable inflationary rates since the late 1990s, despite several shocks such as an inflation spike from 4% in 2010 to 18.7% in 2011 (Mawejje and Lwanga 2015).

[6] Surplus of oil over the amount needed to cover the royalty and other costs

More recently, despite the considerable 2015 exchange rate depreciation that led to an interest rate increase from 11% to 17% (CIA 2017, Internet site), inflation has remained in single digits, averaging 6.7% in the fiscal period 2015–2016.

Food price inflation has increased from 5% in September 2016 to 23.1% in May 2017 due to a drought in the Horn of Africa, while core inflation[7] increased to 7.2%. However, food price inflation dropped to 11.8% by August 2017 (Bank of Uganda 2017) and core inflation remained at 5.1% in May 2017, close to the Bank of Uganda's 5% target (IMF 2017a, Internet site).

Exchange Rate

Between 2012 and May 2018, Uganda's exchange rate declined from UGX 2591: USD 1 to UGX 3740: USD 1 (IMF 2017a, Internet site; Bank of Uganda 2018, Internet site).

Government Finances

Total government revenue, including taxes and grants, in 2015–2016 was projected at USD 3.75 billion (UGX 14 trillion[8]) (15.2% of GDP), with projected expenditure of USD 5.41 billion (UGX 20.3 trillion) (20.1% of GDP) (CIA 2017, Internet site; IMF 2017a, Internet site).

Figure A11.4-11 presents government revenue from income tax, value added tax (VAT), excise duties and international trade taxes.

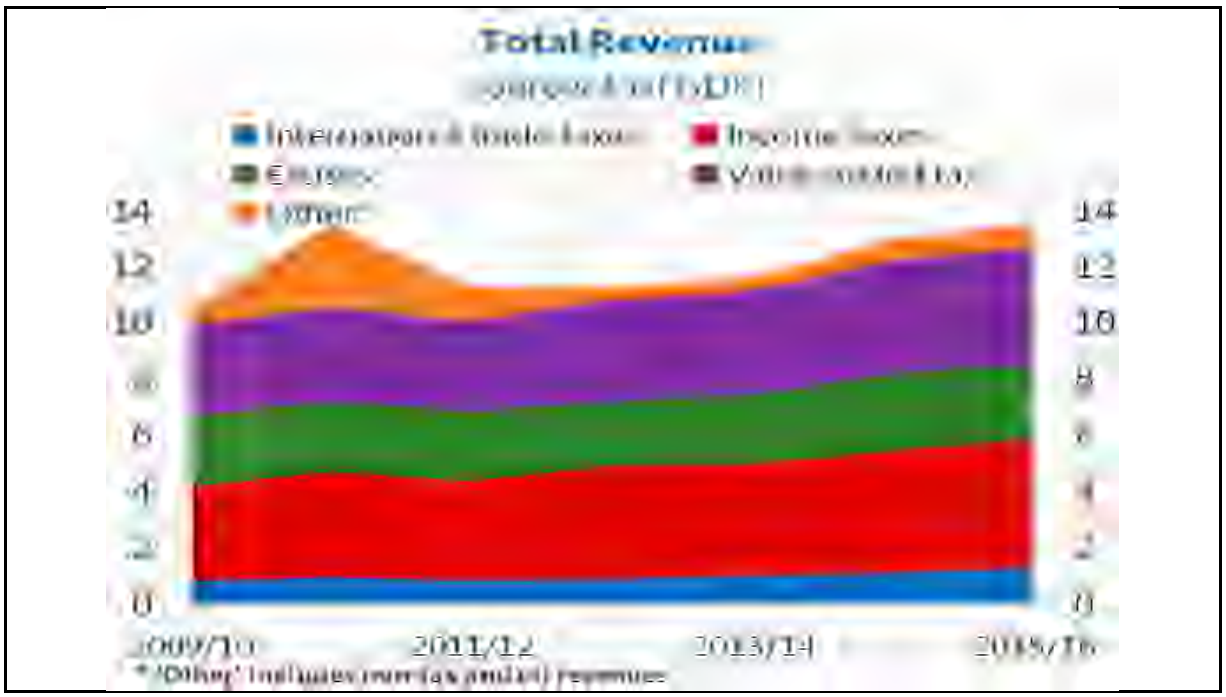


Figure A11.4-11 Government Revenue

SOURCE: IMF 2017c, Internet site

[7] Core inflation (underlying inflation) measures total inflation within an economy, excluding commodities such as food and energy prices, which tend to be much more volatile and prone to inflationary spikes.

[8] Conversions based on exchange rate on 24 August 2018. Source: https://www.xe.com/currencyconverter/

Foreign grants are relatively low for Uganda compared to the East African region:

- about 2% of GDP in 2009–2010
- about 1% of GDP in 2013–2014
- about 1.5% of GDP in 2015–2016 (IMF 2017c, Internet site).

Between 2012 and 2015, state expenditure exceeded income; by 2015–2016, the fiscal deficit had increased to about 5.3% of GDP at more than UGX 4393 billion (USD 1.2 million).

The recent 2015–2016 budget was focused on energy and road projects.

Debt

Uganda received debt relief on seven occasions between 1982 and 2006. In 1998, Uganda became the first country to receive debt relief (USD 650 million) (UGX 2.4 trillion) under the IMF and World Bank Initiative for Heavily Indebted Poor Countries (HIPC). Under the Multilateral Debt Relief Initiative (MDRI) in the mid-2000s, the debt was further relieved by USD 3.6 billion (UGX 13.5 trillion). As a result, Uganda's total outstanding external debt declined from a 1992 peak of 102% of GDP to 12% of GDP in 2007 (Romero-Barrutieta et al. 2015) (see Figure A11.4-12).

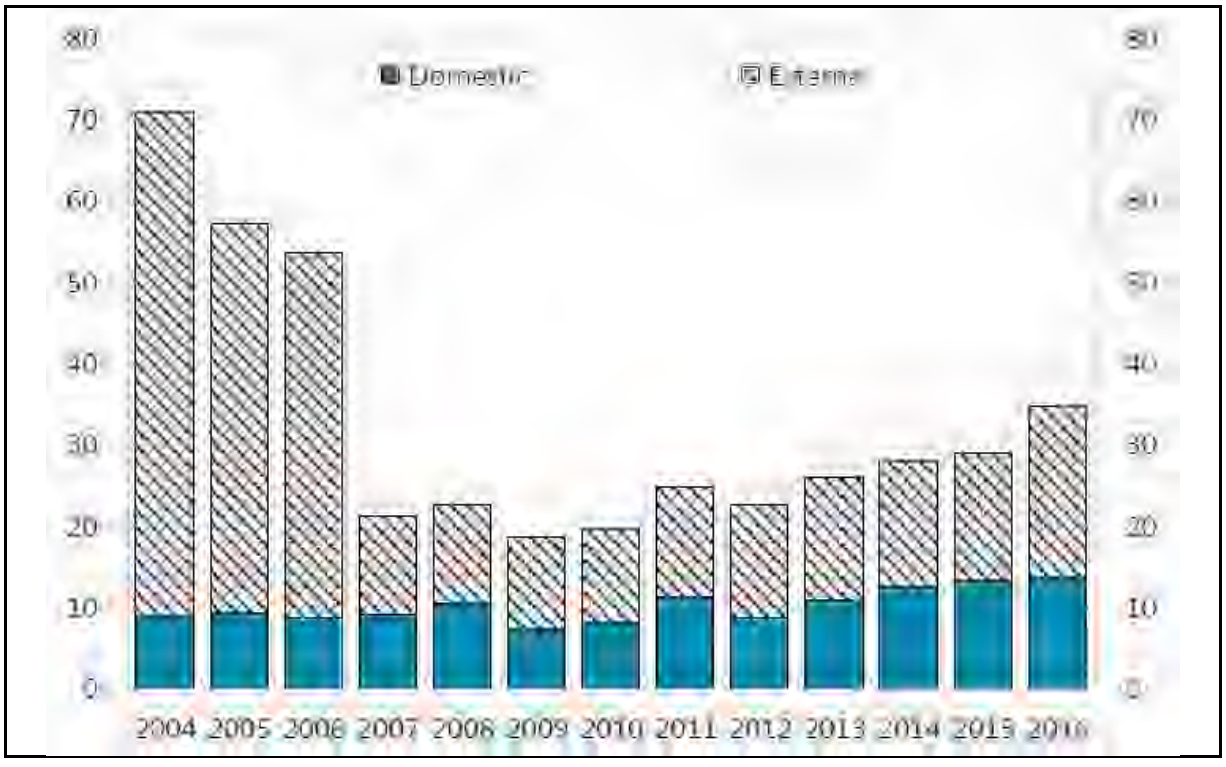


Figure A11.4-12 Public Debt as Percentage of Gross Domestic Product
SOURCE: IMF (2017c, Internet site)

Public and publicly guaranteed debt in Uganda increased from 26.1% of GDP in 2012 to 35.7% of GDP in 2015 (IMF 2017a, Internet site) due to national fronting of large infrastructure projects meant to be financed by external sources (UNDP 2016,

Internet site). Approximately 61% of debt is external, with the remainder domestic debt (IMF 2017a, Internet site).

Public debt is considered sustainable and the risk of debt distress is considered low provided planned investments in energy and transport infrastructure raise growth and revenue (UNDP 2016, Internet site, IMF 2017a, Internet site).

All sovereign eurobonds[9] in Africa are denominated in USD hence significant depreciation of the UGX affects the local currency value of debt service payments. Debt service costs for Uganda rose in 2015 by 2.5 percentage points of GDP and by 27% in local currency terms (AfDB et al. 2016).

Trade

Agriculture accounts for most Ugandan exports; substantial exports in 2014 include coffee (14.9%), sesame seeds (6.3%) and cement (5.5%) (AfDB et al. 2016, IMF 2017a, Internet site).

Uganda's export base is relatively diversified, and the top five export destinations accounted for less than half of exports in 2015 (CIA 2017, Internet site):

- Rwanda (11%)
- United Arab Emirates (UAE) (10%)
- DRC (10%)
- Kenya (10%)
- Italy (6%).

Figure A11.4-13 shows that neighbouring African countries, and the COMESA[10] region in general, are the most important export markets for Uganda but the conflict in South Sudan has affected exports to that country (AfDB et al. 2016, Leading Edge 2017, Internet site).

[9] A eurobond, also referred to as sovereign bond, is a debt security issued by a national government and is denominated in a foreign currency, usually dollars rather than the euro that its name implies (Quartz Africa 2017, Internet site)

[10] The Common Market for Eastern and Southern Africa (COMESA) region consists of Burundi, Comoros, DRC, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

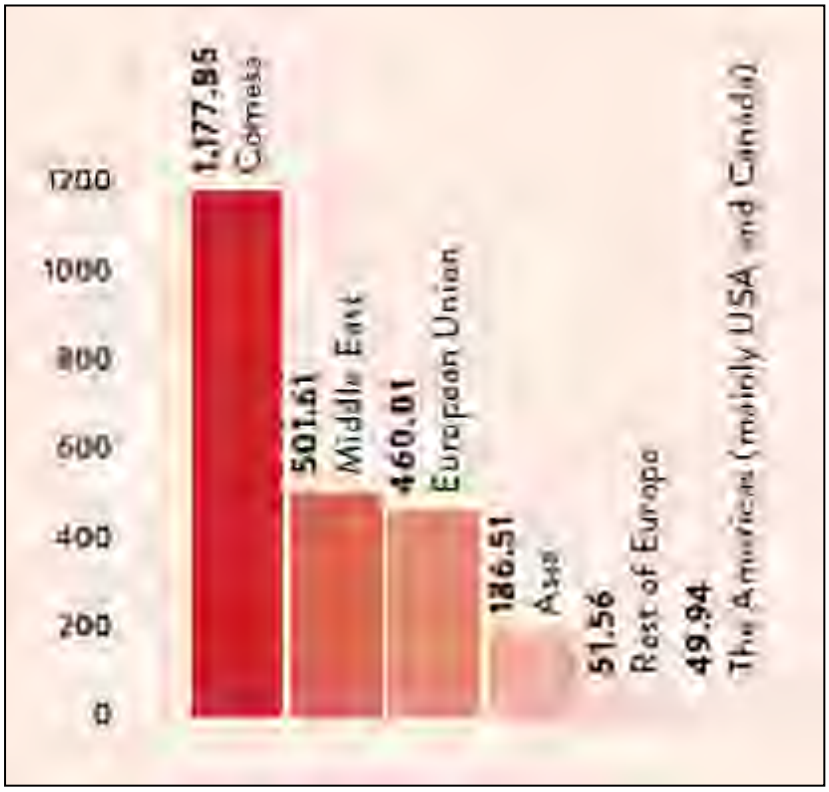


Figure A11.4-13 Main Export Regions, 2016

SOURCE: Leading Edge (2017, Internet site)

NOTE: Values in USD million

Uganda's main imports are vehicles, petroleum, medical supplies and cereals (CIA 2017, Internet site). Oil accounts for 14% of import value, down from 20% in 2012 and 2013 as a result of lower oil prices.

Figure A11.4-14 shows that Uganda's top import partners in 2015 were Kenya (16% of import value), UAE (16%), India (13%) and China (13%) (CIA 2017, Internet site). Though Kenya is in the top three partners that account for nearly half of imports, most imports originate outside Africa.

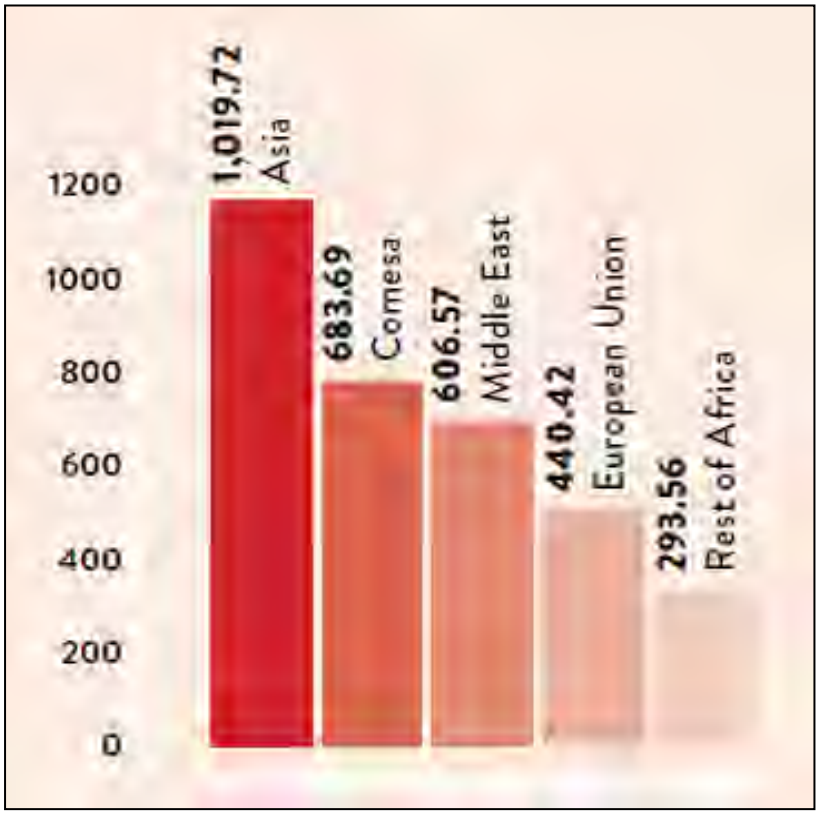


Figure A11.4-14 Main Import Regions, 2016

SOURCE: Leading Edge 2017, Internet site

NOTE: Values in USD million

Table A11.4-9 shows the trade balance for Uganda between 2012 and 2016. From the table imports have consistently exceeded exports, resulting in a negative trade balance. However, a decline in the cost of imports, due to lower oil prices and delayed investments, outweighed a drop in exports, due to lower global and regional demand including from South Sudan, and narrowed the trade deficit during 2015–2016.

Table A11.4-9 Trade Balance

	2012–2013	2013–2014	2014–2015	2015–2016
Exports of goods (USD million/UGX trillion)	2912/10.9	2706/10.1	2738/10.2	2688/10
Export growth (%)		-7.1	1.2	-1.8
Coffee (% of export value)	14.5	14.9	14.6	13.1
Imports of foods (USD million/UGX trillion)	-5035/-18.9	-5074/-19	-4988/-18.7	-4574/-17.2

Table A11.4-9 Trade Balance

	2012–2013	2013–2014	2014–2015	2015–2016
Import growth (%)		0.8	-1.7	-8.3
Oil (% of import value)	20.4	21.5	18.7	14.1
Trade balance (USD million/UGX trillion)	-2123/-7.9	-2368/-8.9	-2250/-8.4	-1886/-7
Trade balance (% of GDP)	-8.5	-8.5	-8.3	-7.8

SOURCE: IMF (2017a, Internet site)

Employment

The following characterise the state of employment in Uganda from available information sources:

- The labour force participation rate in 2016 was 70.1% (ILO 2017, Internet site).
- The size of the labour force in 2016 was estimated to be 19 million (CIA 2017, Internet site).
- The unemployment rate in 2013 was 9.4% (CIA 2017, Internet site).
- Youth unemployment in 2014 was estimated at 13.3% (Byamugisha et al. 2014).
- In 2016, 93.5% of the workforce was in the informal sector (World Bank 2017a, Internet site).
- Employment in both the formal and informal labour markets is increasing (CIA 2017, Internet site; World Bank 2017a, Internet site). This is largely attributed to urbanisation (World Bank 2017a, Internet site).
- Growth in the informal labour market seems to be more rapid than growth in the formal labour market as a result of:
    - rapid growth in construction jobs spurred by urbanisation (AfDB et al. 2016)
    - weak performance of the manufacturing and service sectors, generating fewer wage-paying jobs (Spence et al. 2009: 26–27, cited in AfDB et al. 2016).

Table A11.4-10 shows sectoral employment numbers.

Table A11.4-10 Sectoral Employment

Sector	% of Employment	
	CIA[1]	World Bank
Agriculture	40.0	71.9
Industry	10.0	4.4
Services	50.0	20.2

NOTES: [1] CIA (2017, Internet site). [2] World Bank (2017a, Internet site)
Uganda has a low Human Development Index (0.483 in 2014), a small improvement over 0.478 in 2013, but still below the 0.502 average for the world's least developed countries and the 0.518 average for sub-Saharan Africa (AfDB et al. 2016).

The agricultural sector generally absorbs lower-skilled workers, while services, particularly in business, tourism and construction provide opportunities for semi-skilled workers. The public sector, such as government administration, education and health, generally provides most opportunities for highly skilled workers (Mendez-Parra 2015).

Poverty

Uganda has achieved the second-fastest reduction in poverty in sub-Saharan Africa and met the Millennium Development Goals Target 1a of halving poverty by 2015. The proportion of people living below the international poverty line (USD 1.90 per day) (UGX 7150 per day) has reduced by 2.7% per year since 2003 (World Bank 2017b, Internet site).

However, even after two decades of progress, poverty is still widespread. Approximately 35% of the population (about 11 million people) were below the international poverty line in 2013, down from 62% in 2002 and 2003 and 68% in 1993. Agricultural households account for up to 79% of poverty reduction during this period. This is attributed to good farming conditions and favourable prices for agricultural products in regional and international markets which helped to increased income from crops.

Uganda's Gini-coefficient[11] was 0.39 in 2013 having dropped from 0.46 in 2002, indicating increasing equality. The country ranks 66th in the world in terms of income inequality. The wealthiest 10% of households accounted for 33.9% of consumption in 2012, while the poorest 10% accounted for 2.4% (AfDB et al. 2016, CIA 2017, Internet site).

The AOI will traverse the western and central regions, which are briefly described below, largely based on information provided by UBOS (2010a, 2011a) and presented in Table A11.4-11.

[11] The Gini-coefficient is a measurement of the income distribution of a country's residents. This number, which ranges between 0 and 1 and is based on residents' net income, helps define the gap between the rich and the poor, with 0 representing perfect equality and 1 representing perfect inequality.

Table A11.4-11 Economic Statistics for Western and Central Regions, 2010–2011

Indicator	Western Region (% of Total)	Central Region (Including Kampala) (% of Total)
Regional GDP (2009/10)*	18.7	51.7
Employment	16.0	61.3
Total businesses	18.0	59.2
Business per Sector		
Agriculture	43.4	14.5
Mining	40.8	44.2
Manufacturing	17.2	59.1
Construction	6.4	83.1
Trade	18.2	58.4
Transport	6.9	68.5
Accommodation and food	20.5	58.1
Information and communications	12.0	65.3
Finance and insurance	24.4	47.9
Real estate and business services	13.5	71.5
Health and social works	16.3	61.3
Recreation and personal services	16.3	66.2
Education	16.5	56.4

SOURCE: UBOS (2010a, 2011a)

Western Region

Farming, followed by fishing and animal husbandry, are the most important agricultural activities in the western region. Subsistence farming remains widespread in the region (Compassion 2015, Internet site).

The western region is also home to more than half of the world's mountain gorillas and numerous national parks that attract tourists (Leading Edge 2017, Internet site).

The western region experienced one of the fastest poverty reduction rates of all regions in Uganda. Poverty reduced by an annual average of 7.9% between 2006 and 2013. Only 10% of the country's poor lived in the western region in 2013 (compared to 21% in 2010) (World Bank 2016b, Internet site).

Central Region

The central region includes Kampala, which is the capital and economic hub of Uganda. The central region accounted for 51.7% of the GDP, 59.2% of all businesses and 61.3% of employment in 2010–2011 (see Table A11.4-11).

Fishing is most important in the central region because of its location on the shore of Lake Victoria; this sector employs marginally more people than farming (UBOS 2011a). Soils and climate are also well suited to farming, especially along the shore of Lake Victoria where food crops, coffee and cotton are grown (Compassion 2015, Internet site).

The central region has also experienced one of the fastest poverty reduction rates of all regions in Uganda. Poverty reduced by an annual average of 7.4% between 2006 and 2013. Only 6% of the country's poor lived in the central region in 2013 compared to 15% in 2006 (World Bank 2016b, Internet site).

District Level

Despite the declining contribution of agriculture to national GDP, agriculture plays a pivotal role in the economies of the districts traversed by the AOI.

Large-scale tea and sugar plantations are a key agricultural feature in Hoima district and employ many people in Hoima either directly or as out growers.

Fishing is a major economic activity in:

- Hoima: In this district, fishing is done mostly on Lake Albert. The lake covers roughly 38% of the district.
- Gomba, particularly on major landing sites such as Mamba, Lukunyu, Nabuyindo and Maseregenya on Lake Wamala.

The depletion of fish stocks due to unsustainable fishing practices is one of the major challenges for fishermen in Hoima and Gomba (DDPs 2015).

The mining of gold, salt and kaolin takes place in Mubende (DDP 2015).

Other important livelihoods in the districts traversed by the AOI include small-scale agricultural processing, trade in retail and agricultural goods, and provision of services (including tourism). Cattle ranching is also a major economic activity in both Gomba and Sembabule with regular cattle market days a key feature of some subcounties in these two districts. Further information about these activities can be found in Section A11.4.5 on local economy (nonland-based livelihoods) and Section A11.4.6.2 on land-based livelihoods (livestock rearing).

A11.4.4.2 Trend in Condition and Sensitivity to Change

Economic Outlook

Uganda's economic outlook is considered favourable. Economic growth may exceed 5% in 2017–2018, provided weather conditions stabilise (global warming making seasons unpredictable), FDI flows accelerate, the banking system stabilises and budgeted capital spending is executed without delays. FDI in the oil sector could also help support the recovery of growth, following the issuance of exploration permits (World Bank 2017a, Internet site).

Factors that continue to affect economic growth negatively are low business confidence, the ongoing conflict in South Sudan (affecting exports) and high credit costs that continue to hamper domestic private investment.

Over the medium term, infrastructure and oil sector investments could yield growth rates of 6% to 6.5% (IMF 2017a, Internet site).

Growth is expected to be driven mainly by strong performances in the industrial sector and investment in large infrastructure projects that will boost manufacturing and services. Increasing private consumption will also drive growth.

Core inflation is projected to stay close to the 5% target. With the planned infrastructure investments, public debt would increase but remain manageable, assuming the investments lead to higher growth and increased revenue collection. Risks to economic growth include (possible) weak implementation of public investments, adverse weather and regional developments (IMF 2017a, Internet site).

Uganda is in the process of implementing the second National Development Plan (NDPII), the objective of which is to propel the country toward middle-income status by 2020. The NDPs are implemented through sector investment plans (SIPs), local government development plans (LGDPs), annual work plans, and budgets of ministries, departments and agencies (MDAs). The NDPII also seeks to leverage the international and regional frameworks such as Africa Agenda 2063 and the Post 2015 Development Agenda to exploit growth opportunities (UBOS 2016a).

The Ugandan economy is vulnerable to the following key factors:

- Large FDI flows can cause currency appreciation, which decreases price competitiveness of exports.
- Regional conflicts in South Sudan, the DRC and Somalia could weigh on exports and growth, while an increase in refugee movements could exert budgetary pressure (IMF 2017c, Internet Site, Bank of Uganda 2017).
- Uncertainties about global economic growth, tightening of global financial conditions and increasing protectionism could result in reversal of capital flow out of emerging economies, higher financing costs of (increasing) government debt and reduction in exports. Dependency on economic growth in Europe and conflict in the Middle East could affect remittances.
- Depreciation of the exchange rate (due to increasing demand for foreign currency and global uncertainty), leading to an outflow of capital coupled with rising debt levels, would increase debt service costs but make exports more competitive.
- Delays in the completion of public investment programmes (such as road and energy infrastructure, including the Karuma and Isimba hydropower projects, strategic roads, an oil refinery and a standard gauge railway) would prevent the productivity that could be gained from enhanced infrastructure (IMF 2017c, Internet site).
- Cuts in aid would undermine the sustainability of spending, particularly in the social sector.

A11.4.4.3 Ecosystem Services Provided

The Ugandan economy is heavily dependent upon agriculture, fishing, mining and tourism (all provisioning services). These ecosystem services are described in more detail in Sections A11.4.5 (local economy (nonland-based livelihoods)), A11.4.6 (land-based livelihoods) and A11.4.7 (river- and lake-based livelihoods).

A11.4.4.4 Sensitivity Ranking

Sensitivity ranking is covered in sections discussing livelihood activities including crop farming (Section A11.4.6.1), livestock rearing (Section A11.4.6.2), mining (Section A11.4.6.3) and local economy (nonland-based livelihoods) (Section A11.4.5).

A11.4.4.5 Key Considerations

Key considerations are:

- FDI associated with major projects may have effects on the capital account
- major project investments may have effects on the exchange rate and national inflation and earnings
- major projects create employment opportunities
- synergistic effects can result from different planned developments
- international projects may provide training and capacity building of the Ugandan workforce and local companies to satisfy Uganda's local content policy.

A11.4.5 Local Economy (Non Land-Based Livelihoods)

A11.4.5.1 Baseline Condition of Local Economy (Non Land-Based Livelihoods)

This section reports local economic (nonland-based livelihoods) activities at district and PAC level.

District Level

Although primary agriculture is the most important livelihood in the districts traversed by the AOI, the following economic activities are also important (DDPs 2015):

- small-scale processing of agricultural products
- small-scale trade in retail merchandise and agricultural produce
- provision of services including tourism and transport.

Local economic activities are predominantly informal, meaning that they are neither taxed nor regulated by the state and offer little social protection to workers (WIEGO 2018, Internet site).

Small-Scale Processing

Small-scale cottage industries, largely based on the processing of agricultural products, are based in urban areas such as Hoima municipality (KP22), Kyotera town (KP255), Mubende municipality (KP124.5) and Mutukula town (KP295.5), as well as in rural trading centres such as Katikara Trading Centre (KP41) and Nkooko Trading Centre (KP68) (DDPs 2015). Examples of small-scale processing are Alasco grain millers (Hoima district) and Tarra Corporation (Kyankwanzi district) (maize processing).

The development of cottage industries in rural areas is limited by a lack of rural electrification and lack of access to appropriate technology and markets (Mubende DDP 2015).

Trade in Retail Merchandise and Agricultural Produce

Small-scale trade occurs in all the districts traversed by the AOI. The sale of retail goods and agricultural produce by micro-enterprises predominantly occurs on roadsides in trading centres, towns and cities owing to ease of access to customers and good transportation links (Lwengo DDP 2015). In Uganda, a micro-enterprise is an enterprise employing up to four people with an annual sales turnover or total assets not exceeding UGX 10 million (USD 2700) (Uganda Investment Authority 2018, Internet site). Micro-enterprises may rent shop premises, street stands or trade with customers from the privacy of their homes. The types of retail merchandise sold ranges from medicines and hygiene products to fuel wood, mobile airtime and agricultural produce.

Figure A11.4-15 shows the percentage of households with at least one family member engaged in a non-agricultural household-based enterprise, such as petty trading and selling homemade food items, in the districts traversed by the AOI. KIIs found that small business activities often supplement income earnings from agricultural livelihoods.

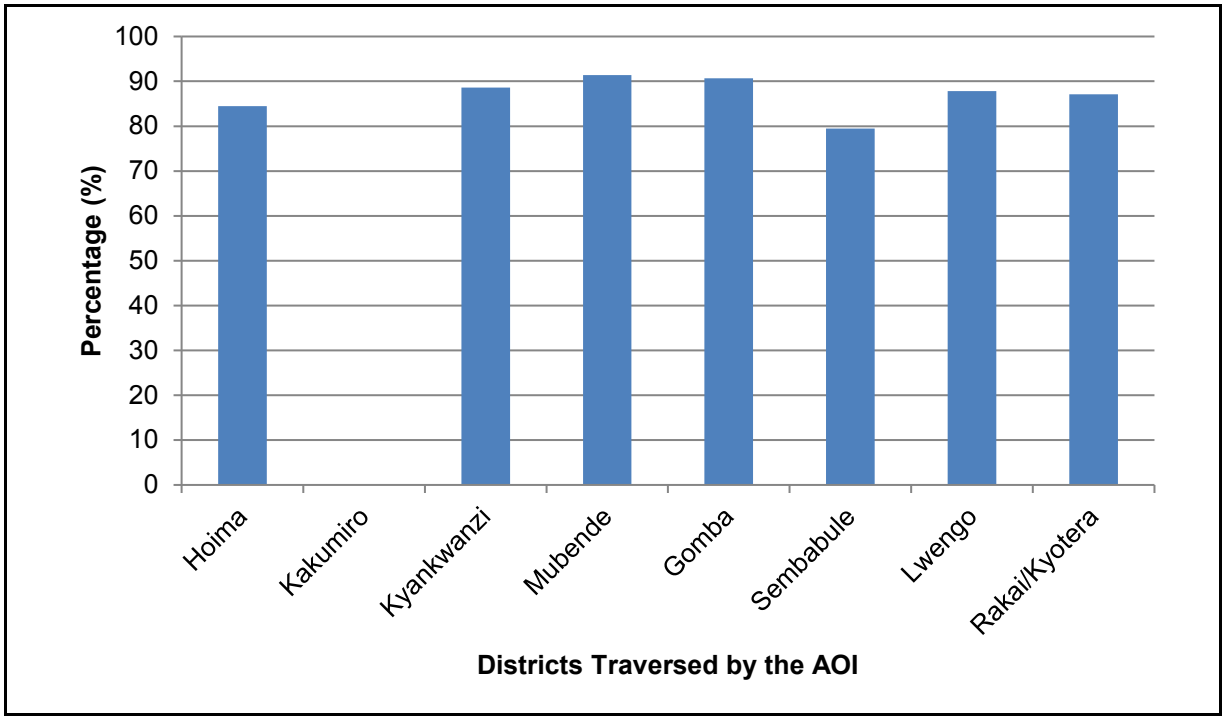


Figure A11.4-15 Percentage of Households with at Least One Member Engaged in a Non-Agricultural Household-Based Enterprise

SOURCE: UBOS (2016c)

NOTE: No UBOS data available for Kakumiro district. However, from primary data collection, it appears that Kakumiro has the same range as the other districts.

Women more often engage in small business enterprises than men. In Hoima, women own about 55% of businesses, most of which are informal micro-enterprises (DDP 2015). In Sembabule district, women are engaged in retail shops and are mostly responsible for petty trade, e.g., selling agricultural and livestock products on the roadside and in markets (DDP 2015).

Trade in retail merchandise and agricultural produce is important to the districts. Constraints to the growth of micro-enterprises are:

- lack of skills, which undermines the competitiveness and productivity of enterprises (Kakumiro DDP 2015)
- limited physical access to markets due to poor road conditions (Gomba DDP 2015)
- limited access to micro-credit and borrowing facilities.

Tourism

Tourism-based livelihoods are important in Hoima district given the abundance of wildlife and geographical features such as hot springs and salt pans along the Albertine Rift (DDP 2015). Figure A11.4-16 shows the main tourism sites in relation to the AOI.

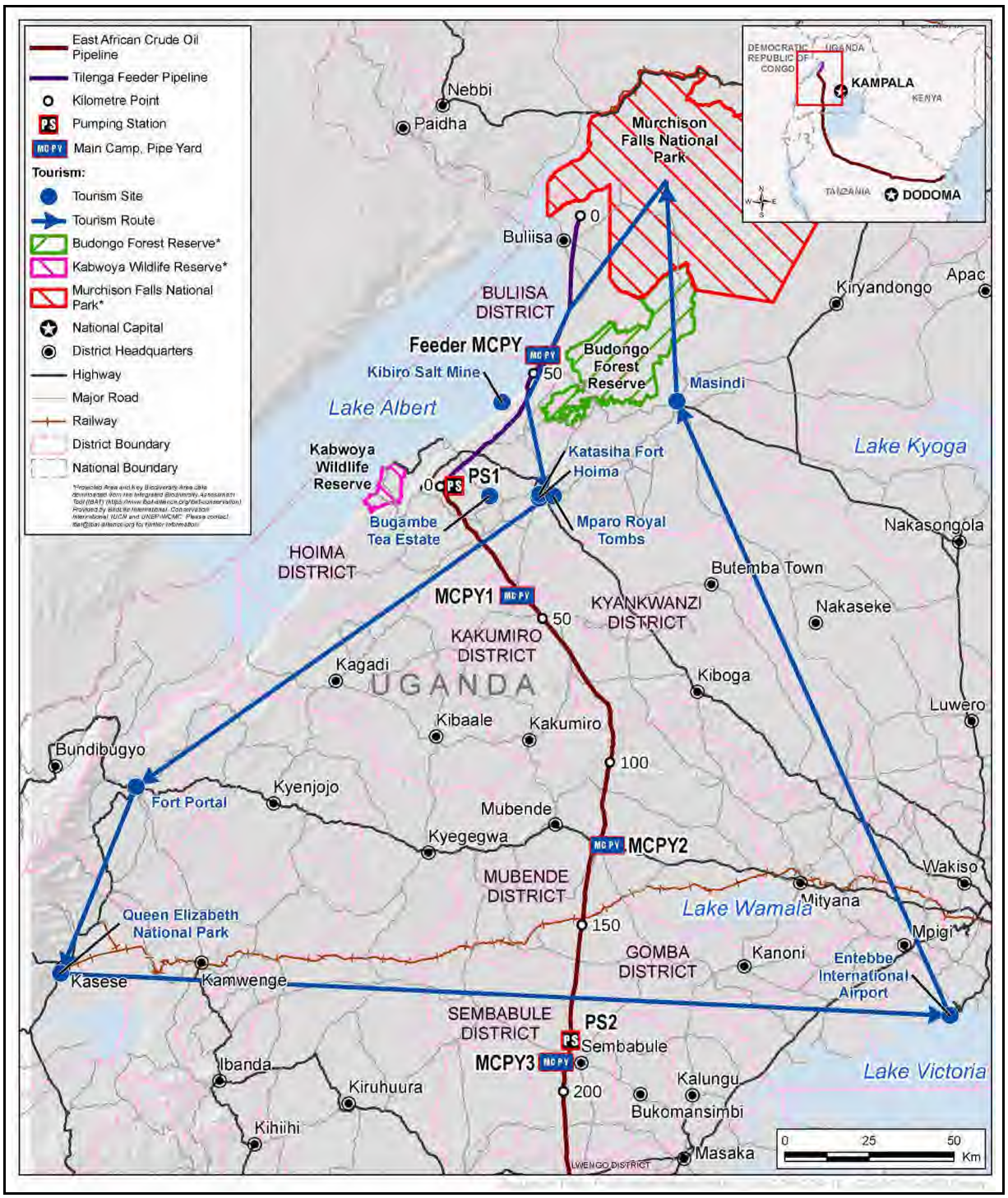


Figure A11.4-16 Tourists Sites

Hoima district is a hub for tourists travelling from Murchison Falls to Queen Elizabeth National Park. Hoima has hotels and guesthouses that have invested in facility upgrades to meet increasing tourist and oil industry requirements.

Tourist sites including the Mparo Tombs (the burial place Bunyoro kings), the Bugambe Tea estate and Kibiro Salt mine (a UNESCO world heritage site) are major tourist attractions for both international and national visitors.

Plans are underway to construct the Kabaale International Airport in Hoima district which is intended to serve as a regional airport to cater for travel to the DRC, South Sudan, Rwanda and Burundi as well as serving regional tourist sites in Uganda.

Potential tourism sites have been identified as investment priorities in:

- Mubende – Booma Hill
- Sembabule – Bigobyamugenyi cultural site, Katonga River
- Lwengo – Kiyanja Wetland (DDPs 2015).

KIIs with kingdom representatives indicate that kingdoms promote tourism and tourism-based livelihoods in the districts traversed by the AOI. In Rakai district, the Kingdom of Kooki operates a museum and shop selling items produced by the local community. The kingdom leaders plan to develop tourism in Rakai by building accommodation and establishing a trail between cultural sites.

Despite the potential of the tourism sector, several challenges remain. Consistent with national-level concerns, human activities have led to serious biodiversity loss and environmental degradation in Hoima (DDP 2015). Lack of infrastructure is a considerable impediment to the development of the industry and tourism-based livelihoods in Sembabule (DDP 2015).

PAC Level

Trade in retail merchandise and agricultural products and provision of services are livelihood strategies present in the sample PACs, particularly among women. Shops selling retail merchandise and agricultural products are present in virtually all the sample PACs (PAC profiles).

Based on KIIs with business owners, the main items sold are:

- stationery and school materials
- maize, beans, rice and other agricultural produce
- general dry foodstuffs (e.g., bread, sweets, cereal) and drinks (e.g., sodas, beers, water) (Figure A11.4-17)
- clothing and shoes
- toiletries and cosmetics (e.g., soaps, toothpaste, shampoo)
- construction materials (e.g., wood, bricks, corrugated iron)
- drugs and medicines (e.g., malaria tablets, acne cream, cough syrups)
- carpentry (making furniture)
- airtime credit for mobile phones and recharge points
- fuel (e.g., petrol) (Figure A11.4-18).

Figure A11.4-17 A Small Business Enterprise in Kigorobya, Hoima District (KP64.5)

Figure A11.4-18 A Fuel Pump in Bukulula, Lwengo District (KP240)

Figure A11.4-19 shows the number of small shops in some of the sample PACs. Shop owners in these PACs employ an average of five people, reflecting the small nature of their operations (KIIs with business owners). Exceptions include shops in Kalembe (KP122) and Mubende municipality (KP124.5), which employ 12 and 30 people respectively.

From the figure, Kyenda (KP125.5), Kamusenene (KP114) and Katikara (KP41) have many shops. These PACs are trading centres. Kyenda is on the Kampala–Mubende highway and at the junction of the road to Gomba district.

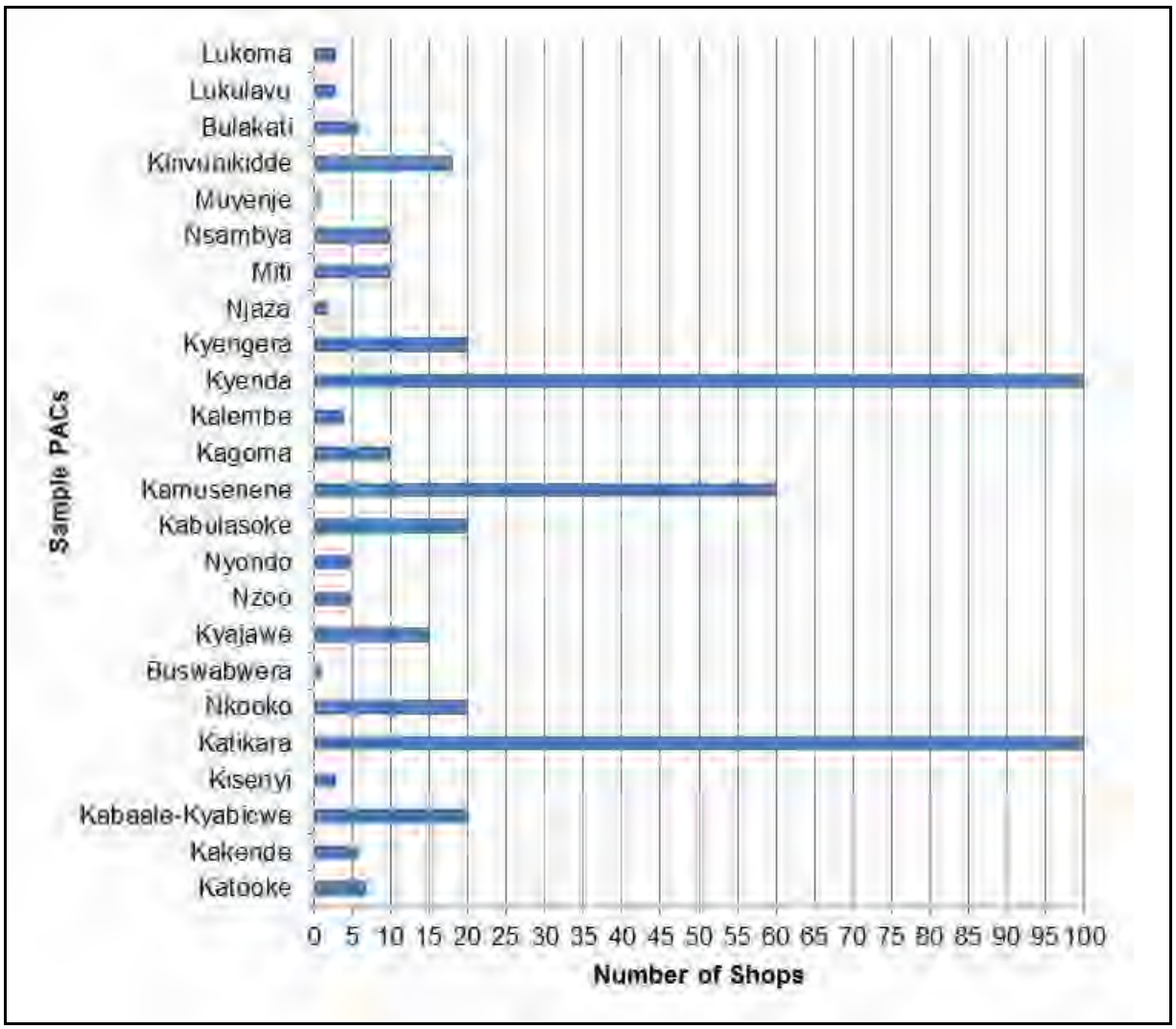


Figure A11.4-19 Number of Shops in Sample Potentially Affected Communities

SOURCE: PAC profiles

A variety of local services is available in the sample PACs (see Figure A11.4-20):

- entertainment, including video halls
- construction, including metal welding, brick-laying and carpentry
- hospitality, including restaurants, bars, guesthouses and hotels
- utilities, including plumbers and electricians
- beauty, including hairdressers and barbers.

From Figure A11.4-20, it can be observed that beauty (see also Figure A11.4-21), construction and hospitality services are available in over half of the sample PACs. Mechanics, tailoring and public transport services are present to a lesser extent. The availability of entertainment, security and utilities services is limited. Note that these are basic services and range from micro-businesses to sole traders and include both qualified and informal personnel and artisans. The capacity of the services was not assessed.

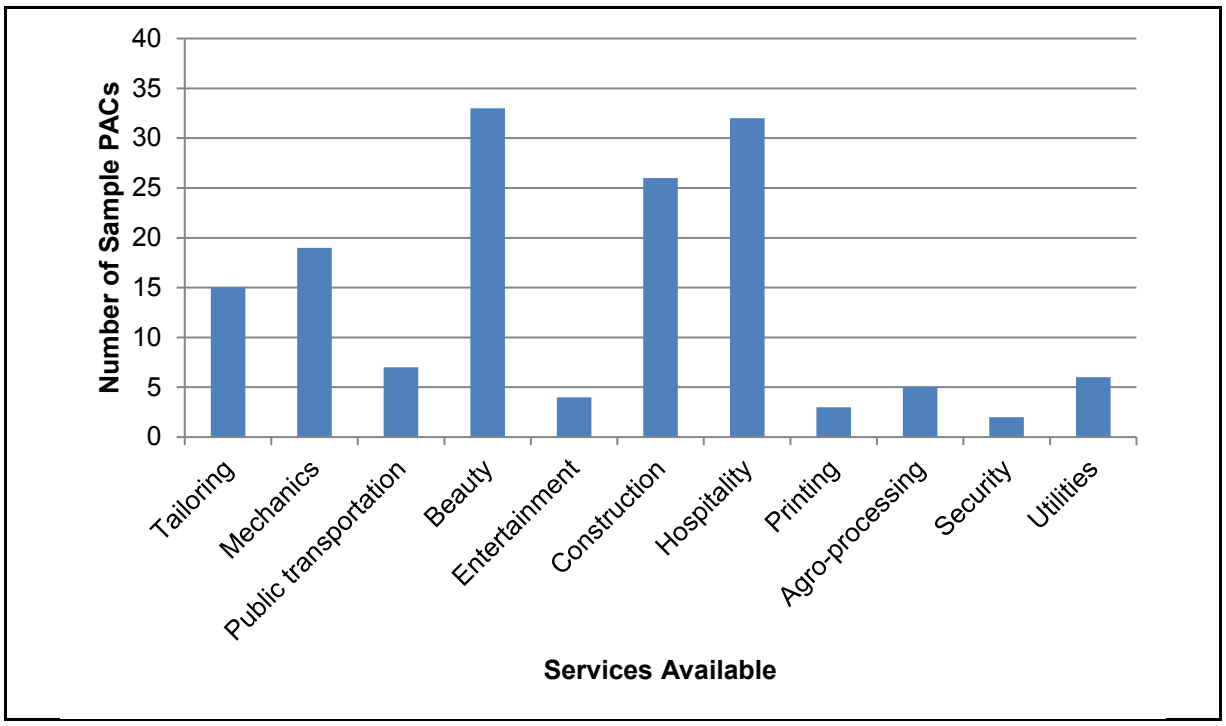


Figure A11.4-20 Services Available in the Sample Potentially Affected Communities

SOURCE: PAC profiles

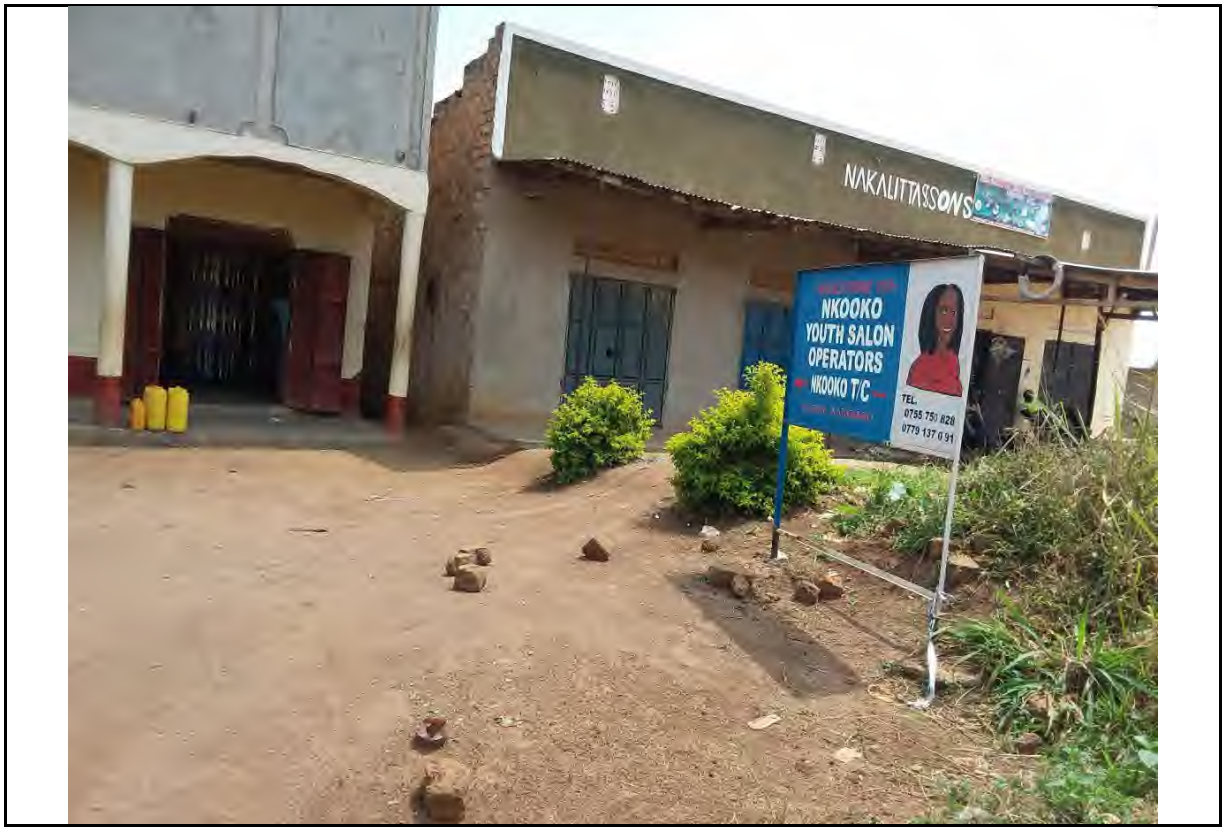


Figure A11.4-21 Nkooko Youth Beauty Salon in Nkooko Trading Centre, Kakumiro District (KP68)

Figure A11.4-22 shows the number of construction, hospitality and beauty services in the sample PACs where data is available.

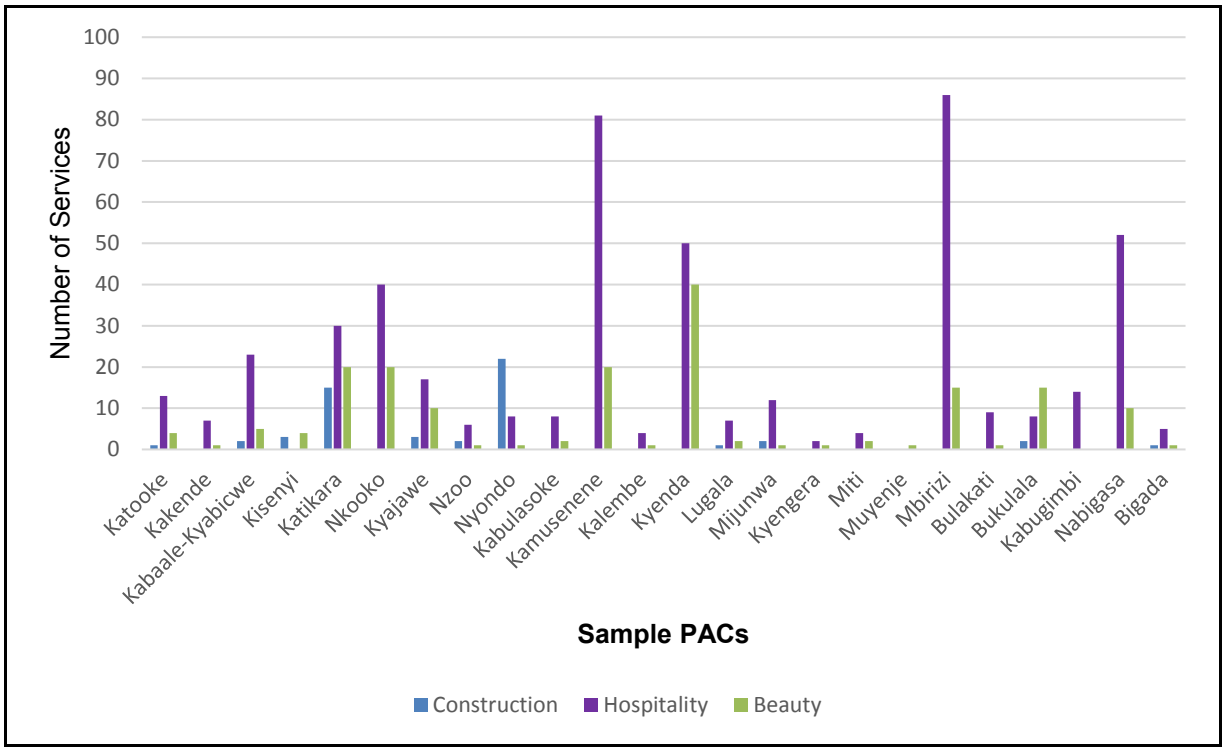


Figure A11.4-22 Number of Services per Category in Sample Potentially Affected Communities

SOURCE: PAC profiles

Figure A11.4-23 and Figure A11.4-24 show respectively the skills base as identified by village leaders FGDs and women's FGDs in all sample PACs. Figure A11.4-23 shows that construction skills were most prevalent. Construction skills refer to local housing construction activities executed by local residents predominantly without formal training.

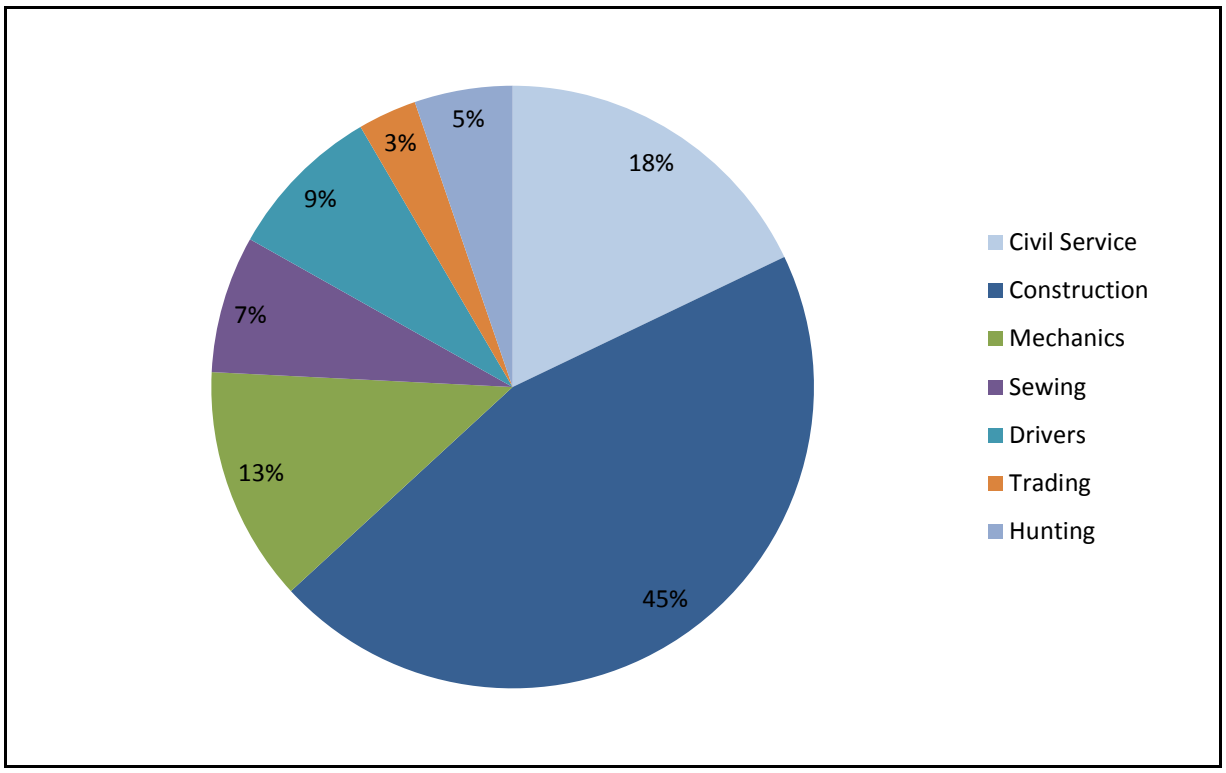


Figure A11.4-23 Skills at Potentially Affected Community Level Cited by Village Leader Focus Group Discussions

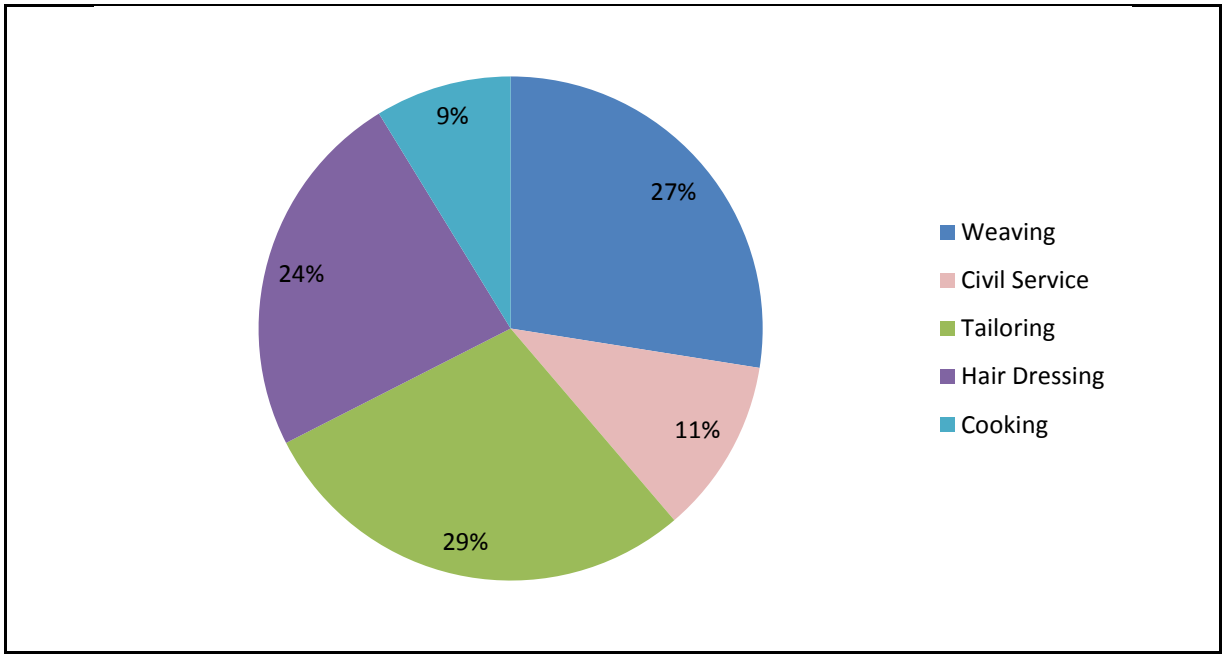


Figure A11.4-24 Skills at Potentially Affected Community Level Cited by Women's Focus Group Discussions

Mutukula town (KP295.5,) a large and densely populated settlement within the AOI, serves as an economic hub for surrounding agricultural communities. Located at the international border between Uganda and Tanzania, the town is a prominent trading

centre with a diverse provision of goods and services (see PAC profile in Attachment A11.2). Parts of the town are connected to the national electricity grid, facilitating business activity in these areas. The tarmac road, which transects the town, is a main route for cargo being transported between the port in Dar es Salaam (Tanzania) and Kampala, as well as other destinations.

Traders migrate regularly daily and weekly between Uganda and Tanzania. These movements are largely unregulated, as custom officials are predominantly concerned with monitoring truck movements. According to FGDs and KIIs, the migration of seasonal agricultural labour (particularly to locations where commercial coffee growing is undertaken) from neighbouring countries (e.g., Rwanda, Burundi) to the areas surrounding Mutukula are common.

Economic activity in Mutukula is reportedly increasing, driven predominantly by the in-migration of Ugandan and non-Ugandan economic migrants. KIIs with customs officials reported an increase in cross-border flows of goods and services. This has led to a rise in customs revenues in Mutukula and benefited local business owners and traders, particularly retail and food outlets supplying passing people and groups. Heightened trading activity has, however, exacerbated pressure on public services (especially health centres) and infrastructure (power, sanitation and roads).

FGDs revealed that Mutukula has a relatively large commercial sex work industry, comprised of nationals from both Uganda and neighbouring countries, particularly Tanzania. Truck and vehicle drivers, as well as traders, are the main targets of sex workers.

Table A11.4-12 shows the income earnings of six local small enterprises in the sample PACs. However, these data need to be read with caution, as they are based on a limited number of KIIs.

Table A11.4-12 Income Earnings of Micro Enterprises in a High and Low Month

District	Subcounty	Settlement	KP	Business Type	Income (High Month) (UGX/USD)	Income (Low Month) (UGX/USD)
Kakumiro	Katikara	Katikara TC	41	Retail (agricultural produce)	10,000,000/ 2,700	2,000,000/ 531.67
Kyankwanzi	Gayaza	Kisala West	81.5	Bar	1,500,000/ 398.68	1,000,000/ 265.77
Mubende	Kitenga	Mubende town	124.5	Retail (agricultural produce)	50,000,000/ 13,289	15,000,000/ 3,987
Sembabule	Mijwala	Nsambya	189	Hair salon	330,000/ 87.71	240,000/ 63.79
Sembabule	Mijwala	Miti	194	Retail (merchandise)	850,000/ 225.91	500,000/ 132.89
Kyotera	Kakuuto	Kabugimbi	282	Retail (merchandise)	400,000/ 106.10	200,000/ 53.00

Table A11.4-12 Income Earnings of Micro Enterprises in a High and Low Month

District	Subcounty	Settlement	KP	Business Type	Income (High Month) (UGX/USD)	Income (Low Month) (UGX/USD)
Kyotera	Kakuuto	Kabonera	284.5	Retail (construction materials)	800,000/212.62	300,000/79.73

SOURCE: KII with business owners

The type and number of small local enterprises and services in all sample PACs can be found in Attachment A11.2.

Programmes such as the Uganda Women Entrepreneurship Programme (UWEP) and the Youth Livelihood Programme (YLP) aim to facilitate the start-up of businesses for women and youth by providing them with zero- to low-interest government loans (KIIs with CDOs). The level of interest paid on the loans depends on the speed of repayment and may be zero if the loan is repaid within the first year or 5% interest if it is repaid within the second year.

Institutions such as Enterprise Uganda have been established to promote the growth of small enterprises by offering:

- training workshops
- assistance with preparation of business plans
- skills development (Fortune of Africa 2013, Internet site).

Business owners in the sample PACs did not refer to the UWEP, YLP and Enterprise Uganda, suggesting that such programmes may not have reached the sample PACs.

KIIs and FGDs with sample PAC members whose livelihoods are based on trade in goods and services revealed the following challenges:

- poor road network rendering transport of goods difficult
- lack of sufficient access to credit to buy bulk supplies and start up enterprises
- customers buying on credit and not paying when due
- fluctuating market prices for agricultural produce
- lack of affordability of electricity and piped water.

Focus groups with women found that sex work takes place in several sample PACs including Nyamasoga (KP0 PS1), Nzoo (KP84), Bethlehem (KP247.5) and Mutukula town (KP295.5).

Sex workers, who are predominantly aged between 19 and 45 years, interviewed in Nyamasoga (KP0 PS1), Hoima municipality (KP22) and Mubende municipality (KP124.5), reported that:

- they work alone, mostly in bars
- they have no alternative means of earning income

- their main customers are tobacco farmers, travellers, businessmen and construction workers
- earnings per day are UGX 10,000 to 30,000 (USD 2.66 to 7.97).

Vocational risks include communicable diseases (e.g., HIV and AIDS) and gender-based violence (GBV) from customers.

Human Rights

The following human rights laws apply to local economy (nonland-based livelihoods):

- Universal Declaration of Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11; African Charter on Human and Peoples' Rights, article 21: Right to an adequate standard of living. Uganda has ratified all these declarations.
- Universal Declaration of Human Rights, articles 1, 2 and 23(2); International Covenant on Civil and Political Rights, articles 2 and 3; International Covenant on Economic, Social and Cultural Rights, articles 2 and 3; ILO Convention 111 on Discrimination (Employment and Occupation); Convention on the Elimination of All Forms of Discrimination Against Women; UN Women's Empowerment Principles (2010); African Charter on Human and Peoples' Rights, articles 2, 3, 15 and 19; Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa: Women's rights. Uganda has ratified all these declarations.

Trends and Sensitivity to Change

Trends with regards to the local economy (nonland-based livelihoods) are as follows:

- Livelihoods based on small-scale agro-processing may benefit from the national calls for more foreign investment in this area (Export Gov 2017a, Internet site). Foreign investment, if attracted, may enable people to participate in more sophisticated post-harvest activities (i.e., packaging), thereby increasing the value they capture from the overall product.
- Infrastructure development is a priority at the national and district level (DDPs 2015 and State House of Uganda 2018, Internet site). Investment in Uganda's road network could lead to lower transportation costs, thereby improving market access for livelihoods based on the trade of retail goods and agricultural products.
- Women and youth engagement in business may intensify as the UWEP and YLP continue to be administered at district and local levels. With support, women and young people may be more empowered to start businesses.
- District governments view tourism as an important growth opportunity and have designated potential sites for future development (DDPs 2015). The development of tourism sites in the districts traversed by the AOI may contribute to the growth of tourism at the district level, increasing the number of job opportunities and income generated. However, funding shortages are a challenge often reported by district governments.
- Sex work in urban areas has increased with women travelling from other districts in Uganda to urban hubs such as Hoima municipality (KP22) and Mutukula town (KP295.5) in Kyotera at the Uganda–Tanzania border.

Ecosystem Services Provided

Local economy (nonland-based livelihoods) does not provide ecosystem services. It does, however, rely on ecosystem services that are described in Section A11.4.6 (land-based livelihoods).

Sensitivity Ranking

Table A11.4-13 presents the sensitive VECs with regards to the local economy (nonland-based livelihoods) identified during the social baseline study.

Table A11.4-13 Local Economy (Nonland-Based Livelihoods) VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Small business owners	Potentially positive	Potential increase in number of businesses and business activity
Employees in informal businesses	Potentially positive	Potential increase in number of businesses and business activity
Sex workers	High (4)	Vulnerable to physical abuse and communicable diseases. Sex workers are increasingly active in the districts traversed by the AOI.

A11.4.5.2 Key Considerations

Key considerations are:

- for small local companies to benefit from major projects, they need to meet standards which are often absent. This may lead to business and trade opportunities being usurped by outsiders.
- women and young people seem to have fewer paid work opportunities and so the lack of start-up capital for the small business entrepreneur is more keenly felt by women and young people
- good road connections between rural communities and urban centres are crucial for business owners to source supplies and market their goods.

A11.4.6 Land-Based Livelihoods

Land-based livelihoods include:

- crop farming
- livestock rearing
- mining
- natural resources use.

A11.4.6.1 Baseline Condition of Crop Farming

National Level

Uganda is an agriculture-based economy. About 72% of the working population is engaged in agricultural activities (World Bank 2017a, Internet site). Census data

indicate that, of the population engaged in agricultural activities, there is a higher number of females (49%) engaged in subsistence agriculture compared to males (37%) (UBOS 2012a: 30).

Households engaged in agriculture tend to undertake mixed farming activities to prevent shocks, such as drought or pest infestations, affecting household income. According to UBOS (2016a), 75% of agricultural households are engaged in crop growing, 58% in livestock farming and 69% are involved in both crop farming and livestock rearing.

The commercial agricultural sector remains small; however, NDPII sets out the intention to transform the sector from subsistence to commercial production (GOU 2013a).

Major Crops

The main cash crops grown are coffee, cotton, tea, tobacco and sugar cane.

Maize, beans, plantain, cassava and sweet potato are grown by most of the agricultural households. Of these crops, maize has the highest uptake with 1.5 million households growing the crop (UBOS 2010b).

Commercial tree planting is increasingly important partially due to increasing construction industry, charcoal and firewood demands. Commercial forestry plantations make up approximately 50,000 ha.

Labour

Agricultural production is predominantly at household level with household members including children assisting after school and during weekends. To transform Uganda from a subsistence agricultural economy to a commercial agricultural economy, a considerable increase in training and mechanisation will be required.

Farming Inputs

Agriculture is characterised by traditional farming methods. Inputs such as improved seed or seedling varieties, fertilisers, pest control measures, irrigation, machinery and equipment are not accessible to most farmers.

According to the World Bank (2016c, Internet site), only one in four farmers used fertiliser, one in ten used pesticides and fewer than 12% of farmers received extension services.

Irrigation

Crops are mainly rain fed. According to the Uganda Census of Agriculture (UCA) 2008–2009, fewer than 1% of agricultural households used any form of irrigation. There are two rainy seasons (March–May and October–November) in the central and southwestern regions of Uganda, and rain harvesting is essential (UBOS 2010c). The Uganda National Meteorological Authority stated that Uganda is currently experiencing the worst drought in the country's history (The Ugandan 2018, Internet site).

Marketing

Commercialisation of agricultural produce is limited primarily by remote farms lacking access to local and regional markets (UBOS 2011b). Figure A11.4-25 shows a typical local market.

Figure A11.4-25 Local Market in Katikara Trading Centre, Kakumiro District (KP41)

Agro Processing

The MAAIF Agricultural Sector Strategic Plan (2016) recognises the importance of agro processing and adding value to agricultural produce, and has highlighted several processing options for Uganda's strategic commodities (MAAIF 2016), including:

- coffee roasting and grinding plants and instant coffee processing
- tea processing
- grain processing
- fish and beef canning
- fruit juice extraction
- natural fibre processing
- butter, cheese, yoghurt, milk curds and UHT milk production
- hides and skin processing
- honey processing including utilisation of beeswax

- cooking oil pressing from nuts and maize
- production of animal feeds and fertilisers.

Farmer Groups

Farmer groups are the main organisations through which the government supports household agricultural production and marketing services.

However, Uganda Cooperative Alliance 2008–2009 found that only 16% of the 3.95 million respondents were members of a farmers group of which 51% were male and 49% were female (UBOS 2011b). The census also found that only a relatively small percentage (35%) of the farmer groups was active.

Role of Women in Agriculture

Figure A11.4-26 sets out the percentage of economically active people involved in agricultural activities. The figure shows that higher numbers of women are involved in crop production (54%), growing vegetables (58%) and fruit cultivation (56%) activities than men.

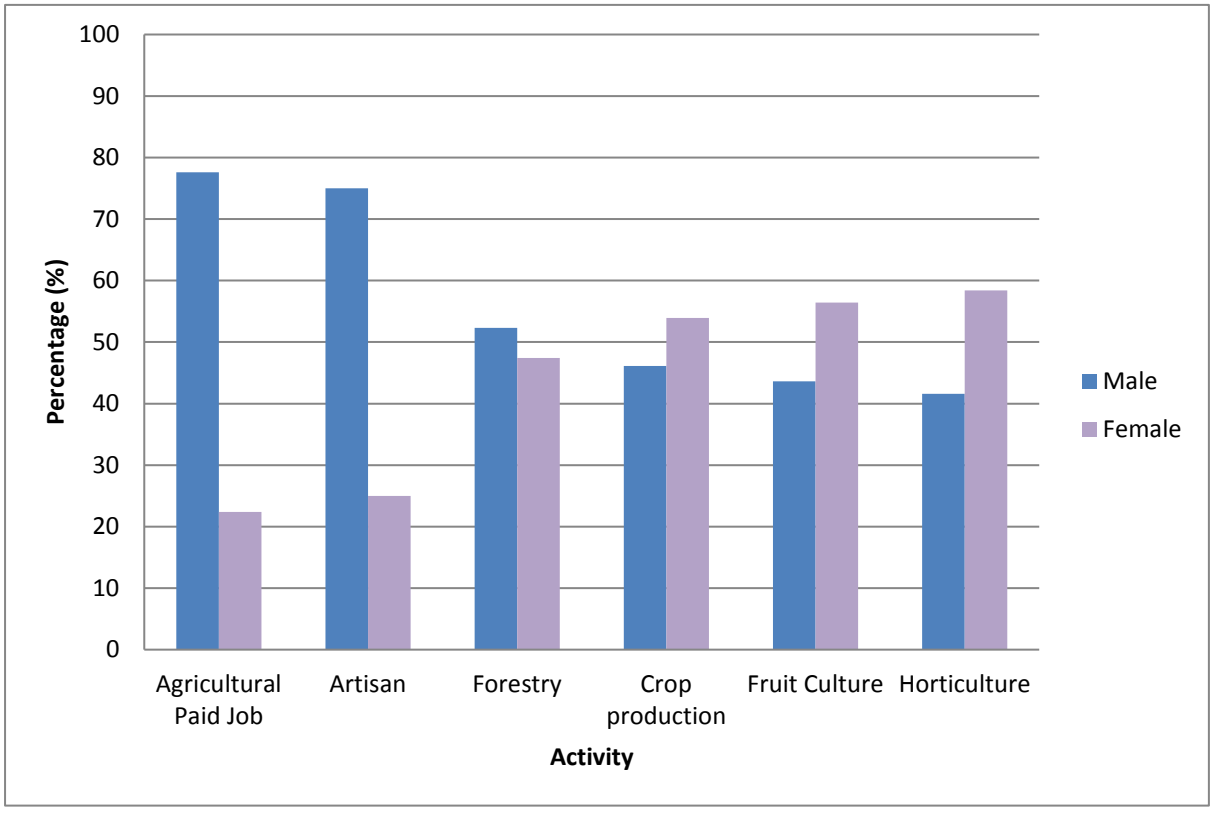


Figure A11.4-26 Economically Active Population (14–64 Years) Involved in Different Agricultural Activities, Disaggregated by Sex

SOURCE: UBOS (2012a)

A World Bank study (2015b) found that male-managed plots were 60% larger than those managed by females and were more likely to be planted with cash crops. The UCA of 2008–2009 found that female farm labourers earned lower wages compared to their male counterparts for the same type of employment.

Major Constraints

Although crop farming is a core sector of Uganda's agricultural economy and the largest employer, major constraints are hindering this sector (New Agriculturalist 2012, Internet site; Export Gov 2017a). These include:

- crop farming operating at a low level of intensity, which results in low productivity
- crop failure because of environmental factors such as unpredictable weather patterns, plant disease or pests
- limited access to finance
- high costs of farm inputs such as hybrid seeds
- limited access to extension activities
- limited farm labour
- inadequate transport networks especially in rural areas and limited means of transportation of agricultural goods to market
- insufficient market information
- weak value chain linkages
- a complex land tenure system.

District and PAC Level

Crop farming is the primary and most important livelihood strategy adopted by nearly all households in the sample PACs except for some households in trading centres or towns such as Mubende municipality (KP124.5), Kyotera town (KP255) and Hoima municipality (KP22) that rely on trading (mostly linked to agricultural equipment and supplies, agricultural product processing and general merchandise).

Commercial and subsistence farming takes place. Figure A11.4-27 shows the percentage of subsistence and commercial farming. Only Kakumiro district has an equal number of commercial and subsistence farmers, which is possibly because of extensive maize production as a cash crop that is marketed in Kampala.

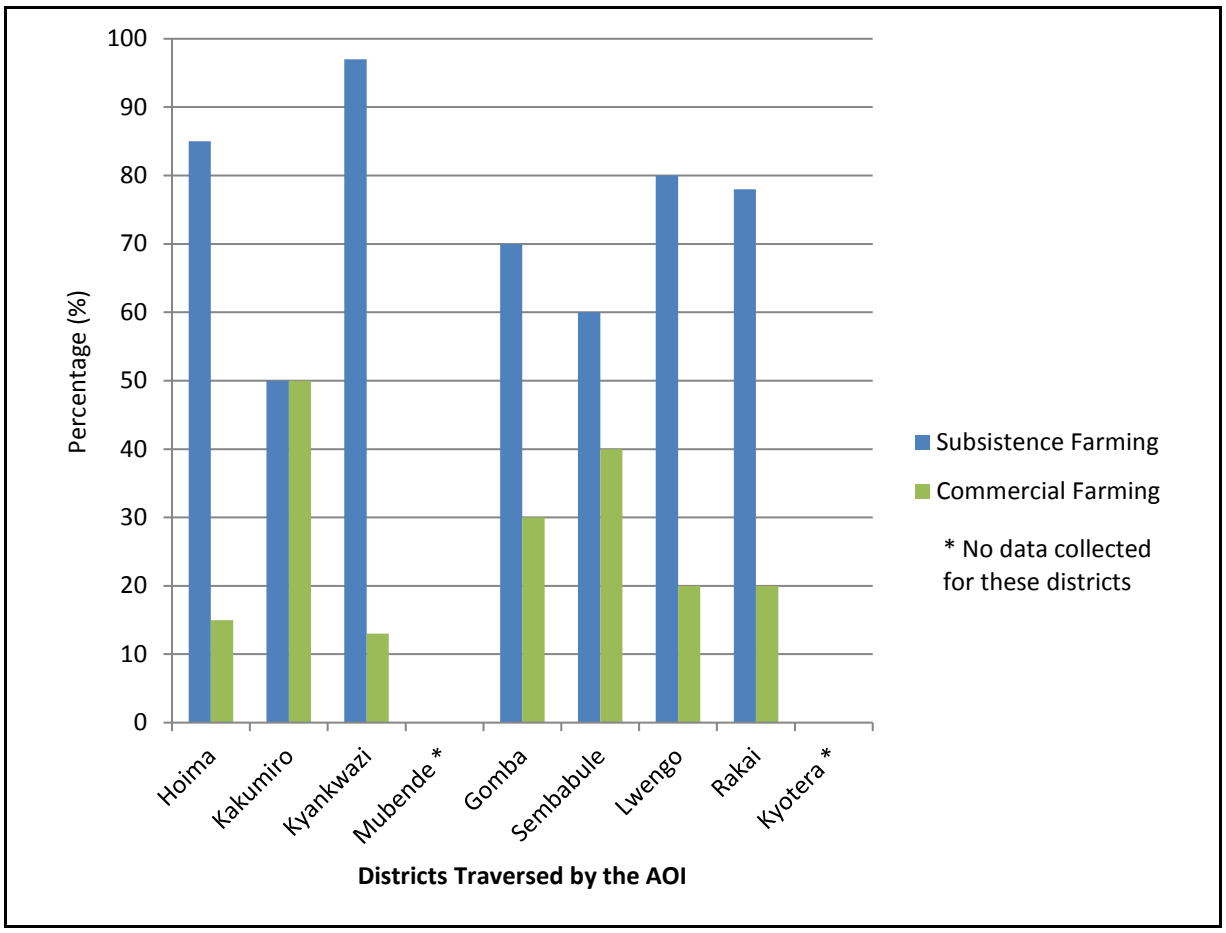


Figure A11.4-27 Proportion of Subsistence and Commercial Farming Across the Districts Traversed by the AOI

SOURCE: KIIs with district agricultural officers

The following large-scale commercial farming enterprises were observed in the districts traversed by the AOI:

- sugar (Hoima Sugar Ltd) in Hoima district (KP0 PS1)
- tea (Bugambe Tea estate) in Bugambe subcounty, Hoima district (KP0 PS1)
- coffee (Kaweri Coffee) in Lwengo district (KP225-240)
- tobacco (Alliance One Tobacco, Uganda Tobacco Services Ltd, Premier Leaf Tobacco, Continental Tobacco Uganda Ltd) in Hoima district
- upland rice is grown in Kakumiro, Hoima and Kyankwanzi districts, but to a very small extent.

Sugar and tobacco cultivation is based on an out grower model providing growers access to credit and inputs such as technical advice, hybrid seeds, pesticide and machinery.

No commercial plantations were observed in the sample PACs. Only a small eucalyptus plantation was identified in Ssanje Katwe village (KP270.5) and Bigada (KP281.5).

Commercial forestry exists in the area crossed by the AOI but to a lesser degree than crop farming or livestock rearing. Both household smallholder plantations and

commercial plantations exist. A large pine plantation in Ntwetwe subcounty, Kyankwanzi district (KP82) in the Taala Forest, is managed by a private company in association with the NFA. There are also commercial private plantations between KP118–119 and KP132.5–133 in Kitenga subcounty, Mubende district and KP281.5 and KP283.5 in Kakuuto subcounty, Kyotera district.

Most of agricultural activities are classified as subsistence or small-scale farming.

Interviews with district agricultural experts revealed the following reasons for the large number of subsistence farmers:

- small land holdings due to division of inherited farmland into smaller parcels
- lack of access to the capital required to develop commercial farming
- costs associated with agricultural inputs (seeds and fertilisers), machinery and storage
- lack of knowledge to transform from small- to commercial-scale farming.

Major Crops

Crops vary across agro-ecological zones.

The main cash crops in the districts traversed by the AOI include coffee, cocoa, sugar cane, tea, soya beans, sorghum and tobacco, and cotton and upland rice on a smaller scale. Sugar and tea tend to be grown in the less arid areas of Hoima and Kakumiro districts. Coffee is traditionally grown toward the south of the AOI in the districts of Rakai, Kyotera and Mubende and to a lesser extent in Kyankwanzi, Kakumiro and Hoima.

Cash crops grown in the PACs include tobacco in the villages of Kayere (KP0), Kakende (KP29.5) and Katikara (KP41), maize and rice in Kabaale–Kyabicwe village (KP35) and Buhimba subcounty, Hoima district and coffee in Mijunwa (KP122.5), Kabugimbi (KP282), Bigada (KP281.5) and Nabigasa (KP283.5).

Figure A11.4-28 presents the seasonal calendar for the farming of crops.

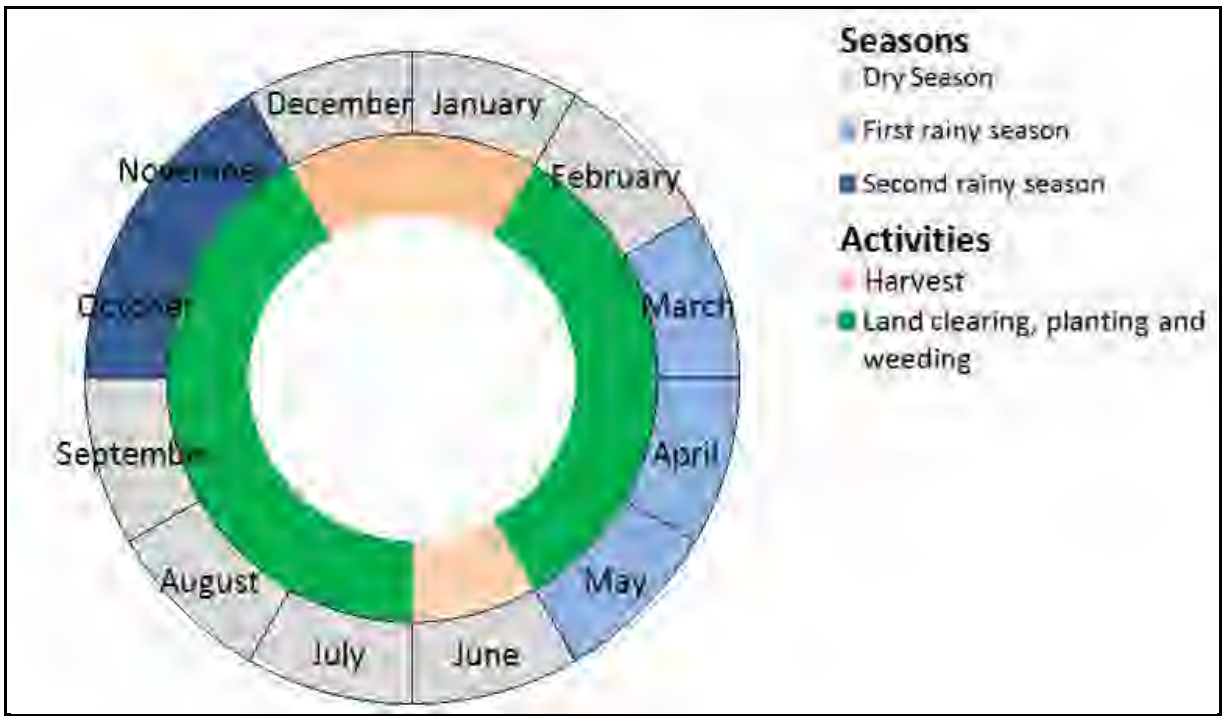


Figure A11.4-28 Seasonal Calendar for Main Crops

Source: SGIs with crop farmers, KIIs with district production officers

Subsistence crops in the districts traversed by the AOI are beans, maize (Figure A11.4-29), bananas (matoke), groundnut, sweet potato, potato, cow peas, sesame, passion fruit, cassava, rice, cabbage and pumpkin. Beans are the most commonly grown crop followed by maize. In all districts, trees such as mango, oranges, pawpaw, pine and eucalyptus are interspersed with arable crops. Crops grown to a lesser extent are ground nut, potatoes, sweet potatoes, millet, sesame, tomatoes, yam and vanilla.

PAC households generally grow a small number of trees for fruit, firewood, lumber, seeds and traditional medicine, as well as to shade crops. Popular trees are avocado, mango, paw paw, guava, citrus, eucalyptus and pine trees. Trees are usually interspersed with crops or near dwellings. Sample PACs repetitively stressed the value of trees to households.

Figure A11.4-29 A Maize Plantation in Kagango, Sembabule District (KP186.5)

Farming Inputs

District agricultural officers have informed that agricultural activities remain dependent on rudimentary hand tools. Nevertheless, a small increase in the use of tractors particularly associated with cash crops such as tobacco (Hoima district) and coffee (Lwengo district) was observed. In addition, isolated examples were provided of a cooperative society, Kyazang, in Lwengo district that owns a tractor for members to use and in Mijunwa (KP122.5) of a privately owned tractor available for hire. A KII with a district agricultural officer in Hoima revealed that, to avoid tractor costs, farmers practiced zero tillage after harvesting. Although reliant on pesticides, the method is beneficial to the soil structure and avoids the necessity to plough the land.

Application of commercial pesticides was found in Hoima, Kakumiro, Lwengo and Sembabule. With increasing numbers of pests such as army worm, locusts, aphids, banana weevils, maize stock borer and termites and crop diseases such as banana bacterial wilt and cassava mosaic, pesticides have reportedly become a necessity. Yet costs associated with pesticides prevent most farmers in the PACs from using them.

SGIs with farmers at PAC level confirmed the necessity of applying pesticides owing to the increasing amounts of pests and plant disease. Alternative techniques

such as pruning, digging up or burning infected plants were undertaken to avoid the costs associated with application of pesticides.

Soil fertility of agricultural plots was reported to be declining. However, application of chemical fertilisers is not common among PACs because of their cost. Instead livestock manure, urea and other organic matter are applied with agricultural practices such as crop rotation and planting of multipurpose trees to promote nitrogen in soils to prevent depletion of soil nutrients.

In the past, in Lwengo, Sembabule, Kyankwanzi and Hoima districts, seeds and seedlings were distributed by the National Agricultural Advisory Services (NAADS). This practice has now become sporadic and targets poorer farming households.

A portion of seeds and tubers are put aside after harvest for the following growing season. Improved varieties of plants and trees are not commonly planted, and the farmers interviewed rarely revealed a desire for improved varieties. This possibly shows the limited extension activities in sample PACS.

Storage of agricultural goods is critical for sample PACs, and it was reported that produce often spoils or must be sold in a hurry at reduced prices because of lack of storage facilities in the household.

Labour

Farming in PACs is predominantly household based, with household members, including children, executing the agricultural tasks such as tilling, planting, weeding and harvesting. Households who have small plots or no land holdings provide labour (paid or in-kind payments) to other farmers. Where labour is not affordable, traditional collective labour is employed, whereby households work on each other's plots on a rotational basis or community members are hired as labourers and served a meal as payment. Hiring of labour is a necessity, although scarcity of casual labour was cited as an increasing challenge in most districts traversed by the AOI (Buseruka subcounty in Hoima; Kasiita subcounty, Kakumiro and Kakuuto subcounty, Rakai, Kakumiro and Kyankwanzi).

In Kakumiro, Kyankwanzi and Lwengo, KIIs indicated that harvesting of produce relied on migrant seasonal workers, mainly from Rwanda. These workers often returned annually for the harvest period.

In coffee, tea and sugarcane plantations, labour is sourced mainly from the neighbouring communities for plantation sections managed directly as opposed to those under the out-grower schemes.

Farmer Groups

The DDPs recognise the importance of farmer groups. The NAADS was prevalent in all districts traversed by the AOI.

Many sample PAC farmers are supported by either the NAADS, a registered farmers' group or an informal farmers' group. The NAADS provides some farmers with seeds, seedlings, extension activities and livestock, but support to its members is reported to be inconsistent. Farmers' associations identified include:

- Hoima District Farmers Association (HODIFA)

- Kisiita Bugaganyizi in Kyajawe (KP57.5)
- Sembabule Farmers Association (SEDAF)
- Kitenga Tuzukuke (KP122.5)
- Buseruka Kwataniza at Katooke (KP1.5).

The level and commitment of support provided by these organisations varied and was reported mostly to be ad hoc. However, members interviewed valued being part of an organisation.

Irrigation

Crop production across the districts traversed by the AOI is predominantly rain fed.

KIIs with agricultural officers and crop specialists stressed the need for appropriate small-scale technologies such as foot treadle pumps for household level irrigation to assist agricultural production. The Hoima DDP asserts that delayed or early rains have more impact on crop yields than the total amount of rain over the course of the year. With increasingly unpredictable wet seasons and erratic rainfall, the need for irrigation is becoming increasing important.

Sample PACs complained about the increasingly unpredictable weather patterns such as late rains causing prolonged droughts. In such cases, crops were watered using water from swamps, rivers, wells, boreholes or valley dams using jerry cans to drip-irrigate newly planted seedlings or seeds. However, it was reported that these water sources were prone to drying up. This irrigation method was said to be time consuming, required substantial human labour to carry the water and only viable if crops were close to water sources. During the field visit, the digging of a 15-m-long canal from a river to a sugar cane plantation in Mutukula town (KP295.5) was observed. In Nkooko Trading Centre (KP68), one farmer used plastic pipes to divert water from a river, but this was only operated during the rainy season. In Mijunwa (KP122.5), the farmers' group, comprising mainly coffee growers, was reportedly in the process of exploring appropriate and cost-effective irrigation methods for its members. In some instances, commercial operations were found to invest in irrigation infrastructure such as Kaweri Coffee plantation in Lwengo district. Out growers of sugar and tobacco manually drip-irrigate seedlings, but irrigation infrastructure was not utilised.

Agricultural Processing

Across the districts, value chain linkages between production, processing and marketing are weak, which results in most agricultural produce being sold unprocessed at the farm gate. Nevertheless, maize milling, and fruit processing facilities were found in the larger towns such as Hoima town and operation of mobile units in Kyankwanzi and Mubende.

Promotion of technologies for primary agro processing and value additions priorities are cited as a priority in DDPs.

Role of Women in Agriculture

Women and men are involved in all aspects of agricultural activities, such as tilling, sowing and harvesting. The Hoima DDP (2015) recognises that in rural agricultural households, women's workloads exceed those of men by several hours a day. It

states that women are involved in crop production and are often responsible for post-harvest processing and storage, marketing of produce, processing staples such as maize and rice for consumption as well as being responsible for household tasks. However, women have limited access to land and productive assets, and there is a discrepancy between women's contribution to crop production and their control over crop marketing and decisions on the use of household funds.

Marketing

Most large towns in the districts traversed by the AOI have a monthly district market and a weekly local market.

Across the districts, value chain linkages between production, processing and marketing are weak, which results in most agricultural produce being sold unprocessed at the farm gate. The Rakai DDP states that agricultural processing is hindered because produce supply is often erratic and there are variable quality control standards. Nevertheless, maize milling, coffee processing and fruit processing facilities were found in the larger towns such as Hoima municipality (KP22), Mubende municipality (KP124.5) and Kyotera town (KP255). Produce is supplied to processing entities by middlemen buyers from farm gate sales.

Farm gate sales of cash crops such as coffee, cotton, maize, rice, sorghum, cassava, bananas and beans to intermediaries are by far the most common way to market produce. Tobacco is purchased directly by the tobacco companies such as Alliance One Tobacco in Hoima and sugarcane is purchased by sugar processing companies such as Hoima Sugar Limited.

Nearly all KIIs revealed that the sample PACs sell their produce surplus such as avocados, onions and potatoes in local markets. To transport their produce, people walk carrying their produce or use bicycles or commercial motorbikes (*boda boda*).

Table A11.4-14 sets out prices for agricultural produce as obtained through KII at sample PAC and district level. Prices vary according to supply and demand, and season. Prices were similar across all sample PACs.

Table A11.4-14 Prices of Agricultural Produce by District

Produce	Price Range Quoted (UGX/USD)	Unit
Avocado	500–700/0.13–0.19	Per piece
Beans	1,200–3,500/0.32–0.93	Per kg
Cassava	50,000–80,000/13.29–21.26	Per bag
Cocoa	5,000/1.33	Per kg
Coffee	2,000-5,000/0.52–1.33	Per kg (depending on grade; and whether it is fresh or dried)
Cotton	1,500/0.40	Per kg
Egg plant	60,000/15.95	Per sack
Eucalyptus trees	150,000/39.89 Large 30,000/7.98 Small	Per tree Depending on size

Table A11.4-14 Prices of Agricultural Produce by District

Produce	Price Range Quoted (UGX/USD)	Unit
Ground nut	2,222–5,000/0.59–1.33	Per kg (depending on being hulled or not)
Irish potato	8,000–15,000/2.13–3.99	Per sack
Jack fruit	5,000/1.33	Per piece
Bananas (matoke)	3,000–5,000/0.80–1.33	Per bunch (depending on size)
Maize	800–1,200/0.21–0.32	Per kg
Millet	2,500/0.66	Per kg
Rice	1,000–2,500/0.27–0.66	Per kg
Sim sim	2,500/0.66	Per cup
Sorghum	1,000/0.27	Per kg
Soya beans	1,000/0.27	Per kg
Sugar Cane	60,000/15.95	Per tonne
Sweet potato	70,000–200,000/18.60–53.15	Per sack
Tobacco	6,300–7,200/1.67–1.91	Per kg (depending on grade)
Tomatoes	120,000–200,000/31.89–53.14	Per basin
Yams	80,000–120,000/21.25–31.88	Per sack

SOURCE: KIIs with agricultural specialists and district agricultural officers, SGIs with crop farmers and Info trade. (2018, Internet site)

Most farmers were able to specify their annual gross earnings from their crops. Table A11.4-15 provides examples of gross earnings for different crops. The prices quoted during the field studies will fluctuate according to demand, season and availability of the produce.

Table A11.4-15 Annual Earnings from Crops across Sample Potentially Affected Communities

Produce	Earnings for One Year per Acre (UGX/USD)
Coffee	3,600,000/956.72
Cassava	47,475/12.62
Ground nuts	1,750,000/465.06
Irish potato	15,000/3.99
Maize	1,800,000/478.35
Rice	5,940,000/1,579
Sorghum	560,000/148.84
Soya	1,520,000/403.99

SOURCE: SGIs with crop farmers

Marketing of produce is cited by sample PACs as being a major challenge to agricultural livelihoods. The main challenges specified by KIIs at district level are:

- inadequate road infrastructure
- high transportation costs which negatively affects produce price
- lack of market price information from surrounding districts, preventing farmers from negotiating prices
- market gluts.

Human Rights

The following human rights laws apply to crop farming:

- the right to an adequate standard of living: Universal Declaration on Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11; African Charter on Human and Peoples' Rights, article 21
- women's rights and children's rights, as they are particularly vulnerable to losing land and family crops: Universal Declaration on Human Rights, articles 1, 2 and 23(2); International Covenant on Civil and Political Rights, articles 2 and 3; International Covenant on Economic Social and Cultural Rights, articles 2 and 3; ILO Convention 111 on Discrimination (Employment and Occupation); Convention on the Elimination of All Forms of Discrimination Against Women; UN Women's Empowerment Principles (2010); African Charter on Human and Peoples' Rights, articles 2, 3, 15 and 18; Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa.

Trend in Condition and Sensitivity to Change

Crop farming trends are as follows:

- The GOU has a five-year Development Strategy and Investment Plan (DSIP) to steer public actions and investments in the agriculture sector. The four key programmes of the plan are enhancing production and productivity; improving access to markets and value addition; creating an enabling environment; and institutional strengthening of the sector.
- Crop farmers, particularly tobacco and sugar farmers, are becoming more commercially orientated and increasingly renting land to enlarge their plot size. These farmers tend to receive assistance from commodity buyers and processors.
- Crop farming is rain fed, low input and low output. Therefore, harvests are vulnerable to the effects of pests, diseases and climate variability. It is common for a crop to be spoilt, thereby threatening household food security and ability to pay for school fees and health services.
- Available labour for farming activities is in decline because young people are migrating to urban areas.

Ecosystem Services Provided

The land-based livelihoods (crop farming) described herein provide the following ecosystem services.

Provisioning services:

- food for basic survival of the population
- income from selling surplus crops to pay for education, clothes and health-related items as well as other basic needs
- jobs for farm labourers
- products for agro-processing activities.

Crop farming is undertaken throughout the AOI PACs, sometimes being their only source of food.

In the sample PACs, most of the farming is subsistence and the agricultural produce is consumed within the family with a small portion being sold at the local market.

Sensitivity Ranking

Table A11.4-16 presents the sensitive VECs with regards to crop farming identified during the social baseline study.

Table A11.4-16 Crop Farming VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Agro pastoralists	Moderate (3)	Agro pastoralists have diversified income streams across crop faming and livestock rearing. Therefore, they are more resilient to external shocks such as pest infestations, animal diseases and climate change.
Commercial farmers (large scale, coffee and tea)	Moderate (3)	Impacts to commercial farming could indirectly affect the livelihoods of the farm workers. However, commercial farmers would be more resilient to adverse conditions than subsistence farmers as a result of greater access to farming inputs, credit and land.
Intermediaries buying goods at farm gates	Moderate (3)	Road access is critical for movement of goods to markets before they spoil. Roads are often in bad condition.
Crop buyers and agro processing	Moderate (3)	Crop buyers, including intermediaries and agro processors, are dependent on the supply of crops, vegetables and fruits to process and sell on. Without the supply of produce, processing will stop. Buyers are dependent on one income stream, but they are likely to have access to credit facilities based on their business.

Table A11.4-16 Crop Farming VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Crop farming households engaged in subsistence and commercial crop farming activities	Very high (5)	Crop farming activities are mostly conducted without inputs and are rain fed. Subsistence farmers have limited access to alternative sources of income due their rural location and lack of education, skills and experience. There is low resilience to external shocks such as crop failure. This can impact on food/nutritional status as well as cash for cost of education and health care.
Landless farm labourers on subsistence farms	Very high (5)	Landless farm labourers are particularly vulnerable. Without income, potential impacts will be felt on household food and nutritional status as well as income for living, education and health care.
Crop farming female-headed households	Very high (5)	Women have limited access to improved farming inputs, have smaller sized plots to grow crops and are more likely to receive lower wages as farm labourers than men owing to cultural norms. They are mainly confined to subsistence farming. Impacts on their crop farming will be felt in their food and nutritional status as well as on their budget for education and health care.

Key Considerations

Key considerations are:

- Crop farming in the sample PACs is mostly undertaken on household land holdings. The impacts of failed crops or loss of land can last for several years as seedlings and seeds are produced each season for the subsequent season.
- Crop farming in the sample PACs is generally rain fed, low input and low output. Therefore, harvests are vulnerable to pests, diseases and climate variability. It is not uncommon for entire crops to be spoilt, thus making households vulnerable in terms of food security and the ability to pay for school fees and health services.
- Farmer groups have relatively low participation but are the government's preferred means of contact.
- Labour shortages may affect household agricultural capability; children are required to complete farm work and miss school when labour is required. This situation may be exacerbated if household members are drawn away to temporary construction jobs.
- Access to markets is a major challenge for crop farmers in rural areas. With poor road conditions and limited market information, farmers are dependent on selling goods in a timely manner locally or to middlemen buying at the farm gate. Any interruptions in the supply chain will affect their ability to market goods and receive a cash income.

- Women are notably disadvantaged in crop farming with limited access to land holdings, capital to improve farming activities and constraints with household duties. With limited education and no other prospects of livelihood opportunities, they are reliant on crops farming as a main stay livelihood.
- Human rights to adequate food and standard of living are sustained.

A11.4.6.2 Baseline Condition of Livestock Rearing

International standards for responsible business provide that individuals should receive adequate compensation when deprived of their means of livelihood[12]. Adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods[13]. Groups showing strong cultural ties to a lifestyle and livelihood such as pastoralists also have cultural rights that need to be protected.

National Level

Livestock rearing is an important economic activity at household level. However, it does not feature prominently in the macro economics of the country (Artelia 2015a).

Domestic consumption of livestock products (meat and milk) is low compared to the country's neighbours with an average of 11 kg of meat and 23 L of milk per capita per year for all Ugandans compared to 41 kg meat and 26 L of milk in Sudan and 15 kg of meat and 198 L of milk per person in Kenya (ICPALD 2013). Figure A11.4-30 presents a national livestock inventory for 2009.

[12] IFC Performance Standards on Social and Environmental Sustainability, Performance Standard #5 Land Acquisition and Involuntary Resettlement, paras 1, 2, Objectives, Requirement 9 (Compensation and Benefits for Displaced Persons); OECD Guidelines for Multinational Enterprises, Chapter II, General Policies, Recommendations 2, 10, 11 and 12.

[13] IFC Performance Standards on Social and Environmental Sustainability, Performance Standard #5 Land Acquisition and Involuntary Resettlement, Objectives, Requirement 9 (Compensation and Benefits for Displaced Persons).

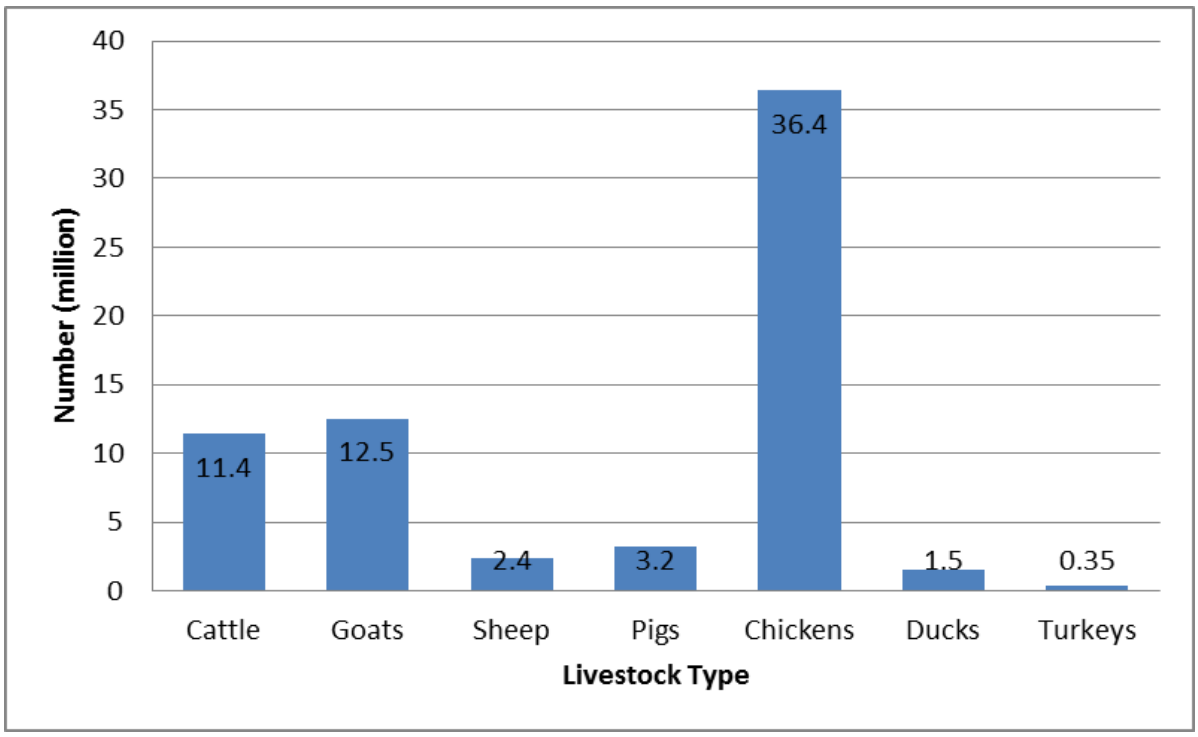


Figure A11.4-30 Livestock Numbers per Species
SOURCE: UBOS (2009a)

Livestock regulations and policies are the responsibility of the MAAIF. Policies established to organise and manage the sector are as follows (Artelia. 2015b):

- national animal breeding policy (1997)
- dairy policies: dairy sector policy (1993), dairy industry act (1998)
- animal health policies: policy on delivery of veterinary services (2001), national veterinary drug policy (2002)
- meat policy (2003)
- national animal feeds policy (2005)
- draft rangeland management policy (2012).

Management and implementation of these policies is undertaken at district level.

Livestock Rearing Practices

Livestock are reared on a commercial basis but also at household level for both cultural and economic reasons including:

- prestige to illustrate family wealth
- investment and a means of savings
- cultural for payments of dowries
- income to pay for school fees and health services
- source of food (eggs, milk and meat)
- source of hide
- source of manure for crops.

Livestock rearing takes place under four types of livestock production systems; agro-pastoral, semi-intensive, commercial ranching and pastoral (FAO 2018).

Agro-pastoralists undertake livestock rearing alongside crop farming. A small number of animals are kept. Pasture lands, either in 'paddocked' areas with informal hedging or fencing on privately owned land or on communal village land, are used to graze livestock.

Semi-intensive production systems are when livestock, including fowl, are kept in confined spaces and provided fodder, feeds and crop residues. These farming entities are mainly in the central and southwestern subregions and in peri-urban areas.

Commercial ranching production systems consist of large herds of animals, particularly cattle, which are grazed on expansive areas of fenced private lands and are provided with supplementary feed inputs. Commercial ranching accounts for 10% of the national herd and this system is mainly found in the central and southwestern regions within the cattle corridor. Production is for beef and milk. Herd sizes can be as large as 10,000 heads of cattle and in the case of goats over 600.

The fourth system, nomadic pastoral production, which is less common and remains mainly in the northeast of Uganda, is a system where livestock are moved from one place to another in search of pastures and water on communal lands. Nomadic pastoralist practices have largely disappeared in Uganda due to factors including:

- government policies that prioritise modern livestock development
- climate change resulting in prolonged droughts
- land tenure matters.

Livestock breeding of goats, sheep and cattle is concentrated in the northeast and along the cattle corridor (UBOS 2009a) that stretches from the temperate southwest of Uganda, across the central subhumid rangelands and up to the northeast arid or semi-arid rangeland. This corridor used to be the traditional migratory route to pastures throughout the seasons. As livestock rearing has become a more sedentary activity, this corridor has become the densest livestock (cattle and goats) production area in Uganda. The cattle corridor is characterised by pastoral systems in the northeast of the corridor, large commercial ranches concentrated in the central region and semi-intensive and commercial systems in the southwest of Uganda, where dairy farming is predominant.

Localised nomadism is still practiced (Rakai DDP 2015). This involves movements of livestock herds, usually cattle, between villages within district borders and occasionally between districts during the dry seasons. In Kyotera district, there were reports of Tanzanian livestock herds being moved illegally to communal grazing areas at Sango bay on the shores of Lake Victoria. Localised nomadism, which enables pastoralists (agro-pastoralists and commercial ranching) to survive the increasingly unpredictable seasons, is undertaken in an organised manner with host pastures being rented. Herders, often family members, move the animals by road or trucks to the pastures and remain with their herd for the duration of their stay in the host pasture. Livestock movements, however, are prohibited during disease quarantines.

Breeds of livestock remain principally indigenous despite government initiatives to encourage livestock farmers to replace local breeds with high yielding introduced breeds (Kabi et al. 2016). Cattle keepers in Uganda have bred indigenous cattle suited to their agro-ecological zones. The Zebu, East African shorthorn Zebu and their crossbreeds represent 93.3% of the Ugandan herd and are favoured by agro pastoralist and pastoralist production systems. Commercial ranches manage herds with a mixture of indigenous and cross breeds, but introduction of exotic and improved breeds is becoming more common. Other breeds, including exotic breeds are Nganda, Boran, Sahiwal, Angus, Holstein Friesian and Bosmara.

The main goat breeds reared are small East African breeds, Mubende and Kigezi. However, exotic meat goats, mainly Boer crosses, Alpine and Savannah, are being introduced.

Sheep breeds favoured are indigenous Ankole fat tailed and Dorset horned breed cross.

Marketing

Trading of livestock is undertaken at regional and district markets or farm gate sales with intermediaries buying live animals for onward sale to abattoirs or to private buyers.

District and PAC Level

The main livestock types in the districts traversed by the AOI are cattle, goats, pigs, donkeys, poultry and sheep. The most common livestock production system is agro-pastoralism performed on a subsistence basis. To a lesser extent, but growing in popularity, is the semi-intensive production system of chicken and pigs. Intensive chicken rearing production was encountered at Katikara (KP40, MCPY1), Nkooko Trading Centre (KP68) and Mutukula town (KP295.5) with flocks of up to 5000 fowl. Cattle rearing as a commercial system is most common in Hoima, Gomba, Sembabule, Lwengo, Kyotera and Rakai districts, with large cattle ranches concentrated in Gomba, Sembabule and Lwengo. Cattle ranches commonly cover tens of square kilometres of paddocked private land with herd sizes of reportedly up to 10,000 heads of cattle, also alongside cattle smaller herds of goats and sheep are also raised. Often, considerable investment is made in animal health management, breeding and infrastructure to make ranching operations commercially successful. Examples of commercial cattle ranches for beef and milk production at district level is Banuti Ranchers Ltd, which has private ranches of cattle and goats spread across Sembabule and Lwengo as well as other neighbouring districts. Larger scale commercial ranching of cattle with herds of up to 600 was encountered at Kayere (KP0, PS1) Kabaale-Kyabicwe (KP35) and the largest at Mabale (KP183).

KIIs with district agricultural officers suggested that there is minimal effort to improve livestock breeds among agro-pastoralists in the AOI. However, commercial ranches are beginning to introduce exotic breeds to improve dairy and beef production, although it was reported that these breeds can be more susceptible to diseases and are not as resilient as indigenous breeds.

Most households in the sample PACs rear livestock. Cattle, goats, pigs, sheep and poultry (chicken, duck and turkey) are kept. Figure A11.4-31 shows the distribution of livestock among the households surveyed.

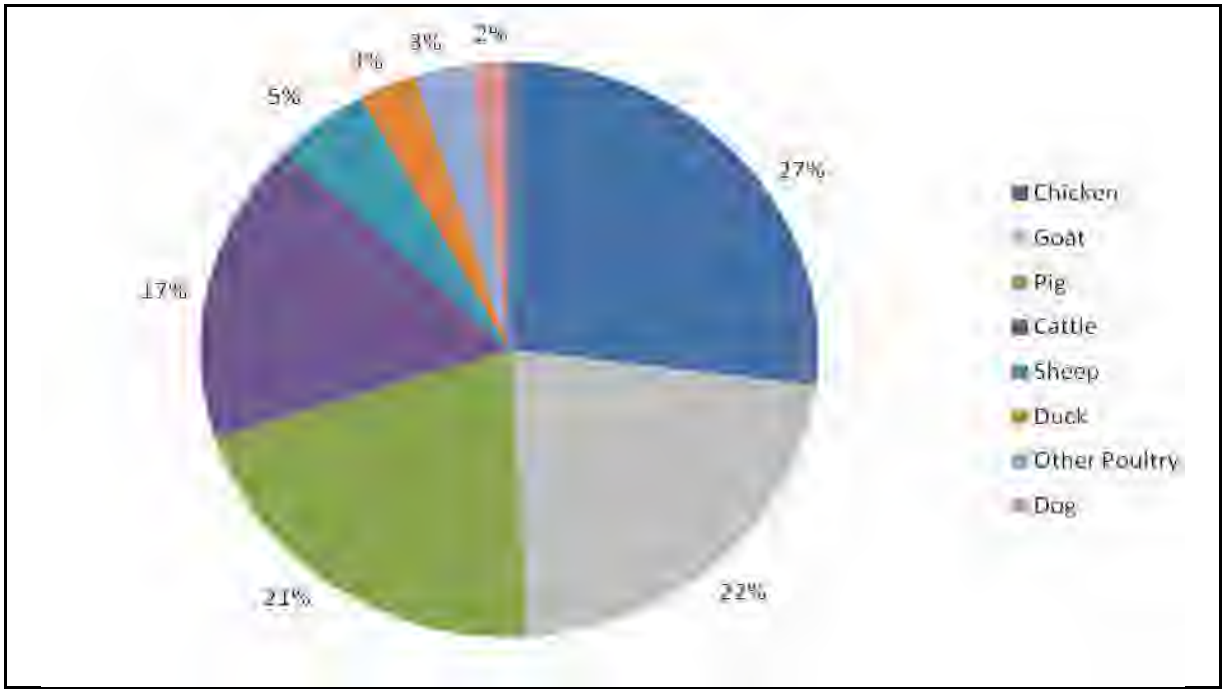


Figure A11.4-31 Livestock and Poultry Kept by Potentially Affected Community Households

SOURCE: HHIs

From the figure, poultry are the most commonly kept livestock, followed by goat, pigs and cattle.

Agro-pastoralists rear livestock as part of sedentary farming activity and grazing takes place on paddocked areas or the smaller animal is tethered. Animal feed was reported to be expensive, so few provided inputs apart from crop residue and salt. Pigs are reared as part of a semi intensive production system on maize, cassava and sweet potato. Poultry are free range with no inputs provided. In terms of commercial production chickens are raised semi-intensively in barns with feed supplementation and commercial cattle ranches provide feed such as mineral salts, maize bran, maize silage and molasses (Asizua et al. 2009).

Labour

Within the agro pastoralist system, all household members share the task of caring for livestock, although females are more likely to care for smaller livestock such as chickens and goats. In the case of large herds of cattle men dominate (Figure A11.4-32). The care, slaughter and sale of livestock are locally perceived as the primary activity of men, but in practice it is shared between sexes. Children are also relied upon to assist with livestock care. Table A11.4-17 sets out the activities related to the livestock rearing.

Figure A11.4-32 A Mixed Herd of Ankole Cattle in Buswabwera, Kakumiro District (KP61)

Table A11.4-17 Livestock Rearing Responsibilities by Household Member

Task	Responsibility
Administer medicine	Men
Caring for calves and young livestock	Women Children
Buying livestock	Men
Cleaning livestock and Kraals	Women Children Herdsmen
Grazing and searching for watering points	Men Herdsmen Children
Milking	Men Women
Marketing dairy products	Women

Within the system of commercial ranching, large herds of cattle, goats and sheep (Figure A11.4-33) are tended to by a herder, sometimes a family member or, herders are sought from pastoralist tribes such as the Karamojong from the northeast of Uganda or the Banyarwanda from the southwest of Uganda or Rwanda. The commercial ranches are reliant on employing several herders to manage the welfare of livestock to maintain optimal productivity of the herd. A KII with a district agricultural officer reported a commercial cattle ranch in Gomba employing up to 150 herders on a formal basis.

Herders encountered during the field studies were either elderly or youth and mainly male. In the morning, livestock are taken from the kraal, an enclosed area made of wood and fencing, to grazing pastures assigned to households or to water sources. To access water sources, the herdsman and or the livestock owners sometimes must traverse land not assigned to them; when this is the case, permission is sought. The animals are returned to the kraal in the evening. One livestock owner reported that people were hired to carry water in containers to cattle during the dry season. Herdsmen were found to be paid a monthly salary and, in some cases, were permitted to milk the cows and sell for their own profit or consume the milk.

Figure A11.4-33 Livestock including Cattle and Sheep Grazing in Njaza, Sembabule District (KP184.5)

Grazing and Localised Nomadism

Localised nomadism of cattle is common in the sample PACs and essential for the larger herds of cattle. Formal arrangements are made between the pasture owner and the livestock owner. These arrangements may be in the form of rent payments or exchange of animals. Herders and their families remain with the cattle during the time spent on the pasture.

Figure A11.4-34 shows the localised nomadic movements identified in the sample PACs and watering points and dams used by cattle.

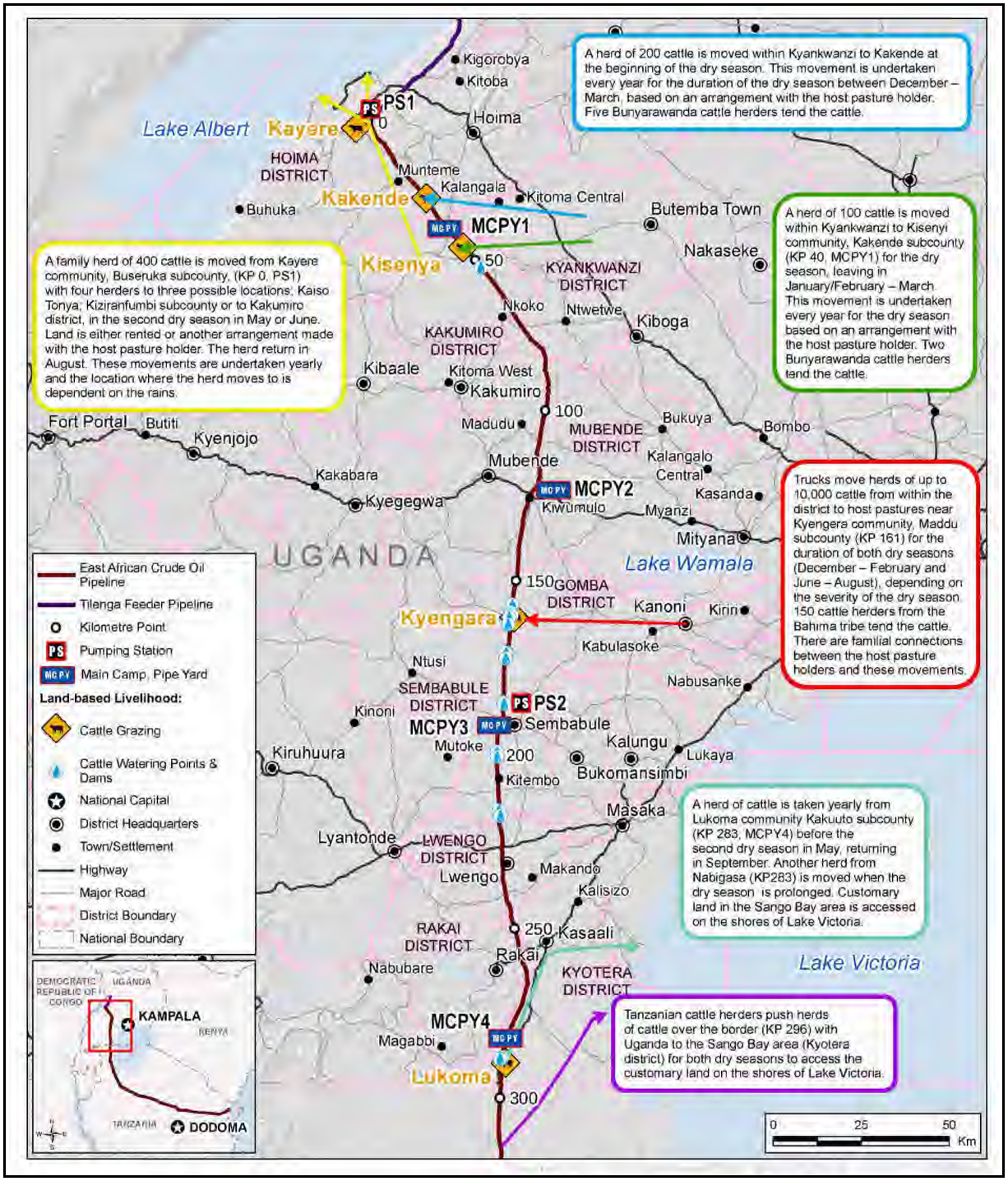


Figure A11.4-34 Localised Nomadic Movements

SOURCE: KIIs with livestock owners and district agricultural officers

It was reported that Tanzanian pastoralists bring herds across the border to the Sango Bay area in Kyotera during the dry seasons.

Marketing

The PAC household survey showed that most households keep livestock for both subsistence and sale (54%)

Agro pastoralists commonly walk livestock to markets, although the commercial ranches use trucks. Marketing of livestock takes place at mixed markets (selling agricultural produce such as vegetables and fruit, livestock and poultry produce and general merchandise such as clothes and manufactured goods) throughout the districts traversed by the AOI. Livestock markets are privately run under a tender allocated by the government. They are tightly regulated with payment dues of up to UGX 15,000 (USD 3.99) for selling and or purchasing animals. Animals cannot be loaded until dues are paid and a letter has been issued by the district veterinary officer. Vendors of livestock must produce a letter from their community LC1 to show proof of ownership of livestock. Farm gate sales were commonly reported with intermediaries purchasing animals to sell on to buyers. In addition to these marketing channels, commercial ranches reportedly sell live animals directly to abattoirs and street butchers (FAO 2018).

The major determinants of sale price for live animals cited by KIIs are the live body weight, breed, age, reproductive stage and sex. Table A11.4-18 presents prices ranges for livestock species. Prices paid for livestock vary across the districts.

Table A11.4-18 Prices Quoted for Livestock across Districts Traversed by the Area of Influence

Livestock Species	Price Range UGX/USD/Per Head
Cattle local breed (female, male, bull, bullocks, heifers)	700,000–2,000,000/186.05–531.59
Cattle hybrid	1,800,000–2,500,000/478.43–664.44
Chicken	10,000–25,000/2.66–6.64
Duck	5,000–10,000/1.33–2.66
Goat	250,000/66.53
Pig	100,000–500,000/26.61–133.06
Sheep	112,000–250,000/29.79–66.50

SOURCE: KIIs with district agricultural officers

Livestock owners were disinclined to provide typical annual income earned from livestock owing to the variation year on year in numbers, breed and gender of animals sold and other driving factors that determine whether livestock are sold. In addition, at the time of fieldwork a quarantine on all livestock movements was in place that affected marketing of all ruminant livestock. Some markets have not been functional since 2012 in Rakai and Kyotera owing to quarantine.

Nevertheless, one commercial rancher at Kyengera (KP160.5) estimated annual income of UGX 32.5 million (USD 8642) gained from a herd of 100 cattle and UGX 6000 (USD 1.60) from a herd of 50 goats and UGX 4.5 million (USD 1197) from a herd of 50 sheep and UGX 4 million (USD 1064) from 5 pigs.

District agricultural officers were unable to specify rearing costs of livestock because animals were kept under an open-grazing system and farmers were not accustomed to keeping records for veterinary costs, additional feed and water.

Livestock products were reported to be sold at the farm gate, in markets and to local milk collectors. There were milk coolers reported in Hoima, Sembabule, Gomba, Kyotera and Mubende districts; in addition, commercial cattle ranches invest in coolers owing to the scale of their operations. Coolers act as a collection point for milk, which is then transported to urban hubs such as Hoima municipality (KP22), Mubende municipality (KP124.5) and Kampala for sale as milk and for dairy product processing. Products are transported to markets primarily on foot or, less commonly, by motorcycle (Figure A11.4-35) and vehicle. Women sell dairy products such as ghee, cheese and yoghurt, and men market meat and hides. Across all respondents, it was found that men sell live animals except for poultry, which was cited as being sold by both women and men. No intermediaries are engaged in the selling of livestock products. Market prices of animal products, as indicated by key informants are set out in Table A11.4-19.

Figure A11.4-35 Milk being Transported to the Dairy by Motorcycle in Hoima, Hoima District (KP74.5)

Table A11.4-19 Average Price for Livestock Products

Product	Price Range Paid (UGX/USD)	Per Unit Sold
Cheese	12,000–30,000/3.19–7.98	kg
Ghee	10,000–16,000/2.66–4.25	kg
Milk	600–1,100/0.16–0.29	litre
Yoghurt	1,000/0.27	litre
Hides	700–7,000/0.19–1.86	kg
Meat (type not specified)	10,000/2.66	kg

SOURCE: FGDs with leaders and women, SGIs and KIIs with pastoralists

Veterinary Services

The range of veterinary services available in the districts includes:

- extension activities incorporating training and demonstrations
- veterinary treatment and disease control, surveillance, clinical treatment, vaccinations and artificial insemination
- regulatory services including meat hygiene, inspection verification, control of movement and quality control.

Livestock diseases reported across the districts traversed by the AOI are set out in Figure A11.4-36. The most common disease reported was East Coast fever, a tick-borne disease affecting cattle and their calves; second was foot and mouth disease.

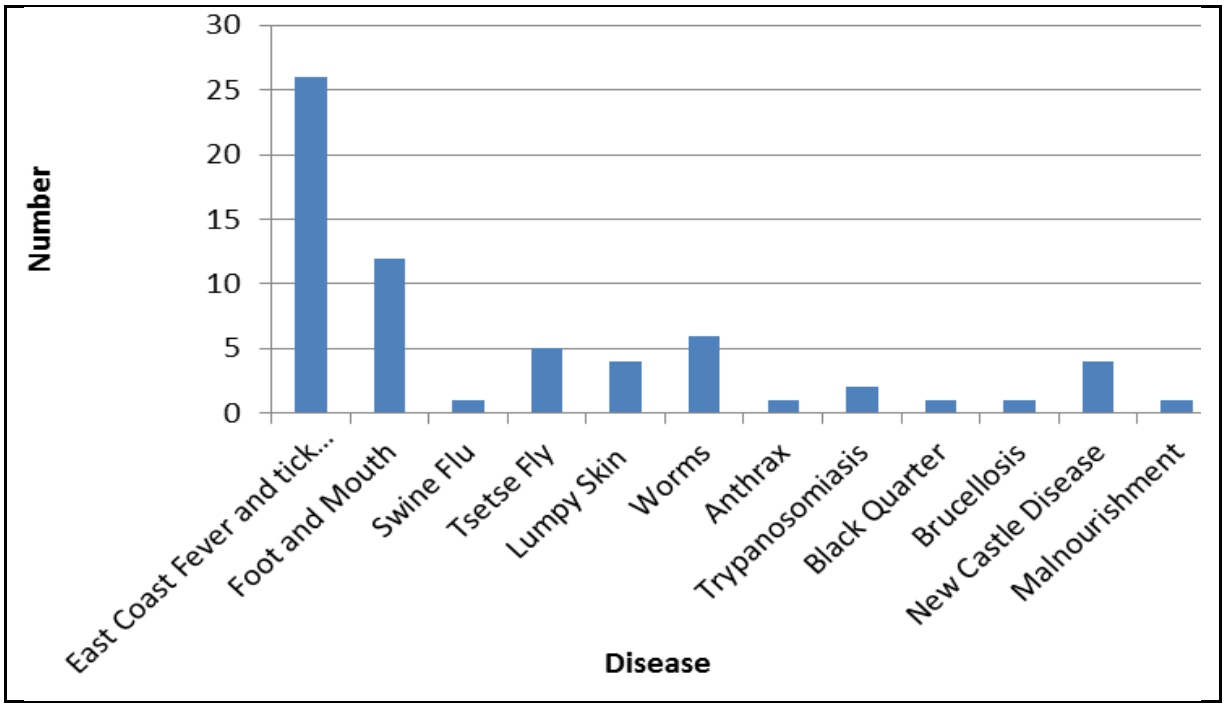


Figure A11.4-36 Prevalent Animal Diseases within Herds

SOURCE: KIIs with district veterinary officers, SGIs and KIIs with livestock owners

KIIs with livestock specialists at the district level indicated that livestock diseases were on the increase and it is recognised that this trend is a major constraint for the commercialisation of the sector. Some of the reasons cited for the increase in diseases are:

- counterfeit veterinary drugs
- farmers' failure to consult veterinary doctors on how to treat diseases and parasites that affect their livestock
- absence of communal dips and sprays
- government initiatives that promote exotic breeds, which are less resistant to disease
- the absence of animal check points on roads to enforce compliance with regulations governing movement of animals

- displacement of some livestock farmers from their land especially those in the cattle corridor from Butoloogo areas (KP84–104), owing to the changes in the land tenure system from customary to titled land
- movement of livestock across international borders.

Veterinary officers and livestock specialists reported livestock injuries, through:

- mishandling by traders during transportation and at markets
- falling in to excavations made for ASM extraction, particularly for sand
- poor shelter
- poor feeding and access to water especially during drier months.

Challenges Facing Livestock Rearing

The following challenges to livestock rearing were cited across sample PACs:

- prevalence of diseases; veterinary services were reported as unaffordable by livestock owners interviewed
- quarantines enforced by the MAAIF have resulted in the closure of livestock markets which has left livestock owners unable to market their animals, leaving them without access to cash
- climate variability has resulted in sustained lengthening of the dry seasons, making access to water sources and pastures difficult
- livestock theft, especially cattle. This is cited as a major challenge and on the increase. Cattle breeders reported theft to be particularly high in the border areas with Tanzania (KP282–296). Cattle are branded to identify livestock, but this does not act as a deterrent with many thefts never being reported or recovered.
- absence of government support for livestock owners
- lack of available land to make livestock rearing commercially viable
- threats from animals such as snakes and baboons were cited by 28% of livestock owners interviewed. Baboons were said to be a problem in Buseruka, Lugusulu, Madudu and Butoloogo subcounties.
- increasing livestock injuries, including falling into excavations related to informal ASM, when moving animals to pastures and water sources
- prices of livestock and their products fluctuate as a result of the sellers need for cash and condition of the animals
- conflict as a result of damage to crops when herds of stray into farmland
- competition for resources such as water and land between pastoralists and host communities.

Human Rights

The following human rights laws apply to livestock rearing as a land-based livelihood:

- the right to an adequate standard of living. Universal Declaration on Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11; African Charter on Human and Peoples' Rights, article 21
- the right to water, as this is one of the communities' main concern regarding livestock rearing

- groups showing strong cultural ties to a lifestyle and livelihood (for example pastoralists) also have cultural rights. Universal Declaration of Human Rights, article 27; International Covenant on Economic, Social and Cultural Rights, article 15; UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage; African Charter on Human and Peoples' Rights, article 17
- international standards for responsible business also provide that individuals should receive adequate compensation when deprived of their means of livelihood. IFC Performance Standards on Social and Environmental Sustainability, Performance Standard #5 Land Acquisition and Involuntary Resettlement, paras 1, 2, Objectives, Requirement 9 (Compensation and Benefits for Displaced Persons); OECD Guidelines for Multinational Enterprises, Chapter II, General Policies, Recommendations 2, 10, 11 and 12
- adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods. IFC Performance Standards on Social and Environmental Sustainability, Performance Standard #5 Land Acquisition and Involuntary Resettlement, Objectives, Requirement 9 (Compensation and Benefits for Displaced Persons).

Trends in Condition and Sensitivity to Change

Trends in condition for livestock are as follows:

- Long-distance movements in search of water and pasture are no longer undertaken. Localised pastoralism is common with organised movements of livestock to host pastures.
- Livestock owners with large herds of cattle are increasingly reliant on pasture rental agreements and, in the dry season, scarce water sources.
- Government initiatives promote the introduction of exotic livestock breeds; however, livestock owners are slow to engage and the new breeds are less disease resistant.
- Despite an increased prevalence of livestock diseases, livestock owners lack access to veterinary services. At the time of the survey, foot and mouth disease quarantine prevented any livestock movements.
- Rural households invest in livestock as a means of saving for dowries, school fees and health treatment.
- Access to grazing land and watering points is decreasing as a result of increased use of land by activities including crop farming and building or improving roads and dwellings.
- Ongoing conflicts between farmers and livestock owners over access to land is likely to worsen due to the growing population and changing weather patterns.
- Settlements that are better connected to markets have seen an increase in income from sale of milk and animals.

Ecosystem Services Provided

The land-based livelihoods (livestock rearing) described herein provide the following ecosystem services:

Provisioning services:

- rural income from selling livestock
- food security for families and future generations (if managed in a sustainable manner)
- financial security (livestock rearing is part of a diversification strategy to ensure some cash will be available when other means of income fail).

Cultural services:

- preservation of cultural heritage and traditional knowledge where livestock rearing is inter-generational.

Key points to note are that within the districts traversed by the AOI, livestock are used both for subsistence and for sale. Livestock rearing in the sample PACs is predominantly sedentary with grazing on owned or rented land, while a form of localised nomadism takes place owing to increasingly unpredictable rains particularly in the Kyankwanzi, Buseruka and the Sango Bay areas.

Land provides a provisioning service as a resource for livestock keeping. It provides grazing resources, water sources, ground for movement and habitation of livestock herds and trees for shelter and medicinal herbs.

Sensitivity Rating

Table A11.4-20 presents the sensitive VECs in relation to livestock rearing identified during the social baseline study.

Table A11.4-20 Livestock Rearing VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Commercial ranch owners	Moderate (3)	Commercial ranch owners own large tracts of land and rear livestock commercially with assistance of production inputs. As operations are large scale, they are more resilient to external shocks except for disease, climatic change and a shortage of labour (e.g., herdsmen and other farm workers).
Livestock keepers and their families including women, children and elderly undertaking crop farming (agro pastoralism incorporating small-scale livestock production)	Moderate (3)	Livestock keepers, who are also crop growers, are vulnerable to loss of livestock but less vulnerable than those who rely solely on livestock rearing.
Livestock owners and their families including women, children and elderly with herds, not undertaking crop farming in conjunction with livestock keeping	Very high (5)	Without free movements of large herds (cattle), animals may not have sufficient pasture and water sources. Herd owners are less resilient to external shocks as their main dependency is on their herd.

Table A11.4-20 Livestock Rearing VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Hired herdsmen (often of Karamojong, Bunyarawanda ethnicity or non-Uganda nationals)	Very high (5)	Herdsmen employed by cattle owners have low or no education and some are without identity cards. They have no alternative livelihood means and are more vulnerable to external shocks.

Key Considerations

Key considerations are:

- Livestock rearing activities in the sample PACs are under pressure due to shortage of land and water resources.
- Localised nomadic pastoralism within and between villages is undertaken in the sample PACs during the dry seasons.
- Livestock diseases are common and increased movements of vehicles and people could increase the spread of diseases.
- Owners of large herds in the sample PACs often do not have diversified income.
- Human rights of access to food and a decent standard of living are maintained.

A11.4.6.3 Baseline Condition of Artisanal and Small-Scale Mining

National Level

The Directorate of Geological Survey and Mines (DGSM) in the Ministry of Energy and Mineral Development is the regulatory authority for mining and ASM activities.

Deposits of gold, tin, tungsten, niobium, coloured gemstones, limestone, marble, kaolin, clay, granites are present in Uganda, see Figure A11.4-37. In addition, construction materials such as sand, clay, murram, limestone, marble, kaolin and stone aggregates are quarried.

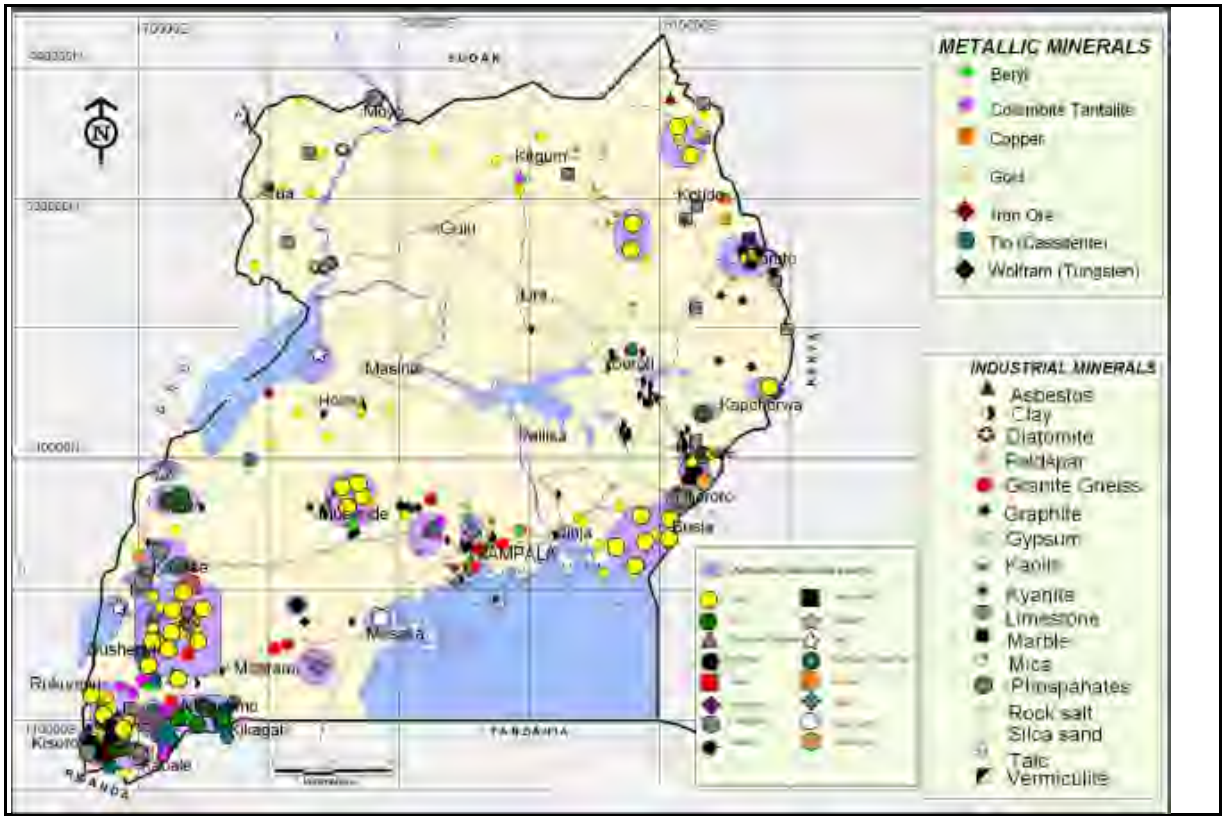


Figure A11.4-37 Metallic and Industrial Minerals

SOURCE: MEMD (2017b)

The Geological Survey of Uganda was set up in 1919. Between the 1950s and the 1970s, mining expanded and became more formalised with copper, phosphates, limestone, tungsten, coloured gemstones, niobium, tantalum, gold and tin being exploited. During the civil unrest of the 1970s, the mining sector collapsed and stimulated an environment for the development of unlicensed ASM activities, with retrenched employees of the formal sector setting up their own mining activities, particularly in the southwest and to a degree in the east and northeast of the country. During the stability of the 1980s, gold discoveries by ASM miners created rush situations and introduced ASM to rural farming communities. Mining was not a priority during the nation building of the 1990s, and continued on a small scale, with medium-scale mining of construction materials and small-scale and artisanal mining of precious metals, base metals, construction aggregates and other minerals (Blacklock 2017).

To date, Uganda's mining sector is characterised by a combination of officially registered local and international mining companies, and ASM. The Energy and Mineral Sector Performance Report 2016–2017 reports a total of 692 licences, of which 150 are prospecting licences, 374 exploration licences, 49 location licences,39 mining leases and 76 mineral dealers' licences (Daily Monitor 2018, Internet site).

The Mining Act (2003) provides legislation for prospecting, exploration and mining (Alchetron 2017, Internet site). Two aspects of the Act applicable to ASM are listed below:

- prospecting licence: a one-year, non-exclusive licence is granted to the holder to prospect for minerals around the country
- exclusive prospecting licence: the licence is mineral specific and is limited to an area of 20.48 km^2 (7.91 square miles).

ASM provides livelihoods for almost 200,000 women and men and over a million Ugandans indirectly benefit (EARF 2018). It is estimated that ASM has grown by 40% since 2008 (Spiegel 2012). The sector provides an alternative to agricultural subsistence farming and offers employment where there are few other livelihood alternatives. It also reduces rural-urban migration.

However, ASM is associated with illicit activities, environmental degradation, exposure to occupational hazards and other serious health and safety concerns for miners and their communities, displacement of people, and in-migration of prospectors.

Construction Materials

EARF highlights that 'Article 244 of the Constitution of Uganda (1995) states that clay, murram, sand, or any stone commonly used for building or similar purposes are not considered minerals, resulting in their exclusion from previous mining law' (2018: 10). Yet, at 6% growth per annum, the construction sector is strong and the current market demand is the main driver especially with the large number of current and imminent infrastructure projects in the country. For example, the cement industry is preparing to double in-country production through development of new limestone mines with large-scale companies such as Hima Cement Ltd, Kampala Cement Ltd and Tororo Cement Ltd driving the exploitation of limestone (UNDP 2018).

District and PAC Level

Full-scale geological studies have not been undertaken to determine the presence of minerals across the districts traversed by the AOI, and the mineral status of these districts is largely unknown. Known deposits are largely unexploited.

Construction materials such as sand, stone for aggregates, laterite soils for brick making and gold are the main targets for mining and quarrying in the districts.

Sand mining occurs in all the districts traversed by the AOI, particularly in wetlands. It takes place all year round but increases in the dry season. For most existing sand pits, permission is sought from landowners and a fee paid. Shovels and spades are used as mechanised equipment is unaffordable for most people. Sand sources were said to be decreasing owing to an increasing number of people seeking to make a living from this resource. Sand is sold at the site of extraction to buyers who collect the material with trucks. The monthly income of a sand miner, generating sand from a quarry, was said to range between UGX 150,000–400,000 (USD 39.88–106.36). Sand mining is performed alongside crop farming activities within a household and is a major source of income.

ASM of gold takes place in Kakumiro, Kyankwanzi and Mubende districts. ASM involves the collaboration of various teams: landowners who own the pits, miners or 'diggers' extract the ore, 'grinders' pulverise the ore and washers or 'panners' clean the ore.

Men, women and children are involved. Permission is sought by miners from the pit owner to work the claim. Financial 'supporters' assist in providing finance for tools and food (EARF 2018).

ASM can be performed all year round, but in the rainy season water pumps are required to drain pits, which is not always affordable. The income of miners and other actors in the ASM sector varies according to the agreement the miners have with the pit owner. Payment can be in the form of food, a daily wage (UGX 10,000, about USD 2.66 per day) or an agreed portion of the amount of gold sold to buyers (Akumu and Kelly 2016). Income patterns in ASM are exceedingly unstable.

Gold buyers from Kampala buy from miners, the pit owners or local dealers. The buyers then sell the gold to brokers, generally Indian traders, in Kampala. The gold is reportedly exported to China and Dubai.

Mubende district has become a hub for gold mining with finds in 2016, which caused an increase of thousands of miners, including experienced miners from the DRC, Rwanda and Tanzania. During a KII, the Mubende natural resource officer estimated that up to 25,000 people had been working one site in Rugunyi village (Bukuya subcounty, near KP111). ASM workers have settled in nearby towns, waiting for an opportunity to return to the mining sites.

Based on KIIs with district natural resource officers, it is likely that gold ASM activities occur in:

- Nkooko subcounty (Kakumiro district)
- Ntwetwe subcounty (Kyankwanzi district)
- Mubende, Butoloogo and Madudu subcounties (between KP84 and KP112; bordering Bukuya subcounty in Mubende district)
- Ntwetwe subcounty (KP82; Kyankwanzi district)
- Nkooko subcounty (between KP69 and KP82; Kakumiro district).

Extraction of clay (lateritic soils) from wetlands for brick making is undertaken in all districts traversed by the AOI (DDPs, KIIs with natural resource officers). It is undertaken for household use and sale. The brick making process can take up to three weeks. Buyers generally purchase the bricks at the production site.

Crushing stone for aggregate was undertaken to a lesser extent. Permission from landowners is sought for the extraction of rock before it is processed manually into small pieces with a hammer. Stone crushing is undertaken all year round and the aggregate is sold to buyers on site. Crushing of stone for aggregate was found in Hoima, Kyankwanzi, Kyotera, Mubende and Lwengo districts.

Rock quarried for blocks or slabs was only reported in Mubende district.

Table A11.4-21 sets out known mineral deposits in the districts traversed by the AOI.

Table A11.4-21 Mineral Deposits by District

District	Site Name and Subcounty, Where Known	Mineral	Estimated Number of Sites
Hoima	In most wetlands around the district	Sand	40
	Kyedikyo, Hoima municipality	Stone aggregates	50
Kakumiro	Mabengere Wetland, Mabengere	Sand	2
	Nkooko SC	Gold	2
Kyankwanzi	Kayindiyindi, Ntwetwe	Gold	<10
	Kasimoni, Watuba SC	Sand	>10
	Kikonda, Nsambya S/C	Sand	>10
	Kikonda, Nsambya Kyakabuga, Nsambya SC	Stone aggregates	>10
Mubende	Nabakazi wetland	Sand and clay	10,000 miners operating over several mine sites within expanse of wetland area
	Nkusi	Clay	Few
	Kiye	Sand	Few
	Katabalanda	Sand	Few
	Lubali-Kitungi	Gold*	10,000 miners operating over several mine sites
	Rugungi	Gold	25,000 miners operating over several mine sites
	Ruteete	Gold	Few
	Bweyonde (Kalwana Subcounty)	Gold	5,000 miners operating over several mine sites
	Musozi near Kiganda	Dimensions stones	1
Gomba	Kabulasoke	Sand	45
	Kyegonza	Sand	40
Sembabule	Katonga wetlands, Rubaare	Sand	1
	Kyoga wetlands, Kyamabogo	Sand	1
	Kyambidde seasonal wetland, Mijwaala subcounty	Sand	1
	Mabindo, Mijwaala subcounty	Sand	2
	Mitete, Matete	Sand	7
Rakai	Kisoma mining site	Sand	Less than 15 sites

Table A11.4-21 Mineral Deposits by District

District	Site Name and Subcounty, Where Known	Mineral	Estimated Number of Sites
Kyotera	Kabanyegenya mine site, Kakuuto	Sand	50
	Kisoma, Kyotera Town Council	Sand	10
	Nabigassa, Nabigassa subcounty	Stone aggregate	100

SOURCE: KIIs with district natural resource officers.
NOTE: These figures may not be exhaustive of all the mining activities at present owing to the informal way it is undertaken making the ASM activities itinerant.

In all sample PACs, some people were engaged in ASM. See Figure A11.4-38 for ASM locations.

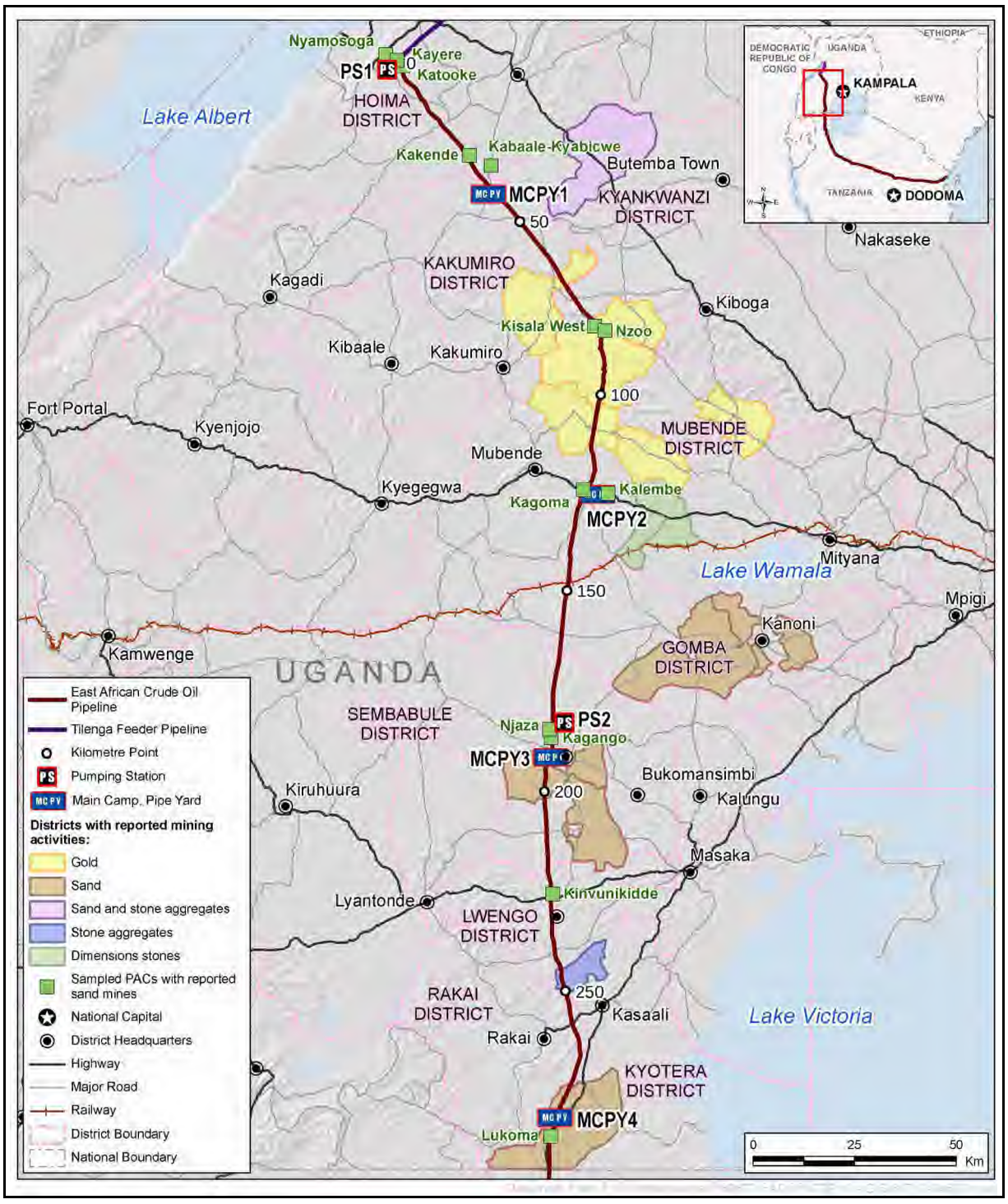


Figure A11.4-38 Artisanal Mining in the Sample Potentially Affected Communities

Problems associated with ASM, as reported by district natural resource officers, were as followed:

- ASM is undertaken in an uncontrolled manner, without a licence, and often without the knowledge of the authorities.

- Environmental degradation can occur. Open pits and uprooted trees can create drainage problems and stagnant water provides breeding grounds for mosquitoes. Open holes are dangerous for humans and animals.
- The aesthetic value of abandoned and active mine sites is low.
- Mining is undertaken without protective equipment exposing miners to health and safety matters. Unsupported tunnels in hard rock associated with gold mining were reported in Kyankwanzi district.
- Women working in ASM obtain fewer benefits than men.
- Child labour is prominent, especially in extremely poor households in rural communities.
- Gaining access to the deposits can create conflicts and boundary disputes.
- In-migration of people, including experienced ASM miners from Tanzania, Rwanda and the DRC, is common (reported in Kakumiro, Gomba, Kyankwanzi and Mubende districts).
- Demand for sand, clay and aggregate fluctuates.
- Customers do not always pay miners.
- Miners in Mubende district are using mercury and cyanide to process gold. These chemicals drain into waterbodies (Akumu and Kelly 2016).

Human Rights

The following human rights laws apply to ASM:

- the right to an adequate standard of living
- the right to freedom from child labour and other children's rights because children often participate in the family work of mining, which can be harmful to them
- in the case of artisanal mining, the right to life is also at risk, the related rights to liberty and security of the person and the right to be free from cruel, inhuman or degrading treatment.

Other relevant standards include:

- Voluntary Principles on Security and Human Rights.

Trend in Condition and Sensitivity to Change

ASM trends include:

- The government is increasingly acknowledging the importance of ASM and moving toward formalisation of the sector.
- Extraction of construction materials such as sand, clay for bricks and stone for aggregate is on the increase due to an expanding construction industry in Uganda.
- ASM activities provide increasingly major benefits to households and create multiplier effects in local communities.
- ASM activities slow down urbanisation and create downstream employment.
- Rush scenarios (large and sudden in-migration of people) for gold ASM have been encountered in subcounties neighbouring those traversed by the AOI, in Mubende district.

Ecosystem Services Provided

The land-based livelihoods (ASM) described herein provide the following ecosystem services:

Provisioning services:

- income from sale of minerals and construction materials (e.g., sand, clay, gravel)
- materials for dwellings and shelter
- salt for livestock and domestic consumption.

ASM is an abiotic provisioning ecosystem service undertaken throughout the AOI by sample PACs, primarily in the dry season.

Sensitivity Ranking

Table A11.4-22 presents the sensitive VECs with regards to ASM identified during the social baseline study.

Table A11.4-22 Artisanal and Small-Scale Mining VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Pit owners on ASM sites dependent on mining for their income	Moderate (3)	These VECs are moderately vulnerable to loss of income but are likely to be more resilient if relocated owing to the relatively cash rich nature of pit ownership.
Non-Ugandan nationals undertaking ASM activities informally	Very high (5)	This category of people will be highly vulnerable as they hold no identity papers and have no legal standing in Uganda.
Artisanal and small-scale miners engaged as casual labour on an informal basis, pursuing mining as a sole occupation	Very high (5)	These VECs do not have access to land for farming or livestock as an alternative livelihood and have therefore very high vulnerability.
Child artisanal miners engaged as casual labour on an informal basis, pursuing mining as a part-time occupation	Very high (5)	Children encounter high safety risks and lack access to education as a result of their mining activities.
Women in ASM	Very high (5)	These VECs are highly vulnerable as they have less access to productive capital than men and may be relying on ASM activities as a sole livelihood.

Key Considerations

Key considerations are:

- large construction projects may require substantial quantities of construction materials. This would increase the pressure on existing sources of supply with the following potential results:
  - price increases for construction material with indirect effects felt through the construction industry and possibly making housing less affordable
  - opening of new (licensed and unlicensed) borrow pits to meet increased demand
  - a surplus of borrow material, fall in prices and fall in employment after the demand is closed once construction is completed.
- owing to the informal and hence often covert nature of ASM activities, it is difficult to assess the precise location of ASM sites at any time.
- PACs' human rights to a decent livelihood, safety and security.

A11.4.6.4 Baseline Condition of Natural Resources Use

National Level

Products such as biomass fuel (firewood and charcoal), wild foods (honey, insects, mushrooms and bush meat), timber, medicinal plants and grasses play a vital part in the subsistence of rural communities in terms of energy for cooking, food security, construction materials for shelter, medicine and income. With an increasing population and a high demand and reliance on natural resources, environmental management of these resources has become essential. This section should be read in conjunction with the biodiversity sections, which report on plant and animal species available to PACs.

Hunting occurs throughout rural areas in Uganda and requires a permit from the UWA under the Uganda Wildlife Act 1996. However, hunting often takes place without a permit.

Apiculture (bee keeping) is a fast-growing industry. However, despite being only one of five countries in sub-Saharan Africa licensed to export honey to the European Union, Uganda has been unable to meet national demands for honey, let alone export the produce. The Ugandan Beekeepers Association estimates that only between 800–1200 metric tonnes of honey are produced per year which is 1% of a potential 500,000 tonnes of honey per year (Ghent University 2017, Internet site).

District and PAC Level

Forest, rangeland and wetland habitats characterise the districts traversed by the AOI. Local communities harvest natural resources in these habitats for subsistence or for cash income.

Table A11.4-39 presents the natural resources use in the sample PACs.

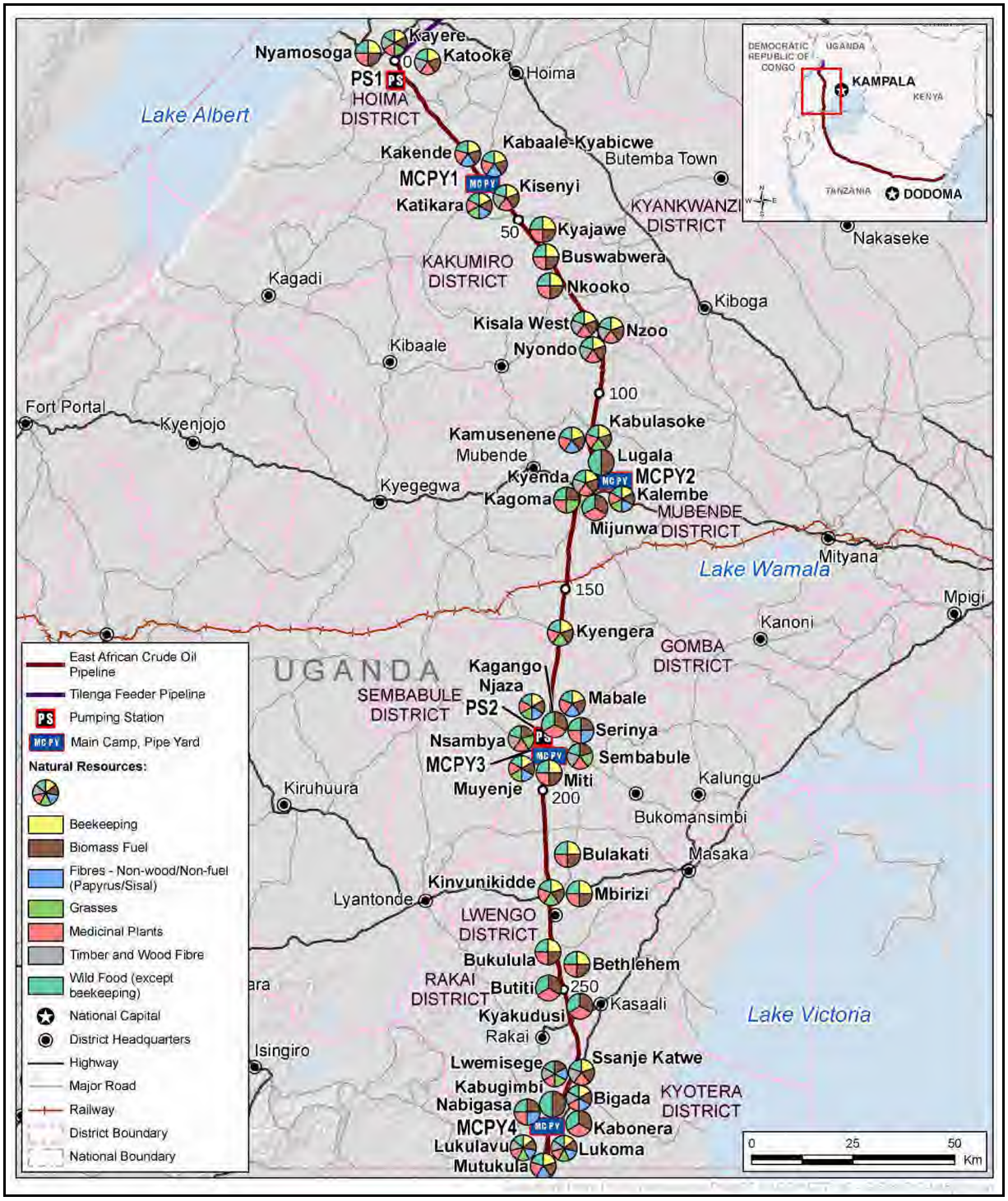


Figure A11.4-39 Natural Resources Harvested in the Sample Potentially Affected Communities

The various natural resources used are discussed below.

Timber and Wood Fibres

Trees, mainly eucalyptus and pine, are used for construction (poles for scaffolding or joists and uprights in houses and planks for walls; Figure A11.4-40), household furniture, kitchen utensils, poultry cages and shelters.

Figure A11.4-40 Wood Cut for Firing a Brick Kiln in Katikara Trading Centre, Kakumiro District (KP41)

Wood is sourced from private land in areas adjacent to communities with permission sought from the landowner. On occasions firewood was reported to be collected from Bugambe Forest Reserve, Katooke (KP1.5) (see Botany Biodiversity Baseline Report, Appendix A1). Wood harvested by PACs is bought by specialised wood merchants for onward sale and by local households for construction and repair of their own dwellings.

Fibre from the inner bark of the Mutuba tree (*Ficus natalensis*) is used to make the traditional bark cloth (olubuggo) which is used as mats, decorations and funerals. The Mutuba trees were found to be collected in the villages of Nsambya (KP189), Muyenje (KP192), Lukoma (KP287.5), Ssanje Katwe (KP270.5) and Lwemisege (KP272).

Biomass Fuel[14]

Firewood, an important source of cooking fuel, is collected in communal land by communities in all districts traversed by the AOI. Firewood collected from the rural

[14] Biological material derived from living or recently living organisms–both plant and animal–that serves as a source of energy.

areas is traded in towns and trading centres. A study on household firewood consumption in Rakai district found that:

- households spend an average of 4 to 6 hours a day collecting firewood and typically collect 4 to 6 head loads per week to cover their needs
- responsibility for collecting firewood falls largely on women and children
- up to UGX 200,000 (USD 53.16) per year is spent on purchasing firewood
- 90% of the households surveyed made two fires per day (Agea et al. 2010).

Distances travelled to find firewood have reportedly increased due to diminishing sources. In some instances, permission from private land is sought to access firewood and an annual fee is paid.

Charcoal use is popular in all districts traversed by the AOI (Figure A11.4-41). The national charcoal survey undertaken in 2015 found that the major tree and shrubs species used for charcoal making are *Acacia hockii*, *Ficus natalensis*, *Albizia coriaria*, *Eucalyptus grandis*, *Combretum molle*, *Maesopsis eminii*, *Mangifera indica* and *Milicia excelsa*.

Figure A11.4-41 Charcoal Sacks in Lugusulu Subcounty, Sembabule District

The harvested wood is converted to charcoal in earth or mound kilns. The wood can be put in the kiln immediately after harvesting but for increased efficiency it is often dried for 2 to 14 days. The wood is left in the kiln for up to a week. The charcoal is then cooled using water, damp soil or sand, or leaving the hot coals spread out on the earth in the open air. Charcoal production is generally undertaken in the wet season due to the requirement for water.

Charcoal processing is found in a small number of sample PACs. The process is undertaken by a few households, who specialise in this activity. Wood is collected in farming areas, plantations near communities or from private land in which case permission is obtained. In some cases, charcoal producers are given free access to

wood in return for clearing land for crop growing or a payment is made to a land holder. Charcoal is predominantly produced for sale, with small amounts used for the household. Women package the final product into 50-kg bags, which are sold along main roads for an average price of UGX 22,000 (USD 5.85). Charcoal dealers purchase the charcoal for sale in urban centres. The average monthly income of a full time charcoal producer is estimated at UGX 317,000 (USD 84.27) per month and for a part time charcoal maker UGX 170,000 (USD 45.19) per month (MEMD 2015).

Fibres (Nonwood, Nonfuel)

Papyrus *Cyperus papyrus* grows in abundance in wetland areas of the districts traversed by the AOI and the shore of Lake Albert to the west of the pipeline route. The papyrus is cut, dried and used to make sleeping mats, flooring and screens, baskets and fish traps. Both men and women engage in mat weaving. Mats are sold for UGX 5000–10,000 (USD 1.33–2.66) along the roadsides and in local markets.

Papyrus is harvested from wetland areas by sample PACs near to River Kafu (KP39 MCPY1), River Nabikazi (crossing KP114 and KP148–149), Katonga River (KP165) and Kibale River (KP274). It was reported to be collected on an as-needed basis and was said to be in plentiful supply. Some households specialise in weaving papyrus mats to be sold by the roadside.

Grasses

Grasses, which are harvested by both women and men predominantly on village land, have several uses. These include:

- thatching of roofs. Grass for thatch is harvested on a regular basis during the rainy season in a small number of sample PACs in Hoima district.
- animal fodder, which is gaining importance due to ongoing depletion of communal grazing areas and the shortage of pasture land during the dry season
- making brooms, which is a seasonal activity; brooms are generally sold at local markets.

The grass is cut by specialised collectors with a scythe and bundled for sale by the roadside. In the case of Kayere, Nyamasoga (KP0) and Katooke villages (KP1.5), the grass is sold to the lakeshore populations, where the majority of houses have thatch roofs, but where no suitable grass is available. A bundle of grass is sold for UGX 2000–4000 (USD 0.53–1.06). Prices vary according to the season, abundance and distance from the source at which is sold.

Grass for animal fodder is mainly harvested in central and southern sample PACs within the traditional cattle corridor. Grass is harvested solely for household livestock consumption and not for sale. It was reported to be collected daily from open grazing areas surrounding crop farming plots.

Medicinal Plants

FGDs revealed that there is a substantial reliance on locally sourced medicinal plants for common illnesses. People use both medicinal plants and modern

medicine to treat illnesses. However, use of local medicinal plants is more prevalent in the remote rural areas. This is possibly due to the lack of adequate medical facilities such as clinics and pharmacies. Medicinal plants are found in areas surrounding crop farming plots as well as tree covered areas. While there is common knowledge of medicinal plants among the population at large, a few men or women specialise in traditional medicine within most sample PACs.

Wild Food

Wild fruit and vegetables are harvested by all sample PACs for household consumption with surplus occasionally sold in local markets or within the community.

Edible wild plants are harvested throughout the year from the peripheries of cleared land where crop farming is undertaken and tree covered areas and are used to supplement the diet. Wild foods are mainly harvested by women and children.

Mushrooms are harvested between March and May and August and October from scrubland or forest and groves near communities. Mushroom picking is mainly conducted by women and children to supplement the household's diet.

Grasshoppers are harvested by men, women and children to supplement the diet. Grasshoppers are caught in open areas using a light placed in a large drum to attract the insects at night or they are caught by hand. Grasshoppers are only available between November and December.

Ants are collected between February and April and between March and June. Collection of ants involves smoking out ants nesting underground or from ant hills in open areas.

Both grasshoppers and ants are harvested for home consumption and excess is sold 'fresh or fried' in local markets or by the roadside.

Hunting

Hunting of wild animals was reported to occur in all sample PACs on an infrequent basis. Animals hunted include; duiker, impala, bush buck; baboons, bush pig, rabbits; squirrels, hippopotamus, Ugandan cob, rats and warthog.

Hunting is undertaken by men in crop growing areas and in uncultivated communal lands. Hunting commonly uses nets, dogs (with a bell attached to the collar) bow and arrow and spears. Nets are laid across expected escape routes and held at either end. The animals are then driven into the nets and killed with a spear. Hunters consume the meat within the household either fresh or smoked. Only a small percentage of catches are traded in nearby markets. It was reported that hunters' monthly income from meat sale generally ranged from UGX 20,000–40,000 (USD 5.31–10.63). Hunters stated that there is a considerable decrease in the wild animal population due to over hunting, clearing of forest and grassland areas for agriculture, increased grazing and shortage of rain.

Figure A11.4-42 A Hunter with a Bow and Arrow in Kayere, Hoima District (KP0)

Apiculture

Apiculture is a livelihood activity practiced in all districts traversed by the AOI. Gomba, Mubende, Sembabule, Lwengo and Kyotera have high densities of beekeepers (Kajobe et al. 2016).

Honey is harvested twice a year between March and June and August and October. Other bee products such as brood comb and bee bread are harvested on a small scale (New Agriculturalist 2018, Internet site).

Most sample PACs typically have one or two beekeepers. Traditional hives are made from timber, bamboo, borassus palm or woven from forest climbers. Hives are placed in farm plots or in tree-covered areas inside or outside community land. Permission to place the hives is not always sought from land holders. The number of hives for a beekeeper ranges between 5 and 18. Men traditionally tend the hives and women assist in honey processing, hive cleaning and selling the products.

Apiculture is considered profitable with 1 kg of honey sold for UGX 5000 (USD 1.33). The honey is sold in the local communities, local markets or to wholesale

buyers (including a supermarket) in Hoima district. Most beekeepers reported that although business was good there had been a reduction in the number of bee colonies over the years.

Both Rakai and Hoima DDPs state that honey production was reported to be low despite ideal conditions to support beekeeping. The reasons cited were the traditional methods used to extract the honey, a reduction in colony sizes and a less marketable final product because of a smoky taste. Both districts have set up demonstration centres, distributed modern hives and provided training for beekeepers.

Challenges and Constraints

- A growing population has put pressure on the natural resources due to encroachment on wetlands and forest areas for dwellings, farming and grazing.
- Many timber and charcoal dealers are unlicensed, which makes regulation by the districts difficult.
- The high cost of alternative sources of energy for cooking and lighting (gas, solar and electricity) forces people to use wood and charcoal.
- The rate of tree cutting is much higher than the rate of reforestation.
- The honey production is inefficient. Traditional beehives and rudimentary equipment can lead to contamination of the processed honey. Fermentation of honey is common due to lack of appropriate equipment and storage facilities. Potentially valuable byproducts such as wax and propolis are discarded. To increase production, beekeepers need more support in terms of equipment and on-going practical training.
- The bee population is decreasing because:
    - hives are usually destroyed and colonies often killed in the process of collecting honey
    - non-organic pesticides kill bees
    - there is habitat pressure for bees due to population increase
    - honeybee pests and predators affect traditional beehives.

Human Rights

The following human rights laws apply to natural resources use:

- the right to an adequate standard of living
- the right to health as communities use some plants for medicinal purposes.

Trend in Condition and Sensitivity to Change

Trends in natural resources use include:

- Natural forest and scrubland is diminishing and women must travel increasing distances to collect wood. With few affordable alternatives to firewood and charcoal long-term sustainability of existing sources of biomass fuel is uncertain.
- Medicinal plants are widely used for human and animal illnesses; more so in remote rural areas due to the inaccessibility of medical facilities. However, increased clearance for farming and infrastructure may threaten availability.

- Although hunting is only permitted with a licence, illegal hunting is practiced on a small scale. Hunting has however diminished because there is a decrease in game populations due to over hunting, clearing of forest and scrubland areas for agriculture, and increased livestock grazing.

Ecosystem Services Provided

The natural resources covered in the section above are all provisioning ecosystem services (i.e., products) in their own right. They are obtained from a variety of ecosystems within or near the PACs including forests, wetlands and pasture rangelands. As such, these natural resources play a vital role in subsistence of rural communities in terms of energy for cooking, food security, construction materials for shelter, traditional medicine and income. With an increasing population and a high demand and reliance on natural resources, continued protection of and access to these resources is essential.

Sensitivity Rating

Table A11.4-23 presents the sensitive natural resources use VECs identified during the social baseline study.

Table A11.4-23 Natural Resources Use and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Bee keepers	Low (1)	Beekeepers are more resilient to external shocks because beekeeping activities supplement farming activities.
Fibres and grass collectors	Low (1)	Fibres and grass are widespread and their availability will not be substantially impacted
Hunters	Low (1)	Hunters are generally not reliant on the bush animals they catch for food or as a main income.
Medicinal plant users	Moderate (3)	Without access to medicinal plants there may be limited means to treat illnesses in an affordable manner.
Wild food users	High (4)	Plants supplement diets and are used in months when households may not have sufficient access to food.
Firewood collectors (women)	High (4)	With limited access to firewood, household meals cannot be cooked, affecting the health of family members. Access to firewood is already diminishing and women must walk long distances.

Key Considerations

Key considerations are:

- Communities, especially poorer households, are dependent on natural resources for the provision of wild food, traditional medicine and firewood for cooking.

- A growing population and urban demand for firewood and charcoal has reduced their availability in the AOI.
- There is a decline in bee population due to habitat destruction in favour of crop farming and animal grazing. Additional removal of land cover may affect the bee population further.
- PACs' human rights to a decent livelihood and food security.

A11.4.7 River and Lake-Based Livelihoods

A11.4.7.1 Baseline Conditions of River and Lake-Based Livelihoods

National Level

The fisheries sector provides a livelihood to fishermen and those engaged in the supply chain which includes small- and industrial-scale fish processing, fish trading, boat-building, net making, trading in fishing equipment and extension activities provided by the government. The current annual production from fisheries is about 461,000 tonnes and from aquaculture 111,000 tonnes (ACME 2017, Internet site).

Fisheries activities are mainly undertaken in open water such as major and minor lakes, rivers and wetlands.

The MAAIF provides oversight of all aspect of fisheries in the country under the following departments:

- production and marketing
- fisheries resources and development
- fisheries regulation control and quality assurance
- aquaculture management and development.

The National Fisheries Policy (2004) forms the legislative framework for fisheries activities. The policy aims to ensure sustainable fish production and utilisation by properly managing capture fisheries, promoting aquaculture and reducing post-harvest losses. It has 13 policy areas, each objectives and strategies. To achieve the objectives, decentralised co-management practices are promoted, including beach management units.

A major challenge facing lake fisheries is illegal fishing with use of indiscriminate fishing gear such as fine-mesh-gill and seine nets. This is particularly problematic in Lakes Albert and Victoria and attempts are made by the Government to address the problem through patrol activities, registration, and licensing of fishermen and vessels (Nakkazi 2017, Internet site).

The Government is supporting the emergence of pond- and dam-based aquaculture. The sector is currently dominated by subsistence production with little or no technical inputs or management. However, there is an increase in commercialisation of the sector and cage culture, larger ponds, and better quality fish seed (fertilised fish eggs) and feed are being introduced. There are currently an estimated 12,000 farmers involved in aquaculture in the country (FAO 2018, Internet site).

District and PAC Level

The district production coordinator is the technical head of the fisheries sector and coordinates the functions and activities of the district fisheries.

Figure A11.4-43 and Figure A11.4-44 show the water catchment and river areas accessible to the sample PACs.

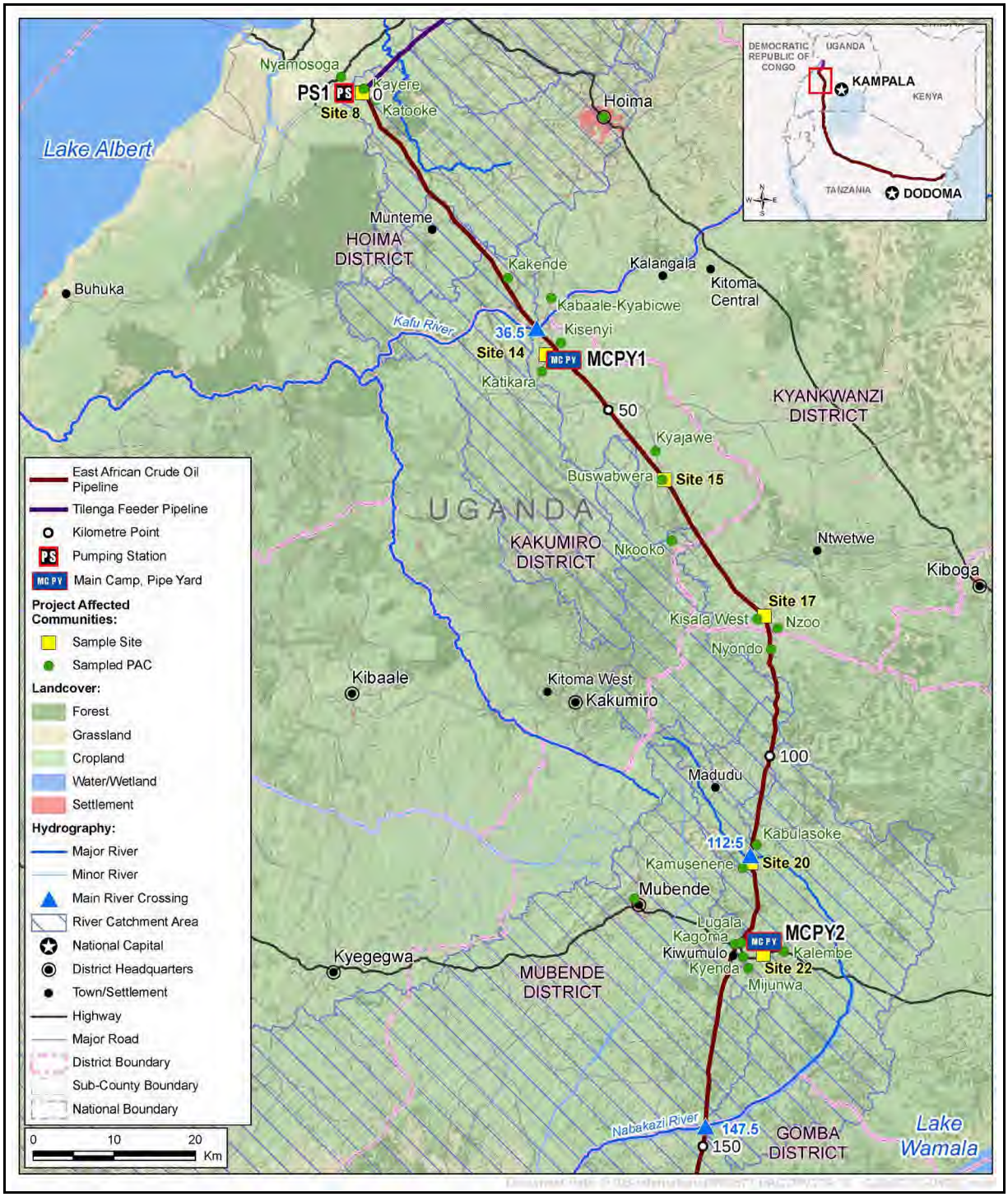


Figure A11.4-43 Land Cover, Water Catchments and River Areas in the Sample Potentially Affected Communities – North

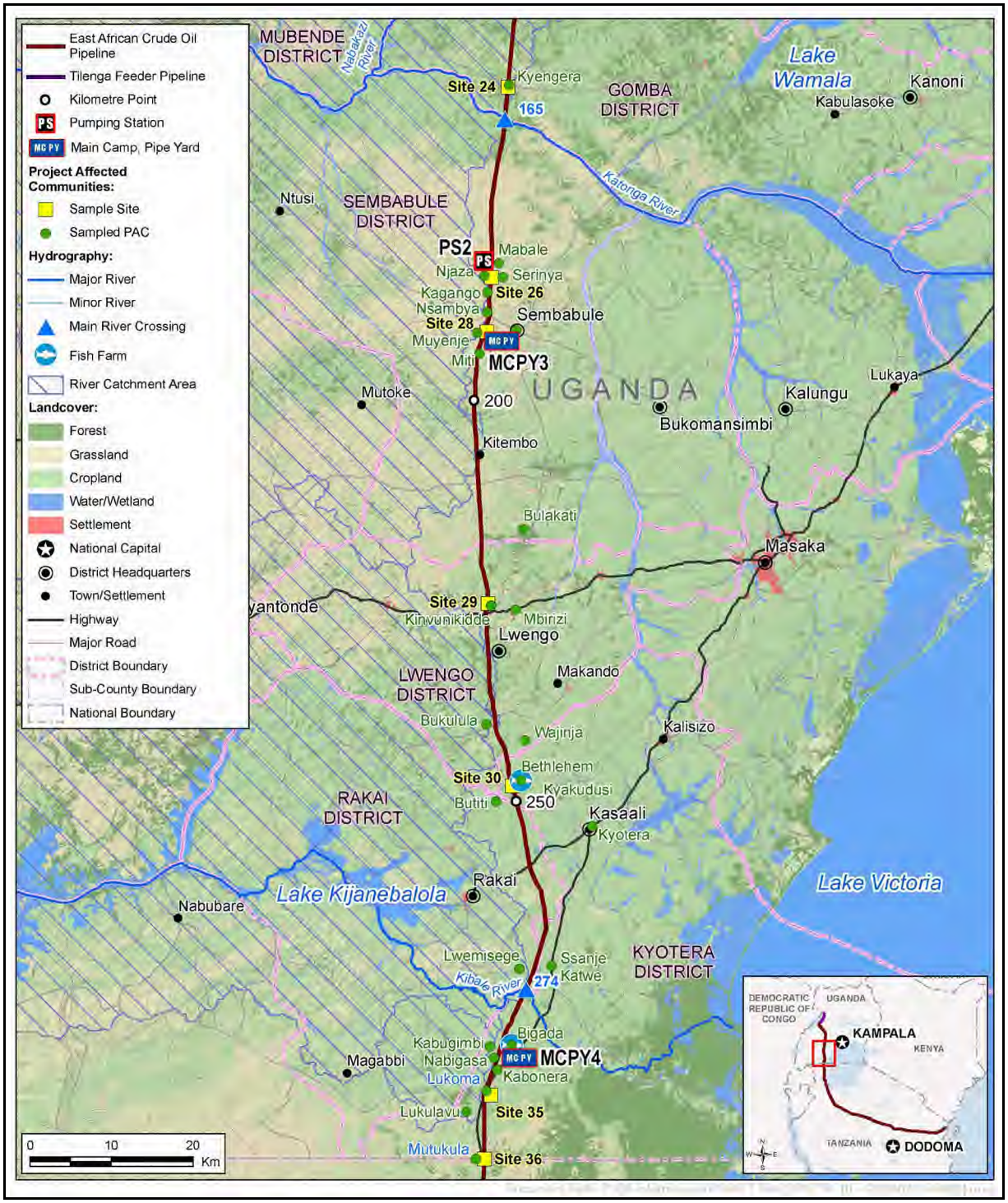


Figure A11.4-44 Land Cover, Water Catchments and River Areas in the Sample Potentially Affected Communities – South

River, Stream, and Wetland Fishing

The AOI crosses the Kafu River (KP39 MCPY1), Nabikazi River (crossing at KP114 and KP148–149), Katonga River (KP165) and Kibale River (KP274) (see Appendix A2 Aquatic Biodiversity Baseline Report). These main rivers and a series of minor

rivers, streams and wetland areas provide fisheries for local communities (Figure A11.4-43).

FGDs found that freshwater fishing was undertaken in all sample PACs. Fishing is likely to be encountered at all river, stream and wetland crossings and the major rivers.

Fishing takes place all year round, although the dry season causes some tributaries and wetland areas to dry. These rivers contain *Protopterus aethiopicus, Schilbe intermedius, Labeo* species*,* small *Mormyrids* and macroinvertebrates such as Chironomids (see Aquatic Biodiversity Baseline Report).

Fishing is generally practiced alongside crop production and livestock rearing activities during the growing season when little agricultural activity is required. Landless fishing households, or those with small agricultural plots, are more dependent on fishing activities as a source of protein and to derive an income. FGDs found that fishermen who have no access to land belong to the poorer sections of the community (Kafu River in Kakumiro, MCPY1 KP36.5–54.5, and Kibale River, Kyotera KP274).

Fish is regarded as an important source of protein for the household, especially during the 'hungry months' when agricultural produce is in short supply.

Gear

FGDs and KIIs with district fisheries officers found that the following gear is used:

- gill nets (see earlier in this section)
- fish traps or baskets (see earlier in this section)
- spear fishing (fishermen scan the water for fish to spear).

Marketing

Fish caught in rivers and wetlands are mainly consumed by the household. Surplus is processed and marketed by women.

Freshwater fishing challenges

FGDs and KIIs with district production officers and fishermen found the following challenges associated with freshwater fishing:

- basic fishing techniques used by fishermen in rivers and wetlands have low returns
- seasonal watercourses drying during the dry season reduce fishing opportunities for a large part of the year
- increased conversion of wetland areas for agricultural activities reduces fishing opportunities.

Lake Fishing

Fishing is practiced on Lake Albert (Buseruka subcounty, Hoima district), Lake Wamala (Gomba district) and Lake Victoria, and minor lakes such as Kijjanebarola (Rakai district) and Kacheera (Kyotera district).

Fishing communities are centred on landing sites, where boats and nets are shored, fish processing is undertaken, food stalls and traders operate, and beach management units are active. These sites also serve as gathering points for recreation and have been linked with social ills and elevated HIV rates (see also Section A11.4.11 on community health).

Fishing communities have expanded substantially in recent years and attracted unemployed youth and, in the case of Hoima district, youth from the DRC (Artelia 2015b).

Males dominate the fishing activity (Hoima DDP 2015). However, women are involved in the supply chain. Fishermen are of diverse ethnic backgrounds. In Hoima, fishing is undertaken by the Baganda, Bakobya, Bagungus and Banyoro. The Alur make up a large proportion of the fishermen on the shores of Lake Albert in Hoima district.

Lake fishing is predominantly a full-time occupation and fishing households are therefore solely dependent on this source of income. Some fishermen have invested in vessels and fishing gear such as nets while others work as crew.

A small percentage of fishermen also engage in crop farming, livestock rearing or trading. These part-time fishermen travel to the lakes from inland villages (Artelia 2015b) when they deem fish prices to be profitable and during seasonal agricultural downtime.

Fishing is undertaken all year round, but with peaks in the rainy seasons from March to May and October to November.

Lake fishing is undertaken from the shore or from vessels. Boats are usually paddled, with only a minority having outboard engines. There are typically two people per vessel and no fish-cooling capacity.

Generally, offshore fishing trips are undertaken once a day, but when the catch is low, a second trip may be made. Fishermen usually leave in the evening (night fishing) or early morning to cast their nets and collect their catch the next morning. Studies undertaken by Advisian (2015: 42) found that some fishermen stay out on the lake for two to three weeks without landing. Gill nets are left in the water and towed to landing sites without lifting the nets out of the water. This method avoids the need for cooling facilities because the fish are kept alive for the entire duration of the trip.

During the dry seasons, winds can pick up on the lakes and, without life jackets, fishing becomes hazardous. FGDs found that fishing communities experience high levels of mortality due to the changeable weather on the lake and absence of safety equipment.

Most fishermen rent vessels, as they cannot afford to buy them, especially if they fish part-time. Vessel owners (men and women) are the more affluent members of the local fishing communities (Artelia 2015b). They generally do not fish themselves but rent out their boats and nets. Rental prices of vessels range between UGX 80,000–120,000 (USD 21.26–31.89) per month on Lake Albert (Artelia 2015b: 146). The less affluent full-time or part-time fishermen use vessels and nets they have

hired and share the daily catch as in-kind payment. Artelia (2015) found that there were various profit sharing scenarios:

- 50% of the catch for the owner of the equipment (boat and net) or the person that rents it, and 50% for the fishermen crew (divided among themselves)
- 20% to the boat owner, 40% to net owner and 40% to the fishermen crew.

The main fish caught in lakes in the districts traversed by the AOI are Nile Perch, Tilapia, Mudfish and Clarias species.

FGDs and KIIs with district fisheries officers found that the following gear is used.

Gill Nets

Gill nets are the most popular fishing gear. The nets are made locally out of synthetic line which is traded in urban centres such as Hoima or Kyotera and at landing sites. The nets are normally set out at dusk and hauled in at dawn. Drift gillnetting is commonly practised on Lake Albert, but rarely on smaller waterbodies. The nets have different mesh sizes according to the type of fish targeted. Mesh below 100 millimetres is illegal but, according to KIIs with fishermen, finer mesh is still used.

Longline

This comprises a long length of line (100 to 300 metres) carrying baited fishhooks. A longline is placed in the lake in the morning or afternoon and left to fish passively overnight.

Hooks

This method consists of hooks placed along a shore line. Bait is put on the hooks to attract the fish.

Cast Nets

A cast net is circular with weights around the circumference. When cast, the net opens and then closes after hitting the water trapping fish within the area it covered. Cast nets are used from vessels or from the shore in shallow waters. Cast net fishing is mostly undertaken by men, but from the shore, on occasion, by women.

Fish Traps or Baskets

Traps or baskets, made from natural materials such as papyrus, have a conical entrance to a capture chamber. These traps are strategically placed in areas where fish regularly pass or congregate, such as river mouths, fringes of papyrus wetland areas, main river channels and access channels to wetland areas. This method is not commonly used.

Marketing and Processing of Lake Fish

Fish prices are typically high due to the strong demand and short supply. High market prices encourage fishermen to sell rather than consume or share their catches in the local fishing community. FGDs found that fish is sold:

- fresh or processed in local markets such as Hoima municipality, Masindi town and Kyotera town

- fresh or processed at regional markets or in the DRC in the case of fish caught in Hoima district.

FGDs found that profits are shared once the fish has been sold to the end user (Hoima DDP 2015 and Artelia 2015b). In Rakai and Kyotera districts, over 95% of fish is processed in factories. The following processing factories are recorded:

- Oakwood Investments in Kasensero and Byansi Fisheries in Kalisizo, Rakai district
- Byansi Fisheries in Kyoere
- Green Fields, Fish Ways and Fresh Patch in Entebbe
- Ggege Limited and Bountwe Limited in Kampala.

Where physical access is possible, refrigerator lorries collect the fresh fish from the landing sites for transport to the factories. Where such access is not possible, fishermen transport their catch by motorbike (Rakai DDP 2015).

Fish is also processed locally before being marketed. Processing is undertaken mainly by women by sun drying fish on makeshift papyrus racks or smoking the fish in firewood-fuelled mud ovens. Salting, which is a male activity, is also undertaken to preserve and sell the fish (Artelia 2015b).

In general, only a portion of fish caught is kept for the household. For instance, in Hoima district it was reported that fishermen consume 20–30% of the fish caught (DDP 2015).

Lake Fishing Challenges

FGDs and KIIs with district production officers and fishermen identified the following challenges associated with lake fishing:

- There is an ongoing reduction in fish stock due to overfishing (Rakai DDP 2015). Illegal fishing gear is used to boost catches such as beach seines, fine-meshed cast nets or small hooks, thereby exacerbating the problem.
- There is insufficient infrastructure at fish landing sites such as cold rooms, handling slabs and safe water for cleaning fish.
- In 2003, the MAAIF established beach management units for lake shore fishing activities at district level to improve control and monitoring of fishing to prevent overfishing and appropriate usage of legal equipment.

Aquaculture

Aquaculture is a growing economic sector in the districts traversed by the AOI and all districts are investing in aquaculture initiatives as evidenced in DDPs. However, it is still predominantly a subsistence activity, undertaken in manufactured or dammed ponds up to approximately 500 m^2 in size (see Figure A11.4-43).

Aquaculture is an all year activity, generally executed alongside farming. An added benefit of aquaculture is that it can be used as guarantee for microcredit financing.

The main fish for aquaculture are tilapia, catfish, common carp, cichlids and lungfish (Rakai DDP 2015).

An aquaculture enterprise was identified at Bethlehem (KP247.5) and Nabigasa (KP281.5) (see Figure A11.4-45), which consisted of four fishponds with tilapia,

managed by two employees. Most of fish raised in the ponds were marketed, but a proportion was consumed within the household.

Figure A11.4-45 Fishermen Using Nets to Catch Fish in Bethlehem, Kyotera District (KP247.5)

Aquaculture Challenges

FGDs and KIIs with district production officers and fishermen identified the following challenges associated with aquaculture:

- Aquaculture is constrained by low inputs and the low quality of fish fry and feeds, resulting in poor productivity.
- Major diseases including fungal infection and stunted growth are experienced as a result of poor feeds.
- Predators such as monitor lizards, snakes and herons further reduce yields (UBOS 2009b).

Human Rights

The following human rights law applies to river and lake-based livelihoods:

- the right to an adequate standard of living. Universal Declaration on Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11; African Charter on Human and Peoples' Rights, article 21.

Trend in Condition and Sensitivity to Change

The following trends were identified for river and lake-based livelihoods:

- Lake fish stocks are decreasing due to overfishing and decreasing fish stocks encourage the use of illegal fishing gear (fine-meshed nets).
- Population growth is increasing pressure on natural resource use, including river fishing; additionally, this is causing more wetlands to be drained for agriculture and other land use thus further constraining fish availability.

Ecosystem Services Provided

The river and lake-based livelihoods described herein provide the following provisioning ecosystem services:

- income from selling catch and fishing equipment
- food to supplement diets
- products for fish processing activities.

Fishing has been an important activity for generations and is a major part of the PACs' way of life, for the lake fisherfolk.

Sensitivity Rating

The social baseline identified sensitive VECs for river and lake-based livelihoods. These are presented in Table A11.4-24.

Table A11.4-24 River and Lake-Based Livelihoods VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Lake fisherfolk who fish part time	Moderate (3)	This category of fisherfolk undertakes fishing activities alongside crop farming or informal trading activities therefore they are less vulnerable to a reduction of one of their income streams.
Women who process and market fish (river) as part of a multiple livelihood strategy	Moderate (3)	Women have limited income earning opportunities. Fish processing and marketing is undertaken alongside crop farming. Women have generally more than one income stream and will therefore not be dependent on fish processing and marketing as the sole means of making a livelihood for the household.
Lake fisherfolk who fish full time	Very high (5)	This category of fisherfolk is dependent on fishing as a sole livelihood and subsistence activity. There are few other income-generating opportunities available and without land holdings they are particularly vulnerable.

Table A11.4-24 River and Lake-Based Livelihoods VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Women who are dependent on lakeshore fishing	Very high (5)	Women fishing from lakeshores are considered highly vulnerable with low resilience to external shocks as they have no alternative means of livelihood and are dependent on shore fishing for food security and income generation.
Landless who fish on rivers	Very high (5)	The landless are more reliant on deriving an income from natural resources. With no or limited alternative income generating opportunities other than fresh water fishing, this category is considered highly vulnerable.
Employed workers of aquaculture enterprises	Very high (5)	Often landless and exclusively dependent on their job.

A11.4.7.2 Key Considerations

Key considerations are:

- lake fishing and aquaculture are small-scale subsistence activities
- those whose livelihoods are dependent on fishing are poor and do not have access to credit, and so their resilience is low
- there is pressure on the fisheries sector due to increasing crop failures caused by drought or floods forcing crop farmers to look for alternative means of generating an income
- young people are becoming more attracted to fishing activities as the size of farming plots for the younger generations is diminishing, rendering crop farming less profitable
- human right to access to food and an adequate standard of living for communities.

A11.4.8 Land and Property

A11.4.8.1 Baseline Conditions of Land and Property

National and District Level

The Land Act (1998; 2010) identifies four forms of land tenure: customary, leasehold, freehold and mailo (see below) (MLHUD 2013). Most citizens hold their land under customary tenure, which applies to specific land areas that are governed by customary laws. Land under this tenure system is communally, jointly or individually owned, often without land titles and often presided over by elders, clan leaders or figureheads within communities). In the laws of Uganda, customary

tenure is defined as “a system of land tenure regulated by customary rules which are limited in their operation to a particular description or class of persons.”

Over 60% of land is held under a customary tenure system, most of which is found in the northern, western and southern parts of the country and in Hoima, Kakumiro and Kyankwanzi. Key problems associated with this tenure include lack of security for landowners and disadvantages for women (MLHUD 2013).

The Land Act (1998; 2010) provides for two mechanisms in which rights held under customary tenure can be formally recognised:

- acquiring a Certificate of Customary Ownership. Any person, family or community holding land under customary tenure on former public land may acquire a certificate of customary ownership. A Certificate of Customary Ownership can be acquired through a tiered application process. Applications are reviewed by the Area Land Committee and certificates are eventually issued by the district land board.
- forming a Communal Land Association (CLA) by any group of persons under the Land Act for any purpose connected with the communal ownership and management of land, whether under customary law or otherwise (GOU 2013b).

Under the mailo tenure system, land is registered under the Registration of Titles Act, which grants the holder a land title and absolute ownership in perpetuity. This tenure system recognises occupancy by tenants (known as *Bibanja* holders), whose relationship with the landlords is governed and guided by the provisions of the Land Act (1998; 2010). Land held under mailo tenure (approximately 23,300 km^2) is confined to Buganda (central Uganda) and Bunyoro (western Uganda). At present there are over 250,000 mailo land title holders in Uganda (MLHUD 2013).

The mailo tenure also termed “native” freeholds separate the ownership of land from occupancy or ownership of developments by lawful occupants. This can cause conflicts of interest and overlaps in rights on the same piece of land. The Land (Amendment) Act of 2010 grants statutory protection to the lawful occupants against any arbitrary eviction if the prescribed nominal ground rent is paid (GOU 2010). However, the nominal ground rent provided for is largely ignored creating a land use deadlock between tenants and registered landowners (CNOOC et al. 2016). A key feature of land ownership in the central region for land owned by Buganda Kingdom and on which many EACOP PACs reside.

The third land tenure system (freehold) is similarly governed by the Registration of Titles Act. Under this system, a registration of title in perpetuity and conferment of full powers of ownership is provided to the land holder, who may use the land for any legal purposes. Only national citizens are legally entitled to own land under the freehold system and there is little land held under freehold tenure. Where it is held, the majority has been issued to church missionaries, academic institutions and some individuals. This system is mostly found in the central region of Buganda, i.e., all districts traversed by the AOI except Hoima, Kakumiro and parts of Kyankwanzi (MLHUD 2013).

The leasehold land tenure system entails owning land for a set period, usually 49 or 99 years, with agreed conditions and a rental fee or premium.

Land conflicts form the highest percentage of disputes reported in formal and informal dispute resolution systems in Uganda. Common concerns reported are landlord-tenant relations on mailo land, land tenure insecurity in post-conflict northern Uganda, disputes over land expropriation by the Government, and the implications of oil exploration and mining for local land tenure systems and rights (MLHUD 2013).

Access to Land

The Land Act (1998; 2010) includes provisions to ensure access to land and to enhance the security of tenure for all citizens, such as the legal recognition of customary ownership at the individual level. The legislation also recognises land held by a community to maintain access to community land, its use and the titling of communal land.

Communities (usually clan members) who share communal land and are seeking to formalise their ownership must arrange themselves into a CLA and register their interest with the district registrar of titles. Under the designation as a Communal Land Organisation, the association can obtain certificates of customary ownership and freehold titles. After the titles are obtained, the association has the possibility to:

- transfer land they own under customary tenure or freehold to individual families if they wish to do so
- set aside areas of common land use within the communally owned land and set up a common land management scheme (setting the prerequisites for natural resource takings).

Within the central region (Buganda), the Buganda Land Board launched a process of registering tenants (*Bibanja* holders) occupying land without any documentation to support their occupancy. The objective was to offer the tenants (current users) a 49-year lease, following payment of fees to the Buganda Land Board. After registration, the *bibanja* holders were to be provided with a certificate that shows that they hold the lease. However, the process has been legally challenged due to concerns over what might happen following the expiry of the 49-year lease and as such has been halted. Large sections of the EACOP route traverse districts within Buganda region.

The 1995 Constitution grants land ownership rights solely to citizens of Uganda. Foreigners cannot own freehold land. However, they may obtain leases for 49 or 99 years. Foreign individual or corporate investors cannot acquire land for crop or animal production. Foreigners can either rent or lease land from citizens or the Government (Global Property Guide 2016, Internet site).

The Land Act seeks to protect equitable ownership of land for women and vulnerable persons through three dispositions:

- women and vulnerable persons cannot be excluded from customary ownership (all customs that exclude them are regarded as null by the law)
- land committees must protect interests of women, children and disabled persons
- women must be represented in land committees, CLAs and tribunals.

Land Management

Lack of an established land legal framework exposed customary landowners to forceful evictions and land grabbing on a national and local scale. The Government has engaged in an ongoing reform process to tackle the root causes of these matters and to accommodate rapid changes in Ugandan society in relation to the oil and gas discoveries.

The objectives of the National Land Policy (2013) are to:

- stimulate the contribution of the land sector to overall socio-economic development, wealth creation and poverty reduction in Uganda
- harmonise and streamline the complex tenure regimes in Uganda for equitable access to land and security of tenure
- clarify the complex constitutional and legal framework for sustainable management and stewardship of land resources
- redress historical injustices to protect the land rights of groups and communities marginalised in the past or based on gender, religion, ethnicity and other forms of vulnerability to achieve balanced growth and social equity
- ensure planned, affordable and orderly development of rural and urban settlements, including infrastructure development (GOU 2013b).

The MLHUD is responsible for policy formulation and the oversight of the land sector nationally. The ministry is composed of three directorates, two of which are central in land management: the directorate of land management, and the directorate of physical planning and urban development. At the district level, land is administrated by the district land office, district land board and district tribunal (not functional). The district land management officer provides technical services to the district administration and the district land board. The district land board is responsible for holding and allocating land in the district, facilitating the registration and transfer of interests in land and compiling and maintaining rates of compensation payable (i.e., crops and nonpermanent buildings).

At the subcounty level, land is administrated by an area land committee and a recorder. In 2016, an online cadastre (register of land ownership) was launched for the mining sector, which aims to reduce conflicts between different landowners who are involved in mining activities.

Large tracts of land are also owned by institutions like the Church and the Kingdoms who lease land to individuals on a lease-hold basis. This land is usually centrally managed with regional and field offices to handle land matters on behalf of the responsible institution.

Challenges

Land management is hampered by the problems shown in Table A11.4-25.

Table A11.4-25 Land Management Challenges

Challenge	Description of Challenge
Land titling	Few land holdings are titled. This can be attributed to factors including the protracted process required to register land officially and the associated cost.
Speculation	Speculation is a common consequence of publicly disclosed land acquisition. Speculative behaviour is often initiated and may be funded by resourceful individuals with access to information on potential development areas (information which is otherwise not publicly available). Acting on such information, speculators extort land from desperate land owners (usually parcels held under customary tenure) often at below-market prices and without consent from family or clan members who have interest in the same land. In addition, due to the large number of unregistered land parcels in the area, land is often transferred and registered without consent or due process by individuals who do not share interests in the targeted land and who have access to the land administrative system. Legitimate land owners (with customary tenure rights) are thus deprived of their land rights, often without their knowledge.
Contested land ownership	Weaknesses in the land administrative system give rise to land ownership disputes, not least as a result of incomplete transactional processes, including title registrations.
Recognising and formalising rights under customary tenure	Customary tenure does not give clan leaders any land ownership rights. However, these institutions have the power to establish rules for people claiming their rights and interests on specific parcels of land. Increasingly, land is being parcelled into individual plots, even in clan-held areas, and there is therefore evidence of a move toward individual ownership. A Certificate of Customary Ownership linked to membership of a given clan may not be relied on as stable instruments since social migration and community dynamics change family and community composition.

SOURCE: Adapted from CNOOC et al. (2016)

Land and Gender

Despite policy and legal safeguards, the head of the household (predominantly male) is usually perceived as the rightful owner and custodian of the land. In Uganda women formally own 16–26% of the land and informal (customary) ownership is reported to be approximately 15% and conjugal ownership is reported to be 3% (Landau 2016). As the value of land is increasing, male dominance over land–related decisions is increasing.

Women and young men are dependent on the head of the household for their access to land. Teenage sons can participate in land management as heirs and are entitled to decide what to do with their inheritance. Women and girls do not typically participate in land-related decisions.

A considerable source of inequality of land rights is linked to the practice of customary marriages, which are polygamous and not legally registered. At the end of a customary marriage (i.e., separation or widowhood), women may lose any land

rights. This type of marriage does not protect women's land rights, leaving them vulnerable to loosing access to land.

Land Holdings

National data relating to average land holding size are scarce. However, the UCA states that the national holding size is 1.1 ha (UBOS 2011b). According to the DDPs (2015) agricultural landholdings are fragmented and small. The average size of land holdings ranges from 1 ha (in Rakai district) to 2.5 ha in Hoima and Sembabule districts. Kyankwanzi district is an exception with an average holding just under 4 ha. The DDPs recognise that the small size of holdings constrains the agricultural sector and is attributed to a growing population; inheritance protocols dividing land between family members, rendering inherited parcels of land too small to make a living; and a shortage of land.

Land Conflicts

Land conflicts are the most common source of dispute, and are mainly due to:

- inheritance of land and land partitioning among the heirs
- nonconsented land sales within the family
- exclusion of women from land ownership
- fraud over land purchase or illegal land sales
- disputes over land boundaries
- expansion of settled and ranching farming, national parks, towns and settlements encroaching on village land
- land use plans that deny local communities access to land and natural resources needed for livelihoods
- village boundaries not being properly set
- land being acquired by the Government for public purposes, but subsequently being used for other purposes, causing dissatisfaction with the original landowners.

The Land Act (1998; 2010) created a dedicated judiciary system to solve land conflicts through district land tribunals, although this resulted in numerous problems and the approach was abandoned in 2006. Land cases are handled by the judiciary system through civil magistrate courts. This often results in delays in conflict resolution as these courts are overloaded. For example, in 2013, 75% of the courts case backlogs are related to land-related conflicts (MLHUD 2013).

PAC Level

From KIIs and FGDs, it was reported that plot sizes in sample PACs range from 0.02–80 ha. The most common is 1–2 ha. It is important to note that there were exceptions to this and larger plot sizes ranging from 50–166 ha were found at Kayere (KP0) and Katooke (KP1.5), Kisenyi (KP40) and Katikara Trading Centre (KP41), Mabale (KP183) and Njaza (KP184.5). The largest land holding (166 ha) identified is in Njaza village (KP184.5). The smallest land holding is 0.023 ha in Lukoma village (KP287.5). Table A11.4-26 presents access to land, land conflicts and land tenure regimes in the sample PACs.

Table A11.4-26 Access to Land, Land Tenure and Land Conflicts in the Sample Potentially Affected Communities

KP	Project Component	District	Subcounty	Settlements	Conflicts and Conflict Resolution Reported by the PACs	Land Tenure Regimes
0	PS1	Hoima	Buseruka	Hoima municipality, Kayere, Nyamasoga, Katooke	At Katooke and Kayere, disputes are caused by people grazing their animals where crops are being cultivated. Pastoralists and farmers often clash over this matter, with the pastoralists saying that the farmers should erect fences to protect their crops from animals. However, some pastoralists have no access to grazing land and so are forced to move their animals towards crops. Youth increasingly have no access to land because of inheritance protocols and the subdivision of family land making the parcels of land smaller with each generation, reducing the viability of productive land. Land speculation is prevalent. Reports of speculative behaviour such as forced eviction of rightful owners from land or extortion of land from needy landowners at below-market prices and often without consent from family.	Common: Private, public, leasehold, customary Not common: Kibanja holders (with papers), freehold
0–5		Hoima	Buseruka	Katooke	Disputes occur from the actions of pastoralists grazing their animals on crop land. Pastoralists are typically unwilling to pay compensation after this has happened. Local Council Authorities become involved to solve the disputes as they arise. Land speculation is high. Reports of speculative behaviour such as forced eviction of rightful owners from land or extortion of land from needy landowners at below-market prices and often without consent from family.	Common: Private, public, leasehold, customary Not common: Kibanja holders (with papers), freehold

Table A11.4-26 Access to Land, Land Tenure and Land Conflicts in the Sample Potentially Affected Communities

KP	Project Component	District	Subcounty	Settlements	Conflicts and Conflict Resolution Reported by the PACs	Land Tenure Regimes
5.5–31.5		Hoima	Kiziranfumbi	Kakende	Land disputes often occur due to the boundaries between land parcels being unclear. Youth have limited access to family lands due to inheritance protocols. Land speculation is high. Reports of speculative behaviour such as forced eviction of rightful owners from land or extortion of land from needy landowners at below-market prices and often without consent from family.	
32–36		Hoima	Buhimba		Local leaders have encouraged people to clearly demarcate their land to avoid conflicts. Where conflicts do arise, the local leaders intervene to resolve the situation. Youth have limited access to family lands due to inheritance protocols.	
36.5–40		Kakumiro	Kisiita		Within this trading centre, people were evicted to provide space for a development. In the surrounding area, pastoralists graze their animals. Youth have limited access to family lands due to inheritance protocols for crop land which causes conflicts.	Common: mailo land Uncommon: public land
40–54.5	MCPY1	Kakumiro	Kisiita	Kisenyi, Kakende, Kabaale-Kyabicwe, Katikara Trading Centre	At Kisenyi, there are boundary conflicts between neighbours. At Kakende, there is a land dispute which is current in court and has been for the last 17 years.	

Table A11.4-26 Access to Land, Land Tenure and Land Conflicts in the Sample Potentially Affected Communities

KP	Project Component	District	Subcounty	Settlements	Conflicts and Conflict Resolution Reported by the PACs	Land Tenure Regimes
55–66.5		Kakumiro	Mpasaana		Under a government-led resettlement process, people were allocated 4.9 ha of land to allow them to move away from Kibale Game Reserve. There was a rapid succession of transactions as some people decided to sell. Initially, there were very few disputes as people knew who the correct owners were. However, disputes started when people tried to alter boundaries and as pastoralists encroached on crop farmland. Youth have limited access to family lands due to inheritance protocols.	
67–69		Kakumiro	Nkooko		Land conflicts have arisen between the Banyoro and Baganda. The Baganda are claiming land that they believe was owned by their ancestors.	
69.5–83.5		Kyankwanzi	Gayaza		Conflicts have arisen between absentee landlords and local people. The area was formerly a game reserve.	Common: private, freehold and mailo.
84–112		Mubende	Butoloogo and Madudu		Over the last five years, the population has expanded causing conflict between pastoralists and other people as there is now limited grazing land for many animals. Disputes are settled by the subcounty agricultural officer and police to ensure that crop farmers are compensated.	Common: private, mailo Not common: public, communal

Table A11.4-26 Access to Land, Land Tenure and Land Conflicts in the Sample Potentially Affected Communities

KP	Project Component	District	Subcounty	Settlements	Conflicts and Conflict Resolution Reported by the PACs	Land Tenure Regimes
112.5–125		Mubende	Kitenga	Kamusenene, Lugala, Mijunwa	A combination of Local Council Committees that involve community leaders and the courts are used to resolve disputes. Increases in land speculation have increased land conflicts related to customary land as well as eviction of tenants on mailo land. Complaints were referred to the district land board.	Common: communal, mailo, private
125–147	MCPY2	Mubende	Kitenga	Kyenda, Kalembe, Mubende municipality, Kagoma	At Kalembe, conflicts occur due to land grabbing by wealthy people, many of whom are based in Kampala. They buy land cheaply from vulnerable people (such as the elderly) and evict people forcibly when double titling occurs (this is where more than one person claims legal ownership of the same parcel of land, often due to fraudulent activities).	
147–185		Sembabule	Lugusulu	Mabale	Disputes occur over boundaries and between groups and are settled in the local council committees.	Common: private, mailo, lease, freehold Not common: communal, public.
185	PS2	Sembabule	Lugusulu	Njaza, Serinya, Kagango,	At Serinya, a fraudster claimed to have the title for the entire village and forced the residents to pay him land tax. As he is now deceased, the people have refused to pay his heir. At Kagango, land speculation is linked to fraud across the district. Youth have limited access to family lands due to inheritance protocols.	

Table A11.4-26 Access to Land, Land Tenure and Land Conflicts in the Sample Potentially Affected Communities

KP	Project Component	District	Subcounty	Settlements	Conflicts and Conflict Resolution Reported by the PACs	Land Tenure Regimes
185–191		Sembabule	Lugusulu and Mijwala	Muyenje	At Muyenje, a few people own a lot of land and many own small land parcels (bibanja), which they use for crop agriculture. In recent years, the increase of migrants has brought people together and forced them to organise land boundaries clearly with the aim of avoiding conflicts. Increasingly land is being used for the construction of buildings and houses, rather than for cultivation. Youth have limited access to family lands due to inheritance protocols.	
192–201	MCPY3	Sembabule	Sembabule TC, Mijwala	Nsambya, Muyenje, Miti, Sembabule Market Zone	Historically there were more disputes with pastoralists, but the number of conflicts has decreased. Some of the pastoralists have started to grow crops and complain when their crops are eaten by other pastoralists' livestock. Land speculation is high in and around Sembabule Town Council subcounty. Levels of expectation of potential benefits to be secured through the resettlement process have led to reports of speculative behaviour and, in some cases, violence associated with forced eviction of rightful owners from land or 'land grabbing'.	
201.5–217		Sembabule	Lwebitakuli	Bulakati	Typical disagreements are caused by boundary disputes between crop farmers and pastoralists. Such disputes are increasing as there is a reduced amount of land available.	

Table A11.4-26 Access to Land, Land Tenure and Land Conflicts in the Sample Potentially Affected Communities

KP	Project Component	District	Subcounty	Settlements	Conflicts and Conflict Resolution Reported by the PACs	Land Tenure Regimes
217.5–274		Lwengo Kyotera	Lwengo Nabigasa Kasaali	Bukulula, Kiswaga, Nanywa, Mbirizi	Conflicts have increased in recent years due to growing land value. The courts and the police are asked to intervene when conflicts occur. There is a recent trend where more land is being sold rather than inherited.	Common: private, customary, public Not common: communal
282	MCPY4	Kyotera	Kakuuto	Kabugimbi	With increased speculation surrounding oil-related activities, there is a trend in absentee Mailo land holders requesting that land users renew agreements with them or face eviction threats.	
272–290		Rakai Kyotera	Kifamba Kasasa Kakuuto	Lukulavu, Kabonera, Lukoma, Ssanje Katwe, Lwemisege	At Lukoma, land disputes have occurred after parents gave their children land without any written agreement.	

SOURCE: FGDs with village leaders

From the table the following can be concluded:

- land conflicts are common in the AOI
- the younger generations have limited access to family lands as inheritance protocols make inherited land parcels too small for making a living
- land speculation, whereby speculators extort land from land holders using falsified documents or other means, has become a common occurrence (Business and Human Rights Resources Centre 2018, Internet site)
- across all land tenure systems, privately owned land is most common.

There are land conflicts in most of the sampled PACs. These relate predominantly to:

- crop farmers and pastoralists encroaching on each other's land. The lack of implementation of land management plans contributes to this problem.
- land being sold to more than one person, often without formal title deeds leaving the buyers vulnerable. The process of obtaining a title deed is costly and involves many steps.
- family land being sold without the consent of the entire family
- dispute over the exact boundaries between plots and villages.

Existing land conflicts identified by KIIs and FGDs in sample PACs are presented in Figure A11.4-46.

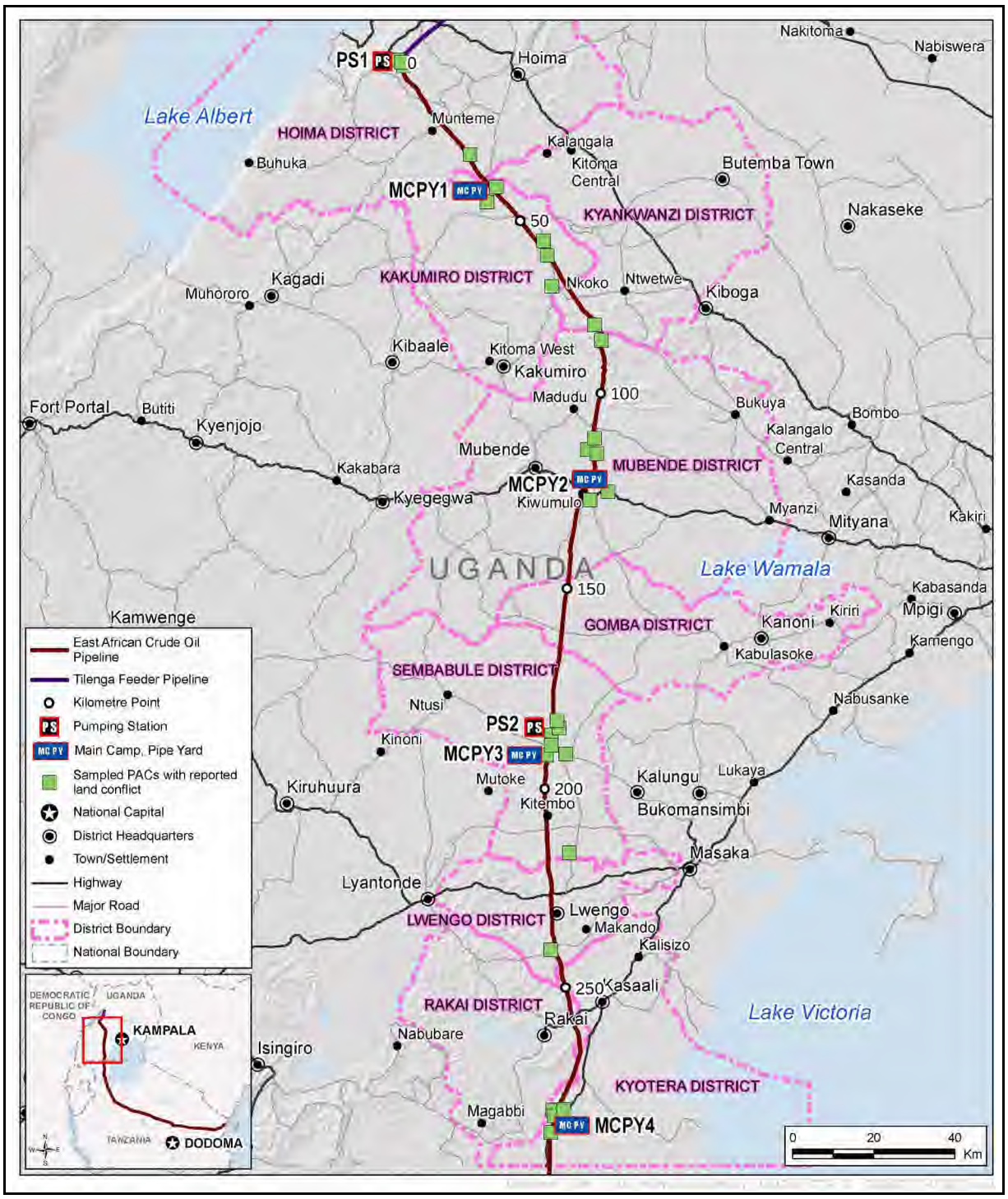


Figure A11.4-46 Existing land Conflicts Reported in Sample Potentially Affected Communities

Settlements and Housing

In rural areas, most of the dwellings concentrate along national and secondary roads. Hamlets and villages often have a central trading place in which the main business and social activities take place.

Traditional house structures common throughout the PACs are constructed using wood joists and uprights, with thatched roofing and adobe walls. Other structures are improved houses with brick walls, and zinc or fired clay tiled roofs.

A11.4.8.2 Human Rights

The following human rights laws apply to land and property:

- Universal Declaration of Human Rights, article 17; African Charter on Human and Peoples' Rights, article 14.
- Universal Declaration on Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11; African Charter on Human and Peoples' Rights, article 21.
- Universal Declaration on Human Rights, articles 1, 2 and 23(2); International Covenant on Civil and Political Rights, articles 2 and 3; International Covenant on Economic Social and Cultural Rights, articles 2 and 3; ILO Convention 111 on Discrimination (Employment and Occupation); Convention on the Elimination of All Forms of Discrimination Against Women; UN Women's Empowerment Principles (2010); African Charter on Human and Peoples' Rights, articles 2, 3, 15 and 18; Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa.
- Universal Declaration of Human Rights, articles 25.2 and 26; International Covenant on Civil and Political Rights, article 24; International Covenant on Economic, Social and Cultural Rights, articles 10, 12 and 13; Convention on the Rights of the Child; African Charter on Human and Peoples' Rights, article 18; African Charter on the Rights and Welfare of the Child.

A11.4.8.3 Trend in Condition and Sensitivity to Change

The following trends and sensitivities were identified:

- an increase in population and in-migration in certain areas with accompanying purchase of land by migrants is causing an increasing scarcity of land. The overall number of disputes involving land-related cases is increasing.
- long-standing discrimination that excludes women from owning, inheriting and controlling land is causing a high level of inequality. Furthermore, as the value of land increases, male dominance over land-related decisions is likely to increase.
- recognition of land value and the enactment of land legislation have increased the quantity of land being registered, sold and purchased. Therefore, there is less land being inherited and more land being sold.
- land is often bought by village outsiders with higher purchasing power. During these transactions, there are an increasing number of fraud cases. The sale of land for private use is reducing the availability of communal village land, which was used for grazing in the past.

A11.4.8.4 Ecosystem Services Provided

The ecosystem services provided by land have been considered in Section A11.4.6, Land-Based Livelihoods.

A11.4.8.5 Sensitivity Ranking

The social baseline study has identified several sensitive VECs with regards to land and property use. These are listed in Table A11.4-27.

Table A11.4-27 Land and Property VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Livestock rearers practicing localised nomadism	Moderate (3)	Without access to land or water, livestock quality and quantity will be adversely affected; localised nomadism has become increasingly important because of recent droughts and climate variability.
Landholders without title deeds (Kibanja or other)	High (4)	Without formal acknowledgement land holders will not have land ownership rights and will not be eligible to compensation, only for crops grown.
Youth	High (4)	Youth have limited access to land outside their customary rights as a member of a clan or family and inheritance protocols mean that parcels of land are becoming smaller and less viable.
Female headed households	Very high (5)	Without land ownership rights and long-standing discrimination that excludes women from owning, inheriting and controlling land causing a high level of inequality and without access to productive capital women are particularly vulnerable.
Previously displaced/resettled HH/individuals	Very high (5)	Households or individuals who have undergone resettlement or compensation within the AOI will be particularly vulnerable to further change and will have low resilience to additional shocks.

A11.4.8.6 Key Considerations

Key considerations are:

- the increasing scarcity of land because of a growing population
- the vulnerability of most landowners due to lack of formal title deeds
- women being disadvantaged in terms of access to land. Compensation for loss of land will mostly be paid to the head of household (men) without spousal consent, leaving women vulnerable in terms of access to that compensation.
- the existence of numerous land conflicts exacerbated by shortage of land
- the lack of land management plans which impact on the distribution of land

- the existence of vulnerable groups in terms of land take, such as illegal users of the land, including hunters and natural resource collectors (see land-based livelihoods, Section A11.4.6)
- an increase in “land-grabbing” schemes used to obtain land unlawfully or under false pretexts, high amounts of land speculation and reports of speculators extorting land from people creates fear and insecurity.

A11.4.9 Workers’ Health, Safety and Welfare

A11.4.9.1 Baseline Condition of Workers’ Health Safety and Welfare

National Level

The majority of the International Labour Organisation (ILO) conventions have been incorporated into Ugandan national legislation. The Ministry of Gender, Labour and Social Development (MGLSD), through the district administration, provides oversight to work-place conditions and worker–employer relations. Every employer is required to provide their employees with a written contract of employment from their first working day. However, in practice workers are not always provided with adequate information on their terms of employment and their labour rights (DTCIDC 2016).

Employment Contracts

Uganda’s labour market has been subjected to legal reforms since 2013 and, since 2016, all employers are required to issue itemised pay slips and Key Employment Terms (KET) to employees covered under the Employment Act (2006). In practice, the majority (90%) of the labour force is not covered by legislation as they operate in the informal economy where workplace activities are largely unregulated (DTCIDC 2016). Informal workers are mostly concentrated in the agricultural sector.

Informal workers lack written employment contracts and most are paid daily after the work is completed. Workers’ entitlements to job security, sick pay, support in case of work injury, paid holidays, access to grievance mechanisms and regular working hours are largely absent. Basic rights, such as the right to paid leave, maternity leave (with 60 days leave at full wages) and safe working conditions, are often violated (ISER 2017).

A normal working week involves the completion of 48 hours with any additional hours paid as overtime. There is no limit on the amount of overtime that can be completed by workers.

The current minimum wage (UGX 6000 per month; USD 1.60 per month) was last increased in 1984. The Minimum Wages Advisory Board, set up in 2015, has suggested a new figure of UGX 136,000 (USD 36.15) but this is yet to be gazetted.

All workplace unions must be registered under the National Organisation of Trade Unions or the Central Organisation of Free Trade Unions. As of 2016, 52 labour unions were registered covering 547,000 workers comprising 3.2% of the total labour force (DTCIDC 2016).

A culture of unionisation in the project area is largely non-existent. Some employers reportedly ignore legal requirements to enter collective bargaining agreements with

registered unions. Some companies are believed to interfere to prevent their employees from joining unions or they avoid direct employment contracts through subcontracting, outsourcing services or providing temporary employment contracts thereby bypassing collective bargaining (The Danish Institute for Human Rights 2016). There are also concerns of unions not representing workers and of employees being ill-informed of their rights (ISER 2017).

Workers have limited power to negotiate with their employers. This is exacerbated by poor awareness of labour rights among workers. High levels of illiteracy and the complexity of laws governing labour in Uganda makes it difficult for people to understand their rights, rendering them vulnerable (ISER 2017).

However, a system exists whereby complaints related to work-place-employer–employee disputes can be submitted to union leaders (if they exist within the organisation) or to the district labour office. The complaints are then forwarded to the industrial court. However, the court has a five-year case baglog (The Danish Institute for Human Rights 2016).

Gender

Women's limited access to education and early marriage restricts them from obtaining equal pay within the formal and informal sectors of the economy. In 2013, the proportion of women recorded to be company owners was lower than the average for sub-Saharan Africa, as illustrated in Figure A11.4-47.

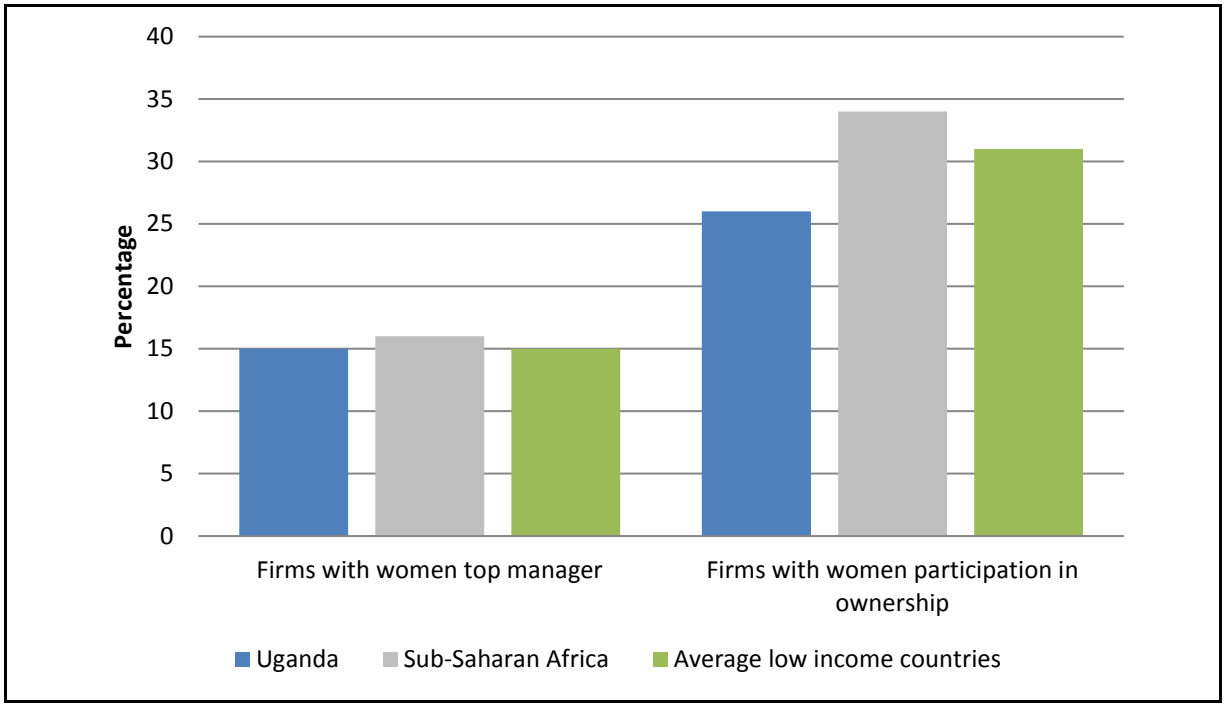


Figure A11.4-47 Percentage of Women in Top Management Positions and Participating in Ownership

SOURCE: World Bank and IFC 2013

Women face numerous challenges in the workplace, including sexual harassment, abuse and exploitation. Such challenges limit women's prospects and opportunities for advancement in the workplace (UHCHR 2016).

In addition to women, other groups, including those living with HIV/AIDS, casual or temporary workers and child-headed households, also experience workplace discrimination.

The Equal Opportunities Commission investigates cases reported by complainants and cases instigated by the commission itself (The Danish Institute for Human Rights. 2016).

Social Security

Social security schemes consist of contributory and or compulsory social insurance for formal workers. These are known as the National Social Security Fund (NSSF) and the Public Service Pension Scheme that covers all public servants and exclude people active in the informal sector (ILO 2018). The government is planning to introduce a nationwide Social Health Insurance scheme, which would also cover workers from the informal economy.

The NSSF is the main contributory social protection scheme and provides support to workers engaged in the formal sector in the form of old-age pensions, and benefits for disabilities following work injuries. The scheme is mandatory for businesses with more than five employees and voluntary for smaller firms. As of June 2011, the NSSF had a membership of equivalent to 1.3% of the population and has achieved limited success (DTCIDC 2016).

Micro-financed insurance schemes are an option for informal economy workers and are privately run through micro-finance institutions or health-care providers. This type of scheme provides accident and health insurance, although these have had limited uptake due to the cost of membership.

The proportion of the population covered by government or private social protection is estimated at 3.5%, which is lower than the 4.3% average across sub-Saharan Africa. The proportion of people covered by health protection is 2%, compared with an average across Africa of 25%.

Occupational Health and Safety

The MGLSD, through the Department of Occupational Safety and Health, is responsible for administration and enforcement of the Occupational Safety and Health (OSH) Act 2006. Despite government efforts to improve the safety and health of all workers in the country, limited change has occurred due to lack of regulators enforcing the Act.

The management of OSH risks within the workplace is not recognised as a priority by business owners and personnel supervisors, and Uganda's labour productivity is the lowest in East Africa due to poor working conditions (Office of the Auditor General 2016). A national audit of labour and working conditions was undertaken by the Office of the Auditor General in 2015 and contained the following key findings:

- very few privately owned businesses were formally registered with the MGLSD, with 756 businesses holding registration certificates out of approximately 1 million entities. Despite a statutory requirement for businesses to register each year, only 5% of businesses had successfully re-registered for a second year. The lack of business registration means that most businesses are not known to the MGLSD and cannot be inspected for their OSH performance.
- in 2015, the Department of Occupational Safety and Health had conducted inspections of just 139 of businesses, and the department lacked the appropriate staffing, training and resources needed to conduct a greater number of inspections.
- the level of OSH awareness among the national workforce, supervisors and senior management is low. Workers are typically not aware of their legislative rights and are not consistently compensated for workplace injuries in accordance with national legislation (Office of the Auditor General 2016).

Recently, the informal mining sector has experienced considerable expansion and many mining sites are operated without OSH controls or adequate provision of worker welfare facilities. Informal mining operations are particularly hazardous due to the use of large excavated pits, basic machinery for digging and processing ore, and mercury for gold processing.

Workplace accidents that occur include fire, collapse of walls at construction sites, and illnesses related to exposure to noise, vibration and heat. The most recent government data available from the MGLSD indicated that 1520 people were injured at various workplaces between 2006 and 2008 and, 856 workers contracted various occupational diseases and illnesses in 2007. From 2008–2009, over 40 buildings were recorded to have collapsed, killing and injuring many workers (Office of the Auditor General 2016).

Alinaitwe et al. (2007) investigated the frequency and type of accidents that occurred within the construction sector. The most common causes of accidents involved being hit by a falling object, limbs being caught in moving machinery and injuries involving vehicles. The research indicated that 15% of people involved in a workplace incident were killed and 37% experienced a permanent reduction in their ability to continue their main economic activity.

The Danish Institute for Human Rights reports that in 2011, Uganda had the highest rate of construction incidents in the world, with 4200 major injuries taking place each year, purportedly because of inadequate construction materials and high numbers of workers on sites (2016). Employers and employees do not consistently report workplace incidents, and workers do not commonly use legal processes to claim their entitlement for injury. The use of a legal process to obtain compensation is problematic as most workers are employed without a formal written contract.

Child Labour

The minimum age of employment is 14, although children aged 12 and 13 can engage in light work up to a maximum of 14 hours per week if it does not interfere with their schooling. Children between 14 and 17 must not work more than 43 hours per week and cannot work at night (7 p.m. to 7 a.m.) or undertake any hazardous work. These provisions are in line with international standards.

A national survey on child labour completed between 2011 and 2012 (ILO 2013) indicated that 39% of children were involved in an economic activity (93% in the agricultural sector); this is higher than the sub-Saharan Africa average of 28%. Over the last ten years, the prevalence of child labour has decreased substantially and has been linked to higher school attendance at a national level. However, child labour in areas such as ASM and family work (i.e., crop farming and livestock rearing) is still prevalent. Many families have unstable livelihoods and need every family member to be earning an income. Ugandan children as young as seven are exploited in forced labour within the country in the agriculture, fishing, forestry, cattle-herding, mining, stone-quarrying, brick-making, car-washing, scrap-metal-collection, street-vending, bar, restaurant and domestic-service sectors (United States Department of State 2014). An estimated two million children are still engaged in child labour across Uganda, 507,000 of whom are exposed to hazardous work, including sexual exploitation, mining, commercial agriculture, construction and armed conflicts (OHCHR 2016). Children who are the sole heads of households are particularly vulnerable to child labour.

Human Trafficking

In 2009, the Prevention of Trafficking in Persons Act (2009) was enacted. Under Section 21, the designated office for Prevention of Trafficking in Persons is mandated to develop a national action plan on human trafficking. This national action plan was implemented in 2015 and the government has since trained over 1000 officers to reduce forced labour and human trafficking in the country.

According to the US Department of State (2017), the Government of Uganda has shown increasing efforts in investigating, prosecuting, and achieving convictions in trafficking cases, initiated criminal prosecution of labour recruitment agencies for allegations of their involvement in trafficking and promoted the Coordination Office to Combat Trafficking in Persons to being an official department. Insufficient funding, corruption and inconsistent victim assistance have hindered the effort. The government has not institutionalised anti-trafficking training among law enforcement and front-line officials, and it remains without an official lead agency with authority to manage, fund, and drive the efforts of the national taskforce.

PAC Level

While there is no document information available at a local level associated with worker safety and welfare, anecdotal information collected from KIIs indicates small business do not provide adequate welfare or OSH controls to the workforce in the sample PACs. For example, small vendors were observed undertaking motorbike repair activities within sample PACs, using mechanised machinery without any OSH controls in place. Such small businesses typically provide almost no worker welfare facilities.

Human Rights

The following human rights laws apply to this VEC:

- the right to nondiscrimination
- freedom from child labour
- freedom from forced labour

- freedom of association
- the right to just and favourable working conditions
- the right to work in a healthy and safe environment.

International standards for responsible business require that:

- minimum labour standards are respected by organisations
- supply chains must be considered in a company's effort to eradicate human rights risks in its activities.

Trend in Condition and Sensitivity to Change

The following trends were identified:

- the ongoing expansion of the informal mining sector across the country is resulting in greater OSH risks, as this sector is largely unregulated and the awareness of OSH among the workforce and employers is low
- there is no culture of unionisation in Uganda; workers often do not have the power to negotiate with their employer
- people work in unsafe and unhealthy conditions and often do not have access to personal protective equipment. Employers do not offer insurance or medical care in case of work-related injury or disease. There is no grievance mechanism for employees who have this type of claim.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

Table A11.4-28 provides the sensitivity ranking for the local workforce.

Table A11.4-28 Workers' Health, Safety and Welfare Key VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Local workforce health and safety and welfare	Very high (5)	The local workforce has a low occupational health and safety awareness

A11.4.9.2 Key Considerations

Key considerations are:

- unscrupulous recruitment agencies exist in Uganda and potential workers may be asked to pay fees to 'register' their interest in being part of a workforce
- low level of awareness of health and safety, and worker rights in the existing PACs
- low levels of understanding of a nondiscriminatory work culture such as with a mixed gender workforce in the PACs
- the human rights of workers with regards to health and safety.

A11.4.10 Social Infrastructure and Services

A11.4.10.1 Baseline Condition of Social Infrastructure and Services

National Level

Electricity

The liberalisation of Uganda's power sector in the late 1990s resulted in the unbundling of the state-owned Uganda Electricity Board into three state companies: the Uganda Electricity Generation Company Limited (UEGCL), the Uganda Electricity Transmission Company Limited (UETCL) and the Uganda Electricity Distribution Company Limited (UEDCL) (Norton Rose Fulbright 2015, Internet site). UEGCL is responsible for the production and sale of electric power in Uganda. UETCL undertakes bulk power purchases and sales, import and export of energy, and operation of grid assets above 33 kV (Norton Rose Fulbright 2015, Internet site). UEDCL's primary purpose is to distribute electric power to domestic and commercial end-users in Uganda, operating grid assets at and below 33 kV (New Vision 2016b, Internet site). The Rural Electrification Agency (REA) was also established at this time to facilitate the government's goal of achieving universal access to electricity by 2035 (REA 2018, Internet site). The country generates its own electricity supply, predominantly from hydroelectric power stations (GOU 2018, Internet site). The country has 850 MW of installed capacity, the majority of which is hydro-generated capacity (see Figure A11.4-48).

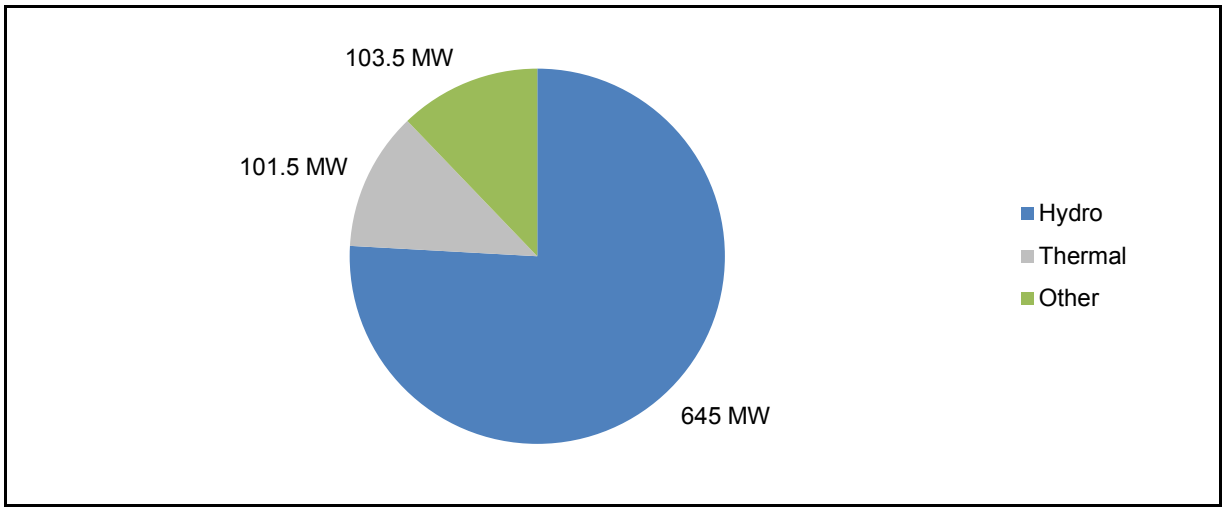


Figure A11.4-48 Electricity Capacity by Power Source
SOURCE: USAID 2017, Internet site

The role of hydropower plants in generating Uganda's electricity will increase following the completion of the following large hydro facilities:

- Karuma hydropower plant, Kiryandongo district, 600 MW capacity
- Isimba hydropower plant, Jinja district, 183 MW capacity (UEGCL 2018, Internet site).

These power generation projects are a direct response to national development objectives and priorities, which includes providing electricity access to 80% of the population by 2040 (AfDB 2015).

A large proportion of Uganda's rural population remains without access to electricity (see Figure A11.4-49).

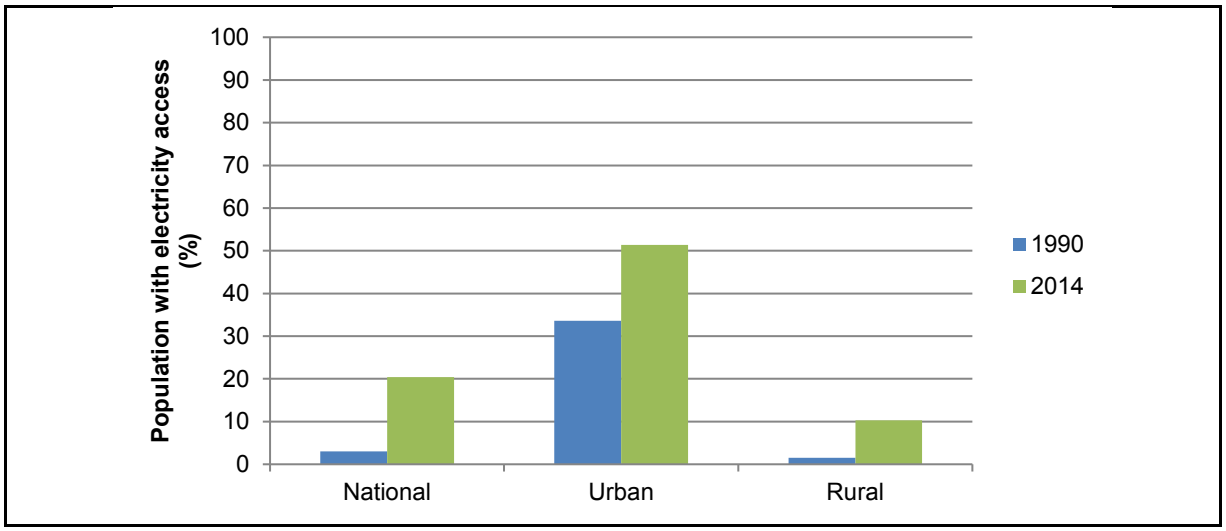


Figure A11.4-49 Proportion of the Population with Access to Electricity in 1990 and 2014

SOURCE: World Bank 2017c, Internet site

To address the lack of electrical power provided to rural areas, a 10-year Rural Electrification Strategy and Plan (RESP-2) was approved by the Government of Uganda in 2013. With financial support from the African Development Bank and European Commission, the target of the RESP-2 is to increase electricity access in rural areas to 26% by 2022. The RESP-2 includes:

- the construction of 1147 km of medium voltage and 808 km of low voltage distribution networks
- the provision of connections to the grid for 58,206 rural households, 5320 business centres and 1474 public institutions (European Commission 2018, Internet site).

In the absence of electricity, wood and charcoal provide almost all the energy required to meet the basic energy needs for cooking in rural areas and many urban households (UNDP 2014). In 2013, the use of firewood and charcoal in Uganda was estimated at 44 million tonnes per year. Out of this, only 26 million tonnes is reported to be sustainable, raising concerns about the availability and longevity of future supplies (UNDP 2014).

Solar energy is also being utilised, but on a much smaller scale. Over 30,000 solar photovoltaic systems have been installed in rural areas and two larger photovoltaic plants are at the planning stage (Africa-EU RECP 2018, Internet site). The DPPs suggest that solar power may play a more important role in electricity generation in the future.

Recognising the potential of solar power, the Government of Uganda has endeavoured to reduce the costs of producing solar, wind and geothermal energy by allowing VAT relief on business inputs purchased by producers (Lighting Africa 2018, Internet site).

Telecommunications

Uganda's communications sector is growing fast, driven by the rapid expansion of mobile telephony (ITU 2009, Internet site). There are more than 19 million mobile phone subscribers, equivalent to 50% of the population, with approximately 28 million mobile phone subscribers projected by the end of 2019 (Cartesian 2015). Uganda's main mobile network operators and their share of mobile subscriptions are presented in Figure A11.4-50.

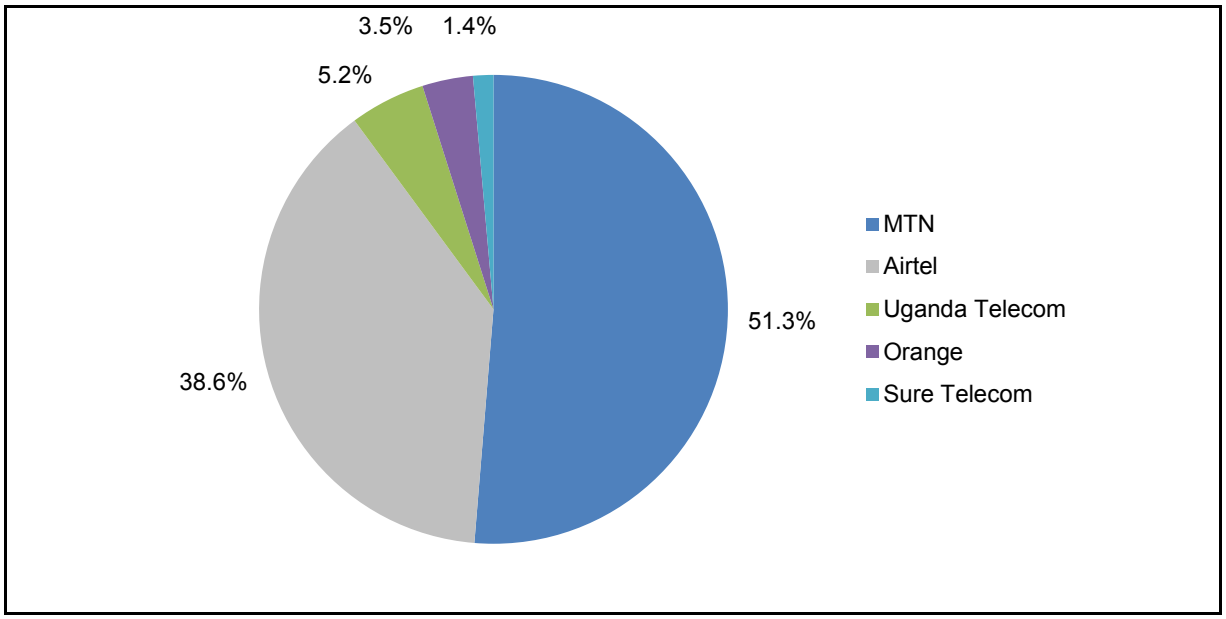


Figure A11.4-50 Main Mobile Operators and Proportion of Total Mobile Subscriptions

SOURCE: Cartesian 2015

The projected number of mobile subscriptions will increase the demand for network, data transmission and fibre-optic equipment in Uganda in the future (Export Gov 2017, Internet site).

A 3G mobile broadband service was launched in three major cities in March 2008 (ITU 2009, Internet site) and 3G is now available in most secondary urban areas. The installation of a 5000-km marine fibre-optic cable off the coast of East Africa in 2009 has improved the cost and performance of Uganda's internet service through cross-border connectivity arrangements (Teams 2014, Internet site). Nevertheless, the service remains slow and expensive by international standards (Export Gov 2017b, Internet site).

Figure A11.4-51 and Figure A11.4-52 show that the number of fixed and mobile internet subscribers has increased steadily between 2012 and 2015.

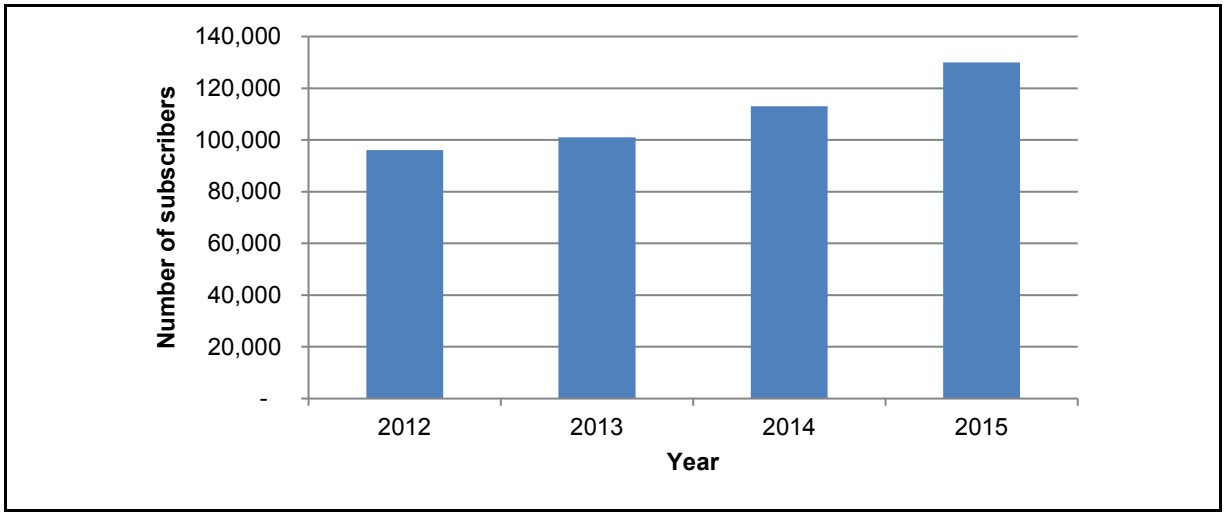


Figure A11.4-51 Fixed Internet Subscribers, 2012–2015
SOURCE: Export Gov (2017b, Internet site)

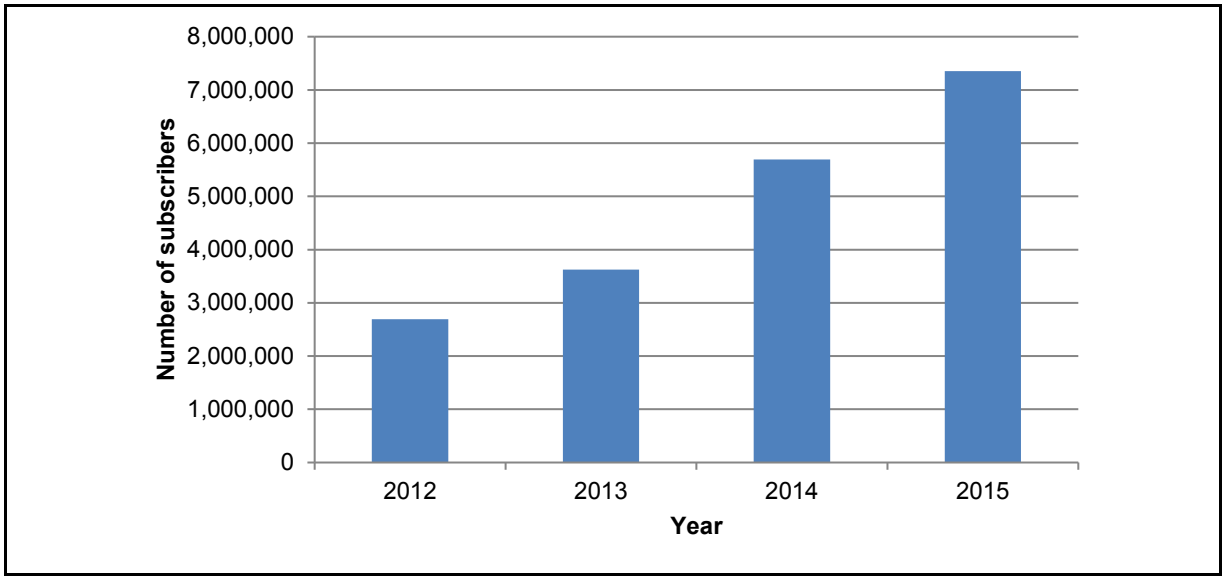


Figure A11.4-52 Mobile Internet Subscribers, 2012–2015
SOURCE: Export Gov (2017b, Internet site)

The number of people with mobile internet subscriptions is far greater than fixed internet subscriptions. In 2015, there were over 7 million mobile internet subscribers compared to 130,000 fixed internet subscribers. Internet access has increased and become more affordable, however internet usage remains largely concentrated in urban areas where the infrastructure is available and there is a greater disposable income (Freedom House 2018, Internet site). The costs associated with internet access remain expensive for many Ugandans, particularly those living in rural parts of the country. Internet coverage and connectivity in remote areas is limited (Freedom House 2018, Internet site).

Mobile money services were first introduced in Uganda in March 2009 and have grown substantially since then (Bank of Uganda 2016). A survey conducted in 2015 found that 43% of Ugandan adults have access to, and 26% actively use, mobile

money accounts (CGAP 2015, Internet site). Trends in the number of registered customers and transactions are shown in Figure A11.4-53.

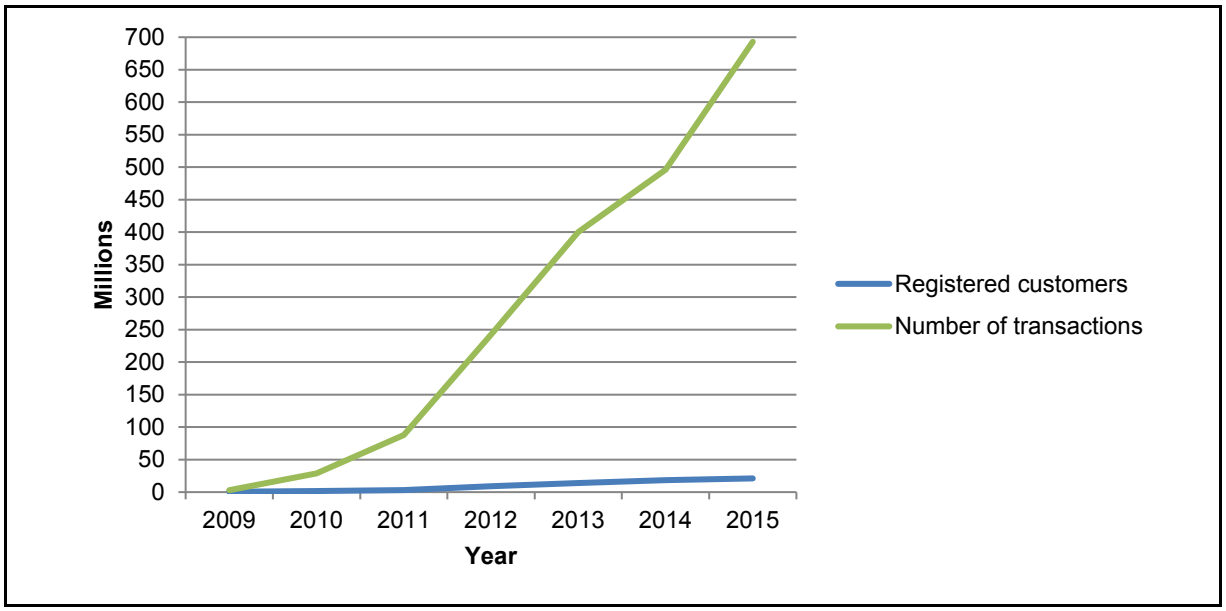


Figure A11.4-53 Number of Mobile Money Registered Customers and Number of Cumulative Transactions, 2009–2015

SOURCE: Bank of Uganda 2016

Figure A11.4-53 shows that the number of registered customers and mobile money transactions increased between 2009 and 2015. The number of transactions has risen considerably since mobile money services were introduced seven years ago (from 3 to 693 million transactions).

Registered users can:

- load money into their accounts (cash-in); users make cash deposits with mobile money agents who load their money for a transaction fee
- make transfers to other users (registered or not) and buy airtime top-ups from mobile money agents
- withdraw money (cash-out); users withdraw cash via mobile money agents for a transaction fee (Ndiwalana et al. 2012).

The benefits of mobile money in Uganda include:

- increased accessibility to financial services
- agricultural commercialisation, rural development and poverty reduction (Baganzi and Lau 2017).

Media

Newspapers

There are 24 daily and weekly newspapers in Uganda (Freedom House 2015, Internet site). The country's leading newspapers are the:

- New Vision
- Daily Monitor
- Bukedde.

The state-owned *New Vision* and independent *Daily Monitor*, printed in English, are the oldest and second oldest newspaper publications respectively (Freedom House 2015, Internet site). The government-owned *Bukedde* is printed in Luganda, one of the most widely spoken local languages in Uganda.

There has been a general decline in newspaper circulation in Uganda, partly resulting from the growing popularity of social media (e.g., Facebook, Twitter and YouTube) as a means of disseminating news and information.

Radio

Radio broadcasting, which began in 1952, is the most widely accessed news medium in Uganda (Freedom House 2015, Internet site). A study of over 2000 households, individuals, businesses and institutions found that 83.3% of respondents listen to the radio, mostly during the late afternoon and early evening (ACME 2015, Internet site). There has been tremendous growth in Uganda's radio industry since the liberalisation of broadcasting in the 1990s and over 180 private radio stations are now in operation (UNESCO 2015, Internet site). Popular radio stations include Radio Simba, a commercial private radio station which broadcasts in Luganda (Radio Simba 2018, Internet site). Community radio stations are also popular, particularly in rural areas where individuals have few media sources available (UNESCO 2018, Internet site). Community radio stations have played an important role in disseminating information for development purposes with a focus on health, education and sports (UNESCO 2015, Internet site). Community radio stations include Radio Apac, Mama FM and Speak FM (UNESCO 2018, Internet site).

Television

Like radio, there has been a substantial growth in Uganda's television industry since the 1990s. Television broadcasting started in 1963 and the state-owned Uganda Broadcasting Corporation (UBC) operates two television channels (UBC TV and Star TV) (Zenith 2017, Internet site). There are several private television channels, mostly based in Uganda's cities, including East Africa TV and NTV Uganda (Zenith 2017, Internet site). The study by ACME (2015, Internet site) examined television usage and found that the most popular time for television watching is 7–9 p.m. In urban areas, roughly 80% of the participants reported watching television at home; in rural areas, this figure dropped to 44.6% with 36.3% reporting that they watch TV in public places instead.

Waste Management

The provision of waste management services under the Local Government Act 1997, is the responsibility of local government authorities (Komakech 2014). Rapid population growth and higher levels of economic activity in urban areas has led to a substantial increase in waste generated. In Kampala, Ojok et al. (2012) report 900 tonnes of daily waste generated across the city (2012). With reduced funding from central government, municipal authorities reportedly do not have the capacity to meet the demand. Inadequate waste collection and disposal in Uganda's major towns and cities has exacerbated many of the environmental hazards associated with urban areas and generated public health risks. In the absence of effective waste management services, some urban communities practice local waste management techniques (i.e., recycling and composting) (Okot-Okumu and Nyenje 2011). Nevertheless, field studies found considerable amounts of waste dumped in open areas, streams and drainage canals, burnt near to homesteads or buried. This can contribute to environmental pollution, clogging of waterways and increases flood risks (DLCA 2015, Internet site).

Domestic liquid waste in Uganda is mainly disposed of via pit latrines. The percentage of the population with access to basic sanitation facilities has steadily increased and is estimated at approximately 80%. Nevertheless, the relatively high cost of constructing new latrines and poor health education limits the installation and use of improved toilet facilities in Uganda. This is discussed in the community health section, A11.4.11. Existing public and private toilets are often in poor condition and require maintenance, especially in areas with high population densities (Daily Monitor 2013, Internet site).

Transport

The baseline conditions for transport infrastructure in Uganda are described in the traffic baseline report (Appendix A12).

Water and Sanitation Services

The baseline conditions for water and sanitation services in Uganda are described in Section A11.4.10 on community health.

District and PAC Level

Electricity

Figure A11.4-54 shows that less than 20% of households have access to electricity in the districts traversed by the AOI. However, access to electricity may improve following the completion of energy generation projects in the districts. In Hoima, a new small hydropower plant is scheduled for construction in Kigorobya subcounty (DDP 2015). New power lines are due to be installed in Kyankwanzi district as part of the RESP-2 (DDP 2015). Figure A11.4-55 shows new power lines in Katikara Trading Centre (KP41), Kakumiro district.

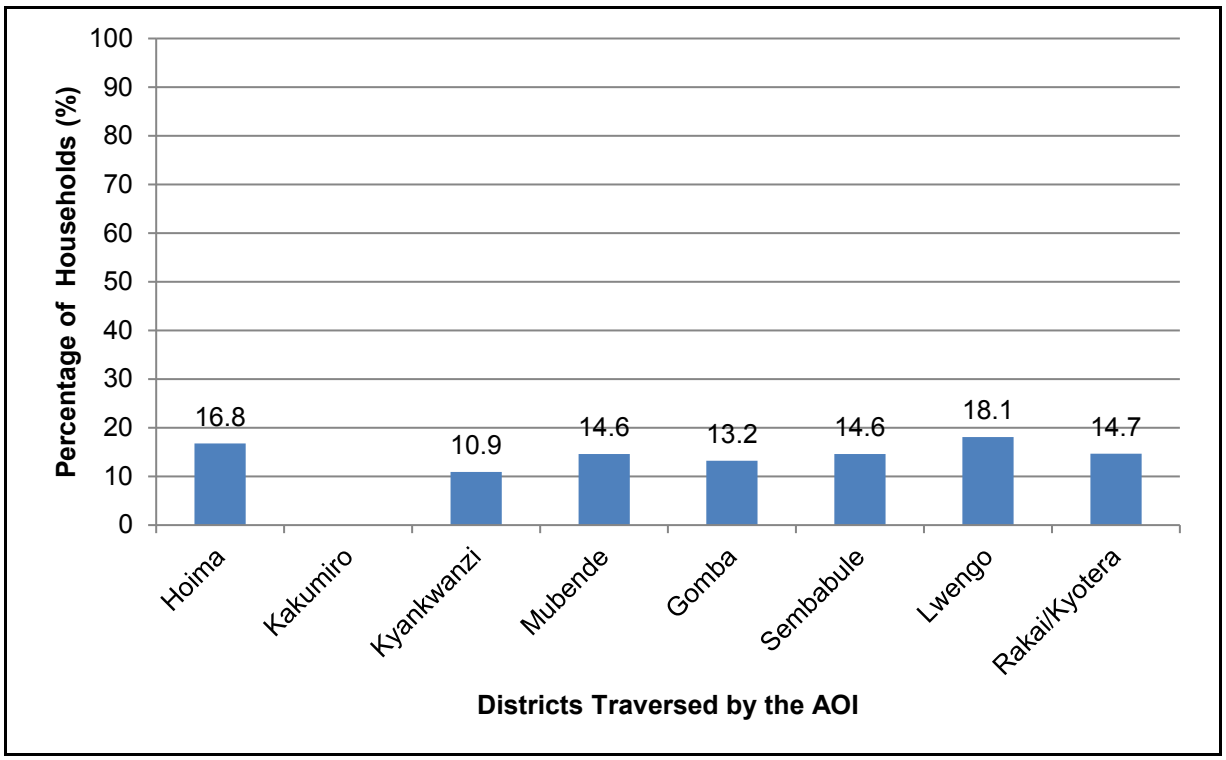


Figure A11.4-54 Percentage of Households with Access to Electricity by District

SOURCE: UBOS 2016c

NOTE: Data for Kakumiro district is not available

Figure A11.4-55 Power Cables Running through Katikara Trading Centre, Kakumiro District (KP41)

In the absence of electricity, people in the districts traversed by the AOI rely on alternative energy sources for lighting, principally fuel lamps and solar powered torches, and candles to a lesser degree (see Table A11.4-29).

Table A11.4-29 Main Lighting Source of Energy

District	Subcounty	Main Energy Source for Lighting
Hoima	Bugambe	Fuel lamp
	Buhimba	Solar
	Buseruka	Solar
	Kiziranfumbi	Candle
Kakumiro	Katikara	Solar
	Kisiita	Solar
	Mpasaana	Solar
	Nkooko	Solar
Kyankwanzi	Gayaza	Solar
	Ntwetwe	Solar

Table A11.4-29 Main Lighting Source of Energy

District	Subcounty	Main Energy Source for Lighting
Mubende	Butoloogo	Solar
	Kitenga	Solar Fuel lamp
	Madudu	Fuel lamp
Gomba	Maddu	Solar
Sembabule	Lugusulu	Fuel lamp
	Lwebitakuli	Solar
	Mijwala	Solar Battery or torch Fuel lamp
	Sembabule Town Council	Solar
Lwengo	Lwengo	Fuel lamp
	Ndagwe	Fuel lamp
Rakai	Kifamba	Fuel lamp
	Lwanda	Fuel lamp
Kyotera	Kakuuto	Solar Fuel lamp
	Kasaali	Fuel lamp
	Kasasa	Fuel lamp
	Kyotera	Electricity
	Nabigasa	Fuel lamp

SOURCE: FGDs with women

Fuel and solar lamps can be purchased from retail outlets in trading centres, towns and cities. In some cases, solar lamps have been provided free as part of development efforts to reduce the reliance on fuel lamps in households.

The percentage of households using fuel lamps has declined nationwide whereas the use of solar power for lighting is expanding (Furukawa 2012). The local government for Hoima district plans to train more households in alternative energy sources including solar power (DDP 2015). In Lwengo district over 2000 solar units have already been distributed to households (DDP 2015). Nevertheless, most DDPs focus on increasing solar power utilisation in health facilities, administrative buildings and water supply systems rather than at the household level (Kyankwanzi, Mubende and Rakai DDPs 2015).

Telecommunications

The districts traversed by the AOI exhibit similar characteristics with regards to the proportion of the population who own a mobile phone and use the Internet.

Figure A11.4-56 presents the percentage of the population aged 10 years and above (total, male and female) who own at least one mobile phone in the districts traversed by the AOI.

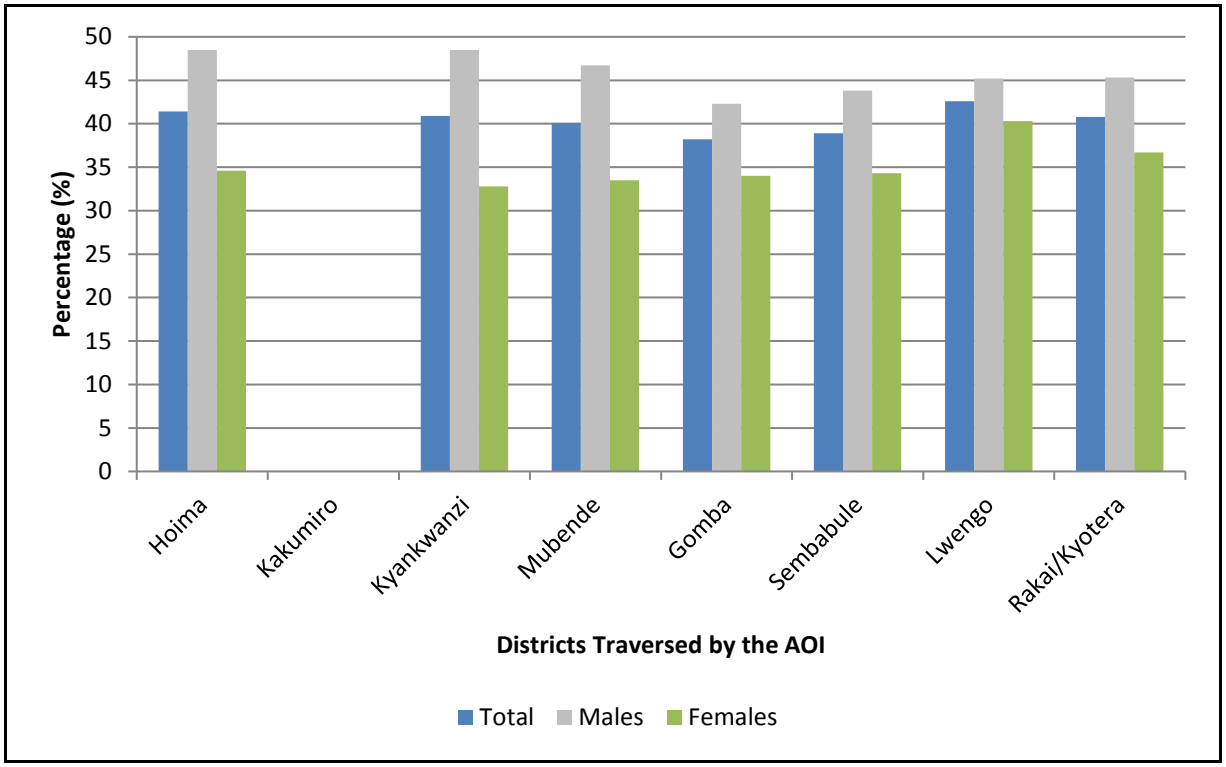


Figure A11.4-56 Mobile Phone Ownership in the Districts Traversed by the Area of Influence

SOURCE: UBOS 2016c

NOTE: Data for Kakumiro district is not available

From Figure A11.4-56, the following observations can be made:

- the variation between districts is relatively small
- more males than females own mobile phones in the districts; the greatest disparity is in Kyankwanzi district where 48.5% of males own mobile phones compared to 32.8% of females.

The percentage of mobile phone ownership per household in the sample PACs is high (see Figure A11.4-57).

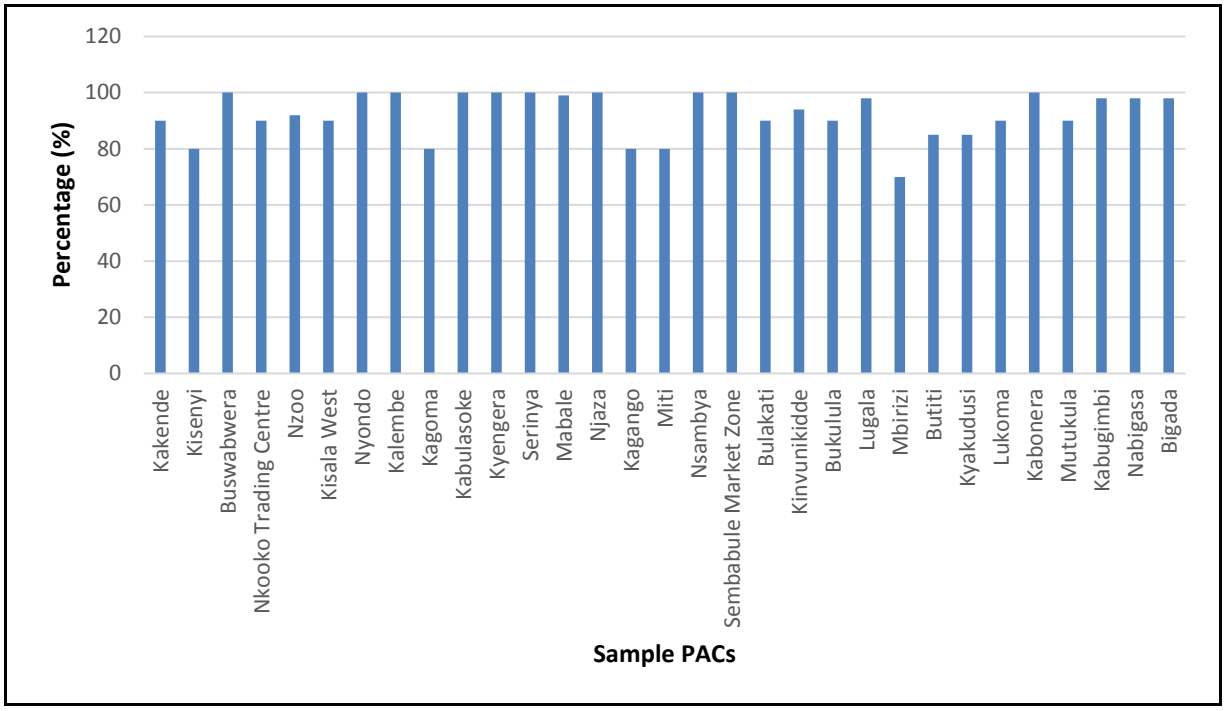


Figure A11.4-57 Percentage of a Mobile Phone Owning Households in Sample Potentially Affected Communities

SOURCE: KIIs with village chairmen

The household survey showed that 123 out of 177 households (nearly 70%) reported owning a mobile phone, which shows and upward trend in mobile phone ownership since the UBOS study.

It was reported that the male household heads more often own mobile phones than the women in the household. Mobile phones are used to call family members in urban areas, transfer money and negotiate market prices with buyers and intermediaries. Charge-up cards are bought in the local shops. These shops tend to have electricity and serve as mobile phones charging points.

The percentage of the population (total, and male and female) that use the internet in the districts traversed by the AOI is shown in Figure A11.4-58.

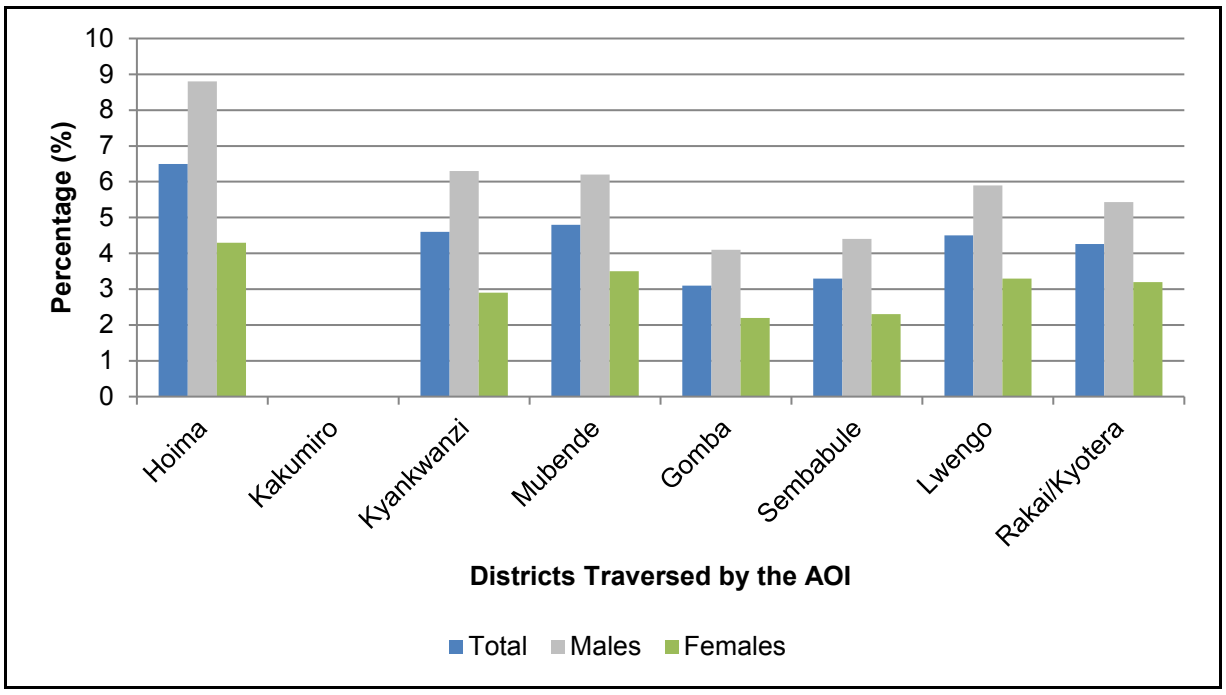


Figure A11.4-58 Internet Usage in the Districts Traversed by the Area of Influence

SOURCE: UBOS 2016c

NOTE: Data for Kakumiro district is not available

From Figure A11.4-58, it can be observed that:

- internet penetration in the districts remains low; on average, 4.4% of persons aged 10 years and above use the internet despite reported growth in internet subscriptions at the national level
- more males use the internet than females in the districts; the most major difference is in Hoima district where 4.5% more males use the internet than females.

Internet use in the sample PACs is considerably less common than mobile phone ownership (see Figure A11.4-59).

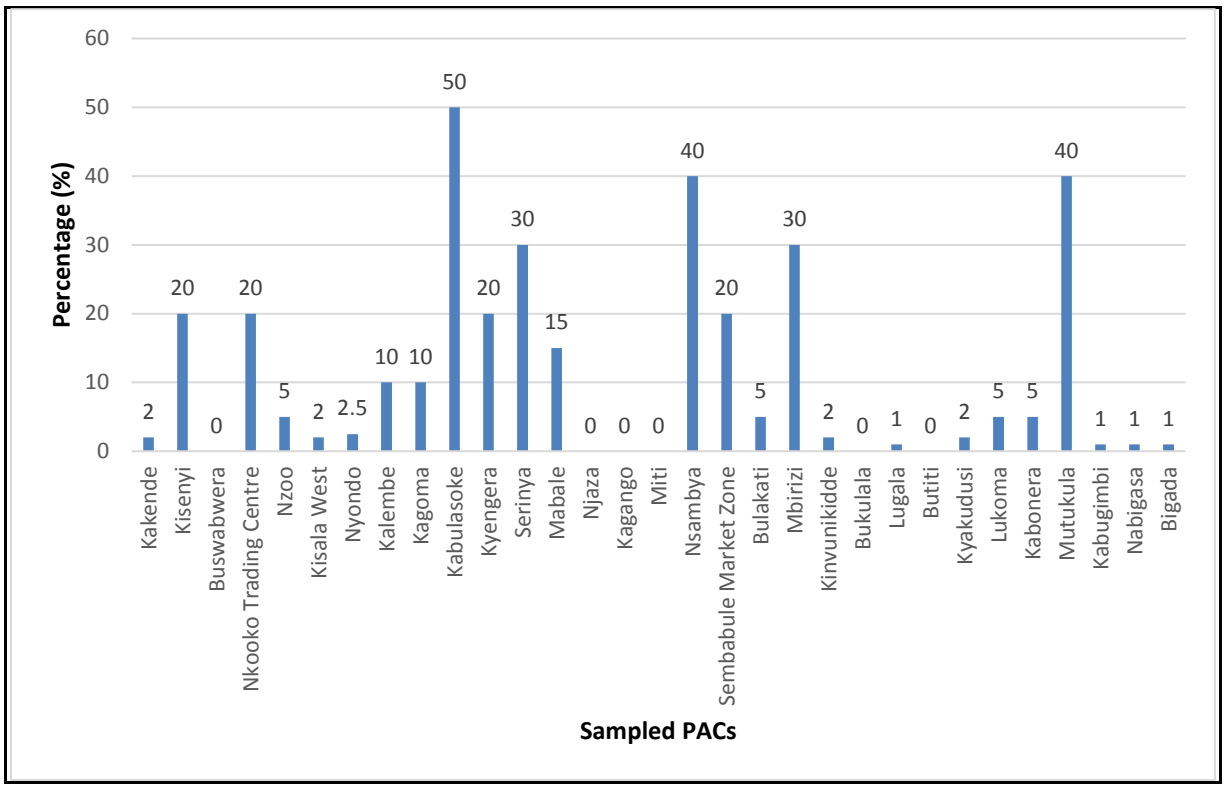


Figure A11.4-59 Percentage of Internet Users in Potentially Affected Communities

SOURCE: KIIs with village chairmen

From Figure A11.4-59, it can be observed that:

- internet use in 15 of the sample PAC is either non-existent or very limited (i.e., 5% or less)
- there is a considerable degree of variation between internet usage levels in the sample PACs; the difference between the highest and lowest levels of internet usage is 48 percentage points.

Media

Leading national newspapers such as the *New Vision*, the *Daily Monitor* and the *Bukedde* are widely available in the districts traversed by the AOI. Radio is the most widely used type of media in the districts traversed by the AOI and in the PACs (see Figure A11.4-60).

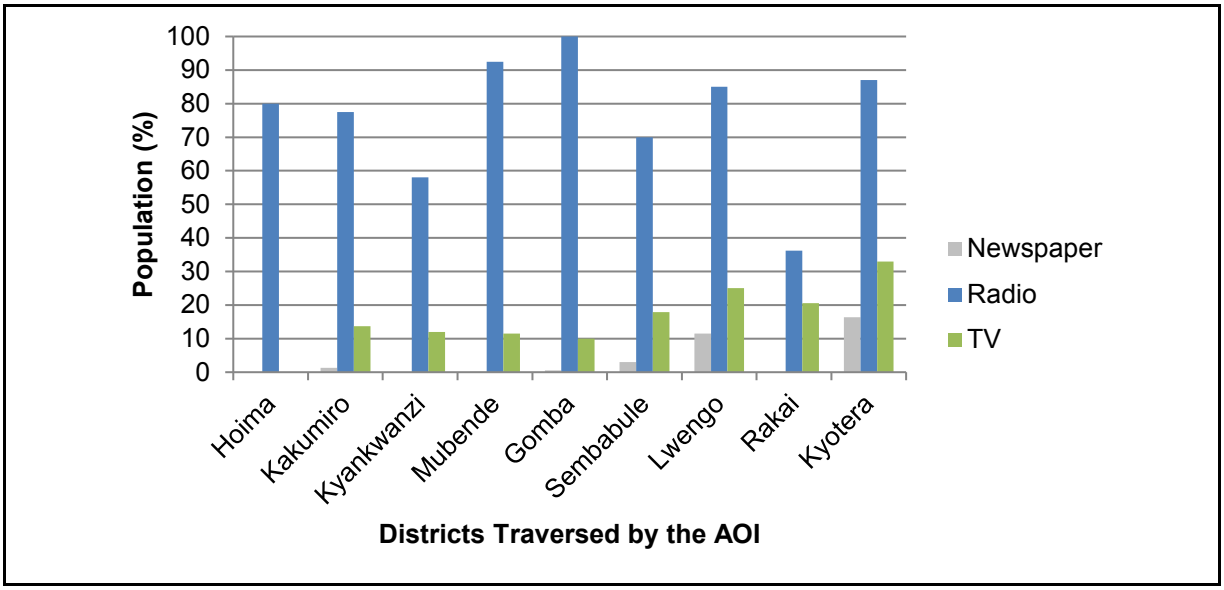


Figure A11.4-60 Newspaper, Radio and Television Usage in the Districts Traversed by the Area of Influence

SOURCE: KIIs with village chairmen

The popularity of radios in the districts may reflect low literacy levels and limited disposable incomes, which may limit access to newspaper and television.

Table A11.4-30 lists the radio and television stations based in the districts traversed by the AOI.

Table A11.4-30 Radio and Television Stations in the Districts Traversed by the Area of Influence, 2011

District	Radio Broadcasting Stations	Television Broadcasting Stations
Hoima	Radio Hoima Liberty FM Spice Radio Radio Maria New Life Church Uganda Broadcasting Corporation (UBC)	Uganda Broadcasting Station (UBC)
Mubende	Tropical FM Radio Simba VOT Heart FM Kaboozi FM MBS FM	
Sembabule	Mbabule FM	

SOURCE: UCC 2011, Internet site

NOTE: No radio and television stations reported by UCC (2011, Internet site) in the districts of Kakumiro, Kyankwanzi, Gomba, Lwengo, Rakai and Kyotera

Table A11.4-45 indicates a total of 13 radio stations and 1 television station in the districts traversed by the AOI. This is only a small proportion of the nationally available stations.

Municipal Waste Management

Waste management in the districts traversed by the AOI is poor (DDPs 2015). Lack of effective waste management systems, designated dumping sites and low levels of waste collection is widely reported, particularly in town councils and trading centres. Littering and indiscriminate disposal of polythene bags and medical waste are environmental concerns in Hoima, Mubende, Sembabule and Lwengo (DDPs 2015). Dumping of waste in wetlands and watercourses has created favourable conditions for disease in some districts with implications for public health.

The proportion of the population in the districts traversed by the AOI with access to some form of sanitation facility fluctuates considerably, ranging from 91% in Hoima to 55% in Gomba (see community health section A11.4.11).

During KIIs it was found that the main waste management strategies undertaken in the sample PACs is the burning of waste in open air or burial of waste in private pits. These activities are undertaken near homesteads.

FGDs with women revealed that most PAC members have access to some form of pit latrine. Open defecation was also reported in some PACs. FGDs with women further revealed that community members do not regard their physical environment as clean.

Human Rights

The following human rights laws apply to social infrastructure and services:

- Universal Declaration of Human Rights, article 25; International Convenant on Economic, Social and Cultural Rights, article 12; African Charter on Human and Peoples' Rights, article 16: Right to health. Uganda has ratified all these declarations.
- Universal Declaration of Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11; African Charter on Human and Peoples' Rights, article 21: Right to an adequate standard of living. Uganda has ratified all these declarations.
- Component of Universal Declaration of Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 12; African Charter on Human and Peoples' Rights, article 16: Right to water. Uganda has ratified all these declarations.

Trends and Sensitivity to Change

The following trends were identified for social infrastructure and services:

- under the efforts of the RESP-2, rural access to electricity may continue to improve. Uganda's overall electricity generation capacity will also likely improve once the construction of new hydropower plants in Kiryandongo district and Jinja district are complete.
- renewables may play an increasingly important role in Uganda's energy sector as the national government continues to support renewable project developers. The share of the sector is projected to grow considerably as 157 MW of feed-in-

tariff supported projects are expected to be commissioned by the end of 2018 (Climate Scope 2017, Internet site).

- Uganda's telecommunications infrastructure is rapidly expanding in line with growing demand for mobile and internet services nationwide. Mobile operators have installed 4G networks around Kampala and there are plans to make 4G available in other cities and urban settlements going forward (Export Gov 2017b, Internet site). Mobile phone and internet subscriptions are expected to reach 28.7 million and 11.9 million in 2021 respectively (Business Sweden 2017).
- the mobile money market in Uganda may grow in line with the rising number of internet subscriptions. Mobile money operators may also provide customers with new and diverse opportunities. Ugandans can now also pay for petrol and TV subscriptions, purchase airline tickets and play the lotto using mobile money.
- the use of social media in Uganda has proliferated in recent years in urban areas and among the youth. Internet use and penetration is still very low in rural areas. Popular platforms such as Facebook and Twitter are commonly used to access the latest news and communicate with others (Freedom House 2015, Internet site). The proliferation of social media is likely to be an ongoing trend, particularly if the number of mobile internet subscriptions continues to rise (Uganda Business News 2017, Internet site).

Ecosystem Services Provided

The social infrastructure and services described herein provide the following provisioning ecosystem services:

- electricity from hydro, fossil fuels and solar energy
- cooking fuel from biomass and firewood (see Section A11.4.6.4 on natural resources use).

Sensitivity Ranking

Table A11.4-31 provides the sensitivity ranking for infrastructure and social services.

Table A11.4-31 Social Infrastructure and Social Services VECs and Sensitivity Rankings

VEC	Sensitivity Ranking	Rationale for Rating
PACs – media (radio, television, newspapers	Low (1)	All households in the PACs have access to one or more media information sources.
PACs – electricity	Moderate (3)	Most PACs do not have access to grid electricity and rely on other means for cooking and lighting. Lack of grid electricity limits the economic development of PACs. Population growth and in-migration increases competition for the few available connections.
Households without mobile phone and internet	Moderate (3)	These households may become increasingly vulnerable as information is increasingly shared using those media.

A11.4.10.2 Key Considerations

Key considerations are:

- PACs rely on radio as a main means of receiving information
- mobile phone and internet is becoming increasingly important for exchanging information
- rural electrification is low, limiting general development.

A11.4.11 Community Health

The community health baseline section is based on the format presented in the IFC good practice note for health impact assessment (HIA). In accordance with this note, several environmental health areas (EHAs) are described:

- health system
- communicable diseases linked to the living environment (termed respiratory and housing issues under the EHAs)
- vector-related diseases
- soil-, water- and waste-related diseases
- sexually transmitted infections (STIs), including human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS)
- food and nutrition related concerns
- noncommunicable diseases
- accidents and injuries
- veterinary medicine and zoonotic diseases
- exposure to potentially hazardous materials, noise and offensive odours
- social determinants of health
- social cultural health practices.

Note that exposure to potentially hazardous materials, noise and offensive odours have not been considered in the baseline but are considered in the impact assessment.

A11.4.11.1 Baseline Condition of Health Systems

National Level

Health care in Uganda is delivered by both public sector (government) and private entities that include private-not-for-profit (PNFP) and private-for-profit (PFP) organisations and complementary health service providers such as traditional healers. The government (MOH 2014) owns most of the health facilities in the country. The national target for access to services is that everyone should have a health facility within 5 km of their residence. Access measured against this indicator stood at 72% nationally in 2015 (MOH 2016).

A target of having a hospital or a level IV (see Table A11.4-32) primary care facility per 100,000 people was met in 2014, with a national census of health facilities recording 147 hospitals and 188 level IV primary care facilities (MOH 2014).

Provision of public health care has been decentralised with districts and subcounties having a key role in the planning, delivery and management of health services in their respective areas. The health service delivery structure is organised in tiers starting from the community level up to the national level, including the role of the Ministry of Health (MOH) as described below in Table A11.4-32.

Table A11.4-32 Health System Delivery Structure

Structure	Level	Description of Role Function in Structure
Village health teams (VHTs) or health centre (HC) I	Village Target population of 1000 people	VHTs are the first level of health care delivery and mainly consist of volunteers in villages facilitating health promotion, service delivery, community participation and empowerment.
HCs II, III and IV	Village Target population of 5000 people	This is the second level of service delivery and includes: HC IIs provide a first level of interaction between the formal health sector and communities. They only provide health prevention and promotion services, community outreach services and links with VHTs. Curative services include outpatient care, emergency care and emergency deliveries.
	Village Target population of 20,000 people	HC IIIs provide basic preventive, health promotion and curative services, and support and supervision to lower level units. There are provisions for limited inpatient services, laboratory services for diagnosis, maternity care and first referral cover for the subcounty.
	Health subcounty	HC IVs provide the same broad level of care as HC III, with the addition of more advanced inpatient care, and blood transfusion, laboratory, emergency and other services. HC IVs were introduced in some areas as a strategy to address poor access to health care services.
General hospitals (GHs)	Target population of 500,000 people	This includes all services offered at HC IV and other general services including surgery, imaging services and inpatient care. In-service training, consultation and research to community-based health care programmes also occurs at this level. They are generally managed by the district government.
Regional referral hospitals (RRHs)	Target population of 2,000,000 people	This level consists of more specialised clinical services in addition to services offered at GHs. Specialist services may include paediatrics, psychiatry, ophthalmology, dentistry, intensive care, radiology, pathology, and higher level surgical and medical services. These institutions are also generally involved in teaching and research. While RRHs are managed by the MOH, they manage and develop their own operating budgets. Each district has a designated RRH that provides services not available at the GH level.
National referral hospitals (NRHs)	Target population of 35,000,000 people	This is the highest level and provides the most comprehensive and specialised level of care level. They provide advanced tertiary services in addition to all the other clinical services, as well as providing teaching and research. These facilities are fully autonomous.

Table A11.4-32 Health System Delivery Structure

Structure	Level	Description of Role Function in Structure
Health subcounty	Subcounty	Health subcounties are mandated with planning, organisation, budgeting and management of the HC III, II and I services and private providers.
District health systems	District	District health systems are responsible for the delivery of health services and the management of human resources, the development and passing of health-related bylaws and monitoring of sector performance. Local district governments manage public GHs and HCs and provide supervision and monitoring of all health activities (including those in the private sector) in their respective areas. Health service delivery is decentralised at the district level, with the DHMT, led by a district heath officer, mandated to implement programmes and policy.
Ministry of Health	National	The MOH is responsible for: • policy analysis, formulation and dialogue • strategic planning and resource mobilisation • setting standards and quality assurance • advising other government departments and agencies on health concerns • capacity development, and technical support and supervision • provision of nationally coordinated services and coordination of research • monitoring and evaluation of the overall health sector performance.

All hospitals are expected to provide support supervision to lower levels and to maintain links with communities through Community Health Departments. As of 2015, Uganda had 160 public hospitals: 2 NRHs, 14 RRHs and 144 GHs.

The country has an estimated 1.55 health workers per 1000 persons, which is below the WHO ratio of 2.28 per 1000 persons. Below this point, a country is considered to have a critical shortage of personnel. According to 2015 statistics, nurses and midwives are staffed to 83% and 76% respectively. Other staffing levels are also sub-optimal, notably pharmacists (8%), anaesthetic personnel (30%), health administrators (33%) and cold chain technicians (40%). Overall, staffing levels are skewed in favour of specialised health institutions and larger health facilities: RRH (81%), GH (69%), HC IV (85%), HC III (75%) and HC II (49%) (MOH 2014).

The reasons most commonly cited for not filling positions in the public sector include:

- inadequate and unpredictable wages
- difficult working conditions with inadequate number of support personnel, especially laboratory technicians and pharmacists
- inadequate accommodation and social amenities

- limited capacity to attract and retain personnel due to capacity constraints at district level.

Reproductive Health

Women in Uganda have an average of 5.4 children in their lifetime, a decline from a high of 7.4 children per woman in 1980s. The fertility rate remains higher among women in rural compared to urban areas and decreases with increasing level of education and household wealth (UBOS 2017b). Family planning is an essential component of reproductive health. Use of contraceptives among married women has increased at the national level from 26% in 2011 to 39% in 2016.

Maternal Health

Maternal health refers to the health of women during pregnancy, childbirth and the postpartum period (the first six weeks after birth). This is an important measure of health system functionality. Key indicators for maternal health are maternal mortality and access to antenatal and delivery care. Maternal and perinatal conditions account for approximately 20% of the total disease burden in Uganda. The maternal mortality rate (MMR) was estimated to be 336 per 100,000 live births in 2016, decreasing from a high of 600 per 100,000 in the 1990s (UBOS 2017b). The main causes of maternal deaths in the country are haemorrhage, eclampsia, birth complications, unsafe abortion and sepsis (WHO and UNICEF 2012).

Access to skilled antenatal care is nearly universal in Uganda (at 96%). Three-quarters (74%) of child births occur at a health facility under the care of skilled personnel, increasing from 58% in 2011 (UBOS 2017b).

Child Health

Uganda has made substantial progress in child survival, from an under-five mortality rate of 178 per 1000 live births in 1990 to 64 per 1000 live births in 2016 (Figure A11.4-61) (UBOS 2017b). Figures indicate that one in every 23 Ugandan children die before their first birthday (i.e., 43 per 1000 live births), and one in every 17 children die before the fifth birthday (UBOS 2017b). The leading causes of child deaths are respiratory infections, malaria, prematurity, birth asphyxia and diarrhoea (WHO 2015a). Data on child mortality rates in the project districts were not conclusive as a result of gaps in the HMIS.

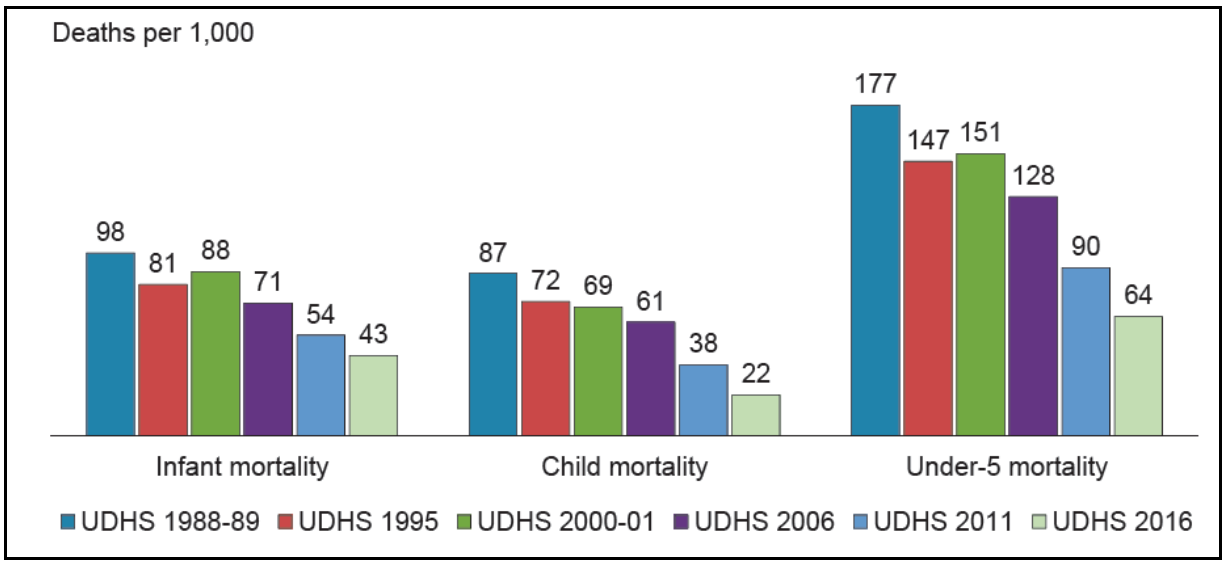


Figure A11.4-61 Trend in Child Mortality Rates

SOURCE: UBOS 2017b

Immunisation

Uganda's childhood immunisation package is closely aligned with the WHO and UNICEF guidelines. The desired goal is full immunisation of 90% of children under one year of age at the national level, with at least 80% coverage in every district or equivalent administrative unit (WHO 2009).

District and PAC Level

The distribution and types of health facilities available in the project districts are included in Table A11.4-33 and Figure A 11.4-62. A comprehensive services and readiness assessment (SARA) of health facilities close to the proposed pipeline route and AGIs is available in Attachment A11.4.

At the RRF in Hoima, only 59% of positions are filled; Mubende RRH has 61% of positions filled and the hospital in Masaka has 68% of positions filled.

Table A11.4-33 Distribution and Type of Health Facilities by District, 2017

District	HC II	HC III	HC IV	GH	RRH	NRH	Total
National	2941	1289	197	144	14	2	4587
Hoima	14	27	2	0	1	0	44
Kakumiro	6	6	2	0	0	0	14
Mubende	27	11	5	1	0	0	44
Kyankwanzi	7	5	1	0	0	0	13
Lwengo	9	4	3	0	0	0	16
Gomba	10	6	1	0	0	0	17
Sembabule	17	4	2	0	0	0	23
Rakai	40	12	0	1	0	0	53

SOURCE: Uganda HMIS 2017

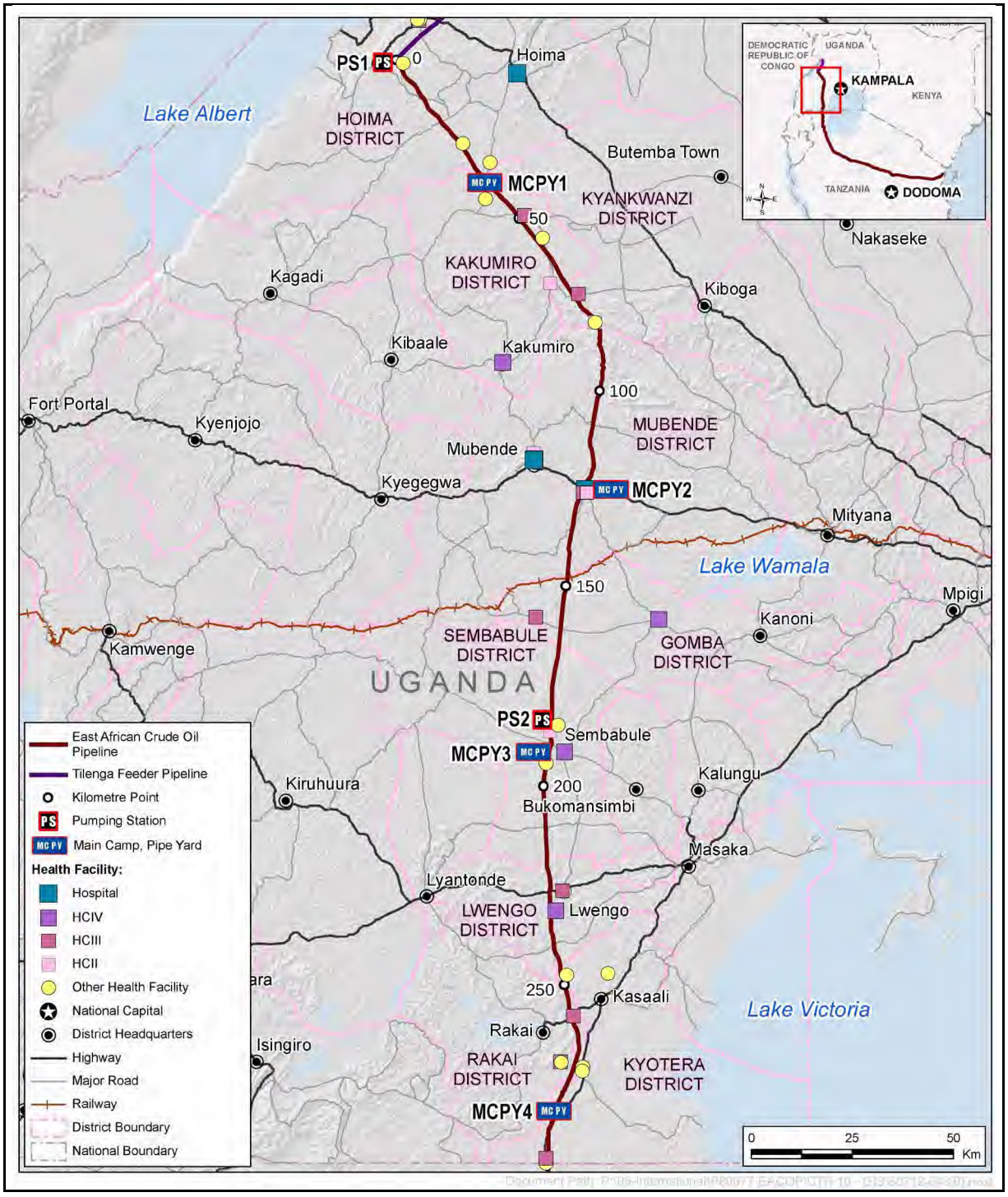


Figure A 11.4-62 Health Facilities by District

Health System Challenges

The baseline assessment identified the following health system challenges in the districts traversed by the AOI:

- shortage of skilled health personnel

- inadequate financial resources
- high burden of communicable and infectious diseases
- increasing burden of noncommunicable diseases
- inadequate and inequitable distribution of health facilities
- inadequate solid waste management facilities
- inadequate water and sanitation facilities
- shortage of medical supplies and equipment
- delay in seeking medical care
- inadequate emergency care services.

These challenges were common throughout the project districts.

Reproductive health services are generally available in all the districts traversed by the AOI and reports indicated an increase in the uptake of modern contraceptive methods and access to condoms.

Figure A11.4-63 shows the number of maternal deaths occurring in the districts traversed by the AOI in 2016. Hoima and Mubende recorded the highest number of maternal deaths during this year at 54 and 34 respectively. Some of these deaths were referrals from other districts to the regional hospital.

Baseline findings show that the most women in the districts receive skilled antenatal care and that most births occur at health facilities. However, home deliveries remain a challenge that continues to be addressed. Data on the coverage of institutional deliveries in the project districts were inconclusive because of gaps in the HMIS.

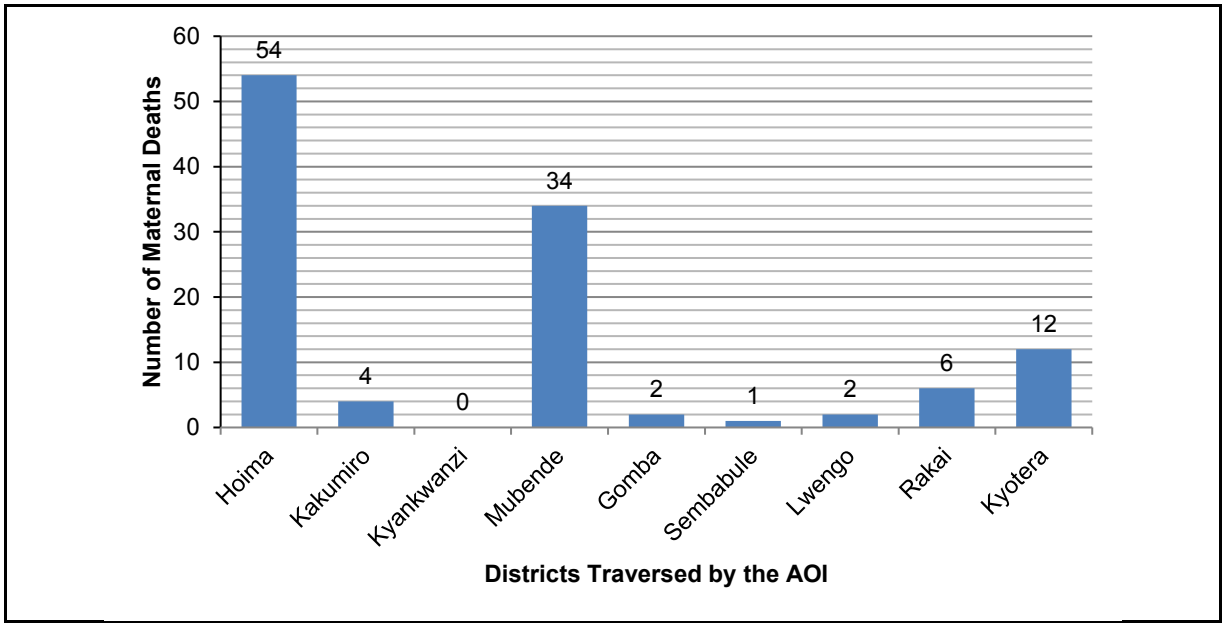


Figure A11.4-63 Maternal Deaths Occurring in Health Facilities by District, 2016

SOURCE: Uganda HMIS 2017[15]

[15] Data does not include maternal deaths occurring in community.

Immunisation coverage in the project districts is summarised in Table A11.4-34.

Table A11.4-34 Immunisation Coverage Among One Year Olds by District, 2017

District	Measles	DPT-HepB-Hib-3	Polio-3	Bacillus Clamette-Guerin (BCG)
Hoima	81%	92%	No data because of gaps in the HMIS	
Kyankwanzi	72%	87%		
Kakumiro	76%	89%		
Mubende	92%	100%		
Gomba	72%	85%		
Sembabule	81%	100%		
Lwengo	76%	93%		
Rakai	74%	90%		
National average	86%	97%		

SOURCE: Uganda HMIS 2017[16]

Large data gaps on immunisation coverage were noted. None of the districts traversed by the AOI had data available for BCG and polio coverage in 2016 and 2017, pointing to a weakness in the HMIS. Coverage of measles vaccinations is poor, except for Mubende, and does not attain the 90% coverage required for herd immunity.

Human Rights

The following human rights laws apply to community health:

- Universal Declaration of Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 12; African Charter on Human and Peoples' Rights, article 16: Right to health. Uganda has ratified all these declarations.
- Universal Declaration of Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11, African Charter on Human and Peoples' Rights, article 21: Right to an adequate standard of living. Uganda has ratified all these declarations.
- Universal Declaration of Human Rights, articles 1, 2 and 23(2); International Covenant on Civil and Political Rights, articles 2 and 3; International Covenant on Economic, Social and Cultural Rights, articles 2 and 3; ILO Convention 111 on Discrimination (Employment and Occupation); Convention on the Elimination of All Forms of Discrimination Against Women; UN Women's Empowerment Principles (2010); African Charter on Human and Peoples' Rights, articles 2, 3, 15 and 18; Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa: Women's rights, which are relevant because

[16] Data on immunisation coverage for BCG and polio were not available. Coverage for the third dose of DPT-HepB-Hib was generally high and above threshold in all.

women are particularly vulnerable to certain health risks related to EACOP. Uganda has ratified all these declarations.

- Universal Declaration of Human Rights, articles 25.2 and 26; International Covenant on Civil and Political Rights, article 24; International Covenant on Economic, Social and Cultural Rights, articles 10, 12 and 13; Convention on the Rights of the Child; African Charter on Human and Peoples' Rights, article 18; African Charter on the Rights and Welfare of the Child: Children's rights, which are relevant because children are particularly vulnerable to certain health risks related to EACOP. Uganda has ratified all these declarations.

Trends in Condition and Sensitivity to Change

The following trends were identified for health systems:

- Maternal deaths in Uganda have decreased by almost half over the past two decades (from 600/100,000 live births in the 1990s to the current 336/100,000 live births (WHO 2015)). The country has also made remarkable progress on child survival, reducing by two-thirds the rate of child mortality over the past two and a half decades. Baseline findings show that maternal outcome and child survival in the project districts have generally improved as a result of increased access to comprehensive reproductive, maternal and child health services.
- Despite the improvement in some parameters, the sensitivity to change of the health systems in the project districts is high. The majority of the DHMT respondents noted that the existing structures and systems only managed to partially manage existing challenges and did not have the required capacity to meet any additional requirements brought about by project-associated changes. This includes short term changes (e.g., infective outbreaks) as well as longer-term impacts associated with chronic conditions.
- The VECs' ability to respond to the change would likely be insufficient, slow and compromised by the bureaucratic processes that are required to necessitate an adequate response. It is likely that external assistance would be required to effectively address any changes. The anticipated decrease in available services may have long-term impacts on general morbidity and mortality.
- Despite a high sensitivity to change, project-related activities are not expected to affect a substantial change to VECs due to the relatively short temporal duration.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

Table A11.4-35 presents the sensitive health systems VECs.

Table A11.4-35 Sensitive VECs with Regards to Health System Facilities

VEC	Sensitivity Ranking	Rationale for Ranking
PACs in the districts of Kakumiro, Kyankwanzi, Lwengo, Gomba and Sembabule	High (4)	Difficult access to appropriate health care and services

Key Considerations

A key consideration is:

- population growth (natural and from PIIM) may lead to local health care facilities being over-stretched.

A11.4.11.2 Baseline Condition of Communicable Diseases Linked to the Living Environment

Communicable diseases (e.g., acute respiratory infections, pneumonia, tuberculosis (TB), meningitis and leprosy) rely on fluid exchange, contaminated substances or close personal contact to travel from an infected carrier to a healthy individual. Therefore, they are directly linked to housing design, overcrowding, housing conditions and the general living conditions in a community.

Several communicable diseases linked to living conditions can be identified in the districts traversed by the AOI. These are outlined below.

Acute Respiratory Infections

National Level

Acute respiratory infections (ARI) were identified as the leading cause of disease burden in the districts traversed by the AOI and the country in general. Reports indicated an ARI prevalence of 9–12% in the central region and 17% in the western region (UBOS 2012b). Lower respiratory infections are the second leading cause of disease burden in Uganda (after HIV and AIDS) and are responsible for nearly 10% of all deaths (WHO 2015a).

District and PAC Level

Data obtained from the district level HMIS (see Figure A11.4-64) show that ARI contributed to at least 20% of the outpatient load in the project districts, with the highest burden recorded in the districts of Kyankwanzi (37%) and Gomba (35%). The lowest burden was recorded in the Hoima district (21%). ARI also featured prominently among the top five diagnoses in the local health facilities review and were often noted in FGDs and KIIs as common diseases experienced by PACs.

FGDs and KIIs at local level found that ARI were sporadically reported across PACs in the pipeline corridor, with a concentration of cases in the central part of the pipeline corridor in Mubende TC (KP124.5) and Kitenga (KP125.5).

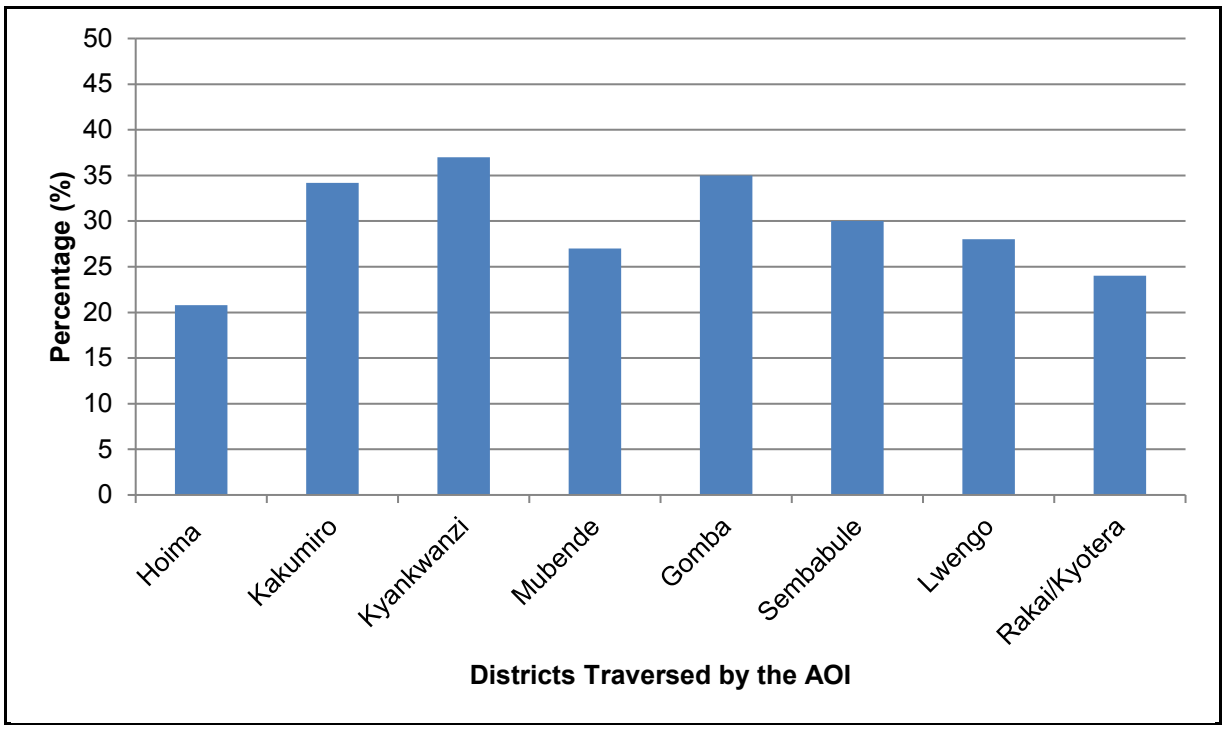


Figure A11.4-64 Acute Respiratory Infection among Outpatients, 2016–2017
SOURCE: HMIS (2017)

Tuberculosis

Tuberculosis (TB) is an infectious bacterial disease caused by *Mycobacterium tuberculosis*, which most commonly affects the lungs. Individuals with active pulmonary TB produce airborne droplet nuclei, containing infectious *M. tuberculosis* while speaking, sneezing and particularly coughing. Crowding, poor ventilation and duration of exposure increase the risk of transmission. People infected with TB bacilli will not necessarily become sick with the disease. The immune system 'walls off' the TB bacilli which can lie dormant for years. Almost 10% of immune competent adults infected with *M. tuberculosis* ultimately develop active TB. When someone's immune system is weakened, the chances of becoming sick are increased. As such, HIV and poverty are important co-risk factors for development of active TB disease.

National Level

TB remains a major public health challenge in Uganda with an incidence rate of around 200 new cases per 100,000 (2015 estimate) (WHO 2016a). Like most countries in sub-Saharan Africa, Uganda is battling with the dual epidemic of TB, and HIV and AIDS. It is estimated that approximately 42% of TB patients in the country are co-infected with HIV and AIDS (WHO 2015b, WHO 2016a).

Multidrug resistant TB (MDR-TB) is also an emerging challenge at a prevalence of 1.6% for new cases and 12% of retreatment cases (WHO 2015). According to the 2016 global TB report, Uganda recorded relatively low rates of treatment success at 73%, below the recommended target of 85%, but did well to exceed the 90% target of enrolling HIV-positive TB patients on treatment (WHO 2015).

TB services in the country are integrated into the general health care system and are further decentralised to community level with a good coverage of directly observed treatment short-course (DOTS) strategy.

District and PAC Level

Baseline findings show that TB is endemic in all the districts traversed by the AOI. District level HMIS data from 2016 shows that Hoima district recorded the highest number of TB cases (1046 bacteriological confirmed cases) followed by Mubende (368 confirmed cases) and Kyotera (277 confirmed cases). It is important to note that a proportion of the case load in Hoima and Mubende are referrals from other districts to the RRHs in these two districts.

The lowest TB case load was recorded in the districts of Kakumiro, Kyankwanzi and Sembabule (see Figure A11.4-65). MDR-TB has also been identified in the area, with the highest number of cases in 2016 recorded in Kyotera (12) and Hoima (31) districts. TB-HIV co-infection emerged as a challenge in all the districts, further complicating drug adherence and treatment outcomes.

The number of TB cases reported at PAC level were low with only a small concentration of reports in Kagango (KP186.5).

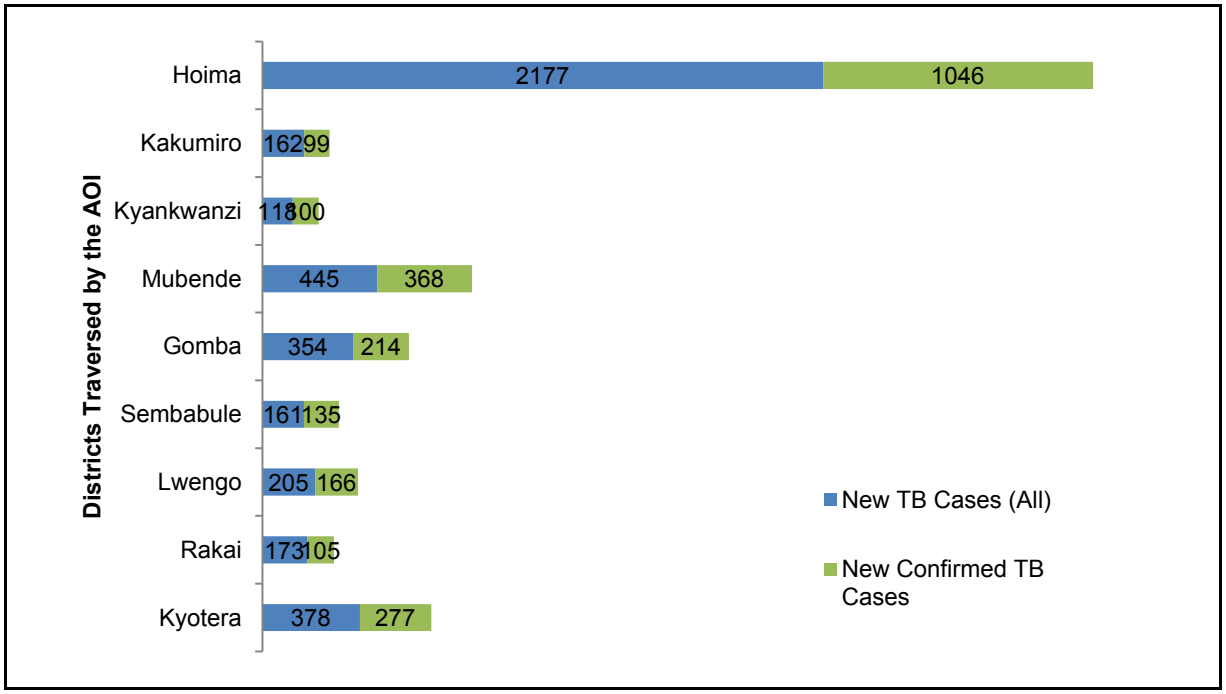


Figure A11.4-65 Distribution of Tuberculosis Cases by District, 2016

SOURCE: Uganda HMIS (2017)

Measles

Measles is a highly contagious, infectious disease caused by a paramyxovirus. Transmission follows inhalation of airborne respiratory droplets from an infected person's cough or sneeze. Unvaccinated children and those living in overcrowded or poor socio-economic conditions are at increased risk of measles. The disease is

one of the leading causes of death among young children, even though a safe and cost-effective vaccine is available (WHO 2017).

National Level

The disease remains a public health challenge in all parts of Uganda, despite ongoing immunisation efforts. Latest statistics from the 2016 Ugandan Demographic and Health Survey (DHS) indicate the national measles vaccination coverage was estimated at 80%, lower than the 90% coverage target required for herd immunity (UBOS 2017b).

District and PAC Level

Measles outbreaks occur often in all districts traversed by the AOI. HMIS data from 2016 show that the districts of Mubende, Kyotera and Hoima registered the highest number of measles cases (over 1500 cases per annum) while Lwengo, Sembabule and Rakai recorded the lowest number of cases (fewer than 200 cases per annum).

Measles was also reported in the PACs as one of the common diseases affecting children. The key underlying factor is low measles vaccine coverage. Measles were reported in Kakende (KP29.5), Nkooko Trading Centre (KP68), Buswabwera (KP61), Kabugimbi (KP282), Lukoma (KP287.5) and Mutukula town (KP295.5).

Meningitis

Meningitis is a viral or bacterial infection of the membrane covering the brain and spinal cord. Even when meningitis is diagnosed early and adequate therapy is available, between 5–10% of patients die, typically within 24–48 hours of experiencing the first symptoms. Many thousands of survivors are left with brain damage, hearing loss or learning disabilities. Transmission is through direct contact with respiratory droplets. Infections caused by *Haemophilus influenzae* type b (Hib), *Streptococus pneumoniae* and *Neisseria meningitidis* are responsible for high morbidity and mortality among children (Trotter 2007).

National Level

A section of northern Uganda lies within the African meningitis belt. These border areas and adjacent west Nile, northern and northeastern districts experience frequent outbreaks of meningococcal meningitis. The last outbreak was in 2016 in the Nakaseke district (Ainebyoona 2016, Internet site). The western and central regions are outside the meningitis belt and do not experience large outbreaks, but isolated cases of bacterial, viral or other forms of meningitis occur.

District and PAC Level

Analysis of HMIS data show that approximately 99% of the BOD attributable to meningitis was due to nonbacterial meningitis. Records showed a variance from hundreds to thousands of cases being diagnosed in all the districts traversed by the AOI. In 2016, only 88 cases of bacterial meningitis were recorded in the project districts (see Figure A11.4-66). Findings from FGDs and KIIs show that the incidence of meningitis is low in PACs. However, there were reported cases in both children and adults in PACs in Butiti (KP249.5) and Kyakudusi (KP251).

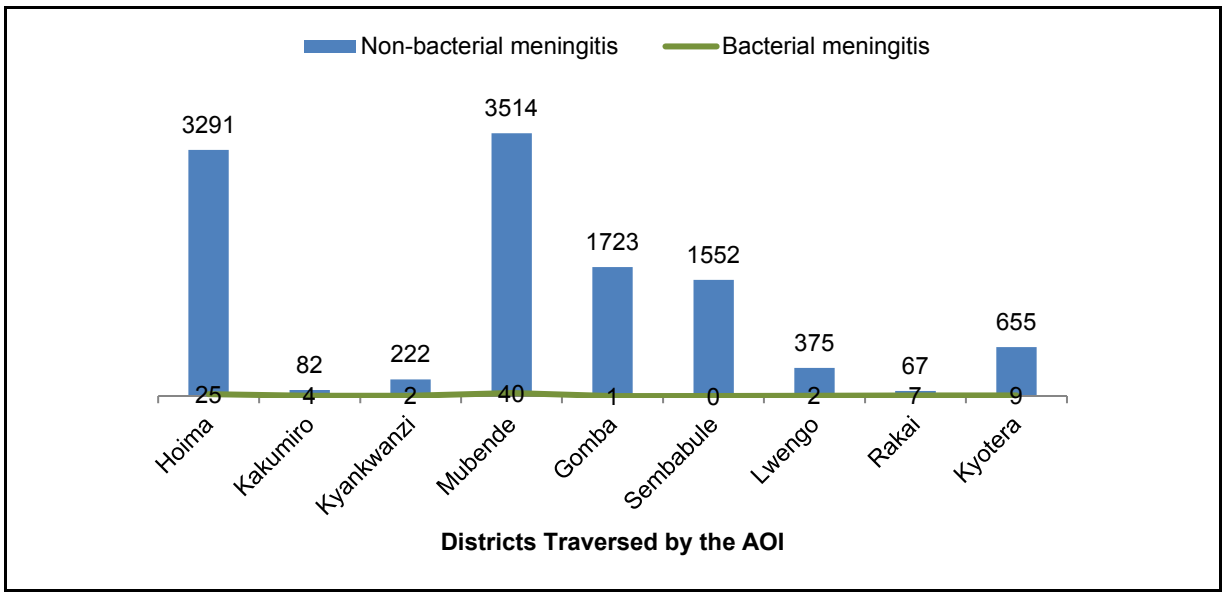


Figure A11.4-66 Distribution of Meningitis Cases by District, 2016

SOURCE: Uganda HMIS (2017)[17]

Leprosy

Leprosy is closely associated with poverty and overcrowding. The disease is caused by the slow-growing bacillus *Mycobacterium leprae,* which is not highly infectious. The incubation period of the disease is about 5 years but symptoms can take up to 20 years to appear (WHO 2012). Leprosy was not present in any of the PACs along the pipeline corridor, according to FGDs and KIIs.

National Level

The current target is to eliminate leprosy in all countries by 2020 (WHO 2012). Whereas Uganda has largely succeeded in eliminating leprosy as a public health problem, 300 new cases continue to be notified each year according to the National TB and Leprosy Programme (NTLP). About two-thirds of these cases occur in 13 districts in the southeastern, north and northwestern regions of the country. New cases are unevenly distributed and this further complicates control efforts (MOH 2018, Internet site).

District and PAC Level

Baseline findings show that leprosy occurs in all the districts traversed by the AOI, but, in general, the number of cases recorded on the HMIS database is low and of no statistical significance to the project.

Trend in Condition and Sensitivity to Change

The national trend in the annual incidence of TB has shown a progressive decline over the past 10 years.

The sensitivity to diseases related to living conditions in the districts traversed by the AOI varies from moderate to very high. These are based on the existing BOD in

[17] 99% of the cases are nonbacterial meningitis

the districts, the available health services, trends in disease, stakeholder concerns and in-migration into high burden areas.

The district of Rakai is considered to have a moderate sensitivity based on the available data, which illustrated no concerns regarding housing and overcrowding, lowest prevalence of diseases associated with living conditions. However, the data indicates that the other districts traversed by the AOI were deemed to have either a high or very high sensitivity to change.

Sensitivity Ranking

Several sensitive VECs were identified for communicable diseases due to living conditions. These are presented in Table A11.4-36.

Table A11.4-36 Communicable Disease VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Households close to roads	Moderate (3)	Increased exposure to diesel particulate matter and other pollutants that have a detrimental effect on the respiratory system.
Children (especially under five years old)	High (4)	Immature immune systems and low herd immunity
Elderly	High (4)	Lower immune response and greater risk for contracting communicable diseases
Households using biomass fuel for indoor cooking and lighting	High (4)	Poor indoor air quality associated with higher risk of ARIs
Individuals living in overcrowded areas associated with poor housing and low socio-economic standards	High (4)	Higher likelihood of disease spread and inadequate ventilation
Immuno-compromised individuals	Very high (5)	Poor immune response and clear link between TB and HIV

Key Considerations

Key considerations are:

- interaction between PACs and an expatriate labour force may increase the risk of transmission of communicable diseases.
- given the high incidence of communicable diseases and the poor health facilities, PIIM into the PACs will likely increase the prevalence of communicable diseases.

A11.4.11.3 Baseline Condition of Vector-Related Diseases

Malaria

Malaria is caused by parasites that are transmitted to people through the bites of an infected female Anopheles mosquito. Nearly half of the global population are at risk of malaria infection with most of the cases and deaths occurring in sub-Saharan

Africa. According to latest estimates from the WHO, released in December 2016, there were 212 million cases of malaria and 429,000 deaths in 2015 (WHO 2016b).

National Level

Malaria remains the leading cause of disease burden in Uganda and poses a substantial challenge to socio-economic development. The entire population is at risk of infection, though children under five years and pregnant women are particularly vulnerable (MOH 2014a, Internet site). Malaria transmission displays a stable, perennial pattern in 90–95% of the country. In the rest of the country, particularly the highland areas, there are areas of low and unstable transmission with the potential for epidemics. Transmission occurs year-round, but there is seasonal variation in intensity with a peak at the end of the rainy seasons (UBOS 2015).

Plasmodium falciparum is the predominant parasite species, while the important anopheles mosquito species are *A. gambie* and *A. funestus*. Hospital records indicate that malaria is responsible for 30–50% of outpatient visits, 15–20% of admissions and up to 20% of inpatient mortality (UBOS 2015). Figure A11.4-67 shows the distribution of malaria in Uganda (MOH 2014a, Internet site). Hoima falls within very high malaria transmission area, while the rest of the districts traversed by the AOI fall within the medium-high transmission zones.

The National Malaria Control Programme is tasked with implementation of the Malaria Control Strategic Plan 2014–2015 to 2019–2020 which prioritises the following measures (UBOS 2015):

- use of long-lasting insecticidal nets or insecticide treated bed nets (ITN)
- indoor residual spraying (IRS)
- environmental management (where feasible and effective)
- uncomplicated malaria case management with artemisinin-based combination therapy (ACT) at the community level and in health units
- treatment and prevention of malaria during pregnancy, including intermittent preventive treatment in pregnancy
- early detection and response to malaria epidemics, monitoring and evaluation and operational research.

Figure A11.4-67 Distribution of Malaria Endemicity in Uganda
SOURCE: MOH 2014a, Internet site

District and PAC Level

Malaria accounts for between 20–50% of outpatient cases in the districts traversed by the AOI. HMIS data from 2017 indicate that the malaria case load (confirmed by rapid diagnostic test) was highest in Hoima, Mubende and Kyotera, and lowest in Gomba (Figure A11.4-68).

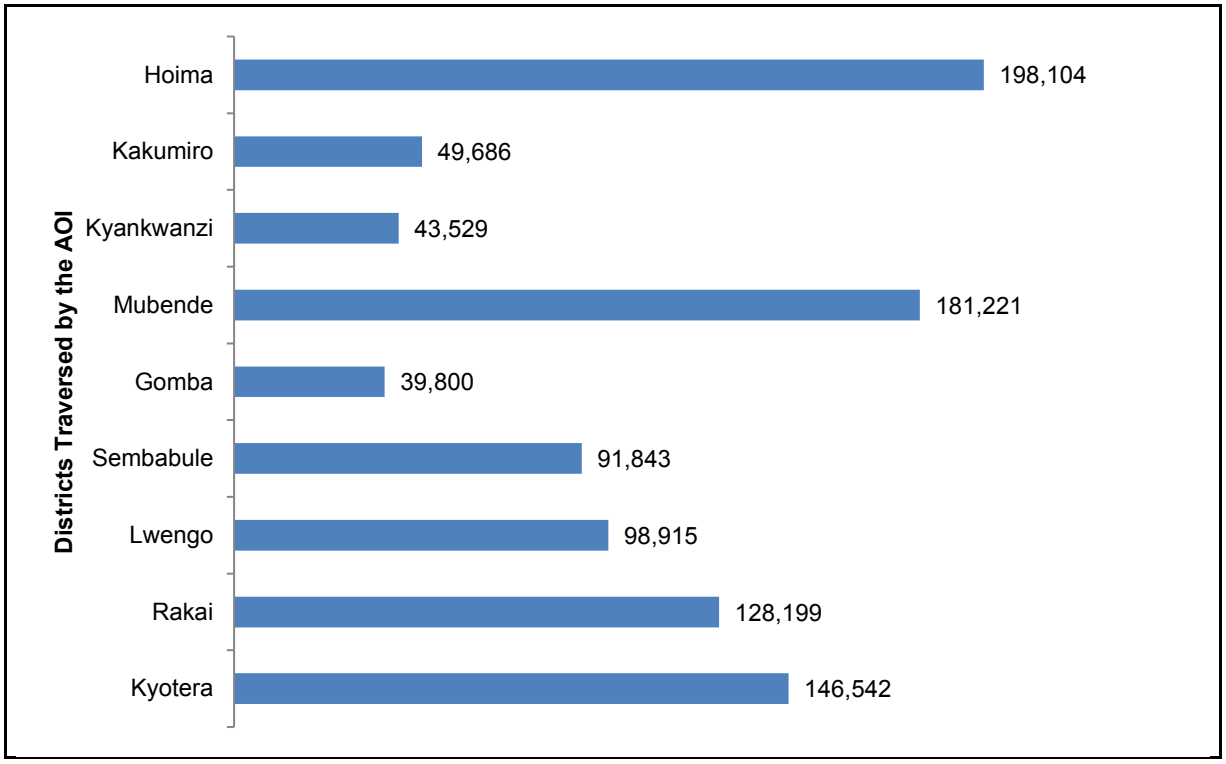


Figure A11.4-68 Malaria Cases by Project, 2017

SOURCE: Uganda HMIS (2017)

Findings from FGDs and households surveys show that malaria is among the most common ailments experienced by sample PACs. This was further corroborated by findings from health facilities where malaria consistently ranked among the top five contributors to morbidity. All the districts traversed by the AOI received periodic mass distribution of ITNs. They also received targeted distribution of ITNs to pregnant mothers and children under-five years and malaria prophylaxis in pregnancy. Malaria case management with rapid diagnostic test and artemisinin in combined therapy is routinely available in all health facilities. Population coverage of ITNs in the project districts is reported to be above 82%. At the time of the report, IRS was not implemented in any of the project districts.

Arboviral Diseases

Arboviral (arthropod borne viruses) diseases that may occur in the project area are dengue and yellow fevers, while Rift Valley fever remains a potential threat.

These acute viral fevers are transmitted by the day-biting Aedes mosquitoes which breed mainly in human-made containers. These diseases are often poorly documented and under-reported owing to limited awareness by health care providers, lack of diagnostic capability, and confounding clinical diagnosis from other febrile infections.

Dengue Fever

In recent years, the rapid spread of dengue has made it a global concern. The disease is widespread throughout the tropics, with local variations in risk influenced by rainfall, temperature and unplanned rapid urbanisation. Transmission has been

effectively sustained by travel. Dengue is likely to be under-recognised and under-reported in Africa because of low awareness by health care providers, other prevalent febrile illnesses, and lack of diagnostic testing and systematic surveillance.

Dengue is endemic in Uganda. Early signs and symptoms of the disease are often like other viral fevers and febrile infections which confound clinical diagnosis (Amarasignhe et al. 2011). At the time of writing, insufficient data were available at a district level to describe the BOD.

Yellow Fever

Yellow fever (YF) is an acute viral haemorrhagic disease transmitted by Aedes mosquito bites. YF symptoms range from a mild influenza-like syndrome to a severe haemorrhagic fever. A small proportion of patients who contract the virus develop severe symptoms and approximately half of those die within 7–10 days. Most recently in March to April of 2016, an outbreak of yellow fever was confirmed in Masaka district and spread to seven other districts including Rakai (WHO 2018, Internet site).

YF surveillance is through border control and weekly reporting of suspected cases. Vaccination is not routinely provided in the country's childhood immunisation package, but reserved for outbreak events, thus immunisation coverage is generally low. HMIS data on YF were found to be insufficient in all the project districts. Cases of yellow fever were reported in Bigada (KP281.5), Bukulula (KP240) and Bethlehem (KP247.5).

Human African Trypanosomiaisis

Human African Trypanosomiasis (HAT), commonly known as sleeping sickness, is endemic in parts of Uganda. Two forms of the parasite occur – *Trypanosoma brucei. gambiense* is dominant in northwest and *T. b. rhodesiense* in the southeastern region (Simarro et al. 2012). The rural populations whose livelihoods depend on agriculture, fishing, animal husbandry or hunting are at the highest of risk of exposure to the tsetse fly bites that transmit the parasite. Approximately 7% of the country (over two million people) is at risk of HAT. The districts traversed by the AOI are within a low risk area for sleeping sickness transmission.

HAT was reported in PACs near protected areas in Hoima, in the communities of Kayere (KP0), Katooke (KP1.5) and Nyamasoga (KP0), and in Lukoma (KP287.5) near the Tanzanian border.

Onchocerciasis

Onchocerciasis, commonly known as river blindness, is caused by the parasitic worm *Onchocerca volvulus*. It is transmitted to humans through exposure to repeated bites of infected blackflies of the genus Simulium. River blindness is found in discrete locations in the country, including most of the districts traversed by the AOI. The disease is most common in Hoima where 398 cases were recorded in 2016 (see Table A11.4-37), and 245 cases in 2017. The district implements an onchocerciasis elimination strategy, which includes biannual mass treatment with ivermectin and vector elimination measures and results indicate that transmission of the disease has been interrupted.

Table A11.4-37 Cases of Human African Trypanosomiasis and Onchocerciasis by District, 2016

Project District	Cases of HAT (2016)	Cases of Onchocerciasis (2016)
Hoima	65	398
Kakumiro	16	29
Kyankwanzi	30	53
Mubende	25	29
Gomba	0	51
Sembabule	4	16
Lwengo	52	0
Rakai	3	0
Kyotera	30	1

SOURCE: Uganda HMIS (2017)

Trend in Condition and Sensitivity to Change

Confirmed malaria cases increased in all project districts from 2015 to 2016 (see Figure A11.4-69). The number of cases remained high in 2017, with minimal changes across all project districts. Other vector-related diseases generally show a decreasing trend.

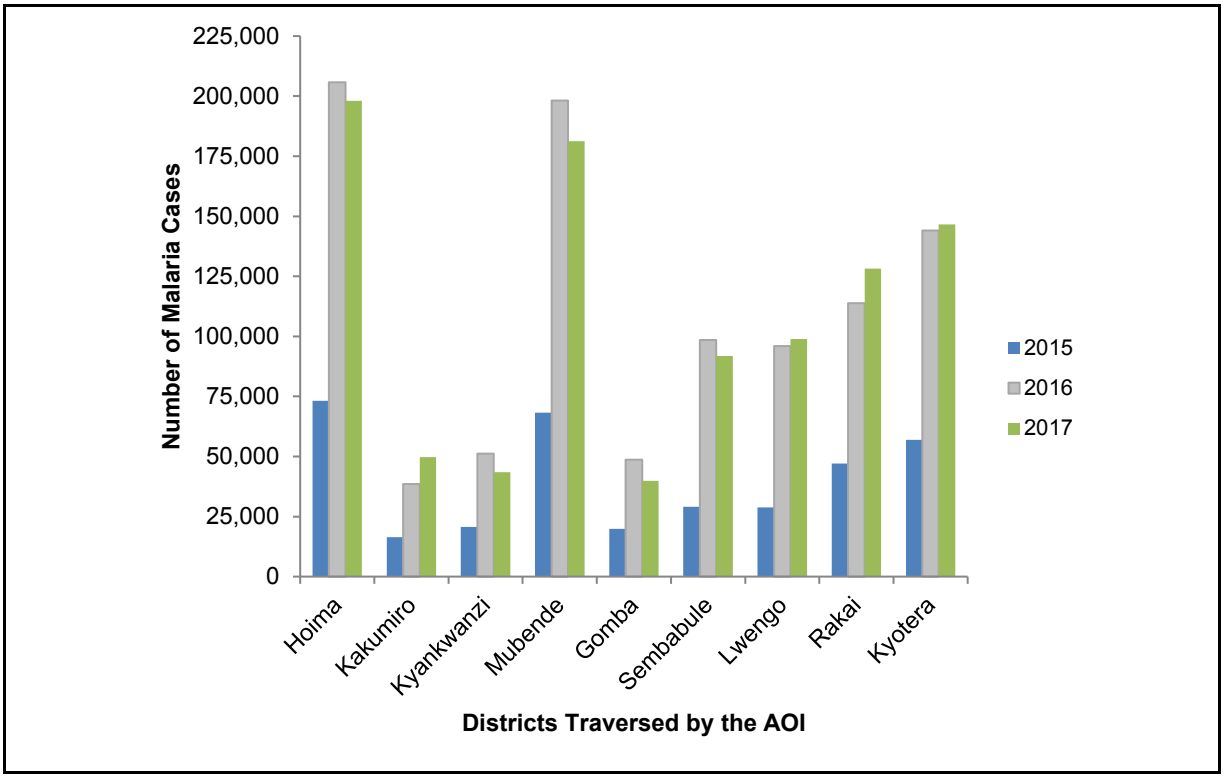


Figure A11.4-69 Trend in Malaria Cases by District, 2015–2017

SOURCE: Uganda HMIS (2017)

The sensitivity of the districts traversed by the AOI with regards to vector-related diseases varies from moderate to high. Due to a high BOD in conjunction with an increase in disease trends, the districts of Hoima, Mubende, Rakai and Kyotera are all considered to be highly sensitive to change with a lower resilience than the other project districts.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The sensitive VECs for vector-related diseases are presented in Table A11.4-38.

Table A11.4-38 Vector-Related Diseases and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Children (especially under five years of age)	High (4)	Immature immune systems
Pregnant women	High (4)	Potential of disease affecting unborn child
Individuals living in overcrowded areas associated with poor housing and poor sanitary conditions	High (4)	Higher likelihood of disease spread and increased mosquito densities
Rural populations	High (4)	Poorer access to medication and health facilities

Key Considerations

Key considerations are:

- construction activities may create standing water, in which malaria-spreading mosquitoes can breed
- vector management activities, if not aligned with national strategies, may increase vector resistance and compromise local authority interventions
- PIIM may promote vector breeding, disease transmission and an increased burden on health systems
- environmental sanitation, health care services and prophylaxis, vector control programmes and the management of PIIM are key for controlling malaria.

A11.4.11.4 Baseline Condition of Soil-, Water- and Waste-Related Diseases

The prevalence of soil-, water- and waste-related diseases is highly dependent on sanitation facilities and access to safe drinking water.

Access to Drinking Water and Sanitation

National Level

The latest WHO and UNICEF statistics show that 79% of the Ugandan population has access to safe drinking water, an increase from 40% in 1990. Access to adequate sanitation is generally poor at just 19% (29% in urban areas and 17% in rural areas) with limited progress in recent years (UNICEF 2015). Access to basic

sanitation facilities is higher at an estimated 80% (MOH 2017a). The relative high cost of constructing latrines and poor health education were noted as factors limiting sanitation improvements (UBOS 2014).

An estimated 78% of households do not have functional hand-washing facilities for after toilet use. Only 8% have access to water and soap. Functional hand-washing facilities were available in 30%, 26% and 14% of households in the central north, central south and Bunyoro regions respectively (UBOS 2014).

Waste disposal was generally poor. An estimated 44.2% of households (19.5% urban and 52.2% rural) dispose of waste in their gardens, with 22.5% burning and 8% burying waste. Only 7% of waste was disposed in a supervised dump (20.3% in urban areas) (UBOS 2014).

District and PAC Level

Figure A11.4-70 shows the proportion of the population in the districts traversed by the AOI with access to safe drinking water. The districts of Gomba, Lwengo and Kyotera recorded the best access to safe drinking water at 87%, 72% and 63%, respectively, while Mubende, Kakumiro, Sembabule and Rakai ranked in the bottom five with coverage below 50% (MWE 2017).

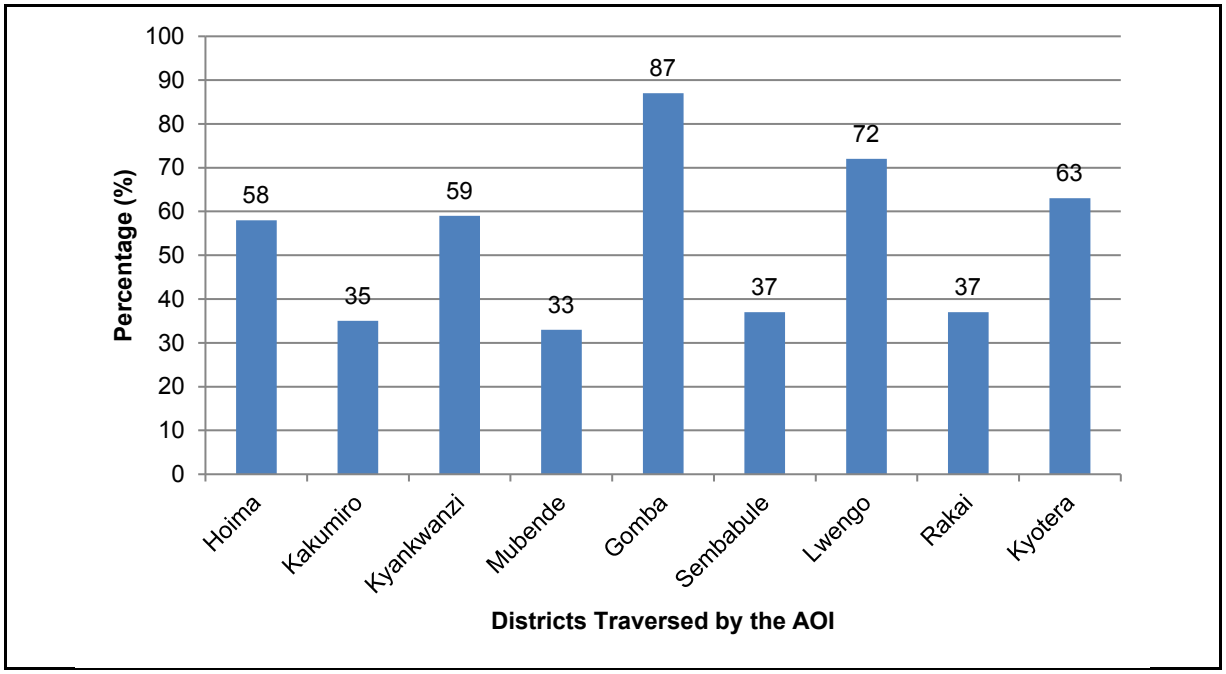


Figure A11.4-70 Access to Safe Drinking Water by District, 2016–2017
SOURCE: MWE 2017

Information from 39 PAC profiles indicate that 51% of communities have access to boreholes; however, many of these are noted as being nonfunctional. Moreover, 36% of the PACs state that they have access to unprotected community wells, suggesting that access to safe drinking water is limited. Others rely on surface water from lakes, rivers and reservoirs for their domestic needs, often sharing these water sources with livestock. Only Kyenda (KP125.5), Sembabule Market Zone (KP190), Bukulula (KP240) and Ssanje Katwe (KP270.5) had access to piped water

according to FGDs. More than half (51%) of households reported that they were not satisfied with the quality of water from their main source. The situation worsens during the dry season when more households are cut off from their regular source. Water reliability, quantity and affordability concerns were also reported.

Most of the population in the districts traversed by the AOI have access to some form of sanitation facility, with the highest coverage recorded in Hoima (91%) followed by Mubende (84%) and Rakai (84%) (MWE 2017).

Access to sanitation facilities was found to be much lower in the districts of Gomba (55%) and Kyankwanzi (59%). Pit latrines are the commonest type of sanitation facility. Access to hand-washing facilities is still a challenge with coverage noted to be between 17% and 65% (see Figure A11.4-71) (MWE 2017).

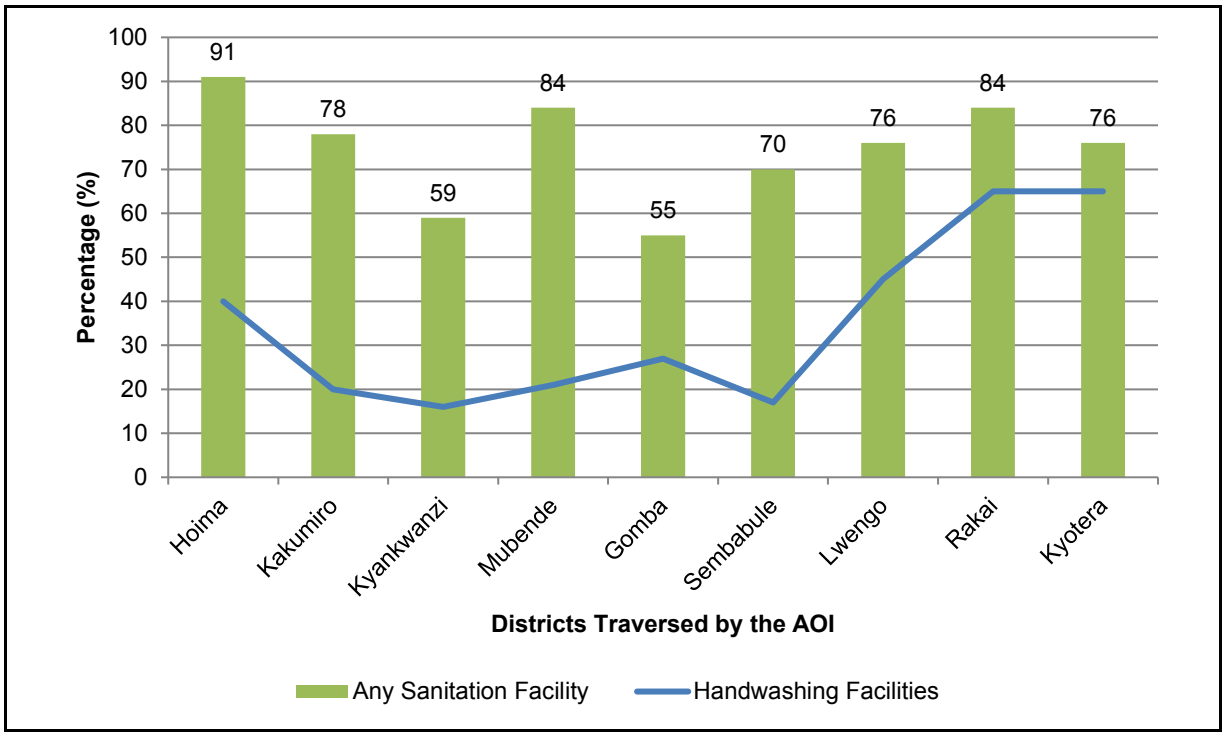


Figure A11.4-71 Access to Sanitation Facilities by District, 2016–2017
SOURCE: MWE 2017

Diarrhoeal Disease

National Level

Diarrhoeal disease is still a major public health concern in Uganda, although a considerable decline in this disease's share of the disease burden has been recorded. Diarrhoeal disease is estimated to be responsible for 5% of deaths in the country, a decline from 11% in 1990 (IHME 2013). However, among children under five years, diarrhoea remains among the top causes of morbidity and mortality (WHO 2015a).

According to the 2011 UDHS, cases of diarrhoea among children were highest in the eastern region (32%) and lowest in the southwest region (14%). The western region recorded a 19% prevalence (UBOS 2017b).

District and PAC Level

Baseline findings show that diarrhoea is a common cause of morbidity in the districts traversed by the AOI. According to HMIS data, approximately 3% of all outpatient cases present with diarrhoea (Figure A11.4-72). Cases were reported in most PACs traversed by the AOI, ranging from Katooke (KP1.5) and Nzoo (KP84) in the north to Kabonera (KP284.5) and Mutukula town (KP295.5) toward the south.

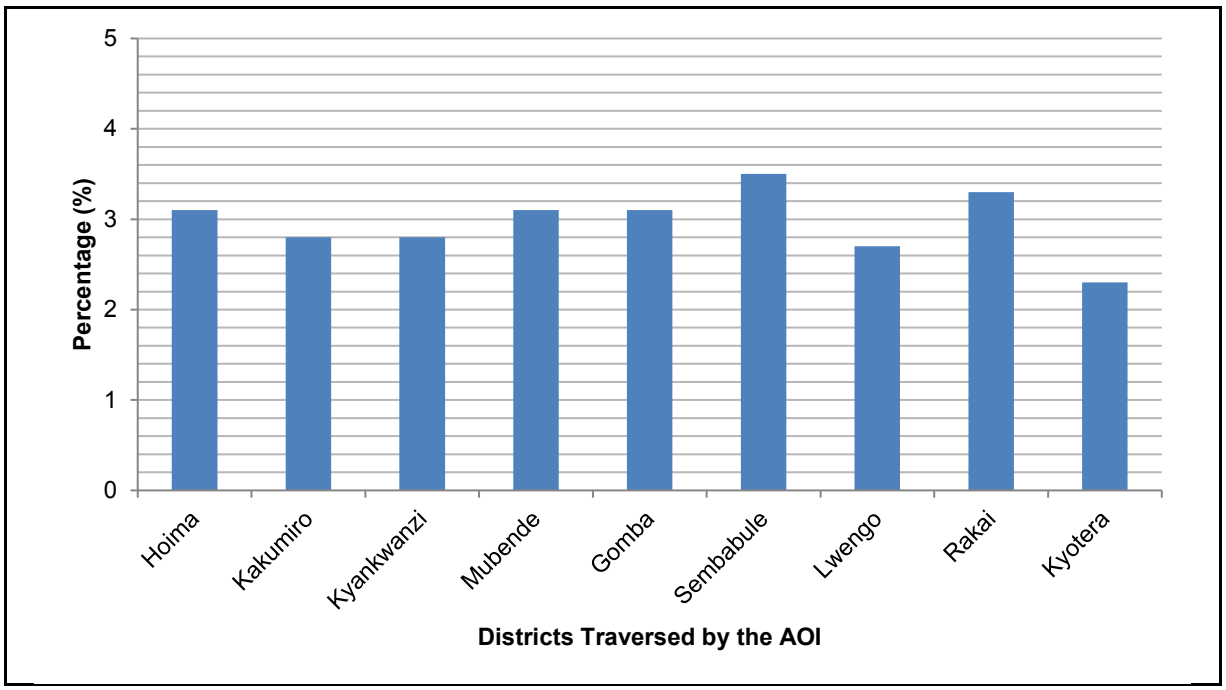


Figure A11.4-72 Diarrhoeal Disease Morbidity by District

SOURCE: Uganda HMIS 2017

Cholera

Cholera is caused by the bacteria *Vibrio cholerae* and is the main cause of dehydrating diarrhoea in adults. Clinical episodes range from asymptomatic infection to acute fulminant watery diarrhoea which, if untreated, may be fatal (Sack et al. 2004). No cases of cholera were reported during the study in any of the PACs.

National Level

Uganda experiences frequent cholera outbreaks, with an estimated 11,000 cholera cases and 61–182 cholera-related deaths each year. Most cases (81%) occur in a relatively small number of districts comprising just 24% of the total population. Cholera outbreaks are particularly common among fishing communities around the lakes. In 2015, an outbreak in Hoima district resulted in over 200 cases and 6 deaths (Mugwera 2015, Internet site; Bwire et al. 2017).

District and PAC Level

Cholera remains a major risk in all the districts traversed by the AOI with a variable level of vulnerability identified across districts. The key underlying factors leading to higher vulnerability are:

- limited access to safe drinking water
- inadequate sanitation
- poor hygienic practices.

HMIS data show that all the project districts except Kyankwanzi have recorded cholera cases (see Table A11.4-39).

Table A11.4-39 Cholera Cases by Districts, 2015–2017

Project District	Cholera Cases		
	2015	2016	2017
Hoima	263	202	43
Kakumiro	5	16	7
Kyankwanzi	0	0	0
Mubende	4	7	0
Gomba	0	2	0
Sembabule	5	11	17
Lwengo	9	2	0
Kyotera	0	0	5
Rakai	16	1	13

SOURCE: Uganda HMIS 2017

Dysentery and Typhoid Fever

National Level

Typhoid fever (also called enteric fever) is a severe febrile illness that follows infection by a gram-negative bacillus, *Salmonella* spp. The disease continues to be a public health concern in many developing countries, including Uganda. Typhoid is commonly over-reported due to the lack of required diagnostic facilities. The techniques usually performed are very nonspecific and cross-react with other bacterial and parasitic diseases. Febrile illnesses such malaria often confound the diagnosis of typhoid due to similarity in the general presentation.

District and PAC Level

HMIS data show that the districts traversed by the AOI record several cases annually (Figure A11.4-73). FGD participants in PACs consistently listed typhoid among common ailments in their community. These diseases are notifiable and surveillance is done through weekly reporting of cases. Typhoid cases were reported in 14 PACs.

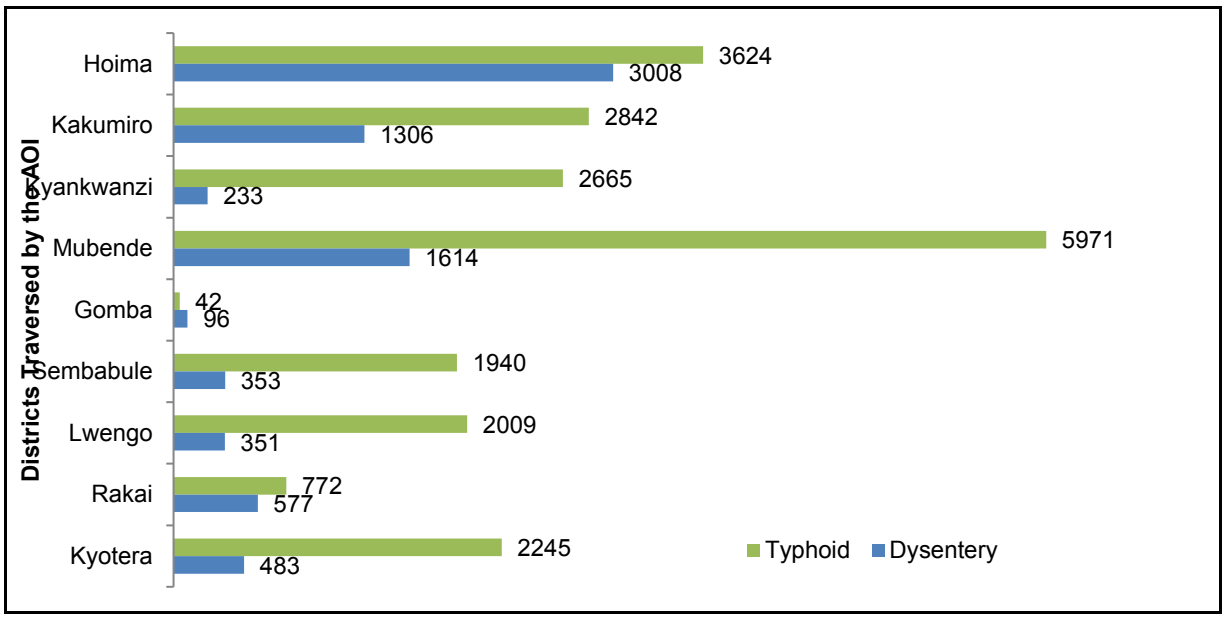


Figure A11.4-73 Typhoid and Dysentery Cases by the Area of Influence, 2017
SOURCE: Uganda HMIS 2017

Schistosomiasis and Intestinal Worms

Schistosomiasis, also known as bilharzia, is a tropical disease caused by parasitic trematode worms of the genus Schistosoma. In Africa, the urogenital form (caused by *Schistosoma haematobium*) and the intestinal form (caused by *Schistosoma mansoni*) are common. Infection is prevalent in tropical and subtropical areas, especially in poor communities without potable water and adequate sanitation. Therefore, the prevalence of schistosomiasis is a good indicator of the level of sanitation in a potentially endemic area.

National Level

Schistosomiasis in Uganda is mainly caused by *S. mansoni* and affects more than 10% of the population. Research has shown high prevalence near lakeshores and along large rivers, with no transmission above 1400 m altitude or where total annual rainfall was less than 900 mm per year (Tukahebwa et al. 2013).

District and PAC Level

The Lake Albert area shows a community prevalence of up to 80% (Tukahebwa et al. 2013). Schistosomiasis is a high risk in Hoima district and generally low risk in the rest of the project districts. However, intestinal worms are endemic throughout the country and their transmission is promoted by lack of adequate sanitation. Intestinal worms were reported throughout the districts traversed by the AOI, with more cases noted toward the south in Miti (KP194), Muyenje (KP192) and Kinvunikidde (KP225). Mass de-worming of young children is implemented across the county to control the infection.

Trend in Condition and Sensitivity to Change

The following trends with regards to soil-, water- and waste-related disease management were identified:

- access to safe drinking water and basic sanitation facilities is improving
- most of the districts traversed by the AOI reported a decrease in the burden of diarrhoeal diseases. This was partly attributed to improvements in hygiene behaviour. In addition, WASH programmes are coordinated and implemented by the Uganda Sanitation Fund. Most programmes are focused on behaviour change communication (BCC) programmes that target open defecation. Programmes target approximately 5.6 million people in over 9000 villages, to live in open defecation free (ODF) environments, and to adopt good hygienic practices. A particularly effective initiative is Community Led Total Sanitation (CLTS)
- potential for cholera, dysentery and typhoid outbreaks remain high in all the project districts as a result of underlying challenges in environmental health conditions.

Ecosystem Services Provided

Water-related diseases are linked to safe water, which provides the following provisioning ecosystem services:

- general health
- form of livelihood (see Section A11.4.7 on river and lake-based livelihoods).

Sensitivity Ranking

Several sensitive VECs were identified in relation to soil-, water- and waste-related diseases (see Table A11.4-40).

Table A11.4-40 Soil-, Water- and Waste-Related Diseases VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Children	High (4)	Undeveloped immune response and greater risk for contracting diseases
Elderly	High (4)	Compromised immune response
Immuno-compromised individuals	High (4)	Poor immune response
Communities with existing poor access to safe water and adequate sanitation	High (4)	High likelihood of infection

Key Considerations

A key consideration is:

- PIIM into PACs may influence the availability of water, exacerbate unsanitary conditions and increase disease spread and BOD.

A11.4.11.5 Baseline Condition of Sexually Transmitted Infections

HIV and AIDS

National Level

The HIV epidemic in Uganda continues to be generalised and stable, without a substantial change of pattern over the last decade. Uganda achieved impressive success in the control of HIV during the 1990s, bringing down the prevalence among adults 15–49 years from a high of 18.5% in 1992 to 6.4% in 2005 (MOH 2017b). See Figure A11.4-74.

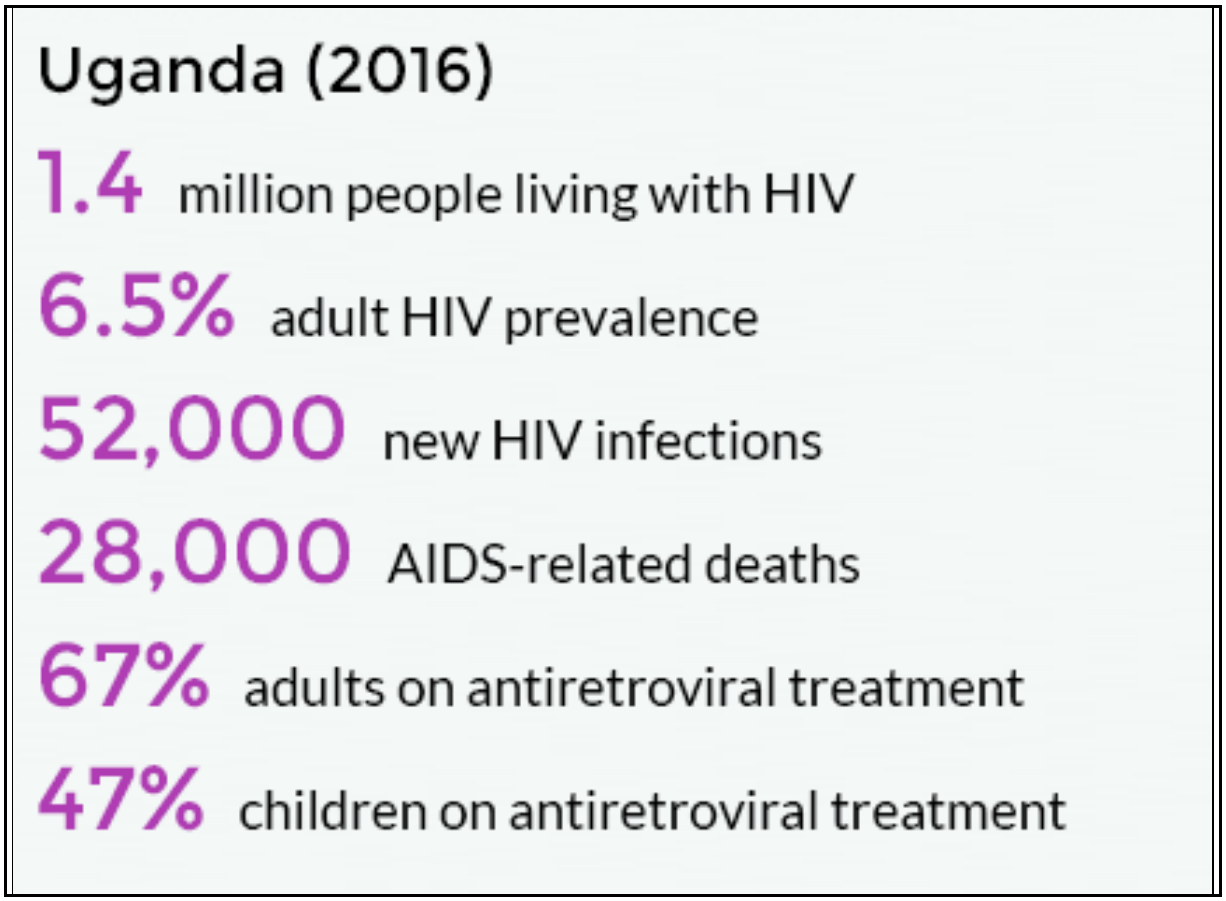


Figure A11.4-74 Key HIV Statistics for Uganda, 2016
SOURCE: UNAIDS 2016

However, recent findings show an increase in HIV prevalence. In 2016, an estimated 52,000 new HIV infections were recorded and 28,000 people were estimated to have died from AIDS-related illnesses. While there have been increased efforts to scale up treatment initiatives, there are still many people living with HIV who are not treated (including possibly high-risk groups such as commercial sex workers). Punitive laws and stigmatising attitudes toward sex workers, people who inject drugs and gay men has meant that these people, who are most vulnerable to infection, are far less likely to engage with HIV services (AVERT 2017, Internet site).

The reported HIV prevalence is higher in urban areas (7.5%) than rural areas (5.8%) and higher among women (7.5%) compared to men (4.3%). The prevalence varies across regions as shown in Figure A11.4-75.

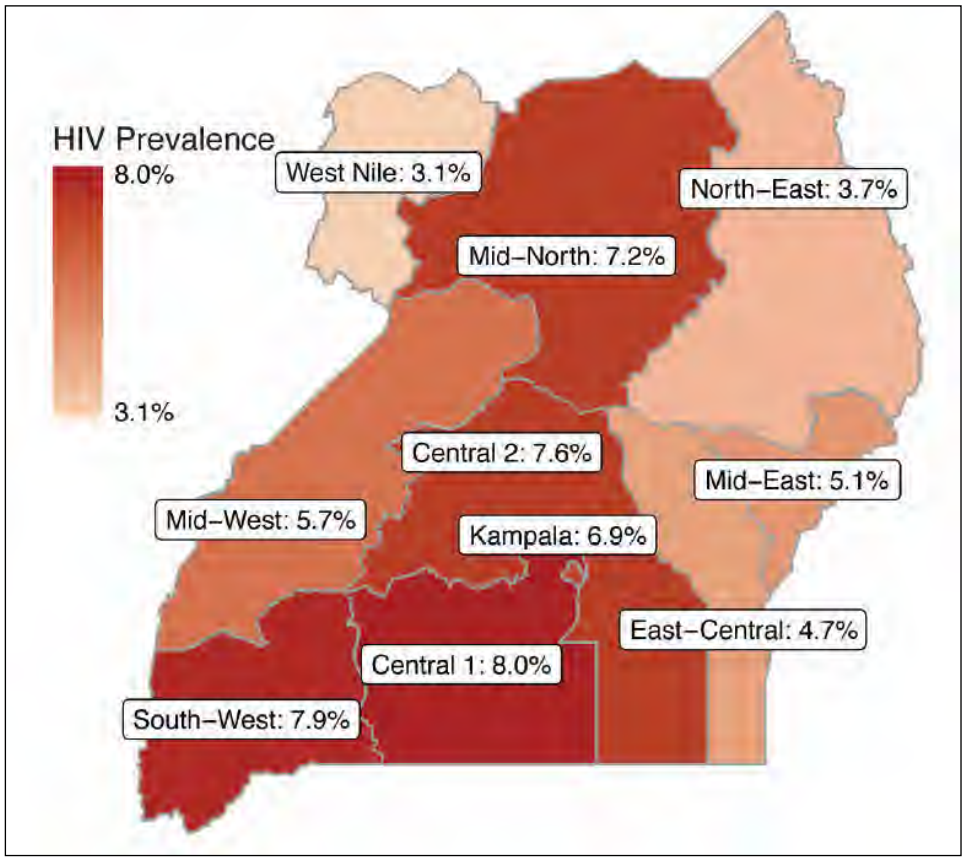


Figure A11.4-75 HIV Prevalence in Regions of Uganda, 2016–2017
SOURCE: MOH 2017b

District and PAC Level

HMIS data show that the HIV positivity rate was highest in Rakai (12%) and Sembabule (8.5%), and lowest in Kakumiro (4.4%) and Kyotera (5.6%) (see Figure A11.4-76). These rates are derived from programme data and weighted HIV prevalence among pregnant women who attend ante-natal clinics and therefore do not necessarily reflect the true prevalence in the general population.

Hotspots for HIV infection were identified along major transport corridors, and in trading centres and fishing communities, the common underlying factor being availability of disposable income that drives commercial sex activity. The following determinants for HIV infection were identified by informants in the AOI:

- high population mobility
- location along major transport routes with rest stops for truck drivers
- fishing communities
- trade hubs
- existence of most-at-risk populations (most urban centres)
- cultural practices such as wife inheritance

- road construction that has increased PIIM
- high-risk sexual behaviour.

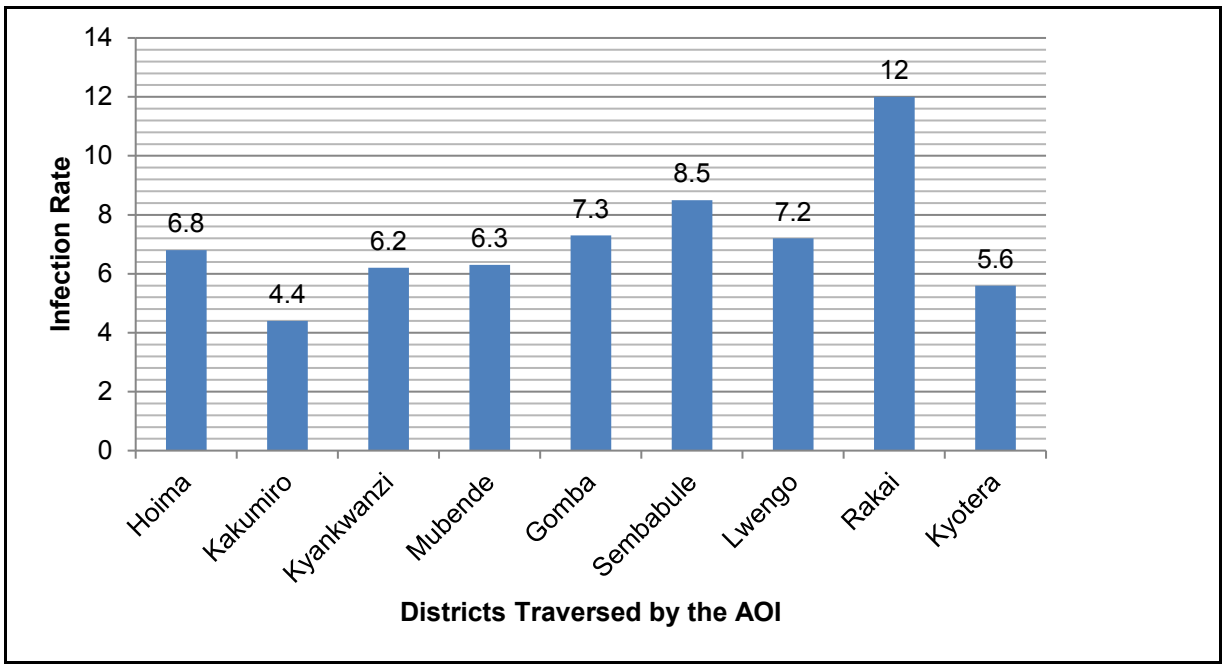


Figure A11.4-76 HIV Infection Rate by District, 2016
SOURCE: Uganda HMIS 2017

HIV care and treatment services were generally available and freely accessible. There were reports of shortages of first-line drugs in some districts linked to supply chain inefficiencies.

Women FGDs revealed that most women had acquired their knowledge about HIV-AIDS via various public health messages broadcast on the radio or at health clinics. They understood preventative measures to include using condoms, abstinence, being faithful and male circumcision. When asked if people followed measures for preventing HIV, 84% of the women replied no. The FGDs revealed that those living with HIV/AIDS were not stigmatised in communities, with only seven PACs (16% of the sample) stating there was stigmatisation.

Sexually Transmitted Infections

Sexually transmitted infections (STI) such as gonorrhoea, syphilis and chlamydia are an important global health priority because of their devastating impact on women and infants. Moreover, STIs and HIV are linked by biological interactions and can occur in the same population cohorts. Infection with certain STIs can increase the risk of acquiring and transmitting HIV and can alter the course of HIV progression.

National Level

STIs are prevalent in Uganda with HMIS data recording over 73,000 cases of urethral discharge and 125,000 cases of genital ulcers in 2013. The data also

indicated a syphilis prevalence of 2.0% among pregnant women (UNAIDS 2013). Prevalence remained at 2.0% in 2017 (MOH 2017b).

Studies have also documented the occurrence of herpes simplex virus-2, hepatitis B virus, gonorrhoea, chlamydia infection, bacterial vaginosis and other STIs. Alongside hepatitis A, C and E viruses, hepatitis B infection is highly endemic in Uganda, with transmission occurring in childhood and adulthood. A recent study indicates a seroprevalence of 10% in the general population. It is also estimated that more than 1.4 million Ugandans are chronic carriers of the virus. Since 2012, the country has included hepatitis B vaccine in its routine child vaccination programme (Bwogi 2009).

District and PAC Level

Baseline findings show that STIs are common in the districts traversed by the AOI. The districts of Mubende, Hoima and Rakai recorded the highest number of cases in 2017 (see Figure A11.4-77). The incidence of STIs is prevalent in the districts traversed by the AOI, with cases of syphilis recorded in 16 PACs including Katooke (KP1.5) and Buswabwera (KP61) in the north and Butiti (KP249.5) and Kyakudusi (KP251) toward the south. STIs were also reported in Kyenda (KP125.5) and Mbirizi (KP225).

Unsafe sexual practices, especially among the youth, were the key underlying factor despite widespread availability of condoms. STI services were generally available in most public health facilities.

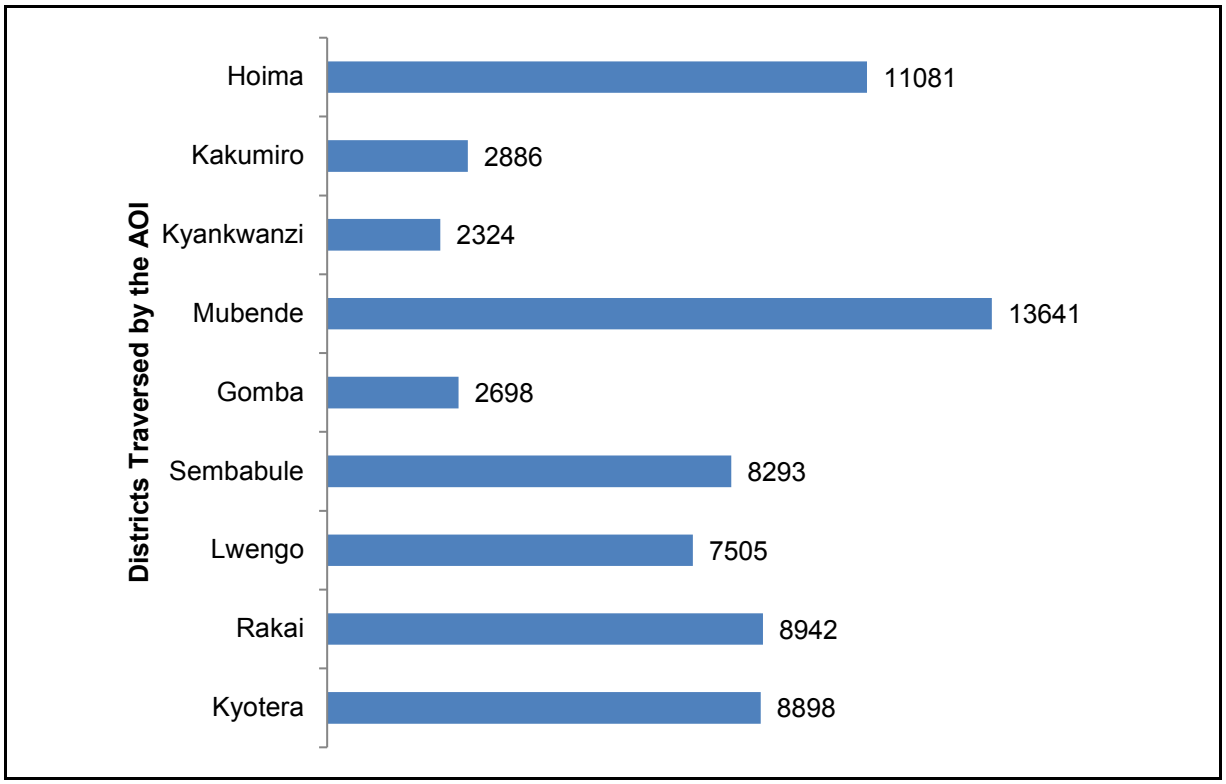


Figure A11.4-77 Sexually Transmitted Infections Cases by District, 2017
SOURCE: Uganda HMIS 2017

Trend in Condition and Sensitivity to Change

The following trends were identified:

- The national trend in HIV prevalence showed a decrease over the previous two decades, from a high of >18% in the 1990s to a record low of 6.4% in 2005. However, the current picture shows stagnation and pockets of increasing prevalence.
- More than half of the districts traversed by the AOI reported a decrease in HIV prevalence (based on data captured at antenatal clinics) over the past three years (Figure A11.4-78). This was attributed to upscale of interventions including health education, free condom distribution, increased availability and uptake of HIV care and treatment, and reduction of HIV-related stigma. The AIDS epidemic in Uganda in the 1990s, more than any other place, substantially impacted the districts of Kyotera and Rakai. Many young men and women died from AIDS related infections, leaving many households headed by the elderly. Recent government and international interventions have substantially reversed this trend.

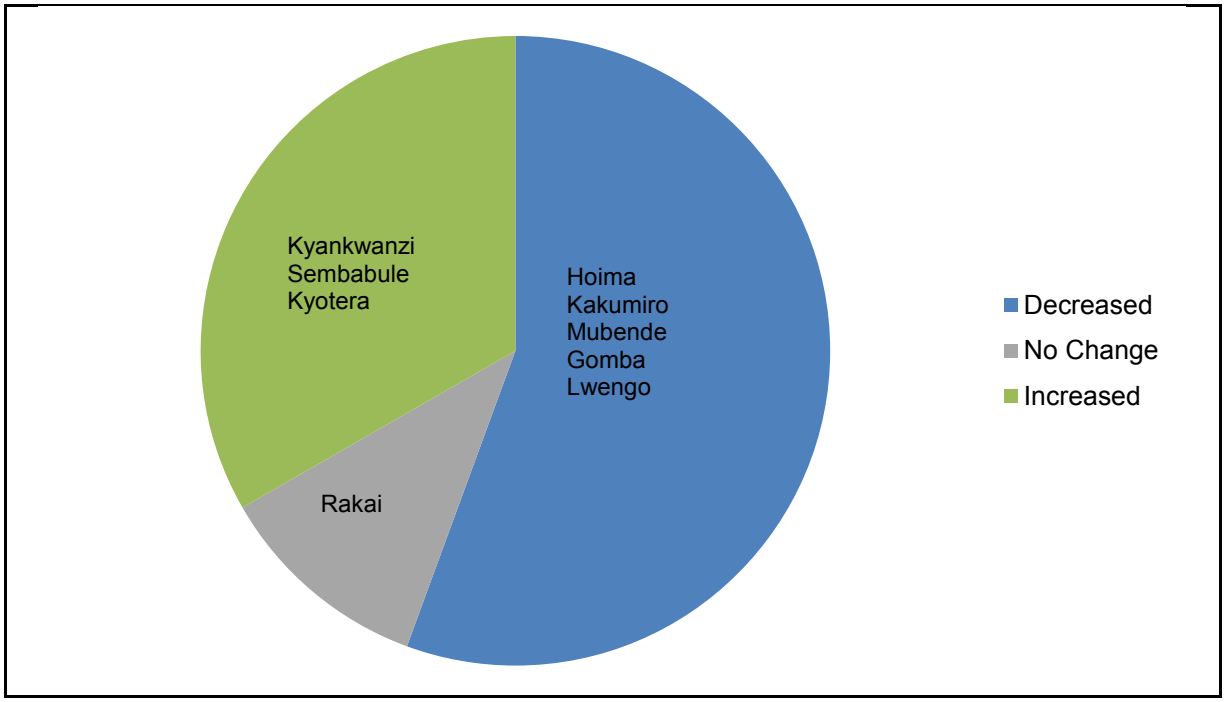


Figure A11.4-78 Trend in HIV Prevalence in the Project Districts, 2015–2017

SOURCE: Uganda HMIS 2017

- HMIS data shows that Kyankwanzi, Kyotera and Sembabule reported an increase in new HIV infections. The increase in Sembabule was attributed to ongoing major road construction that has caused a sudden PIIM of job seekers and traders. The increase in Kyankwanzi was linked to the increase of workers displaced from closed gold mines in Mubende. The location of Kyotera at the Tanzanian border, with high population mobility, was the key determinant for increasing HIV infections in that district.
- All the districts are considered highly sensitive to change with regards to HIV and AIDS, and other STIs, with the district of Sembabule rated as highly sensitive based on a high BOD and an increase in disease trend.

- None of the VECs are considered resilient to change as increases in disease prevalence related to construction projects and other extractive operations have been noted by stakeholders in some of the districts.
- Any project-related change may result in a substantial deviation from the baseline status, while the duration and associated challenges brought about by these changes are typically considered to be longer-term. As with other EHAs, any substantial change has the potential to overwhelm the existing capacity of district health services and may result in a permanent negative change.
- As the potential project-related changes to incidences of HIV and STIs are typically observed in communities near project infrastructure, in larger trading centres and along project access roads, specific types of communities have been identified and, where possible, referenced to KPs.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The social baseline identified several sensitive VECs with regards to sexually transmitted diseases. These are presented in Table A11.4-41.

Table A11.4-41 Sexually Transmitted Disease VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Women and young girls	High (4)	High risk group for disease spread due to high level of GBV and rape
PACs along transport routes and access roads	High (4)	Truck driver stops linked to transactional sex
PACs close to artisanal mining activities	High (4)	Artisanal miners linked to transactional sex
Commercial sex workers	High (5)	High risk group for disease spread due to unsafe sex

Key Considerations

A key consideration is:

- Districts with a high prevalence of STDs, PIIM and a growing population are likely to have increased STI prevalence.

A11.4.11.6 Baseline Condition of Food and Nutrition Related Considerations

Uganda produces more food than it consumes. Yet, poverty still limits people's access to nutritious food, especially in the north and east of the country. Rapid population growth and the presence of a large refugee population pose further challenges to the country's food security. Inadequate diets are a root cause of persistent nutritional problems which undermine the health, growth and development of Ugandan children (WFP 2017, Internet site).

Food security is not a major concern in the districts traversed by the AOI with most of the districts reporting enough food availability throughout the year.

Malnutrition and Anaemia

National Level

Even in the absence of a specific food crisis, many communities in Uganda struggle with chronic malnutrition, especially among young children. The immediate causes are high disease burden of communicable diseases such as malaria, diarrhoeal disease and respiratory infections, and inadequate calorie intake (UBOS 2012b).

Stunting affects 29% of children under five years of age, while anaemia rates stand at 53%. A mother's educational attainment makes a difference, with highest rates of malnutrition in uneducated mothers. Poverty plays a role in wasting and stunting with the poorest fifth of the population having double the malnutrition rates compared with the wealthier groups (UBOS 2017b).

District and PAC Level

Acute malnutrition is generally not regarded as a major public health concern in the districts traversed by the AOI, with hospital data showing prevalence of 0.2–1.2% among children less than five years of age (see Figure A11.4-79).

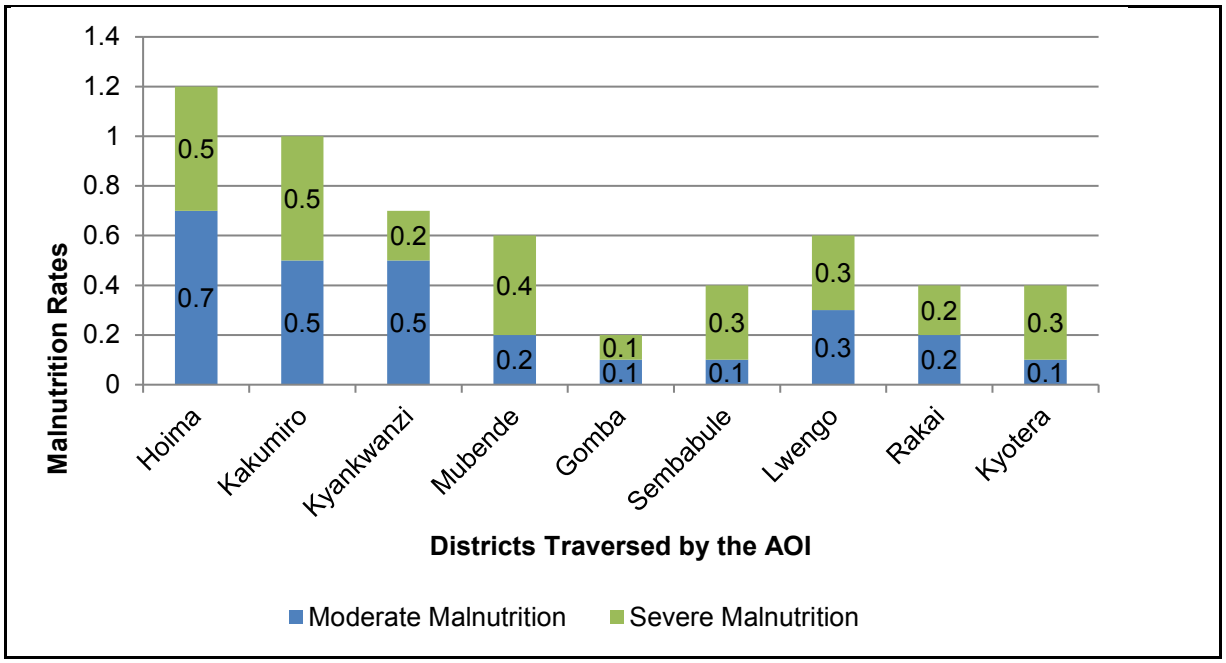


Figure A11.4-79 Malnutrition Rates among Children seen at Health Facilities, 2017

SOURCE: Uganda HMIS 2017

More than half of project district households (58%) reported that they experience periods of hunger, but these are generally short-lived. FGDs reported that malnutrition commonly occurs within PACs in Hoima, Kakumiro and Kyotera districts.

KIIs with district health officials show that cases of malnutrition occur, but that these are generally confined to a few localities such as Katikara (KP41), Nkooko Trading Centre (KP68) and Bethlehem (KP247.5) and are largely associated with poor feeding habits and disease co-morbidities. Anaemia contributes 1–2% to overall

morbidity, but it remains a considerable burden among young children and women in the districts traversed by the AOI.

Trend in Condition and Sensitivity to Change

Available data show that chronic malnutrition rates have decreased while acute malnutrition rates have generally remained low and stable at the district level. The 2016 UDHS shows that stunting prevalence has declined to 29% from 33% in 2011 and 46% in 1995. The proportion of underweight children has also declined to 11%, from 14% in 2011 and 21% in 1995. Acute malnutrition rates (wasting) have remained low at around 4–6%. There were concerns for future food insecurity related to weather patterns, especially drought, and rapid population growth in urban centres. Data on the trend of anaemia were inconclusive.

Ecosystem Services Provided

Ecosystem services related to food and nutrition are covered under land-, and river- and lake-based livelihoods, Sections A11.4.6 and A11.4.7.

Sensitivity Ranking

The social baseline identified VECs sensitive in relation to food and nutrition (see Table A11.4-42).

Table A11.4-42 Food and Nutrition Related VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
Landless	Moderate (3)	May have less access to subsistence crops and wild foods.
PAC households	Moderate (3)	Vulnerable to price inflation
Elderly	High (4)	Elevated level of vulnerability to food price inflation due to lower ability to bolster income
Women-headed households and children	High (4)	Elevated level of vulnerability related to income insecurity, land tenure and food price inflation
Hunter gatherers	High (4)	May have less access to wild foods due to reduced access to hunting and gathering area

Key Considerations

Key considerations are:

- most farmers in the AOI are subsistence farmers and an increase in external demand will need to be managed
- PIIM into the AOI may increase food prices and, as a result, affect food security of vulnerable groups.

11.4.11.6.1 Baseline Condition of Noncommunicable Diseases

The BOD attributable to noncommunicable diseases (NCDs) is on the increase worldwide, with cardiovascular diseases, diabetes, cancer and chronic respiratory conditions responsible for most of the deaths. In sub-Saharan Africa, it is predicted that NCDs and injuries may cause up to 60% of morbidity and 65% of mortality by

2020 (WHO and AFRO 2011). The risk factors underlying the major chronic NCDs are unhealthy diet, physical inactivity, alcohol consumption and smoking (WHO and CDC 2010).

The demographic and nutritional transitions taking place in Uganda, as in other developing countries, are leading to accelerating growth of NCDs (Schwartz et al. 2014). This increasing burden threatens to overwhelm already over-stretched health services.

It is estimated that NCDs account for 27% of all deaths in the country, of which cardiovascular diseases contributes 9% (WHO 2014) (see Figure A11.4-80). Baseline findings show that NCDs are an emerging health concern in the project districts. The government is in the process of drafting a national policy which will guide monitoring and surveillance of NCDs (MOH 2017, Internet site).

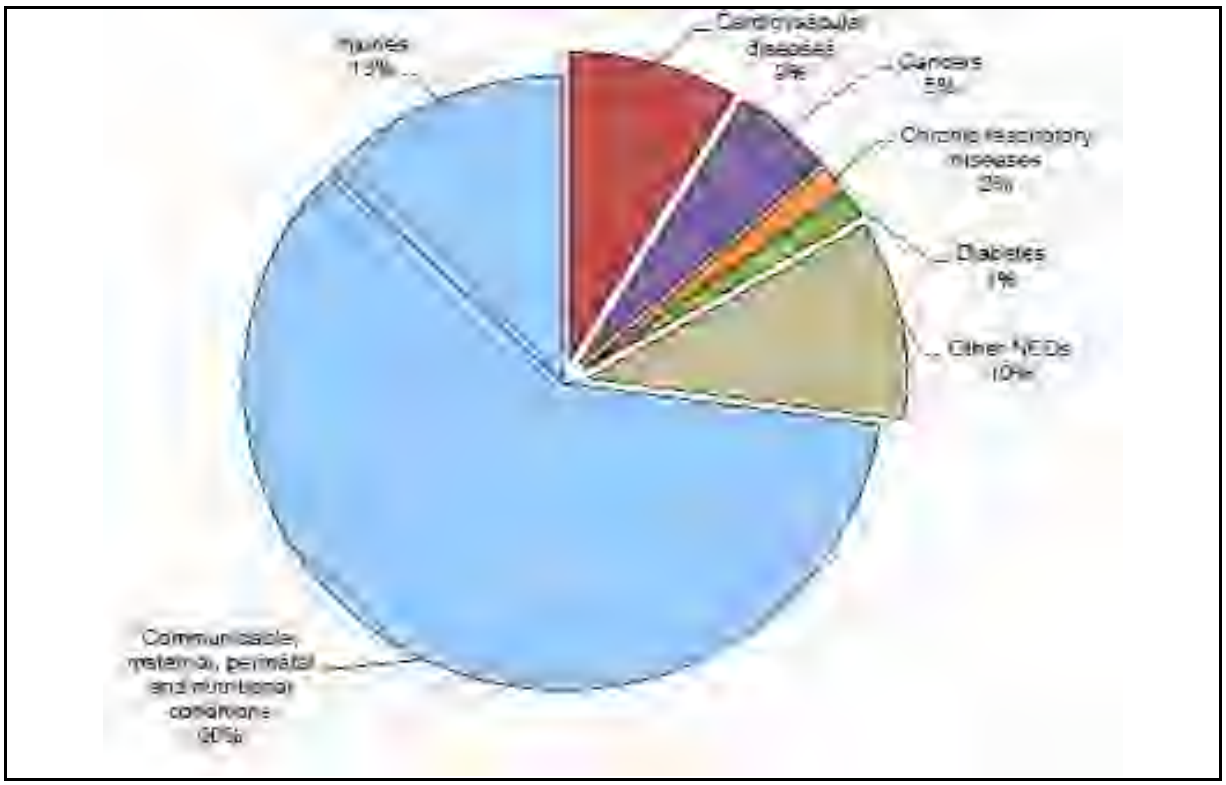


Figure A11.4-80 Distribution of Causes of Death in Uganda, 2012
SOURCE: WHO (2012)

Cardiovascular Disease and Hypertension

National Level

The Uganda Heart Institute reports a 500% increase in outpatient attendance due to heart related conditions from 2002–2009 (MOH 2014b, Internet site). Hypertension is the leading risk factor for cardiovascular diseases with a national prevalence of 43% among men and 39% among women, age over 25 years (WHO 2015a). Most hypertensive patients are unaware of their condition (Musinguzi and Nuwaha 2013).

District and PAC Level

Baseline findings show that heart disease and hypertension are common in the districts traversed by the AOI. HMIS data show that Hoima, Lwengo and Kyotera recorded the highest number of hypertension cases in 2017 (see Figure A11.4-81). Findings from FGDs show incidences of hypertension in Nkooko Trading Centre (KP68) and Kyenda (KP125.5). KIIs indicate that obesity is an emerging concern, especially in urban areas. Care and treatment services for hypertension and heart diseases were generally available in hospitals, but there were challenges regarding drug availability and limited access to specialised care.

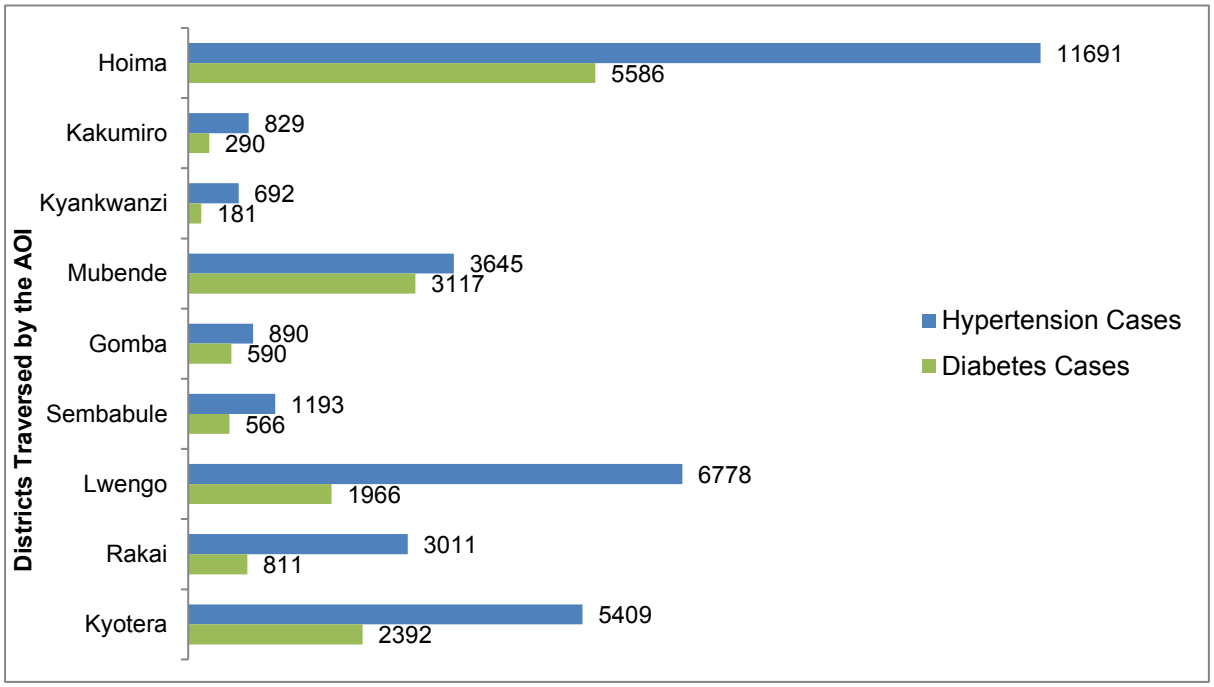


Figure A11.4-81 Hypertension and Diabetes Cases by District, 2017

SOURCE: Uganda HMIS 2017

Diabetes

National Level

The prevalence of diabetes in Uganda ranges from 5–7% (Nyanzi 2014). Limited awareness and negative perceptions of the disease hinders its control. Only 34% of the population have adequate knowledge about lifestyle diseases (Mayega 2014).

District and PAC Level

All districts traversing the AOI have recorded an increase in diabetes cases. HMIS data (2017) show high numbers of diabetes cases in the districts of Hoima, Mubende, Kyotera and Lwengo (see Figure A11.4-81). Diabetes care and treatment services were generally available at hospitals but very limited at lower level facilities. Incidences of diabetes were recorded at Kyenda (KP125.5), Mabale (KP183), Bukulula (KP240), Kyakudusi (KP251), Lukoma (KP287.5) and Mutukula town (KP295.5).

Cancers

National Level

The Uganda Cancer Institute has reported an upward trend in cancer incidence in recent years (MOH 2014). Estimates suggest that cancers are responsible for at least 5% of deaths in the country (WHO 2014). The leading cancers among women were noted to be cervical, breast and oesophageal cancers, while the commonest among men are cancers of the prostate, oesophagus and Kaposi's sarcoma (GLOBOCAN 2012).

District and PAC Level

The burden of cancers in the districts traversed by the AOI is not well understood. HMIS data show that several cases of cancers are recorded in the districts every year, especially cervical cancer in women and prostate cancer in men, with most suspected cancer cases referred to higher level facilities. Concerns regarding the increase in the incidence of cancers associated with poly aromatic hydrocarbon exposure were noted by district level health authorities.

Chronic Respiratory Disease

The burden of chronic respiratory disease in Uganda is related to tobacco use and indoor air pollution (Schwartz et al. 2014). This disease group includes asthma, chronic obstructive pulmonary disease (COPD), occupational lung diseases and pulmonary hypertension.

National Level

The national prevalence of daily tobacco smoking is estimated to be 10% (16% among males and 3% among females) (WHO 2014). Most of the 16% of adults diagnosed with COPD were women. Though tobacco use was more common in men, daily exposure to poorly ventilated indoor smoke from cooking with biomass fuels was considerably higher in women. In some areas, chronic coughing that could be associated with TB was highly stigmatised (Schwartz et al. 2014).

District and PAC Level

HMIS data show that asthma is common in the districts traversed by the AOI while very few cases of COPD are recorded (see Figure A11.4-82).

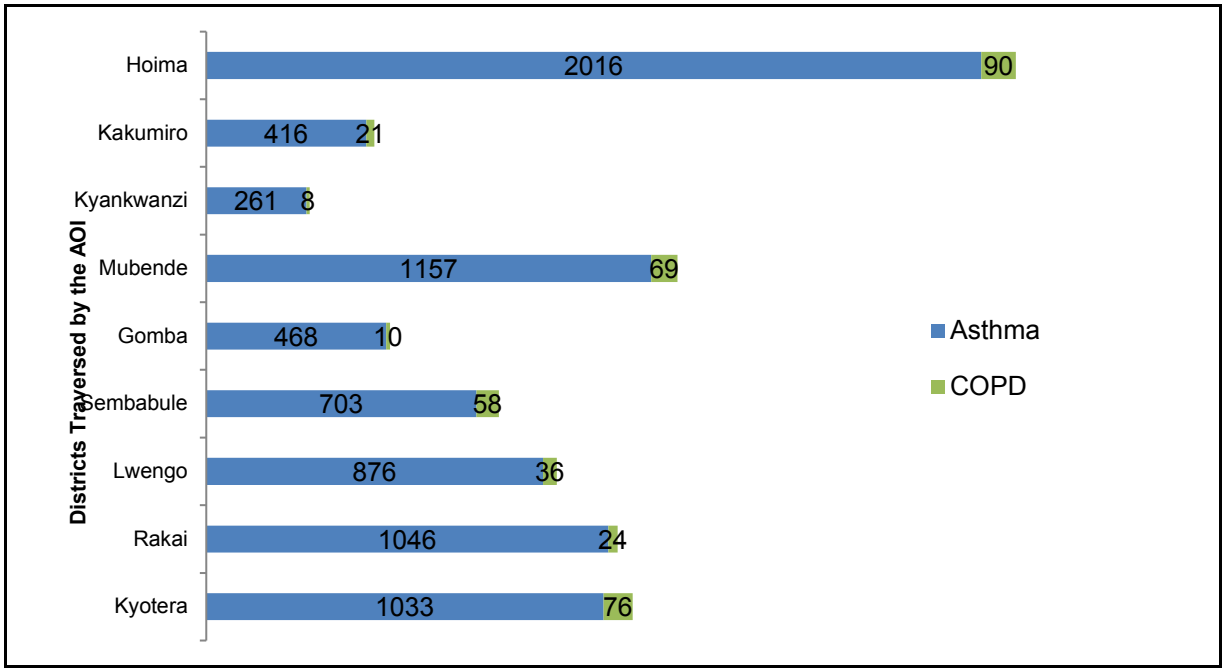


Figure A11.4-82 Asthma and Chronic Obstructive Pulmonary Disease, 2017
SOURCE: Uganda HMIS 2017

Trend in Condition and Sensitivity to Change

NCDs, particularly heart disease, hypertension and diabetes, are showing an upward trend nationally and in the districts traversed by the AOI. This increase is largely attributed to urbanisation and changes in lifestyle.

While NCDs are an important risk factor with regards to community health in general, the sensitivity to change in all project districts is rated as moderate with little variation between districts.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The social baseline did not identify any sensitive NCD VECs.

Key Considerations

Unless there is a sustainable growth of the districts' economies an increase in NCD is unlikely.

A11.4.11.7 Baseline Condition of Accidents and Injuries

Physical Assault and Domestic Violence

Domestic violence is widely acknowledged to be of great concern in Uganda, from human rights, economic and health perspectives. Baseline findings show that gender-based violence (GBV) including physical and sexual assault is a common cause of injuries in the project districts. Substance (alcohol) abuse, social and

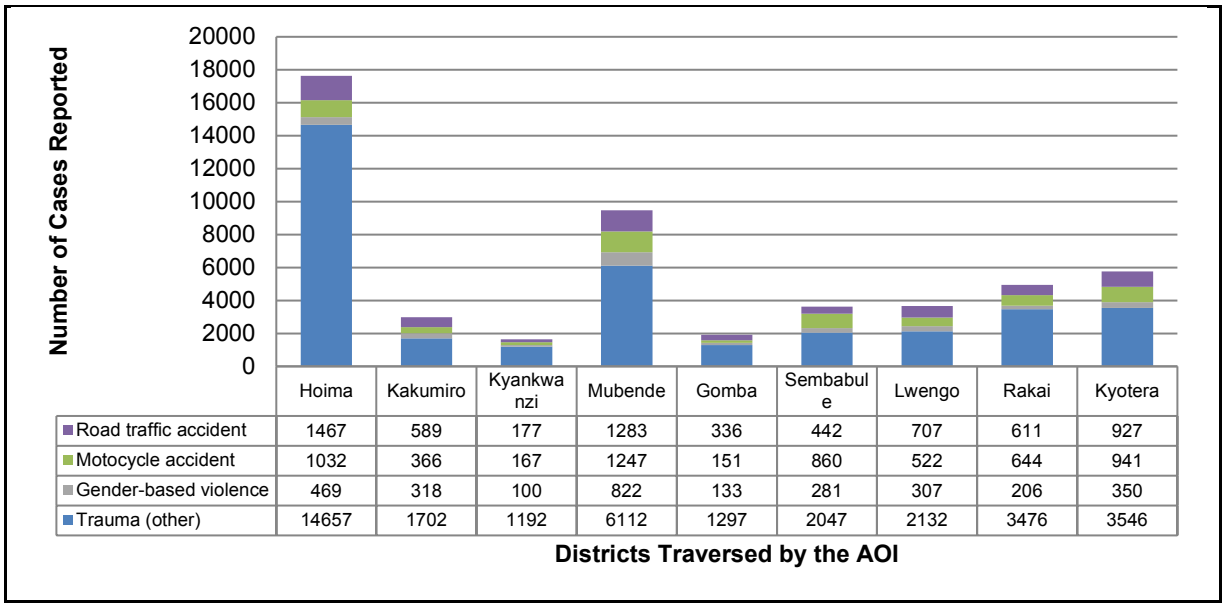
economic challenges were identified as contributing factors. The incidence of domestic violence and GBV was reported in 38 PACs traversed by the AOI (discussed below in Section A11.4.11.9). FGDs indicate that women generally do not have support networks for victims of domestic violence.

Accidents and Injuries

Road traffic and occupational accidents and injuries are an important consideration. Road accidents are covered in the traffic baseline report (see Appendix A12).

Hospital statistics from districts traversed by the AOI show that injuries were the leading cause of surgical emergencies and have become a considerable health burden.

Figure A11.4-83 shows the number and causes of injuries recorded at health facilities across the districts. Hoima recorded the highest number of injuries followed by Mubende and Kyotera. Motorcycle-related accidents featured prominently among the causes.



	Hoima	Kakumiro	Kyankwanzi	Mubende	Gomba	Sembabule	Lwengo	Rakai	Kyotera
Road traffic accident	1467	589	177	1283	336	442	707	611	927
Motocycle accident	1032	366	167	1247	151	860	522	644	941
Gender-based violence	469	318	100	822	133	281	307	206	350
Trauma (other)	14657	1702	1192	6112	1297	2047	2132	3476	3546

Figure A11.4-83 Accidents and Injuries Recorded at Health Facilities, 2017
SOURCE: Uganda HMIS 2017

Occupational Accidents and Injuries

This is discussed in Section A11.4.9.

Trend in Condition and Sensitivity to Change

Trends in traffic accidents are described in the traffic baseline report (see Appendix A12). Trends in workers' health are described in Section A11.4.9 (workers' health, safety and welfare section).

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

Sensitivity for traffic-related injuries are ranked in the traffic baseline report (see Appendix A12). Women, in particular sex workers, are considered highly vulnerable (4) in terms of GBV.

A11.4.11.8 Baseline Condition of Veterinary Medicine and Zoonotic Diseases

Zoonotic diseases are caused by infectious agents that can be transmitted between animals and humans. These include diseases such as pandemic influenza (swine or avian influenza), viral haemorrhagic fevers (e.g., Ebola, Marburg, Rift Valley fever, rabies, brucellosis and leptospirosis). Emerging zoonotic diseases have potentially serious human health and economic impacts and their current upward trend is cause for concern.

The most important zoonotic diseases to consider for the AOI are viral haemorrhagic fevers, pandemic influenza, brucellosis and rabies.

Viral Haemorrhagic Fever

National Level

Viral haemorrhagic fever (VHF) is a general term for a severe illness, sometimes associated with bleeding and that may be caused by different viruses especially Lassa fever, Crimean-Congo, Marburg and Ebola viruses. Uganda has experienced repeated outbreaks of VHFs, particularly Ebola, Marburg and more recently Crimean–Congo viruses (Mbonye et al. 2012).

Ebola outbreaks have occurred in the districts of Gulu (2000), Bundibugyo (2007), Luwero (2011 and 2012) and Kabaale (2012) in western Uganda. The 2012 outbreak had a death rate of 57% (4 deaths out of 7 confirmed cases) (Mbonye et al. 2012).

District and PAC Level

VHFs, particularly Ebola and Marburg, pose a substantial risk in all the districts traversed by the AOI. In 2017, four project districts recorded suspected cases of VHFs as follows:

- Hoima (13 cases)
- Sembabule (11 cases)
- Mubende (1 case)
- Kakumiro (1 case).

Rabies

National Level

Rabies is a public health problem in many developing countries although it is often under-reported due to limited awareness, public veterinary health services and diagnostic ability. Rabies is endemic throughout Uganda with transmission largely occurring from bites by infected domestic dogs (Fevre et al. 2005). Most domestic dogs are not vaccinated against rabies.

District and PAC Level

Evidence shows that many cases of dog bites are recorded in the local health facilities and these are often promptly managed with post-exposure prophylaxis to prevent progression to full-blown rabies, which is known to be 100% fatal.

Brucellosis

Brucellosis is common among pastoral communities in Uganda. Each of the districts traversed by the AOI recorded at least 100 cases of brucellosis in 2017, with highest number recorded in Sembabule (1193) and Mubende (1005), Kyengera (KP160.5) and Bethlehem (KP257.5). The mainstay of diagnosis is rapid serological tests that are mostly available at district and referral hospitals. Key informants reported that the disease is likely to be over-diagnosed because of inaccurate tests.

Pandemic influenza remains an important global threat because of increasing population mobility and mixing. Uganda had over 200 confirmed cases, but no deaths, during the 2009 swine flu pandemic caused by H1N1 influenza strain. Pandemic influenza therefore remains a relevant consideration.

Trend in Condition and Sensitivity to Change

Rabid dog bites have increased in the districts traversed by the AOI, leading to an increase in demand for post-exposure prophylaxis for rabies, with the vaccine often out of stock. The risk from VHFs remains high given their occurrence in the country and potential for spontaneous outbreaks.

Although the conditions relevant to this EHA are prevalent throughout the AOI, the estimated BOD remains low at the time of writing.

However, potential for outbreaks is a substantial challenge that imparts a measure of risk in the AOI. Due to the low-grade re-occurrence of potential VHF cases in Hoima, Kakumiro, Mubende and Sembabule, these districts are considered to have a high sensitivity to change. A major outbreak will pressure existing health systems and may overwhelm service delivery, further impacting on morbidity and mortality.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The social baseline identified that all PACs are equally sensitive VECs with regards to veterinary and zoonotic diseases.

Key Considerations

A key consideration is:

- VHFs and the associated outbreak potential remains a risk to PACs, in those that are impacted by PIIM.

A11.4.11.9 Baseline Condition of Social Determinant of Health

Social determinants of health are the conditions in which people are born, grow, live, work and age, including the health system. These circumstances are typically shaped by the distribution of money, power and resources.

Mental Health

National Level

Uganda has recognised mental health as a serious public health concern and has recently implemented reforms aimed at strengthening the country's mental health system. In 2010, only 1.8 beds per 100,000 people, were available in mental care hospitals (at the NRHs) – 1.4 beds per 100,000 people in community-based psychiatric inpatient units and 0.4 beds per 100,000 people in forensic facilities. There is only one mental health worker per 100,000 people (Kigozi et al. 2010).

District and PAC Level

Although mental illness is recognised as a public health burden in all the project districts, reliable data are scarce. Baseline findings show that epilepsy, bipolar disorder and major depression are the most common mental disorders in the districts traversed by the AOI. Substance use disorders, anxiety and psychotic disorders were also reported to be common.

Only one PAC, Mbrizi (KP225), reported that a member of the community had a mental illness. KIIs at PAC level found that mental illnesses are rarely openly spoken about, due to community perceptions of causes of illness, which included curses, satanic powers, bewitchment, as well as socio-economic causes such as poverty and familial discord.

Substance Abuse and Social Ills

National and Regional Level

Substance misuse is a growing public health concern in Uganda. A recent study found that at least 20% of high school students in the country have used drugs. It was reported that young people commonly abuse alcohol, tobacco (cigarettes, *shisha and kuber*), marijuana and khat. Access to illicit drugs such as cocaine and heroin was also reported (Kidumu 2013, Internet site).

District and PAC Level

FGDs in PACs show that alcoholism, ‘smoking drugs’, prostitution, and theft and gambling are among the social challenges in the project districts. Commercial sex work (CSW) was particularly reported in the towns of Hoima, Kyotera, Mubende, Lwengo and Mutukula.

Gender Based Violence

National Level

GBV creates both a health and psychological burden for women. It is also recognised that in many societies, women are socialised to accept, tolerate and even rationalise the practice. Women are more than twice as likely to experience sexual violence as

men, with 22% of women aged 15–49 reporting that they had experienced sexual violence at some point, with 13% reporting this in the past 12 months. The experience is lowest in women with more than a secondary school education (UBOS 2017).

District and PAC Level

Baseline findings show that GBV is common in the study area. The highest number of cases was recorded in the districts of Mubende, Hoima and Kyotera and at PAC level FGD with women found particularly high number of reported cases in Mbirizi (KP225), Bukulula (KP240) and Bethlehem (KP247.5). In addition, all sex workers interviewed reported that they had been subjected to GBV at some point. FGDs indicate that women in this setting are also marginalized in education, employment opportunities, decision-making and many other aspects.

Teenage Pregnancies and Early Marriages

Teenage pregnancy and early marriages are important on health and social grounds. Children born to very young mothers are at increased risk of sickness and death. Teenage mothers are more likely to experience adverse pregnancy outcomes and other socio-economic challenges. A recent national survey shows that 24% of 15–19-year-old girls in Uganda have given birth or are pregnant with their first child (UBOS 2017b). Baseline findings show that teenage pregnancies and early marriages are a concern in all the project districts and are increasing.

Lack of formal education, cultural norms (acceptance in society, religious beliefs) and poverty (dowry and failure to pay for education) are some of the drivers of increase in teenage pregnancy. This has been identified by the government as a key challenge to Uganda's development. Several campaigns by government and other donor agencies toward prevention of teenage pregnancy, abuse and education of the girl child are ongoing in most public and private media outlets.

Trend in Condition and Sensitivity to Change

Data on the trend of mental disorders were not conclusive, but the perception of health officials is that cases are increasing. Psychosocial stressors (economic strife, poverty and other social challenges), and alcohol and drug abuse were identified as contributing factors. In FGDs with health personnel, 74% felt that social problems have increased, in particularly alcoholism and prostitution.

Based on the available data, the VECs sensitivity to change as it relates to social ills, is considered moderate across all districts traversed by the AOI. However, four districts with a higher burden of GBV and CSW – Hoima, Mubende, Lwengo and Kyotera – have been identified as highly sensitive.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Ranking

The social baseline identified two sensitive VECs related to social determinants to health as shown in Table A11.4-43.

Table A11.4-43 Socially Determined Diseases Related VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
PACs whose members are employed by the project	High (4)	Disposable income increases alcohol, drug use and commercial sex work
PACs where PIIM is expected	High (4)	Decrease in social structure and social cohesion

Key Considerations

A key consideration is:

- PAC households that experience a sudden increase in disposable income may be affected by a loss of cohesion through increased use of substances such as alcohol and drugs, and sex workers.

A11.4.11.10 Baseline Condition of Social Cultural Health Practices

Health-Seeking Behaviour

The way people choose a health provider and at which stage of an illness they seek consultation depends on a variety of factors. Culture and spirituality may influence health-seeking behaviour (HSB) as well as the type and perceived severity of an illness.

National Level

The 2015–2016 Uganda health sector performance report shows that 50% of patients seek care from a public health facility when they first fall ill or suffer an injury. This is a considerable increase from 33% in 2004. The reported use of home remedies or self-medication has decreased from 10% in 2004 to the current 0.6% and traditional medicine (TM), as a first source of treatment, has dropped from 1.1% in 2004 to 0.5% in 2015–2016 (MOH 2017a).

District and PAC Level

Baseline findings show that most of the population in the districts traversed by the AOI make use of formal health care services. However, self-medication and the use of TM can negatively affect outcomes by delaying treatment.

Traditional Medicine

National Level

TM is a routed practice in the districts traversed by the AOI and across Uganda. In contradiction with the national levels, nearly 60% of the population use TM for their primary health care, particularly herbal medicine. TM is used in the treatment of malaria, TB, HIV and AIDS, mental disorders and many other illnesses in Uganda (Tabuti et al. 2012; Lamorde et al. 2010).

District and PAC Level

FGDs show that TM is most often used in the treatment of pregnancy complications, infertility, epilepsy, ulcers, fever, skin diseases, cough, diarrhoea, stomach ache, malaria and head ache, and those who have been 'bewitched'. Traditional beliefs and practices, poor awareness of health concerns and challenges in the health care system (e.g., accessibility, affordability and availability of services) were reported as key contributing factors.

Trend in Condition and Sensitivity to Change

The following trends were identified:

- HSB has improved and most of the population in the districts traversed by the AOI now use the formal health care system as well as TM. This was attributed to health education and system strengthening, including provision of outreach services.
- There is an increasing demand for services and high utilisation rates for maternal and child health services.
- Use of TM has generally decreased as people embrace modern health care.

Ecosystem Services Provided

Social cultural health practices are linked to the use of wild plants, which provides the following provisioning ecosystem services:

- ingredients for treatment of common illnesses (TM).

Sensitivity Ranking

The social baseline identified a sensitive VEC with regards to social cultural health practices, presented in Table A11.4-44.

Table A11.4-44 Social Cultural Health Practice Related VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Ranking
PACs where PIIM is anticipated	Moderate (3)	Higher burden on health systems may lead to adverse HSB

Key Considerations

A key consideration is:

- PIIM may lead to pressure on healthcare services.

A11.4.12 Community Safety, Security and Welfare

A11.4.12.1 Baseline Condition of Community Safety, Security and Welfare

This section describes the safety, security and welfare context of the PACs.

Community Wellbeing

To understand a PAC's sense of wellbeing and sensitivity to change, it is important to understand how they perceive key events in their communal history. In FGDs PACs identified the following important historical events:

- New infrastructure and services are regarded as substantial positive events. PACs recalled the dates of construction of HCs, dams, tarmac roads, boreholes and vaccination campaigns.
- Health epidemics were remembered as key negative events. These included measles outbreaks, and the onset of HIV and AIDS and animal diseases such as foot and mouth disease.
- Major natural disasters, earthquakes and droughts also form a substantial part of communal history.

The PAC profiles in Attachment A11.2 provide additional information on PACs historical timelines.

Community Aspirations

FGDs with PAC leaders and with women's groups shared that the most often expressed aspirations were related to infrastructure and service improvement (e.g., schools, health facilities, roads and electricity; see Figure A11.4-84). This is in line with the data obtained for the historical events. Employment opportunities were not raised as often as other aspirations. This contrasts with the stakeholder engagement undertaken during the scoping phase during which employment aspirations were consistently raised as this was the first time some stakeholders had been provided information about the project.

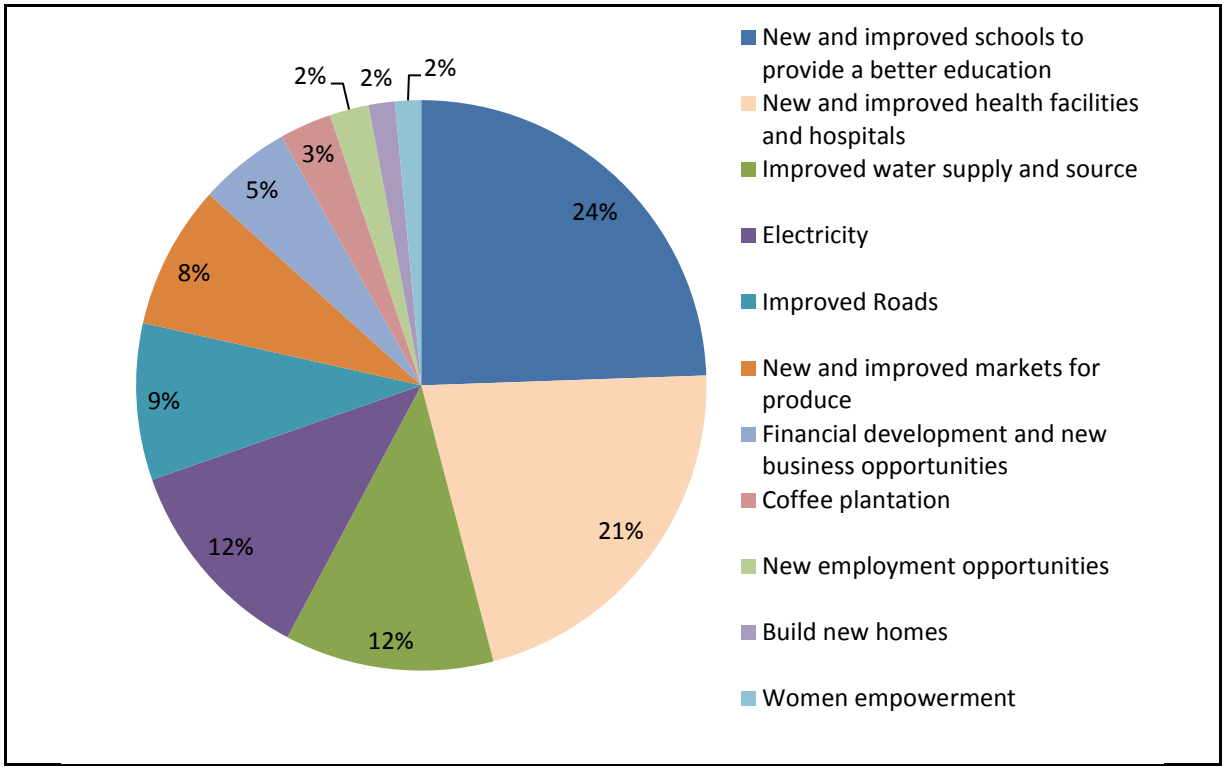


Figure A11.4-84 Potentially Affected Communities' Aspirations

SOURCE: FGDs with community leaders and women

Community Cohesion and Social Support

Field survey data indicated a strong social fabric for all PACs with well-developed social networks and a sense of place.

In PAC households, bonds and commitment to support one another are strong. Households generally work as a unit on agricultural plots and ties to ancestral land are strong and traditional inheritance protocols for land allocation to family members maintain their connection. Unspoken kinship allegiances extend to patrilineal clans and to tribal affiliations.

Maintaining the traditional relationship with land is becoming increasingly difficult as plots are becoming too small to remain viable, forcing younger generations to migrate to urban areas. In addition, over recent years, mutual support in PACs appears to be decreasing, possibly as a result of migrations, emerging use of technology and intermarriage.

Familial ties with ancestral lands are particularly deemed important in terms of burial ceremonies and rituals, which are deeply rooted in a diversity of numerous cultural beliefs, traditions and religions. With few public cemeteries, families of the deceased bury their dead in locations available to the household. This commonly is within the curtilage of the family's land holdings. Deemed sacred, graves are often marked with rocks or simply go unmarked. Often generations are buried at grave sites.

Little outside assistance from Government initiatives or NGOs was observed in the sample PACs. However, NGOs such as World Vision, the Rakai Health Sciences Programme, Hoima Catholic Development Organisation, Action AID and the World Bank were mentioned during KIIs with CDOs and FGDs in PACs. The Rakai DDP (2015) acknowledges that NGOs are working within the district on natural resource management projects.

Community based organisations (CBOs) were prominent in all PACs. Savings and credit cooperative organisations, commonly referred to as 'savings circles', are prevalent CBOs. These self-help groups are owned, governed and managed by their members, and set up to provide loans and savings. Members agree to save money together and offer loans up to an agreed amount within the circle. Loans generally do not exceed the shares owned by the individual and are given at reasonable rates of interest (2.5–5.0% was quoted by members). Criteria for joining one of the 108 savings circles recorded in the sample PACs include: being a village resident of Ugandan nationality, signing the constitution and agreeing to contribute an agreed sum of money on a weekly or monthly basis.

The existence and functioning of the savings and credit cooperative organisations in PACs shows the social capital of communities, and trust and mutual reciprocity. Savings circles generally have 15–50 members. Money is used for various purposes, particularly for crop growing and the purchasing of agricultural inputs (pesticides, seeds, feed and veterinary drugs), livestock and animal feeds. Other uses cited were setting up a business, paying school fees, paying for a funeral and buying land. The main challenge reported was that members wanted to borrow

more than was available. Drought conditions, leading to low yields and loss of livestock, regularly caused members to forfeit their repayments.

Safety and Security

The Uganda Police Force (UPF), established under Article 212 of the 1995 Constitution of the Republic of Uganda, is headed by the Inspector General of Police who provides oversight to regional and district commanders.

At community level, the rule of law is enforced by community leaders and by police officers at police stations or police posts (the smallest unit). However, not all rural communities have a police station. There is a major police station at Hoima municipality (KP22).

In addition, the national approach to community policing includes the establishment of community 'crime preventers' who are individuals proposed by local communities and their leaders to be trained in policing and to assist the police force in maintaining law and order in the community.

There are 21 directorates charged with the management of specific aspects of policing via units within the UPF, engaging 37,400 police officers and 396 civilian personnel. Of relevance are the:

- Directorate of Traffic and Road Safety, established to enforce traffic and road safety laws
- Directorate of Police Fire Prevention and Rescue Services, which is charged with fire prevention and fire extinguishing, and active participation in national disaster management activities with other strategic stakeholders. However, there is no firefighting infrastructure in the sample PACs traversed by the AOI, except for Hoima.
- Directorate of Criminal Investigation and Crime Intelligence (CID), which ensures effective detection, investigation and prevention of crime
- Directorate of Counter Terrorism, which is charged with investigating and responding to terrorist incidents in the country
- Oil and Gas Protection Directorate. Recognising the importance of the oil and gas industry in Uganda, the Oil and Gas Police Protection Directorate was established and charged to maintain security of the routes, wells and any oil related installations in the Albertine Graben area to bolster security (UPF 2017, Internet site; Oil in Uganda 2013, Internet Site).

Crime

The Uganda Annual Crime Report (2014) indicated that serious crime rates have increased by 13% since 2013. The most common serious crime was reported to be defilement, accounting for more than half of all serious crimes in 2014 (GOU 2014). The total number of cases that were investigated in 2014 represented an increase of 25.8%, while reported cases of rape increased by 5.4% since 2013.

The Overseas Security Advisory Council (OSAC) (2017) reports that organised crime syndicates operate on a small scale, undertaking robberies or roadside assaults, stealing valuables and attacking individuals. Gang crime is on the increase with groups such as the Kifeesi gang operating in Kampala and in other urban towns and trading centres. Gangs are popular among disengaged youth, and

the number of the members is increasing despite Government arrests and crack downs on leaders and members.

National Security

A past insurgent war in the north of the country with the Lord's Resistance Army (LRA) which started in the mid-1990s and concluded over 12 years ago, it operates now in Central African Republic. Isolated instances of internal conflict have arisen in recent years, e.g., violent clashes were reported in western Uganda in Bundibugyo and Kasese districts in 2014 and 2016 (FCO 2018, Internet site).

The Uganda National Action Plan (NAP) for Arms Management was launched in 2004 and its implementation is ongoing. Most illicit small arms in the region are old stocks that are passed from one conflict area to another. Established trade in small arms occurs along the gun corridor: Somalia, Southern Sudan, the DRC and Uganda. The emergence of modern terrorism (Al-queda and Al-shabab), and pirates in the Indian Ocean, have continued to support the proliferation and circulation of illegal small arms. The threat of Al-shabab retaliatory attacks to Uganda People's Defence Forces' operations in Somalia is still the biggest public security threat in Uganda as witnessed by the suicide bombings in Kampala in 2010.

In Uganda, the activities of the Allied Defence Force have continued to escalate the small arms problem.

OSAC recognises that Uganda's extensive and porous borders, often too remote to police, enable a consistent flow of illicit trade and immigration (2017). Rebel groups operate freely in eastern DRC, which poses as a potential risk along Uganda's western border (OSAC 2017, Internet site).

While there is relative stability and prosperity in the country, Uganda still has some underlying conditions that could result in internal conflict such as grievances over land and oil, and ethnic divisions (USAID 2018, Internet site).

The importance people attach to ethnic groups, area of origin, religious affiliations and cultural institutions often predominate over national identity. Youth particularly fall within this category (International Alert 2014).

Over the past 30 years, the GOU has instated a decentralised governance structure. This has assisted in reducing national-level conflict. However, it has incited local-level conflict through highly competitive races for district leadership positions and altering relations between local ethnic groups (Green 2015).

Road Safety

Despite the high rate of road traffic incidents in Uganda (see traffic baseline report Appendix A12), PACs did not perceive traffic accidents as a high risk. The exception was for those PACs along or near to the highway which stretches from the Tanzania border to Kyotera and onwards to Masaka (PACs KP286–296). During stakeholder engagement and baseline data collection, the dangers and fatalities associated with this highway were mentioned regularly, particularly at Lukoma (KP287.5), Kabonera (KP284.5) and Kyotera town (KP255).

Conflict

Even though communities are generally peaceful, conflicts were reported in KIIs and FGDs. Conflicts or disputes mentioned are related to:

- land concerns (trespassing, destruction of crops by livestock, land grabbing and boundary disputes)
- criminal acts (theft, defilement, rape and GBV)
- rumour mongering
- access to water resources
- unsettled debts.

The most often mentioned disputes related to theft and land. The latter is described in Section A11.4.8, Land and Property. Land conflicts are generally resolved with the assistance of the community leaders (see Section A11.4.1 on governance and administration). In the case of theft, defilement and rape, the police would occasionally be called. However, PAC members said that community leaders would initially endeavour to resolve any dispute or conflict.

Household domestic quarrels were mentioned often and reportedly resolved through family meetings supported by clan members. If the matter cannot be resolved, the village chairperson or another village leader relevant to the matter will get involved. Where resolution could not be reached at this level, the subcounty community development officer may be called upon to mediate, but this was not a frequent occurrence.

Gender

FGDs with women and village leaders in the sample PACs revealed the task and role divisions between men and women. Only cooking and cleaning within the household are the sole responsibility of women. All other tasks are shared by women and men. Women have the largest responsibility for child upbringing, collecting water, wood and wild plants and fruit, cultivating land, household budgeting, buying goods and sale of produce. Men mostly undertake tasks related to house construction, hunting and fishing. Males mostly inherit and own land. Women are mostly regarded as the protectors of the household. The above shows that women are important members of the household and wider community. They are highly entrepreneurial and their substantial contribution to the informal economy through labour (much of it unpaid) cannot be underestimated.

However, women are considered vulnerable in many ways:

- GBV against women is common in the districts traversed by the AOI. Substance abuse, especially alcohol, was a major contributing factor.
- Women are also vulnerable in marriage. This vulnerability relates to the noncontractual nature of some types of marriage and the resulting inability to claim spousal rights in the event of mistreatment, divorce or abandonment.

In many regions, a cultural ideal for men is to marry once they have finished school and have a job, and for girls to marry at a young age. By 18 years old, 78% of girls have married and 10% are married before the age of 15. The government launched the African Union Campaign to End Child Marriage and its National Strategy on Ending Child Marriage and Teenage Pregnancy (2014, 2015–2019 and 2020),

which was developed in partnership with civil society organisations, including Girls Not Brides members in Uganda, and UN agencies. Led by the MGLSD, the strategy contains a multisectoral monitoring and evaluation framework, and an indicative budget for the implementation of the strategy.

The gender structure of land rights in Uganda varies across the country, but in general it is highly unequal, with women's rights restricted, while men are more likely to have ownership and control rights. This gender unequal tenure pattern reflects the system of patrilineal inheritance and patrilocal residence patterns that characterise much of Ugandan tenure relations. These systems imply that women's rights to land and property are less secure than men's. Particularly for rural women, this inequality of access to the key productive asset is a fundamental determinant of poverty and social disadvantage.

The low quality and accessibility of policing, health and education facilities in very poor areas exacerbate women's situation. The lack of resources of the police service acts as a constraint on women trying to extricate themselves from abusive situations.

The MGLSD is responsible for the development and implementation of national policies that work toward achieving gender equality in the public and private sector.

The Government is signatory to international, regional and has nation laws and policies that advance participation of women in public leadership. The development of a National Gender Policy in 1997, and its revision in 2007, confirms the GOU's commitment to take actions that will bring about more equal gender relations. During the 2017 parliamentary elections, 11% of elected MPs were female.

Female MPs have formed the Uganda Women Parliamentary Association as a forum to discuss, share experience and support activities that facilitate women's participation and leadership with the aim of ensuring gender responsive legislation processes. The women's movement has used the Uganda Women Parliamentary Association as a channel for advocacy at parliamentary level, as an opportunity to focus on matters as women, and a window to work with women's organisation to influence laws and policies. The Parliament of Uganda, under Speaker Rebecca Kadaga, has been commended for the actions taken to promote women and girls' rights in Uganda amid the challenges brought about by a reluctant Executive.

Other Vulnerable Groups

PAC members identified the following potential vulnerable groups.

Widow-Headed Households

Several widow-headed households were encountered in PACs. It was reported that widows find it difficult to meet basic needs to maintain a household. Elderly widows were said to be subject to theft of property and land from relatives and often found it difficult to obtain enough food because they could not tend to crops.

Children

Children are the single largest group (59%) of Ugandans living in absolute poverty. Children were deemed vulnerable, those from poor households. Poor children were reported to be less likely to attend school.

AIDS orphans kept by guardians were regarded as particularly vulnerable as they have limited opportunity to attend school or access health care and may be discriminated against compared to the guardians' own children.

Children were also vulnerable to child labour, in livestock-rearing households where it is traditionally seen as a child's role to tend to livestock.

Orphans were regarded as especially vulnerable, facing challenges such as lack of education and parental guidance, as stated during FGDs in Kakumiro district.

Elderly

The elderly were deemed vulnerable as they are unable to work the land and are depended on remittances sent by family members.

Elderly women who are disabled suffer discrimination, poverty, stigma and isolation, gender-based violence and face obstacles in accessing justice. Their economic situation is exacerbated by the burden of looking after orphans and other vulnerable children left by youth who died during the HIV and AIDS pandemic.

Youth

Youth were reported to be vulnerable, as they had limited access to productive assets (such as land or capital) and many lacked vocational skills. With few employment opportunities in rural PACs it was common for youth to turn to alcohol and substance abuse.

People Living with Disabilities

People living with disabilities, including those living with mental, hearing and sight impairment, were said to be vulnerable. This was attributed to lack of ability to work the land effectively and reliance on other people for financial and food security and discrimination.

People Living with Illnesses

People with illnesses such as epilepsy, TB, and HIV and AIDS were classified as vulnerable as they were unable to work their land and relied on other people for financial and food security.

Land Users Who Have No Land Title

Land users who have no land title, no customary status or who have not yet acquired an 'interest in the land' were deemed vulnerable. This is reported under Section A11.4.8 land and property. In addition, PACs stressed that with inheritance protocols and the subdivision of land, it is increasingly difficult for households to survive off small plots of land. This has made more people dependent on natural resources to supplement their food consumption and to gain a living (see Section A11.4.6.4 natural resource use).

Ethnicities

The main ethnic groups in the AOI are discussed in Section A11.4.2. During baseline data collection it was found that, while some villages featured predominantly one ethnic group, many were composed of a diverse mix of

ethnicities. This was reported to be as a result of mixed marriages across different ethnicities, and a relatively mobile population. It was repeatedly stressed during FGDs and KIIs that ethnicity is not a defining feature of vulnerability but that other factors, such as being landless (see Section A11.4.8), are more likely to make a household more vulnerable.

Human Rights

The following human rights laws apply to community safety, security and welfare:

- Universal Declaration of Human Rights, article 3; International Covenant on Civil and Political Rights, article 6; African Charter on Human and Peoples' Rights, article 4.
- Universal Declaration of Human Rights, article 3; International Covenant on Civil and Political Rights, article 9; African Charter on Human and Peoples' Rights, article 6.
- Universal Declaration on Human Rights, article 25; International Covenant on Economic, Social and Cultural Rights, article 11; African Charter on Human and Peoples' Rights, article 21.
- International Covenant on Civil and Political Rights, article 7; African Charter on Human and Peoples' Rights, article 5.
- International Covenant on Economic, Social and Cultural Rights, article 12; African Charter on Human and Peoples' Rights, article 16. The right to health is an international human rights law standard in itself and is also a component of the right to an adequate standard of living: Universal Declaration of Human Rights, article 25.
- Universal Declaration on Human Rights, articles 1, 2 and 23(2); International Covenant on Civil and Political Rights, articles 2 and 3; International Covenant on Economic. Social and Cultural Rights, articles 2 and 3; ILO Convention 111 on Discrimination (Employment and Occupation); Convention on the Elimination of All Forms of Discrimination Against Women, UN Women's Empowerment Principles (2010); African Charter on Human and Peoples' Rights, articles 2, 3, 15 and 18; Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa.
- IFC Performance Standards on Social and Environmental Sustainability, Performance Standard # 4 Community Health, Safety and Security, para 1, Objectives, Requirement 5 (Community Health and Safety), Requirement 6 (Infrastructure and Equipment Design and Safety), Requirement 7 (Hazardous Materials Management and Safety); OECD Guidelines on Multinational Enterprises, Chapter II General Policies, Recommendations 2, 10, 11 and 12; Chapter IV Human Rights; Chapter VI Environment.
- IFC Performance Standards on Social and Environmental Sustainability, Performance Standard # 1 Emergency Preparedness and Response, Objectives, Requirements 20–21 (Emergency Preparedness and Response).
- IFC Performance Standards on Social and Environmental Sustainability, Performance Standard # 4 Community Health, Safety and Security, Requirements 12–14 (Security Personnel).
- African Charter on Human and Peoples' Rights, article 24

Trend in Condition and Sensitivity to Change

The following trends were observed:

- Communities consisting of mixed ethnicities and religions generally live in harmony. However, increasing migration and arrival of outsiders in PACs threatens this equilibrium. With improvements in infrastructure and increasing migration, communities will diversify.
- Traditions are gradually deceasing in prevalence. The Government is promoting traditions through the reestablishment of kingdoms, encouraging people's valuation of cultural heritage.
- Savings circles are popular in rural PACs in the absence of banks and borrowing facilities. With improved infrastructure, micro-credit borrowing may be more accessible, thus the number savings circles, that also foster social cohesion and thus wellbeing, may reduce.
- Despite Government policies and actions, gender inequality prevails in all aspects of life for women and girls, which continues to stymie the females in society.
- Despite government efforts to combat women's discrimination, women still have a precarious legal status, lack political power, suffer from 'overburden' of unpaid tasks and chores, and experience high levels of sexual violence.

Ecosystem Services Provided

This VEC does not provide ecosystem services.

Sensitivity Rating

The social baseline study has identified sensitive VECs in relation to community safety, security and welfare. These are listed in Table A11.4-45.

Table A11.4-45 Community Safety, Security and Welfare VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Women	Very high (5)	Cultural attitudes toward women and their role within the household hinder many females in PACs. Disadvantaged through a lack of education and with limited access to land, and support mechanisms such as access to credit facilities and agricultural inputs, women are deemed particularly sensitive to change.
Widow headed households	Very high (5)	Widows are challenged to meet basic needs of the household in terms of food security, shelter, welfare and ability to pay for schooling and health care. Their situation is compounded by the gender aspect. Elderly widows reported as being subject to theft of property and land.

Table A11.4-45 Community Safety, Security and Welfare VECs and Sensitivity Ranking

VEC	Sensitivity Ranking	Rationale for Rating
Children (particularly in poor households. AIDS orphans, and boys from cattle keeping and plantation agriculture communities)	Very high (5)	As minors in society children are particularly vulnerable. Those children from poor households will be less likely to attend school. They are more likely to be relied on to perform household tasks and generate income, exposing them to child labour which prevents them from accessing school.
Elderly (men and women)	Very high (5)	The elderly find it difficult to meet basic needs and afford health care. Unable to work the land, they depend on family to provide support and remittances, and exchange what little they own for food.
Youth	Very high (5)	Young people are particularly sensitive to change as they have limited access to productive assets (such as land or capital), they lack education and vocational skills and their situation is compounded by a lack of employment opportunities.
Disabled	Very high (5)	Disabled people find it difficult to meet basic needs and afford health care. Unable to work their land, they depend on family to provide support and remittances, and exchange what little they own for food.
People living with illnesses	Very high (5)	People with illnesses (e.g., epilepsy, TB, HIV and AIDS) are unable to work their land and rely on other people for financial and food security.
Land users without land titles	Very high (5)	Land users who have no land title as, without formal acknowledgement of land ownership, they will not be eligible for compensation, only for crops grown.

A11.4.12.2 Key Considerations

The following are key considerations:

- There are effective established mechanisms for conflict resolution and support groups at village level; however, lack of land and migrations, emerging use of technology and intermarriage are reducing their effectiveness.
- Although PACs are generally peaceful, conflicts arise as a result of changing demographics and decentralisation, underlining the requirement for effective stakeholder engagement.
- There are vulnerable groups which will need special considerations.

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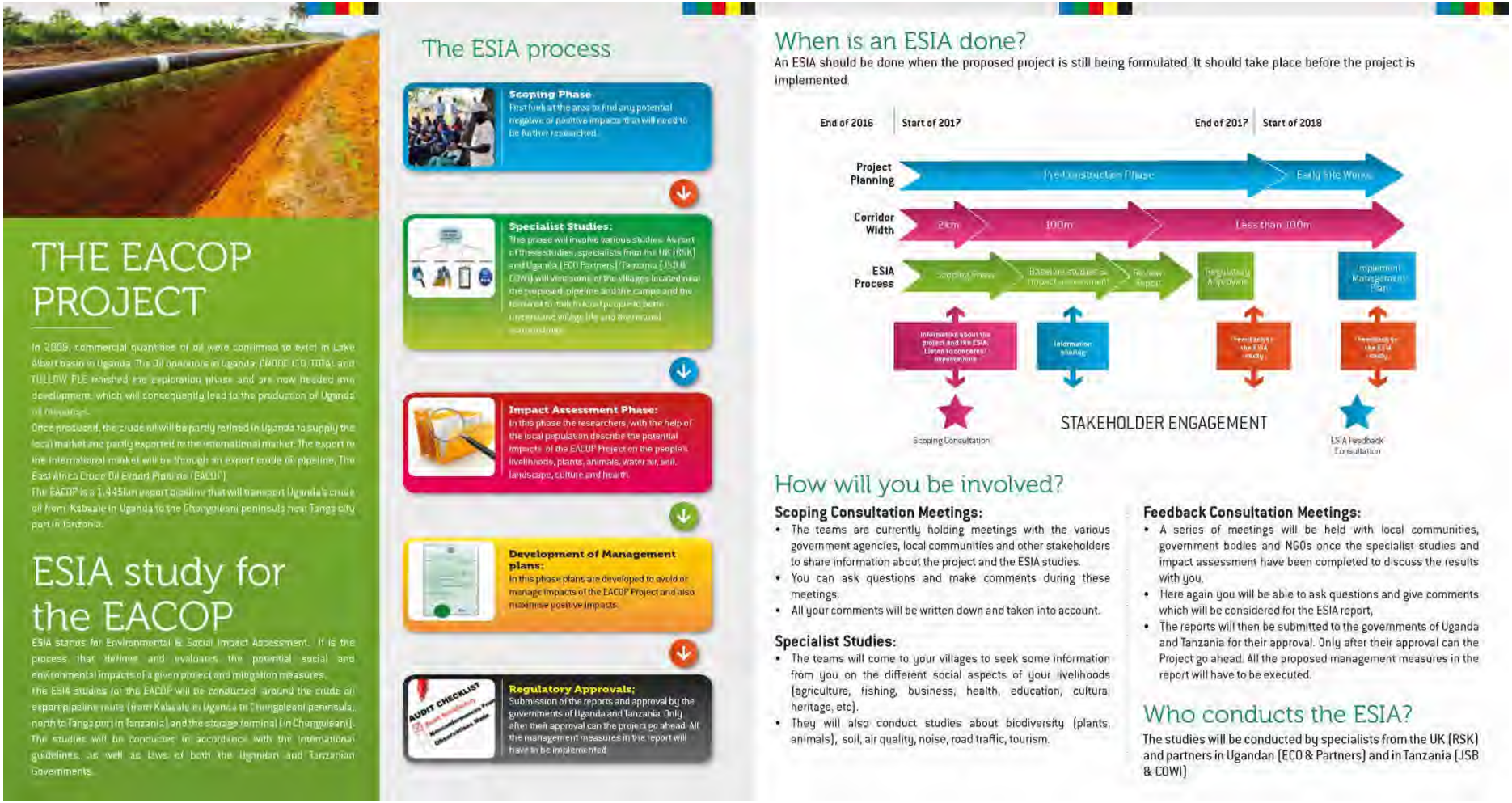
ATTACHMENT A11.1 BID DOCUMENTS


THE EACOP PROJECT
In 2006, commercial quantities of oil were confirmed to exist in Lake Albert basin in Uganda. The Oil operators in Uganda; CNOOC LTD, TOTAL and TULLOW PLC finished the exploration phase and are now headed into development, which will consequently lead to the production of Uganda's oil resources.
Once produced, the crude oil will be partly refined in Uganda to supply the local market and partly exported to the international market. The export to the international market will be through an export crude oil pipeline, The East Africa Crude Oil Export Pipeline (EACOP).
The EACOP is a 1,445km export pipeline that will transport Uganda's crude oil from Kabaale in Uganda to the Chongoleani peninsula near Tanga city port in Tanzania.
ESIA study for the EACOP
ESIA stands for Environmental & Social Impact Assessment. It is the process that defines and evaluates the potential social and environmental impacts of a given project and mitigation measures.
The ESIA studies for the EACOP will be conducted around the crude oil export pipeline route (from Kabaale in Uganda to Chongoleani peninsula, north to Tanga port in Tanzania) and the storage terminal (in Chongoleani).
The studies will be conducted in accordance with the international guidelines, as well as laws of both the Ugandan and Tanzanian Governments.
The ESIA process
Scoping Phase
First look at the area to find any potential negative or positive impacts that will need to be further researched.
Specialist Studies:
This phase will involve various studies. As part of these studies, specialists from the UK (RSK) and Uganda (ECO Partners) (Tanzania (JSB & COWI) will visit some of the villages located near the proposed pipeline and the camps and the technical to talk to local people to better understand village life and the natural surroundings.
Impact Assessment Phase:
In this phase the researchers, with the help of the local population describe the potential impacts of the EACOP Project on the people's livelihoods, plants, animals, water, air, soil, landscape, culture and health.
Development of Management plans:
In this phase plans are developed to avoid or manage impacts of the EACOP Project and also maximise positive impacts.
AUDIT CHECKLIST
Regulatory Approvals:
Submission of the reports and approval by the governments of Uganda and Tanzania. Only after their approval can the project go ahead. All the management measures in the report will have to be implemented.
When is an ESIA done?
An ESIA should be done when the proposed project is still being formulated. It should take place before the project is implemented.
End of 2016
Start of 2017
End of 2017
Start of 2018
Project Planning
Pre-Construction Phase
Early Site Works
Corridor Width
2km
100m
Less than 100m
ESIA Process
Scoping Phase
Baseline studies & impact assessment
Review report
Regulatory Approvals
Implement Management Plan
Information about the project and the ESIA. Listen to concerns/ experiences
Information sharing
Feedback on the ESIA study
Feedback on the ESIA study
STAKEHOLDER ENGAGEMENT
Scoping Consultation
ESIA Feedback Consultation
How will you be involved?
Scoping Consultation Meetings:
• The teams are currently holding meetings with the various government agencies, local communities and other stakeholders to share information about the project and the ESIA studies.
• You can ask questions and make comments during these meetings.
• All your comments will be written down and taken into account.
Specialist Studies:
• The teams will come to your villages to seek some information from you on the different social aspects of your livelihoods (agriculture, fishing, business, health, education, cultural heritage, etc).
• They will also conduct studies about biodiversity (plants, animals), soil, air quality, noise, road traffic, tourism.
Feedback Consultation Meetings:
• A series of meetings will be held with local communities, government bodies and NGOs once the specialist studies and impact assessment have been completed to discuss the results with you.
• Here again you will be able to ask questions and give comments which will be considered for the ESIA report,
• The reports will then be submitted to the governments of Uganda and Tanzania for their approval. Only after their approval can the Project go ahead. All the proposed management measures in the report will have to be executed.
Who conducts the ESIA?
The studies will be conducted by specialists from the UK (RSK) and partners in Ugandan (ECO & Partners) and in Tanzania (JSB & COWI)

Social and Environmental Studies to be conducted
PHYSICAL ENVIRONMENT
Surface Water
Underground Water
Soil
Air Quality
Noise
Landscape
SOCIO-ECONOMIC ENVIRONMENT
Socio-Economic
Community and Livestock Health
Traffic
Education
Culture and Archaeology
BIODIVERSITY
Protected Areas and Sensitive Habitats
Plants and Animals
Fish and Fisheries
The EACOP route from Kabaale (Uganda) to Chongoleani Tanga (Tanzania)
UNOC
TOTAL
TULLOW OIL
For more information please contact:
EACOP PROJECT IN UGANDA
TEAM - Total East Africa Midstream,
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P.O.Box 34867, Kampala – Uganda
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Email: EACOP.info@total.com
EACOP PROJECT IN TANZANIA
TEAM - Total East Africa Midstream,
369 Toure Drive, Ground Floor, Kilwa House, Oysterbay
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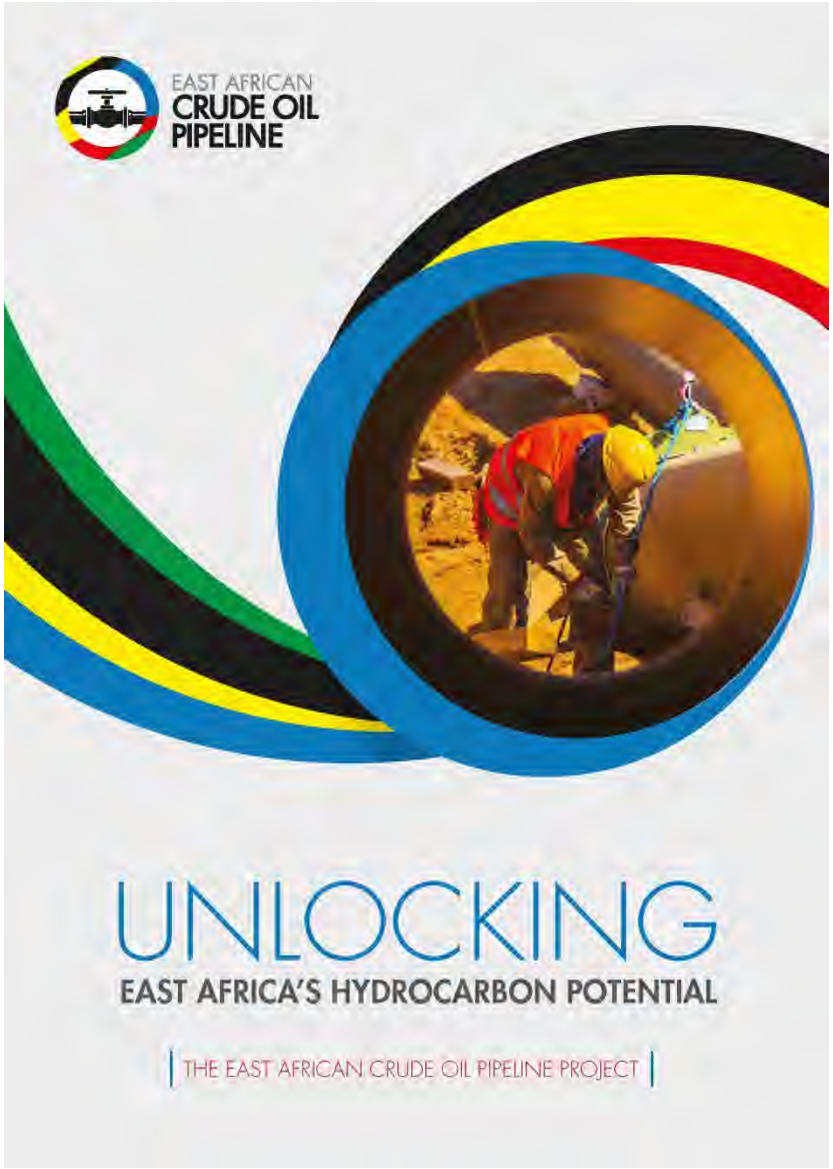
EAST AFRICAN CRUDE OIL PIPELINE
Environmental and Social Impact Study (ESIA)
The longest electrically heated pipeline in the world.


EAST AFRICAN
CRUDE OIL
PIPELINE
UNLOCKING
EAST AFRICA'S HYDROCARBON POTENTIAL
THE EAST AFRICAN CRUDE OIL PIPELINE PROJECT

THE EAST AFRICAN CRUDE OIL PIPELINE (EACOP)

In 2006, commercial quantities of oil were confirmed to exist in Lake Albert basin in Uganda. The Oil companies in Uganda; CNOOC LTD, TOTAL and TULLOW PLC finished the exploration phase and are now headed into development, which will consequently lead to the production of Uganda oil resources.

Once produced, the crude oil will be partly refined in Uganda to supply the local market and partly exported to the international market. The export to the international market will be through an export crude oil pipeline; The East Africa Crude Oil Export Pipeline (EACOP). This pipeline will be constructed and operated through a Pipeline Company with shareholding from the Uganda National Oil Company, the Tanzania Petroleum Development Corporation and the three oil companies, CNOOC, TOTAL and TULLOW.

The EACOP Project

The EACOP is a 1,445km crude oil export pipeline that will transport Uganda's crude oil from Kabaale in Uganda to the Chongoleani peninsula near Tanga port in Tanzania.

- The pipeline route was selected by the Government of Uganda as the least cost and most robust route.
- Due to the viscous and waxy nature of Uganda's crude oil, the pipeline will need to be heated along the entire route, making the EACOP the longest electrically heated pipeline in the world.
- The pipeline will be buried to minimize the impact on the environment.
- Some facilities will be above ground and will be designed to ensure minimal environmental and social impact.
- The project will be compliant with the Ugandan and Tanzanian national legislations and international requirements.
- The Marine Export Storage Terminal and the Load-Out Facility will be located north of Tanga port over the Chongoleani peninsula.

EACOP Schedule

1,445km	1.2m	216Kbd	6	2	53

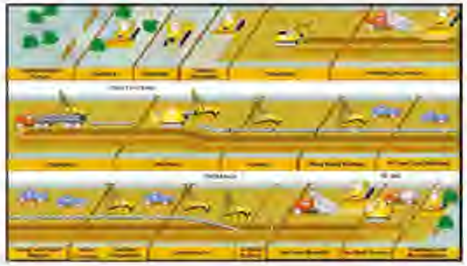
The Construction Phase

Once the Final Investment Decision (FID) is undertaken, the pipeline construction will start and last about 36 months.

The construction will comprise of:

1. Construction of the Pipeline

The construction will be undertaken as shown in the diagram below. Once ready, the pipeline is carefully placed in the pre-dug trench or, in some cases it will require to be bored under waterways or roads by using horizontal drilling.



2. Construction of the Temporary Facilities

Other facilities will be built such as;

- Coating plants & Pipes Storage Yards
- Construction of additional Work space (Fuel, Helipad, Waste)
- Hydro-test dams, access roads, borrow pits

3. Construction of the Marine Terminal and the Jetty

The crude oil, transported by the pipeline will be stored in the Terminal located on Chongoleani in Tanga bay, before being shipped and sold in other countries. Vessels will be thus loaded with the crude oil at a sheltered deep-water site.

Land Access

Land will be required to construct the EACOP and related facilities. This land will be acquired on either a temporary or permanent basis.

Temporary Access to Land

- within an approximately 30m wide right of way for construction.
- for temporary above ground facilities (like construction camps).
- Land required for temporary basis will be leased for approximately 1- 4 years and returned to owners in a fully reinstated condition.

Permanent Access to Land

- Land required on a permanent basis for above ground installations (Pumping Stations, Pressure Reduction Stations and the Marine Storage Terminal) and for the permanent Right of Way will be acquired.
- After construction, EACOP will need land easements along the pipeline corridor with some restrictions in safety zones.

The EACOP project is committed to:

- Compliance with applicable national legislation and international requirements.
- Ensuring that all landowners and users living along the pipeline corridor will be treated with respect and compensated fairly.
- Vulnerable people identified and assisted as necessary.
- Secure agreements with each affected household, deliver compensation and livelihood restoration programs and help households move out of the area (for those who choose in-kind compensation for resettlement), help them move into their new land).

Committed to the Protection of the Environment
The EACOP project will ensure that health, safety, security, social, economic and environment are addressed throughout the planning, construction, and operational phases of pipeline operations.
The pipeline's route has been selected to avoid the most environmentally sensitive areas like national parks and the high population density areas.
Facilities will be carefully located and operated to reduce any potential physical and ecological impacts.
We have developed a biodiversity charter which sets the principles of our work. According to this charter, we carry out all EACOP activities while:
• AVOIDING unnecessary impact to the ecosystem, the biodiversity and the local communities.
• MINIMIZING any unavoidable impact to the ecosystem, the biodiversity and the local communities.
• RESTORING: Rehabilitating the impacted areas and managing their restoration
• OFFSETTING any residual impact seeking a net positive gain.
THE MITIGATION HIERARCHY
AVOID
MINIMISE
RESTORE
OFF SET
Committed to Socio-Economic Development
We consider national content as key for the success of our operations. We will therefore promote national participation by:
• Reinforcing the use of Ugandan and Tanzanian workforce and contractors through training programs and support to local companies
- strengthening of local skills and capacities
- creating direct and indirect employment
- supporting local content and local procurement
• Contributing to human development participating in local development programs (road safety, access to energy, capacity building...)
• Reinforcing infrastructures.
Employment Creation
The pipeline will create short term (2-3 years) employment for both highly skilled professionals, semiskilled and casual labourers. It is expected that casual workers who will be involved in the construction phase of the proposed project will be sourced locally from each district and this will further promote the development of local capacity.
About 10,000 people will be employed during the construction phase.
Committed to Stakeholder Engagement
The EACOP Project is committed to meaningful engagement with all of its stakeholders based on the principles of participation, respect for human rights, non-discrimination, empowerment, transparency and accountability. Stakeholder engagement will therefore be conducted in order to:
• Establish lasting, positive relationships with stakeholders.
• Provide project information to enable stakeholders contribute meaningfully all along the process.
• Work co-operatively with stakeholders to understand their concerns and seek solutions.
• Commit towards the addressing of stakeholder concerns in a fair and effective manner.
• Pro-actively consult in an open based dialogue appropriate for the different stakeholders.
UNOC
TOTAL
TULLOW
EACOP PROJECT IN UGANDA
EACOP PROJECT IN TANZANIA
EAST AFRICAN CRUDE OIL PIPELINE
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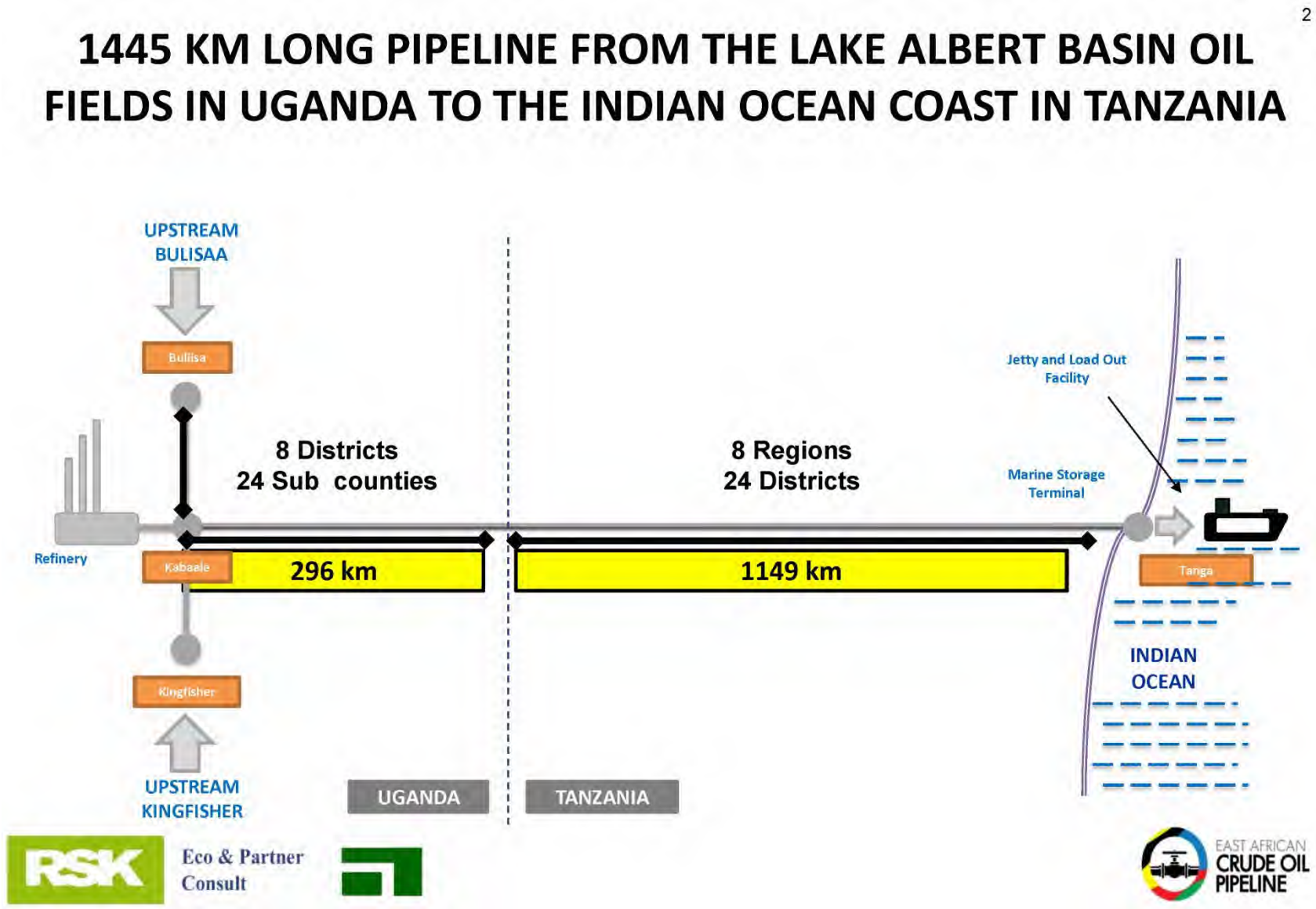
1

PIPELINE CONSTRUCTION

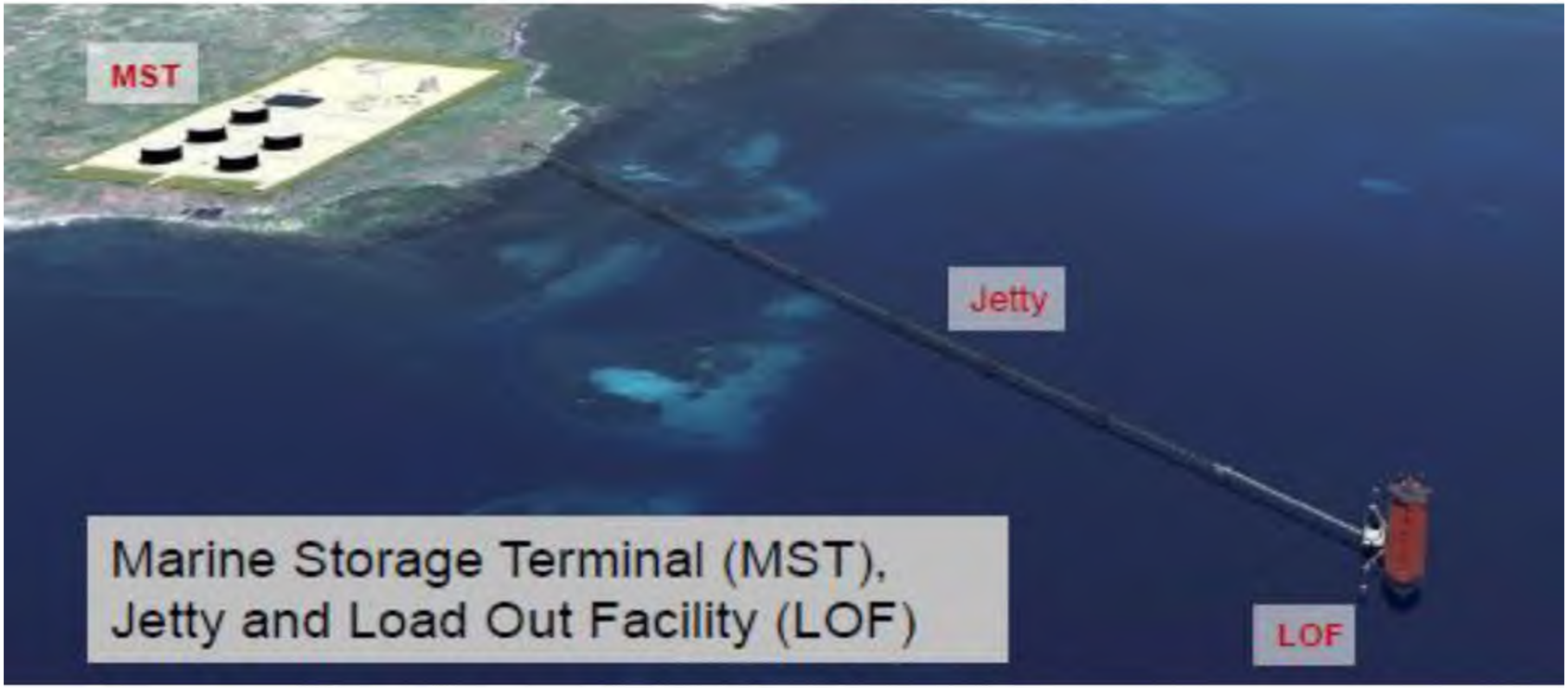
RSK Eco & Partner Consult

EAST AFRICAN CRUDE OIL PIPELINE


2
1445 KM LONG PIPELINE FROM THE LAKE ALBERT BASIN OIL FIELDS IN UGANDA TO THE INDIAN OCEAN COAST IN TANZANIA
UPSTREAM BULISAA
Bullisa
8 Districts
24 Sub counties
8 Regions
24 Districts
Jetty and Load Out Facility
Marine Storage Terminal
Refinery
Kabaale
296 km
1149 km
Tanga
INDIAN OCEAN
Kingfisher
UPSTREAM KINGFISHER
UGANDA
TANZANIA
RSK
Eco & Partner Consult
EAST AFRICAN CRUDE OIL PIPELINE

MARINE STORAGE TERMINAL (MST) AND LOAD-OUT FACILITY (LOF) LOCATED NORTH TO TANGA CITY PORT OVER THE CHONGOLEANI PENINSULA

3

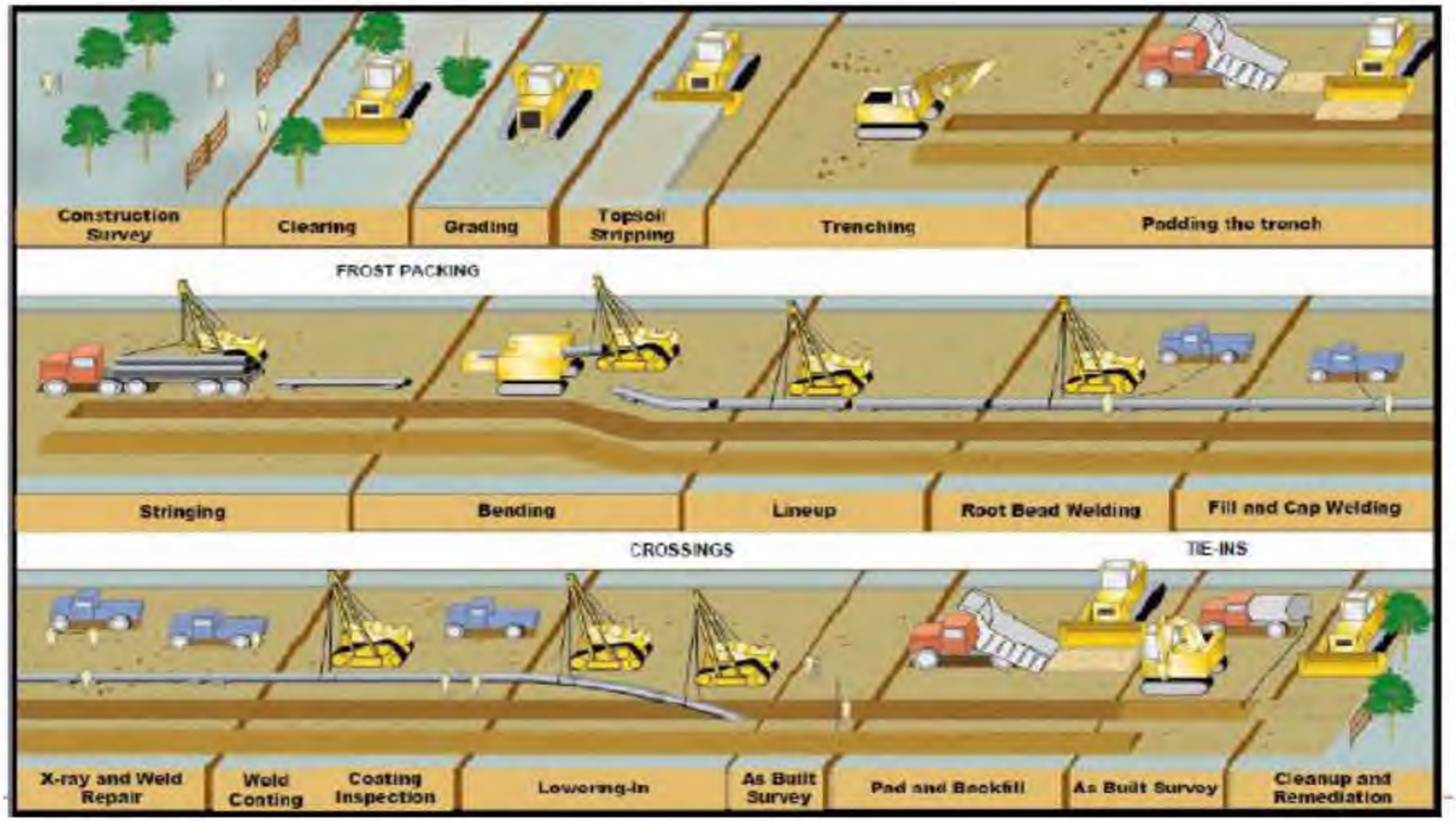


RSK Eco & Partner Consult

EAST AFRICAN CRUDE OIL PIPELINE

4

STAGES OF CONSTRUCTION OF THE PIPELINE

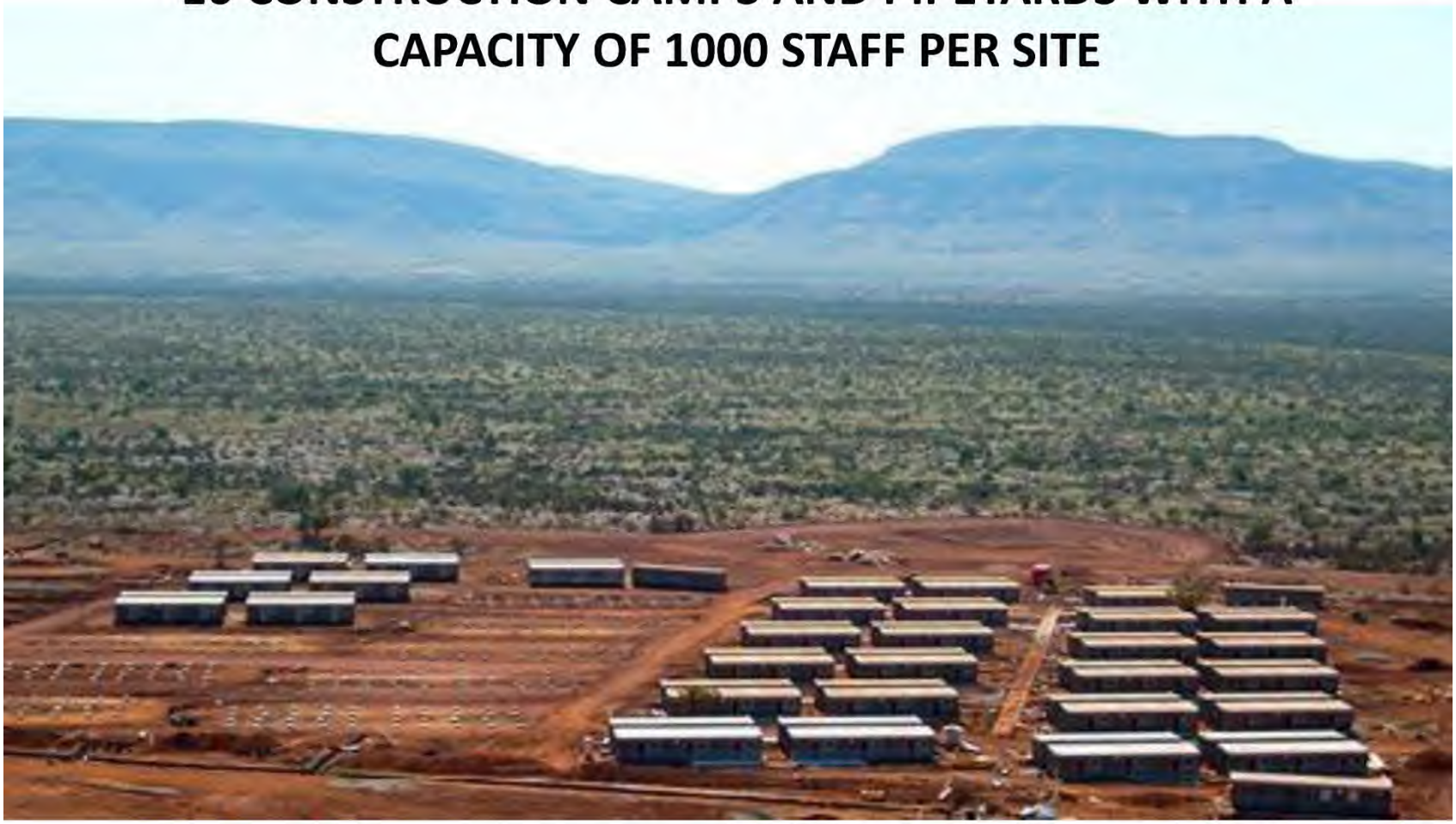


RSK Eco & Partner Consult

EAST AFRICAN CRUDE OIL PIPELINE

5

16 CONSTRUCTION CAMPS AND PIPEYARDS WITH A CAPACITY OF 1000 STAFF PER SITE



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EAST AFRICAN CRUDE OIL PIPELINE

PERMANENT ABOVE GROUND FACILITIES

Block Valve Stations

Pumping Stations

TEMPORARY ABOVE GROUND FACILITIES

Coating Plants

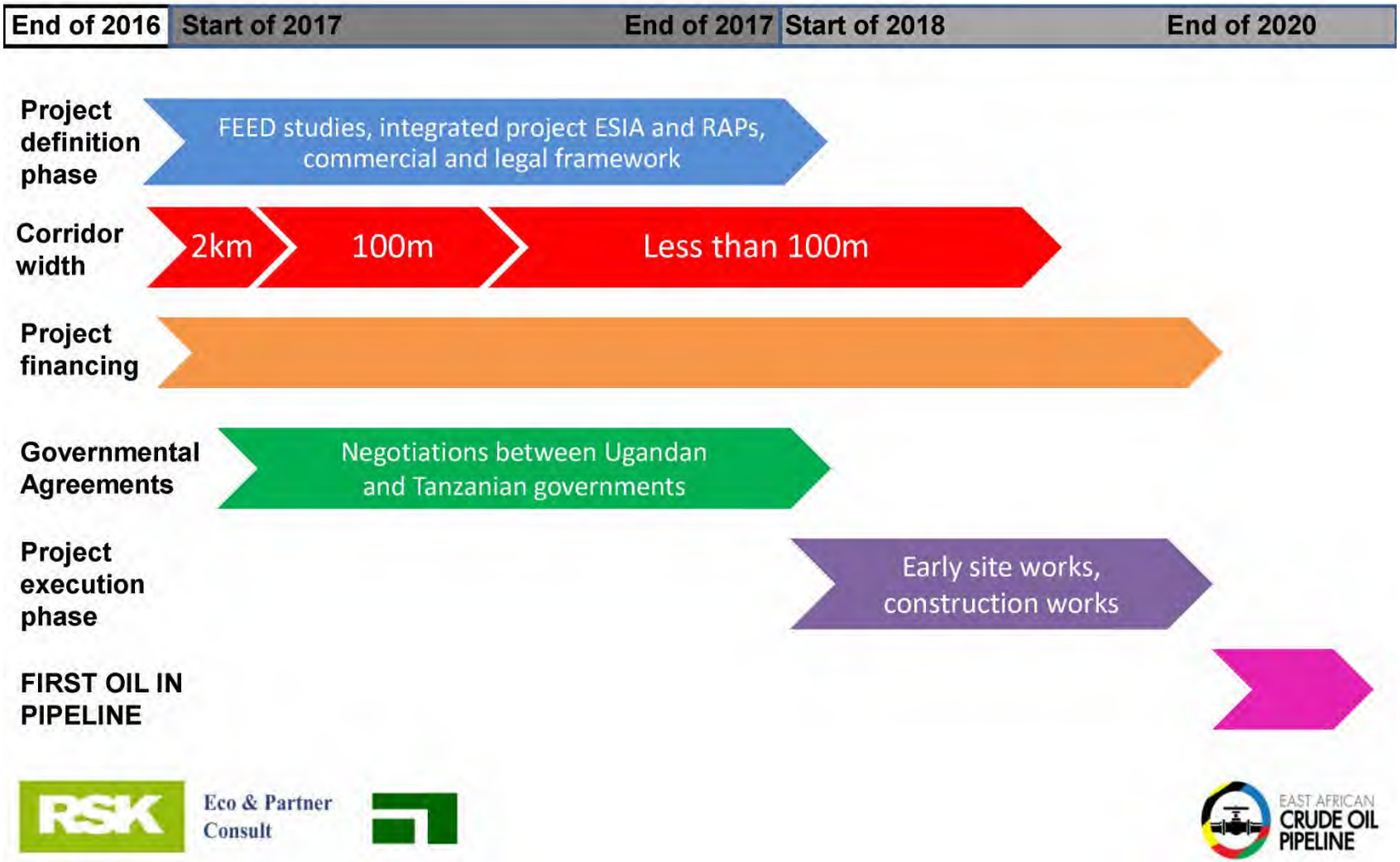
Construction Camps

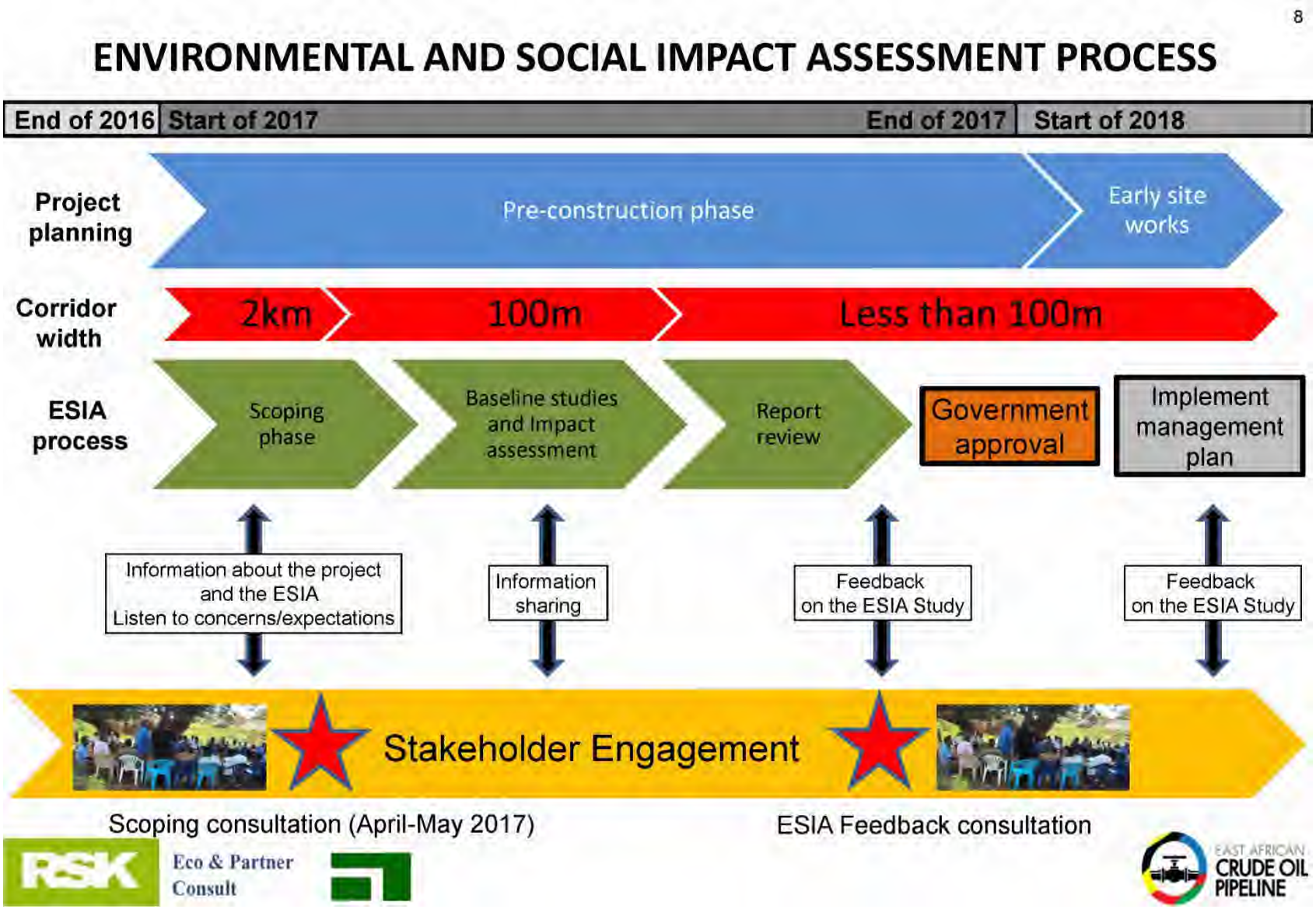
RSK Eco & Partner Consult

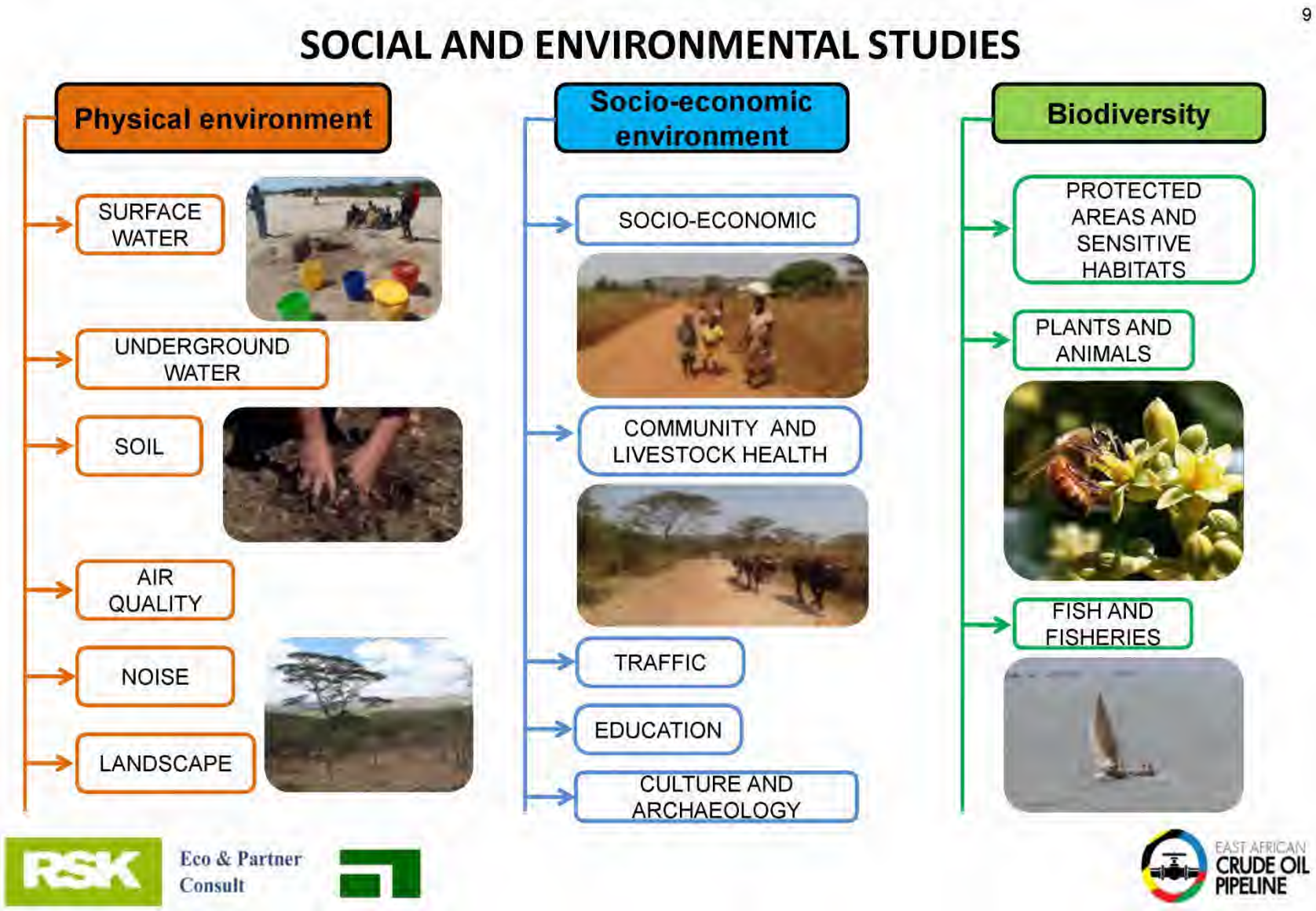
EAST AFRICAN CRUDE OIL PIPELINE

7

PIPELINE PROJECT TIMELINE




8
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROCESS
End of 2016
Start of 2017
End of 2017
Start of 2018
Project planning
Pre-construction phase
Early site works
Corridor width
2km
100m
Less than 100m
ESIA process
Scoping phase
Baseline studies and Impact assessment
Report review
Government approval
Implement management plan
Information about the project and the ESIA
Listen to concerns/expectations
Information sharing
Feedback on the ESIA Study
Feedback on the ESIA Study
Stakeholder Engagement
Scoping consultation (April-May 2017)
ESIA Feedback consultation
RSK
Eco & Partner Consult
EAST AFRICAN CRUDE OIL PIPELINE


9
SOCIAL AND ENVIRONMENTAL STUDIES
Physical environment
SURFACE WATER
UNDERGROUND WATER
SOIL
AIR QUALITY
NOISE
LANDSCAPE
Socio-economic environment
SOCIO-ECONOMIC
COMMUNITY AND LIVESTOCK HEALTH
TRAFFIC
EDUCATION
CULTURE AND ARCHAEOLOGY
Biodiversity
PROTECTED AREAS AND SENSITIVE HABITATS
PLANTS AND ANIMALS
FISH AND FISHERIES
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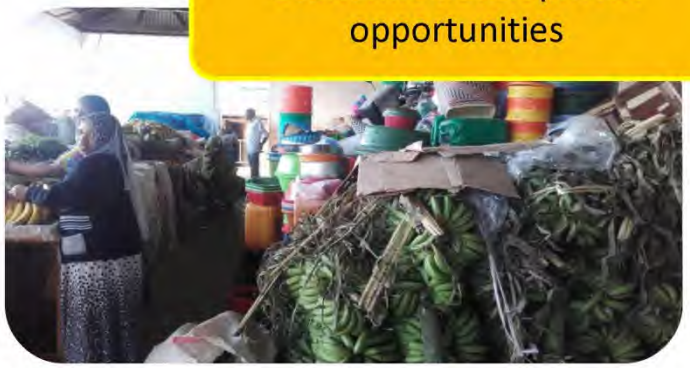
EAST AFRICAN CRUDE OIL PIPELINE

10

POTENTIAL BENEFITS

Job opportunities

Economic development opportunities



Improvement of roads

RSK Eco & Partner Consult

EAST AFRICAN CRUDE OIL PIPELINE

11

POTENTIAL NEGATIVE IMPACTS

Disturbance to wildlife and vegetation

Impact on land leading to potential economic displacement

Impact on health and well-being:
noise and traffic

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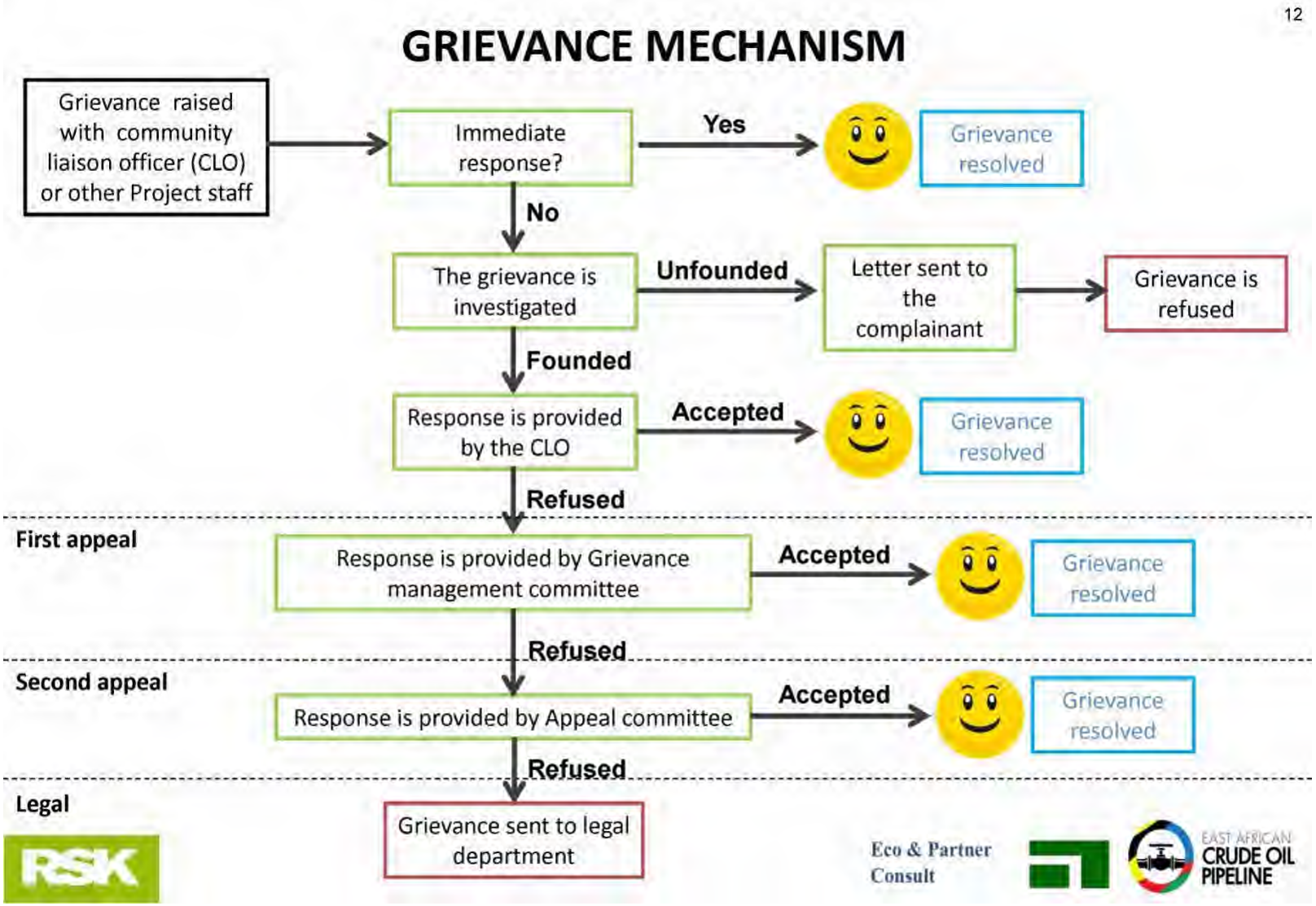
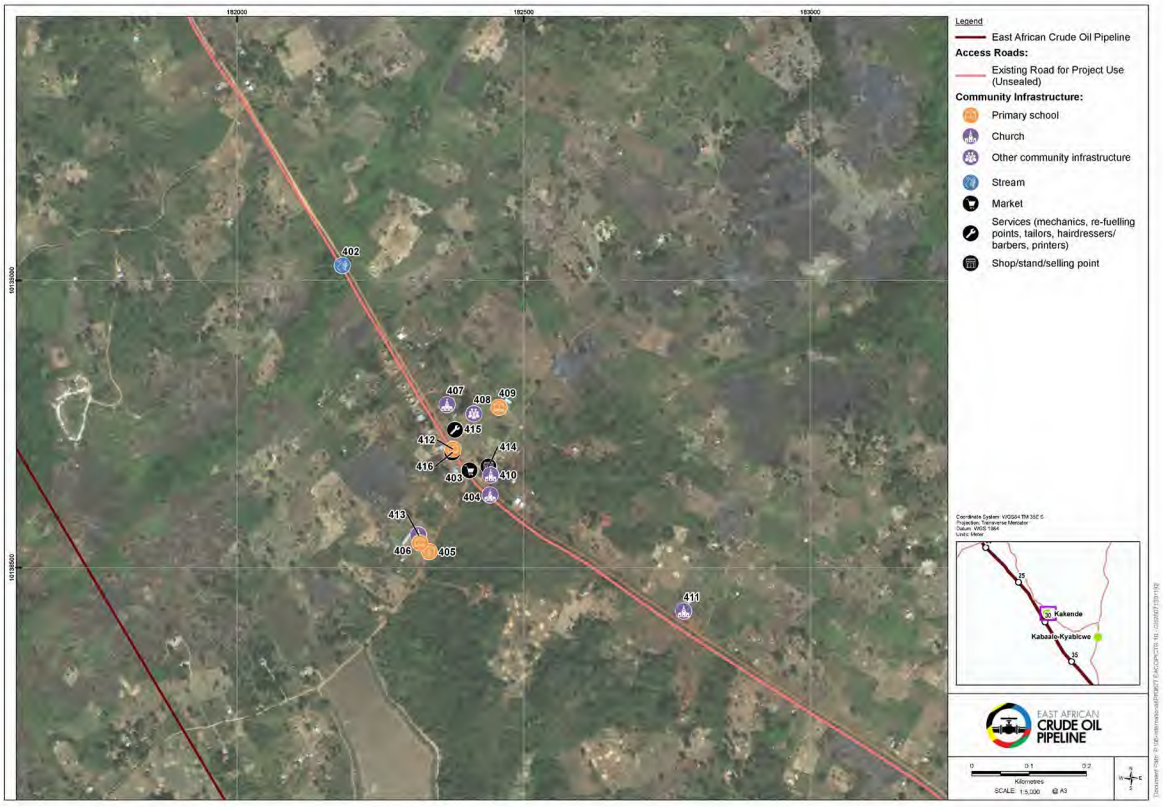
EAST AFRICAN CRUDE OIL PIPELINE


12
GRIEVANCE MECHANISM
Grievance raised with community liaison officer (CLO) or other Project staff
Immediate response?
Yes
Grievance resolved
No
The grievance is investigated
Unfounded
Letter sent to the complainant
Grievance is refused
Founded
Response is provided by the CLO
Accepted
Grievance resolved
Refused
First appeal
Response is provided by Grievance management committee
Accepted
Grievance resolved
Refused
Second appeal
Response is provided by Appeal committee
Accepted
Grievance resolved
Refused
Legal
Grievance sent to legal department
RSK
Eco & Partner Consult
EAST AFRICAN CRUDE OIL PIPELINE

ATTACHMENT A11.2 SITE AND POTENTIALLY AFFECTED COMMUNITY PROFILES

Potentially Affected Community Profiles

Kakende



PAC PROFILE KAKENDE - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- Within the trading centre

Churches/ Mosques:
- Kakende Church of Uganda
- Kakende Full Gospel church

Electric lighting within community centre:
- Use of solar panels

Communal road:
- Trunk earth roads

General condition of roads within community:
- Poor condition

Level of traffic along main road:
- Low mainly comprising of boda boda cyclists

Recent history of accidents:
- Mainly involving boda boda cyclists

Education

Schools:
- Pre-school within Kakende community school
- Pre-school within Kakende modern school
- Kakende Community Primary school
- Kakende Modern Primary school

Cultural Heritage

Cemetery/ graveyard:
- Burial is done for individual homesteads

Graves are market by placing down concrete, planting flowers and heaping soil.

Health

Clinic:
- 1 private clinic

River:
- Kamugenyi and Kajubya River

Community well:
- Several unprotected wells

Community pumps:
- 2 boreholes

Communal washing areas:
- Rivers and streams

Commerce

Market:
- Kakende market

Business:
- Chemist: 1
- Trading shops: 6
- Bars: 4
- Video halls: 1
- Hair saloons: 1
- Restaurants: 3
- Tailors: 3
- Fuel is sold in bottles

PAC PROFILE KAKENDE - DESCRIPTION

Population

Principal land-based and water-based livelihood strategies

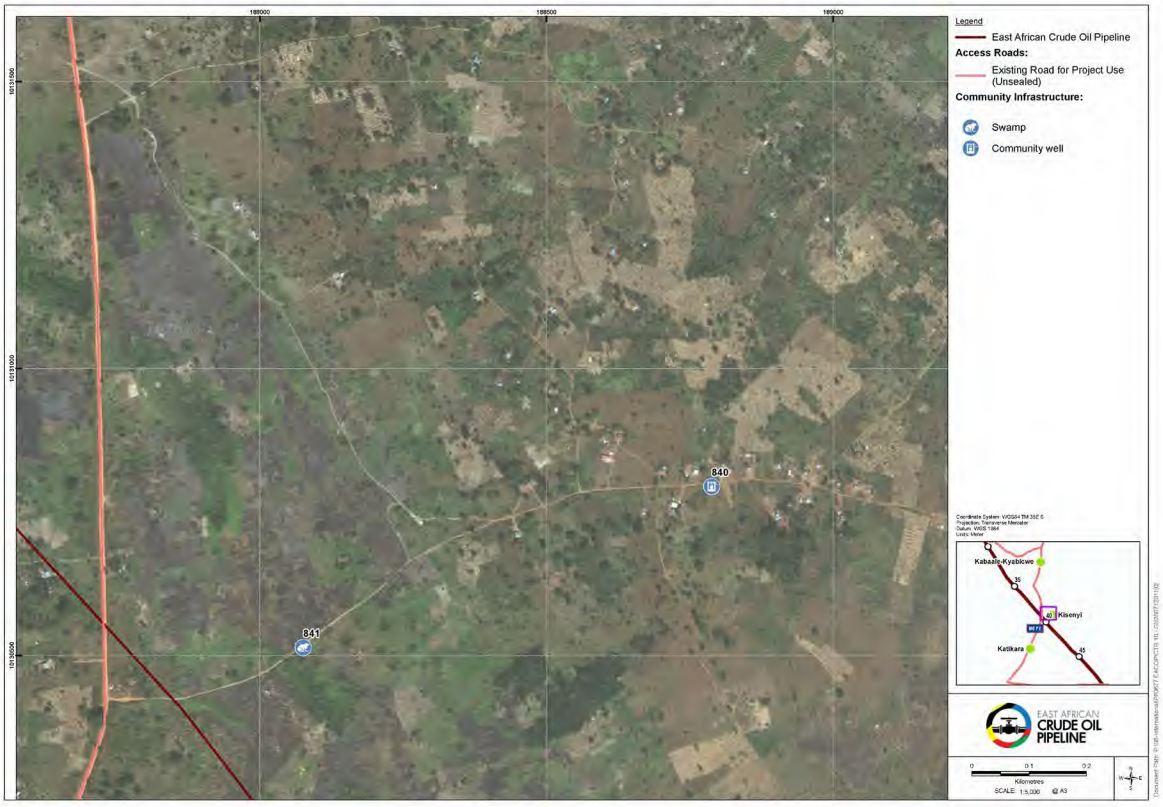
Kakende is located in the subcounty of Kiziranfumbi within Hoima district. The village comprises of less than 50 houses within the trading centre.

Land-based and water-based livelihood strategies:
The community livelihood is mainly agriculture, both subsistence and commercial. Crops grown include cassava, maize, tobacco, beans, bananas, cotton and sugarcane for commercial purposes. Livestock is reared in the village and includes cattle, goats, pigs and sheep. Fishing is present on a small scale, with one fish pond located in the village. Many of the population are involved in hunting. Several members of the community engage in charcoal production. Firewood collection is common in the bushy areas of the area and lumbering is also practiced. Sand mining is also undertaken. There are very few beekeepers in the village.

Main aspirations for the future:
- Good roads passable at all times of the year
- A health facility within the village
- Quality schools which provide good education for children
- Electricity which is affordable
- More boreholes

Timeline

Kisenyi



PAC PROFILE KISENYI - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- A tree

Churches/ Mosques:
- Protestant church
- Catholic church

Communal roads:
- Kisenyi road (murram)

General condition of roads within community:
- Good but dusty

Level of traffic along main road:
- Low

Recent history of accidents:
- Motorcycle accident, due to speeding, over loading, poor mechanical conditions of motorcycle.

Education

Cultural Heritage

Graves are marked with heaped soils or cement depending on the level of income.

Health

Community pumps:
- 1 operational

Commerce

Business:
- Shops: 3
- Produce buying: 5
- Milling machine: 1
- Hair saloons: 4
- Drivers: 5
- Timber: 2
- Honey: 3
- Construction: 3
- Mechanics

PAC PROFILE KISENYI - DESCRIPTION

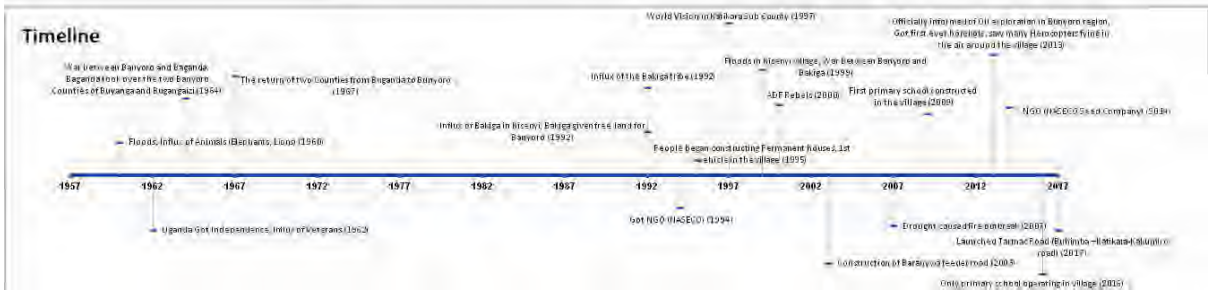
Principal land-based and water-based livelihood strategies

Kisenyi is located in the subcounty of Katikara within Kakumiro district.

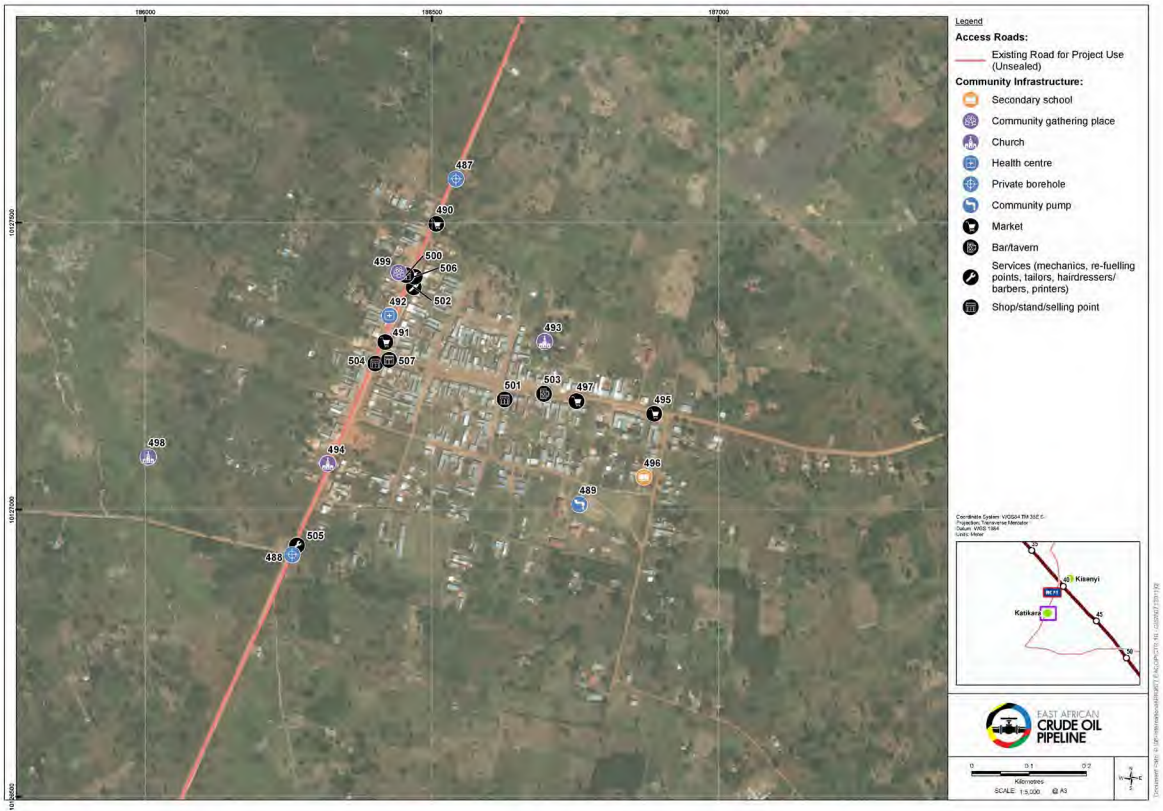
Land-based and water-based livelihood strategies:
Goats, sheep, pigs, chickens and cows are reared in the community. Crop farming is also present, with the main types of crop grown including cassava, cotton, maize, bananas, beans, tobacco, sweet potatoes, sugarcane and groundnuts among others. The plating of oranges, mangoes, jackfruits, avocados and eucalyptus takes place on tree plantations in the village. Charcoal burning and sand mining are undertaken in the community. Beekeeping is also practiced.

Main aspirations for the future:

- Economic development
- Improved access to social services
- Technical schools
- Healthy and peaceful families
- Good education services for our children
- A good health facility
- Empowered women
- Electricity
- Improved produce prices
- Markets for produce



Katikara



PAC PROFILE KATIKARA - COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Yes, but rented

Community gathering place:
- Market place

Churches/ Mosques:
- Miracle church

Electric lighting within community centre:
- Yes

Power Cables:
- Yes

Communal roads:
- Hoima –Kakumiro Road (murram)
- Mpongo Road (murram)

General condition of roads within community:
- Good but dusty

Level of traffic along main road:
- High (congested)

Recent history of accidents:
- Motorcycle accident, due to speeding, over loading, poor mechanical conditions of motorcycle.

Education

Cultural Heritage

Cemetery/ graveyard:
- These are located at subcounty level

Graves are marked with heaped soil or cement depending on level of income.

Health

Dispensary:
- Health centre 3 (private)

Health centre:
- Health centre 3 (private)

Hospital:
- Yes

Community pumps:
- 1 operational

Piped water from storage tanks:
- Yes, but has not yet started working

Public latrines:
- Yes

Commerce

Market:
- Yes

Business:
- Shops: 100
- Restaurants: 10
- Hair saloons: 20
- Carpentry: 15
- Beer depot: 1
- Grain miller: 3
- Chapati sellers: 10
- Clinics and chemists: 8
- Bars: 10
- Betting centre: 3

PAC PROFILE KATIKARA - DESCRIPTION

Population

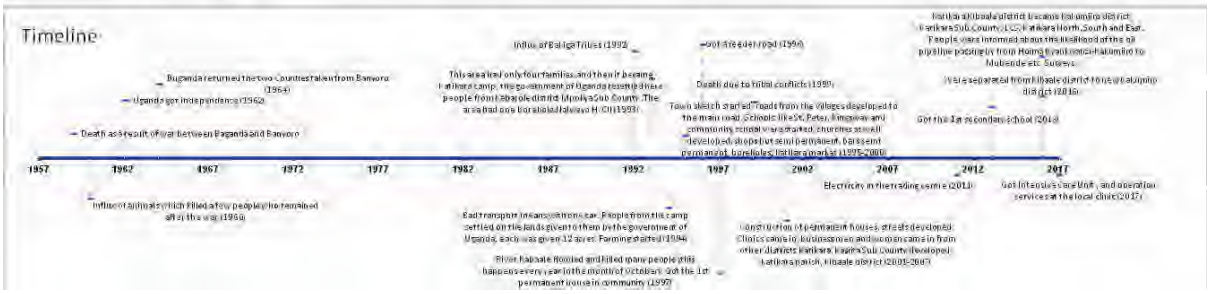
Principal land-based and water-based livelihood strategies

Katikara Trading Centre is located in the subcounty of Katikara within Kakumiro district. The area is characterised with various infrastructures. The predominant language is Runyoro, Generally Katikara Trading Centres is a very busy community.

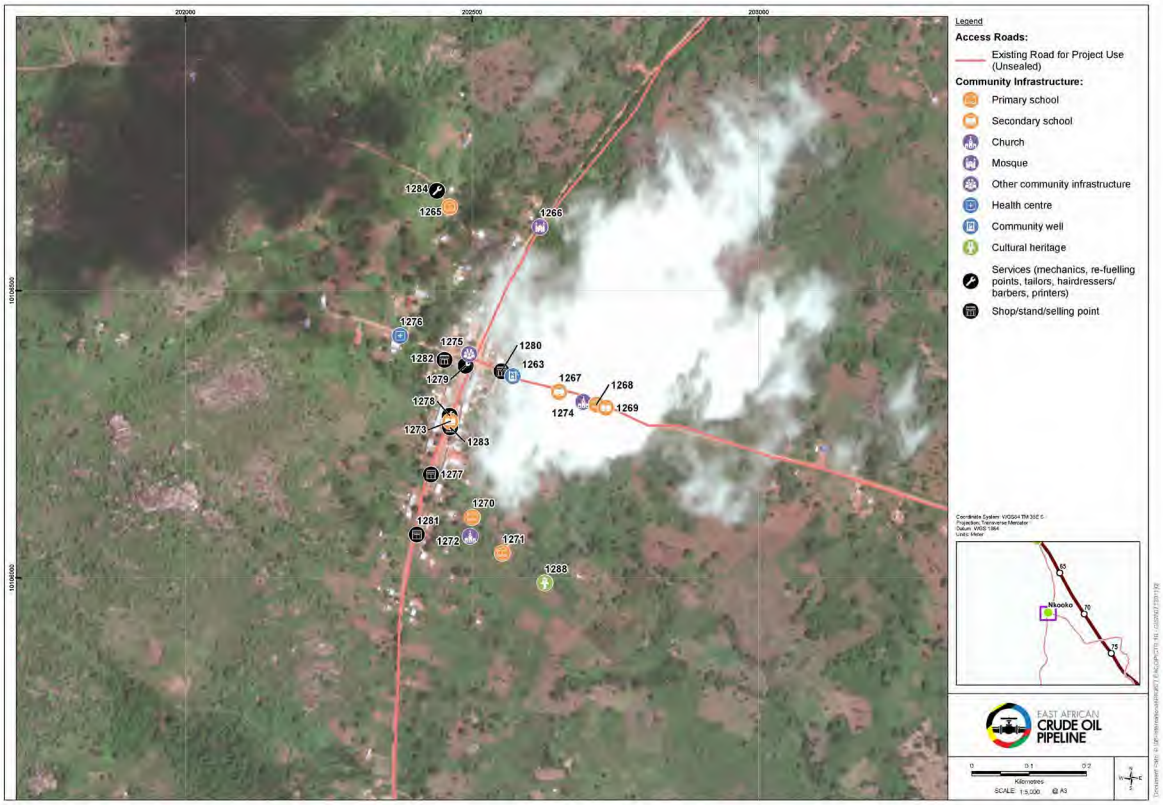
Land-based and water-based livelihood strategies:
The main kept livestock in the area are goats, sheep, pigs, chickens and cows. Crop farming is practiced in the area and the main crop types are cassava, cotton, maize, bananas, tobacco, sugarcane and groundnuts. The planting of oranges, mangoes, jackfruits and eucalyptus is undertaken in tree plantations. Charcoal burning and sand mining also occurs.

Main aspirations for the future:

- To be like Kampala city
- To became a Municipal or town council
- Improved health facilities
- Better schools and the development of vocational schools
- Sensitization of HIV/AIDS
- Improved access to social Services
- Good road infrastructures
- Modern Market for produce



Nkooko Trading Centre



PAC PROFILE NKOOKO - COMMUNITY INFRASTRUCTURE

General

Administrative Offices:
- Nkooko Subcounty offices

Community gathering place:
- Within Trading Centre
- At the Subcounty community hall
- At Nkooko Primary School playground for the teachers

Churches/ Mosques:
- Nkooko Catholic church
- Nkooko C.O.U
- Miracle Centre Church
- Nkooko Mosque

Electric lighting within community centre:
- Use of Hydro electric power and solar panels

Power cables :
- Several within the trading centre

Communal roads:
- Trunk earth roads
- 1 murram road (Buhimba-Kakumiro Road)

General condition of roads within community:
- Poor condition

Level of traffic along main road:
- High

Recent history of accidents:
- Mainly involving boda boda cyclists and saloon cars

Education

School :
- Tom's Foundation pre-school and Primary school
- Nkooko Pre-school and Primary school
- St Joseph's Secondary school

Teachers' accommodation blocks:
- All the schools have some accommodation

Cultural Heritage

Cemetery/ graveyard:
- Burial is done for individual homesteads

Graves are marked by placing concrete down, planting flowers and heaping soil.

Health

Health centre:
- Nkooko health centre III

Clinic:
- 4 private clinics

River:
- Kanangalo River

Community well:
- Several unprotected wells

Community pumps:
- 2 boreholes

Commerce

Market:
- Nkooko Market

Business:
- Bars: 30
- Petrol station: 4
- Hair saloons: 20
- Guesthouses: 4
- Shops: 20
- Restaurants: 6
- Re-fuelling points: 3
- Food sellers, tailors

PAC PROFILE NKOOKO - DESCRIPTION

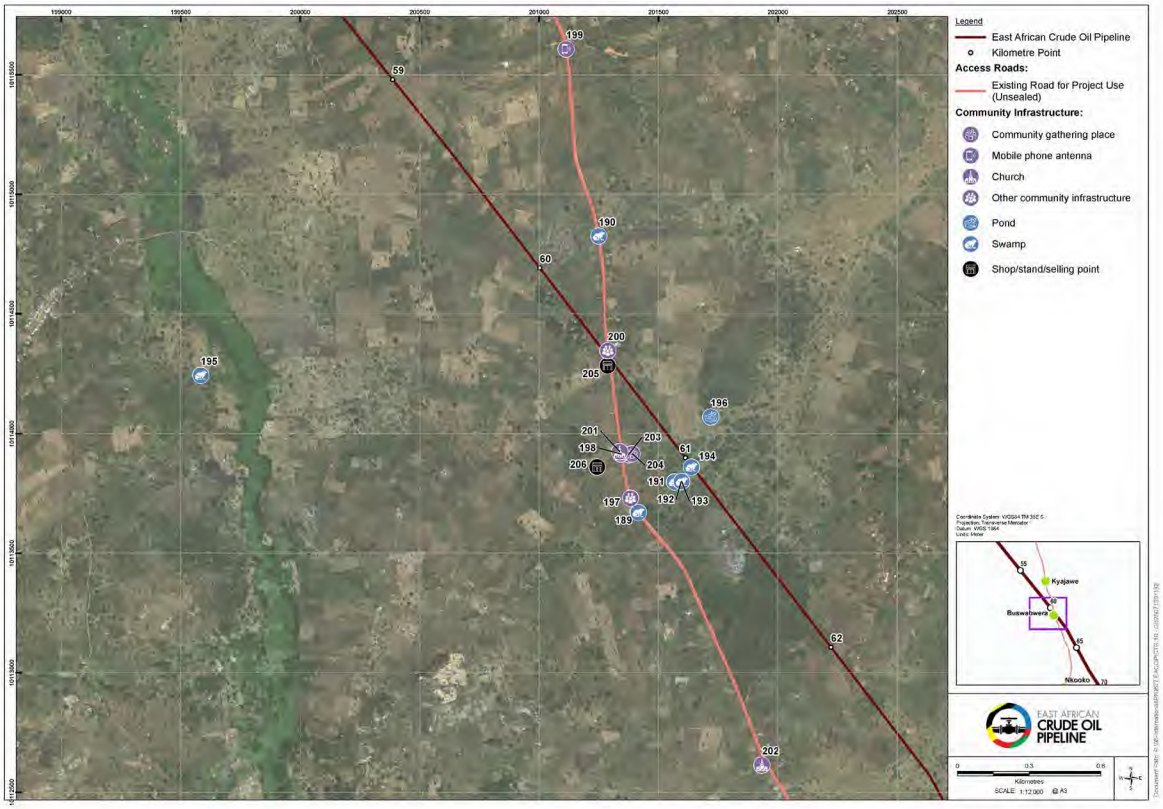
Principal land-based and water-based livelihood strategies

Nkooko Trading Centre is located in the subcounty of Nkooko within Kakumiro district. This settlement is the main trading centre within Nkooko subcounty. The area is surrounded by rocks and hills.

Land-based and water-based livelihood strategies:
The main economic activities include agriculture and trade. Livestock is kept within the community and include cattle, goats, pigs and sheep and poultry. Both subsistence and commercial farming is undertaken and crops grown include cassava, maize, coffee and beans. Several members of the trading centre engage in charcoal production. Sand mining, stone quarrying and clay mining are all practiced in the area. Beekeeping is present on a small scale. Firewood collection is common in the community.

Main aspirations for the future:
- Having a more literate community
- Women empowerment
- Good social services
- Tarmac road and good road networks
- Town Council
- Agro processing factories

Buswabwera



PAC PROFILE BUSWABWERA - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- Buswabwera Church of Uganda

Recent history of accidents:
- Moderate

Churches/ Mosques:
- Buswabwera Church of Uganda

Electric lighting within community centre:
- None but the village has electricity poles

Mobile phone antenna:
- 1 within the area

Communal road:
- 1 trunk road - Kiboga–Buhimba Road.

General condition of roads within community:
- The roads are in poor state.

Level of traffic along main road:
- Minimal level of traffic- mainly passenger cars transporting commodities and people

Education

Cultural Heritage

Cemetery/ graveyard:
- Burials are conducted in the villages of the deceased.

Graves are marked with stones, crosses and cement.

Nsangabyaya site is a cultural heritage site.

Health

River:
- River Mabengere
- River Balibona

Public latrines:
- There is 1 public toilet in the village at the church.

Commerce

Business:
- Shops: 1

PAC PROFILE BUSWABWERA - DESCRIPTION

Population

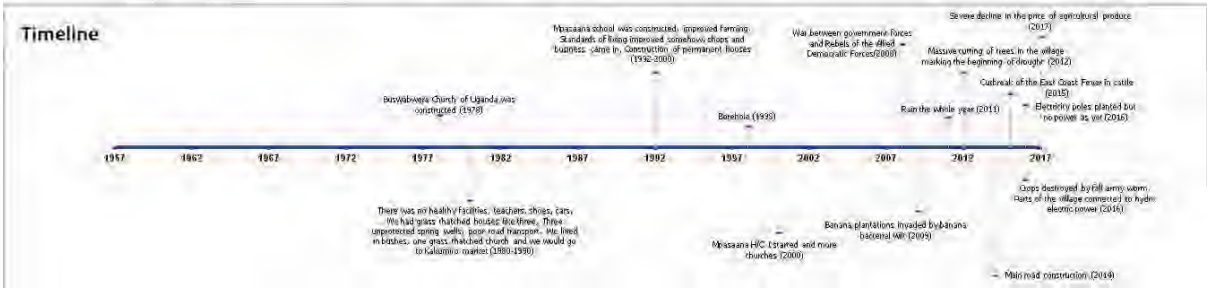
Principal land-based and water-based livelihood strategies

Buswabwera is located in the subcounty of Mpasaana within Kakumiro district and is characterised by its scattered structure of settlements. This small village has very limited infrastructure.

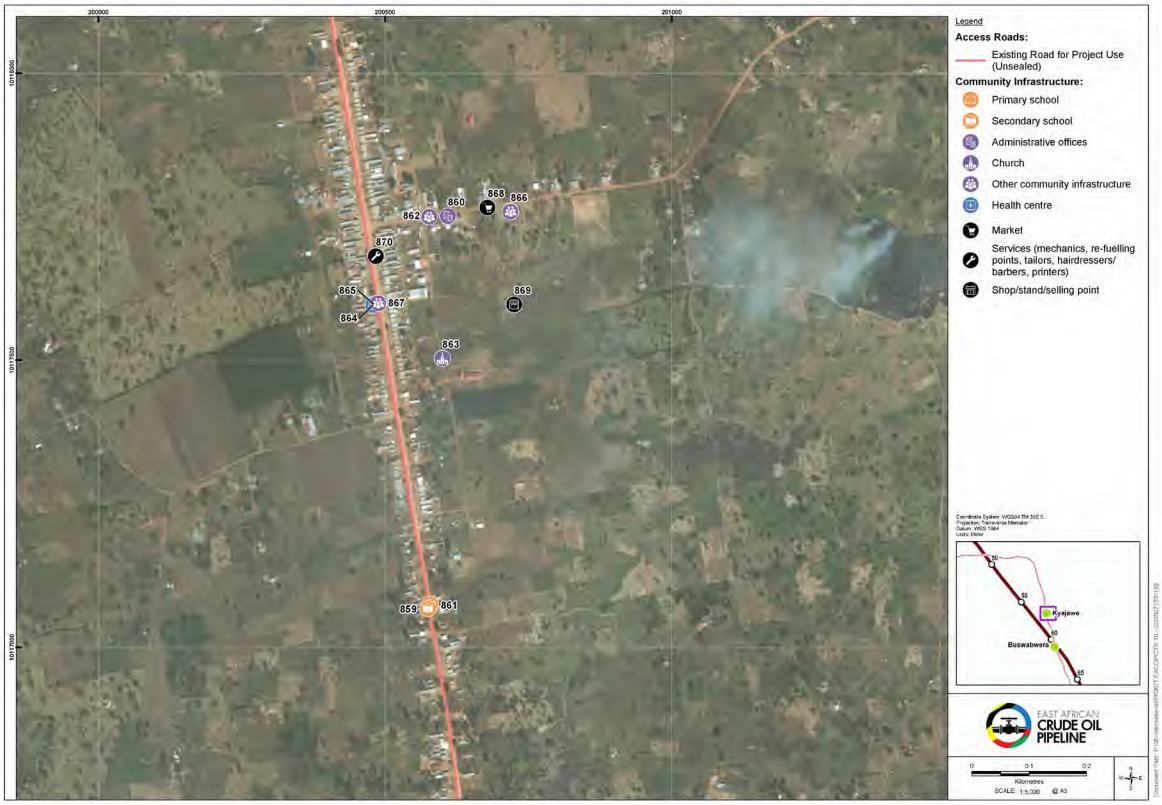
Land-based and water-based livelihood strategies:
Most of the land within the community is covered by crop farming and animal rearing. The main crop types grown in plantations are mangoes, oranges and avocados. The main kept animals include cattle, goats, pigs, and sheep, all on a small scale. Charcoal production is undertaken at low levels, primarily due to the depletion of trees within the area. Firewood collection is common around bushes. Sand mining and beekeeping both occur on a small scale around the village.

Main aspirations for the future:
- Constructions of schools and health facilities
- Building protected water sources
- To have electricity
- More shops
- Construction of a market
- Women projects and organizations to help women

Timeline



Kyajawe



PAC PROFILE KYAJAWE - COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Mpaasana Subcounty offices
- Uganda police post- Mpaasana

Community gathering place:
- Subcounty offices
- Within the chairpersons shop/bar

Churches/ Mosques:
- Mpaasana Town Church
- Mpaasana Faith and Worship Church
- Mpaasana Mosque

Electric lighting within community centre:
- Use of hydro electric power and solar panels

Power Cables:
- Power cables supplying electricity to central community

Communal road:
- Trunk earth roads
- Nkooko-Mpaasana Road (murram)

General condition of roads within community:
- Fair condition on the trunk murram road, poor condition on the trunk- earth roads

Level of traffic along main road:
- High

Recent history of accidents:
- Mainly involving boda boda cyclists and saloon cars

Education

Schools :
- Parental Care Nursery and Primary school

Cultural Heritage

Cemetery/ graveyard:
- Burial is done for individual homesteads

Graves are marked by placing down concrete, planting flowers and heaping soil.

Health

Clinic:
- 4 private clinics

River:
- Mabengere River

Marshes:
- Along Mabengere River

Community well:
- Seasonal wells

Community pumps:
- 1 borehole

Commerce

Market:
- Mpaasana Market

Business:
- Shops: 15
- Produce buying: 10
- Hardware stores: 3
- Tailor: 5
- Bodaboda: 8
- Hair saloons: 10
- Restaurants: 3
- Butchers: 3
- Milling machines: 3
- Mechanics: 5
- Clinics: 1
- Chemists: 4
- Bars: 10
- Carpentry: 3
- Agro chemical shops: 3
- Lodges: 4
- Refuelling points: 2
- Food sellers

PAC PROFILE KYAJAWE - DESCRIPTION

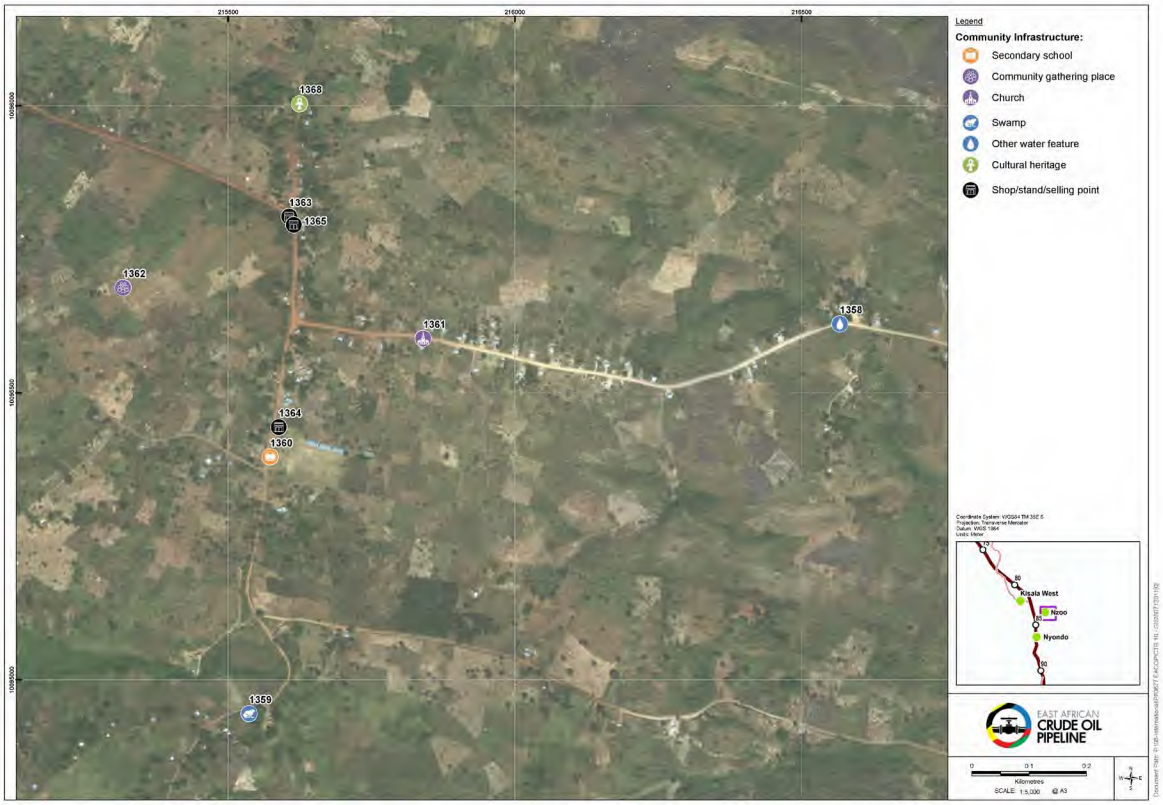
Principal land-based and water-based livelihood strategies

Kyajawe is located in the subcounty of Mpasaana within Kakumiro district. The area is one of the busiest trading centres within Mpaasana sub-county and is characterised mainly with trade and commerce. The settlement itself is linear especially along the busy trunk murram road (Nkooko-Mpaasana Road). Further from the trading centre are farmland and gardens.

Land-based and water-based livelihood strategies:
In the village, cattle, goats, pigs and sheep are kept. Subsistence and commercial farming are present and include the growing of cassava, maize, coffee and beans. Few people engage in charcoal production. Firewood collection is common. Sand mining and beekeeping are both undertaken in the area on a small scale. Eucalyptus and pine tree plantations can also be found in the community.

Main aspirations for the future:
- Having a safe water supply
- Health centre
- Government run schools constructed
- Tarmac roads
- Reliable market for agricultural produce
- Better education for children

Nzoo



PAC PROFILE NZOO – COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- At Nzoo Primary school hall, in fairly good state.

Churches/ Mosques:
- There are many churches including:
- Nzoo Catholic Church
- Nzoo Church of Uganda
- Full Gospel

Communal road:
- 1 trunk road, Buwembo Road

General condition of roads within community:
- Poor condition

Level of traffic along main road:
- Low level of traffic - mainly by the heavy trucks transporting food given the fact that then major economic activity is crop farming.

Education

School :
- Good Hope Nursery school
- 1 primary school

Teachers' accommodation blocks:
- There are few accommodation blocks at Nzoo primary school. They are in a worrying state.

Cultural Heritage

Place of worship:
- Kakora midwife

Cemetery/ graveyard:
- Burials are conducted in the villages especially in homesteads of the deceased.

Graves are marked using stones, crosses and cement.

Health

Health Centre:
- Nearest is Kisala Health Centre in Kisala.

River:
- Kitumbi River.

Community well:
- Kayanja well

Private boreholes:
- Kayanja private borehole

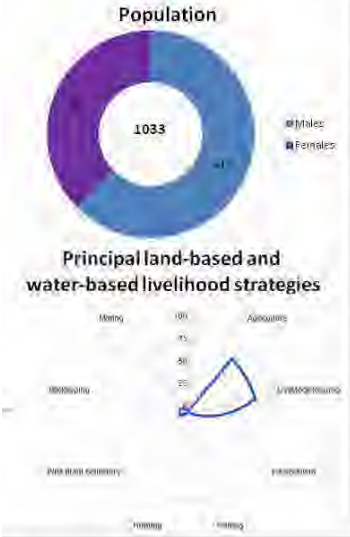
Communal washing areas:
- Along Kayanja Well. The area has poor hygiene.

Commerce

Markets :
- Kampanzi Market- daily market

Business:
- Shops: 5
- Produce buying: 15
- Bodaboda: 12
- Hair saloons: 1
- Bars: 6
- Carpentry: 2

PAC PROFILE NZOO - DESCRIPTION

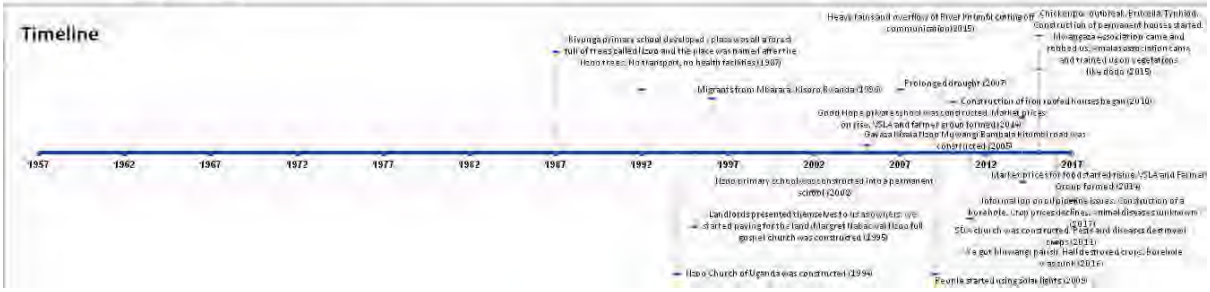


Nzoo village is located in the subcounty of Ntwetwe within Kyankwazi district. The area can be characterised with limited infrastructure.

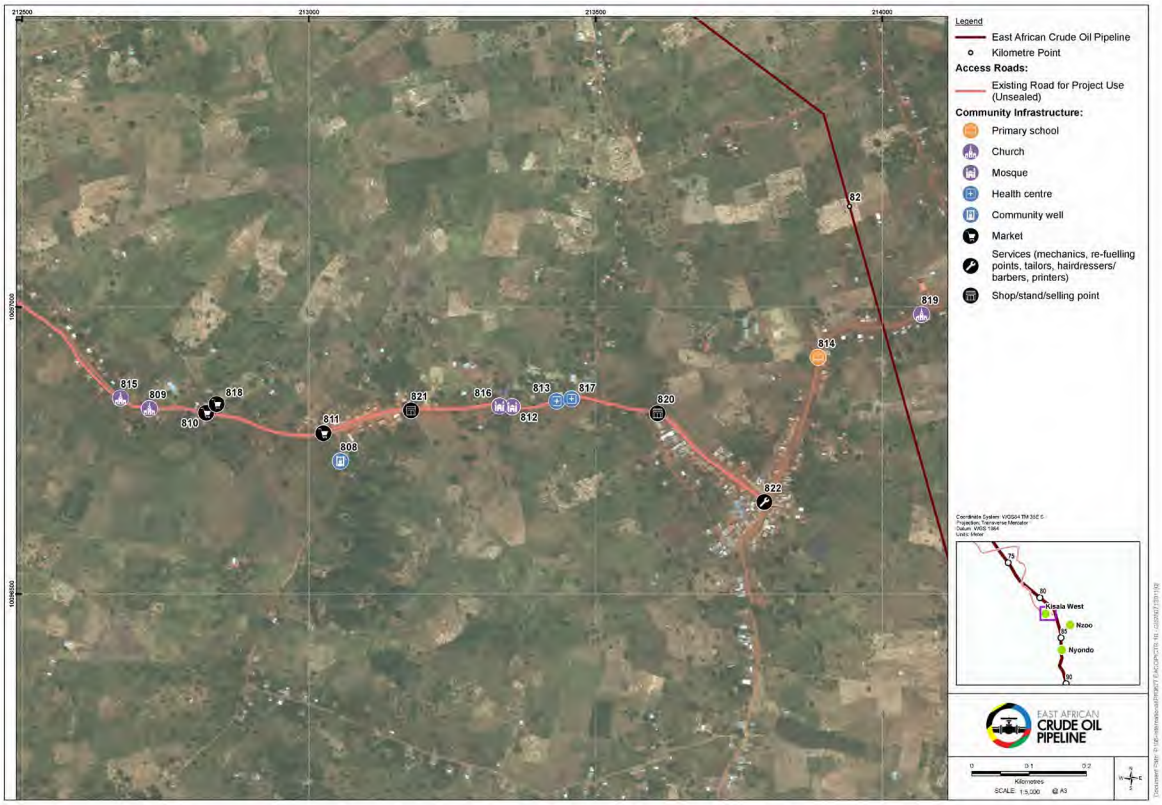
Land-based and water-based livelihood strategies:
The main kept livestock in the village are cattle, goats, sheep poultry and pigs. There is a high level of crop farming in the community with mangoes, oranges and pineapples being grown in plantations. Hunting exists but on a very small scale. Firewood collection is common whereas charcoal production is undertaken at low levels. There are some beekeepers within the community though at minimal scale; it is collected for commercial purposes.

Main aspirations for the future:

- Having a hospital built here
- Construction of secondary schools
- Our roads need to be improved on
- Building good permanent houses
- Our village becoming into a town
- More developments, more cars, electricity
- Kitumbi bridge constructed
- Reliable market for agricultural produce

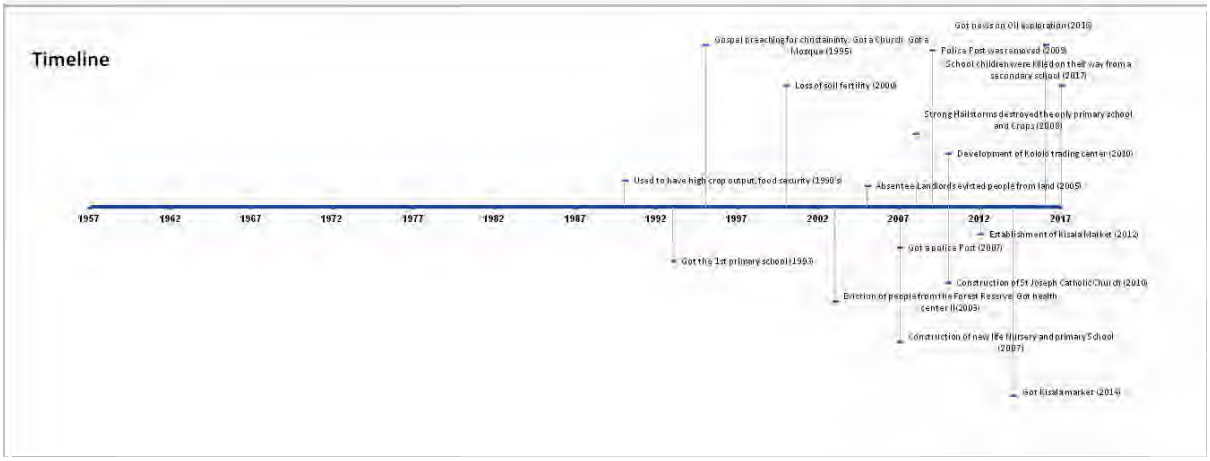


Kisala West

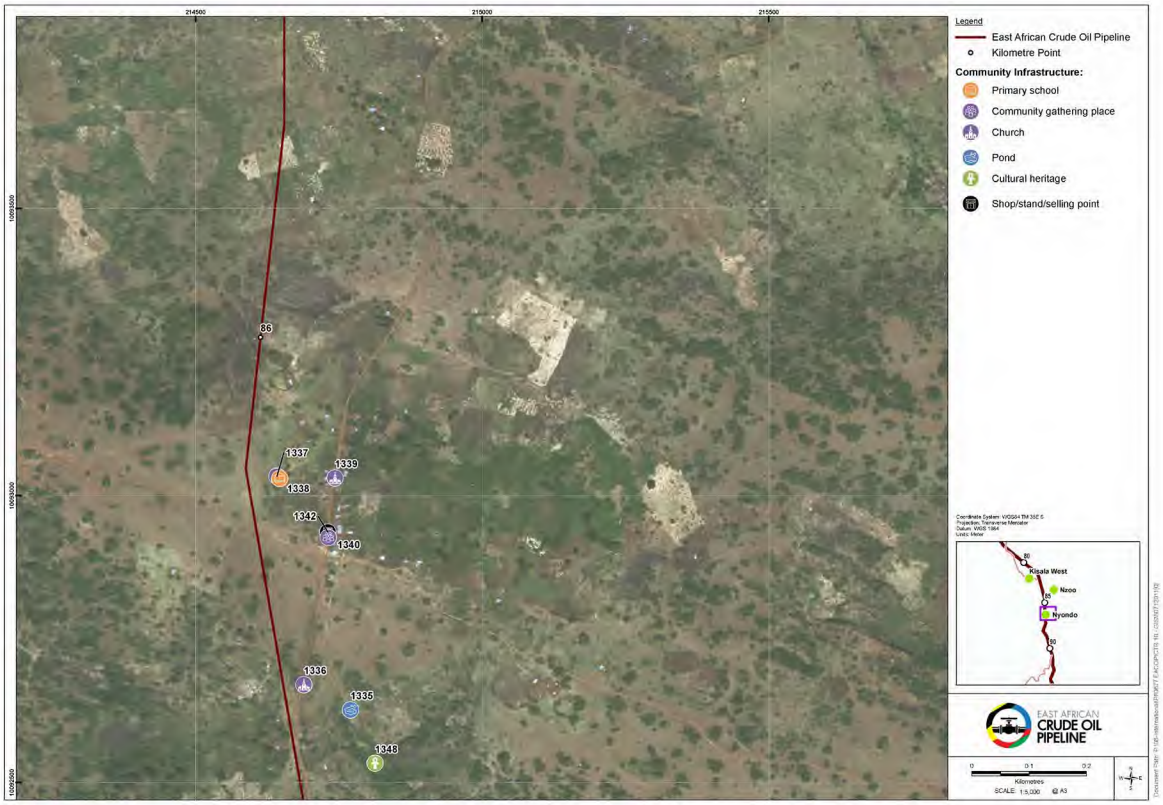


PAC PROFILE KISALA WEST - DESCRIPTION

Principal land-based and water-based livelihood strategies



Nyondo



PAC PROFILE NYONDO – COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- At Kigoba LC1 compound

Churches/ Mosques:
- Nyondo Baptist Church
- Nyondo Catholic Church
- 1 mosque

Name and category of community road:
- 1 trunk road, Kampanzi Road

General condition of roads within community:
- The roads are in poor state

Level of traffic along main road:
- Low level of traffic – mainly the heavy trucks transporting food crops given the fact that the major economic activity is crop farming.

Education

School :
- Nyondo Nursery and Primary school
- Nsinamu Nursery and Primary school
- Buganyi – Butoloogo Primary school
- SEED Senior Secondary School

Teachers' accommodation blocks:
- There are few accommodation blocks, they are in a worrying state.

Cultural Heritage

Cemetery/ graveyard:
- There are no burials held within the trading centres. Burials are conducted in the homesteads of the deceased.

Graves are marked using stones, crosses and cement.

Witchcraft is practiced in the area.

Health

Health centre:
- Butoloogo Health Centre III

Clinics:
- 2 clinics- 1 in Nyondo and 1 in Nsinamu

Rivers:
- River Kanena
- River Nakasenyi

Marshes:
- Along the rivers

Communal washing areas:
- Along the River Kanena (poor hygiene)

Commerce

Market:
- Katibenda market. This is a daily market.

Business:
- Produce buying: 20
- Shops: 5
- Bars: 6
- Chemist: 1
- Restaurants: 2
- Bodaboda: 10
- Charcoal sellers: 10
- Butchers: 2
- Hair saloons: 1
- Carpentry: 2
- Cattle trade: 10
- Brick making: 20
- Traditional healer: 1
- Street food seller

PAC PROFILE NYONDO- DESCRIPTION

Population

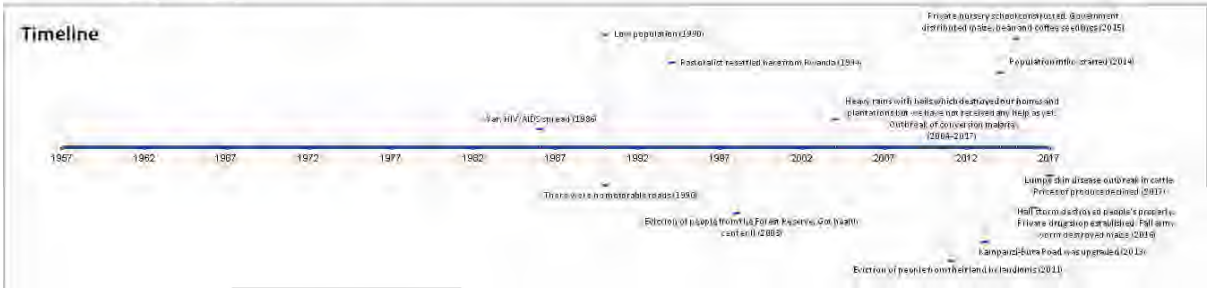
Principal land-based and water-based livelihood strategies

Nyondo is located in the subcounty of Butoloogo within Mubende district. The area is very hills and had limited infrastructure. Generally the population consists of migrants who don't have land titles so cannot claim ownership of land.

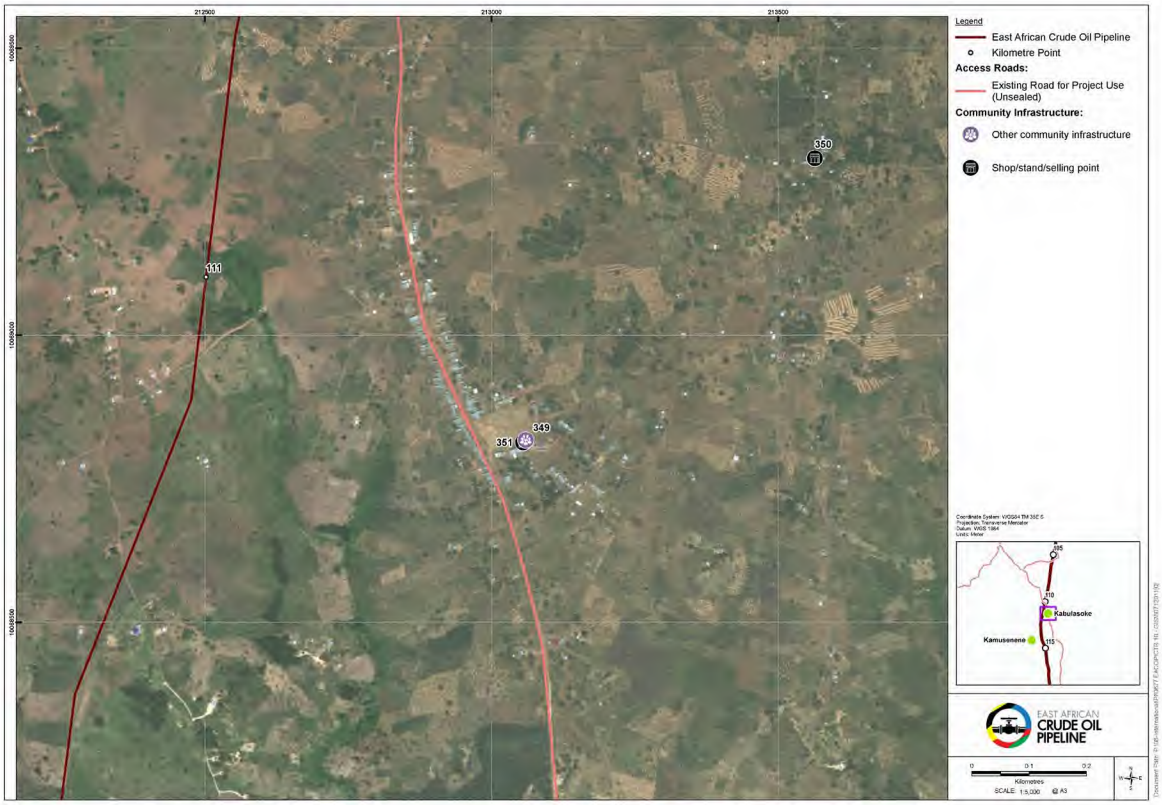
Land-based and water-based livelihood strategies:
Within the village there is a high level of crop farming due to the area having few buildings and large plots of land. Livestock rearing is also practiced with cattle, goats, sheep, pigs and poultry being kept. Hunting exists on a small scale. Mangoes, oranges and pineapples are grown in plantations in the village. Charcoal production occurs on a small scale, mainly due to the depletion of trees in the area. Firewood collection is common practice. Sand mining is also undertaken within the community.

Main aspirations for the future:
- Development including hospitals
- Village growing into a town
- Construction of road to ease movement
- Ambulance
- Schools
- Safe water sources

Timeline



Kabulasoke



PAC PROFILE KABULASOKE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Chairperson's house

Community gathering place:
- The meetings are convened at Kabulasoke Trading Centre

Churches/ Mosques:
- Over 6 churches, including:
- Lulungo SDA Church
- Kyaterekera Pentecostal Church
- End Times Pentecostal Church
- Sinai Church of Uganda
- Barehebwa omugisha's Pentecostal Church
- Kabulasoke Mosque

Mobile phone antenna :
- Major service providers are available- MTN, AIRTEL and Africell

Communal roads:
- Bukadde-Lulongo Road (dirt road)
- Lulungo -Kyenda Road (dirt road)
- Butambizi-Kabulasoke Road (dirt road)
- Katagumkwa-Kimansulo Road (dirt road)

General condition of roads within community:
- Poor

Level of traffic along main road:
- Very low

Recent history of accidents:
- Accidents are a very rare occurrence in the area.

Education

School:
- Lulungo Nursery and Primary School
- Galilaya Nursery and Primary School
- Sinai Nursery and Primary School
- Kabulasoke Brainstorm Nursery and primary school

Cultural Heritage

Cemetery/ graveyards:
- There is no cemetery within the village.

Graves are marked with cement stones and crosses

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Nearest health centre Madudu Health Centre III, which is 5km away

Hospital:
- The nearest hospital is Mubende Regional Referral Hospital, which is 18km away

River:
- There is 1 stream called Kiyiyi stream

Marshes:
- Kiyyi swamp

Community well:
- Various ponds in the community

Community pumps:
- 1 shallow well in the community

Private boreholes:
- 3 boreholes

Commerce

Business:
- Produce buying: 10
- Bars: 8
- Hair saloons: 2
- Shops: 20
- Vendors, tailors, barber shops, mechanics

PAC PROFILE KABULASOKE - DESCRIPTION

Population

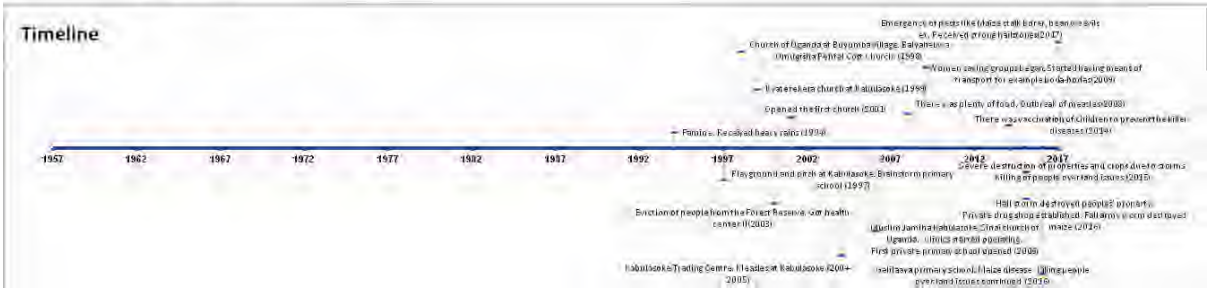
Principal land-based and water-based livelihood strategies

Kabulasoke is located in the subcounty of Madudu within Mubende district.

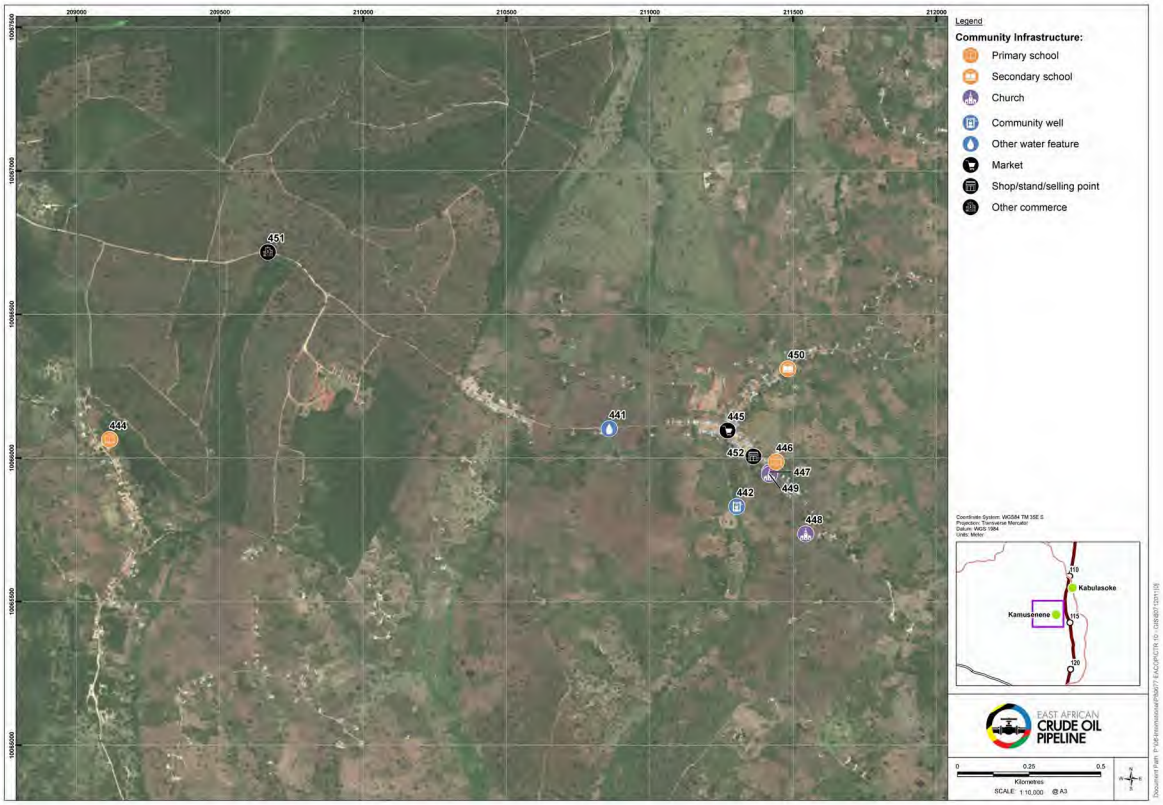
Land-based and water-based livelihood strategies:
The main livelihood strategies of the area include subsistence farming and rearing livestock. Cattle, goats, chicken and pigs are the main kept livestock in the community. The main crops are maize, beans, groundnuts, Irish potatoes and bananas. Market gardening is practiced; it includes tomatoes and cabbages. Hunting occurs on a small scale. There are a number of tree orchards, especially consisting of eucalyptus and pine trees. Charcoal production is common in the area as the main sources of energy for domestic use is firewood. Traditional healers use natural resources for medicinal purposes. Sand mining and brick making are present in the community. There are five beekeepers in the village.

Main aspirations for the future:
- Gold mining
- Having improved Health and education services
- Safe water
- Good roads
- Electricity

Timeline



Kamusenene



PAC PROFILE KAMUSENENE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Administrative issues handled at LC1 Chairperson's house

Community gathering place:
- The meetings are convened at Kifufu Trading Centre

Churches/ Mosques:
- Over 6 churches, including:
- Kyadembe Pentecostal Church
- Sanyu Pentecostal church
- Grace Pentecostal Church
- Natete Church of Uganda
- Kamusenene Pentecostal Church
- Kifufu Mosque

Mobile phone antenna:
- Major service providers are available- MTN, AIRTEL and Africell

Communal road:
- Kaweri coffee-Katabalanga Road (dirt road)
- Kirawula-Kyenda Road (dirt road)

General condition of roads within community:
- Poor

Level of traffic along main road:
- Very low

Recent history of accidents:
- Accidents are a very rare occurrence in the area.

Education

School :
- St. Christopher Nursery and Primary school
- Trust Nursery and Primary School
- St. Christopher Senior Secondary School
- St Peter's Technical Institute- 14km away (tertiary)

Teachers' accommodation blocks:
- St. Christopher has staff quarters

Cultural Heritage

Cemetery/ graveyards:
- There is no gazettes cemetery within the village.

There are no significant markings of graves as residents use ridges and stones patterns. The majority of residents are of Rwandese descent and they don't attach much importance to burial grounds of their dead. They also don't carry out funeral rites like many of the tribes in Uganda.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are 5 drug shops in the area.

Health Centre:
- The nearest is Madudu Health Centre- 5km away

Hospital:
- The nearest hospital is Mubende Regional referral hospital which is 15km away.

River:
- 2 streams called Kiyiyi stream and Serunjabi stream

Marshes:
- Kiyyi swamp and Serunjabi swamp

Community well:
- 1 valley dam

Community pumps:
- 1 non-functional borehole

Private boreholes:
- 3 boreholes

Commerce

Business:
- Produce buying: 50
- Shops: 60
- Hair saloons: 20
- Restaurants: 4
- Bars: 70
- Bodaboda garages: 2
- Butchers: 5
- Chapati sellers: 7
- Video halls: 4

PAC PROFILE KAMUSENENE- DESCRIPTION

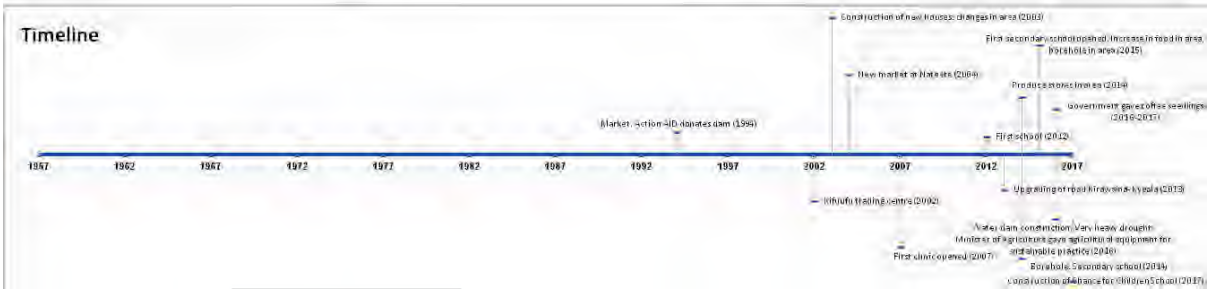
Principal land-based and water-based livelihood strategies

Kamusenene is located in the subcounty of Kitenga within Mubende district. There is a large coffee estate in the village called Kaweri Coffee that is privately owned. Most of the residents in the village are tenants.

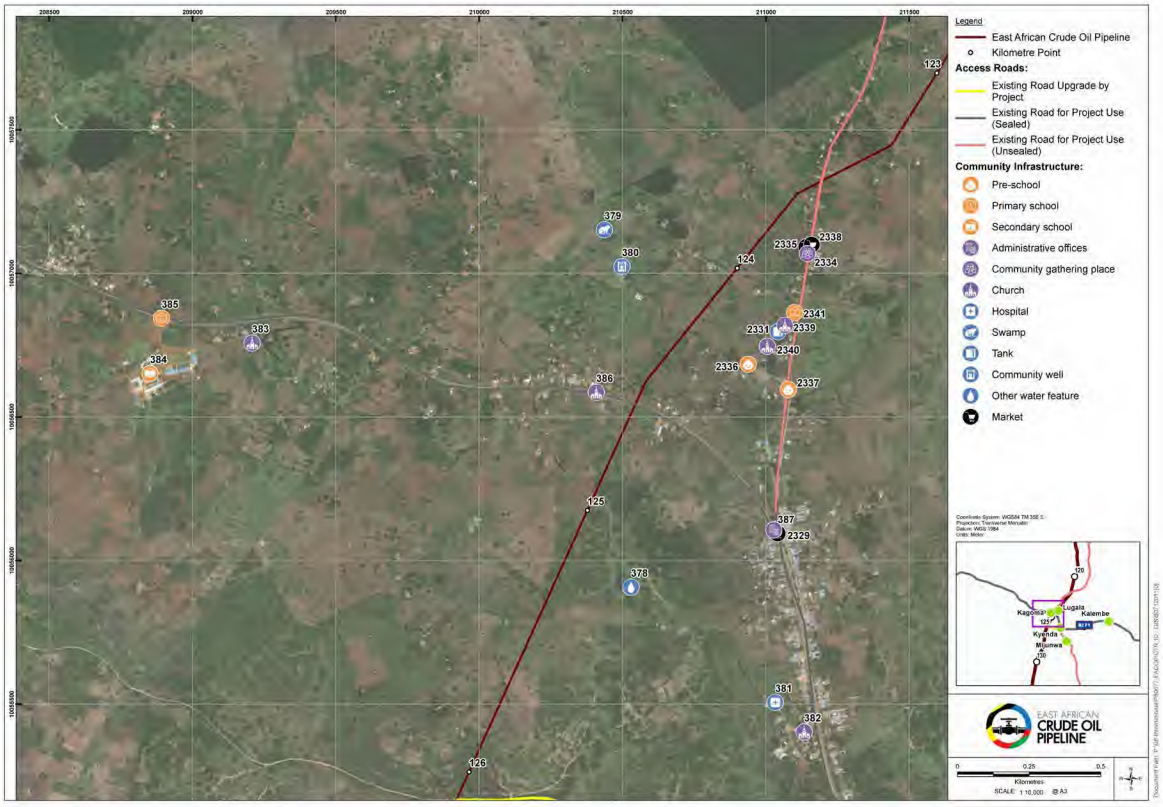
Land-based and water-based livelihood strategies:
The main livestock kept in the village are cattle, goats, chickens and pigs, with two people owning over 50 heads of cattle each. The main crops grown in the community are maize, beans, groundnuts, cassava, sweet potatoes and bananas. Market gardening is also present with tomatoes and cabbages being grown. Some residents hunt edible rats and squirrels. There are a number of tree orchards especially eucalyptus trees and pine trees. Charcoal burning is used for domestic use in few homes. Traditional healers collect natural resources for medicinal purposes. Brick making is also undertaken on a small scale.

Main aspirations for the future:
- Electricity
- Hospital
- Water
- More schools
- Restaurants
- Stores/produce
- Increase in food
- Construction of new roads
- New churches

Timeline



Kagoma



PAC PROFILE KAGOMA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson

Community gathering place:
- The community currently uses the premises of St. Zoe Schools, Kagoma

Churches/ Mosques:
- Lwebuka Pentecostal Church
- St. Achilles Catholic Church
- Victory Church, Kagoma
- Light Evangelism Ministry Church
- Kagoma Seventh day Adventist Church

Mobile phone antenna:
- MTN and Airtel. Airtel network is the most reliable one in the village

Communal road:
- Mubende–Mityana Road (tarmac road)
- Kagoma-Lwebuka–Ssaka road (dirt road)

General condition of roads within community:
- Poorly maintained

Level of traffic along main road:
- There is moderate traffic flow in the area, but the Mubende-Mityana Road is busy.

Recent history of accidents:
- Lwebuka has a few minor accidents, but the Mubende-Mityana Road has a number of fatal accidents – approx. 3 accidents per month.

Education

School:
- St. Zoe Nursery and Primary school
- Seeta Nursery school
- St. Zoe Secondary School
- St. Zoe Vocational School, Kagoma. Tertiary - courses relating to carpentry, tailoring, hairdressing and events management

Teachers' accommodation blocks:
- St. Zoe Schools have teachers accommodation units.

Cultural Heritage

Place of worship:
- There are over 10 shrines

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with soil that is heaped into a ridge, cementing, stone patterns, crosses.

Distinct markings are used for the Balaalo and followers of the babisaka religion.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- Kagoma Drug shop

Health centre:
- Nearest is Kyenda Health Centre III ,which is 2km away

Hospital:
- Nearest hospital is Mubende Referral Hospital, which is about 14 km away from the village

Community well:
- 3 dams and many unprotected wells

Commerce

Business:
- Shops: 10

PAC PROFILE KAGOMA - DESCRIPTION

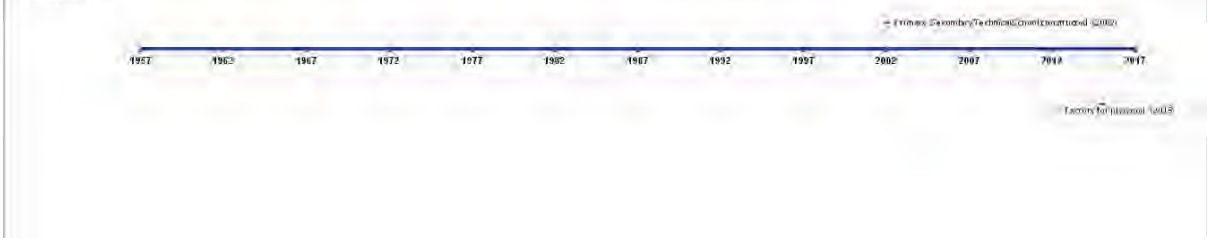
Population

Kagoma is located in the subcounty of Kitenga within Mubende district.

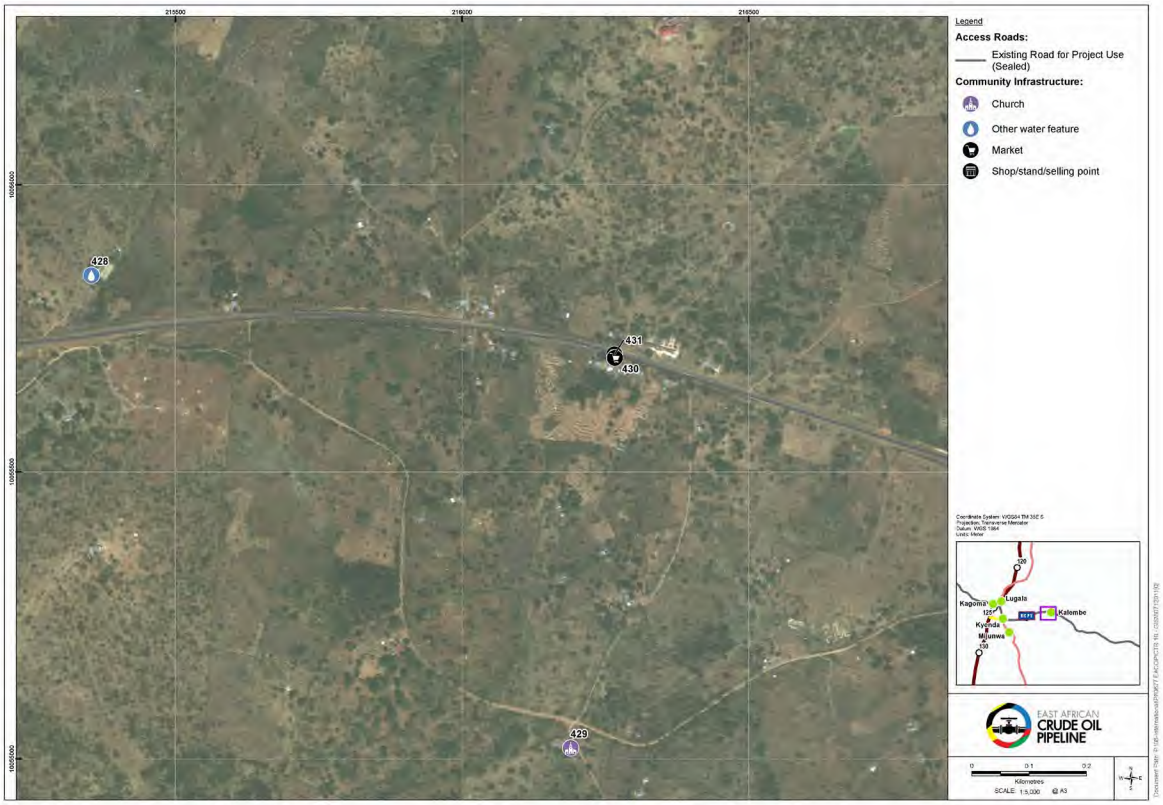
Land-based and water-based livelihood strategies:
The residents of Kagoma largely practice subsistence farming, growing arable crops such as maize, bananas, coffee, cassava, pumpkins and beans among others. Livestock is also largely practiced and includes the rearing on cattle, goats, chickens, pigs and sheep; three residents own over 50 heads of cattle. Market gardening is present with tomatoes and cabbages being grown by about 12 residents. Hunting is undertaken in the village and residents catch Uganda kobs, rabbits and antelopes. Other residents and planted eucalyptus trees and orange trees. Traditional birth attendants gather natural resources to use as herbs. Sand mining and brick making is also undertaken in the community. There is one resident in the village who owns over 10 beehives.

Main aspirations for the future:
- May develop into a Town Council
- Improvement in infrastructure

Timeline



Kalembe



PAC PROFILE KALEMBE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Administrative issues handled at LC1 Chairperson's place

Community gathering place:
- The meetings are held at Kalembe Trading Centre

Churches/ Mosques:
- Over 7 Churches or Mosques including:
- Kyadembe Pentecostal Church
- Jerusalem Pentecostal church
- Freedom Christian Church
- Kalembe Church of Uganda
- Gloria Pentecostal Church
- Kalembe Mosque

Mobile phone antenna:
- Major service providers are available- MTN, AIRTEL and Africell

Communal road:
- Mubende –Mityana Road (tarmac road)
- Kisujjo –Bugonzi road (dirt road)
- Maria-Kikandwa Road (dirt road)

General condition of roads within community:
- Poorly maintained

Level of traffic along main road:
- Very high level of traffic along Mityana-Mubende Road

Recent history of accidents:
- Accidents are few in the area

Education

School :
- Nearest primary and secondary school is Kalonga School, 2km away.

Cultural Heritage

Graves are marked using cement, stone markings and ridges of earth.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- The nearest health centre is Kalonga Health Centre III, which is 2km away.

Hospital:
- The nearest hospital is Mubende Regional Referral hospital, which is 22 km away.

Lake:
- Water ponds shared with animals

Community pumps:
- 1 non-functional borehole

Commerce

Business:
- Shops: 4
- Hair saloons: 1
- Bars: 4
- Markets: 2

PAC PROFILE KALEMBE- DESCRIPTION

Population

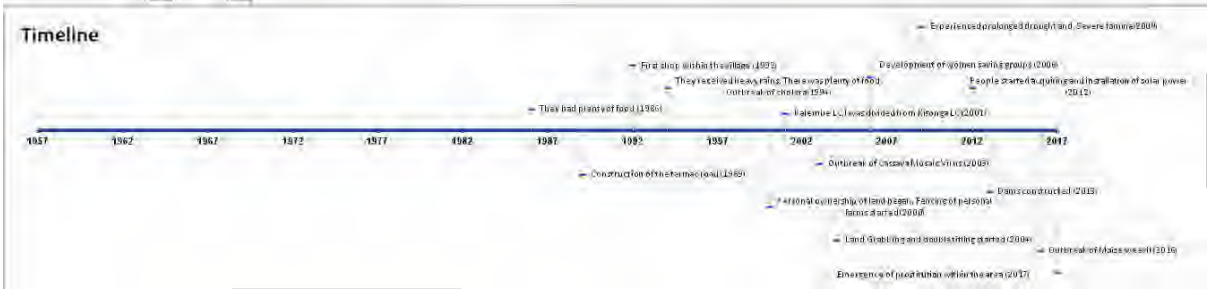
Principal land-based and water-based livelihood strategies

Kalembe is located in the subcounty of Kitenga within Mubende district.

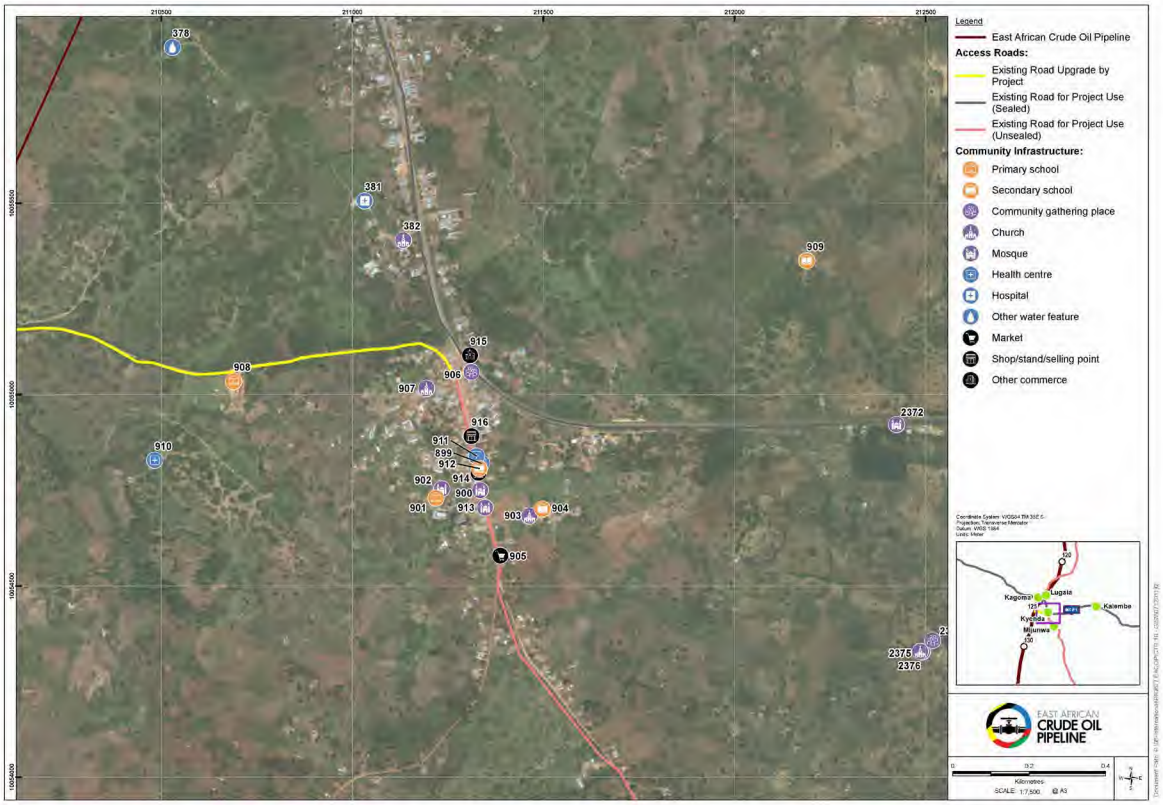
Land-based and water-based livelihood strategies:
The residents of Kalembe largely practice subsistence farming, growing arable crops such as maize, bananas, coffee, cassava, pumpkins and beans among others. Livestock is also largely practiced and includes the rearing on cattle, goats, chickens, pigs and sheep; four residents own over 50 heads of cattle. Market gardening is present with tomatoes and cabbages being grown. Fishing is also undertaken. There are a number of residents who have planted eucalyptus trees and pines trees. Traditional healers use and collect natural resources for medicinal purposes. Brick making and sand mining are both undertaken in the community.

Main aspirations for the future:
- Electricity for the businesses to expand
- Water
- A hospital
- Schools

Timeline



Kyenda



PAC PROFILE KYENDA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Offices are in Kyenda Trading Centre

Community gathering place:
- Meetings are held at Kitenga Health Centre III

Churches/ Mosques:
- Senkulu Catholic Church
- Kasana Church of Uganda
- Over 6 Pentecostal churches in the village
- Kyenda Mosque

Animal waste disposal area :
- Kyenda abattoir

Mobile phone antenna :
- MTN and Airtel

Communal road:
- Kyenda-Maddu Road (dirt road)
- Mityana-Mubende Road (tarmac road)
- Kyenda- Kasambya Road (dirt road)

General condition of roads within community:
- With the exception of Mityana Mubende road, the rest of the roads are poorly maintained

Level of traffic along main road:
- The roads are generally busy

Recent history of accidents:
- Accidents along roads in Kyenda village average about 3 per month

Education

School :
- Mary Star Nursery school
- Central Nursery school
- St. Gonzaga Nursery school
- Mistarkam Nursey school
- Senkulu Primary school
- Kasana Model Secondary school
- Nearest tertiary school is St Zoe Technical Institute- 4km away

Teachers' accommodation blocks:
- Senkulu Primary School has teachers' accommodation

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked by heaping soil into a ridge and planting a cross on top of the resting place.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are about 7 drug shops in Kyenda village

Health centre:
- Kyenda Health Centre III

Hospital:
- Nearest hospital is Mubende Referral Hospital

Community well:
- 3 dams and many unprotected wells

Piped water from storage tanks:
- Stand pipes from National Water and Sewerage Corporation

Private boreholes :
- 1 non-functional borehole

Communal washing area :
- Private wash bay

Commerce

Market :
- Kyenda market

Business:
- Shops: 100+
- Hair saloons: 40
- Petrol station: 3
- Produce buying: 40
- Butchers: 20
- Bars: 50
- Garages for boda bodas: 30

PAC PROFILE - KYENDA- DESCRIPTION

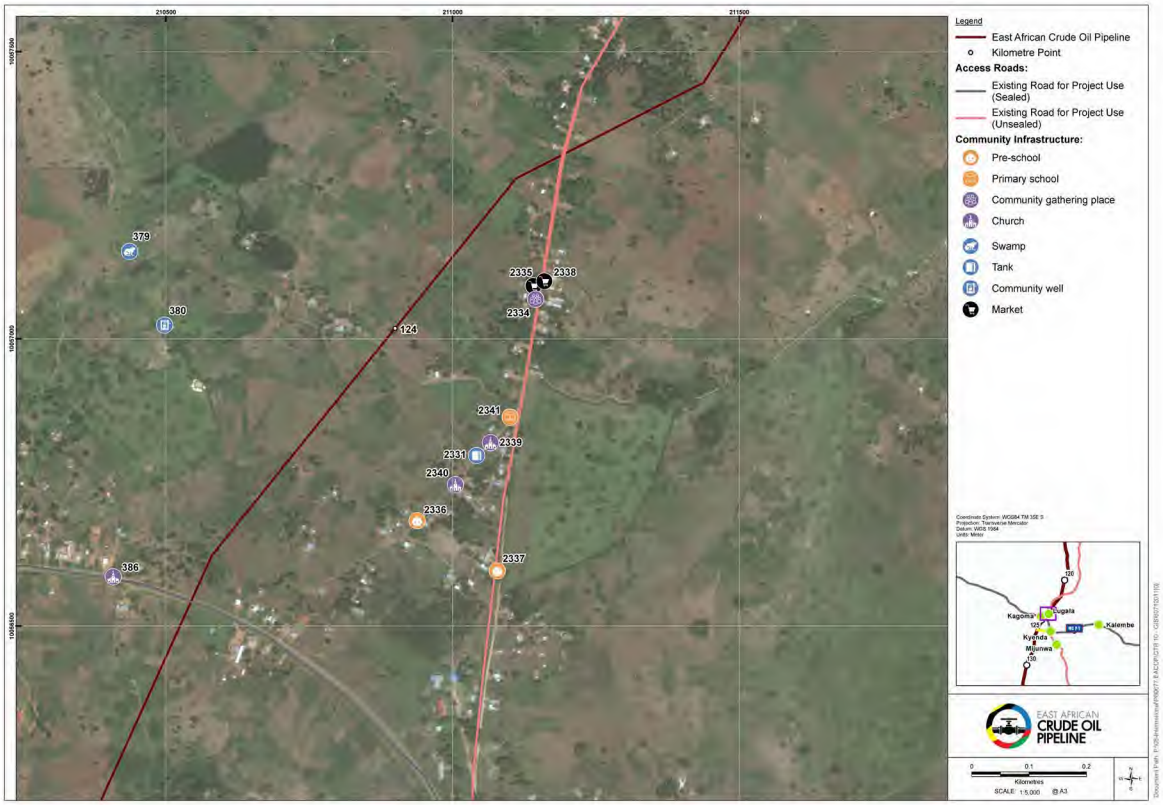
Principal land-based and water-based livelihood strategies

Kyenda is located in the subcounty of Kitenga within Mubende district. The village has a sizeable trading centre with a number of residents engaged in the retail trade.

Land-based and water-based livelihood strategies:
Some residents engage in subsistence farming, growing arable crops including maize and beans. A number of residents own eucalyptus trees in the area. The main kept livestock are cattle, pigs, goats and sheep, with two residents owning large animal farms. Traditional birth attendants collect natural resources, mainly to be used as herbs. Brick laying is also undertaken using loam soil.

Main aspirations for the future:
- Educated children
- Different business types
- Improved market access to our produce
- Improved housing
- Industries and factories

Lugala


Legend
East African Crude Oil Pipeline
Kilometre Point
Access Roads:
Existing Road for Project Use (Sealed)
Existing Road for Project Use (Unsealed)
Community Infrastructure:
Pre-school
Primary school
Community gathering place
Church
Swamp
Tank
Community well
Market
379
380
386
124
2334
2335
2338
2339
2340
2341
2331
2336
2337
Kagoma
Lugala
Kalembe
Kyenda
Mbamwa
EAST AFRICAN
CRUDE OIL
PIPELINE

PAC PROFILE LUGALA - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- The community uses a courtyard at a private residence

Churches/ Mosques:
- 1 church in the village: Luggala Israel Pentecostal Church
- Itambiro Iya Bisaka (one of the traditional religions practised in the area, with a leader called Bisaka)

Mobile phone antenna:
- MTN and AIRTEL mobile networks are available

Communal road:
- Kitenga – Maduddu road (dirt road)
- Kirangwa – Budiba road (dirt road)
- Nsisi road (dirt road)
- Kyojaomanyi road (dirt road)
- Kyejunga road (dirt road)
- Kibisi road (dirt road)

General condition of roads within community:
- Poor. The roads are motorable but narrow

Level of traffic along main road:
- Few vehicles along the roads with the main modes of transport being motorcyles "boda bodas"

Recent history of accidents:
- 5 minor accidents involving motorcycles occur every month and there has been 1 fatal accident involving a motor vehicle every 6 months

Education

Schools:
- Alliance Nursery and Primary School

The Nearest secondary schools are:
- Kitenga Secondary School (1.5 miles away)
- St Zoe Secondary School (2 miles away)

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village. Each household sets up a place as a burial ground

Graves are marked with heaped soil. Stones are collected into a pattern at the grave and some graves have crosses erected at the tomb. Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are drug shops within Kyenda Trading Centre (approximately 1.5 km away)

Health Centre:
- The nearest is Kitenga Health Centre III (approximately 2 miles away)

Community Well:
- There is no community well in the village; water is sourced from dams which are also used as animal drinking points

Community Pumps:
- There are no community pumps in the village

Commerce

Business:
- Shops: 2 retail shops in Kyebando Trading Centre.
- Bars: 2 operating on a small scale
- Street food sellers: none
- Bicycle mechanics
- Tailors
- Barber

PAC PROFILE LUGALA - DESCRIPTION

Population

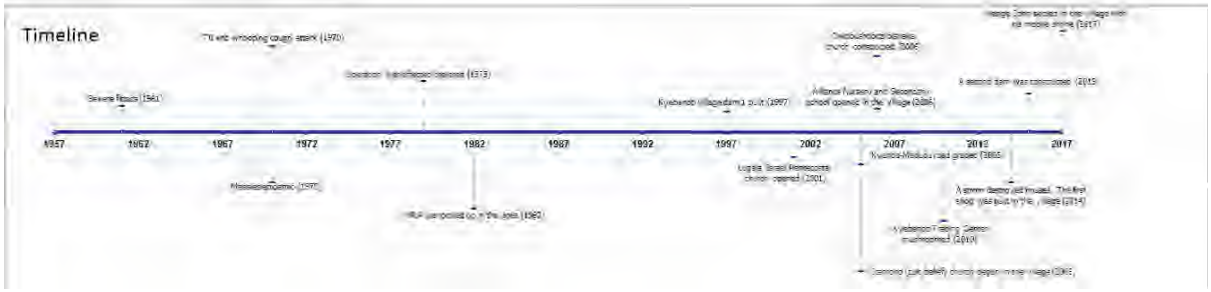
Principal land-based and water-based livelihood strategies

Lugala is located in the subcounty Kitenga within Mubende District

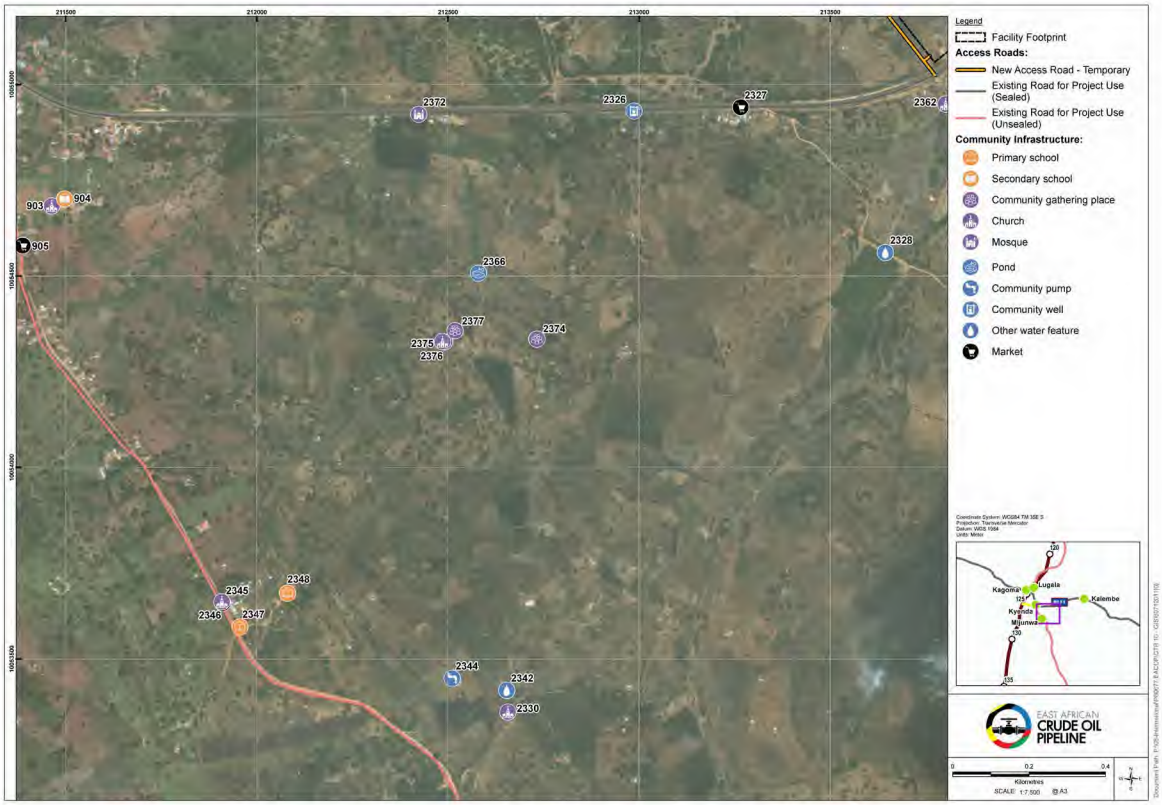
Land-based and water-based livelihood strategies:

The main community livelihood is agriculture, both subsistence and commercial. Cash crops grown include coffee, beans and groundnuts. Food crops grown include cassava, maize, sweet potatoes and bananas. Livestock is reared in the village and includes cattle, goats, chickens, ducks, rabbits, sheep and pigs. A number of tree orchards consisting of eucalyptus can be found in the village. Brick-making and mining takes place and natural resources are gathered for herbal medicinal purposes. Some houses are also engaged in beekeeping at a small-scale.

Main aspirations for the future:
- New water sources
- Better quality of roads
- New land titles for all



Mijunwa



PAC PROFILE MIJUNWA - COMMUNITY INFRASTRUCTURE

General

Administrative Office
- The chairman's home served as LC1 office

Community gathering
- The community uses part of the chairman's home

Churches/Mosques
- Mujunwa Pentecostal Church
- Mijunwa Seventh Day Adventist Church
- Voice of Prophess in Nsanga Trading Centre
- Buterevu Mosque

Mobile phone antenna
- MTN and AIRTEL mobile networks available

Name and category of community road
- Kyenda-Mijunwa road (dirt road)
- Kyenda-Gomba road (dirt road)
- Mityana-Mubende road (tarmac road)

General condition of roads within community
- Narrow but motorable

Level of traffic along main road
- Relatively large number of vehicles along the road, especially along (Mityana0Mubende road. Main type of transport is the boda boda

Recent history of accidents
- 3 minor accidents involving motorcycles occur every month and 2 major accidents per month

Education

School
- Jesus the King Nursery School
- St Joseph Nursery School
- Mujunwa Islamic Nursery and Primary school
- Nearest secondary school os Kitenga Secondary School (1 mile away)
- Nearest technical school is St Zoe Technical and Vocational School (3 miles away)

Cultural Heritage

Cemetery/ graveyard
- No gazetted cemetery within the village. Each household sets up their own burial ground.

Graves are marked by heaping soil into a ridge, patterned with stones and some are marked with crosses. There is need to use local knowledge to identify grace sites

Health

Disepnsary
- Nearest in Kyenda Trading Centre (1.5 km away)

Health Centre
- Nearest is Kitenga Health Centre III (1 mile away)

Hospital
- Mubende Referral Regional Hospital (14 miles away)

Marshes
- Kasensero marsh

Community well
- One shallow water well

Community pumps
- 1 private borehole

Commerce

Market
- Kyenda Market (1 mile away)

Business
- Shops: Kyemu Trading Centre, Buterevu Trading Centre and Nsanga Trading Centre
- Bars: 6
- Tailor

PAC PROFILE MIJUNWA - DESCRIPTION

Mijunwa Village is located in the subcounty of Kitenga within Mubende district.

Land-based and water-based livelihood strategies:

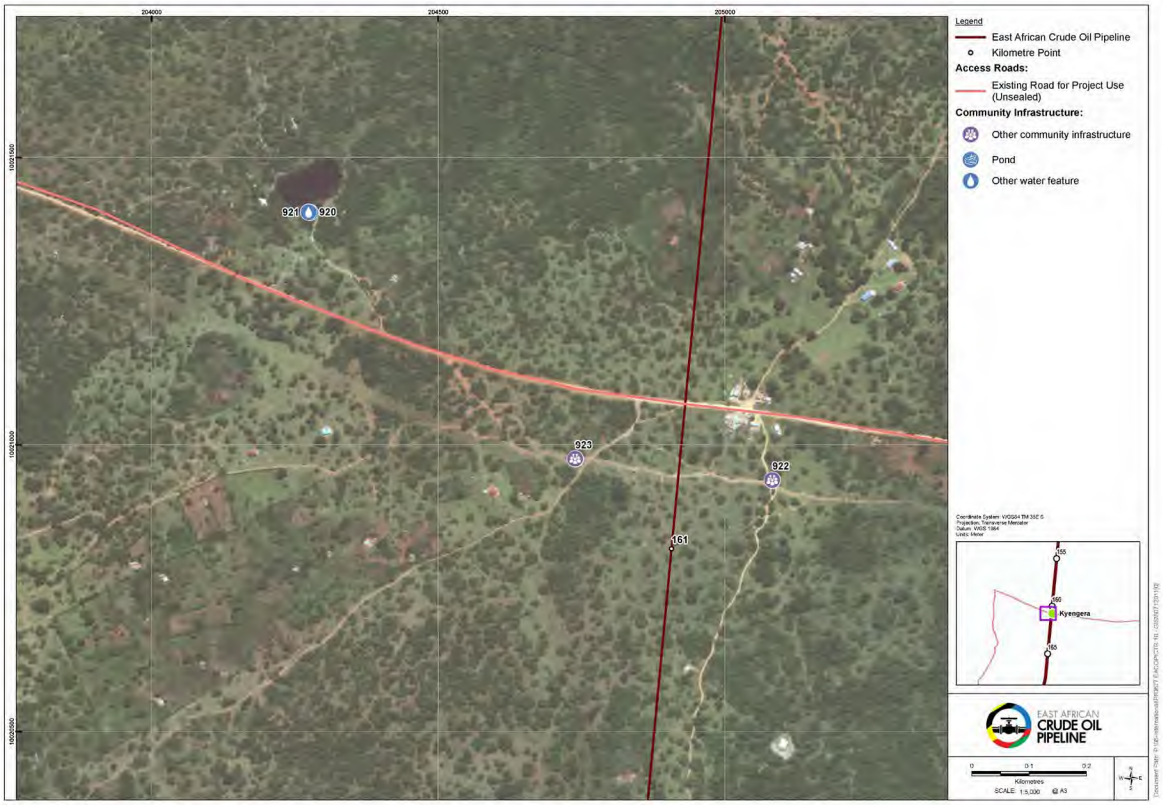
The main livelihood strategies in the village are livestock rearing and crop farming. Livestock reared include cattle, goats, chickens, ducks, rabbits, sheep and pigs. The main cash crops grown are coffee beans and groundnuts, and food grown for consumption include cassava, maize, sweet potato and bananas. Tree orchards consisting of Eucalyptus are found in the village, each usually spanning one acre of land. Four households are engaged in charcoal production. Brick making and mining are also present on a small scale. Beekeeping is undertaken by two members of the village. The gathering of natural resources for herbal medicinal purposes is also common.

Main aspirations for the future:

- Refurbishment of Kansensero Valley Dam
- Dissipate gender based violence
- New infrastructure such as schools and health facilities
- Organisations set up to help vulnerable people
- Access to better health equipment and resources
- Sensitisation on development

Principal land-based and water-based livelihood strategies

Kyengera



PAC PROFILE KYENGERA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses Bugula Trading Centre

Churches/ Mosques:
- Elma's Pentecostal Church
- St.Yakobo Church of Uganda
- Kibona Catholic Church

Mobile phone antenna :
- Airtel network is the most reliable one in Bugula Trading Centre

Communal road:
- Maddu-Kasambya road (dirt road)

General condition of roads within community:
- Roads are generally poor

Level of traffic along main road:
- There is moderately heavy traffic

Recent history of accidents:
- About 5 accidents per month

Education

School:
- Bugula Nursery and Primary school
- Nearest secondary school is Kyayi SEED Secondary Senior Secondary School which is 4 miles from the village
- Nearest tertiary school is Bukalagi Technical Institute

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village as residents have private graveyards. Clans in the area bury their dead in communal graves.

Graves are marked by heaping soil into a ridge, cementing of graves and stone marking.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- Bugula drug shop

Health centre:
- Nearest is Kyayi Health Centre III which is 4 miles away

Hospital:
- Nearest hospital is Maddu Health Centre IV

River:
- Katonga River

Community well:
- They use valley dams (1 private, 1 public)

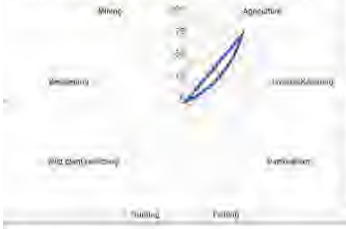
Commerce

Business:
- Shops: 20
- Restaurants: 2
- Hair saloons: 1
- Maize mills: 1
- Water vendors: 30
- Cattle trade: 700
- Produce buying: 40
- Crop farming: 200
- Milk cooling: 1

PAC PROFILE KYENGERA - DESCRIPTION

Population

Principal land-based and water-based livelihood strategies



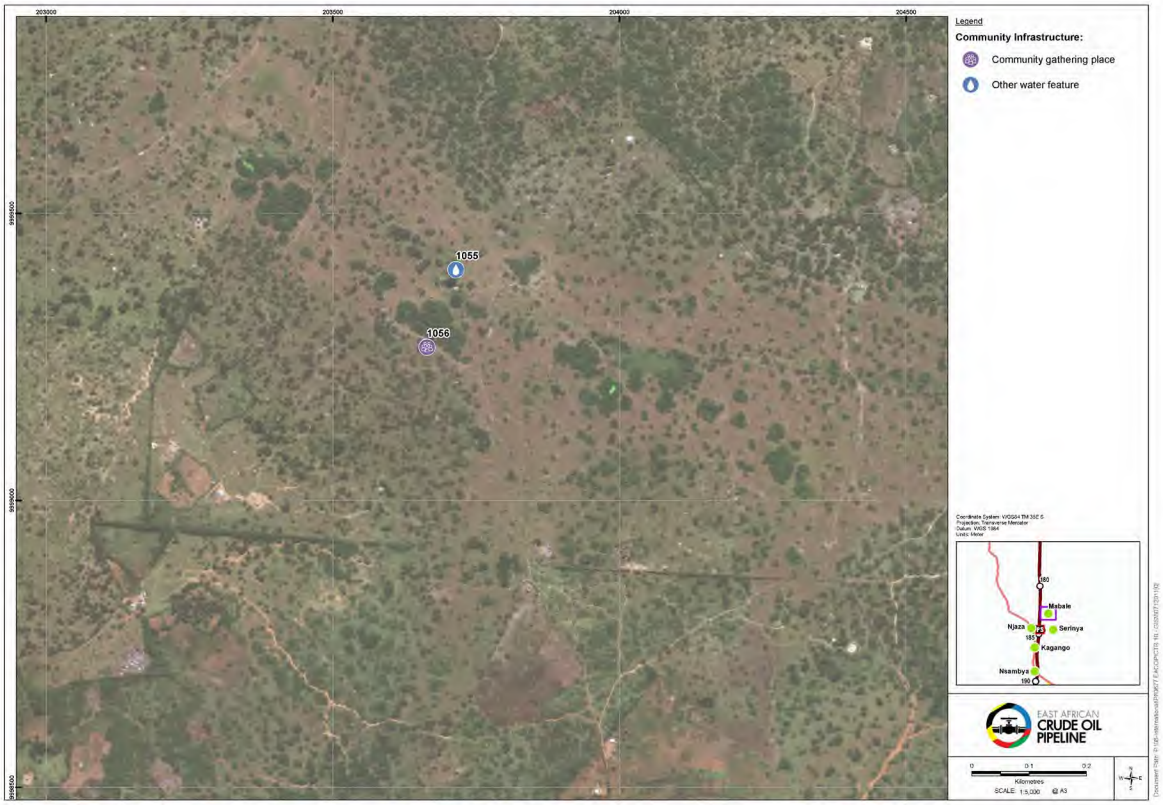
Kyengera is located in the subcounty of Maddu within Gomba district.

Land-based and water-based livelihood strategies:
Pastoralism is the primary activity in the village and is done on a large scale. Cattle, goats, sheep and chickens are reared. Subsistence farming is practiced on a small scale and includes crops such as maize, bananas, cassava and beans. Market gardening is also practiced with cabbages and other vegetables grown. A few residents in the community hunt Uganda kobs and warthogs. Three residents grow eucalyptus trees. Charcoal production is present. Traditional birth attendants collect natural resources. Brick laying activities are undertaken by a few individuals.

Main aspirations for the future:
Growing into a big business Centre
Veterinary drug shops
Better school buildings
Health unit in the area
Electricity
Tarmac roads

Timeline

Mabale



PAC PROFILE MABALE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses the Chairperson LC1

Churches/ Mosques:
- There is one church which is Mabale Pentecostal Church

Mobile phone antenna :
- Airtel network is the most reliable network in the village

Communal road:
- Mabale –Njaza Road (dirt road)

General condition of roads within community:
- Roads are very narrow with thorny bushes and shrubs

Level of traffic along main road:
- No traffic

Education

School :
- The nearest Nursery and Primary School is Selinya
- The nearest secondary school is Kagango Secondary School, which is about 6km away from the village
- Nearest tertiary school is Lutunkl Technical Institute- 6km away

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with soil heaped into a ridge, cementing graves and stone marking.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Nearest is Kagango Health Centre II, which is 6km away

Hospital:
- Nearest hospital is Sembabule Health Centre IV, which is about 12 km away from the village

Community well:
- They use valley dams

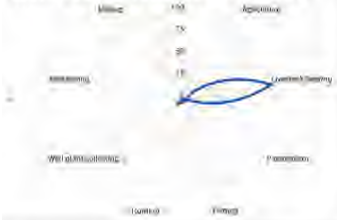
Commerce

Business:
- Cattle trade: 30
- Milk vending: 10

PAC PROFILE MABALE- DESCRIPTION

Population

Principal land-based and water-based livelihood strategies

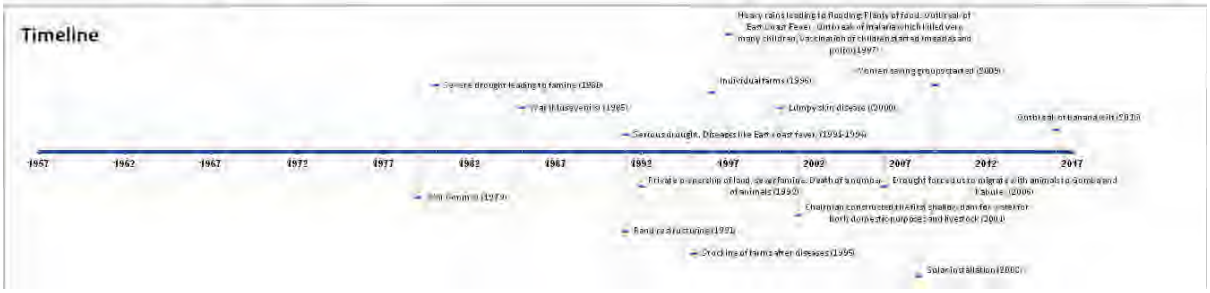


Mabale is located in the subcounty of Lugusulu within Sembabule district.

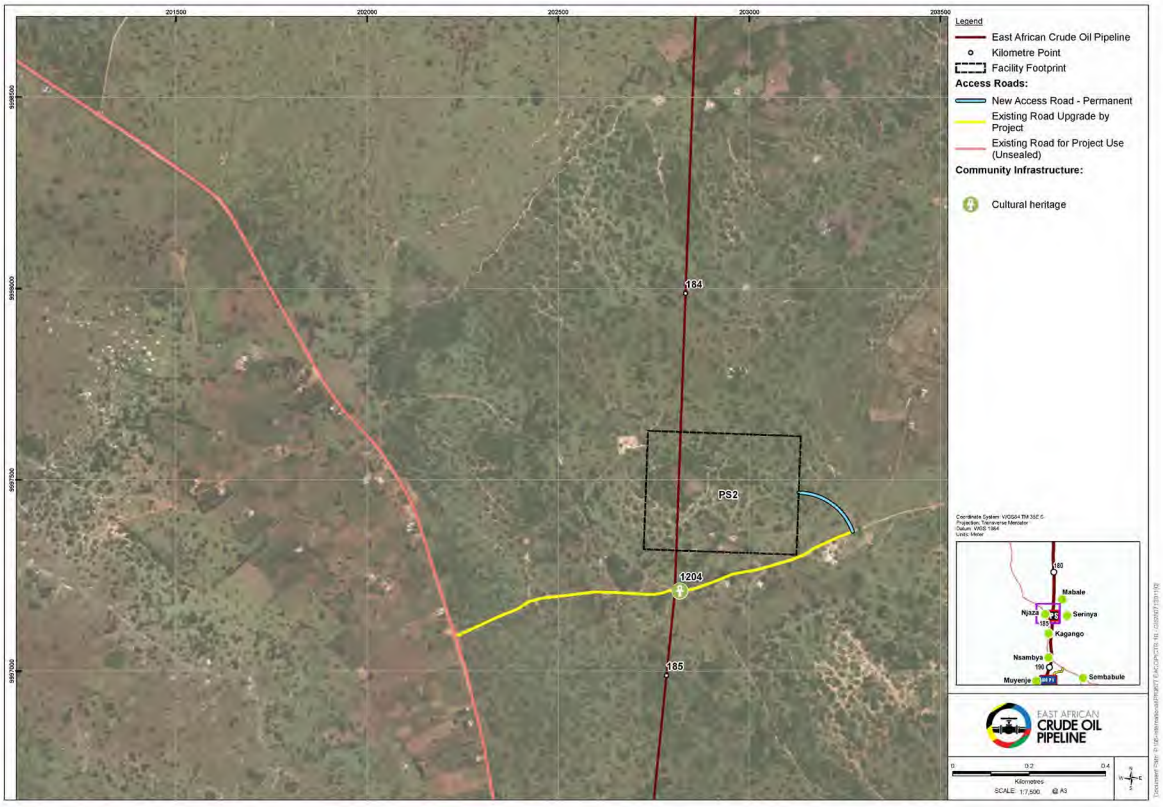
Land-based and water-based livelihood strategies:
Cattle rearing is the primary livelihood within the village. A small section of land is used for subsistence farming of crops such as maize and beans. Hunting is present in the village with some residents catching Uganda kobs. The gathering of natural resources is mainly undertaken by traditional birth attendants.

Main aspirations for the future:
- Developing into a business centre
- The village needs schools
- It also needs electricity
- Require water dams and hospital

Timeline



Njaza



PAC PROFILE NJAZA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses a tree shade next to the Chairpersons homestead that also acts as polling station

Churches/ Mosques:
- Njaza Church of Uganda
- Njaza Pentecostal Church

Mobile phone antenna :
- None- Major service providers are available- MTN and AIRTEL. Airtel is most reliable

Communal road:
- Njaza-Mabale road (dirt road)
- Njaza-Serinya road (dirt road)

General condition of roads within community:
- Narrow and poorly maintained roads, notably Njaza-Mabale road (dirt road)

Level of traffic along main road:
- Moderately busy due to sand haulage trucks

Education

School :
- The primary schools in the nearby villages of Serinya and Kagango also have pre-schools which serve the community
- Kagango Church of Uganda Nursery and Primary School (3km away)
- Serinya Nursery and Primary School (3km away)
- Kagango Secondary School (3km away)
- Lugusulu High School (3km away)

Cultural Heritage

Graves are marked with soil heaped into ridges, cementing of graves and the use of stone patterns.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Kagango Health Centre II, which is 4km away
- Lugusulu Health Centre III, which is 8km away
- Ssembabule Health Centre IV

Hospital:
- Nearest referral hospital is Mulago Hospital in Masaka which is about 54 km from the village

Community well:
- They use 3 valley dams that are also used by cattle

Commerce

Business:
- Shops: 2

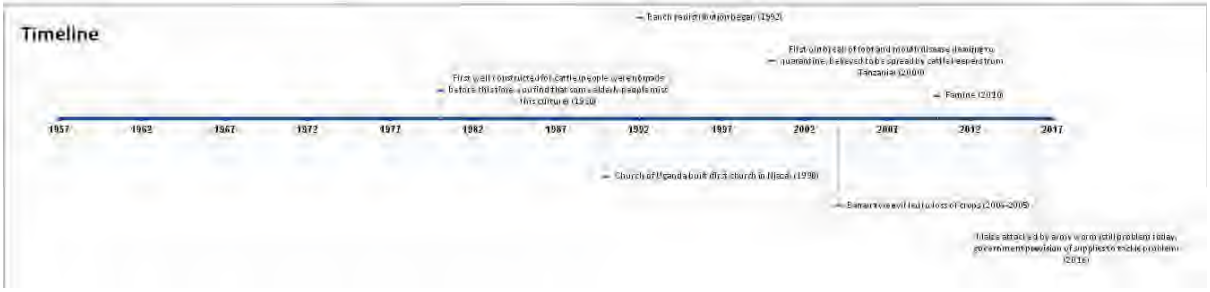
PAC PROFILE NJAZA - DESCRIPTION

Principal land-based and water-based livelihood strategies

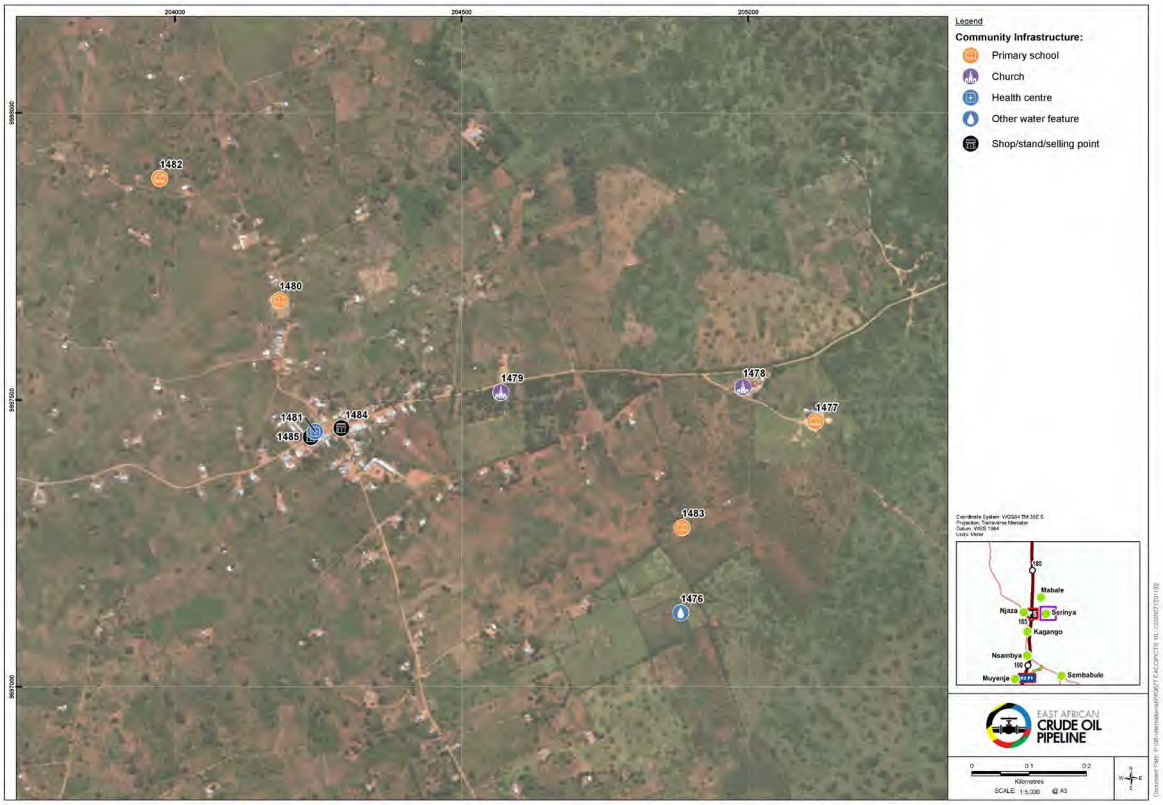
Njaza is located in the subcounty of Lugusulu within Sembabule district. Most residents have over 20 acres of grazing land with a few scattered households.

Land-based and water-based livelihood strategies:
Cattle keeping is the primary activity in the village and is practiced on a large scale. The main kept animals include cattle, goats and chickens. The main crops grown are bananas, maize and beans which also act as cash crops. Hunting is present in the community with antelopes and Uganda kobs being caught. Few residents have tree plantations. Many residents are involved in charcoal production. The gathering of natural resources is common, mainly for herbal medicines. A number of residents are involved in sand mining and brick making.

Main aspirations for the future:
- School
- Health centre



Serinya



PAC PROFILE SERINYA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses Selinya Trading Centre

Churches/ Mosques:
- Church of God
- Selinya Church of Uganda

Electric lighting within community centre:
- Use of solar power for lighting barber shops and saloon

Mobile phone antenna :
- MTN, Airtel, Africell and K2 available

Communal road:
- Serinya –Bugololwa road (dirt road)
- Serinya –Sembabule road (dirt road)

General condition of roads within community:
- Roads are generally poor with gulleys, with some sections of the feeder roads being narrow

Level of traffic along main road:
- Moderate

Recent history of accidents:
- Accidents are a rare occurrence

Education

School :
- Divine Nursery and Primary School
- Selinya Nursery and Primary School
- The nearest secondary schools are: Kawanda Secondary school and Sembabule Secondary school
- Nearest tertiary school is Lutunku Technical Institute - 20km away

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village

Graves are marked with ridges of soil, cemented areas and stone marking.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are 3 drug shops in the area

Health centre:
- Nearest is Kagango Health Centre II, which is 4km away

Hospital:
- Nearest hospital is Ssembabule Health Centre IV, which is about 11 km away from the village

Community well:
- They use valley dams

Community pumps:
- The village has 2 valley dams

Private boreholes:
- 1 non-functional borehole

Commerce

Business:
- Shops
- Bars
- Chapati sellers
- Restaurants
- Mechanics
- Tailors
- Barber shops
- Hair saloons

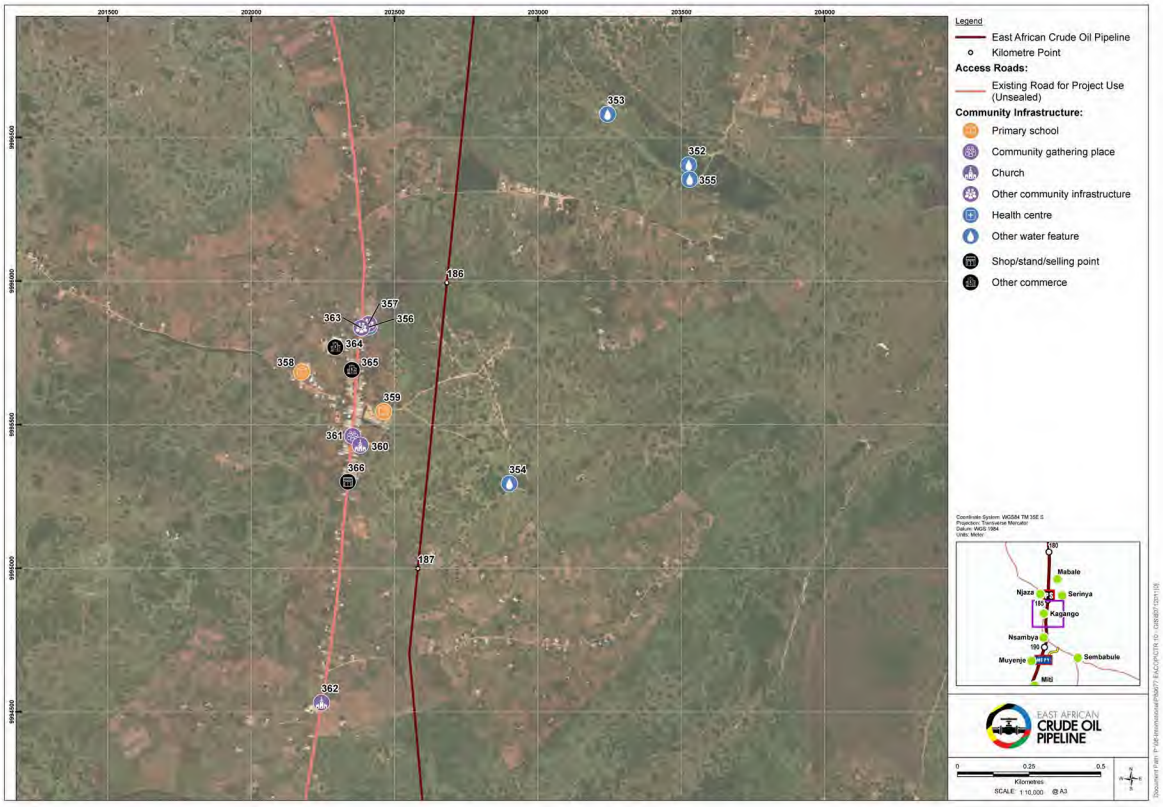
PAC PROFILE SERINYA - DESCRIPTION

Serinya is located in the subcounty of Lugusulu within Sembabule district. Most residents of the village are bibanja owners though there are parcels of land under lease hold and mailo.

Land-based and water-based livelihood strategies:
The primary sources of livelihoods in the village include subsistence farming of crops including maize, beans, peas, Irish potatoes and bananas. Livestock farming is carried out by few households on a large scale with animals including pigs, goats, chickens and cattle. Some members of the community hunt Uganda kobs and squirrels. Charcoal production is undertaken. Herbs are collected by traditional birth attendants. Brick laying using loam soil is practiced on a small scale. Beekeeping is also practiced on a very small scale.

Main aspirations for the future:
- Electricity
- Piped water
- Construction of public dams

Kagango



PAC PROFILE KAGANGO – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using Kagango Parents Primary School Premises

Community gathering place:
- The community currently uses Kagango Parents Primary School Premises

Churches/ Mosques:
- Church of God
- Pentecostal Church
- Kagango Mosque

Mobile phone antenna :
- MTN and Africell

Communal road:
- Sembabule-Lugusulu road (dirt road)
- Kagango-Kyebando road (dirt road)
- Kagango –Selinya road (dirt road)

General condition of roads within community:
- Roads are generally poor

Level of traffic along main road:
- Moderately busy

Recent history of accidents:
- Accidents are a rare occurrence

Education

School :
- Kagango Parents Nursery and Primary School
- Kagango Infants Primary School
- Lugusulu High School
- Nearest tertiary school is Lutunku Technical Institute - 22km away

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with heaped soil, cement and stone marking.

Local knowledge is needed to identify grave sites in the area.

Health

Health centre:
- Kagango Health Centre II

Hospital:
- Nearest hospital is Sembabule Health Centre IV, which is about 12 km away from the village

Community well:
- They use valley dams

Community pumps:
- The village has 2 valley dams, 1 of which is private

Commerce

Market :
- Nearest Market is Sembabule market, which is 12 km away

Business:
- Shops
- Bars
- Pancake sellers
- Mechanics
- Tailors
- Barber shops
- Hair saloons

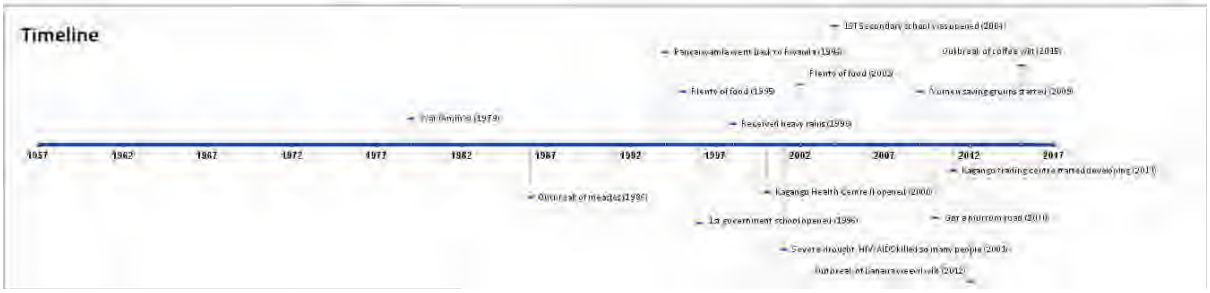
PAC PROFILE KAGANGO - DESCRIPTION

Population

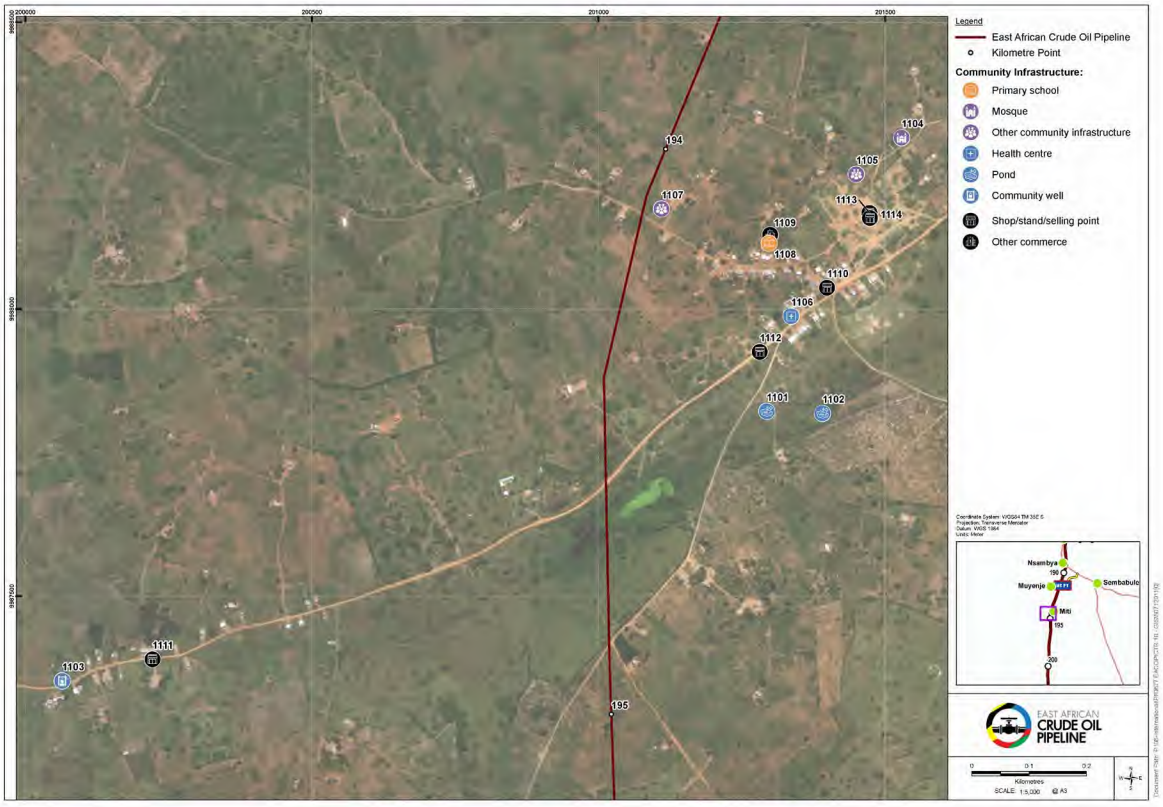
Kagango is located in the subcounty of Lugusulu within Sembabule district. The majority of the residents are bibanja owners.

Land-based and water-based livelihood strategies:
The residents of the village largely practice subsistence farming. The cash crop grown include maize, beans, coffee and bananas among others. Cows, goats, chickens and pigs are also kept in the community. Some residents hunt Uganda kobs and warthogs. Eucalyptus trees are grown by few residents in plantations. Traditional birth attendants gather natural resources. Brick laying using loam soil in practiced on a small scale. Beekeeping is also present on a small scale.

Main aspirations for the future:
- Infrastructural development like schools, hospitals
- Increased agricultural production



Miti



PAC PROFILE MITI – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses Kabagarabe market shade in the trading centre

Churches/ Mosques:
- Miti Church of Uganda
- Miti Apostle Church
- Miti Mosque

Electric lighting within community centre:
- Electric poles are being erected

Mobile phone antenna:
- None- Major service providers are available- MTN, AIRTEL and Africell.

Communal road:
- Sembabule-Nambirizi road (dirt road)
- Miti-Kyabafisa road (dirt road)
- Kasekera-Miti road (dirt road)
- Bugaba-Miti road (dirt road)

General condition of roads within community:
- Relatively well maintained roads

Level of traffic along main road:
- Moderately busy roads

Recent history of accidents:
- 1 road accident per month

Education

School :
- Pre-St. Aloysius Nursery and Primary School
- The nearest secondary school is Muteesa Royal College, which is 0.5km
- Star College Technical Institute- 5km away (tertiary school)

Cultural Heritage

Graves are marked with soil heaped into ridges, the cementing of graves and the use of stone patterns.

Local knowledge is needed to identify the grave sites in the area.

Health

Health centre:
- Sembabule Health Centre IV, 3km away

Dispensary and clinic:
- Bbira clinic and drug shop
- Betty's clinic and drug shop
- Kaawa's clinic

Hospital:
- Nearest referral hospital is Mulago Hospital in Masaka, which is about 50 km from the village

Marshes:
- Miti marsh

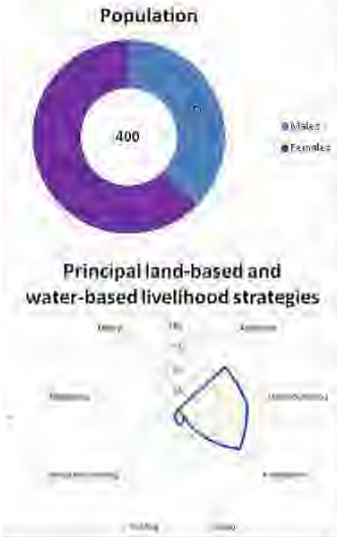
Community well:
- They use valley dams that are also used by cattle

Commerce

Market :
- There is a market area where mainly commodities for domestic use are sold

Business:
- Shops: 10
- Hair saloons: 2
- Trade in agriculture
- Produce: 5
- Restaurants: 2
- Chapati sellers: 2
- Mechanics: 2

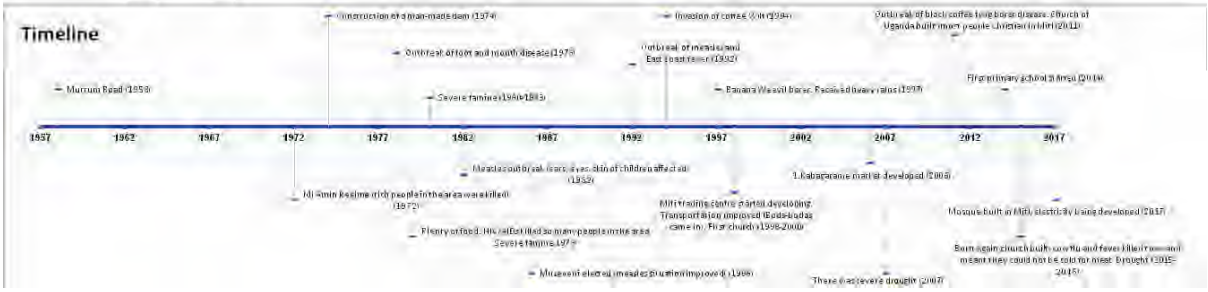
PAC PROFILE MITI - DESCRIPTION



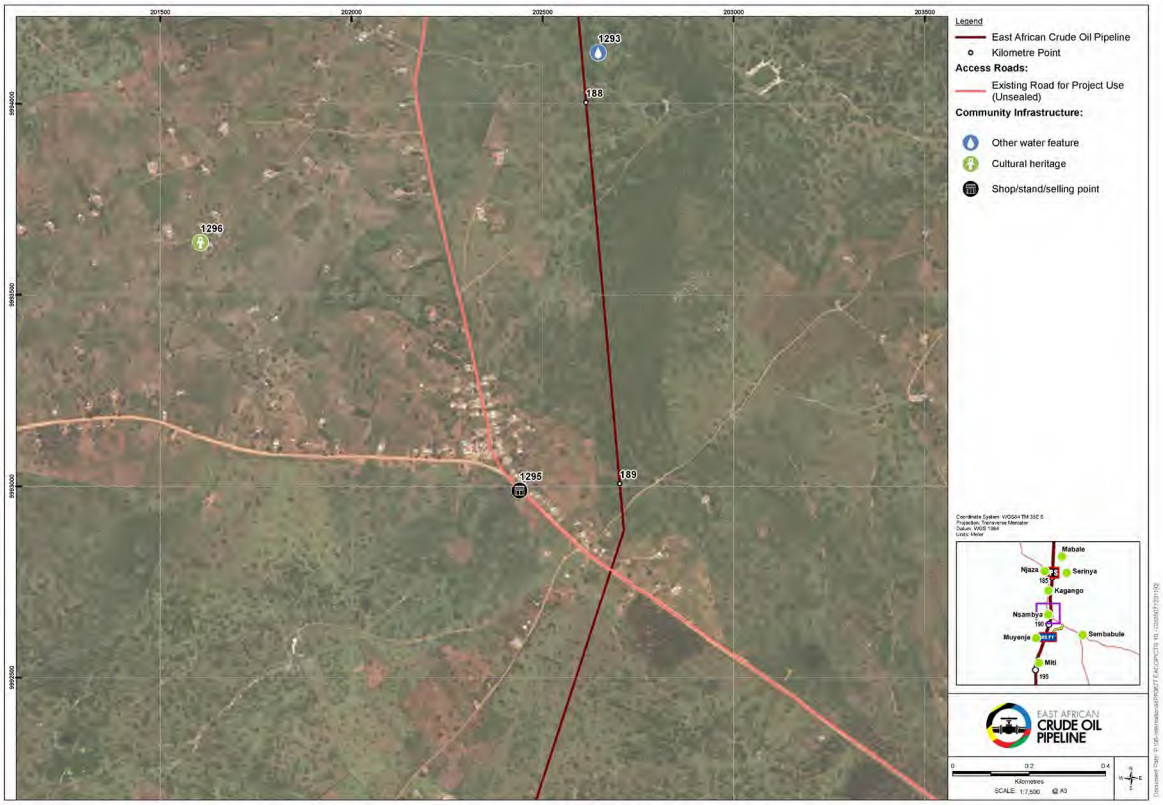
Miti is located in the subcounty of Mijwala within Sembabule district.

Land-based and water-based livelihood strategies:
Cattle keeping is one of the key livelihood activities. The main crops grown for food include bananas, sweet potatoes and cassava. The main cash crops grown include cassava, beans, coffee, maize, and a variety of different fruit trees. Residents of the village hunt antelopes, Uganda kobs and warthogs. There are few tree plantations in the village, but those that do exist consist of eucalyptus trees. The gathering of natural resources is carried out mainly for herbal medicine. A number of residents are involved in brick making.

Main aspirations for the future:
- Improved health services and facilities
- Improved water supply (Piped water)
- Industrial development for example a coffee factory
- Schools
- Women empowerment



Nsambya



PAC PROFILE NSAMBYA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses trading centre under a tree shade

Churches/ Mosques:
- Nsambya Catholic Church

Mobile phone antenna :
- None- Major service providers are available- MTN, AIRTEL and Africell and K2

Communal road:
- Sembabule-Ntusi road (dirt road)
- Nsambya-Lugusulu road (dirt road)
- Namwandu road (Kabaka road)
- Mujadi road (dirt road)

General condition of roads within community:
- Relatively well maintained roads

Level of traffic along main road:
- Moderately busy roads

Recent history of accidents:
- 1 road accident per month

Education

School :
- Divine Junior Nursery School
- Good Angels Nursery School
- The nearest primary school is Kagango Primary School – approximately 3km away
- The nearest secondary school is Kagango Secondary School – 3km away
- The nearest tertiary school is Star College Technical Institute and is 6km away

Cultural Heritage

Cemetery/ graveyard:
- None within the village but there is a cemetery at a Catholic church within Nakasagazi village.

Graves are marked with heaped soil, cement and stone markings.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- Good care clinic and drug shop
- Musawo Amina drug shop

Health centre:
- Kagango Health Centre II, which is 3km away
- Lugusulu Health Centre III, which is 10km away
- Sembabule Health Centre III

Hospital:
- Nearest referral hospital is Mulago Hospital in Masaka which is about 52km from the village

Community well:
- They use valley dams that are also used by cattle

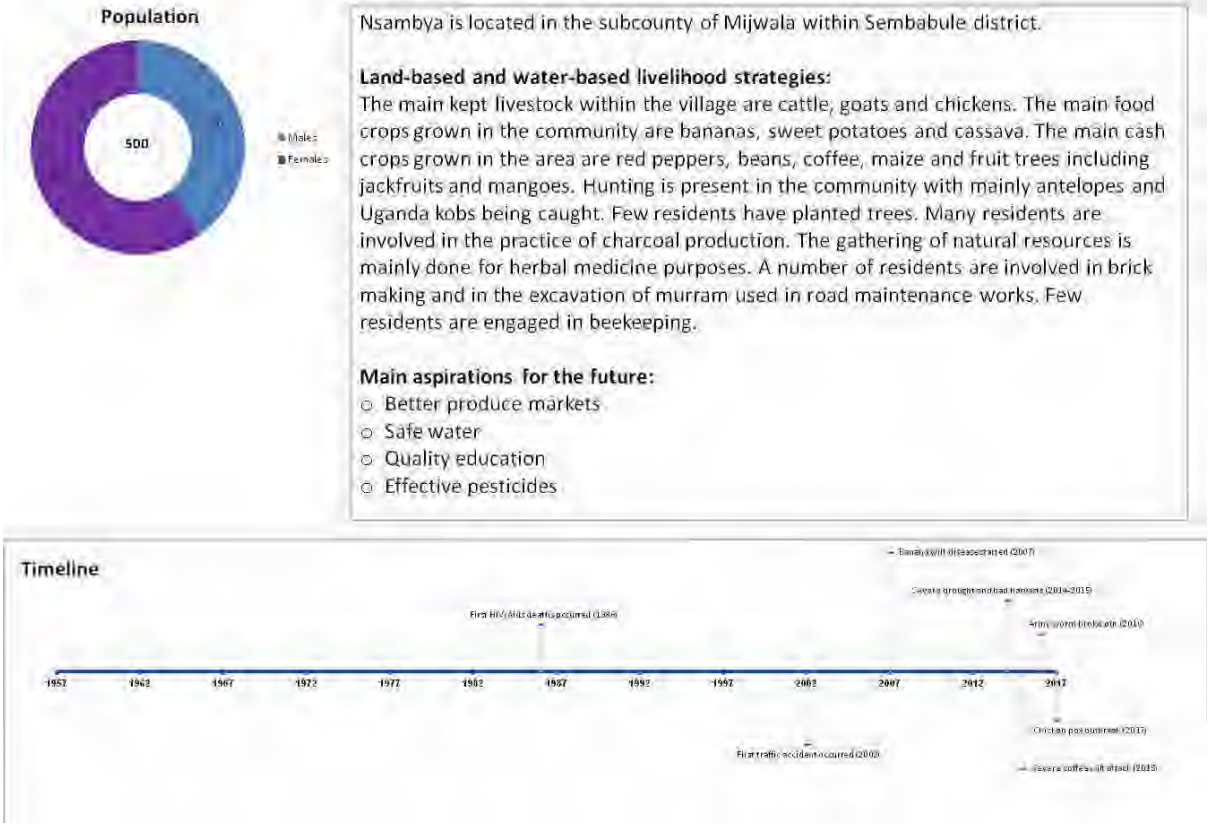
Community pumps:
- 1 borehole that is non-functional

Commerce

Market :
- There is a market area where mainly commodities for domestic use are sold

Business:
- Shops: 10
- Mechanics

PAC PROFILE NSAMBYA - DESCRIPTION



Muyenje

PAC PROFILE MUYENJE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses Muyenje Trading Centre

Mobile phone antenna :
- None- Major service providers are available- MTN, AIRTEL and Africell

Communal road:
- Nakayaga –Ndeeba road (dirt road)
- Sembabule Ntusi road (tarmac road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Approximately 5 vehicles per day

Education

School :
- Miss Nansamba St. Bernard's Primary School, Muyenje
- Byanika Parents Primary School
- The nearest secondary schools are Sembabule Church of Uganda Secondary school and Uganda Martyrs Sembabule
- The nearest terfiary school is Lutunku Polytechnic- 11km away

Cultural Heritage

Cemetery/ graveyard:
- No gazetted cemeteries within the village, each households have their own graveyards.

Soil is heaped into ridges to mark burial grounds, as is cementing the burial ground and adding stone patterns.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- Nearest dispensary is Kagango village

Health centre:
- Nearest is Sembabule Health centre IV

Hospital:
- Mulago hospital (36 km away)
- Villa Maria hospital (32km away)
- Bam Hospital in Matete trading centre (11km away)

Community well:
- 6 unprotected community wells

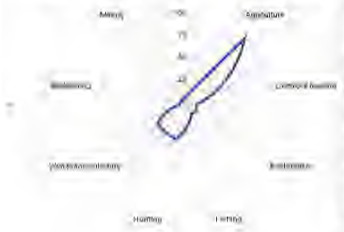
Community pumps:
- 1 non-functional

Commerce

Business:
- Hair saloons: 1
- Tuck shops: 1

PAC PROFILE MUYENJE - DESCRIPTION

Principal land-based and water-based livelihood strategies

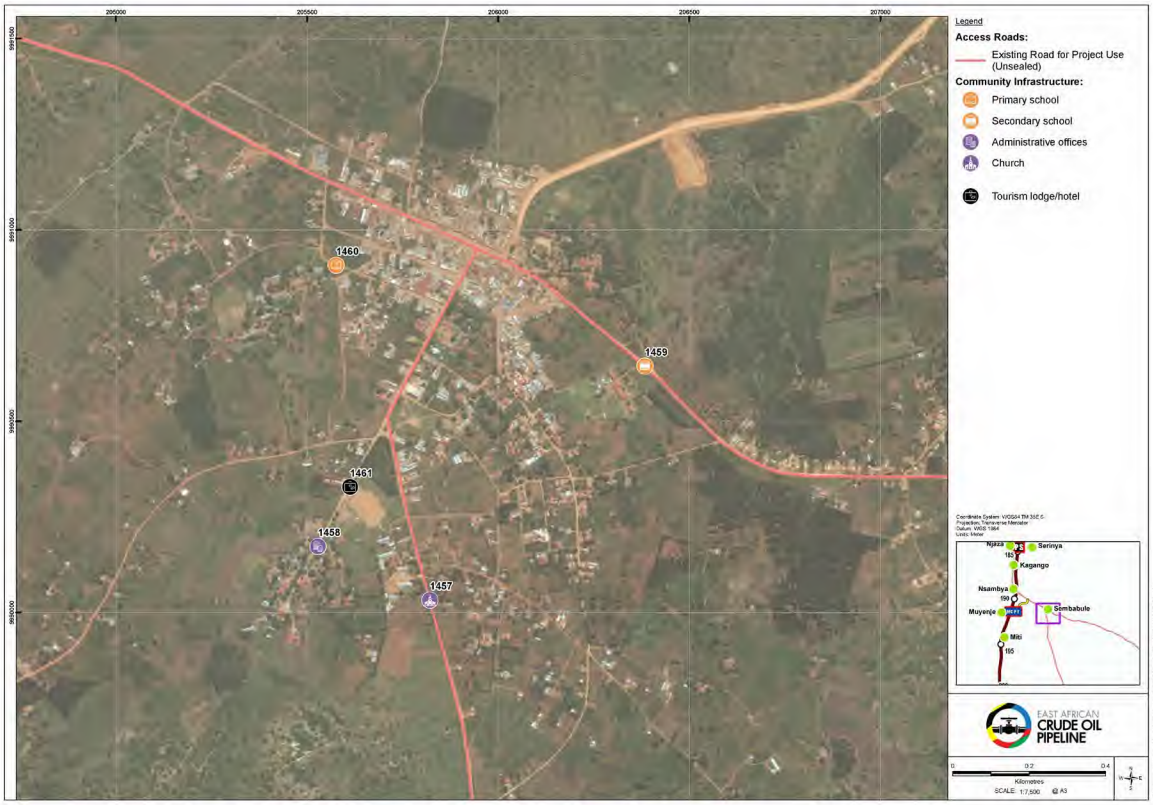


Muyenje is located in the subcounty of Mijwala within Sembabule district.

Land-based and water-based livelihood strategies:
The main kept livestock in the village rattle, goats, chicken, rabbits and pigs; four residents own over 100 heads of cattle. The main crops grown are coffee, maize, bananas, beans and fruit trees. The hunting of warthogs, antelopes and Uganda kobs is present in the village. A few residents have eucalyptus trees, pine trees and fruit trees. The gathering of natural resources is practiced and is used for herbal medicines. Sand mining is also undertaken in village.

Main aspirations for the future:
- To have places of worship
- To have safe and clean water supply
- To have schools in the village
- To have a healthy facility in the village
- Large scale coffee planting programmes
- Improved maize

Sembabule



PAC PROFILE SEMBABULE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- Sembabule church of Uganda premises

Churches/ Mosques:
- Ssembabule Church of Uganda
- Agape Community Church

Community waste disposal system:
- The Town Council provides waste bins which are then carried away using waste disposal truck

Animal waste disposal area:
- Sembabule abattoir

Mobile phone antenna:
- Major service providers are available- MTN, AIRTEL, Africell and K2

Communal road:
- Sembabule-Mubende road (dirt road)
- Church road (dirt road)
- Sekimpi road (dirt road)
- Senoga road (dirt road)
- Kasubi road (dirt road)

General condition of roads within community:
- Roads are moderately maintained

Level of traffic along main road:
- Moderately busy roads

Recent history of accidents:
- Accidents are a very rare occurrence

Education

School :
- St. Elizabeth Nursery School
- Semabahule Church of Uganda Nursery and Primary School
- Sembabule Church of Uganda Secondary School
- Star College Technical Institute (tertiary)
- Lukunku Polytechnic Institute (tertiary)

Teachers' accommodation blocks :
- Sembabule Church of Uganda has staff quarters

Cultural Heritage

Health

Health centre:
- Sembabule Health Centre IV

Clinic:
- Victoria clinic
- Twiyina Omujuni clinic
- Dr. Kasibante's clinic
- God's clinic

Hospital:
- Muhumuza Hospital in Matete (privately owned) in Matete (18km away) and Villa Maria Hospital (40km away)

Community well:
- The cell is connected to the National Water and Sewerage Corporation grid

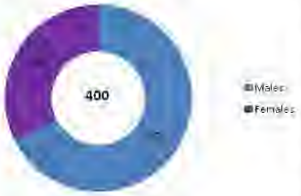
Communal washing areas:
- There is a privately owned washing bay

Commerce

Business:
- Shops
- Bars
- Street food sellers
- Restaurants
- Lodges
- Mechanics
- Petrol station
- Tailors
- Hair saloons
- Barber shops
- Printers

PAC PROFILE SEMBABULE - DESCRIPTION

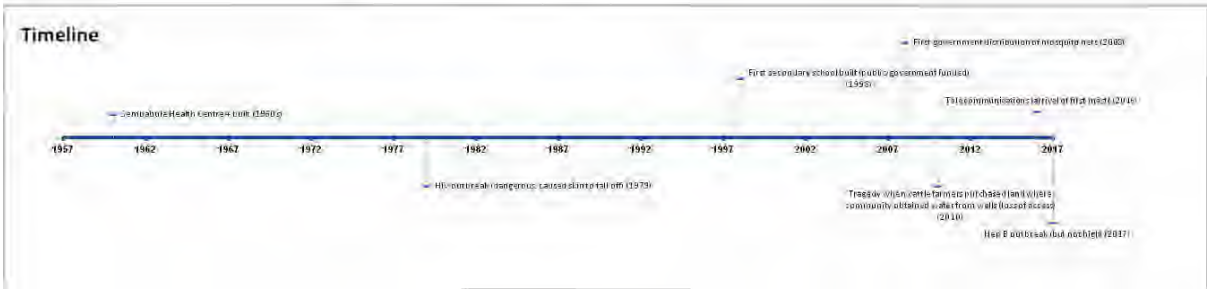
Population



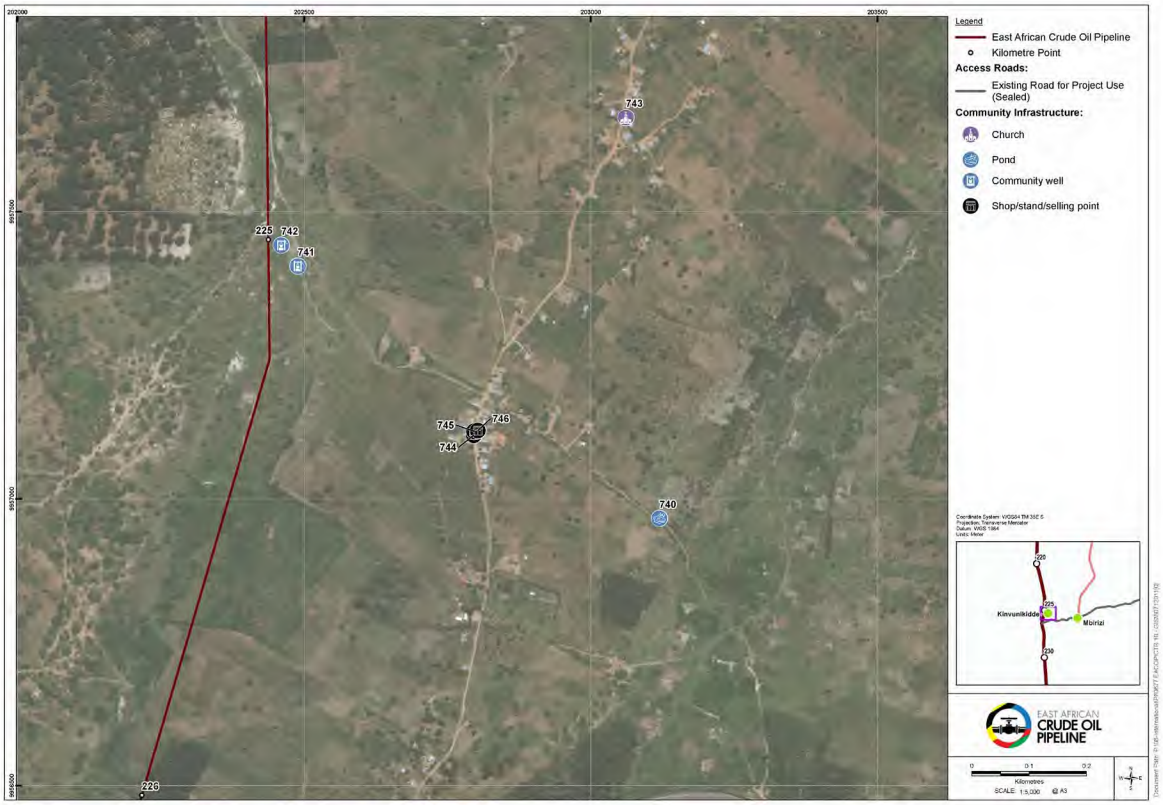
Sembabule Market Zone is located in the subcounty of Sembabule Town Council within Sembabule district. The area is primarily an urban setting with a few crops grown on small scale.

Land-based and water-based livelihood strategies:
Few homesteads in the community keep chickens and cattle. The residents grow some crops including maize, beans and bananas on very small plots of land. Market gardening is also undertaken but on a very small scale.

Timeline



Kinvunikidde



PAC PROFILE KINVUNIKIDDE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- Kinvunikidde Trading Centre and at Nakatooke Hamlet

Churches/ Mosques:
- Kinvunikidde Church of Uganda
- Church of God, Kinvunikidde
- Calvary Temple, Kinvunikidde
- Kinvunikidde Catholic Church

Mobile phone antenna:
- None- MTN and AIRTEL mobile telephone networks are available

Communal road:
- Kinvunikidde-Nkoma road (dirt road)
- Kinvunikidde –Mbirizi RC (dirt road)
- Masaka –Mbarara road (tarmac)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Moderate number of vehicles along the road, except along the Masaka-Mbarara road

Recent history of accidents:
- 7 accidents per year, mainly non-fatal involving motorcyclists

Education

School :
- St. Aloysius Nursery School
- Cleverland Nursery School
- Mbirizi Primary School
- Balimenkya Primary School
- The nearest secondary school is Hope Integrated Secondary school - 2km away
- Lwengo Technical Institute- 8km away (tertiary)

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village

Graves are marked by soil heaped into ridges, crosses, cement and stone patterns.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Kyetume Health Centre III, which is 4km away
- St. Francis Health Centre (privately owned by the Catholic Missionaries), which is within Mbirizi Trading centre

Hospital:
- Nearest referral hospital is Lwengo Health Centre IV, which is approximately 9 km away

Community well:
- 7 community wells (unprotected)

Community pumps:
- 2 non-functional boreholes

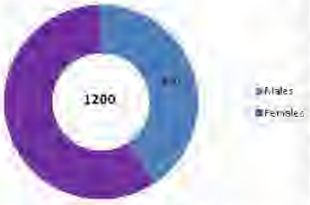
Public latrines:
- At the churches

Commerce

Business:
- Shops: 18
- Bars
- Mechanics

PAC PROFILE KINVUNIKIDDE - DESCRIPTION

Population



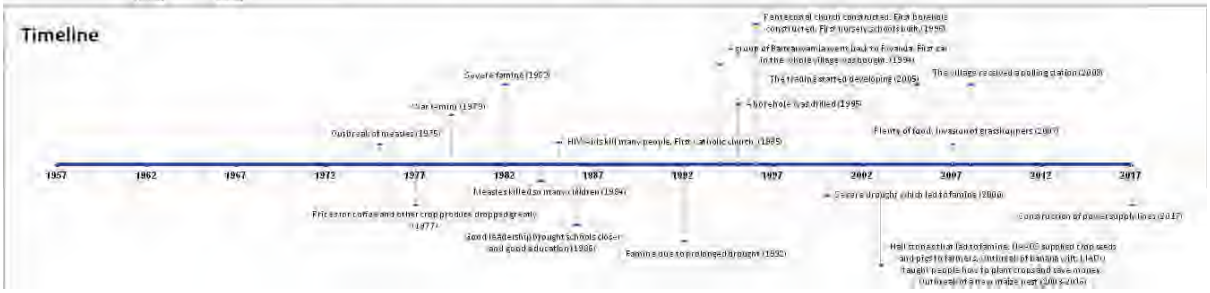
Principal land-based and water-based livelihood strategies

Kinvunikidde is located in the subcounty of Lwengo within Lwengo district.

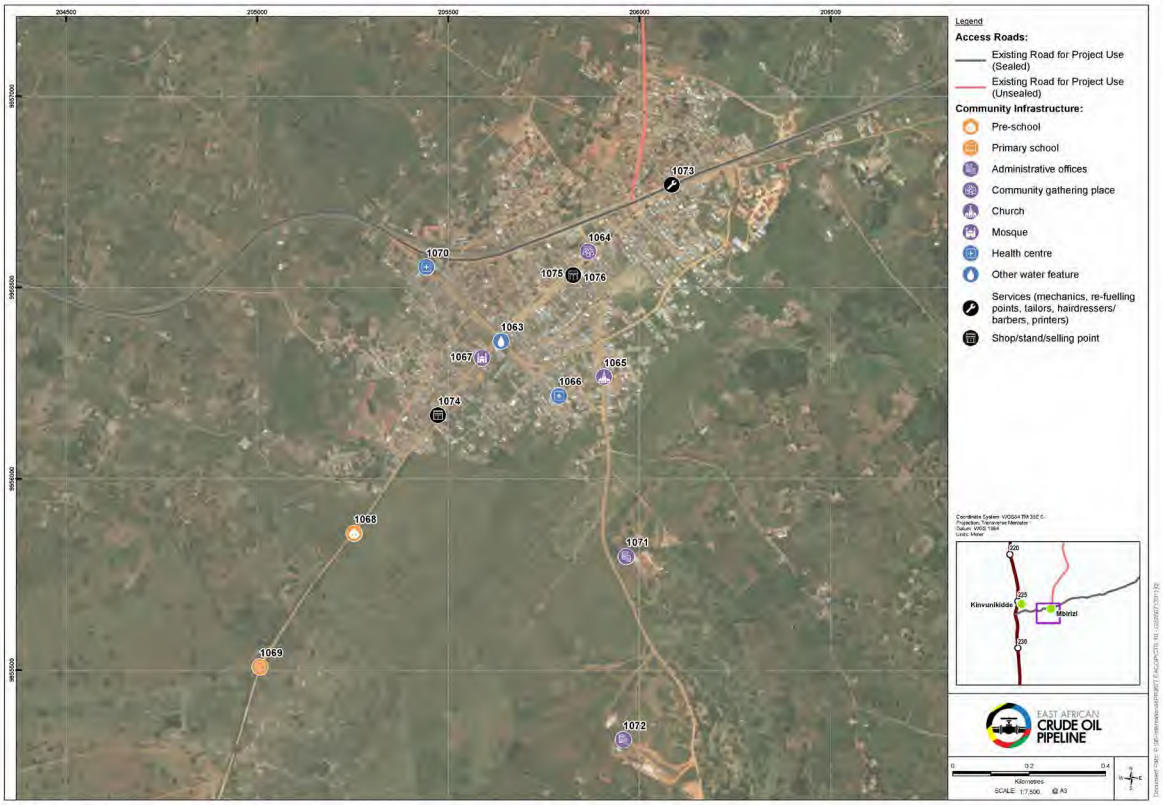
Land-based and water-based livelihood strategies:
The main kept livestock in the village are cattle, goats, chicken, rabbits and pigs. There are a number of fruit trees including mangoes in the village, in addition to coffee, bananas and maize that are grown as cash crops. Food crops include cassava, maize and bananas. Antelopes, enjaza and rabbits are hunted within the community. There are a number of tree orchards especially eucalyptus trees grown by residents. Charcoal production is present on a small scale. Natural resources including plants such as omululuza, kamunye, mavigamukulu and seziwundu are collected for herbal medicines. Beekeeping is practiced on a small scale.

Main aspirations for the future:
- Education services
- Having improved health services
- Industrial development for example a coffee factory and fruit making industry
- Infrastructural development
- Improved water supply
- Have electricity in the village

Timeline



Mbirizi



PAC PROFILE MBIRIZI – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- There are LC1 administrative offices within Lwengo Trading centre

Community gathering place:
- The community uses a patch in Lwengo Trading Centre and a football pitch within the Trading Centre

Churches/ Mosques:
- Prayer Palace, Mbirizi
- Answar Masjid

Communal waste disposal:
- Garbage skip has been put in place by the Town Council

Mobile phone antenna :
- None- MTN and AIRTEL mobile telephone networks are available

Communal roads:
- Lwengo road that connects Lwengo Trading Centres to Kyotera Town (dirt Road)
- Mulyazaawo Road (dirt road)
- Nyenje road

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Moderate number of vehicles along the road

Recent history of accidents:
- Accidents are a very rare occurrence in the village

Education

School :
- Town Standard Nursery and Primary School
- Top Care Nursery and Primary School
- Ddungu Junior Nursery and Primary School
- The nearest schools include St Josephs Secondary school, Modern Secondary school and Mbirisi High School- all 1km away
- Lwengo Technical Institute - 5km away (tertiary)

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery.

Burials take place at local level and graves are market with stone patterns, crosses and some have constructed headstones.

Health

Health centre:
- Mbirizi Muslim Health Centre III
- St. Francis Hospital, Mbirizi (privately owned missionary hospital)

Clinic:
- 2 clinics

Hospital:
- Nearest referral hospital is Lwengo Health Centre IV, which is approximately 3 km away

Community well:
- 1 unprotected well

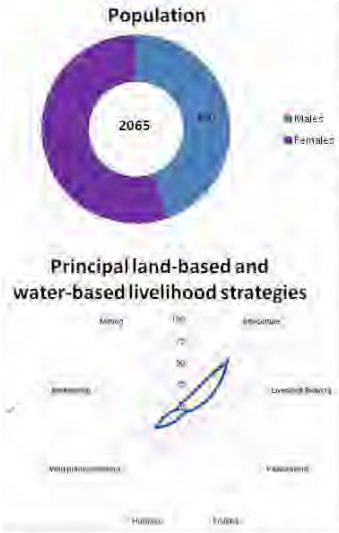
Piped water from storage tanks:
- The Trading Centre is connected to the National Water and Sewerage Corporation grid, with piped water connectivity

Public latrines:
- At the churches

Commerce

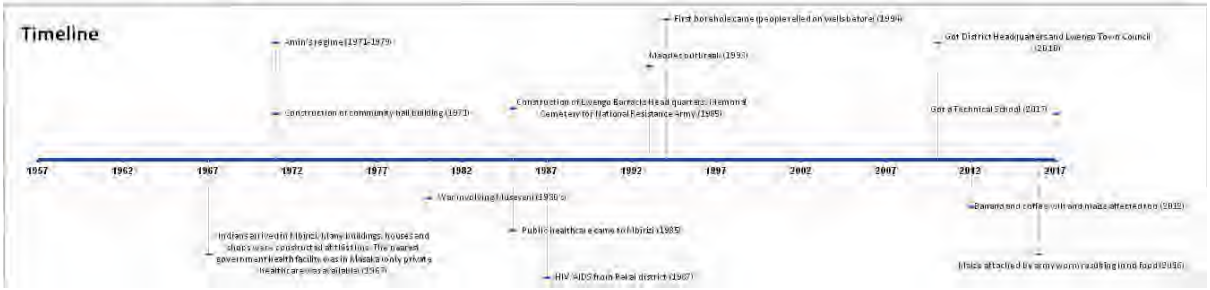
Business:
- Hair saloons: 15
- Restaurants: 20
- Chapati sellers: 30
- Bars: 30
- Lodge: 6
- Video halls: 2
- Shops
- Street food sellers
- Mechanics
- Barber shops
- Printers

PAC PROFILE MBIRIZI - DESCRIPTION

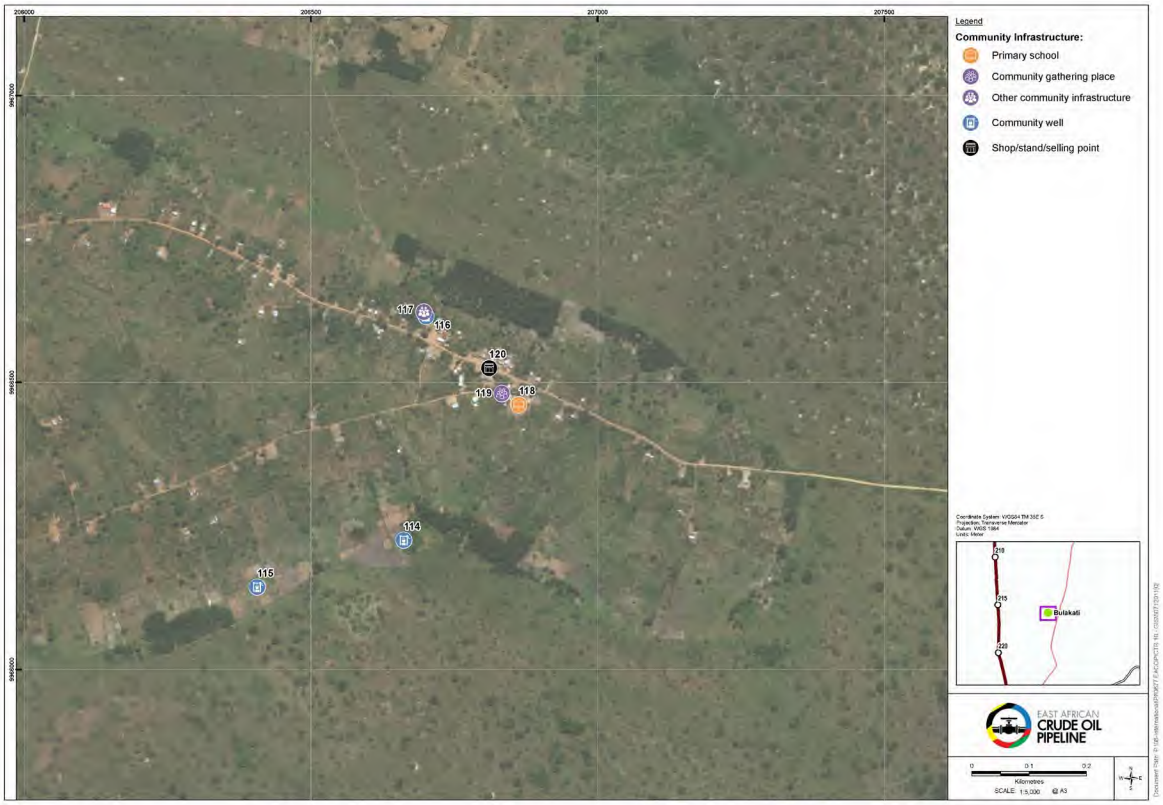


Mbirizi is located in the subcounty of Lwengo within Lwengo district.

Livelihood strategies:
The main kept livestock in the village are cattle, goats, chickens and pigs. Most residents use charcoal for cooking however, this is bought in from other communities. Crop farming is not present in the village however it is practiced in neighbouring villages.



Bulakati



PAC PROFILE BULAKATI – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson

Community gathering place:
- The community currently uses Kitewunza Trading Centre, under the tree

Electric lighting within community centre:
- There is a hairdressing saloon that uses solar as an energy

Mobile phone antenna :
- None- Major service providers are available- MTN, AIRTEL and Africell and K2

Communal road:
- Busanje-Ntete road (dirt road)
- Mbirizi-Sembabule road (dirt road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Very low level of traffic

Education

School :
- Jordan Nursery and Primary School
- The nearest secondary school is Mayira Secondary School – 5km away
- The nearest secondary school is Lwengo Technical Institute - 14km away

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village

Graves are marked with soil heaped into ridges, cementing of graves and stone markings.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Nearest is Matete Health Centre III - 7km away

Hospital:
- Nearest hospitals are Kitovu Hospital and Mulago Hospital, which are 30 km away from the village

River:
- Besanje (seasonal stream)

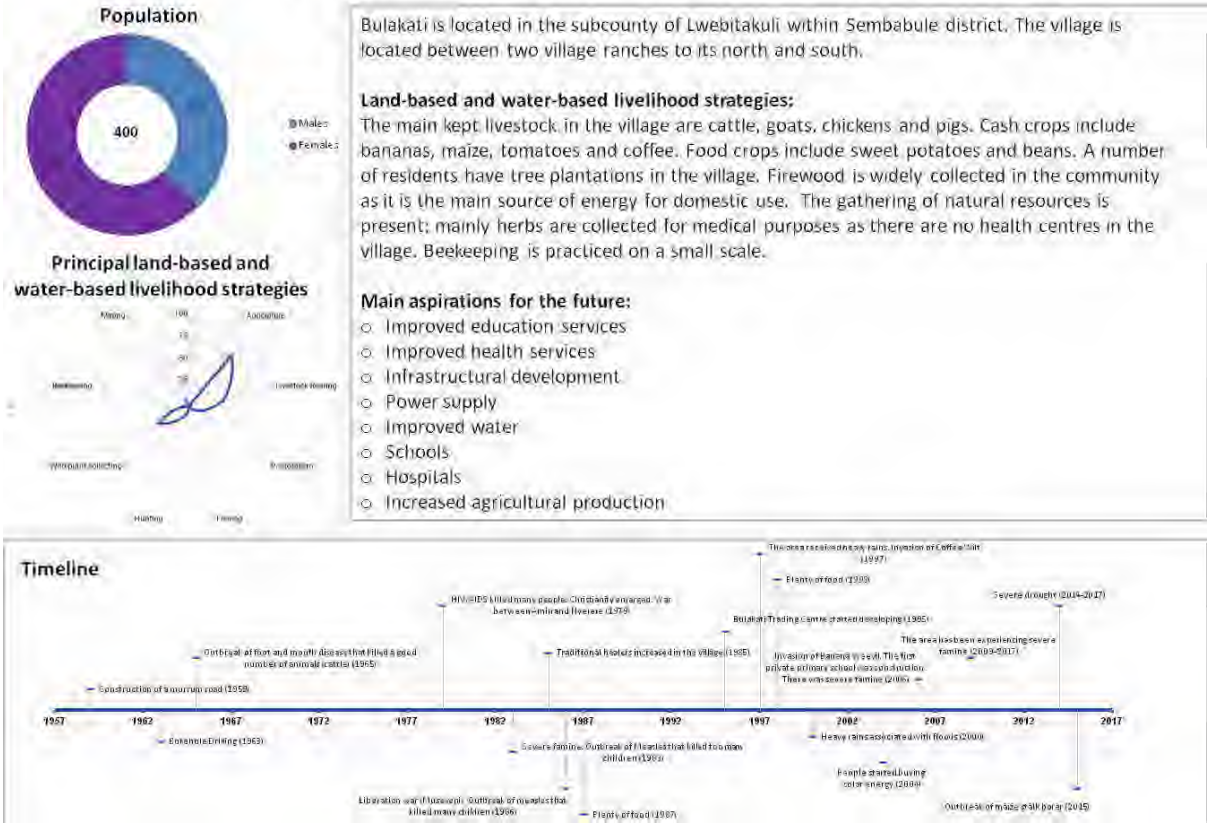
Community well:
- 1 unprotected community well (Katete well)

Community pumps:
- 1 functional borehole

Commerce

Business:
- Shops: 6
- Restaurants: 2
- Bars: 3
- Hair saloons: 1
- Butchers: 1
- Chapati sellers: 4
- Commercial farmers (coffee)
- Barber shops

PAC PROFILE BULAKATI - DESCRIPTION

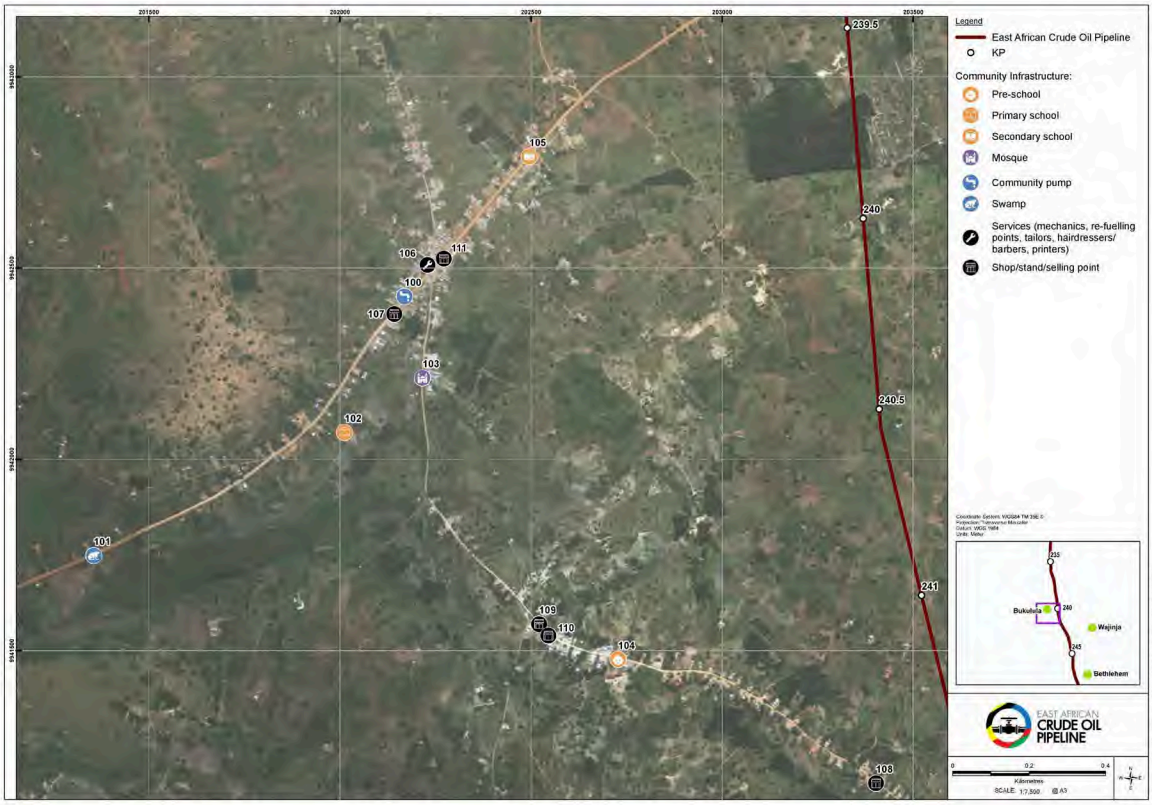


Bulakati is located in the subcounty of Lwebitakuli within Sembabule district. The village is located between two village ranches to its north and south.

Land-based and water-based livelihood strategies:
The main kept livestock in the village are cattle, goats, chickens and pigs. Cash crops include bananas, maize, tomatoes and coffee. Food crops include sweet potatoes and beans. A number of residents have tree plantations in the village. Firewood is widely collected in the community as it is the main source of energy for domestic use. The gathering of natural resources is present; mainly herbs are collected for medical purposes as there are no health centres in the village. Beekeeping is practiced on a small scale.

Main aspirations for the future:
- Improved education services
- Improved health services
- Infrastructural development
- Power supply
- Improved water
- Schools
- Hospitals
- Increased agricultural production

Bukulula



PAC PROFILE BUKULULA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses Ndeeba trading centre

Churches/ Mosques :
- Bukulula Pentecostal Church
- Ndeeba- Takuwa Masjid Mosque

Mobile phone antenna :
- None - MTN and AIRTEL mobile telephone networks are available

Communal road:
- Bukulula-Kibanyi road (dirt road)
- Kyabakuza –Kabaale road (tarmac road)
- Kiwangala –Lwengo road
- Bukulula-Nambirizi road

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Moderate number of vehicles along the road

Recent history of accidents:
- 1 accident (mainly involving boda boda cyclists) per month

Education

School:
- Biva Education Centre
- Takuwa Primary School
- Canan Primary School
- Nearest secondary school is Ndagwe Secondary school - 4km away
- Nearest tertiary is Lwengo Technical Institute - 6km away

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with heaped soil.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are 3 drug shops within the Trading Centre

Health centre:
- Nearest is Nnanywa Health Centre III, which is 2km away

Hospital:
- Nearest referral hospital is Lwengo Health Centre IV which is approximately 6 km away

River:
- Kyanamirira stream

Marshes:
- Kyanamirira marsh

Community well:
- 4 unprotected community wells

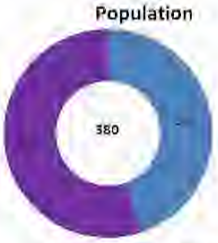
Community pumps:
- 1 non-functional borehole

Commerce

Business:
- Restaurants: 8
- Hair saloons: 15
- Carpentry: 2
- Shops
- Street food sellers

PAC PROFILE BUKULULA - DESCRIPTION

Population



Principal land-based and water-based livelihood strategies

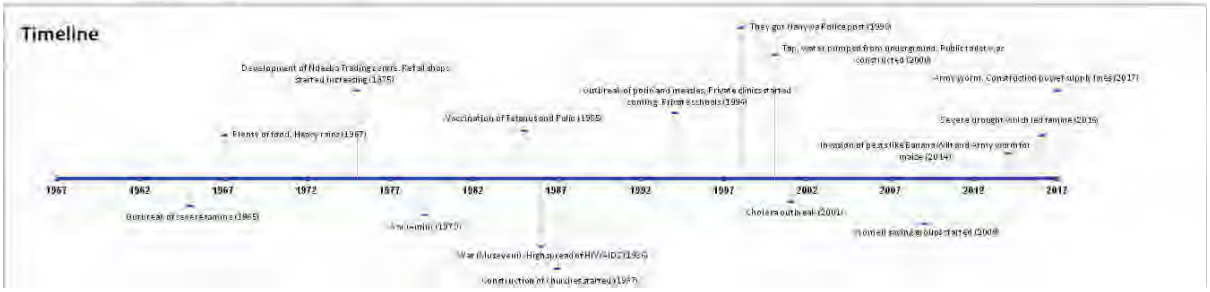
Bukululu, Kiswaga and Nanywa b are located in the subcounty of Ngadwe within Lwengo district. The three villages are connected to one trading centre (Ndeeba) that serves as the source for most products of domestic use.

Land-based and water-based livelihood strategies:
Subsistence farming is dominant especially the growing of food crops and cash crops. The main crops grown are coffee, beans, onions, cassava, maize and bananas. There are a number of different eucalyptus tree orchards in the community. Livestock keeping is present on a small scale and the main kept animals are cattle, goats, chickens, ducks and pigs. A sizeable number of youths are involved in the transport industry. Charcoal production is undertaken on a small scale. The gathering of natural resources occurs for herbal medicines. Beekeeping is practiced but on a small scale.

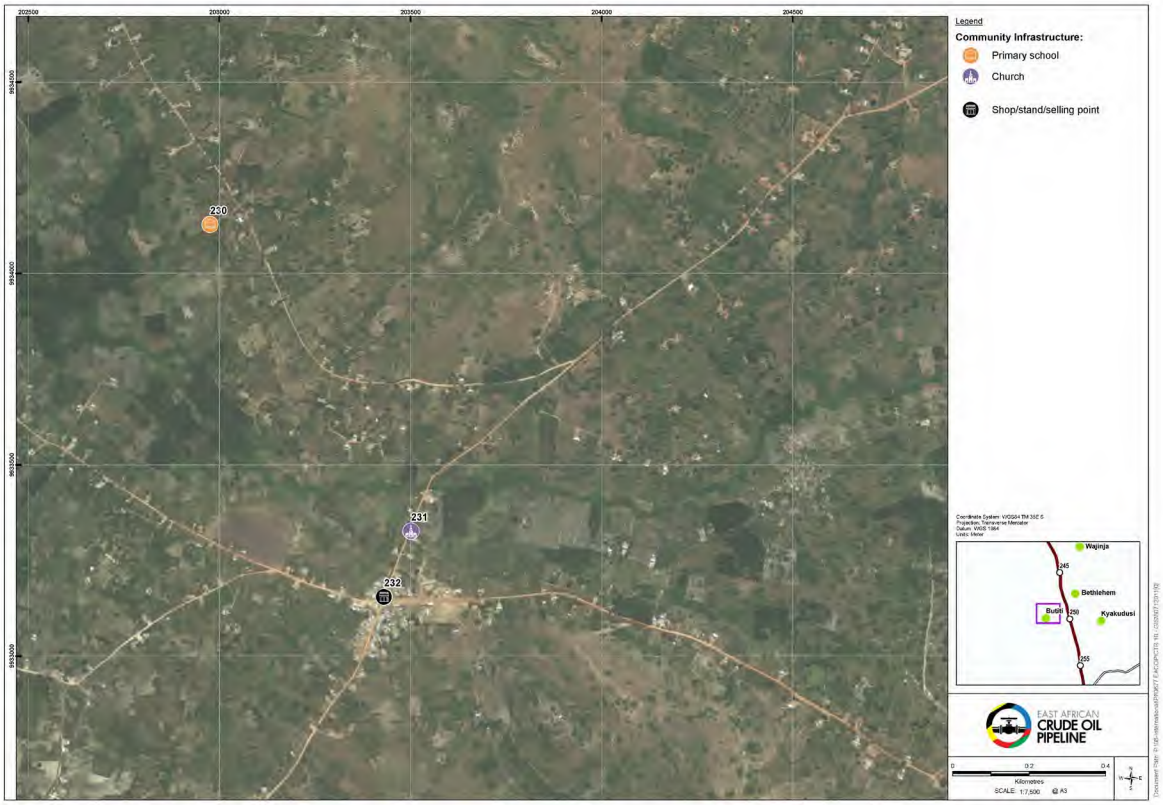
Main aspirations for the future:

- Improved roads
- Drainage systems are required
- Infrastructural development like power supply lines
- Industrial development to provide employment opportunities for children
- Construction of technical schools
- Agricultural development
- Improved health services

Timeline



Butiti



PAC PROFILE BUTITI – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Within the trading centre

Community gathering place:
- The community holds meeting within the trading centre or at Butiti Health Centre

Churches/ Mosques:
- Butiti Seventh day Adventist church
- Butiti Pentecostal
- Butiti Catholic church

Electric lighting within community centre:
- Yes

Power cables:
- Yes

Mobile phone antenna :
- None- AIRTEL is the only available

Communal road:
- Bethlehelm-Butiti-Kirundamaliga road
- Lwanda –Dwaniro road

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Heavy traffic

Recent history of accidents:
- 1 per month

Education

School :
- Wisdom Hill Butiti Nursery and Primary School
- Butiti Nursery and Primary School
- Biyinzika Nursery and Primary School
- The nearest secondary schools are St.Sebastian, Bethlehem and St.Josephine, Bakiita, which are 6km away
- The nearest tertiary school is Kamengo Technical Institute - 12km away

Teachers' accommodation blocks :
- Wisdom Hill has teachers accommodation

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with heaped soil.

Local knowledge is needed to locate grave sites.

Health

Health centre:
- Butiti Health Centre II

Hospital:
- Nearest is Rakai Regional Hospital, which is 20km away

River:
- Butiti-Kamulabba stream

Community well:
- 4 community wells

Community pumps:
- 3 community pumps

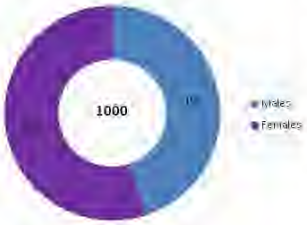
Commerce

Market:
- Only active on Thursdays

Business:
- Selling points: 6
- Street food sellers
- Tailors
- Barber shops
- Mechanics
- Hair saloons

PAC PROFILE BUTITI - DESCRIPTION

Population

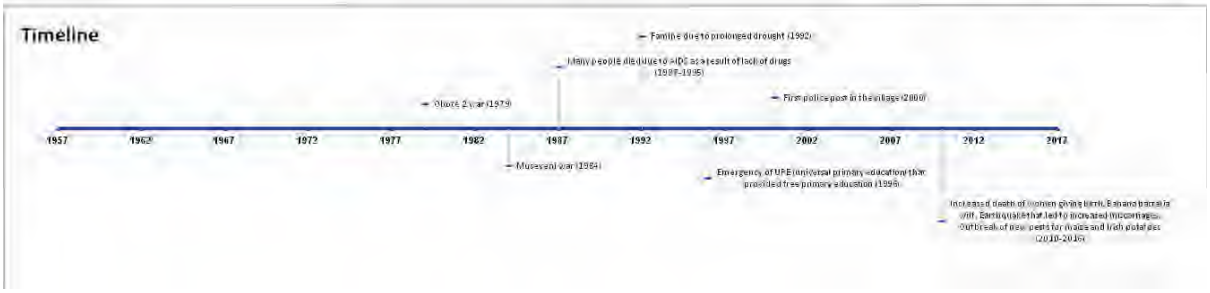


Butiti is located in the subcounty of Lwanda within Rakai district. The village is located in a relatively big trading centre and is the urban hub for the neighbouring communities. Most of the residents are tenants.

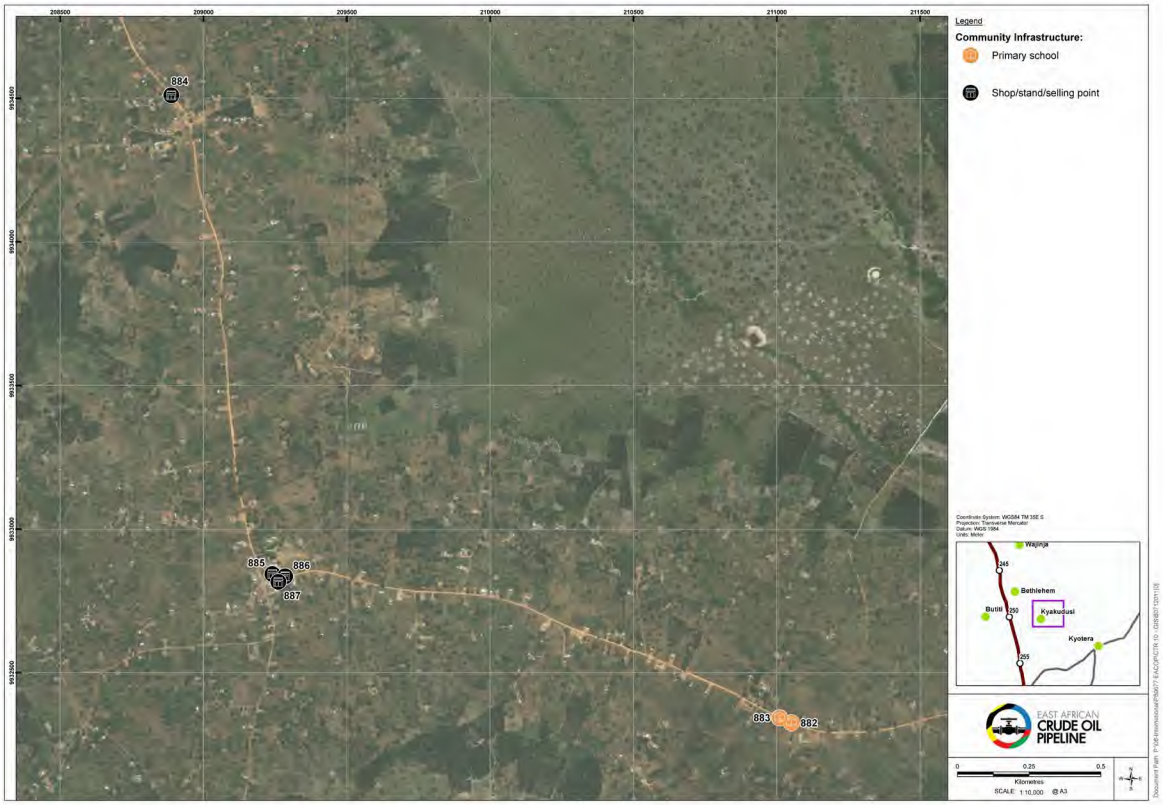
Land-based and water-based livelihood strategies:
Subsistence farming is present and the main crops grown include coffee, maize, beans, vanilla and tomatoes. Livestock keeping is undertaken in the village and includes the rearing of cattle, goats, chickens, pigs and sheep. The hunting of squirrels and rabbits is present in the village but on a relatively small scale. There are a number of eucalyptus tree growers in the area. Charcoal production is practiced on a small scale and the gathering of natural resources for the use in herbal medicines is present. Beekeeping is also undertaken on a small scale.

Main aspirations for the future:
- To be a sub-county
- To have lodges
- To have gravity/piped water
- Improved education
- Improved health services

Timeline



Kyakudusi



PAC PROFILE KYAKUDUSI – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Administrative issues handled at LC1 Chairperson's place or Kyakudusi Primary School

Community gathering place:
- The meetings are convened at the trading centre

Churches/ Mosques:
- Kyakudusi Catholic of Uganda
- Kyakudusi Pentecostal church
- Kyakudusi Mosque

Electric lighting within community centre:
- Yes

Power cables:
- Yes

Mobile phone antenna :
- Major service providers are available- MTN, AIRTEL and Africell

Communal road:
- Kyotera-Kalisizo road (dirt road)
- Kyotera -Gayaza road (dirt road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- No traffic on the main road

Recent history of accidents:
- Accidents are a very rare occurrence

Education

School :
- Midway Nursery and Primary School
- Kyakudusi Nursery and Primary School
- Students go to Gayaza Parish Secondary School

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with heaped soil, stones, crosses and cement.

Local knowledge is needed to located grave sites.

Health

Health centre:
- The nearest health centre is Bethlehem, which is about 5km

Hospital:
- The residents trek about 7km to Kasali Health Centre III

River:
- There is 1 stream called Kitakata

Marshes:
- Kitakata swamp

Private boreholes:
- 3 boreholes

Commerce

Market:
- They head to Bethlehem

Business:
- Shops
- Kiosks
- Timber trade
- Bars
- Alcohol selling points
- Restaurants
- Tailors
- Hair saloons
- Barber shops

PAC PROFILE KYAKUDUSI - DESCRIPTION

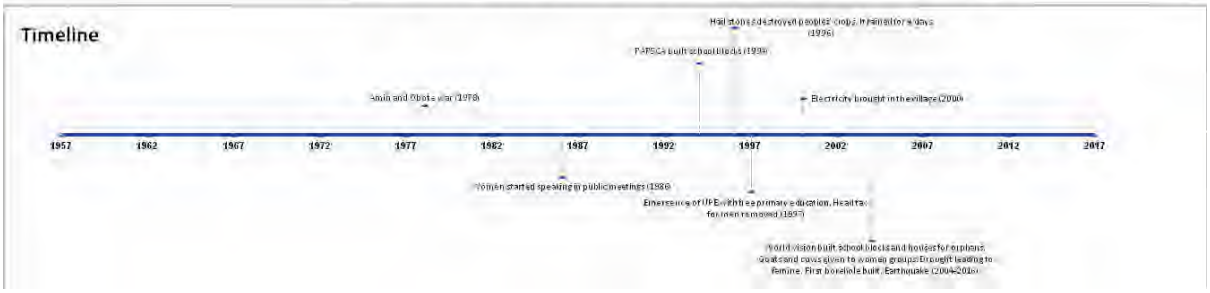
Population

Kyakudusi is located in the subcounty of Kasaali within Kyotera district. Most of the residents of the village are bibanja owners though there are parcels of land under leasehold and mailo.

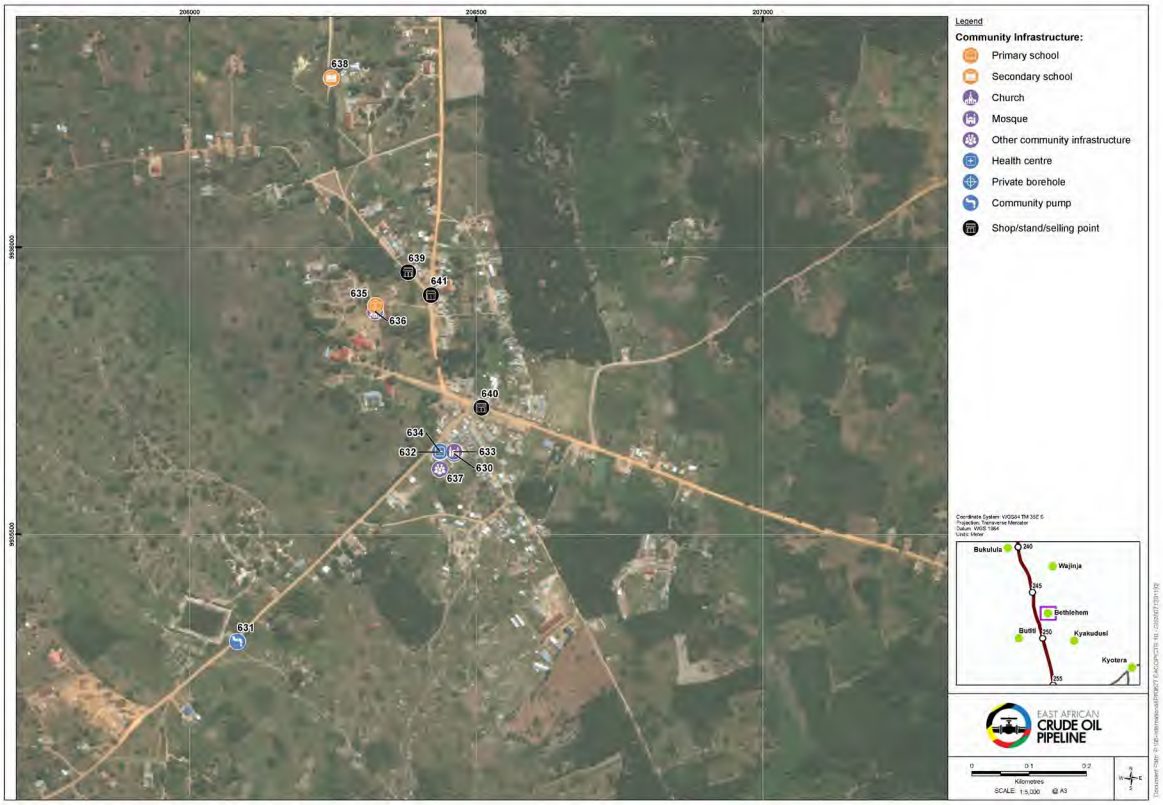
Land-based and water-based livelihood strategies:
The primary source of livelihoods in Kyakudusi include subsistence farming of crops such as maize, bananas, rice, cassava, onions, cabbages, egg plants, beans, sweet potatoes and coffee. The main kept livestock within the village care cattle, goats, chickens and pigs. Market gardening is practiced with vegetables grown including tomatoes and onions. Hunting is undertaken on a small scale. There are a number of tree orchards consisting mainly of eucalyptus and pine trees. Firewood is collection is common in the village as it is one of the main sources of energy for domestic use. Charcoal production is also practiced as residents sell this on to others. Traditional healers collect natural resources of medicinal purposes. There are six beekeepers in the community.

Main aspirations for the future:
- Reduced fuel prices that is in Uganda fuel should be 50% cheaper than Tanzania
- Employment opportunities from the project
- Have secondary schools in villages
- Have a health centre in the village
- Reduction for electricity chares so that people install electricity in their houses
- Boarder taxes between Uganda and Tanzania should be removed for trade purposes
- Suggest for Tanzania to supply rice to Uganda if it's to have fuel from Uganda

Timeline



Bethlehem



PAC PROFILE BETHLEHEM – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Offices located in trading centre

Community gathering place:
- The meetings are convened at the Trading Centre

Churches/ Mosques:
- Kibonzi Church of Uganda
- St. Charles Catholic Church

Mobile phone antenna:
- None- Major service providers are available- MTN, AIRTEL and Africell

Communal road:
- Kyotera-Kalisizo road (dirt road)
- Kibonzi -Kayunga road (dirt road)
- Kibonzi-Mbirizi road (dirt road)
- Bethlehem-Buyambe road (dirt road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- No traffic on the main road

Recent history of accidents:
- Accidents are a very rare occurrence

Education

School :
- St.Charles Nursery and Primary School
- Kibonzi Nursery and Primary School
- Bethlehem Secondary School
- Nearest tertiary school is in Kamengo

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with heaped soil, stones and cement.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Bethlehem Health Centre III

River:
- There is 1 stream called Lwanjovu

Marshes:
- Lwanjovu swamp

Community well:
- 1 community well that is unprotected

Private boreholes:
- 2 private boreholes: 1 shallow, 1 deep

Commerce

Business:
- Shops
- Kiosks
- Bars
- Restaurants
- Tailors
- Hair saloons
- Barber Shops

PAC PROFILE BETHLEHEM - DESCRIPTION

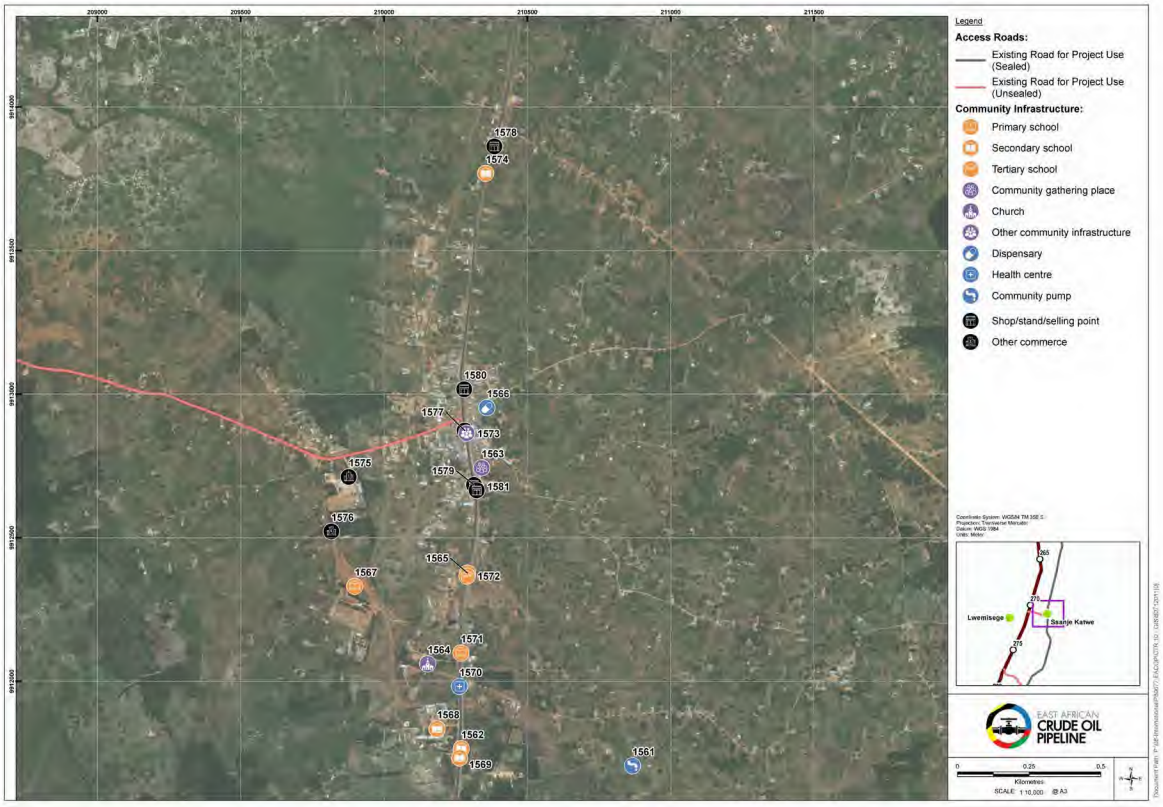
Principal land-based and water-based livelihood strategies

Bethlehem is located in the subcounty of Nabigasa within Kyotera district.

Land-based and water-based livelihood strategies:
Both commercial and subsistence farming is present in the village with crops including maize, bananas, rice, cassava, onions, cabbages, egg plants, beans, sweet potatoes and coffee. Main kept livestock include cattle, goats, chickens and pigs. Market gardening is practiced in the village with crops such as tomatoes and onions grown. Eucalyptus trees and pine trees are grown in orchards. Charcoal production and firewood collection is carried out in the village. Beekeeping is undertaken on a small scale.

Main aspirations for the future:
- Infrastructure development
- More electricity
- Enough food supply
- New employment opportunities

Ssanje Katwe



PAC PROFILE SSANJE KATWE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses a court yard at 1 of the residents homesteads under a tree (Jambula)

Churches/ Mosques:
- Bethel Church of Uganda
- Sanje Catholic Parish
- Sanje Pentecostal Church
- Bubajo Catholic Church
- Sanje Katwe Muslim Mosque
- Bubajo Masjid Mosque

Electric lighting within community centre:
- Houses within the trading centre are connected to the National electricity grid

Power cables :
- Power cables supplying electricity passes through the village

Mobile phone antenna :
- None- Major service providers are available- MTN and AIRTEL

Communal road:
- Mutululula-Kyotera road (tarmac)
- Kabaano-Kabujanja road (dirt road)
- Sanje-Kabale road (dirt road)
- Sanje-Kamujanja (dirt road)
- Sanje –Kabale (dirt road)
- Katafali-Kabale (dirt road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Relatively busy considering that it is the main outlet to Tanzania from Uganda

Recent history of accidents:
- Few accidents, averaging 1 motor accident in 3 month

Education

School :
- Sanje Modern Primary School
- Moonlight Primary School Sanje
- Glory Christian School
- God's Grace Nursery and Primary School
- Sanje Community Primary School
- Sabina Primary School
- Bubajo Islamic Primary School
- Mary Immaculate Primary School
- Kabale-Sanje Senior Secondary School
- St. Mary's Senior Secondary School, Sanje
- Sanje Community Polytechnic (tertiary)

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with soil that is heaped into a ridge.

Local knowledge is needed to locate grave sites.

Health

Health centre:
- St. Jude Health Centre (private)
- Nearest Health Centre III is in Kasasa Trading Centre, 8 km away

Clinic:
- Over 8 clinics including: Sanje Domiciary Clinic, Sanje Premier Clinic, Mirembe Clinic and Shalom Clinic

Hospital:
- Nearest hospital is Kabuuto Health Centre IV, 8 km away

River:
- Kawenda stream
- Bukoola stream

Marshes:
- Kyombo swamp
- Kanyabula swamp
- Bulumba swamp

Community well:
- 3; Kyombo, Kanyabula and Bulumba

Community pumps:
- 7 functional boreholes

Piped water from storage tanks:
- 1 water storage tank for National Water and Sewerage Corporation (NWSC)

Public latrines:
- 1 non-functional public latrine

Communal washing areas:
- 2 - mainly vehicle cleaning points

Commerce

Market :
- There is 1 gazetted market area and mainly deals in retail goods (products for domestic use and food products)

Business:
- Shops
- Hair saloons
- Mechanics
- Restaurants
- Carpentry
- Bodabodas
- Bars
- Tailors
- Bakery
- Counsellorship
- Kiosks
- Street food sellers
- Lodge
- Masons
- Barber shops
- Printers
- Fuel station
- Pharmacies

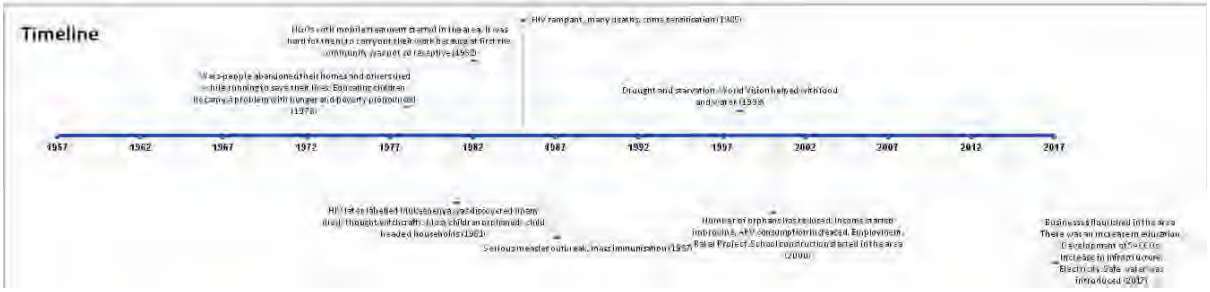
PAC PROFILE SSANJE KATWE - DESCRIPTION

Principal land-based and water-based livelihood strategies

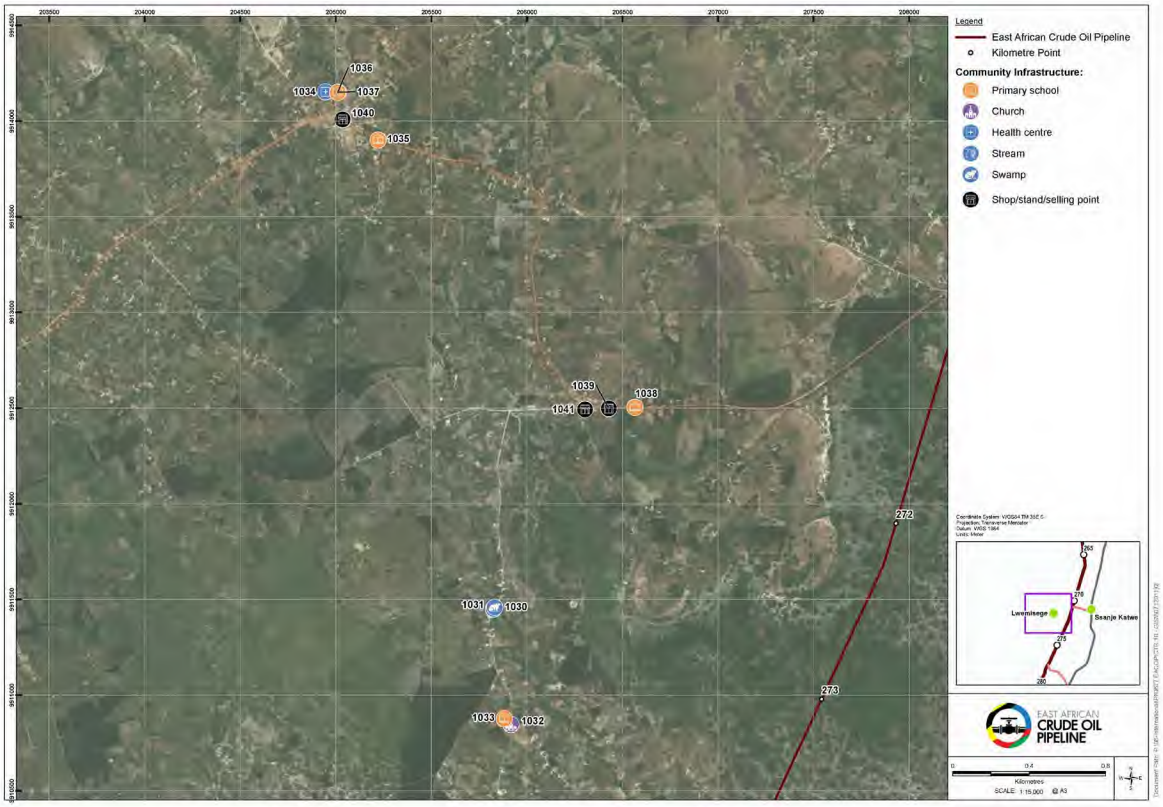
Ssanje Katwe is located in the subcounty of Kasasa within Kyotera district. Most of the residents are bibanja owners.

Land-based and water-based livelihood strategies:
The primary sources of livelihoods in the village are subsistence farming and livestock keeping. The main food crops include maize, coffee, bananas, rice, cassava, onions, cabbages, egg plants, beans and sweet potatoes. The main kept animals are cattle, goats, chickens and pigs. Market gardening is practiced in the village, growing mainly tomatoes, passion fruits, onions and egg plants. Antelopes and Uganda kobs are hunted in the area. There are a number of tree orchards consisting of eucalyptus and pine trees in the community. Firewood collection is common around the village and charcoal production is also undertaken. There is one operation quarry in the community. Beekeeping is practiced on a small scale.

Main aspirations for the future:
- Town Board or Town Council
- Proper planning for housing in the area



Lwemisege



PAC PROFILE LWEMISEGE – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses the premises of Lwemisege Primary School

Churches/ Mosques:
- St. Bernard Catholic Church
- Church of Christ ; Lwemisege

Mobile phone antenna :
- None- Major service providers are available- MTN and AIRTEL

Communal road:
- Nyanga-Lwemisege road (dirt road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Few vehicles

Education

School:
- Lwemisege Primary School
- The nearest secondary school is Kifamba Secondary School, approximately 5 km away from the village
- The nearest tertiary school is Sanje Technical Institute

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with heaped soil, patterns of stones and crosses.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Nearest is Kifamba Health Centre III which is 6km away

Hospital:
- Nearest referral hospital is Kakuuto Health Centre IV, which is approximately 15 km away

River:
- Lutemye seasonal stream
- Bukoola stream

Marshes :
- Lutemye swamp
- Bukoola swamp

Community pumps:
- 7 functional boreholes

Piped water from storage pumps:
- 1 water storage tank for National Water and Sewerage Corporation (NWSC)

Commerce

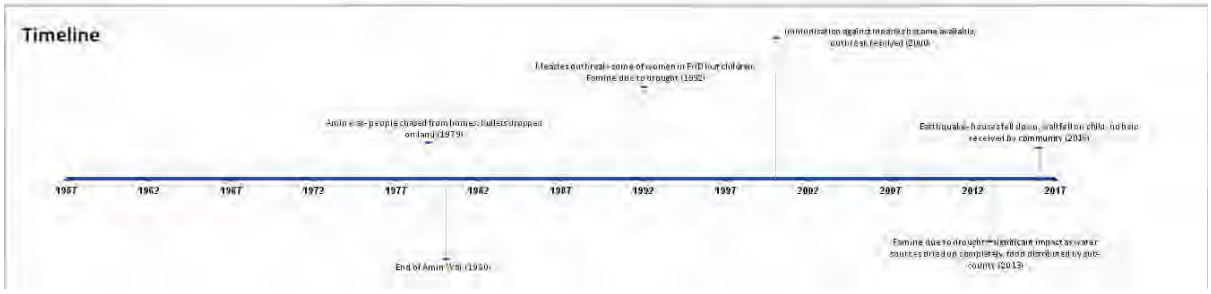
Market:
- Food products are sold on 'market days' at the church

PAC PROFILE LWEMISEGE - DESCRIPTION

Lwemisege is located in the subcounty of Kifamba within Rakai district. Most of the residents are bibanja owners.

Land-based and water-based livelihood strategies:
The primary source of livelihoods in the village is subsistence farming. Crops grown include maize, bananas, sweet potatoes, beans, coffee and Irish potatoes. Livestock keeping mainly involves cattle and chickens however some residents also keep pigs. Eucalyptus trees are planted in the community. Fruit is gathered from the village surroundings. Natural resources are also collected for the use in herbal medicines. Beekeeping is practiced on a small scale.

Main aspirations for the future:
- Would like to start growing and selling coffee for money



Lukulavu

PAC PROFILE LUKULAVU – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1

Community gathering place:
- The community currently uses Lukulavu Trading Centre

Churches/ Mosques:
- Lukulavu Pentecostal Church
- Lukulavu Masjid Mosque

Mobile phone antenna:
- None- Major service providers are available- MTN and AIRTEL Africell and K2

Communal road:
- Lukulavu road (dirt road)
- Kyotera –Mutukula road (tarmac road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Few vehicles along Lukulavu road

Education

School :
- The nearest primary school is Kyalugaba Primary School - 4km away
- Umar Islamic Secondary School
- Nearest tertiary school is Sanje Community Polytechnic - 20km away

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked with soil heaped into ridges.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Nearest is Mutukula Health Centre, which is 8km away

Hospital:
- Nearest referral hospital is Kakuuto Health Centre IV, which is approximately 15 km away

River:
- Lwemukunya stream which separates Lukoma Village from Lukulavu Village

Community well:
- 1 unprotected well

Community pumps:
- 3 boreholes- 2 functional

Private boreholes:
- 1 that belongs to the mosque

Commerce

Business:
- Shops: 3

PAC PROFILE LUKULAVU - DESCRIPTION

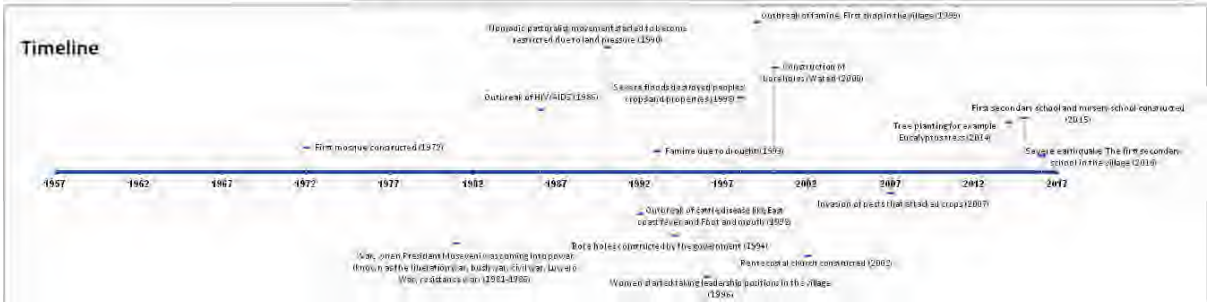
Principal land-based and water-based livelihood strategies

Lukulavu is located in the subcounty of Kakuuto within Kyotera district. Most of the land in the village is under private mailo ownership. Most of the land is under ownership of one family.

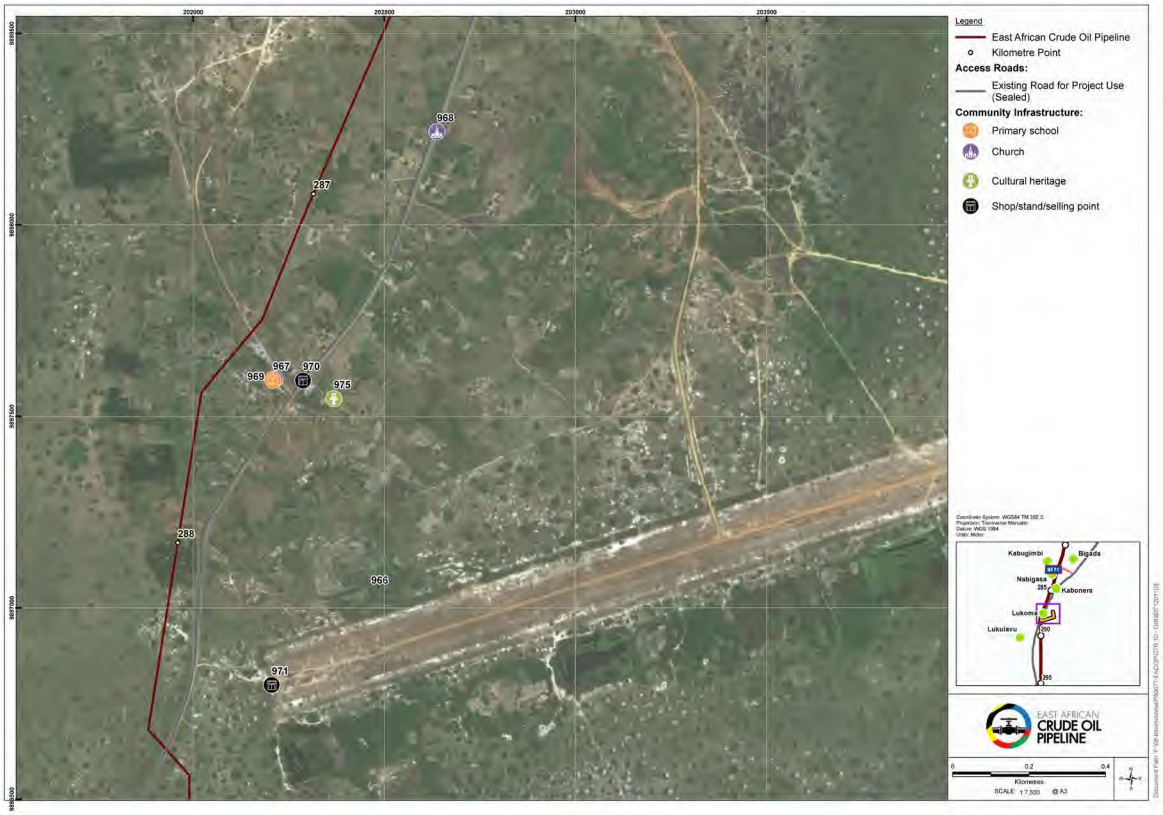
Land-based and water-based livelihood strategies:
The main crops grown in the village are maize, bananas, coffee, cassava and Irish potatoes. There are a number of tree orchards consisting of eucalyptus trees. The main kept animals in the village are cattle, goats, chickens, ducks, rabbits and pigs. Charcoal production is undertaken in the village. Firewood collection is common in the community. The gathering of natural resources is also present for the use in herbal medicines.

Main aspirations for the future:
- More schools
- Health facility
- Improved agriculture
- Good road networks
- Improved education system

Timeline



Lukoma



PAC PROFILE LUKOMA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Currently using the homestead of the Chairperson LC1.

Community gathering place:
- The community currently uses Lukoma Trading Centre

Churches/ Mosques:
- Lukoma Church of Uganda
- Square Church

Mobile phone antenna :
- None- Major service providers are available- MTN, AIRTEL, Africell and K2

Communal road:
- Lukoma-Ntete road (dirt road)
- Luwanga road (dirt road)
- Kyotera Mutukula road (tarmac road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Few vehicles along Lukoma – Ntete road and Luwanga Road but high along Kyotera-Mutukula road

Recent history of accidents :
- 4 per year along Kyotera-Mutukula road

Education

School :
- Bright future Nursery School, Lukoma
- The nearest primary school is Kabenola Primary School, approximately 7km away
- Bigada Secondary School – 6km away
- Nearest tertiary school in Sanje Community Polytechnic- 15km

Cultural Heritage

Place of worship:
- There is1 shrine.

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Soil is heaped into ridges to mark graves.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Nearest is Mutukula Health Centre, which is 8km away

Hospital:
- Nearest referral hospital is Kakuuto Health Centre IV, which is approximately 8 km away

River:
- Lwemukunya stream

Community well :
- 1 unprotected community well

Community pumps:
- 1 borehole
- 1 shallow well

Commerce

Business:
- Shops: 3

PAC PROFILE LUKOMA - DESCRIPTION

Population

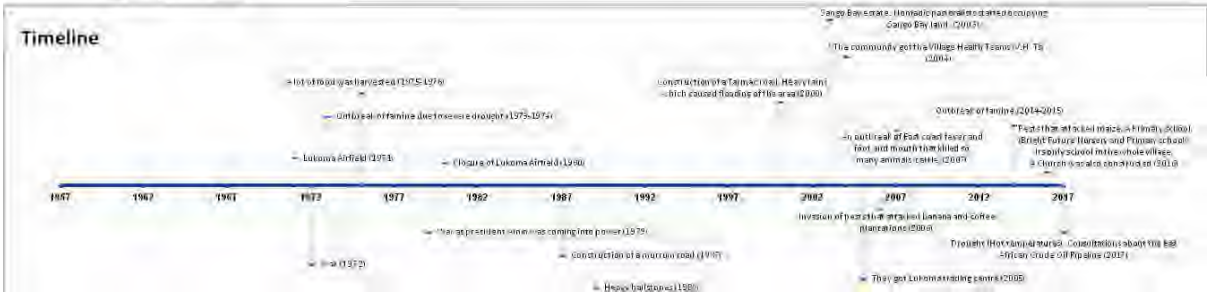
Principal land-based and water-based livelihood strategies

Lukoma is located in the subcounty of Kakuuto within Kyotera district. There is a small trading centre along the Kyotera-Mutukula road containing a few retail shops.

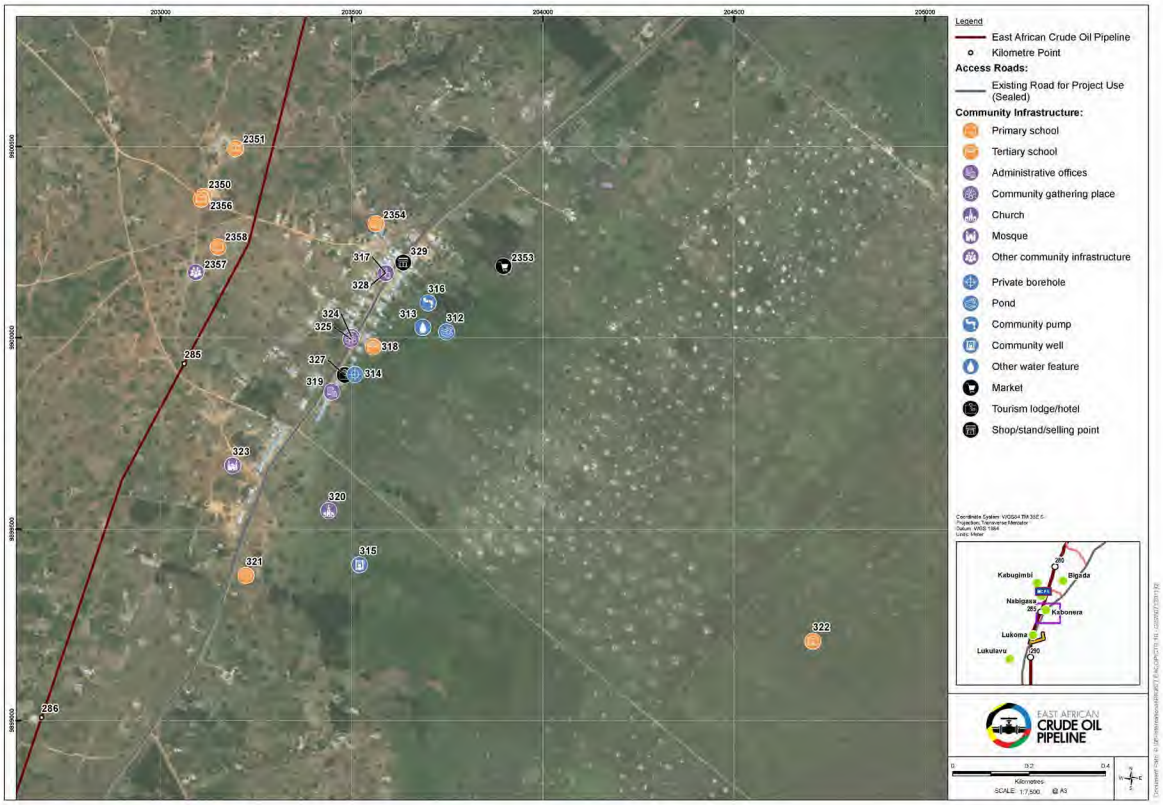
Land-based and water-based livelihood strategies:
The growing of arable crops such as maize, bananas, Irish potatoes, cassava and coffee is one of the primary livelihoods in the village. Main kept livestock in the village include cattle, goats, chickens, ducks, rabbit and pigs. There are few tree plantations within the community. Firewood collection and charcoal production are also undertaken. Traditional birth attendants collect natural resources for medicinal use.

Main aspirations for the future:
- Improved education system
- An airstrip
- Adequate market for agricultural produce
- New infrastructures (schools, health centres etc.)

Timeline



Kabonera



PAC PROFILE KABONERA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Within the trading centre

Community gathering place:
- The community holds meeting under the mango tree

Churches/ Mosques:
- There are 7 churches in the village
- 2 mosques

Electric lighting within community centre:
- Yes

Power cables:
- Yes

Mobile phone antenna:
- MTN and AIRTEL are the available networks

Communal road:
- Mutukula-Kyotera road
- Kabonera-Bidaga road
- Kabonera-Kakoma road
- Kabwasa-Kabonera road

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Relatively heavy traffic

Recent history of accidents :
- 1 per month

Education

School:
- Divine Wisdom Nursery and Primary School
- Hope Care Nursery and Primary School
- Victory Nursery and Primary School
- Arise and Shine Nursery and Primary School
- The nearest secondary school is John Mary Secondary School, which is 5km away, in Bigada
- The nearest tertiary school is Sanje Technical Institute - 20km away

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village.

Graves are marked by heaped soil and cement.

Local knowledge is needed to identify grave sites.

Health

Health centre:
- Kakuuto HCIV, which is 10km away is the nearest

Hospital:
- Nearest is Kakuuto HCIV, which is 10km away

Community pumps:
- Shallow well and borehole

Public latrines:
- Yes. It was constructed for health workers

Commerce

Business:
- Bars
- Shops
- Kiosks
- Restaurants
- Street food sellers
- Tailors
- Barber shops
- Mechanics
- Hair saloons

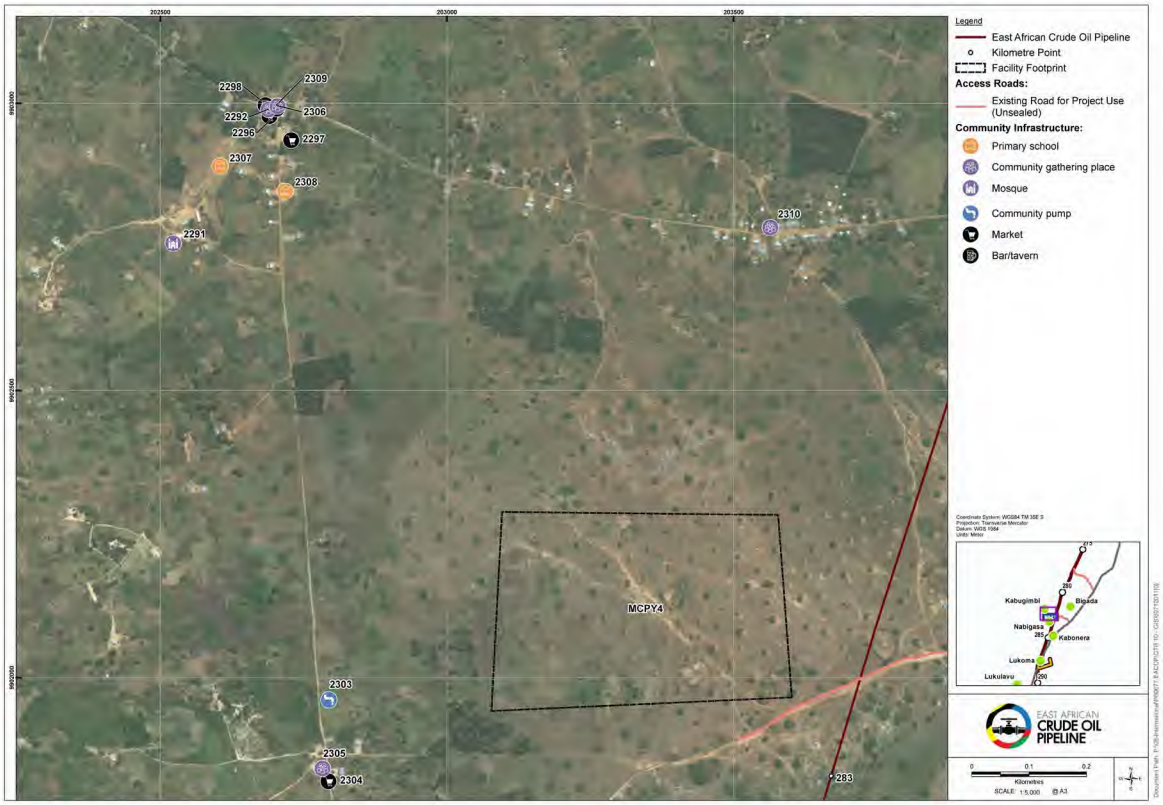
PAC PROFILE KABONERA - DESCRIPTION

Kabonera is located in the subcounty of Kakuuto within Kyotera district. The village is located within a large trading centre with a number of activities, especially in the retail trade.

Land-based and water-based livelihood strategies:
Cattle, goats, chickens, sheep and pigs are the main kept livestock in the village. Main crop types include coffee, maize, beans, avocados and tomatoes. Hunting activities are present in the area but on a small scale. There are a number of eucalyptus trees growing in the community. Natural resources are gathered for the use in herbal medicines. Beekeeping is also practiced in the village on a very small scale.

Main aspirations for the future:
- High standard of education for children
- Develop financially and prosper
- Build own homes not rent
- New skills taught to children

Kabugimbi



PAC PROFILE KABUGIMBI - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- Kajaga Trading Centre

Churches/ Mosques:
- Pentecostal Church in the village

Mobile phone antenna:
- MTN and AIRTEL mobile networks available

Communal road:
- Nabigasa-Bigasa road (dirt road)
- Kakoma- Kabwasa road (dirt road)
- Kibanda- Kakuuto road

General condition of roads within community:
- Poor. The roads are motorable but narrow

Level of traffic along main road:
- Few vehicles along the roads

Recent history of accidents:
- 1 accident has been recorded in the last 2 years and involved a boda boda cyclist.

Education

Schools:
- Grace Academy Nursery and Primary School
- St. John's Nursery School
- Nearest Secondary School is Bigada Secondary School (4km away)

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village

Graves are marked with heaped soil. Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are 5 drug shops within Kabonela Trading Centre (2km away)

Health Centre:
- The nearest is Kakuuto Health Centre III (10km away)

Community Well:
- Kamudiku Well (unprotected)
- Kakindu Well (unprotected)
- Nakasagazi Well (unprotected)

Community Pumps:
- There are two functional boreholes

Commerce

Business:
- Shops: Lambikiriza and Kajaga Trading Centres.
- Bars: Small scale
- Street food sellers: Yes
- Bicycle mechanics

PAC PROFILE KABUGIMBI - DESCRIPTION

Population

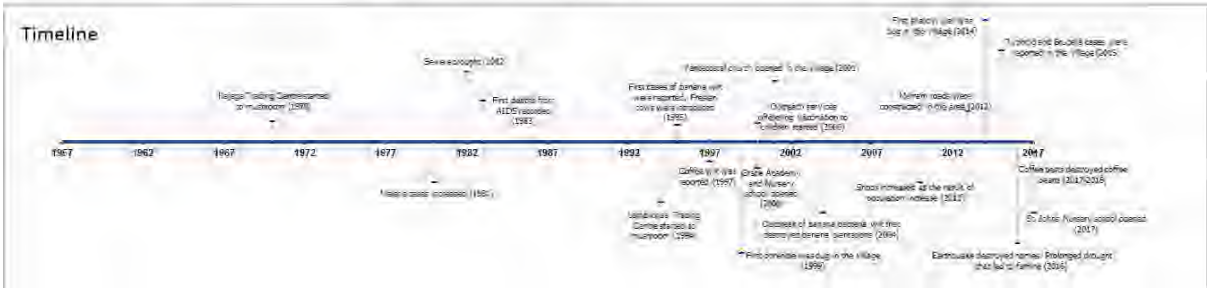
Principal land-based and water-based livelihood strategies

Kabugimbi is located in the subcounty Kakuuto within Kyotera district.

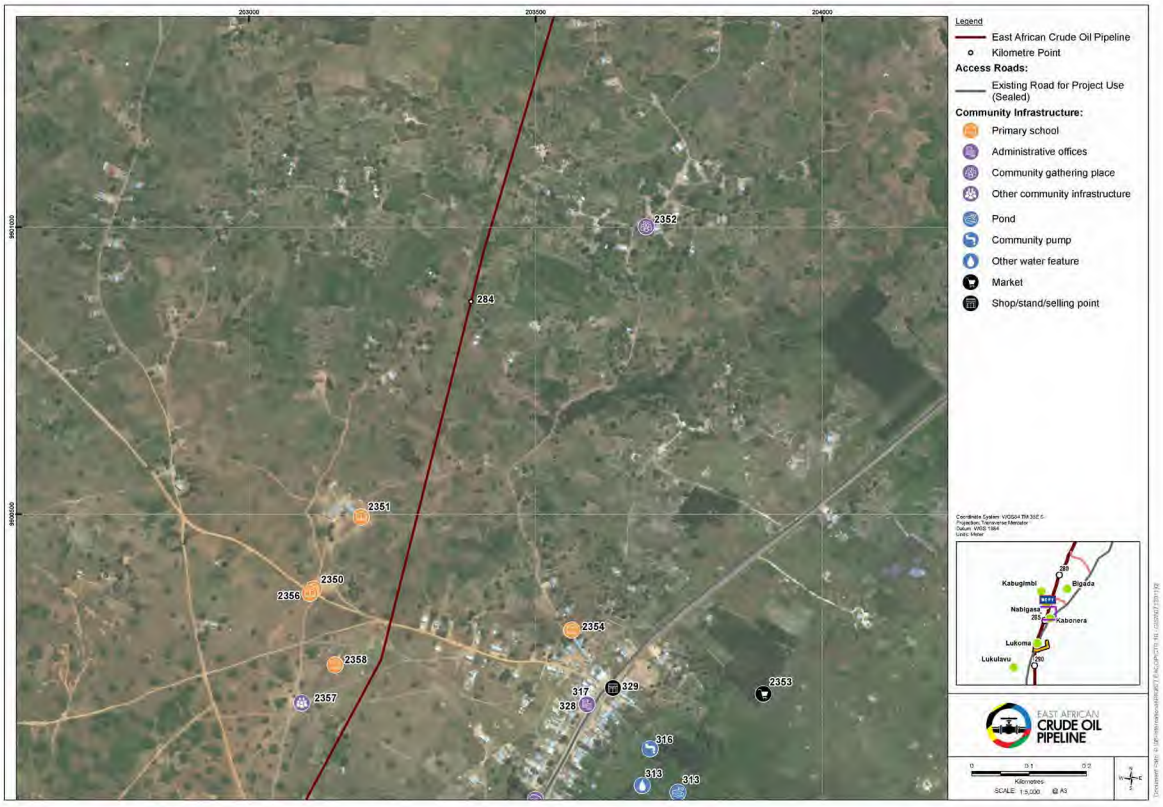
Land-based and water-based livelihood strategies:
The main community livelihood is agriculture, both subsistence and commercial. Crops grown include coffee, beans and onions for commercial purposes and cassava, maize, Irish potatoes, sweet potatoes and bananas for personal consumption. Livestock is reared in the village and includes cattle, goats, chickens and pigs. A number of tree orchards consisting of eucalyptus can be found in the village. Few village members engage in charcoal production and mining activities. The gathering of natural resources for herbal medicinal purposes is also undertaken.

Main aspirations for the future:
- Electricity
- Improved infrastructure such as primary schools and health centres
- Safe water source
- Better quality of roads

Timeline



Nabigasa



PAC PROFILE NABIGASA - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- The community currently uses a courtyard at a private residence

Churches/ Mosques:
- 2 churches: Nabigasa Catholic Church and Elim Pentecostal Church

Mobile phone antenna:
- MTN and AIRTEL mobile networks are available

Communal road:
- Kabonela-Nabigasa road (dirt road)
- Kabonela-Kajaga road (dirt road)

General condition of roads within community:
- Poor: the roads are motorable but narrow

Level of traffic along main road:
- Few vehicles along the roads with the main modes of transport being motorcycles "boda bodas"

Recent history of accidents:
- 3 minor accidents involving motorcycles occur every month and there has been 1 recorded accident involving a motor vehicle in the last three years.

Education

Schools:
- St. Augustine Nursery and Primary School
- St. Kizito Nabigasa Primary School
- The nearest secondary school is Bigada Secondary School, which is approximately 4km away
- The nearest tertiary education facility is Sanje Technical school, which is approximately 12km away.

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village. Each household sets up a place as a burial ground.

Graves are marked with heaped soil. Stones are collected into a pattern at the grave and some graves have crosses erected at the tomb. Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are five drug shops with Kabonela trading centre (approximately 2km away)

Health Centre:
- The nearest is Kakuuto Health Centre IV (5km away)

Health Clinic:
- One clinic: Musawo Maggie's Clinic

Hospital
- Kalisizo hospital is the nearest and it is approximately 45km away.

Community Well:
Water is sourced from wells in neighbouring villages such as:
- Kabugimbi (1km away)
- Kabonera (2km away)
- Kyakacwere (3km away)
- Kakoma (3km away)

Community Pumps:
- There is one community borehole which is functional at Kasaalu and two private boreholes

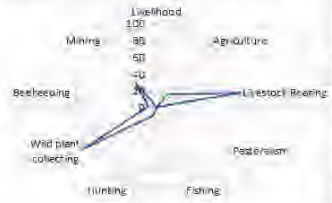
Commerce

Business:
- Shops: Kabonela trading centre has many shops
- Bars: close to 15 bars operating on a small scale
- Street food sellers: close to 20 food vendors
- Bicycle mechanics
- Tailors

PAC PROFILE NABIGASA - DESCRIPTION

Population

Principal land-based and water-based livelihood strategies



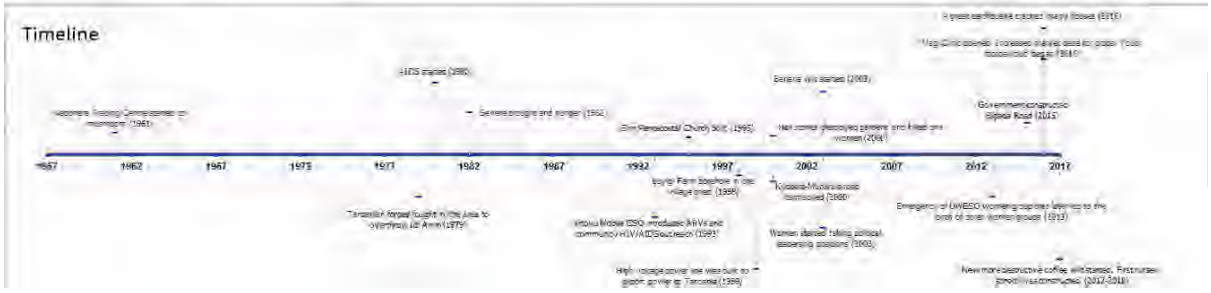
Nabigasa is located in the subcounty Kakuuto within Kyotera District

Land-based and water-based livelihood strategies:

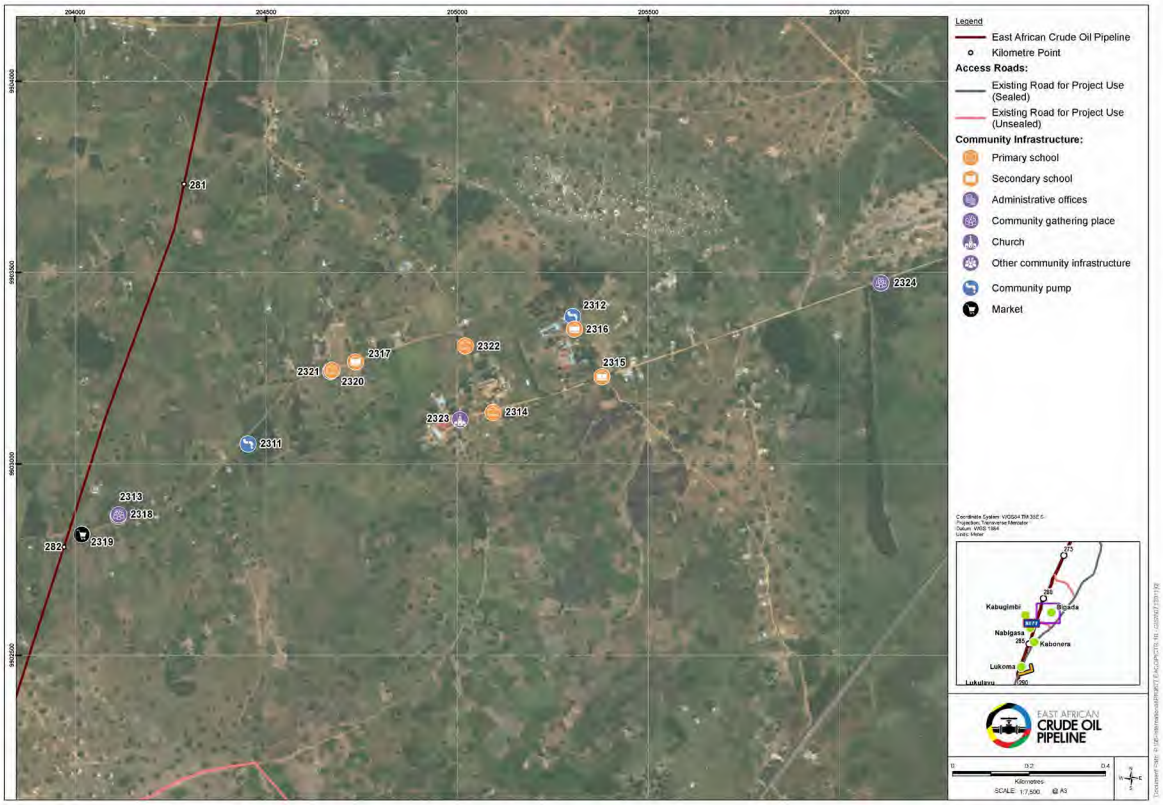
The main community livelihood is agriculture, both subsistence and commercial. Cash crops grown include coffee, beans, soya beans and onions. Food crops grown include cassava, maize, irish potatoes, sweet potatoes and bananas. Livestock is reared in the village and includes cattle, goats, chickens, rabbits, sheep and pigs. A number of tree orchards consisting of eucalyptus can be found in the village. Some villagers hunt at the neighbouring Sango Bay. Brick-making takes place and natural resources are gathered for herbal medicinal purposes.

Main aspirations for the future:

- Improved infrastructure such as roads and water sources
- Construct health facilities and a secondary school in the village
- Electricity
- Better extension services



Bigada



PAC PROFILE BIGADA - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- Kasambya Trading Centre

Churches/ Mosques:
- 2 churches in the village: Bigada Catholic Parish and Bigada Church of Uganda

Mobile phone antenna:
- MTN and AIRTEL mobile networks available

Communal road:
- Bigada- Kasambya road (dirt road)
- Sempagama road (dirt road)
- Kasambya-Kawine road

General condition of roads within community:
- Poor. The roads are motorable but narrow

Level of traffic along main road:
- Few vehicles along the roads with the main modes of transport being motorcycles "boda bodas". Bigada to Koki (Rakai) is used by trucks that transport sand and firewood

Recent history of accidents:
- 1 accident has been recorded in the last four years and involved a boda boda cyclist and a motor vehicle.

Education

Schools:
- Kakuuto Church of Uganda Primary School
- Bigada Primary School
- Bigada Secondary School
- Diana Beauty Salon and Vocational Training Centre skills children in hairdressing and sewing.

Cultural Heritage

Cemetery/ graveyard:
- There is no gazetted cemetery within the village. Each household sets up a place as a burial ground.

Graves are marked with heaped soil. Stones are collected into a pattern at the grave and some graves have crosses erected at the tomb. Local knowledge is needed to identify grave sites.

Health

Dispensary:
- There are 5 drug shops within Kabonela Trading Centre (approximately 3km away)

Health Centre:
- The nearest is Kakuuto Health Centre III (4km away)

Community Well:
- Kamudiku Well (unprotected)
- Kakindu Well (unprotected)
- Nakasagazi Well (unprotected)

Community Pumps:
- There is one borehole which is functional

Commerce

Business:
- Shops: Kasambya and Kajaga Trading Centres
- Bars: Small scale
- Street food sellers: Yes
- Bicycle mechanics
- Tailors

PAC PROFILE BIGADA - DESCRIPTION

Population

Principal land-based and water-based livelihood strategies

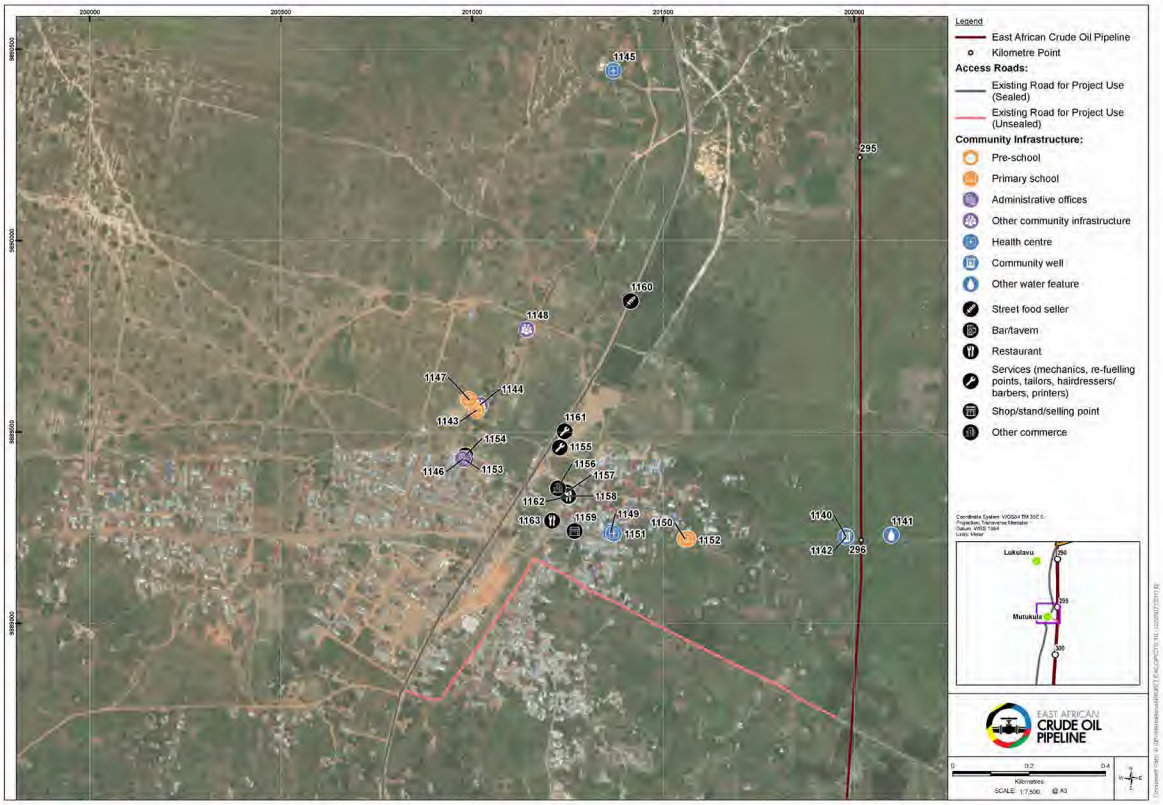
Bigada is located in the subcounty Kakuuto within Kyotera District

Land-based and water-based livelihood strategies:
The main community livelihood is agriculture, both subsistence and commercial. Cash crops grown include coffee, beans and soya beans. Food crops grown include cassava, maize, sweet potatoes and bananas. Livestock is reared in the village and includes cattle, goats, chickens, rabbits, sheep and pigs. A number of tree orchards consisting of eucalyptus can be found in the village. Brick-making and mining takes place and natural resources are gathered for herbal medicinal purposes. Some houses are also engaged in beekeeping at a small-scale.

Main aspirations for the future:
- Electricity in the entire village
- Piped water
- Better quality of roads
- Construction of new health facilities

Timeline

Mutukula Town



PAC PROFILE MUTUKULA – COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- Within the trading centre

Community gathering place:
- Under construction near Mutukula Prison Primary School. The community currently uses the primary school premises for community gatherings/meetings.

Churches/ Mosques:
- St Joseph Catholic Church
- St Andrew Mutukula Church of Uganda
- Masjid Saraf Mosque

Electric lighting within community centre:
- Houses within the town board are connected to the National electricity grid especially Kabawo zone

Power cables:
- Yes

Mobile phone antenna:
- None- Major service providers are available- MTN and Airtel

Communal road:
- Masaka-Mutukula Highway (tarmac)
- Kyasimbi Road (dirt road)
- Market Road (dirt road)

General condition of roads within community:
- Poor with potholes

Level of traffic along main road:
- Average high along the highway

Recent history of accidents:
- 2-3 accidents along the highway per month

Education

School:
- St. Emmanuel Nursery and Primary School
- St. Francis Nursery and Primary School
- St. Andrews Nursery and primary School
- Goodwill Nursery and Primary School
- Mutukula Parents Primary School
- Mutukula Prisons Primary School
- St. Joseph Secondary School
- Mutukula and Umar Islamic Secondary School

Cultural Heritage

Cemetery/ graveyard:
- There are 2 cemeteries - 1 in Kabawo zone for Christians and another for Muslims

Some graves are cemented, some are formed by carving patterns of stones around the grave. Most of the graves are raised in the form of a ridge. For pastoralists, the grave sites are flat with a few patterns of stones and sticks to mark the grave sites.

Local knowledge is needed to identify grave sites.

Health

Dispensary:
- Joyce Dispensary
- Kyakuwa Dispensary
- Katrina Dispensary

Health centre:
- Mutukula Health Centre III

Clinic:
- There are many

Community well:
- Several unprotected community wells

Community pumps:
- A number of community water pumps including boreholes and stand pipes

Piped water from storage tanks:
- Yes

Private boreholes:
- There are a number of private boreholes including Sentovu Youth and Kimbugwe

Public latrines:
- Mutukula Market
- Public Service Vehicles Park Mutukula

Communal washing areas:
- There are a number of communal washing bays

Commerce

Market:
- 1 big open market i.e. Mutukula market

Business:
- Shops
- Kiosks
- Bars
- Street food sellers
- Lodges and Hotels
- Carpentry
- Tailors
- Masons
- Hair saloons
- Barber shops
- Fuel filling stations
- Pharmacies
- Restaurants

PAC PROFILE MUTUKULA - DESCRIPTION

Population

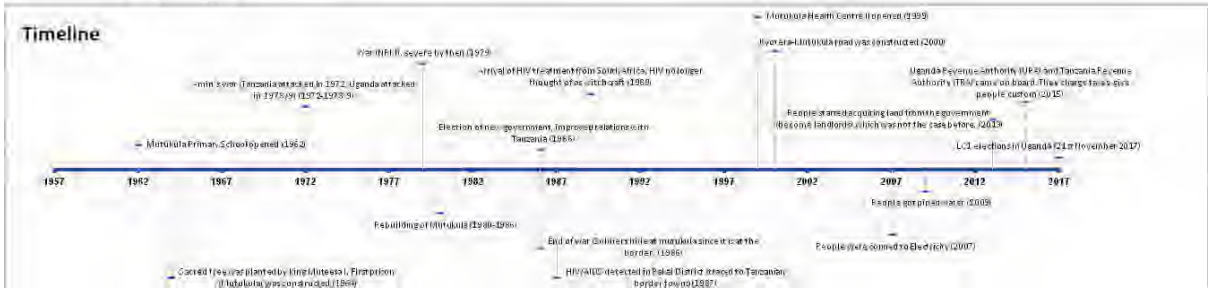
Principal land-based and water-based livelihood strategies

Mutukula is located in the subcounty of Kakuuto within Kyotera district. The village will soon be sub-divided into four villages - Kabaawo zone, Luzinga zone, Kololo zone, Central ward. It is currently under a single village administration and an application has been lodge to the Ministry of Local Government to upgrade its status from a town board to a town council. There are concentrate settlements in Kabaawo zone near the border post between Tanzania and Uganda.

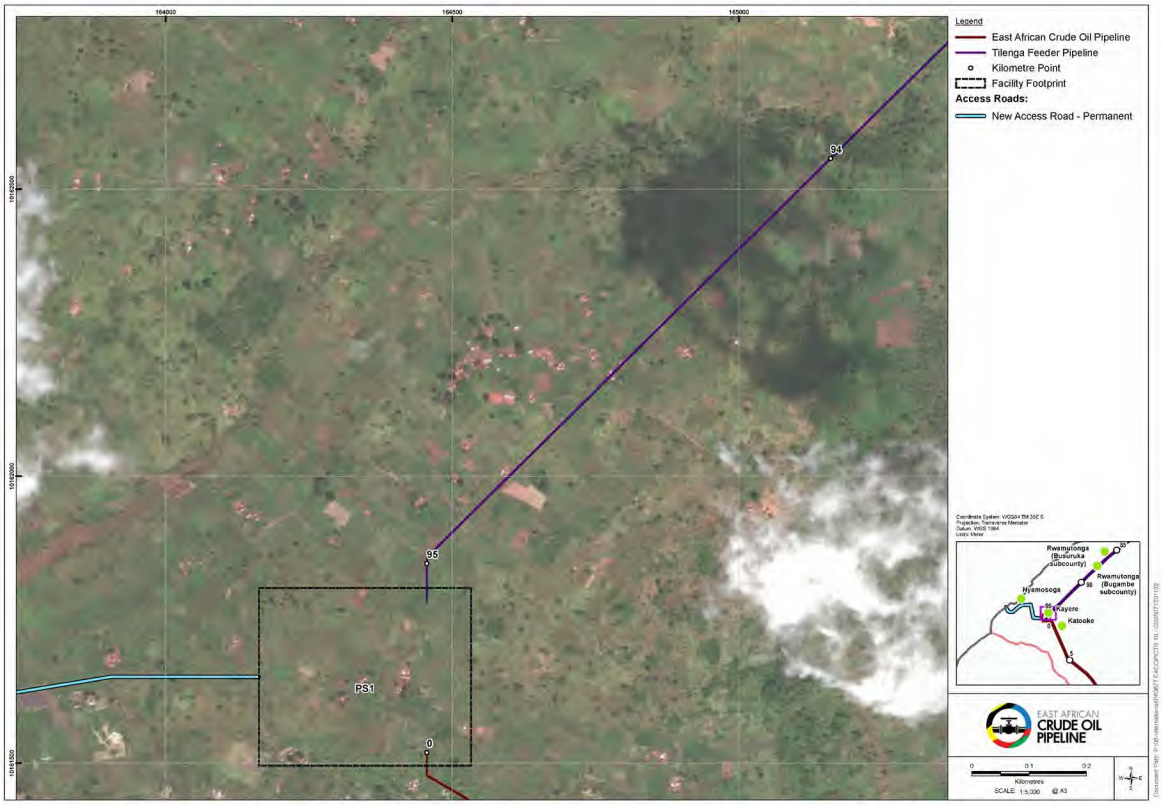
Land-based and water-based livelihood strategies:
Primary sources of livelihoods are subsistence farming and livestock keeping. The main crops include maize, bananas, rice, cassava, onions, cabbages, egg plants, beans, coffee, pineapples and passion fruit. Market gardening is also practiced and includes the planting of vegetables. There are a few tree orchards in the village, especially growing eucalyptus trees. The main kept livestock include cattle, sheep, goats, chickens and pigs. There are few hunters in the village. Small scale charcoal production is undertaken within the community and firewood collection is common. One resident practices beekeeping in the village.

Main aspirations for the future;
- Mutukula to become a town council
- Better socio-economic facilities like tarmac roads
- Access to social services like health, water, electricity
- Better standards of living
- New business opportunities
- New jobs and employment opportunities
- Construction of a modern market place
- Expansion of livestock

Timeline



Kayere



PAC PROFILE KAYERE - COMMUNITY INFRASTRUCTURE

General

Administrative offices:
- At the chairman's house

Community gathering place:
- At Kayere Catholic Church

Churches/ Mosques:
- Kayere Catholic Church: a semi-permanent structure constructed with mud walls

Communal roads:
- Nyamasoga – Kayere road, a murram road

General condition of roads within community:
- Poor road condition

Level of traffic along main road:
- Average

Recent history of accidents:
- Yes, accidents involving motorcyclists claimed numerous lives shortly after road construction.

Education

Cultural Heritage

Graves are marked with heaped soil.

Health

River:
- Wambabya River located North East of the village

Community pumps:
- 2 in place, one located in the Naome Koojo's farm and but currently not functioning for a period of seven years. The other is located on the refinery land, but also not functioning.

Commerce

Business:
- Very few trading shops

PAC PROFILE KAYERE - DESCRIPTION

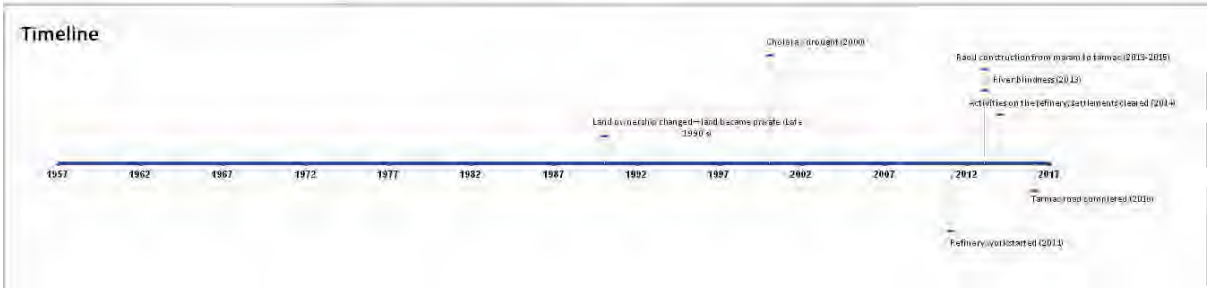
Principal land-based and water-based livelihood strategies

Kayere is located in the subcounty of Buseruka within Hoima district. The occupants of the village were resettled to other villages after the government acquired land for the establishment of the refinery. The area was observed to have scattered seasonal structures for shelters. The area is characterised with thickets and abandoned banana gardens.

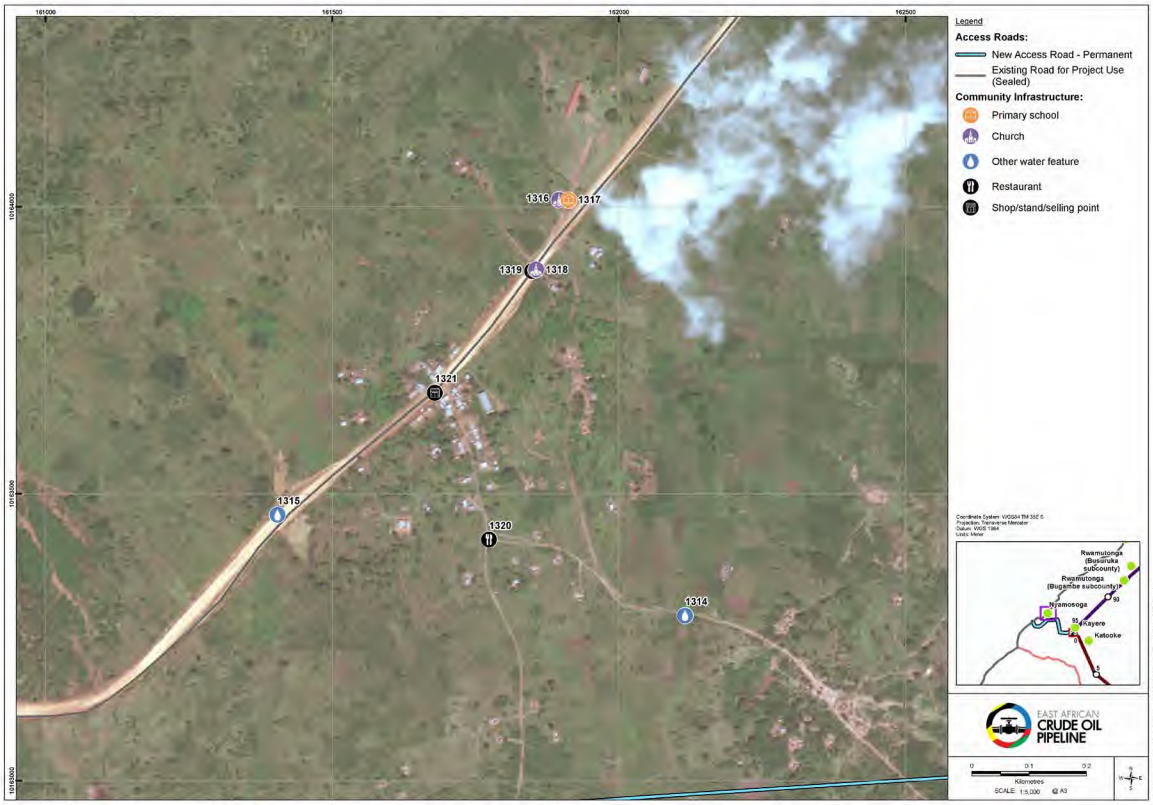
Land-based and water-based livelihood strategies:
The majority of livestock reared within the community are goats, cattle, sheep, pigs and chickens. Crop farming is also present with a variety of different crops grown including cassava, cotton, maize, bananas, beans, tobacco, sweet potatoes, groundnuts and others. Hunting occurs on a small scale for subsistence purposes with animals such as squirrels and edible rats being the targets. Tree plantations are present in the area with the planting of oranges, pineapples, mangoes and avocados amongst others. A small proportion of the village depends on charcoal burning. The gathering of natural resources including beekeeping, grass cutting for thatched houses and firewood collection are all present within the community.

Main aspirations for the future:
- Clean water
- Good quality school so children are safe walking to school
- Health centre
- Better roads to community

Timeline



Nyamasoga



PAC PROFILE NYAMASOGA - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- Under a mango tree

Churches/ Mosques:
- Catholic and protestant church

Electric lighting within community centre:
- Yes

Power cables:
- Yes

Communal roads:
- Refinery road (murram road). Good condition
- Buseruka road (tarmac).

General condition of roads within community:
- Good but dusty

Level of traffic along main road:
- Average

Recent history of accidents:
- Motorcycle accident, due to over speeding, over loading, poor mechanical conditions of motorcycle.

Education

Schools:
- 1 private nursery
- Nyamasoga Primary school

Cultural Heritage

Cemetery/ graveyard:
- Based at household level

Graves are marked by cement and heaped soil.

Health

Dispensary:
- 2 drug shops

Clinic:
- 1 clinic

Community well:
- Akkiidi

Community pumps:
- Yes but not working

Communal washing areas:
- Yes, Akkiidi

Commerce

Market:
- 1 market

Business:
- Shops
- Bars
- Street food seller
- Restaurants
- Barbers/ hair saloons
- Mechanic
- Tailors
- Pharmacy: 2
- Guesthouses
- Lodges

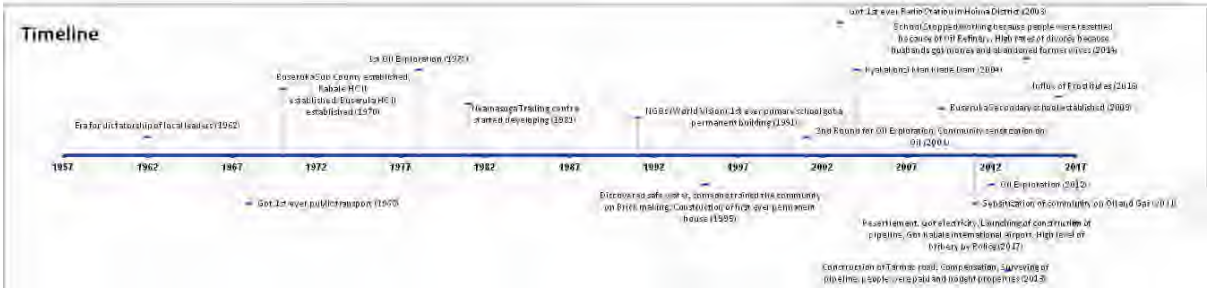
PAC PROFILE NYAMASOGA - DESCRIPTION

Principal land-based and water-based livelihood strategies

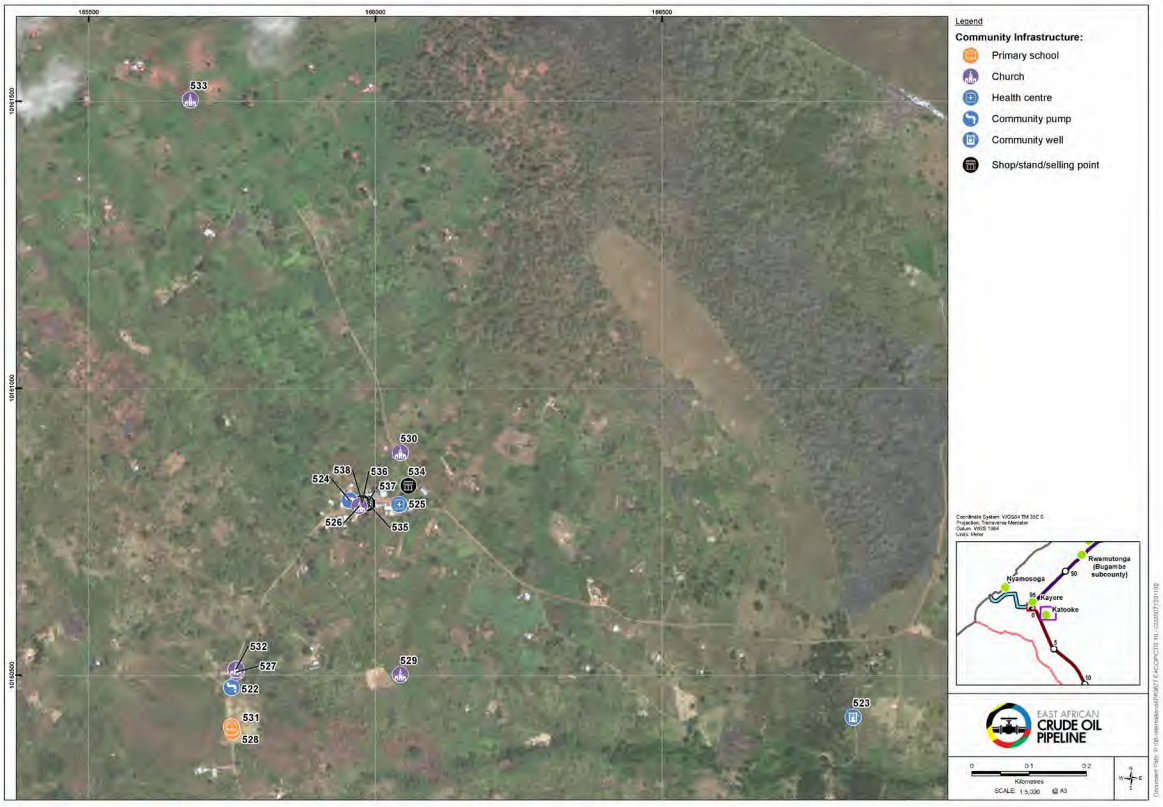
Nyamasoga is located in the subcounty of Buseruka within Hoima district.

Land-based and water-based livelihood strategies:
The main kept livestock in the village are goats, sheep, pigs, chickens and cows. Crop farming is present and the main crop types are cassava, cotton, maize, bananas, beans, tobacco, sweet potatoes, sugarcane, groundnuts, simsims, tomatoes and onions. Oranges, mangoes, jackfruits, avocados and eucalyptus are all grown in tree plantations. Charcoal burning and production is undertaken in the community, as is beekeeping.

Main aspirations for the future:
- Economic development
- Improved access to education
- Access top good and clean water
- Organised community



Katooke



PAC PROFILE KATOOKE - COMMUNITY INFRASTRUCTURE

General

Community gathering place:
- Katooke Church of Uganda
- Katooke Trading Centre

Churches/ Mosques:
- Katooke Church of Uganda
- Katooke Catholic Church
- Christ the way Cchurch

Electric lighting within community centre :
- Use of solar panels

Communal road:
- Several trunk earth roads

General condition of roads within community:
- Poor condition

Level of traffic along main road:
- Medium, mainly comprising of boda boda cyclists

Recent history of accidents:
- Mainly involving boda boda cyclists

Education

Schools:
- Katooke parents Nursery school
- Katooke Primary school

Cultural Heritage

Place of worship:
- 2 shrines within the village on Katooke hill

Cemetery/graveyard:
- Burial is done at homesteads

Graves are marked by placing concrete, planting flowers and heaping soil.

Health

Clinic:
- 3 private clinics

River:
- Wambabya River

Marshes:
- Papyrus along sections of the river

Community well:
- 1 protected well
- 3 shallow wells

Community pumps:
- 1 borehole

Other:
- Odong stream

Commerce

Market :
- Katooke Market

Business:
- Hair saloons: 4
- Carpentry: 1
- Shops: 7
- Transport (Taxis/ motorcycles): 4
- Produce buying: 4
- Fresh food: 8
- Restaurants: 3
- Milk vending: 2
- Milling machine: 3
- Bars:10
- Butchers: 3
- Cinema: 2
- Clinics: 3
- Tailors: 4

PAC PROFILE KATOOKE - DESCRIPTION

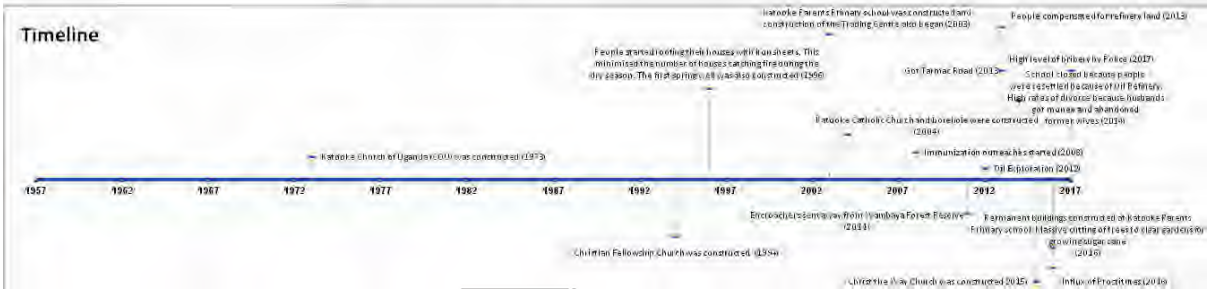
Principal land-based and water-based livelihood strategies

Katooke is located in the subcounty of Buseruka within Hoima district. The village is characterised with scattered settlements away from the trading centre and the population is sparse.

Land-based and water-based livelihood strategies:
The main economic activity within Katooke is agriculture. Crop farming is present for both subsistence and commercial purposes. Crops grown include cassava, maize, tobacco, beans, simsim, bananas, cotton and sweet potatoes. Sugarcane is grown for commercial purposes and is sold to Hoima Sugar Factory located in Kiziramfumbi subcounty. Fishing is present on a low scale in the community fish pond. Many people within the village are involved in hunting. Firewood collection is common, several people are engaged in charcoal production and lumbering is also practiced. Sand mining is also present, as is beekeeping although on a very small scale.

Main aspirations for the future:
- Turn Katooke into a city
- Build a hospital
- Construction of more primary schools, secondary schools, vocational schools
- Bring electricity
- Market construction
- Construction of industries
- Tap water
- Good, motor able roads
- Better security

Timeline



Site Profiles

MCPY1

MAP FOR MCPY-1

MCPY-1 is located at Katikara (Katikara sub-county, Kakumiro District)

Features identified <u>within</u> the project footprint based on transect walk

- Individual trees
- Demarcated agricultural fields
- One structure
- Tracks

Features identified immediately <u>outside</u> the project footprint based on transect walk

- Dirt road
- Dwellings and structures (individual and clustered along large dirt road)
- Demarcated agricultural fields
- Individual and clusters of trees
- Large buildings to the south – looks industrial
- Tracks

For further information about nearby PAC refer to the following PAC profiles:

- Katikara (14-4)
- Kakende (14-1)
- Kabaale-Kyabicwe (14-2)
- Kisenyi (14-3)

MCPY2

MAP FOR MCPY-2

MCPY-2 is located at Kalembe (Kitenga sub-county, Mubende District)

Features identified <u>within</u> the project footprint based on transect walk

- Individual trees
- Demarcated agricultural fields
- Tracks
- (Might be 1 structure/dwelling)

Features identified immediately <u>outside</u> the project footprint based on transect walk

- Existing Tarmac road
- Individual and small clusters of dwellings and structures
- Individual and clusters of trees and shrubs
- Demarcated agricultural fields
- Tracks

For further information about nearby PAC refer to the following PAC profiles:

- Kyenda (22-3)
- Lugala (22-5)
- Mijunwa (22-6)
- Kalembe (22-2)
- Kagoma (22-1)

MCPY3

MAP FOR MCPY-3

MCPY-3 is located at Muyenje (Mijwala sub-county, Sembabule District)

Features identified <u>within</u> the project footprint based on transect walk

- Demarcated agricultural fields
- Tracks
- Individual trees
- Potential settlements (can't tell from GIS data)

Features identified immediately <u>outside</u> the project footprint based on transect walk

- Demarcated agricultural fields
- Tracks
- Individual trees and small clusters of trees
- Individual structures and dwellings
- Potential body of water to the north of the camp
- To south west of camp there is a small cluster of large buildings – could be agricultural or used for a different type of small scale industry

For further information about nearby PAC refer to the following PAC profiles:

- Muyenje (28-3)
- Miti (28-1)
- Nsambya (28-2)
- Sembabule (28-4)

MCPY4

MAP FOR MCPY-4

MCPY-4 is located at Kabugimbi (Kakuuto sub-county, Kyotera District)

Features identified within the project footprint based on transect walk

- Tracks
- Individual trees and small cluster of trees and shrubs
- Individual dwellings and structures

Features identified immediately outside the project footprint based on transect walk

- Existing tarmac road for project use
- Demarcated agricultural fields
- Multiple small bodies of water
- Tracks
- Individual trees and clusters of trees and shrubs
- Individual dwellings and structures
- Strip of open land with few trees running along the south of the main camp and coating yard

For further information about nearby PAC refer to the following PAC profiles:

- Kabugimbi (35-6)
- Nabigasa (35-7)
- Bigada (35-8)
- Kabonera (35-5)

PS1

MAP FOR PS-1

PS-1 is located at Kayere (Buseruka sub-county, Hoima District)

Features identified within the project footprint based on transect walk

- Demarcated agricultural fields
- Tracks
- Settlements in 4 small clusters – look like some may be farm buildings
- Individual trees

Features identified immediately outside the project footprint based on transect walk

- Demarcated agricultural fields
- Tracks
- Individual trees
- Small clusters of settlements (some may be farm buildings)

For further information about nearby PAC refer to the following PAC profiles:

- Kayere (8-1)
- Nyamosoga (8-2)
- Katooke (8-3)

PS2

MAP FOR PS-2

PS-2 is located at Njaza (Lugusulu sub-county, Sembabule District)

Features identified within the project footprint based on transect walk

- Demarcated agricultural fields
- Individual and small clusters of settlements surrounded by trees/shrubs or wall
- Individual and clusters of trees and shrubs
- Tracks

Features identified immediately outside the project footprint based on transect walk

- Demarcated agricultural fields
- Individual and small clusters of trees
- Individual and small clusters of settlements and dwellings (some surrounded by trees/shrubs or walls)
- Tracks
- Large dirt road (might be a small body of water to immediate southwest of camp)

For further information about nearby PAC refer to the following PAC profiles:

- Njaza (26-2)
- Maabale (26-1)
- Serinya (26-3)
- Kagango (26-4)

ATTACHMENT A11.3 DATA COLLECTION TOOLS

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT TECHNICAL PLANNING COMMITTEE (DTPC) INCLUDING THE CHIEF ADMINISTRATIVE OFFICER (CAO) AND DEPUTY CHIEF ADMINISTRATIVE OFFICER (DCAO)			
Name of district		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)		**Position of the interviewee(s)**	
SECTION 1 – INFORMATION ABOUT PROJECT IMPACTS			
Q1-1. What is the district population profile and how has this changed over the past five years?			
Q1-2. Are there any cadastral maps available for the villages in the district/sub county?	☐ Yes ☐ No		
Q1-3. What are the major livelihood activities in the district and how have these changed over time?			
Q1-4. What are the major land tenure systems in the district and how have these changed over time?			
Q1-5. What are the key social conflicts in the district?			
Q1-5-1. What have been the key drivers of these conflicts?			
Q1-5-2. How have these conflicts been resolved?			
Q1-6. What are your initial thoughts regarding the impacts of the EACOP project on the district with respect to livelihoods and land ownership?			
Q1-7. Are there any special interest/especially disadvantaged groups that merit special attention with respect to the anticipated project impacts?	☐ Yes ☐ No		
Q1-7-1. If yes, please explain why.			
Q1-8. How can these impacts be minimized or mitigated within the district? And what role can the district play in the mitigation process?			

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT COMMUNITY DEVELOPMENT OFFICER (DCDO)			
Name of district/sub county		Date of the interview:	
Name of interviewer		Sample site/point:	
Name(s) of the interviewee(s)			
SECTION 1 – INFORMATION ABOUT CDO TEAM/SUPPORT STAFF AND NETWORK			
Q1-1. How long have you, personally, been working in this area?			
Q1-2. Do you have a team that works under/with you? If so, how many people do you have working with you?			
Q1-3. What qualifications do you look for when employing team members?			
Q1-4. What resources do you have at your disposal (vehicles, meeting places)?			
Q1-5. How regularly do you hold meetings, both in-team meetings and meetings with the communities that you serve?			
Q1-6. Who do you report directly to, and how often?			
SECTION 2 – INFORMATION ABOUT AREA OF INFLUENCE/RESPONSIBILITY			
Q2-1. How many villages/towns do you cover? Which ones, specifically?			
SECTION 3 – INFORMATION ABOUT HUMAN RIGHTS ISSUES			
Q3-1. What have the human rights issues been over the past 10 years?			
Q3-2. Has there been an increase or a decrease in human rights issues more recently?			
Q3-3. What are the conflicts in this area (ethnic, farmers versus livestock keepers, land conflicts)?			
SECTION 4 – INFORMATION ABOUT NEEDS			
Q4-1. What are the most pressing needs of the areas in which you work?			
Q4-2. Are the needs led by any specific category of social deprivation/disadvantage (economics/poverty, education levels, cultural marginalization, geographic inaccessibility, mental health)?			
SECTION 5 – INFORMATION ABOUT COMMUNITY ASSETS			

Q5-1. What particular assets do you think the villages/towns in which you work have, or what particular assets do the communities/people have, that should be drawn upon in reaching development goals?	
Q5-2. Is there anything that distinguishes the identity of this community/area that we should know about?	
SECTION 6 – INFORMATION ABOUT DOMESTIC VIOLENCE (AND OTHER SOCIAL ISSUES)	
Q6-1. What is the incidence of domestic violence in this area?	
Q6-2. Is there any village/town that has a higher incidence than others?	
Q6-3. Do you have a door-to-door domestic violence education programme? If not, how else do you address the matter?	
Q6-4. Are there safe houses, or another support system for victims (women, children, men)?	
Q6-5. What other social-ills or inappropriate behaviours do you encounter?	
Q6-6. How are these factored into your work and programmes?	
SECTION 7 – INFORMATION ABOUT WOMEN AND CHILDREN	
Q7-1. Are there specific women-only interest groups/business organizations etc?	
Q7-2. What roles do women play in development projects?	
Q7-3. Could we discuss projects focused on early childhood development, and on other child and youth issues?	
Q7-4. Has gender-based violence been an area of focus for you?	
Q7-5. Has gender-based violence increased/decreased over the past few years? If so, please explain why.	
SECTION 8 – INFORMATION ABOUT NGOS	
Q8-1. Please could we discuss the most locally-active NGOs in the district/sub county?	
Q8-2. What do the NGOs focus on mainly (i.e. agriculture, women, children, HIV/AIDs, vulnerable groups, mental illness)?	
SECTION 9 – INFORMATION ABOUT ORGANISATIONS/GROUPS	

Q9-1. Please can you provide us with a list of the community organizations in this area that you're involved with managing/engaging with/building capacity with?	
Q9-2. What other organizations/groups do you work with (i.e. Ugandan ministries, police, social workers, teachers, small credit/finance institutions)?	
Q9-3. Do you have tight links to the Vision 2040 goals?	
SECTION 10 – INFORMATION ABOUT DEVELOPMENT ASPIRATIONS	
Q10-1. How do you plan and budget for future development aspirations?	
Q10-2. Where do the financial resources come from?	
Q10-3. Where do the human resources come from?	
Q10-4. What opportunities do you see for development in this area?	
Q10-5. What are your most critical projects at the moment?	
SECTION 11 – INFORMATION ABOUT PROJECT PERCEPTIONS	
Q11-1. What do you see as the potential positive impacts of this project?	
Q11-2. What do you see as the potential negative impacts of this project?	
Q11-3. Are you aware of people's perceptions in this area, of this project? Please elaborate.	

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR POLICE OFFICERS, SOCIAL WELFARE AND PROBATION OFFICERS AND SECURITY OFFICIALS						
Name of district			**Date of the interview**			
Name of interviewer						
Name(s) of the interviewee(s)			**Position of the interviewee(s)**			
SECTION 1 - INFORMATION ABOUT CRIME AND CONFLICT IN THE DISTRICT						
Q1-1. What is the current situation regarding crime in the district? Please indicate: • **The key types of crime** • **Their incidence** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	**Crime type**			**Incidence**		
Q1-2. In the past five years, has the crime rate in the district increased, decreased or remained the same?	☐ Increased ☐ Decreased ☐ Remained the same					
Q1-2-1. Please explain the reason behind this change, if any.						
Q1-3. Are there criminal gangs in the area?	☐ Yes ☐ No					
Q1-4. Is there organized crime in the district?	☐ Yes ☐ No					
Q1-5. Are women more vulnerable to crime than men?	☐ Yes ☐ No					
Q1-5-1. If so, please explain why.						
Q1-6. In the past five years, has crime against women increased, decreased or remained the same?	☐ Increased ☐ Decreased ☐ Remained the same					
Q1-7. Please describe the relations between community groups (inter and intra village) and between ethnic groups in the village.	Community groups			Ethnic groups		
Q1-8. Please describe any past and ongoing conflicts within or between the community and ethnic groups. Please indicate: • **The causes of the conflict** • **The scale of the conflict (i.e. whether**	Conflict	Cause	Scale	Impacts	Timeframe	Resolved? (Y/n)

contained or widespread) • The impacts • The timeframe • Whether it has been resolved or not						
Q1-9. Are there any conflicts spread over international boundaries? If so, please elaborate.						
SECTION 2 – INFORMATION ABOUT SOCIAL ILLS						
Q2-1. Please describe the existing levels of social ills in the district. Please indicate: • Their prevalence • Their scale (i.e. contained versus widespread) • Their effects on society • Their gender dimension (i.e. whether men or women are more affected) • Any trends (i.e. whether increasing or decreasing) *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Social ill	Prevalence	Scale	Effects	Gender dimension	Trends
	Alcoholism					
	Gambling					
	Prostitution					
	Other *(please indicate)*					
Q2-2. Is drug use a problem in the district?	☐ Yes ☐ No					
Q2-2-1. If so, please indicate: • The types of drugs being used • Where they are available • Their visibility • Their social implications • Their gender dimension (i.e. whether men or women are the main users) • Any trends (i.e. whether use of the drug is increasing or decreasing) *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Type of drug	Where available	Visibility	Social implications	Gender dimension	Trends

SECTION 3 – INFORMATION ABOUT PERCEPTIONS OF CRIME	
Q3-1. Do people generally feel safe from crime in the district? Please explain your answer.	
Q3-2. Do you think social and economic inequality plays a role in local crime/conflict? Please explain your answer.	

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT ECONOMIST

Name of district/sub county		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s):			

SECTION 1 – INFORMATION ABOUT EMPLOYMENT AND ECONOMIC OPPORTUNITIES

Q1-1. What type of employment opportunities exist in the district/sub county/affected communities? Please indicate:
- **The number of people engaged in these economic activities**
- **The average wage for each activity**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Employment opportunity	Number of people engaged	Average wage
Teaching		
Nursing		
Law enforcement		
Administration		
Other *(please indicate)*		
Other *(please indicate)*		
Other *(please indicate)*		

Q1-2. In the past five years, has the number of employment opportunities increased, decreased or remained the same? Please elaborate on your answer.	☐ Increased ☐ Decreased ☐ No Change
Q1-3. What opportunities are there for existing and new businesses in the district/sub county?	
Q1-4. Are businesses in the district/sub county formally registered?	☐ Yes ☐ No
Q1-4-1. If so, through what entity/ organization or committee?	
Q1-5. Are disabled people considered for job opportunities? Please elaborate on your answer and indicate if there are any laws or regulations in place with regards to employment for disabled people.	☐ Yes ☐ No
Q1-6. In your view what role do women play in local business and industry? Please describe the areas in which they are represented and which not?	
Q1-7. What are the key challenges relating to employment in the district/sub county?	
Q1-8. What are the potential negative impacts on or challenges for businesses by the proposed project?	
Q1-9. What would be the best way to mitigate such negative impacts on businesses or enhance existing employment opportunities or positive impacts in the area?	

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT/SUB-COUNTY LAND EXPERT			
Name of district/sub county		Date of the interview	
Name of interviewer			
Name(s) of the interviewee(s)			
SECTION 1 - INFORMATION ABOUT LAND			
Q1-1. Are there any cadastral maps available for the villages in the district/sub county?	☐ Yes ☐ No		
Q1-2. What are the land tenure categories (personal and communal) applicable to land in the district/sub county?			
Q1-3. If decisions need to be made relating to communal land (village land or land used by pastoralists), who makes those decisions?			
Q1-4. Are the boundaries between pastoralist and farming land well known to the local communities (farmers and pastoralists)?			
Q1-5. What kind of occupancy rights exist and are used in the district/sub county?			
Q1-6. What rights do women in the district/sub county have in terms of land ownership and inheritance?			
Q1-7. What is the range and average landholding of the subsistence farmers in the district/sub county?			
Q1-8. What type of land disputes have occurred in the district/sub county?			
Q1-9. Are there currently land disputes in the district/sub county?	☐ Yes ☐ No		
Q1-9-1. If so, what mechanism is being used to resolve them?			
Q1-10. Who is the regulatory/decision-making authority responsible for land use, planning and management?			

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT ENVIRONMENTAL OFFICER			
Name of district		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)		**Position of the interviewee(s)**	
SECTION 1 - INFORMATION ABOUT ENVIRONMENTAL MATTERS IN THE DISTRICT			
Q1-1. What are the key environmental concerns in the district?			
Q1-2. What interventions are being made to address these concerns?			
Q1-3. How much of an emphasis is placed on community consultation when developing environmental interventions and measures?			
Q1-4. There have been many discussions around water resources and climate change and one intervention seems to entail planting trees. Please explain this process.			
Q1-5. What are the notable achievements in addressing environmental issues in the district?			
Q1-6. Do environmental concerns tend to be overshadowed by livelihood and agricultural concerns? Please explain your answer.			
Q1-7. Do people recognise the importance of sustainable land use? Please explain your answer.			
Q1-8. Are environmental issues incorporated into the local school curriculum?	☐ Yes ☐ No		
Q1-9. Does the district work with agricultural extension officers to identify environmental issues?	☐ Yes ☐ No		

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT NATURAL RESOURCE OFFICER

Name of district		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)		**Position of the interviewee(s)**	

SECTION 1 - INFORMATION ABOUT NATURAL RESOURCES IN THE DISTRICT

Q1-1. Do people consume bush meat in the district?	☐ Yes ☐ No	
Q1-1-1. If so, what type of bush meat and how much bush meat is consumed?	Bush meat consumed	Amount of bush meat consumed
Q1-2. How much, if any, bush meat is sold and for what price?		

Q1-3. What are the strategies for hunting/catching, storing/preserving, cooking and trading bush meat?	Hunting/catching	Storing/preservation	Cooking	Trading

Q1-4. What are people's legal rights with regards to hunting?	
Q1-5. What are the key constraints faced by hunters in the district?	
Q1-6. Are any of the animals hunted classed as endangered species?	☐ Yes ☐ No
Q1-7. Who is the regulatory/decision-making authority responsible for local fauna in the district?	

SECTION 2 – SPECIFIC INFORMATION ABOUT MINING

Q2-1. Are there artisanal mining activities in the district? If so, please indicate: • **The number of sites** • **Where these are located** (use map if possible) • **What is being mined (i.e. gold, salt, kaolin)** • **The approximate number of miners per site** • **Problems related to sites** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Site	Location	Minerals Mined	Number of Miners	Problems at Site

Q2-2. Please describe the mining practices in the district as far as possible (i.e. methods used, equipment used, seasonality and supply chain).	
Q2-3. What are the typical incomes of artisanal miners?	
Q2-4. What are the key challenges faced by artisanal miners?	
Q2-5. What are the key social challenges faced by communities living in close proximity to large scale mining operations?	
Q2-6. Has there been an influx of people searching for resources in the district?	
Q2-7. Who is the regulatory/decision-making authority responsible for artisanal mining?	

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT/SUB-COUNTY AGRICULTURE EXPERT

Name of district/sub county		**Date of the interview:**	
Name of interviewer			
Name(s) of the interviewee(s):			

SECTION 1 - INFORMATION ABOUT AGRICULTURE

Q1-1. What are the main crops grown in the district/sub county/affected communities (including vegetables, fruit and trees)? For each crop, please indicate:
- **Average yield/ha**
- **Cost of production**
- **Sale price per kg or ton**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Crop	Average yield/ha	Cost of production	Sale price per kg/ton

Q1-2. Please describe the seasonal calendar for agricultural crops in the district/sub county (including planting, growing and harvesting).
(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Crop	Planting months	Growing months	Harvesting months

Q1-3. What is the proportion of subsistence farmers to commercial farmers in the district/sub county? Please elaborate on your answer and indicate if there are pockets of commercial farmers.

Subsistence farmers: % Commercial farmers: %

Q1-4. Please describe the agricultural practices used in the district/sub county (i.e. use of machinery, pesticides, division of labour, fertilizer).

Q1-4-1. Please describe any changes in these agricultural practices in the past 5 years, if any.

Q1-5. Please describe the agricultural supply chain. Where are the main crops sold? And to whom (individual costumers, main buyers etc)?

Crop	Sold where	Sold to whom

Q1-6. How important is farming for livelihoods in the district/sub county/ affected communities? Please elaborate on your answer.

Q1-7. What are the key challenges relating to farming (including natural calamities such as droughts and floods) in the district/sub county/affected communities?

Q1-8. Are agricultural services available to farmers? Please can you elaborate and discuss if the situation is the same for farmers with a permanent crop, farmers that use semi-permanent/rotational crop practices?

☐ Yes ☐ No

Q1-9. What would be the best way to enhance or support agricultural production in the area?	
Q1-10. Are there any programmes being developed by the district/sub county to encourage production? Please elaborate on your answer.	☐ Yes ☐ No
Q1-11. Who is the key regulatory/decision-making authority responsible for agriculture?	
Q1-12. Are any prices (for certain crops) regulated by the government? Please elaborate on your answer.	☐ Yes ☐ No
Q1-13. If land is bought and sold in the district/sub county, what determines the price of land?	

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR LIVESTOCK EXPERT

Name of district/sub county		**Date of the interview:**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	• Veterinary • District /sub county livestock officer		

SECTION 1 - INFORMATION ABOUT LIVESTOCK

Q1-1. What are the main livestock species in the district/sub county? For each species, please indicate:
- **The typical selling price of the specimen**
- **The cost of production per specimen**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Livestock species	Selling price per specimen	Cost of production per specimen

Q1-2. What is the proportion of subsistence livestock rearing to commercial livestock rearing to nomadic livestock rearing in the district/sub county?

Subsistence rearing: % Commercial rearing: % Nomadic rearing: %

Q1-3. What are the common diseases and parasites for different livestock species in the district/sub county and when was the last serious epidemic?
(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Livestock species	Common diseases/parasites	Last serious epidemic (year)

Q1-4. What was the incidence of livestock injuries in the district/sub county over the past year.

Q1-5. Please describe the movement/migration of livestock within the district/sub county. Please provide any maps to illustrate this, if available. *(if not use own map or draw map)*

Q1-6. Have migration routes changed over the past 5 years? ☐ Yes ☐ No

Q1-6-1. If so, please explain the reasons behind these changes.

Q1-7. What is the importance of livestock movement/migration for pastoralists in the district/sub county?

Q1-8. What is the importance of livestock to local livelihoods in the district/sub county?

Q1-9. What is the availability of veterinary services in the district/sub county? Please indicate where they are located *(show on map)*

Q1-9-1. What is their level of utilisation? Are they used regularly or not? Please elaborate on your response.

Q1-10. Is livestock theft a problem in the district/sub county? Please elaborate on your answer. ☐ Yes ☐ No

Q1-10-1. If so, has the manner and incidence of livestock theft changed in the past 5 years?	
Q1-11. What would be the best way to enhance or support livestock production in the district/sub county?	
Q1-12. Who represents the interests of pastoralists?	
Q1-13. Has the prevalence of nomadic livestock rearing increased, decreased or remained the same in the past 5 years?	☐ Increased ☐ Decreased ☐ No Change
Q1-13-1. Please indicate the reasons behind this change, if any.	

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT/SUB-COUNTY FISHERIES EXPERT

Name of district/sub county		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			

SECTION 1 – GENERAL INFORMATION ABOUT FISHING

Q1-1. Do people fish in the district/sub county?	☐ Yes ☐ No
Q1-1-1. If so, what type of fishing takes place?	☐ Commercial ☐ Subsistence ☐ Both
Q1-1-2. If so, please indicate: • **The fish species caught** • **Where fishing takes place (i.e. lakes, rivers, estuaries, coasts, ponds, mangroves)** • **The typical market prices per kg of each fish species** • **Any changes in fish stocks during the past 10 years (i.e. an increase, decrease or no change)**	

Fish species	Where caught	Market price per kg	Change in stock in past 10 years

Q1-2. Do seasonal changes affect fishing activities in the district/sub county?	
Q1-3. How many households are involved in commercial fishing and in subsistence fishing in the district/sub county?	
Q1-4. Are the commercial fishermen worse or better off, in terms of socio-economic status, relative to households with other livelihoods such as farming and keeping livestock etc? Please discuss.	☐ Worse off ☐ Better off ☐ No difference
Q1-5. Do fishermen migrate in search of fish or do they have permanent sites? Please elaborate on your answer and discuss for river, sea and lakes.	☐ Migrate ☐ Have permanent sites ☐ Both
Q1-6. Is access to fishing landing sites (i.e. lakes, rivers) easy or difficult? Please elaborate.	
Q1-7. Are fishermen able to use these sites freely or are there certain rules to abide by?	

SECTION 2 - INFORMATION ABOUT FISHING VESSELS AND EQUIPMENT

Q2-1. What type of fishing vessels are used? Please list in priority order and for rivers, sea and lakes.	1. 2. 3. 4. 5.
Q2-2. For sea fishing, is there any dynamite fishing, beach seine or coral mining?	☐ Yes ☐ No
Q2-2-1. If so, please elaborate.	

Q2-3. Is there intertidal gleaning?	☐ Yes ☐ No
Q2-3-1. If so, who is involved (i.e. men, women, children)?	
Q2-3-2. If so, what is being caught?	
Q2-4. Which gear catches more than others?	
Q2-5. Do people tend to own fishing gear or do they borrow or rent it from somebody else?	☐ Own ☐ Borrow/rent ☐ Both
Q2-6. Is the fishing gear expensive to buy/borrow/rent?	☐ Yes ☐ No
Q2-7. Is some equipment more effective than other equipment in terms of fish catch?	
SECTION 3 – INFORMATION ABOUT COMMERCIAL FISHING	
Q3-1. Where are fish products sold?	
Q3-2. How are fish products transported to market?	
Q3-3. Does fishing generate a satisfactory income?	
Q3-4. How important is fishing in comparison to other livelihoods in the area (i.e. mining, pastoralism)?	☐ Very important ☐ Quite important ☐ Not very important ☐ Not important at all
Q3-5. Over the past 5 years, has the importance of fishing increased, decreased or remained the same relative to other livelihoods?	☐ Increased ☐ Decreased ☐ No change
SECTION 4 – INFORMATION ABOUT CHALLENGES FOR FISHERMEN	
Q4-1. Are there any legal requirements related to fishing? For example, is a permit needed in order to fish?	
Q4-2. Are there any illegal fishing activities in the district/sub county?	
Q4-2-1. If so, what is the scale of illegal fishing compared to legal fishing?	
Q4-3. What key challenges do fishermen face in relation to their work?	
Q4-4. Have there been many accidents involving fishermen in the area? If so, what caused them?	
Q4-5. What would be the best way to enhance or support fisheries in the area?	

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR VETERINARY OFFICER			
Name of district/sub county		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	•		
SECTION 1 - INFORMATION ABOUT LIVESTOCK AND VETERINARY SERVICES			
Q1-1. What types of livestock species are common in this district/sub county?			
Q1-2. Are there livestock markets in this district/sub county and if so where?			
Q1-3. What types of animal veterinary services are provided in this district/sub county?			
Q1-4. How are veterinary services delivered to people?			
Q1-5. Are they expensive for local people to afford?	☐ Yes ☐ No		
Q1-6. What are the common diseases and parasites for different livestock species? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Livestock species	Common diseases and parasites	
Q1-6-1. How has this changed in the past five years if at all?			
Q1-7. What is the incidence of livestock injuries?			
Q1-8. What are the key challenges of veterinary work in this district/sub county?			
Q1-9. Is there good coordination and cooperation between the district/sub county veterinary services and the district/sub county health services on preventing rabies?			
Q1-10. What is the cover of rabies vaccinations in domestic animals in the district/sub county?			
Q1-11. Is the rabies vaccine readily available in the district/sub county?			

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR BUNYORO-KITARA AND BUGANDA KINGDOM REPRESENTATIVES			
Name of district		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)		**Position of the interviewee(s)**	
SECTION 1 – GENERAL INFORMATION			
Q1-1. How do you feel your roles and responsibilities should be incorporated into the consultation process for this project?			
Q1-2. In the past five years, has your role changed in society?	☐ Yes ☐ No		
Q1-2-1. If so, how has it changed?			
Q1-3. What is the process of land allocation in the area?			
Q1-4. What is the current situation regarding land availability in the area?			
Q1-5. Are there any specific livelihoods attached to each cultural identity which need to be specifically acknowledged, itemised and protected during the EACOP project?			
Q1-6. What are the key cultural heritage sites in the area (i.e. churches, burial grounds, holy trees)?			
Q1-6-1. How often are these sites used? And by whom?			
Q1-7. Who is the regulatory/decision-making authority responsible for the management of cultural heritage and archaeology in the area?			

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT ENVIRONMENTAL OFFICER			
Name of district		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)		**Position of the interviewee(s)**	
SECTION 1 - INFORMATION ABOUT ENVIRONMENTAL MATTERS IN THE DISTRICT			
Q1-1. What are the key environmental concerns in the district?			
Q1-2. What interventions are being made to address these concerns?			
Q1-3. How much of an emphasis is placed on community consultation when developing environmental interventions and measures?			
Q1-4. There have been many discussions around water resources and climate change and one intervention seems to entail planting trees. Please explain this process.			
Q1-5. What are the notable achievements in addressing environmental issues in the district?			
Q1-6. Do environmental concerns tend to be overshadowed by livelihood and agricultural concerns? Please explain your answer.			
Q1-7. Do people recognise the importance of sustainable land use? Please explain your answer.			
Q1-8. Are environmental issues incorporated into the local school curriculum?	☐ Yes ☐ No		
Q1-9. Does the district work with agricultural extension officers to identify environmental issues?	☐ Yes ☐ No		

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR DISTRICT NATURAL RESOURCE OFFICER			
Name of district		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)		**Position of the interviewee(s)**	

SECTION 1 - INFORMATION ABOUT NATURAL RESOURCES IN THE DISTRICT				
Q1-1. Do people consume bush meat in the district?	☐ Yes ☐ No			
Q1-1-1. If so, what type of bush meat and how much bush meat is consumed?	Bush meat consumed		Amount of bush meat consumed	
Q1-2. How much, if any, bush meat is sold and for what price?				
Q1-3. What are the strategies for hunting/catching, storing/preserving, cooking and trading bush meat?	Hunting/catching	Storing/preservation	Cooking	Trading
Q1-4. What are people's legal rights with regards to hunting?				
Q1-5. What are the key constraints faced by hunters in the district?				
Q1-6. Are any of the animals hunted classed as endangered species?	☐ Yes ☐ No			
Q1-7. Who is the regulatory/decision-making authority responsible for local fauna in the district?				

SECTION 2 – SPECIFIC INFORMATION ABOUT MINING					
Q2-1. Are there artisanal mining activities in the district? If so, please indicate: • **The number of sites** • **Where these are located** (use map if possible) • **What is being mined (i.e. gold, salt, kaolin)** • **The approximate number of miners per site** • **Problems**	Site	Location	Minerals Mined	Number of Miners	Problems at Site

related to sites *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*					
Q2-2. Please describe the mining practices in the district as far as possible (i.e. methods used, equipment used, seasonality and supply chain).					
Q2-3. What are the typical incomes of artisanal miners?					
Q2-4. What are the key challenges faced by artisanal miners?					
Q2-5. What are the key social challenges faced by communities living in close proximity to large scale mining operations?					
Q2-6. Has there been an influx of people searching for resources in the district?					
Q2-7. Who is the regulatory/decision-making authority responsible for artisanal mining?					

Health Impact Assessment
East Africa Crude Oil Pipeline
Questionnaire for District Clinical Health/ Programme Managers

SHAPE has been appointed to undertake a health impact assessment for the East Africa Crude Oil Pipeline (EACOP) or 'project'. As part of this assessment it is important to understand the prevailing health conditions in communities that may potentially be affected by the project. Further to this, it is equally important to understand why these health conditions are important and what factors influence them. We would be most grateful if you could assist us in completing this questionnaire in as much detail as you can, as well as sharing data and other related information with us. This evidence will assist us to understand the specific context and develop management measures to avoid or reduce future negative impacts. As mentioned in other communications, SHAPE, nor the Project seeks to usurp the role of providing public health services, and has the objective of engaging with the District health departments in assessing risks and proposed management measures to avoid or minimise any negative impacts, and to enhance potential benefits, associated with the Project.

The questionnaire has different sections and as relevant, or if the person is available, it would be beneficial if each clinical or programme head can complete the section that is relevant to them.

We will either collect this questionnaire during our next visit, but you are welcome to complete it and email the copy to:

- Dr Milka Owuor: mowuor@shapeconsulting.org
- Dr Izak Olivier: iolivier@shapeconsulting.org

If you have any questions or comments please don't hesitate to contact us on the email addresses above.

Please can each person that completes a section of this questionnaire place their name, role/function and contact details in the table provided below.

Name of Respondent	Role/function of respondent	Contact details
		Tel: Email:
		Tel: Email:
		Tel: Email:
		Tel: Email:
		Tel: Email:
		Tel: Email:
		Tel: Email:
		Tel: Email:
		Tel:

		Email:

1. Health Profile of District/ Sub County or Potentially Affected Communities

Topic	Response
What are the main health challenges in the district, sub County that will be influenced by the proposed Project?	
Are these health challenges similar in our areas of the district (or other/similar geographical area), or are there unique patterns in other areas? *Please expand as relevant*	
What health challenges are the most urgent to address, and what plans or programmes are in place to consider these? *Note that questions relating to a number of topics are posed later, so you can refer to these sections as relevant.*	
Why are these the main health challenges and what influences them? *Please list for each health challenge or factors that cross cut into more than one area* *Note that questions relating to a number of topics are posed later, so you can refer to these sections as relevant.*	
Are there significant social challenges or factors that influence general well-being or health in the district (or other/similar geographical area)? *Items to consider:* • *Cultural factors or practices.* • *Health seeking behaviours.* • *Refugees or internally displaced people.* • *Focussed migration patterns*	

Topic	Response
to areas or emergence of make-shift settlement. • *Areas of severe poverty* • *Education* • *Employment* • *Substance abuse* • *Transactional sex* • *Suicide and mental health* • *Small scale mining* • *Behaviours/Lifestyle*	
Have other industrial development projects affected health and well-being in the district/sub County. If yes how?	*If any negative effects, in your opinion could anything have been done to anticipate these or manage them. If so, what?*
Has there been a change in burden of disease in the past 5 years?	*If so what new conditions are emerging and way and what conditions are improving and why?*
Who are vulnerable groups and why specifically are they specifically vulnerable?	
What the leading causes of morbidity and mortality in children under 5? *What factors influence these?*	
What the leading causes of morbidity and mortality in adults? *What factors influence these?*	

Topic	Response
As information is available please can you share reports, data and statistics with us? If there are any similar reports available that you think may be of use to us, we would be delighted to receive these. *These will not be published in any formal in reports but used to consolidate other evidence on the baseline health conditions so we can anticipate how community health may be influenced by the project.*	• Annual reports from your district for the past three years. • Any disaggregated reports from the various County and Sub-County level for the past three years. • Annual reports for hospitals or health centres that are of relevance to the project area for the past three years. • Any district or County Integrated/strategic health development plans for next 3-5 years, as available. • Any district or County or health infrastructure development plans. • Health data from the district health information system for the past 5 years, including: o Mortality rates (infant, child and maternal) disaggregated to the district, County and Sub County levels, o Birth rates disaggregated to the district, County and Sub County levels. o Top 10 disease trends, disaggregated for: ▪ Children under 5 ▪ Children aged 5-15 ▪ Adults o TB indicators- case detection and treatment success rates and incidence o Acute respiratory infection/pneumonia (in under 5's, 5-15 and adults) o Measles- incidence/prevalence. o Malaria- incidence/prevalence. Coverage and utilisation of LLINs. Coverage of IRS. Coverage of IPTp. o Onchocerciasis- incidence/prevalence and coverage of CDTI. o Diarrhoeal disease separated by non-bloody, bloody (dysentery), typhoid and suspected cholera. o Prevalence or incidence of schistosoma and intestinal parasites. o HIV- incidence/prevalence. Antenatal care incidence rates. Any data from HCT and PMTCT. Number of care and treatment facilities, ART coverage, adherence to ART. o STIs- incidence/prevalence of genital discharge and genital ulcerative disease, age and gender splits as available. o Nutrition: incidence/prevalence of severe acute malnutrition. Any statistics on wasting, stunting and obesity as available o Rates of anaemia as available o Non-communicable diseases- incidence/prevalence of hypertension, diabetes, and cardiovascular diseases. o Accidents and injuries: incidence/prevalence of road traffic accidents, assault and other forms of non-accidental injury. o Cancers: incidence/prevalence separated by gender. o Trends on mental health conditions, separated by gender. o Epi coverage rates.

2. Health Infrastructure and Services

Please complete the table below on healthcare infrastructure/ resources in the District/ Sub County.
Please can you provide a map of the district that shows the location of health facilities?

Type of facility/Name	Location (Sub County and/or town)	Estimated population served	No. of beds	No. of doctors	No. clinic officers	No. of nurses
Hospitals						
Health centres (state level)						

Please complete the following section

Topic	Response
Is the health infrastructure and service adequate in the district or at the sub County level?	*If not, what are the constraints and weaknesses?* *Are any plans in place to address the identified challenges?*
Is there a specific health infrastructure development plan for the district or sub-County(s)?	*If so, please expand?*
Is access to healthcare facilities acceptable in the district and sub-County(s)?	*If not, what are the constraints?*
Is there any particular group or area that has a restricted access? *Why?*	
Are any public health services provided free of charge to the community? *Please expand and is utilisation of these services good?*	
Are health services affordable for the general population?	

Is accessibility and cost of transport a barrier to accessing health services?	
Are the community generally satisfied with the quality of health services provided? *Please expand as relevant?*	
What and where is the referral hospital for the district?	*What is the general travelling time to this facility from the main district health facility?*
Ambulance service	*Does the district have an adequate number of ambulances to support the referral process?* *Does the patient or the patient's family generally need to pay for the services of an ambulance, or buy fuel for the ambulance?* *Are there any dedicated ambulances used for obstetrical transfers?*
Is traditional medicine used commonly by the communities in the district?	
What do you think promotes the practice of accessing traditional medicine?	
Does health seeking behaviour towards traditional medicine impact on public healthcare service delivery or patient well-being?	

What collaboration is there between traditional medicine practitioners and health authorities?	
What outreach health activities performed in the district/ sub-County?	*Are there any constraints in providing these activities?*
Are village health teams active in the district and relevant sub-Counties?	*Are there any constraints in supporting these activities?*
Is there adequate health knowledge and health awareness in the community to support health prevention and health promotion activities in the community? *Please expand as required?*	
Does the district health department have adequate financial resources to support the provision of comprehensive health services in the district?	*Are there any constraints?*
Does the district health department have adequate human capital resources to support the provision of comprehensive health services in the district?	*Are there any constraints?*
Does the district have adequate financial and human resource capacity to manage a sudden increase in the demand for services that may be associated with rapid migration of people?	*Are there any constraints?*

Does the district have adequate financial and human resource capacity to manage a significant outbreak of communicable disease?	*Are there any constraints?*			
Where are medications and consumables for the district health facilities supplied from?	*Is the supply chain adequate and what are specific challenges?*			
Are the following services available in the district?	Blood transfusion	Yes ☐	No ☐	Where:_____
	General surgery	Yes ☐	No ☐	Where:_____
	Mortuary (freezer)	Yes ☐	No ☐	Where:_____
	Intensive care unit	Yes ☐	No ☐	Where:_____
Are basic services (water, power, accommodation) generally available in all public health facilities? *Expand as required?*				
Do all district health facilities have adequate medical waste management systems?	*Please expand as to how this functions at a district level?*			
Is a health service performance management programme in operation for the district in terms of health service provision and activity?	*If yes, please expand on this?*			

3. Health Strategy and Interventions

Is there a health strategy as part of the as part of the Districts Integrated Development Plan (or similar?)	

	If yes, does this strategy include consider the potential impact of private sector investment or industrial development projects?	
What specific health programme interventions are taking place in the district or relevant sub-County's? *Please can you list them in the table below*	*Are there any weaknesses are areas for improvements in these programmes?*	
Are there any public/private partnerships working on public health programmes in the district/sub- County? *Please can you describe as relevant as to what the programme is and who the private sector company is?*	**Project**	**Private Company**
Are there other health actors/partners from the NGO or bi-lateral donor agencies working on health programmes? *If so please complete the table below*		

Please complete the table below to describe on-going health programmes in the district/sub-County.

Type of Health Programme	Location	Date intervention started	Duration of intervention	Programme funder	Programme Partners	Key programme contact
						Name: Tel: Email:
						Name: Tel: Email:
						Name: Tel: Email:
						Name: Tel: Email:
						Name: Tel: Email:
						Name: Tel: Email:
						Name: Tel: Email:
						Name: Tel: Email:

4. Specific Health Topics

Where possible please can the clinical programme head complete the section relevant to their portfolio.

Maternal and child health		
What are the following district health indicators	Maternal mortality rate	_____ per 100,000 live births
	Infant mortality rate	_____ per 1000 live births
	Child mortality rate	_____ per 1000 live births
	HIV prevalence in antenatal care	_____%
	Syphilis prevalence in antenatal care	_____%
	Hepatitis B prevalence rate in blood donors	_____%
	HIV prevalence in blood donors	_____%
	Prevalence of children under 5 that are underweight	_____%
	Prevalence of children under 5 that are severely underweight	_____%
Do mothers generally deliver in healthcare facilities, or at home?	*If at home, what factors drive this behaviour?*	
Is the coverage of childhood vaccination programmes in line with established targets?	*If not, what are challenges to achieving targets?*	
Does the district keep statistics on the rate of still-births?	*If so, is there an increasing or decreasing trend?*	
Respiratory disease		
Are the rates of tuberculosis (TB) rising or falling in the district or sub County(s)?	*What is the reason for this?* *Is it worse in any particular areas within the County, and are there areas with higher incidence/prevalence?* *And in any particular population or demographic group?*	
What health programme		

<table>
<tr><td>interventions are in place to manage TB?</td><td colspan="3">Are there any constraints in detecting TB at an early stage?</td></tr>
<tr><td>Please complete the following TB indicators</td><td colspan="3"><table>
<tr><th>TB Indicators</th><th>Current Value (%)</th><th>Trend (increasing/ decreasing/ no change)</th></tr>
<tr><td>Prevalence of TB infection</td><td></td><td></td></tr>
<tr><td>Case detection rates</td><td></td><td></td></tr>
<tr><td>Treatment success rates</td><td></td><td></td></tr>
<tr><td>TB morbidity</td><td></td><td></td></tr>
<tr><td>TB mortality</td><td></td><td></td></tr>
<tr><td>MDR TB</td><td></td><td></td></tr>
<tr><td>TB/HIV co-infection</td><td></td><td></td></tr>
</table></td></tr>
<tr><td rowspan="3">MDR-TB</td><td>Are there facilities available to diagnose MDR-TB in the district? If so, where?</td><td colspan="2"></td></tr>
<tr><td>Are medications to treat MDR-TB readily available in the district?</td><td colspan="2"></td></tr>
<tr><td>Has the district seen an increase or decrease in MDR TB in recent times?</td><td colspan="2"></td></tr>
<tr><td>Are the rates of acute respiratory infection rising or falling in the district or sub County(s)?</td><td colspan="3">What is the reason for this?

Is it worse at a certain time of the year? Is it worse in any particular areas within the district?</td></tr>
<tr><td>What are housing conditions like in the community that live in the district or sub-County(s)?</td><td colspan="3">In indoor sleeping arrangements, is overcrowding a problem?

Is ventilation in sleeping or living rooms generally adequate?</td></tr>
<tr><td>Has there been a recent outbreak of measles in the district or sub-County(s)?</td><td colspan="3">If so, where and what was the likely contributing factor?

Are there any risk factors that may lead to the potential for a measles outbreak in the future?

Are there any particular areas of the district that are prone to measles outbreaks?</td></tr>
<tr><td>Is the Epi programme effective in the County?</td><td colspan="3">What are the vaccine coverage rates in the past three years for:<table>
<tr><th>Vaccine</th><th>District (%)</th><th>_____ Sub County (%)</th><th>_____ Sub County (%)</th></tr>
<tr><td>Measles 2013</td><td></td><td></td><td></td></tr>
<tr><td>Measles 2014</td><td></td><td></td><td></td></tr>
<tr><td>Measles 2015</td><td></td><td></td><td></td></tr>
</table></td></tr>
</table>

	DPT 2013			
	DPT 2014			
	DPT 2015			

Vector related disease

Is malaria the number one public health challenge in the district?

If so, why is this and in what area has this been noticed?

Are disease trends increasing or decreasing in the past 3-5 years?

Is the transmission of malaria seasonal and is it worse in certain areas?

What season:
Geographical locations:

Has a malaria cluster indicator survey been completed in the district in the past 3-5 years?

If so do you have the results that you can share. Please can you share data on the table below as well.

If so, what were the results?

Malaria indicators	2012	2013	2014	2015	2016
Prevalence of malaria infection- District					
Prevalence of malaria infection- sub-county					
Prevalence of malaria infection- sub-County					
Case numbers (children <5)					
Case numbers (children >5)					
Malaria mortality					
N/B: can report absolute case numbers if rate is not known.					

What programmes are offered to reduce malaria transmission in the district/sub-County(s)?

If so, are these interventions successful?

Programmes	Yes	No
Health information and education		
Malaria case management with RDT and ACT at clinic level		
Malaria case management with RDT and ACT at clinic level		
Intermittent preventive therapy in children		
Insecticide treated bednet		
Indoor residual spray		
Active case detection		

Please complete the relevant sections below.

If there is an indoor residual spray programme ongoing in the district please complete the following questions

Who is managing the programme?	
What is the spray coverage area?	
What insecticide is being used?	

	Have entomological studies been conducted and what mosquito species was dominant?	
If there is an insecticide treated bednet (ITN) programme ongoing in the district please complete the following questions	What ITNs are in use?	
	Is there a universal distribution campaign or only for vulnerable groups?	
	Is payment required?	
	Is utilization of ITNs good or poor? Why?	
If there is a diagnosis and treatment programme ongoing in the district please complete the following questions	Are rapid diagnostic test kits readily available in health centres? If so, are staff trained to use them? Do patients need to pay extra for them?	
	Is ACT readily available in health centres?	
	Do pregnant women receive intermittent prevention therapy in their pregnancy?	
Have any arbo-viral diseases been recorded in the district, or sub-County(s)?	*If yes, please expand on where?* *Are there adequate diagnostic services to detect arbo-viral disease outbreaks in the district?*	
Have any cases of Yellow fever been reported in the district?	*Does the district have the capacity to address a yellow fever outbreak or would it require external support? Please expand?*	
Does lymphatic filariasis or onchocerciasis occur in the district or sub County(s)?	*What controls are in place to combat these diseases?*	

Does leishmaniasis occur in the district or sub County(s)?	*If yes, where do most of the cases occur? Is there any particular part of the county where the risk is highest?* *What controls are in place to combat diseases?*
Water and sanitation related diseases	
Is housing and general environmental health conditions a challenge in the district or sub County(s)? *Why is this the case and are there any specific areas of concern?*	
Is access to safe water a problem for the community in the district or sub County(s)?	*Are there any specific areas that experience more challenges than others and why this is the case?* *Has access improved or worsened in the last 3 years:* *In urban areas:* *In rural areas*: *What is the coverage of improved water sources in the:* • *District:* • *Sub- County_____:* • *Sub- County_____:* • *Sub- County_____:*
Is access to sanitation services a problem for the community in the district or sub County?	*Are there any specific areas that experience more challenges than others and why this is the case?* *What is the coverage of improved latrine coverage in the:* • *District:* • *Sub- County_____:* • *Sub- County_____:* • *Sub- County_____:*
How do household dispose of domestic waste/garbage?	*Generally*: *Urban areas*:

<table>
<tr><td></td><td>Rural areas:</td></tr>
<tr><td>Are diarrhoeal diseases a challenge in the district/ sub-County(s)?

Please complete table on diarrheoal disease indicators</td><td>Are there any specific areas that experience more challenges than others and why this is the case?

Is it worse at any specific time of the year?

<table>
<tr><th>Diarrhoea indicators</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th></tr>
<tr><td>Prevalence of diarrhoea- district</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prevalence of bloody diarrhoea- district</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prevalence of diarrhoea- _____ sub-county</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prevalence of diarrhoea- _____ sub-county</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prevalence of bloody diarrhoea- _____ sub-county</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prevalence of bloody diarrhoea- _____ sub-county</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Case numbers (children <5)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Case numbers (children >5)</td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Have there been outbreaks of dysentery?</td><td>Are there any specific areas that experience more challenges than others?</td></tr>
<tr><td>Have there been any recent outbreaks of typhoid fever in the district/ sub-County(s)?</td><td>If so, please expand on when and where the outbreak occurred?

If yes, is it a major problem? Is it increasing?</td></tr>
<tr><td>Have there been any recent outbreaks of cholera in the district/ sub-County(s)?</td><td>If yes:
• When was the last outbreak (year):
• Where did it occur:
• What were the risk factors:
• Case load:
• Case fatality rate:

What is the likelihood of future outbreaks?

What capacity does the County have to respond to these outbreaks?</td></tr>
</table>

<table>
<tr><td></td><td></td></tr>
<tr><td>Does urogenital or intestinal schistosomiasis occur in the district/ sub-County(s)?</td><td>If so, what particular areas/communities are more affected?

Are there any public health (e.g school based) programmes to control the disease?</td></tr>
<tr><td>Are intestinal parasites common in the district/ sub-County(s)?</td><td>If so, what particular areas/communities are more affected?

Are there any public health (e.g. school based) programmes to control the disease?</td></tr>
<tr><td>Are skin diseases common in the district/ sub-County(s)?</td><td>If so, where does this occur most commonly and what type of skin disease?

Is:
• Scabies is an issue and if so why?

• Impetigo is an issue and if so why?

• Other skin disease and if so why?</td></tr>
<tr><td>Are infectious eye diseases common in the district/ sub-County(s)?</td><td>If so, where does this occur most commonly and what type of disease?

Is:
• Trachoma is an issue and if so why?

• Viral conjunctivitis is an issue and if so why?

What controls are in place to reduce these risks?</td></tr>
<tr><td colspan="2">Sexually transmitted infections (STIs)</td></tr>
<tr><td>Are STIs common in the district/ sub-County(s)?</td><td>Is there trend increasing or decreasing? Why?

Please complete the burden of disease table
<table>
<tr><th>STI indicators</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th></tr>
<tr><td>Prevalence of syphilis (or ulcerative STI)- District</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prevalence of syphilis (or ulcerative STI)- _____ sub-county</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prevalence of syphilis (or ulcerative STI)-</td><td></td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
</table>

	sub-County					
	Prevalence of urethral discharge STI- District					
	Prevalence of urethral discharge STI- _____ sub-county					
	Prevalence of urethral discharge STI - _____ sub-County					
What factors influence the transmission of STIs in the district/ sub-County(s)? *Please expand as relevant?*	*Are truck stops or transport corridors a concern?*					
Are there any high risk areas or 'hot-spots' in the district/sub-County(s) where the transmission of STIs is particularly high? *Please expand as relevant?*						
Are there any groups that are regarded as high risk or vulnerable for the transmission of STIs in the district/ sub-County(s)? *Please expand as relevant?*						
Is commercial sex or forms of transactional sex a challenge in the district/ sub-County(s)? *Please expand as relevant?*	*Has the practice of commercial sex work changed in recent times?* *Who are generally the clients that seek paid sex?* *Is the practice generally tolerated in the community?*					
Are young girls the target for sexual advances for favours from older men ('sugar-daddy's) *Please expand as relevant?*						

Condoms, safe sex and family planning. *Please answer the questions and expand as relevant*	Are condoms widely used in the district/ sub-County(s) or are there cultural or other reasons that limit use?		
	Are condoms generally easily accessible to the community?	Urban areas	
		Rural areas	
	Are there active condom distribution points in communities?		
	Do young girls or women generally have the ability to negotiate safe sex practices?	Urban areas	
		Rural areas	
	Is there good uptake of family planning in the district/ sub-County(s)? *Are there any factors that limit the uptake of family planning?*		
Is the prevalence of HIV increasing or decreasing in the district/ sub-County(s)?	*If so, why do you think this is the case?*		
Does population movement influence the prevalence of HIV and other STIs? *If so, please expand*			
Is there any specific high risk groups in the district/ sub-County(s)? *Please complete section and expand as relevant?*	Fishermen	Yes☐ No☐	
	Farmers	Yes☐ No☐	
	Transport workers	Yes☐ No☐	
	Military/police	Yes☐ No☐	
	Business men	Yes☐ No☐	
	NGO workers	Yes☐ No☐	

	_____ Yes☐ No☐	
	_____ Yes☐ No☐	
HIV testing *Please complete section and expand as relevant?*	Are there facilities available to diagnose HIV in the district/sub-County(s)? If so, where?	
	Do people openly subject themselves to HIV tests or are these generally provider initiated? *Is there stigma associated with testing?*	
	Is uptake of HIV testing high in antenatal care as part of PMTCT?	
	Are the rates of treatment initiation good in newly diagnosed cases?	
HIV care and treatment	Are there facilities available to provide care and treatment (including ART) in the district/sub-County(s)? If so, where?	
	Which facilities can support CD4 counts and viral load determination?	
	Has there been an increase in the number of HIV positive people enrolling in ART programmes?	
	Is adherence to treatment good? Are there any barriers to adherence to ART?	
Please complete the following information related to HIV/AIDS indicators		

HIV indicators	2012	2013	2014	2015	2016
Prevalence of HIV district					
Prevalence of HIV-_____ sub-county					
Prevalence of HIV-_____ sub-County					
Prevalence of HIV-_____ sub-County					
Prevalence of HIV – age 15-49 in district					
Percentage enrolment on ART					
Coverage of PMTCT and % of HIV+ babies from horizontal transmission					
Number of AIDS related deaths					

Does the community have good and consistent knowledge related to HIV transmission and prevention?	*Does this level of knowledge affect high risk sexual behaviour?* *Does the community have unique cultural practices that may predispose them to higher rates of STIs and HIV?*
Are there high levels of	

stigma or discrimination in the communities? *Please expand as relevant*			
Nutritional disorders			
Is malnutrition a problem in the district/sub-County(s)? *If so, please complete the accompanying questions*	Is this an increasing trend?		
	Are there specific geographical areas of concern?		
	Is malnutrition associated with food shortages or poor feeding practices?		
	Are there any specific groups that may are more prone or vulnerable to malnutrition than others?		
Is nutritional surveillance performed in the district/sub-County(s)? *If so, please complete the accompanying questions*	Severe acute malnutrition rates	District	
		_____ Sub-County	
		_____ Sub-County	
		_____ Sub-County	
	Wasting rates	District	
		_____ Sub-County	
		_____ Sub-County	
		_____ Sub-County	
	Stunting rates	District	
		_____ Sub-County	
		_____ Sub-County	
		_____ Sub-County	
Is obesity a growing concern? *If so, please expand*			
Is there a specific time of the year when food insecurity is a challenge?			
Non-communicable disease			
Is there a district strategy to address the risks of non-communicable diseases?	*If so, please expand and outline if there are any challenges in dealing with these conditions?*		
Is hypertension a public health challenge in the district/sub-County(s)?	*If so why, and is this trend increasing?* *Is there an adequate range of medications and special investigations to manage hypertension?*		

Is diabetes a public health challenge in the district/sub-County(s)?	*If so why, and is this trend increasing?* *Is there an adequate range of medications and special investigations to manage diabetes?*
Is asthma a public health challenge in the district/sub-County(s)?	*If so why, and is this trend increasing?*
Is there good care and treatment support for people that are diagnosed with hypertension or diabetes?	*Please expand as relevant, and advise if there is good adherence to treatment for hypertension or diabetes?*
Does the district keep statistics of cancer? *What is the most common cancers in men and women*	*If so, is the incidence increasing/ decreasing?* Men: Women:
Accidents	
Does the district keep statistics of on the trends of trauma from accidents?	*If so, is the incidence increasing/ decreasing?*
Are road traffic accidents or non-accidental injuries (assault) the most common form of accident?	*What are contributing factors to road traffic accidents?* *Are emergency services or medical facilities currently adequately staffed and equipped to deal with road traffic accidents and related trauma?*
Are physical assaults common in the in the district/sub-County(s)?	*If so are these general assault, stab wounds or gunshot wounds?*

	If so, what influences these (please complete questions below)?		
	Domestic violence	Yes☐ No☐	
	Substance abuse	Yes☐ No☐	
	Other:	Yes☐ No☐	
Environmental health			
Does environmental health management fall under the DHMT or under the District Environmental Department (DED)?	*If the DED, what collaboration occurs with the DHMT?*		
Is food hygiene a concern at markets? *Please expand as relevant?*			
Are there any concerns in the district/sub-County(s) related to pollution or contaminated land? *Please expand as relevant?*			
Zoonotic diseases			
Is there a veterinary public health department in the district/sub-County(s)?	*If so, how does the DHMT interact with this department?*		
Is rabies a concern in the district/sub-County(s)? *Please expand as relevant?*	*Are there effective vaccination programmes in place for rabies?*		
Is brucellosis or leptospirosis a concern in the district/sub-County(s)? *Please expand as relevant?*			

Are viral haemorrhagic fevers a concern in the district/sub-County(s)? *Please expand as relevant?*	
Does the movement of people pose a risk to the introduction of zoonotic disease through the movement of cattle and domestic animals?	
Social Determinants of Health	
Is alcoholism a public health challenge in the district/ sub-County(s)?	***If so, where is this most common (urban or rural areas)*** ***Are there any specific areas of concern in the in the district/ sub-County?***
Is the trend of abuse increasing?	***If yes, please expand***?
Are traditional brews or commercial products mainly consumed?	***If so, how***?
Does alcoholism add significantly to the burden of disease in the district?	
Is drug abuse a public health challenge in the district/ sub-County?	***If so, where is this most common (urban or rural areas)*** ***Are there any specific areas of concern in the district***?
What are the most common drugs of abuse?	
Is the trend of abuse increasing?	***If yes, please expand***?
Is suicide an issue in the district?	***If so, please expand***?

Are women marginalised in society?	***If so how*, *Does this affect the health of the family unit*?**
Is gender based domestic violence common or rare?	***Please expand*?**
Are the trends of domestic violence increasing or decreasing?	***Please expand*?**
Is child abuse common or rare?	
Are the trends of child abuse increasing or decreasing?	

-x-x-x-x-x-x-x-x-END-x-x-x-x-x-x-x-x-

Thank you for your efforts in completing this.

Health Facility SARA Tool

Health Facility	Health Facility 1	Health Facility 2	Health Facility 3	Health Facility 4	Health Facility 5
Contact Person					
Function					
Contact Details					
Health care provider availability					
General doctor					
Medical specialist					
Community Health Assistant					
Community Health Officer					
Surgical Technologist					
Community Health Nurse					
Nurse Midwife					
Nurse Aide					
Nurse specialist/public health nurse					
Registered Nurse (RN) anaesthetist					
Pharmacist					
Laboratory technologist					
Laboratory assistant					
Data clerks					
Psychosocial specialist					
HIV Counsellor					
Public health officer					
Radiographer					
Dental technician/officer					
Physiotherapist					

Health Facility SARA Tool

Health Facility	Health Facility 1	Health Facility 2	Health Facility 3	Health Facility 4	Health Facility 5
General support staff					
Administrators (non-clinical)					
Total					
Service availability					
Out-patient services					
In-patient services					
24 hour emergency					
Emergency surgery					
Caesarean section					
Assisted vaginal delivery					
Blood transfusion					
Neonatal resuscitation with bag and mask					
Pharmacy					
Immunization					
Growth monitoring					
VCT for HIV/AIDS					
PMTCT of HIV/AIDS					
Primary health care					
Maternal health care					
Ambulance service (functioning)					
Intensive care					
Laboratory services					
General surgery					
Orthopaedic surgery					
Specialist services					
Radiology					
Isolation facility					
Number of in-patient beds					

Health Facility SARA Tool

Health Facility	Health Facility 1	Health Facility 2	Health Facility 3	Health Facility 4	Health Facility 5
Diagnostic ability					
Malaria RDT					
Malaria microscopy					
HIV RDT					
HIV ELISA					
HIV CD4 count					
TB diagnostic					
Haematology					
Biochemistry					
Parasitology					
Availability of drugs (always in stock)					
ACTs					
Parenteral quinine					
IPT_p (Fansidar/SP)					
ART (Zidovudine, Nevirapine, Efavirenz)					
TB drugs					
EPI vaccinations					
Antihelmintic drugs					
Oral rehydration solution					
Oxytocin/Misoprostol					
Penicillin/Ampicillin/Benzathine P					
Erythromycin					
Doxycycline					
Vitamin A					
Vitamin K					
Iron supplements					
Folic acid					
Insecticide treated bednets					

Health Facility SARA Tool

Health Facility	Health Facility 1		Health Facility 2		Health Facility 3		Health Facility 4		Health Facility 5	
Hypertension drugs										
Antipyretics										
Injectable diazepam / valium										
Injectable magnesium sulphate or other anticonvulsant										
Injectable ergometrine										
Tetanus anti-toxin injection										
Adrenaline injection										
Anti-protozoa drugs										
Anti-histamines										
Dermatological preparations										
Opioid analgesia										
Injectable anaesthesia (Ketamine)										
Availability and functionality of medical equipment										
A=Available; F=Functional	A	F	A	F	A	F	A	F	A	F
Table for gynaecological examination										
Fetoscope										
Autoclave										
Pressure cooker for sterilisation										
Speculum										
Blood giving set										
Delivery forceps										
IV sets										
Vacuum extractor										
Manual vacuum aspirator										
Dilatation and curettage kit										
Operating table										
Operating light										

Health Facility SARA Tool

Health Facility	Health Facility 1		Health Facility 2		Health Facility 3		Health Facility 4		Health Facility 5	
Anaesthesia equipment										
Oxygen equipment										
Bag valve mask and resuscitator										
Blood pressure apparatus										
Stethoscope										
Thermometer										
Weighing scale										
Glucometer										
Endo-tracheal tube/Laryngeal mask										
Intercostal drain										
Urinary catheter/Naso-gastric tube										
Central line or high gauge IV catheter (16G and below)										
Infrastructure										
Regular/reliable running water										
Regular/reliable electricity										
Solar power										
Generator										
Any type of electricity										
Functioning refrigerator										
Functioning landline										
Functioning mobile										
Functioning 2-way radio										
Continuity of services										
In-patient services 24/7										
Emergency services 24/7										
Official opening hours per day (in hours)										

Health Facility SARA Tool

Health Facility	Health Facility 1	Health Facility 2	Health Facility 3	Health Facility 4	Health Facility 5
Staff lives in proximity to HF					
Access to a referral hospital					
Proximity of referral hospital (in km and hours)					
Transportation possibility to referral hospital					
Cost of referral (both ways)					
Staff in-service training					
Staff trained in life saving skills					
Process of health care					
Use of disposable gloves					
Use of protective eye wear and aprons					
Evidence of use of cleaning disinfectant in wards and casualty					
Evidence of soap in wash basins, or hand sanitizer in wards					
Hand washing					
Use of autoclave					
General state of building and state of cleanliness					
Cost of health care					
How much does a basic outpatient consultation cost					
How much does diagnosis and treatment for malaria cost (with RDT use)					

Health Facility SARA Tool

Health Facility	Health Facility 1	Health Facility 2	Health Facility 3	Health Facility 4	Health Facility 5
How much does an admission for a child cost?					
General Questions					
How many people have access to this health care facility- the target population?					
On average how many out-patient consultations do you conduct on a monthly basis?					
What are the 3-5 main health challenges facing the community					
If you had 3-5 wishes to improve health care in the communities that you serve in, what would they be?					

Health Facility SARA Tool

Health Facility	Health Facility 1	Health Facility 2	Health Facility 3	Health Facility 4	Health Facility 5
What are the 5 most common diseases or causes of morbidity in children under 5 years?					
What are the 5 most common diseases or causes of morbidity in adults					
Are there measures in place to deal with disease outbreaks? How has this changed post-Ebola?					

TILENGA FEEDER & EACOP PIPELINE
FOCUS GROUP DISCUSSION GUIDE FOR WOMEN

Name of village		**Date of the interview**	
Name of interviewer:			
Name(s) of the interviewee(s):			
Criteria to be used to select participants:	• *Women's group representatives;* • *Female heads of households;* • *Housewives;* • *Widows;* • *Single mothers* • *Women engaged in business activities.*		

SECTION 1 – INFORMATION ABOUT HISTORICAL TIMELINE

	Date/period	Event
Q1-1. Thinking back as far as possible, please recall all important events in the life of the community from that moment onwards. *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*		

SECTION 2 – INFORMATION ABOUT GENDER ROLES, TASKS AND RESPONSIBILTIES

	Task/role/responsibility	Task for women	Task for men
Q2-1. What are the roles, tasks and responsibilities of men and women in the community? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Household budget		
	Buying goods for the household (i.e. food, clothing etc)		
	Sale of local produce/commerce		
	Education/upbringing of children		
	Water collection		
	Wood collection		
	House construction		
	Cultivating the land (crops cultivated)		
	Managing livestock		
	Hunting		
	Collecting wild plants		
	Fishing		
	Cooking and cleaning		
	Migrant work		
	Making household decisions		
	Protecting the family		
	Owning land		
	Inheriting (how is land divided)		
	Other *(please indicate)*		
	Other *(please indicate)*		

	Skill	Proportion women with skill (all, majority, less than half, few)
Q2-2. What skills (amongst women) exist in this village (i.e. sewing, weaving, soap making)? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*		

Q2-3. Are employment opportunities available in the area equal and open to women and men? Please elaborate.	☐ Yes ☐ No
Q2-4. Do women believe they will be considered for jobs on the project or do you feel mainly that men will benefit from it?	

Q2-5. Are there any women organisations in the village?	☐ Yes ☐ No			
Q2-5-1. If so, please indicate: • **The name of the organisation** • **The organisation's activities** • **The criteria for membership** • **The number of members** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Organisation name	Activities	Criteria for membership	Number of members
SECTION 3 – INFORMATION ABOUT LOCAL DIET AND DAILY NECESSITIES				
Q3-1. Do people in the village generally produce sufficient food as a family to feed the family throughout the year?	☐ Yes ☐ No			
Q3-1-1. If not, please indicate the hunger months and what measures are used to manage these.				
Q3-2. Which markets (if any) do people use to buy and sell goods? Please indicate: • **The name of the market**				
SECTION 4 – INFORMATION ABOUT ENERGY				
Q4-1. What do you use as energy source(s) for cooking? Please indicate: • **The source of energy** • **The proportion of the village (all, majority, less, few) reliant on this energy source for cooking** • **Where it is obtained** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Source of energy for cooking	Proportion of village reliant on energy source for cooking	Where it is obtained	
Q4-2. What do you use as energy source(s) for lighting? Please indicate: • **The source of energy** • **The proportion (All, majority, less, few) the village reliant on this energy source for lighting** *(Note: only ask these questions if the participatory map completed previously shows sacred places)*	Source of energy for lighting		% of village reliant on source for lighting	
SECTION 5 – INFORMATION ABOUT WATER				
Q5-1. Where does local drinking water supply come from (i.e. tap/river/borehole/well)?				
Q5-2. Is the water safe to consume (i.e. is it potable)?	☐ Yes ☐ No			
Q5-3. Is the supply reliable (i.e. does it provide water	☐ Yes ☐ No			

throughout the year)?	
Q5-4. Is local water supply sufficient to meet local demand throughout the year or are there any times when water availability becomes a problem? Please explain.	
SECTION 6 – GENERAL INFORMATION ABOUT HEALTH	
Q6-1. Where is the nearest health facility from the village?	
Q6-2. How would you rate the quality of the health facility (i.e. good, average or poor)?	☐ Good ☐ Average ☐ Poor
Q6-2-1. Please explain your answer.	
Q6-2-2. If poor, what could be done to improve the facility?	
Q6-3. Is traditional medicine a popular form of treatment in your village?	☐ Yes ☐ No
Q6-3-1. If so, for what type of diseases?	
Q6-4. What are the main health problems of women in the village?	
Q6-5. What are the main health problems of children in the village?	
Q6-6. Is diarrhea common in the community?	☐ Yes ☐ No
Q6-7. Where do women go to give birth?	☐ A clinic ☐ At home
Q6-7-1. Please explain the reason why you give birth at home or at the clinic.	
Q6-8. Are family planning services available in the community?	☐ Yes ☐ No
Q6-9. Are there outreach services in the community that offer services such as vaccinations and weight measurements for children?	☐ Yes ☐ No
SECTION 7 – INFORMATION ABOUT HIV/AIDS	
Q7-1. Do you know what HIV/Aids is and is it a problem in the community?	☐ Yes ☐ No
Q7-2. Is there a stigma associated with HIV/AIDS (for example, are people shunned if they are HIV+)?	☐ Yes ☐ No
Q7-3. Are people aware of how to prevent HIV? Please explain how you think we can prevent it.	☐ Yes ☐ No
Q7-3-1. If so, do people follow	

measures for preventing HIV?	
Q7-4. Are women in the village selling their bodies for money?	☐ Yes ☐ No
Q7-4-1. If so, are these women from the local area or from other places?	
Q7-4-2. If so, who are the target groups of these women (i.e. fishermen, businessmen)?	
SECTION 8 – INFORMATION ABOUT MALARIA	
Q8-1. Is malaria a problem in the community?	☐ Yes ☐ No
Q8-2. Are you aware of the causes of malaria?	
Q8-3. What are people doing to prevent malaria?	
Q8-4. Do people use mosquito nets?	☐ Yes ☐ No
Q8-5. How many people here (in the group) have slept under a mosquito net last night?	
SECTION 9 – INFORMATION ABOUT SANITATION	
Q9-1. What sanitation systems are used in the village? Please indicate: • **The percentage of households using this system in the village** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	System / % of households using this system in the village Bush Pit latrines Improved pit latrines Other *(please indicate)*
Q9-2. Would you consider the local environment to be clean?	
SECTION 10 - EDUCATION	
Q10-1. Do you consider attending school as important? Please explain your answer.	
Q10-2. What is the level of literacy amongst women in the community? Please indicate the percentage of literate to illiterate women.	Literate women: % Illiterate women: %
Q10-3. Is there a difference in the literacy rate of men and women? Please explain your answer.	
Q10-4. Is schooling more important for boys than for girls? Please explain your answer.	
Q10-5. Are there any particular problems girls may face at school?	
SECTION 11 – GENDER AND VULNERABILITY	
Q11-1. Is there violence against women in the village? Please elaborate	☐ Yes ☐ No
Q11-2. Are there support networks for women who have problems and require help?	

Q11-3. Please identify the vulnerable people in the village.		
Q11-3-1. Why do you believe that they are vulnerable?		
Q11-4. What types of networks are available for vulnerable groups in the village?		
Q11-5. What are the challenges for each type of vulnerable group? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Vulnerable group	Key issues
SECTION 12 – INFORMATION ABOUT PERCEPTIONS		
Q12-1. Have there been any changes between life in the community in the past and present?	☐ Yes ☐ No	
Q12-1-2. If so, please explain what these changes are and the possible reasons behind them.		
Q12-2. What are your main aspirations for the village in the future?		
Q12-3. What do you think will be the positive and negative impacts of the project on your lives? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Positive impacts	Negative impacts
Q12-4. What would be the best way to support or enhance the lives of women in the area?		

TILENGA FEEDER & EACOP PIPELINE
FOCUS GROUP DISCUSSION GUIDE FOR COMMUNITY LEADERS

Name of village		**Date of the interview:**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	• *Elders/opinion leaders;* • *Women's group representatives;* • *Religious leaders;* • *Traditional leaders;* • *Youth representatives and/or;* • *Administrative leaders.*		

SECTION 1 - INFORMATION ABOUT HISTORICAL TIMELINE

Q1-1. Thinking back as far as possible, please recall all important events in the life of the community from that moment onwards. *(Note: for the purpose of collecting and recording data on the computer, please use the following table and take a picture of the completed historical timeline)*	Date/period	Event

SECTION 2 – INFORMATION ABOUT VILLAGE LIVELIHOOD STRATEGIES

Q2-1. Please indicate which livelihood strategies exist in the village and the approximate percentage of households involved in each strategy. *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Livelihood strategy	Proportion of households involved(all, majority, less than half, few)
	Subsistence agriculture	
	Commercial agriculture	
	Livestock rearing	
	Pastoralism	
	Fishing	
	Commercial mining	
	Subsistence mining	
	Hunting	
	Wild plant collecting	
	Beekeeping	
	Other *(please indicate)*	
	Other *(please indicate)*	

Q2-2. Please draw a participatory village map including the surrounding area. On this map, please indicate:

- **Residential areas**
- **Social infrastructure (i.e. schools, clinics)**
- **Water points**
- **Agricultural areas (for subsistence and commercial agriculture)**
- **Grazing areas (for local and nomadic livestock)**
- **Fishing areas**
- **Hunting areas** *(note: this may be an arrow in a direction as it may be off the map)*
- **Wild plant collection** *(note: this may differ from timber, medicinal plants, food plants, charcoal)*
- **Sacred sites (i.e. burial grounds, worship of holy trees, sacred groves, rivers)**
- **Resource towns for education, health facilities, marketing goods, administration** *(note: this*

may be an arrow in a direction as it may be off the map and different for different resources) *(Note: if people wish to draw other features then encourage them)* *(Note: please record discussions that go on whilst the maps are being drawn and record in the box to the right)* *(Note: participatory mapping exercise to be completed using flip chart paper and felt tip pens)*		
Q2-3. What type of formal employment opportunities exist in the village? Please indicate: • **How many of each opportunity exist (i.e. nurse, teacher, shop)** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Type of employment	Number
Q2-4. What types of businesses (i.e. restaurants, shops, hairdressers, carpenters) exist in the village? Please indicate: • **How many of each exist** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Business	Number
Q2-5. Please list the different skills available in the village. *(Note: allow the participants to define the notion of skills)*		
SECTION 3 – INFORMATION ABOUT LAND USE IN THE VILLAGE		
Q3-1. What are the land tenure categories in and around the village? Please indicate the prevalence (% of each) of the different categories. *(Note: for the purpose of collecting and recording data on the computer, please use the following table)* *(Note: indicate the prevalence of the different categories by ranking them 1 for most prevalent, 2 for second most prevalent etc)*	Land tenure category (public, private, communal)	Prevalence (very common, common, not common)
Q3-2. Has the prevalence of the different land tenure categories changed over the past 10 years?	☐ Yes ☐ No	
Q3-2-1. If so, how?		
Q3-3. How is land allocated to people?		
Q3-4. Are there currently any land disputes in the village (including between farmers and pastoralists?	☐ Yes ☐ No	
Q3-4-1. If so, please describe where they are and what they are about.		
Q3-5. Are there more or less disputes today compared with 10 years ago?	☐ Yes ☐ No	

Q3-5-1. Please explain why this might be.	
Q3-6. What measures are used to solve the disputes, if any?	
Q3-7. Are there more or less conflicts today compared with 10 years ago?	☐ Yes ☐ No
Q3-7-1. Please explain why this may be.	
Q3-8. What measures are used to solve the conflicts, if any?	

SECTION 4 – INFORMATION ABOUT VILLAGE CULTURE

Q4-1. What are the different ethnic groups in the village? Please indicate:
- **The name of the ethnic group**
- **Their area of origin**
- **Their main characteristics**
- **Their representation (All, majority, less than half, few) in the village)**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Tribal group	Area of origin	Main characteristics	Representation in village

Q4-2. If there are any sacred sites on your village land, please describe their characteristics. Please indicate:
- **Its significance**
- **Its frequency of use/visit**
- **Who uses it**
- **Whether it has moveable items**

(Note: only ask these questions if the participatory map completed previously shows sacred places)

Sacred place	Significance	Frequency of use	Used by	Movable? (y/n)

Q4-3. Are there any rituals or ceremonies at certain times of the year? Please indicate:
- **What the ritual/ceremony is about**
- **When it takes place (i.e. timing)**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Ritual/ceremony	Description	Timing

Q4-4. Are there any local customs and practices in the village regarding ancestors and spirits?	☐ Yes ☐ No
Q4-4-1. If so, please describe them.	

SECTION 5 – INFORMATION ABOUT TRAFFIC IN THE VILLAGE

Q5-1. In your view, who has the main responsibility for road safety? *(Note: please select just one option)*	☐ National/regional road authority ☐ Police ☐ Drivers ☐ Pedestrians

Q5-2. What are the main causes of road traffic incidents in the local area? *(Note: please select the two most important options)*	☐ Poor road conditions ☐ Poor weather conditions ☐ Speeding drivers ☐ Drink driving ☐ Poor conditions of vehicles ☐ Drivers using mobile phones
Q5-3. Are there any advertisements about road safety?	☐ Yes ☐ No
Q5-3-1. If yes, please indicate what the focus of these advertisements was. *(Note: please tick all relevant boxes)*	☐ Alcohol consumption ☐ Speeding ☐ Use of seat belts ☐ Careful driving ☐ Other *(please indicate)*
Q5-4. In the local area, is the presence of main roads viewed as a risk to public safety? For example, is there a history of accidents on the local road network?	
Q5-5. If there was a significant increase in road traffic volumes along the local road network, would this have a significant impact on safety and quality of life within the community?	

SECTION 6 – INFORMATION ABOUT DECISION-MAKING IN THE VILLAGE

Q6-1. Who are the key people (including religious leaders) in terms of leadership and decision-making in the village? Please indicate their particular roles. *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*

Stakeholder	Role

Q6-2. How are decisions made in the village? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)* *(Note: there may be different types of decisions and hence different processes)*

Type of decision	process

Q6-3. What types of conflict may arise in the village (i.e. ethnic, crime etc) and who is the regulatory/decision-making authority responsible for managing them? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*

Type of conflict	Responsible authority

SECTION 7 – INFORMATION ABOUT VILLAGE QUALITY OF LIFE

Q7-1. Have there been any changes between life in the community in the past and present?	☐ Yes ☐ No
Q7-1-2. If so, please explain what these changes are and the possible reasons behind them.	
Q7-2. What are your main aspirations for the village in the future?	
Q7-3. What are the main challenges for the village?	1.

	2. 3. 4. 5.
Q7-3-1. What are community members doing to address these challenges?	

Q7-4. What are the main social problems in the village? For each problem, please indicate:
- **Its importance**
- **Any changes in its frequency (i.e. increase, decrease) over the past 5 years**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)
(Note: indicate the prevalence of the different problems by ranking them 1 for the biggest problem, 2 for second biggest etc)

Social problem	Importance	Changes in frequency in past 5 years
Alcoholism		
Theft		
Prostitution		
Gambling		
Other *(please indicate)*		

SECTION 8 – INFORMATION ABOUT PERCEPTIONS

Q 8-1. Have there been any changes between life in the community in the past and present?	☐ Yes ☐ No
Q8-1-2. If so, please explain what these changes are and the possible reasons behind them.	
Q 8-2. What are your main aspirations for the village in the future?	

Q 8-3. What do you think will be the positive and negative impacts of the project on your lives?
(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Positive impacts	Negative impacts

Q8-4. What would be the best way to support or enhance the lives of the community in the area?	

TILENGA FEEDER & EACOP PIPELINE FOCUS GROUP DISCUSSION GUIDE FOR YOUTHS			
Location of the interview		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
SECTION 1 – GENERAL INFORMATION			
Q1-1. Who in the group is currently employed?			
Q1-1-1. For those of you who are currently employed, what work do you do/what livelihoods do you have?			
Q1-1-2. For those of you who are unemployed, please can you indicate how long you have been unemployed for and what the reasons are behind this?			
Q1-2. Have any young people in the village travelled further afield to find work (i.e. in other villages, cities, countries)?	☐ Yes ☐ No		
Q1-2-1. If so, what kind of work have they found there?			
Q1-2-2. If so, have you heard whether they are sending any money back home?			
Q1-3. Within this group, what level of education do people have?			
Q1-4. For those who have been to school, please can you describe your experiences there?			
Q1-5. What activities do young people like to do in the village?			
Q1-6. Are there any clubs or groups for young people in the village?			
Q1-7. What access do young people have to land in the village?			
Q1-7-1. Do you feel that land is easily accessible to you? Please elaborate.	☐ Yes ☐ No		
Q1-8. What are the key challenges faced by young people in the village?			
Q1-8-1. Are there any particular things you are doing to try to address these challenges?			
Q1-9. What are your future hopes and aspirations?			
Q1-10. How do you expect this project to affect young people in the community? What might the positive and negative impacts be?			

Q1-11. Please can you recommend ways in which we can maximise positive impacts/minimize negative impacts of the project on young people?	

TILENGA FEEDER & EACOP PIPELINE
SMALL GROUP INTERVIEW GUIDE FOR CROP FARMERS

Name of village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	• *Individuals who are reliant on subsistence crop agriculture as their main source of food;* • *Individuals who are involved in subsistence/cash crop agricultural activities as a source of income;* • *Individuals who are involved in processing/transporting crop products to markets and/or;* • *Individuals who are representatives of an agricultural association.*		

SECTION 1 - INFORMATION ABOUT CROP AGRICULTURAL PRACTICES

	Crop type	Whether crop is eaten or sold	Who grows the crop (i.e. men, women, children)	Typical crop yield per household per year (kg)	Location where crop is grown (i.e. household land, communal area)
Q1-1. What are the main types of crops grown in the area? For each crop, please indicate: • **Whether the crop is eaten or sold** • **Who grows the crop (i.e. men, women, children)** • **Typical crop yield per household per year (kg)** • **Location where crop is grown (i.e. household land, communal area)** *(refer to map if needed)* *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*					

	Crop sold	Method used to transport crop to market	Role of middlemen/associations in sale of crop	Typical income generated from crop each year	Typical price obtained per crop/per unit
Q1-2. In relation to the sale of crops, please indicate: • **Method used to transport crop to market** • **Role of middlemen/associations in the sale of the crop** • **The typical price obtained per crop/per unit** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*					

	Challenge	Description	Changes in past 5 years
Q1-3. What are the key challenges / problems involved in growing crops? For each type of challenges/problem , please: • **Provide more details about the challenge/problem (i.e. causes, impact on crop farmers in the area)** • **Describe whether this has changed in the past 5 years (i.e. worsened, improved)** *(Note: challenges associated with water and irrigation are asked separately below)* *(Note: for the purpose of collecting and recording data on the computer, please use the following table. Also the challenges in the table are examples and may not be applicable)*	Changes in the market value of crops sold		
	Interference/conflicts between individual farmers		
	Availability of hand equipment/tools		
	Availability of mechanized equipment (i.e. tractors)		
	Transportation of produce to markets (i.e. how is this done?)		
	The application of fertiliser/pesticides		
	Drought causing crop failure		
	Flooding causing crop failure		
	Crop health and disease		
	Soil quality		
	Presence of invasive plant species overtaking crops		
	Poor extension service		
	Other *(please indicate)*		
	Other *(please indicate)*		

SECTION 2 – INFORMATION ABOUT WATER AND IRRIGATION IN CROP AGRICULTURE

Q2-1. What are the main sources of water used in agriculture (i.e. boreholes, wells, canals, river pumps)? *(Note on the map where the source for irrigation is)*	
Q2-2. If irrigation is used for crops, how is water diverted to fields and plantations?	
Q2-3. When is irrigation used by farmers (i.e. throughout the year, during certain periods)?	
Q2-4. Are there any challenges associated with using irrigation in the area?	☐ Yes ☐ No
Q2-4-1. If so which?	
SECTION 3 – INFORMATION ABOUT SUPPORT FOR CROP FARMERS	
Q3-1. Is any support offered to farmers through organisations?	☐ Yes ☐ No
Q3-1-1. If so, please discuss.	
Q3-2. Is any support offered to farmers through government	☐ Yes ☐ No
Q3-2-1. If so, please discuss.	
Q3-3. Have farmers in the area ever received training in enhanced productivity techniques? *(Note: tick all boxes applicable)*	☐ Using high-yield crop species ☐ Enhanced irrigation techniques ☐ Increased use of fertilisers ☐ Ways to access higher value markets ☐ Using information technology (i.e. including phone applications and provision of credit) ☐ Increases efficiency of land use (defining property rights, securing land tenure, increased governance) ☐ Other *(please specify)* ☐ No training received
Q3-3-1. If training has been given to farmers, who was this provided by (i.e. NGO, regional community development officer)	

TILENGA FEEDER & EACOP PIPELINE
SMALL GROUP INTERVIEW GUIDE FOR FISHERMEN

Name of village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	Fishermen at sea, in rivers and lakes		

SECTION 1 - INFORMATION ABOUT FISHERMEN

Q1-1. What is the proportion of households in the village involved in fishing (all, the majority, less than half, only a few)?			
Q1-2. What is the percentage of households that live totally off fishing (all, the majority, less than half, only a few)?			
Q1-3. Has the importance of fishing versus other livelihoods increased/decreased in the last 5 years or stayed the same?	☐ Increased ☐ Decreased ☐ No Change		
Q1-3-1. If any change, please explain the reasons behind this change.			
Q1-4. Who are involved in fishing (i.e. young men, older men, women and children) and how are they involved (specific tasks)? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Household member	Involved (yes/no)	Tasks
	Young men		
	Older men		
	Women		
	Children		
Q1-5. Do people pay others to help them with fishing?	☐ Yes ☐ No		
Q1-6. Do people fish in groups or alone?	☐ Groups ☐ Alone ☐ Both		
Q1-6-1. How are tasks and profits divided amongst people who fish in groups?			
Q1-7. Do fishermen generally belong to specific ethnic groups? Please name them. *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Ethnicity		

SECTION 2 - INFORMATION ABOUT THE TYPE OF FISH THAT ARE CAUGHT AND SUPPLY CHAIN

Q2-1. For each of the type of fish or other sea lake or river animal (i.e. crab, sea cucumber) caught, please provide the following information: • **Typical yields (kg per trip)** • **Change in fish stock abundance (increase/decrease)** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Fish/ sea-lake-river animal species	Typical yield	Change in fish stock (increase/decrease)
Q2-2. What proportion of the fish /animal caught is sold? Please indicate for each species. *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Fish/ sea-lake-river animal species	% of fish/animal sold	
Q2-3. What factors influence decisions to sell versus use at home?			

Q2-4. Where are the fish/animals sold? Please indicate if there are differences for the different species.				
Q2-5. How are the fish/animals transported? Please indicate if there are differences for the different species.				
Q2-6. How are the fish/animals preserved during transport to markets? Please indicate if there are differences for the different species.				
SECTION 3 – INFORMATION ABOUT FISHING AREAS AND FISHING PERIODS				
Q3-1. Where does fishing/ catching animals take place (i.e. in lakes, rivers, estuaries, coasts, mangroves)? For each place, please indicate: • **The best periods for fishing, catching (i.e. all year around or specific months)** • **Periods when fishing/ catching is not allowed** • **The accessibility of the fishing/ catching location (easy, difficult)** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Type of fishing location (lakes, rivers etc)	Best periods for fishing	Periods when fishing is not allowed	Accessibility of location (easy, difficult)
Q3-2. Do fishermen use specific routes from the shoreline to access fishing grounds?	☐ Yes ☐ No			
Q3-2-1. If so, please describe them *(refer to map)*.				
Q3-2.2 How far from the shore do people go?				
SECTION 4 – INFORMATION ABOUT FISHING BOATS/VESSELS				
Q4-1. What types of fishing vessels are used? For each vessel, please indicate: • **The type of fishing vessel** • **How they are powered (motor, manpower)** • **Typical number of people per vessel** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Fishing vessel type	Powered by	Number of people per vessel	
Q4-2. Of the households involved in fishing, what is the proportion of households who own their own vessels/boats?	%			
Q4-3. Has the number boats/vessels increased or decreased over the last 5 years or stayed the same?	☐ Increased ☐ Decreased ☐ No change			
Q4-3. 1 Please explain the reasons behind this change, if any.				
SECTION 5 - INFORMATION ABOUT FISHING GEAR/TECHNIQUES				
Q5-1. How do people catch the fish/ other water animals? Please list the different types of techniques used and explain the main advantages (i.e. ease of use, large yield) and disadvantages (i.e. expensive, dangerous) of using each technique. *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Fishing technique	Advantages	Disadvantages	

Q5-2. Do people fish/catch during the day, night or at both times?	☐ Day ☐ Night ☐ Both
Q5-3. Does seasonality affect the fishing techniques that are used? Please explain.	☐ Yes ☐ No
Q5-3-1. If so, please explain why.	
Q5-4. Do people do intertidal gleaning?	☐ Yes ☐ No
Q5- 4-1. If so, what percentages of households do gleaning?	%
Q5-4-2. If so, what do they glean? Please list the targets.	

Q5-5. What types of fishing equipment are used? For each type of equipment, please indicate:
- **Whether it is generally owned or rented**
- **What costs are involved in purchasing or renting the equipment**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Fishing equipment	Status (owned /rented)	Cost involved
Nets		
Long lines		
etc		

SECTION 6 - INFORMATION ABOUT REGULATION

Q6-1. Are any regulatory bodies managing artisanal/subsistence fishing/catching?	☐ Yes ☐ No

Q6-1-1. If so, please can you name them and say what their roles are? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*

Regulatory bodies	Roles

Q6-2. Are any licenses required to fish/catch?	☐ Yes ☐ No
Q6-2-1. If so, please can you describe them?	
Q6-3. Are there formal and informal rules to abide by when fishing?	☐ Yes ☐ No
Q6-3- 1. If so, what are they?	

SECTION 7 - INFORMATION ABOUT KEY CHALLENGES

Q7-1. What key challenges do fishermen face in relation to their work (i.e. conflicts with commercial fishing companies)?	
Q7-2. What are the dangers associated with fishing/catching?	
Q7-3. How many accidents involving fishermen in the area have there been in the last year?	☐ 0 ☐ Less than 5 ☐ More than 5
Q7-3-1. If so, what caused them?	
Q7-4. Is there any illegal fishing taking place in the area? Please explain the type of illegal fishing activities that occur	☐ Yes ☐ No

TILENGA FEEDER & EACOP PIPELINE SMALL GROUP INTERVIEW GUIDE FOR PASTORALISTS				
Name of community		**Date of the interview**		
Name of interviewer				
Name(s) of the interviewee(s) and contact details				
Criteria to be used to select participants:	Leaders or members of nomadic pastoralist communities or organisations			
SECTION 1 - INFORMATION ABOUT LIVESTOCK AND GRAZING LAND				
Q1-1. Please describe the livestock you keep using the table:	Type of livestock	Typical herd size of household / family	Typical value(selling price) per animal in herd	Typical annual income earned from herd (sale, products, etc)
Q1-2. Please describe the task of each household member with regards to the livestock.				
Q1-3. Do you or other members of your household cultivate crops?	☐ Yes ☐ No			
Q1-3-1. If so can you describe how you combine these two activities? Different members of the family, different times of the year etc.				
Q1-4. For the most important livestock species, please describe how the animals are bred and the main sources of food.				
Q1-5. Where are your main grazing lands located? *(refer to map)*				
Q1-6. Is the land you use for grazing communal or private land or both?	☐ Communal ☐ Private ☐ Both			
Q1-6-1. If private (and not yours) how do you obtain permission to use the land?				
Q1-7. Do you have to pay to use grazing land?				
Q1-8. Where does your livestock get water from (river, boreholes, trough /pond, village supply etc).				

Q1-9. Are there enough watering points where you graze your animals?	
Q1-10. Are these water points providing good quality water?	
Q1-11 Is obtaining water for your livestock ever difficult? If so, please explain why and show where (on the map).	
SECTION 2 - INFORMATION ABOUT NOMADIC PASTORALIST GROUPS AND MOVEMENTS	
Q2-1.Do you travel as a household or only few members of household or as a group of several households with your livestock?	☐ Household ☐ Few members of household ☐ Group of households
Q2-2. If you travel in group, what is the composition of the group (i.e. households, only men, only young men)?	
Q2-3. To which tribe do you belong?	
Q2-4. Do you have a village that you call home and return to annually for an extended period of time? Please explain.	☐ Yes ☐ No
Q2-5. Please explain your annual movements. If it changes every year then please describe your movements of last year. *(Note: Ask participants to draw their movements on a local or regional livestock migration map if available, if not use own)*	
Q2-6. Do you occasionally cross national borders with your herd?	
SECTION 3 – INFORMATION ABOUT THE SALE OF LIVESTOCK/LIVESTOCK PRODUCTS	

Q3-1. Please explain the general process for buying and selling livestock. **Q3-1-1 Are there markets?** **Q3-1-2 If so, what type of markets and where are they** (name the town or area and *if possible show on the map)* **Q3-1-3 What type of livestock is sold/bought there?** **Q3-1-4 Are the markets privately owned / managed or public?**					
Q3-2. Please indicate the following in the table:	Livestock products (meat, cheese, milk, hide, etc indicate from which animal)	Methods of transportation of livestock product to the market	Role of middlemen/associations in the sale of livestock product	Average price per animal/unit of the product sold	Responsibility for the sale of livestock product (i.e. men, women)
SECTION 4 - INFORMATION ABOUT SUPPORT FOR AND CHALLENGES FACING PASTORALIST GROUPS					
Q4-1. What problems, if any, do you face as pastoralists?					
Q4-2. How are you trying to deal these problems?					
Q4-3. What have been the major changes to your way of life over the past 5 years?					
Q4-4. In your view do pastoralists have a higher, lower or similar income to farmers?	☐ Higher ☐ Lower ☐ Similar				
Q4-5. Are there services or infrastructure to support you (i.e dips for	☐ Yes ☐ No				

diseases prevention)? If so, please describe them.			
Q4-6. Are there any animal husbandry organisations in your area?	☐ Yes ☐ No		
Q4-6-1. What role do these organisations play? What support can they provide to you?			
Q4-7. Are there any animal veterinary services available in your area?	☐ Yes ☐ No		
Q4-7-1. Are these services affordable?			
Q4-7-2. How are these services delivered to you?			
Q4-8. What are the common diseases and parasites for different livestock species in the area and how has this changed over the past 5 years? *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Type of livestock	Common diseases and parasites	Changes noted in the past 5 years
Q4-9. How common are livestock injuries in the area?			
Q4-10. Is livestock theft a problem in this area?	☐ Yes ☐ No		
Q4-10-1. If yes, how has livestock theft changed in the past 5 years?			
Q4-11. Are threats from wild life (predators) a problem from this area?			
Q4-12. Is there any conflict between different nomadic pastoralist groups?			
Q4-13. Is there any conflict between farmers and nomadic pastoralists?			
Q4-14. What are the good and the bad sides of being a pastoralist and has this changed over the years?			

TILENGA FEEDER & EACOP PIPELINE
SMALL GROUP INTERVIEW GUIDE FOR NATURAL RESOURCE USERS

Name of village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants	• *People who may rely on bush meat as a source of protein;* • *People who own trap systems, or have knowledge of them, or sell bush meat products;* • *People who live close to designated conservation areas where bush species (and people hunting them) may be present;* • *People who are beekeepers;* • *People who are known to collect wild plants, fruits, nuts, mushrooms, honey etc. for a source of nutrients, medicinal use, or for alcohol;* • *People who provide locally sought building materials in the form of sand, gravel, timber, poles, thatch, corvée, etc and/or;* • *People who produce charcoal for household consumption or cash sale;* • *People who collect intertidal/marine resources (seaweed, coral for lime making, salt)* • *People who harvest mangroves (for household use or cash sale)* • *People who collect plant materials for firewood* • *People who collect craft materials (weaving, carving, pottery)* • *People who graze, collect animal fodder* • *People who use forested areas / trees / caves / open areas for rituals*		

SECTION 1 - INFORMATION ABOUT WILD/BUSH ANIMALS

Q1-1. Do people in the village hunt wild animals?	☐ Yes ☐ No							
Q1-1-1 If yes, please complete the following table:	Animal	How they are hunted	Purpose	Season(s) hunted	% Sale/own use	Frequency of hunting (how often per month)	Income generated per month during hunting season	Those involved in hunting (i.e. men, women, children)
Q1-2. Where are animals being hunted and caught?								

(refer to map)	
Q1-3. Have the numbers of animals increased or decreased in the past 5 years or remained the same? Please describe for the different animals that you hunt as indicated in the table above.	
Q1-3-1. Please explain the reasons behind this change, if any.	
Q1-4. What proportion of households in the village hunt animals (all the majority, less than half, a few)?	
Q1-5. Has the number of people hunting increased or decreased in the past 10 years or remained the same?	☐ Increased ☐ Decreased ☐ No change
Q1-5-1. If any change , please explain the reasons behind this change.	
Q1-6. Has the need for bush meat increased or decreased in the past 10 years or remained the same?	☐ Increased ☐ Decreased ☐ No change
Q1-6-1. If any change please explain the reasons behind this change.	
Q1-7. Is a hunting permit required?	☐ Yes ☐ No
Q1-7-1. If a permit is required who provides it?	

Q1-8. Are there any restricted areas where hunting is not permitted?	☐ Yes ☐ No
Q1-8-1. If so where are these? (*show on the map*)	
Q1-9. Are there any taboos related to hunting, to particular wild animal species?	☐ Yes ☐ No
Q1-9-1 If there are taboos, please describe these.	
Q1-10 Are there any animals that cannot be hunted? Please name them.	☐ Yes ☐ No
Q1-11. What do you understand by illegal hunting?	
Q1-11-1. Are people ever caught for illegal hunting by the authorities?	☐ Yes ☐ No
Q1-12. How is bush meat sold (i.e. locally, in other villages, privately, in an open market)?	
Q1-13. If alternatives were available (i.e. chicken for meat), would they be used?	

SECTION 2 - INFORMATION ABOUT WILD PLANTS (INCLUDING LEAVES, NUTS, FRUITS AND BERRIES)

Q2-1. Please complete the following table:	Wild plant	Purpose (i.e. medicine, food)	Who collects (i.e. men, women)	Where collected (village)	Seasonal variations in availability	Frequency of collection (how often per month)	Own use/sale or both	Income generated per month	Importance of wild plant	Where plant is sold (if relevant)

Q2-2. What percentages of households in the village collect wild plants?	
Q2-3. Has the number of people collecting wild plants increased or decreased over the past 10 years or remained the same?	☐ Increased ☐ Decreased ☐ No change
Q2-3-1. Please explain the reasons behind this change, if any.	
Q2-4. Has the need for wild plants increased or decreased over the past 10 years or remained the same?	☐ Increased ☐ Decreased ☐ No change
Q2-4-1. If there is a change, please explain the reasons behind this change.	
Q2-5. Is a permit to collect wild plants required?	☐ Yes ☐ No
Q2-5-1 If a permit is	

required, who provides it?	
Q2-6. Are there any areas where collecting plants is not permitted? *(please show on the map)*	☐ Yes ☐ No
Q2-7. Are there any plants that are protected and cannot be gathered?	☐ Yes ☐ No
Q2-7-1. If yes, please name them	
Q2-8. Are there any taboos related to particular wild plant species?	☐ Yes ☐ No
Q2-8-1. If there are taboos, can you please describe them?	
Q2-9. Please explain how and where wild plants are sold (i.e. locally, in other villages, privately, in an open market).	

SECTION 3 - INFORMATION ABOUT OTHER NATURAL RESOURCES (FUELWOOD, TIMBER, SAND, GRAVEL, HONEY, MUSHROOMS)

Q3-1. Q2-1. Please complete the following table. Add details of other types of products if collected, such as freshwater sea products (fish, seaweed, etc.)	Type of product	How collected	Roles of men and women	Seasonal variation in product availability	Where collected *(refer to map)*	Permission required to collect? (Y/N)	Frequency of collection (how often per month)	Whether product is sold or for own use	Where product sold (if relevant)	Proportion of households involved (a few, less than half, majority, all)	Increase/decrease in availability
	Honey										
	Mushrooms										
	Fuelwood										
	Timber										
	Sand										
	Gravel										
	Other *(please indicate)*										
	Other *(please indicate)*										
	Other *(please indicate)*										
Q3-2. Please describe how the products are sold (i.e. locally, in other villages, privately, in an open market).											

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR BUSINESS OWNERS			
Name of district/sub county/village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	• *A business owner (i.e. shop, artisan, bicycle mechanic etc) in the village*		
SECTION 1 - INFORMATION ABOUT BUSINESSES IN THE VILLAGE			
Q1-1. What type of business do you operate?			
Q1-2. What are the main products/services you trade in?			
Q1-3. When did you start your business?			
Q1-4. Do you purchase materials/goods for your business?	☐ Yes ☐ No		
Q1-4-1. If so, where do you purchase them from?			
Q1-5. Is your premise owned or rented?	☐ Owned ☐ Rented		
Q1-6. How many people does your business employ?			
Q1-7. Do you have competition?	☐ Yes ☐ No		
Q1-7-1. If so, please elaborate.			
Q1-8. What is the average income and profit of your business in a good and bad month?	Good month:	Bad month:	
Q1-9. Please describe your typical customers (i.e. whether men or women, whether from inside or outside the village, etc)			
Q1-10. What are the main challenges you face in running the business?			
Q1-11. What changes have you observed since y started your business in terms of customers, profits etc and please explain possible reasons why.			

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR COMMUNITY HEALTH FACILITY

Name of village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)		**Position of the interviewee(s)**	
Name of facility			
Type of facility			
Walk through done	☐ Yes ☐ No		
Photos taken	☐ Yes ☐ No		
GPS reference taken	☐ Yes ☐ No	**GPS reference**	
Criteria to be used to select participants:	▸ *Senior representative of the community health facility*		

SECTION 1 – INFORMATION ABOUT MEDICAL STAFF AVAILABILITY

Q1-1. Please indicate:
- **Which staff are available at the community health facility**
- **How many of these staff are available**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

Staff	Currently have/How many	Do not have
General doctor		
Specialist doctor		
Clinical technicians		
Registered nurses		
Enrolled nurses		
Midwives		
Laboratory technologist		
Laboratory assistant		
Pharmacist		
Community health worker		
Cleaning staff		
Security personnel		
Other *(please indicate)*		

SECTION 2 – INFORMATION ABOUT FACILITY INFRASTRUCTURE

Q2-1. Does the facility have regular/reliable running water?	☐ Yes ☐ No
Q2-2. Does the facility have regular/reliable electricity?	☐ Yes ☐ No
Q2-2-1. What type of electricity does the facility rely on?	☐ Generator ☐ Solar power ☐ Other *(please indicate)*
Q2-3. Does the facility have a functioning refrigerator?	☐ Yes ☐ No
Q2-4. Does the facility have a functioning landline?	☐ Yes ☐ No
Q2-5. Does the facility have a functioning mobile phone (not personal)?	☐ Yes ☐ No
Q2-6. Does the facility have functioning two-way radio communication?	☐ Yes ☐ No
Q2-7. What is the condition of the equipment and infrastructure of the facility?	
Q2-8. Any other comments?	

SECTION 3 – INFORMATION ABOUT SERVICE AVAILABILITY	
Q3-1. Does the facility provide out-patient services?	☐ Yes ☐ No
Q3-2. Does the facility provide in-patient services?	☐ Yes ☐ No
Q3-2-1. How many in-patient beds are available (if any)?	
Q3-3. Does the facility provide 24-hour emergency services?	☐ Yes ☐ No
Q3-4. Does the facility provide delivery services (births)?	☐ Yes ☐ No
Q3-5. Does the facility provide blood transfusions?	☐ Yes ☐ No
Q3-6. Is there a pharmacy at the facility?	☐ Yes ☐ No
Q3-7. Does the facility provide immunisations?	☐ Yes ☐ No
Q3-8. Does the facility provide growth monitoring services?	☐ Yes ☐ No
Q3-9. Does the facility provide HIV services (any)?	☐ Yes ☐ No
Q3-10. Does the facility have a functioning ambulance service?	☐ Yes ☐ No
Q3-11. Does the facility offer rapid diagnostic tests for malaria?	☐ Yes ☐ No
Q3-12. Does the facility offer rapid diagnostic tests for HIV?	☐ Yes ☐ No
Q3-13. Does the facility offer HIV CD4 counts?	☐ Yes ☐ No
Q3-14. Does the facility offer TB diagnosis (any kind)?	☐ Yes ☐ No
Q3-15. Do medical staff live in close proximity to the facility?	☐ Yes ☐ No
Q3-16. What are the official daily opening hours of the facility?	
Q3-17. Any other comments?	

SECTION 4 - INFORMATION ABOUT ACCESS TO A REFERRAL HOSPITAL	
Q4-1. How far away is the referral hospital from the community health facility (in hours)?	
Q4-2. Is transportation from the community health facility to the hospital available?	☐ Yes ☐ No
Q4-2-1. What is the cost of this transportation (both ways)?	
Q4-3. Any other comments?	
SECTION 5 – INFORMATION ABOUT THE COST OF HEALTHCARE	
Q5-1. How much does a basic outpatient consultation cost?	
Q5-2. How much does diagnosis and treatment for malaria cost (with RDT use)?	
Q5-3. How much does admission for a child cost?	
Q5-4. Any other comments?	
SECTION 6 – GENERAL INFORMATION ABOUT COMMUNITY HEALTH AND THE FACILITY	
Q6-1. How many people have access to this health care facility?	
Q6-2. What are the 3-5 main health challenges facing the community?	1. 2. 3. 4. 5.
Q6-3. What are the 5 most common diseases in children under 5 years?	1. 2. 3. 4. 5.
Q6-4. What are the 5 most common diseases for all age groups?	1. 2. 3. 4. 5.

Q6-5. What treatment/management plans are in place for addressing such diseases?	
Q6-6. Are there measures in place at the facility to deal with disease outbreaks?	☐ Yes ☐ No
Q6-6-1. If so, what are they?	
Q6-7. What is the status of violence against women in your area?	
Q6-7-1. Has violence against women increased, decreased or remained the same in the past 5 years?	☐ Increased ☐ Decreased ☐ No Change
Q6-8. Is there good community support for local health initiatives?	☐ Yes ☐ No
Q6-9. If you had 3-5 wishes to improve health care in the communities that you serve, what would they be?	1. 2. 3. 4. 5.

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR COMMUNITY HEALTH STAFF			
Name of village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	• *Staff based in local health facilities (i.e. dispensaries)* • *Community health workers* • *Midwives (trained)* • *Traditional Birth Attendants (TBAs)* • *Local community development officers*		
SECTION 1 - INFORMATION ABOUT COMMUNITY HEALTH FACILITIES			
Q1-1. Please describe the health facilities and health services (i.e. outreach programmes) available in the area.			
Q1-2. Please describe how accessible (good, medium, poor) these facilities are to local people in terms of: • **Physical distance between facilities and homes** • **The cost of transportation** • **The cost of a consultation** • **The cost of a treatment/medicine**		**Good/medium/ poor**	
	Physical distance between facilities and homes		
	Cost of transportation		
	The cost of a consultation		
	The cost of a treatment/medicine		
Q1-3. Do people trust the local health facility to correctly diagnose and treat illnesses?	☐ Yes ☐ No		
Q1-4. What proportion of women in the village give birth at a health facility (all, majority, less than half, very few)?	Health facility :		
Q1-5. Do women typically receive advice from a trained community health worker before giving birth?	☐ Yes ☐ No		
Q1-6. Do women typically receive advice from a trained community health worker after giving birth?	☐ Yes ☐ No		
SECTION 2 - INFORMATION ABOUT COMMUNITY HEALTH PROFILE AND CHALLENGES			
Q2-1. What are the main sources of protein consumed by the local population?			
Q2-2. What are the five most common illnesses in the local community?	6. 7. 8. 9. 10.		

Q2-3. How many people (babies, children, adults) are affected by malnutrition in the village and in what manner?		
Q2-3-1. If people are malnourished, what are the main reasons behind people not having enough food?		
Q2-3-2. What are the key challenges/problems relating to food production in the area?		
Q2-3-3. Who is the regulatory/decision-making authority responsible for food and nutrition?		
Q2-4. What role do sexual norms and behaviours play in the existence of diseases such as HIV/AIDS?		
Q2-5. What is the local attitude towards the use of contraception?		
Q2-6. Are any groups in society particularly vulnerable to certain diseases?		
Q2-7. Is food hygiene a problem or has it been a problem in the past?		
SECTION 3 – INFORMATION ABOUT THE ROLE OF TRADITIONAL HEALERS		
Q3-1. Are there any traditional healers practicing in the area?		
Q3-2. Where do they come from (i.e. inside or outside the area)?		
Q3-3. What kind of training have they received?		
Q3-4. Do they need to be registered with the local health authority in order to practice?		
Q3-5. What methods do traditional healers typically use?		
Q3-6. Is there any collaboration between traditional healers and modern medicine?		
Q3-7. Why might somebody favour a traditional healer over a regular doctor at a health facility?		
Q3-8. Are there any problems associated with people choosing traditional medicine over modern medicine?		
SECTION 4 - INFORMATION ABOUT SOLID WASTE MANAGEMENT		
Q4-1. What types of waste	Type	Yes or No

management services are available in the community?	private waste pit near homestead	
	landfill	
	compost waste	
	waste ever burnt in the open air near to houses	
	Other	

SECTION 5 – INFORMATION ABOUT WATER, SANITATION AND HYGIENE							
Q5-1. Please provide a summary of local drinking water sources. Please indicate: • **Sources of water** • **Purpose of water sources** • **Average distance travelled to reach water sources** • **The reliability of water sources (always available or not)** • **The perceived quality of water sources** • **The monthly cost associated with water (if it is paid for)** • **Who collects water from the source (i.e. men, women, children)** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Source of water	Purpose of water	Distance travelled to source	Reliability of water source	Perceived quality of water source	Monthly cost of water (if paid for)	Who collects water from source
	Village well						
	Village hand pump						
	Public borehole						
	Private borehole						
	Surface water (lake, river etc)						
	Bottled water						
	Other *(please indicate)*						

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR COMMERCIAL AND SUBSISTENCE FARMERS				
Name of district/sub county/village		**Date of the interview**		
Name of interviewer				
Name(s) of the interviewee(s)				
Criteria to be used to select participants:	• *Farmers engaged currently in commercial agriculture (attempt to get a variety of crops)*			
SECTION 1 - INFORMATION ABOUT CASH CROPS GROWN				
Q1-1. What types of cash crops do you grow (including vegetables, fruit and trees)? Please indicate: • **Acreage under cultivation per crop** • **Typical income earned per acre** • **Value or sale price per unit of crop** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Name of crop	Acreage under cultivation	Typical income per acre	Value/sale price per unit
SECTION 2 – INFORMATION ABOUT FARMING PRACTICES, WORKFORCE AND OPERATIONS				
Q2-1. Please describe the type of machinery you use, if any.				
Q2-2. Do you use pesticides?	☐ Yes ☐ No			
Q2-3-1. If so, please indicate: • **What pesticides you use** • **Where you purchase them** • **How much they cost** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Pesticide	Purchased from	Cost	
Q2-4. Do you use fertilisers?	☐ Yes ☐ No			
Q2-4-1. If so, please indicate: • **What fertilisers you use** • **Where you purchase them** • **How much they cost**	Fertiliser	Purchased from	Cost	
(Note: for the purpose of collecting and recording data on the computer, please use the following table)				
Q2-5. Which members of your family are involved in your farming operations?				
Q2-6. Do you employ anybody to help with your farming operations?	☐ Yes ☐ No			
Q2-6-1. If so, are these men, women or both?	☐ Men ☐ Women ☐ Mixture			
Q2-7. Do you use irrigation?	☐ Yes ☐ No			
Q2-7-1. If so, please indicate: • **The source of irrigation** • **When you irrigate** • **The cost of irrigation** • **The reliability of irrigation** • **Whether the irrigation infrastructure you use is communal or private** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Source of irrigation	Timing of irrigation	Cost of irrigation	Reliability of irrigation	Communal versus private irrigation infrastructure
Q2-8. Please describe any changes in commercial agricultural practices over the past 10 years.					
Q2-9. How much land do you farm?					
Q2-10. Please describe the seasonal calendar for agriculture (i.e. planting, growing, harvesting).					
Q2-11. Where are your crops sold? Does this vary according to the crop being sold?					
Q2-12. Who are your main customers? Does this vary according to the crop being sold?					
Q2-13. How do you transport your crops to					

the market place? Does this vary according to the crop being sold?				
SECTION 3 – INFORMATION ABOUT COMMERCIAL FARMING CHALLENGES AND OPPORTUNITIES				
Q3-1. What challenges do you face in marketing?				
Q3-2. What are the key challenges relating to farming (i.e. water, pests, theft, soil quality, natural calamities such as flooding or drought)? Please indicate: • **The frequency of these challenges** • **The severity of these challenges** • **The consequences of these challenges** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Challenge	Frequency	Severity	Consequences
	Water shortages			
	Pests and diseases			
	Theft/ theft			
	Poor soil quality			
	Natural calamities			
	Other: *(please indicate)*			
	Other: *(please indicate)*			
Q3-3. What are the opportunities associated with commercial farming?				
Q3-4. Are there any farmer organisations that you are a member of?	☐ Yes ☐ No			
Q3-4-1. If so, please provide details of the organisation. Please indicate: • **The name of the organisation** • **The number of members** • **Its role/ function** • **The support provided** *(Note: for the purpose of collecting and recording data on the computer, please use the following table)*	Organisation name	Number of members	Role/ function	Support provided
Q3-5. What kind of support does the government provide to farmers?				
Q3-6. Are there ever conflicts between farmers or between farmers and pastoralists?	☐ Yes ☐ No			
Q3-6-1. If so, please elaborate.				

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR TRADITIONAL HEALERS			
Name of district/sub county/village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants:	• *One or a small group of traditional healers in the village*		
SECTION 1 – INFORMATION ABOUT TRADITIONAL HEALING IN THE VILLAGE			
Q1-1. How important is traditional medicine as a form of treatment in the local area? For example, is it more popular than orthodox medicine?			
Q1-2. Are your patients mainly men, women or children?	☐ Men ☐ Women ☐ Children ☐ Mixture		
Q1-3. What typical health complaints do people have who come to see you?			
Q1-4. What is the average cost of a treatment?			
Q1-5. What methods do you use (i.e. herbs, rituals)?			
Q1-6. Please describe the relationship you have with the modern medicine (health clinics etc)?			
Q1-7. Why might somebody choose a traditional healer over a regular doctor at a health facility?			
Q1-8. Are you from this village?	☐ Yes ☐ No		
Q1-8-1. If not, where do you come from, how long have you lived here and what brought you here?			
Q1-9. What ethnic group are you from?			
Q1-10. Do people from outside the village seek treatment from you?	☐ Yes ☐ No		
Q1-11. Do you collect any specific wild plants or animals to use in your treatments?	☐ Yes ☐ No		
Q1-11-1. If so, please state the 5 most used plants and how much is required of each plant per year.	**Plant**	**How much needed**	
Q1-12. Do you know of any travelling traditional healers that pass through this area?			

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR TEACHERS

Name of district/sub county/village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
Criteria to be used to select participants	• *One or a small group of teachers in the village*		

SECTION 1 - INFORMATION ABOUT EDUCATION IN THE VILLAGE

Q1-1. What is the literacy rate in the village?	
Q1-2. How does this compare to neighbouring villages?	
Q1-3. What is the proportion of children in the village that attend school on a regular basis?	Attend school: % Do not attend school: %
Q1-3-1. If relevant, what are the reasons for children not attending school?	
Q1-3-2. Does school attendance vary by gender?	☐ Yes ☐ No
Q1-3-2-1. If so, please explain the reasons behind this variation.	
Q1-4. How much importance do parents place on education?	

Q1-5. Please describe the local school(s). Please indicate:
- **The level of education taught (i.e. primary, secondary)**
- **The number of students (male/female) per class**
- **The ratio of students to staff**
- **The ratio of students to classrooms**
- **Whether classrooms are adequately equipped with materials and facilities**

(Note: for the purpose of collecting and recording data on the computer, please use the following table)

School name	Level of education	Number of students per class	Ratio of students : staff	Ratio of students : classrooms	Are classrooms adequately equipped?

Q1-6. What is the pass rate at the level of primary education?	%
Q1-7. What percentage of children go onto secondary school?	%
Q1-8. Do children have to pay to attend primary school?	☐ Yes ☐ No
Q1-8-1. If so, what do they pay for and how much do they pay?	
Q1-9. Do children have to pay to attend secondary school?	☐ Yes ☐ No
Q1-9-1. If so, what do they pay for and how much do they pay?	

Q1-10. What typical challenges are faced by teachers in the school and village?	
Q1-11. How have these challenges changed in the past 10 years, if at all?	

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR CREDIT ACCESS			
Location of the interview		Date of the interview	
Name of interviewer			
Name(s) of the interviewee(s)			
SECTION 1 – INFORMATION ABOUT MICRO-FINANCE SOCIETY/COOPERATIVE			
Q1-1. What collateral do people need in order to become a member of the group/society?			
Q1-2. What is the membership criteria for joining the group/society?			
Q1-3. What is the typical amount of money borrowed by the members?			
Q1-4. What are loans typically used for?			
Q1-5. What interest rate is attached to the loans? What are the repayment terms?			
Q1-6. What area(s) does the society cover?			
Q1-7. What is the level of financial literacy in the communities that you cover?			
Q1-8. Do you offer any training or awareness campaigns to build capacity? If so, please elaborate.			
Q1-9. What are the main challenges you face as a micro-finance society?			
Q1-10. What might the impacts of the society be (positives and negatives)?			
SECTION 2 – INFORMATION ABOUT COMMUNITY-BASED SAVINGS GROUP			
Q2-1. When was the group founded?			
Q2-2. How many members do you have?			
Q2-2-1. What expansion/growth have you had since the group started?			
Q2-2-2. What would be the ideal membership size of the group?			

Q2-3. What is the composition of the group (i.e. men, women or both, young or old, from within or outside the village)?	
Q2-4. How often do you meet?	
Q2-5. Do you have specific focuses that you decide upon as a group?	
Q2-6. What is the criteria for joining the group?	
Q2-7. How did you obtain the money to invest in the first place?	
Q2-8. How much money is typically borrowed?	
Q2-9. What is the money typically used for?	
Q2-10. How does the allocation of payments work? How much interest is attached to loans and what are the repayment intervals?	
Q2-11. What other support do you feel the group provides to members?	
Q2-12. What are your thoughts about the EACOP project?	
Q2-13. What impacts do you feel the project could have on your livelihoods and the investment/growth plans of the group?	
Q2-14. What mitigation measures do you suggest for any possible negative impacts?	

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR MILITARY BARRACKS			
Location of the interview		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
SECTION 1 – BACKGROUND INFORMATION			
Q1-1. When were the military barracks established?			
Q1-2. How many military personnel are based here?			
Q1-3. How many units of accommodation are provided?			
Q1-4. Do families of the military personnel also live in the accommodation, or are they living in nearby communities?			
SECTION 2 - INFORMATION ABOUT COMMUNITY INTERACTIONS			
Q2-1. What interactions do military personnel have with local communities?			
Q2-2. Do military personnel travel into the communities, or do people from the communities approach the barracks?			
Q2-3. Has there been or are there any tension/disputes between the local communities and the military personnel based in the barracks?			
Q2-4. Are any goods/services sourced from the communities, such as:	☐ Food ☐ Water (from boreholes or shallow wells) ☐ Health facilities ☐ Educational establishments (such as schools, colleges etc) ☐ Water disposal sites ☐ Sanitary waste/water disposal sites ☐ Other (please specify)		
Q2-5. Are any non-military personnel from the local community working in the barracks? If so, how many are working and what type of roles do they have?			
SECTION 3 – INFORMATION ABOUT LAND AND PROPERTY			
Q3-1. Are there any nearby land conflicts that military personnel get involved in? If so, please provide details of the different groups involved, and the reason for the conflict.			
Q3-2. Is neighboring land beyond the fence used for military activities, such as training exercises or the storage of materials?			

Q3-3. Have you experienced people starting to live close to the barracks to try and set up housing areas and small-scale vending activities, such as bars, shops, food outlets etc?	
Q3-4. Do they need to be registered with the local health authority in order to practice?	
SECTION 4 - INFORMATION ABOUT HEALTH AND SAFETY	
Q4-1. Are there any other local health and safety issues that the development may need to take into consideration?	
Q4-2. Are there any emergency response vehicles and resources based at the barracks such as a fire truck or ambulance?	
Q4-3. Are there any emergency response vehicles and resources based at the local community such as a fire truck or ambulance?	
Q4-4. Have there been any crime incidents between the communities/pastoralists/in-migrants and barracks?	
Q4-5. One concern is a potential increase in congestion on the road as a result of construction traffic. The barracks is one of the main road users. Are there any particular times of the day/year when it is used more for military movements?	
Q4-6. What is the condition of the local road network?	
Q4-7. Have there been any types of traffic accidents on the road? If yes, what was the main cause of these accidents in your view?	
SECTION 5 – INFORMATION ABOUT THIRD PARTY DEVELOPMENTS	
Q5-1. Do you know of any other major infrastructure developments that are going to take place in the area? These may include the development of new schools, health facilities, establishment of industrial activities, new cattle markets, road improvements etc.	
Q5-2. Are there any plans to expand the barracks in the near future?	

SECTION 6 – INFORMATION ABOUT PROJECT IMPACTS	
Q6-1. How do you think the pipeline may impact the community?	
Q6-2. Are there any stakeholders locally whom you feel would be important for the team to talk with?	

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR BODA BODAS/TAXIS			
Location of the interview		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			
SECTION 1 – GENERAL INFORMATION			
Q1-1. How many vehicles do you own or operate?			
Q1-2. In terms of ownership status, do you:	☐ Own the vehicle outright ☐ Continue to pay the vehicle off ☐ Drive for the owner		
Q1-3. What price do you charge and for what distance?			
Q1-4. What area do you cover/service?			
Q1-5. Do you belong to an association? If so, please name the association you belong to.			
Q1-6. Have you observed any changes in your customer base in the past year? If so, please elaborate.			
Q1-7. What times of the day are you most and least busy?			
Q1-8. Are there any hazards on any particular roads?			
Q1-9. Do you encounter many road accidents during your work? Please elaborate.			
Q1-10. What do you think about the project development coming to your area? How do you think it will impact you and the community?			
Q1-11. Can you recommend any other stakeholders for us to speak to?			

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR RELIGIOUS LEADERS			
Name of district/sub county/village		**Date of the interview:**	
Name of interviewer:			
Name(s) of the interviewee(s):			
Criteria to be used to select participants:	• *Religious leaders of the different denominations in the village*		
SECTION 1 - INFORMATION ABOUT RELIGIOUS LIFE IN THE VILLAGE			
Q1-1. What are the main religious groups in your village?			
Q1-2. How important is religion for members of the community?	☐ Very important ☐ Quite important ☐ Not very important ☐ Not important at all		
Q1-3. Do people follow traditional belief systems in parallel with religious belief systems? Please elaborate on your answer.	☐ Yes ☐ No		
Q1-4. What are the key spiritual beliefs of the villagers?			
Q1-5. Are there any religious sites in the area (whether man-made or natural)? If so, please indicate where.	☐ Yes ☐ No		
Q1-6. Where are religious ceremonies held within the village?			
Q1-7. Are there any tensions between different religious groups?	☐ Yes ☐ No		
Q1-8. What is the role of religious leaders in village decision-making (including conflict resolution)?			
Q1-9. Has this changed in the past 10 years?			
Q1-10. Are there any local prophets that people follow?			

TILENGA FEEDER & EACOP PIPELINE KEY INFORMANT INTERVIEW GUIDE FOR SEX WORKERS			
Location of the interview		Date of the interview	
Name of interviewer			
Name(s) of the interviewee(s)			
SECTION 1 – GENERAL INFORMATION			
Q1-1. What is your familial/marital status?			
Q1-2. Do you operate on your own or as a more formal group?			
Q1-3. Do you pay for security protection?			
Q1-4. Who are your main customers?			
Q1-5. Are there any types of people that you will not see?			
Q1-6. Where do you do your work?			
Q1-7. How much do you earn a day?			
SECTION 2 – INFORMATION ABOUT HEALTH			
Q2-1. Do you have any health issues? If so, please specify.			
Q2-2. Do you encounter gender-based violence?			
SECTION 3 – INFORMATION ABOUT LAND AND PROPERTY			
Q3-1. Are there any nearby land conflicts that military personnel get involved in? If so, please provide details of the different groups involved, and the reason for the conflict.			
Q3-2. Is neighboring land beyond the fence used for military activities, such as training exercises or the storage of materials?			
Q3-3. Have you experienced people starting to live close to the barracks to try and set up housing areas and small-scale vending activities, such as bars, shops, food outlets etc?			
Q3-4. Do they need to be registered with the local health authority in order to practice?			

SECTION 4 - INFORMATION ABOUT ALTERNATIVE LIVELIHOODS	
Q4-1. Do you have any alternative means of generating an income?	
Q4-2. What do you think about the project development coming to your area? How do you think it will impact you and the community?	

TILENGA FEEDER & EACOP PIPELINE
KEY INFORMANT INTERVIEW GUIDE FOR
VILLAGE EXECUTIVE OFFICERS/CHAIRMEN

Name of district/sub county/village		**Date of the interview**	
Name of interviewer			
Name(s) of the interviewee(s)			

SECTION 1 - INFORMATION ABOUT LINKAGES WITH URBAN CENTRES

	Destinations	Purposes	Type of transport (public/private)	Cost per trip
Q1-1. Which towns and other villages is your village connected with, for what purpose and how can they be reached?				
Q1-2. What percentage of households use radios, TVs, telephones, newspapers, the internet in your village?	Radios: % TVs: % Telephones: % Newspapers: % Internet: %			

SECTION 2 – INFORMATION ABOUT DEMOGRAPHY, SOCIAL CLASS AND VULNERABILITY

Q2-1. What is the population size of the village?		
Q2-1-1. What is the number of males relative to females?	Males: Females:	
Q2-2. Are there different socio-economic classes in your community (i.e. poor, middle class, and richer) and if so can you describe the characteristics of those groups and indicate their percentage in the village?	Poor :	%
	Middle class :	%
	Richer :	%
	Other :	%
Q2-3. Are there particular vulnerable groups in the community?	☐ Yes ☐ No	
Q2-3-1. If so, please describe the different groups.		

Q2-4. How many households (or what percentage of the population) may be classed as 'food insecure' (sometimes not having enough food to feed the family), if any?	Number of households: Percentage of the population: %
Q2-5. Has the situation regarding food insecurity improved, deteriorated or remained the same over the past 10 years? Please elaborate on your answer.	☐ Improved ☐ Deteriorated ☐ No change
Q2-6. Are there particular times in the year when food is more readily available than others? If so, which times?	

SECTION 3 – INFORMATION ABOUT VILLAGE LIVELIHOODS

Q3-1. Are there nomadic pastoralists groups or households moving through or around your village land during the year?	☐ Yes ☐ No

Q3-1-1. If so, please indicate:
- **Where they come from (place)**
- **When they arrive and depart**
- **Number of cattle in the group**
- **Number of people / hh in the group**
- **Linkages with the village if any (i.e. family)**
- **Whether there are problems created by their presence**
- **Whether they return annually**
- **What arrangements exist between the pastoralists and the village if any**

Name of pastoralist group/ HH	Where from	Arrival/ departure	Number of cattle	Number of people	Linkages with village	Problems created (if any)	Annual return (Y/N)	Arrangements with group

Q3-2. Has the presence of nomadic pastoralists changed in the area over the past 10 years? If so, please indicate how.	
Q3-3. Do some households in the village rely on remittances?	☐ Yes ☐ No

Q3-3-1. If so, please indicate the percentage of the population benefiting from remittances and elaborate where they mainly come from.	%
Q3-4. Are there any tourism facilities in the area?	☐ Yes ☐ No
Q3-4-1. If so, please indicate: • **The type of facility (i.e. hotel, restaurant)** • **The number of local people employed** • **Whether linked with the environment (i.e. landscapes, wildlife, lakes, rivers, forests)**	Name of facility / Type of facility / Number of local people employed / Linked with environment (Y/n)
Q3-5. What is the potential for tourism in the area in the future? Please provide more details if relevant.	
Q3-6. Has there been any land speculation taking place recently?	☐ Yes ☐ No
Q3-6-1. If so, please elaborate.	
Q3-7. Is there any disputed land in the village?	☐ Yes ☐ No
Q3-7-1. If so, please elaborate.	

TILENGA FEEDER & EACOP PIPELINE SOCIAL AND HEALTH BASELINE STUDY – HOUSEHOLD QUESTIONNAIRE

This household questionnaire is being administered as part of social baseline data collection for the EACOP project. The questionnaire contains a series of questions designed to gather information about households in terms of their composition, homestead structure, economic activities, health, use of natural resources and so forth.

Questionnaire ID			
Name of village		**Name of parish/ward**	
Name of sub-county		**Name of district**	
Name of interviewer			
Date of the interview			

INFORMATION ABOUT THE PERSON BEING INTERVIEWED

First name	
Last name	
Gender	☐ Male ☐ Female
Age	☐ 15-20 years old ☐ 20-30 years old ☐ 30-40 years old ☐ 40-50 years old ☐ 50-60 years old ☐ over 60 years old
Marital status	☐ Single ☐ Married ☐ Divorced ☐ Separated ☐ Cohabitant ☐ Widowed
Education level	☐ none ☐ Primary school (not completed) ☐ Primary school (completed) ☐ Secondary school (not completed) ☐ Secondary school (completed) ☐ University
Mobile phone number	
Is the interviewee the household head?	☐ Yes ☐ No
If not, please name the household head	
If not, relationship to the household head (HH)	☐ Spouse of the HH ☐ Son/daughter of the HH ☐ Son-in-law/daughter-in-law of the HH ☐ Parent of the HH ☐ Parent in law of the HH ☐ Grandchild of the HH ☐ Brother/sister of the HH ☐ Other (specify)

SECTION 1: GENERAL INFORMATION ABOUT THE HOUSEHOLD/HOUSEHOLD HEAD

Q1-1. Household size	Adults		Children (0-5)		Children (6-10)		Children (10-16)	
	Men	Women	Boy	Girl	Boy	Girl	Boy	Girl

Q1-2. Household structure	☐ Nuclear ☐ Extended
Q1-3. Home language	☐ Luganda ☐ Ruyakitara ☐ Lunyora ☐ Other (specify)
Q1-4. Nationality of the household head	☐ Ugandan ☐ Other (specify)
Q1-5. Religion of the household head	☐ Islam ☐ Christian ☐ Animism ☐ Other (specify)
Q1-6. Tribe of the household head	☐ Muganda ☐ Musoga ☐ Munyankole ☐ Mutoro ☐ Munyoro ☐ Mukiiga ☐ Mufumbira ☐ Alur/Luo ☐ Bahaya ☐ Bakonjo/Bamba ☐ Non-Ugandan ☐ Other (specify)
Q1-7. Persons with disability and/or other vulnerabilities in your household	☐ Disability ☐ Other vulnerabilities in household

→ **If so, provide number and type of disability and/or other vulnerabilities in household**	Number	Disability
	Number	Other vulnerabilities

SECTION 2: RESIDENCY

Q2-1. How many years has the household been living here for?	years

Q2-2. Has the household always resided in this village?	☐ Yes ☐ No		
→ If No, from where did the household move from?	Option	Tick if yes	Specify
	Other village in this sub-county		
	Other sub-county in this district		
	Other district		
	Other country		
Q2-3. Who gave the household permission to live on this land?	☐ District Land Board ☐ Chief/headman ☐ Employer ☐ Government ☐ Family inheritance ☐ Cannot recall ☐ Other (specify)		
Q2-4. Does the household pay to stay on this land?	☐ Yes ☐ No		
→ If so, who does the household pay to stay on this land?	☐ District Land Board ☐ Chief/headman ☐ Employer ☐ Government ☐ Landlord ☐ Kingdom agents/chiefs ☐ Clan-head ☐ Other (specify)		

SECTION 3: HOMESTEAD STRUCTURE

Q3-1. How old is your house structure?	years
NO NEED TO ASK - OBSERVATIONS ONLY	
Q3-2. Material used for walls	☐ Sawn planks ☐ Wooden planks/poles ☐ Mud/Stick ☐ Sun dried bricks ☐ Burnt bricks ☐ Cement blocks ☐ Mud plastered with cement ☐ Corrugated iron ☐ Stone/aggregates ☐ Other (specify) (more than one option can be selected)
Q3-3. Material used for roof	☐ Corrugated sheet ☐ Leaves ☐ Thatch grass ☐ Plastic sheet with planks ☐ Clay roof tiles ☐ Mud/Stick ☐ Other (specify)
Q3-4. Material used for floor	☐ Sawn planks ☐ Wooden planks/poles ☐ Paving Bricks ☐ Mud ☐ Mud plastered with cement ☐ Cement ☐ Clay floor tiles ☐ Stone/aggregates ☐ Other (specify) (more than one option can be selected)

SECTION 4: ACCESS TO LAND AND AGRICULTURAL ACTIVITIES

Q4-1. Does your homestead currently have access to arable land?	☐ Yes ☐ No
→ If no, please provide reasons	☐ Not enough money to rent land ☐ Not enough land available ☐ No need for land ☐ Other (specify)

→ If yes, for each plot, could you please provide us with the following information?	Plot No.	Plot size (Acres)	Plot ownership	Is the plot within 100m of the homestead? 1 = yes 2 = no	If not within 100m, travel time by foot from homestead plot (minutes)	Current use of the land	If cultivated, primary crop/vegetable grown (see Q6-2 for list)
OPTIONS FOR ANSWERING:	1						
	2						
For plot ownership: 1 = Plot with Title Deed/ Letter of Allotment 2 = Plot with Signed Lease 3 = Traditional land rights	3						
	4						
	5						
For travel time: 1 = 1-15 min 2 = 16-30 min 3 = 31-45 min 4 = 46-60 min 5 = over 1 hour	6						
For current use of the land: 1 = Cultivation of crops 2 = rented or lent to someone else 3 = fallow/resting 4 = not ever use 5 = other (specify)	7						

Q4-2. Who do you mostly use as labour for cultivating your plots of land?	☐ Family only ☐ Neighbours (non paid) ☐ Hired labour (paid) ☐ Family and non paid labour ☐ Family and paid labour ☐ Other (specify)
Q4-3. What method of tillage do you use?	☐ Manual labour ☐ Cows ☐ Tractor ☐ Other (specify)

Q4-4. For each crop/vegetable, could you please provide us with the following information?

Type	March/April-July/August (production in local units or kg) 2016-2017	September-November (production in local units or kg) 2016-2017	Are they used at home or for sale? 1 = Used at home only, 2 = for sale only, 3 = used at home and for sale	If part is sold, what proportion is sold for cash? 1 = most, 2= some
Maize				
Sorghum				
Millet				
Rice				
Cassava				
Potato				
Plantain				
Yams				
Beans				
Peas				
Cabbage				
Onion				
Tomato				
Coffee				
Tea				
Cotton				
Sunflower				
Sesame				
Tobacco				
Oil Palm				
Coconut				
Other (specify)				

Q4-5. What challenges are associated with cropping and how do you overcome them?

Challenge	Methods to overcome

SECTION 5: TREES

Q5-1. Does your household grow trees? ☐ Yes ☐ No

→ If so, for each tree, could you please provide us with the following information?

Tree	Number	Are they used at home or for sale? 1 = Used at home only, 2 = for sale only, 3 = used at home and for sale	If some is sold, what proportion is sold for cash? 1 = most, 2 = some
Banana			
Pawpaw			
Plantain			
Mango			

	Citrus			
	Avocado			
	Oil palm			
	Coconut			
	Eucalyptus			
	Fir tree			
	Other (specify)			
	Other (specify)			

Q5-2. What challenges are associated with plantations and how do you overcome them?	Challenge	Methods to overcome

SECTION 6: LIVESTOCK

Q6-1. Does your household have livestock? ☐ Yes ☐ No

→ If so, for each animal, could you please provide us with the following information?	Animal	Number	Rearing method? 1 = no grazing 2 = grazing 3 = pastoralism	Are they used at home or for sale? 1 = used at home only, 2 = for sale only, 3 = used at home and for sale	If some is sold, what proportion is sold for cash? 1 = most, 2 = some
	Cattle / cow				
	Goats				
	Ducks				
	Sheep				
	Pigs				
	Chickens				
	Pigeons				
	Donkey				
	Rabbits				
	Other Poultry				
	Other (specify)				

Q6-2. What challenges are associated with domestic livestock and how do you overcome them?	Challenge	Methods to overcome

SECTION 7: HUNTING AND FISHING

Q7-1.Does anyone in your household hunt? ☐ Yes ☐ No

→ If so, <u>for the 5 most important animals</u> that you hunt, please provide us the following information <u>OPTIONS FOR ANSWERING:</u> <u>For frequency of hunting:</u> 1 = once a week 2 = once a month 3 = less than once a month <u>For travel distance:</u>	Species	Frequency of hunting	Travel distance from homestead plot	Means of hunting 1 = guns 2 = traps 3 = other	Use? 1= skins, 2 = rituals, 3 = food, 4 = other	What proportion is sold for cash? 1 = all, 2 = most, 3 = some, 4 = none
	Impala/antelopes					
	Hare					
	Rabbit					
	Partridge/quail					
	Wild pigs/Warthogs					
	Other please specify					

1 = 500m 2 = 500m – 2km 3 = 2km – 5km 4 = above 5km						

Q7-2. Do you fish? ☐ Yes ☐ No

→ If so, for the 5 most important fish species that you fish, please provide the following information (5)

OPTIONS FOR ANSWERING:

For frequency of fishing:
1 = every day
2 = once a week
3 = once a month
4 = less than once a month

For Fishing gear:
1 = Gillnets
2 = Seine nets
3 = Drag nets
4 = Cast nets
5 = Scoop nets
6 = Basket traps (large basket, small basket)
7 = Fixed traps
8 = Handline
9 = Longlines
10 = Troll lines
11 = Spear, stick
12 =Poison fishing
13 = Dynamite fishing
14 = Harpoons

Species	Frequency of fishing	Location: 1 = River/stream, 2 = Lake, 3 = Sea	Fishing gear	1 = On the shore 2 = on boat	What proportion is sold for cash? 1 = all, 2 = most, 3 = some, 4 = none
Tilapia					
Catfish					
Other (specify)					

SECTION 8: USE OF NATURAL RESOURCES

	Type	How often this is collected? 1 = every day 2 = once a week 3= once a month 4 = less than once a month	Is this somebimes bought? 1 = yes, 2 = no	What procartion is sold for cash? 1 = all, 2 = most, 3 = some 4 = none
Q8-1. Does anyone in your household collect, buy, use or sell the following natural resources?	Wood for making charcoal			
	Wood for construction (timber)			
	Trees for rituals			
	Grass/vegetation for grazing animals			
	Grass or reeds for thatching			
	Wild fruits, berries, roots and vegetables for food			
	Mushrooms for food			
	Honey for food			
	Plants for traditional alcohol			
	Plants for weaving			
	Plants or animals for use as medicine			
	Insects for food			
	Artisanal mining for gold or other resources			
	River sand /clay for construction/pottery			
	Stones, aggregates for construction			
	Others (specify)			

SECTION 9: HEALTH

	Disease/illness	Number of household members affected in last six months	Did you seek treatment? 1-=Yes 2 =No	Type of treatment: 1 =Self-medicated 2 = Traditional healer 3 =Medical health facility
Q9-1. Did any members of your household suffer from the following diseases or illnesses in the past six months? If yes, please tell us how many of the household members were affected by each and the type of treatment they used	TB			
	Respiratory infection			
	Malaria			
	HIV/AIDS			
	Other STDs			
	Skin rash			
	Diarrhea			
	Diabetes			
	High blood pressure			
	Cardiovascular disease			
	Cancer			
	Typhoid			
	Meningitis			
	Sleeping sickness			
	Bilharzia			
	Measles			
	Mental disorder			
	Cholera			
	Worms			
	Paralysis			
	Other (specify)			

Q9-2. Please provide the following information about the main water source your household uses in the dry/wet season?

	Dry season (tick correct answer)	Wet season (tick correct answer)
Type of water source	☐ Piped from mains system ☐ Village well/borehole – protected springs ☐ Village well/borehole – unprotected springs ☐ Private well/borehole ☐ Rain harvesting ☐ Piped from river ☐ Collect from river ☐ Pond ☐ Water through "Marambo" ☐ Other (specify)	☐ Piped from mains system ☐ Village well/borehole – protected springs ☐ Village well/borehole – unprotected springs ☐ Private well/borehole ☐ Rain harvesting ☐ Piped from river ☐ Collect from river ☐ Pond ☐ Water through "Marambo" ☐ Other (specify)
Distance travelled to water source	☐ 500m ☐ 500m-2km ☐ 2km-5km ☐ Over 5km	☐ 500m ☐ 500m-2km ☐ 2km-5km ☐ Over 5km
Use	☐ Drinking ☐ Domestic uses ☐ Irrigation/crops ☐ Livestock ☐ Other (specify)	☐ Drinking ☐ Domestic uses ☐ Irrigation/crops ☐ Livestock ☐ Other (specify)
Frequency of collection	☐ Once a week ☐ Twice a week ☐ every second day ☐ once a day ☐ twice a day ☐ three times a day ☐ more than 3 times per day	☐ Once a week ☐ Twice a week ☐ every second day ☐ once a day ☐ twice a day ☐ three times a day ☐ more than 3 times per day
Collection by	☐ Male household heads ☐ Women ☐ Children (more than one option can be selected)	☐ Male household heads ☐ Women ☐ Children (more than one option can be selected)
Reliability	☐ Low ☐ Good ☐ High	☐ Low ☐ Good ☐ High
Quantity	☐ Sufficient ☐ Insufficient	☐ Sufficient ☐ Insufficient
Quality	☐ Good ☐ Not good	☐ Good ☐ Not good
Cost	☐ Affordable ☐ Not affordable	☐ Affordable ☐ Not affordable

	Type of toilet	Tick correct answer(s)
Q9-3. What type of toilet facility does your household use?	Bush (open defecation)	
	Private latrine	
	Public pit latrine	
	Ventilated pit latrine	
	Interior toilet flush tank	
	Exterior flush tank	
	Other (please specify)	

	Option	Tick correct answer(s) if this option is used for solid waste	Tick correct answer(s) if this option is used for food waste
Q9-4.How does your household dispose of solid and food waste	Disposed on a public rubbish dump		
	Disposed in waste collection point		

	Burnt in private waste pit		
	Buried in private waste pit		
	Disposed in compost waste		
	Given to chicken/pigs		
	Other (please specify)		
	I do not know		
Q9-5. How far must you travel to access your nearest public and private health service?	Health service type		Distance travelled (1 = 500m, 2 = 500m-2km, 3 = 2-5km, 4 = Above 5km)
	Public		
	Private		

SECTION 10: FOOD SECURITY/NUTRITION

Q10-1. Do you experience hunger months? ☐ Yes ☐ No

→ If so, could you tell us which of the following months were periods in which the household went hungry last year? For those months where the household was hungry, please give a reason why there was not enough food or why the household had to beg to get what it needed to eat.

Reasons for hunger:
1. Could not produce/grow enough food
2. No money to buy food
3. Not enough land
4. Not enough labour
5. Natural Calamities (bushfire, drought, disease, pests)
6. Not enough agro-inputs (fertilizer, pesticide, implements)
7. Other (specify)

Month	Tick if yes	Reason for hunger
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

SECTION 11: ENERGY

Q11-1. What do you use for lighting? (tick more than once)	☐ Oil/kerosene ☐ Gas ☐ Candle ☐ Battery/torch ☐ Solar ☐ Electricity ☐ Paraffin ☐ Firewood ☐ Grass ☐ Other (specify)
Q11-2. What do you use for cooking?	☐ Firewood ☐ Charcoal ☐ Coal ☐ Electricity ☐ Generator/private sources ☐ Gas ☐ kerosene ☐ Animal residual (dried cattle dung) ☐ Crop husks/remains ☐ Paraffin ☐ Solar ☐ Saw dusts ☐ Other (specify)

SECTION 12: INCOME, EXPENDITURES, ASSETS AND CREDIT

Q12-1. What is the approximate annual income (i.e. amount of cash) for your household? UGX

Q12-2. For each source of household income, could you provide us with the following information?	Income source		Regular (R)/ Occasional (O)/Never (N)	Rank the 3 most important sources of income (1 most important and 3 least important)
	Employment/self-employment	Gross profits from self-employment (artisans: carpenter/builder/ shopkeeper, restaurant)		
		Salaries		
		Migrant remittances		
	Agriculture	Livestock		
		Crops		
	Fishing	Fishing		
		Intertidal collection/gleaning		
		Diving		
		Processing		

		Trading		
		Aquaculture		
	Natural/wild resources	Wild Plants (wild yam/ mushroom)		
		Bush Meat		
		Timber		
		Charcoal/ firewood		
		Artisanal mining (gold, salt, kaolin, sand, other)		
	Other (specify)			

	Item	Rank the 5 most important items (1 most important and 5 least important)
Q12-3. Please indicate your 5 largest household's expenditure items in the last 12 months in the following table.	Food (inc baby food)	
	Personal Items (toiletries, washing powder, diapers etc.)	
	Transport (bus fares, taxis fees)	
	School fees, uniforms, books/equipment	
	Clothes	
	Savings society (micro credit group)	
	Taxes	
	Lighting (paraffin, gas, candles etc.)	
	Charcoal	
	Wood	
	Telephone (cellular)	
	Cost of charging mobile phones	
	Water (transport or pumping costs)	
	Medical expenses	
	Furniture/household equipment	
	Rental (housing/accommodation)	
	Agricultural expenses - crops	
	Agricultural expenses - livestock	
	New buildings or building improvements	
	Debt repayment	
	Other (specify)	

	Item	Number
Q12-4. How many of the items listed in the table below are available in your household and are in working condition?	Bicycle	
	Private motor bike	
	Private car	
	Tractor	
	Wheelbarrow	
	Plough	
	Maize/cassava/rice mill	
	Spade / tools	
	Sewing machine	
	Weaving loom	
	Generator	
	Radio	
	Hi-fi set/ music system	
	Cell phone	
	Television	
	Fridge	
	Table	
	Chair/stool/sofa	

	Bed	
	Cupboard	
	Fishing net	
	Canoe /boat	
	Shot gun (hunting)	
	Other (specify)	
Q12-5. How much did you as a household borrow, if any, from different credit facilities during the last 12 months?	Facility	Amount borrowed in UGX
	Micro credit project/group	
	Friends	
	Family	
	Other (specify)	
Q12-6. What was the main reason for the loan?	Reason	Tick only 1 option
	To cover health costs	
	To repay loan	
	To pay fine or tax	
	To cover education related costs	
	To buy food	
	To construct or repair house	
	To purchase clothing	
	No loan taken	
SECTION 13: TRAFFIC		
Q13-1. What is the main type of transport used by the household?	☐ Private car ☐ Public bus ☐ Taxi/boda boda ☐ Bicycles ☐ Motorbikes ☐ Other (specify)	
Q13-2. In your view, what are the main causes of road traffic incidents in the local area (select the most important two)?	☐ Poor road conditions ☐ Weather conditions ☐ speeding drivers ☐ Drivers under the influence of alcohol ☐ Poor condition of vehicles ☐ Drivers using mobile phones ☐ Other (specify)	
Q13-3. Have you or members of your household seen/heard any advertisements on road safety?	☐ Yes ☐ No	
→ **If yes, then please provide details – what was this focused on?**	☐ Consumption of alcohol ☐ Speeding ☐ Use of seat belts ☐ Careful driving ☐ Other (specify)	
Q13-4. If there were a significant increase in road traffic volumes along the local road network, would you expect this to have a significant impact on your safety and quality of life?	☐ Not at all ☐ A little ☐ Some ☐ A lot	
SECTION 14: PERCEPTIONS AND COMMENTS		
Q14-1. Are there any other comments that you would like to make about the proposed Tilenga Feeder /EACOP project?		
Q14-2.What are your 3 main wishes in life?		
Q14-3. What would you say is good or bad in your life?	Good	Bad

End of interview – please complete the text below

SECTION 15: TO BE FILLED BY THE INTERVIEWER						
Was the interviewee alone?	☐ Yes ☐ No					
If "No" specify who was present (name of the persons)						
Did you find anything remarkable about the interview? Please fill in the table	Criteria	Very satisfactory	Satisfactory	Neutral	Unsatisfactory	Highly unsatisfactory
	The trustfulness of the interviewee					
	The questions that were answered					
	The interview environment					

ATTACHMENT A11.4 SARA HEALTH FACILITY ASSESSMENT

Health Facility	**Hoima Referral Hospital**	**Kiyuni (Gayaza) HCII**	**Kisiita HCIII**	**Kakumiro HCIV**
District	Hoima	Kyankwanzi	Kakumiro	Kakumiro
Ownership	Government	Government	Government	Government
Date of Interview	21/11/2017	22/11/2017	23/11/2017	23/11/2017
Full Name of Informant (s)	Winifred Mbalazi	Nabasa Sarah	Ibrahim Senyole	Dr Judith Tuhaise
Position/Function	Principal nurse	Nurse in charge	Clinical officer in charge	Medical officer in charge
Health Care Provider Availability				
Specialists (medical/surgical)	4	0	0	0
Medical officer	13	0	0	3
Clinical officer	13	1	2	1
Nursing officer	47	1	2	3
Nurse midwife	43	2	4	4
Enrolled nurses	52	2	2	5
Nursing assistant	16	0	0	4
Psychiatric nurse	4	0	0	2
Anaesthetist officer	6	0	0	0
Public health nurse	1	0	0	0
Physiotherapist	2	0	0	0
Laboratory technologist	9	0	0	1
Laboratory assistant	7	2	2	2

Health Facility	Hoima Referral Hospital	Kiyuni (Gayaza) HCII	Kisiita HCIII	Kakumiro HCIV
Radiographer	4	0	0	0
Dentist/dental surgeon	2	0	0	0
Dental officer/technician	6	0	0	0
Pharmacist	1	0	0	0
Pharmacy technician	4	0	0	1
Allied health professional	15	0	3	3
Allied nonhealth professional (other)	13	2	1	2
Support personnel	Outsourced	2	0	5
Total	261	11	16	36
Service Availability				
Out-patient services	√	√	√	√
In-patient services	√	√	√	√
24-hour emergency	√	√	√	√
Emergency surgery	√	Nil	Nil	Basic/Minor surgery
Caesarean section	√	Nil	Nil	√
Assisted vaginal delivery	√	√	√	√
Blood transfusion	√	Nil	Nil	√
Neonatal resuscitation with bag and mask	√	√	√	√
Pharmacy	√	Dispensing cabinet	√	√
Immunisation	√	√	√	√
Growth monitoring	√	√	√	√

Health Facility	Hoima Referral Hospital	Kiyuni (Gayaza) HCII	Kisiita HCIII	Kakumiro HCIV
IMCI (Integrated Management of Childhood Illnesses)	√	√	√	√
VCT for HIV/AIDS	√	√	√	√
PMTCT of HIV/AIDS	√	√	√	√
Primary health care	√	√	√	√
Maternal health care	√	√	√	√
Ambulance service (functioning)	Not functional	Yes, has one functional ambulance	Nil	Yes, donated by are politician
Intensive care	√ (4 bed capacity)	Nil	Nil	Nil
Laboratory services	√	√ (basic)	√ (basic)	√ (basic)
General Surgery	√	Nil	Nil	Basic procedures
Orthopaedic surgery	√	Nil	Nil	Nil
Specialist services	√	Nil	Nil	Nil
Radiology	√ (X-ray & Ultrasound)	Nil	Nil	Ultrasound only
Bed Occupancy	70%-80%	30%	50%-60%	60%-100%
Total beds	400	7	18	60
Diagnostic Ability				
Malaria RDT	√	√	√	√
Malaria Microscopy	√	√	√	√
HIV RDT	√	√	√	√
HIV ELISA	√	Nil	Nil	Nil

Health Facility	**Hoima Referral Hospital**	**Kiyuni (Gayaza) HCII**	**Kisiita HCIII**	**Kakumiro HCIV**
HIV CD4 count	√	Nil	Collect sample and send district laboratory hub	Collect sample and send district laboratory hub
TB diagnostic	√	√	√	√
Haematology	√	Nil	Only check HB	Only check HB
Biochemistry	√	Nil	Nil	Nil
Parasitology	√	Nil	Nil (only urinalysis)	√
Availability of Drugs (always in stock)				
ACTs	√	√	√	√
Parenteral Quinine/Artesunate	√	√	√	√
IPT_p (Fansidar/SP)	√	√	√	√
ART (Zidovudine, Nevirapine, Efavirenz)	√	√	√	√
TB drugs	√	√	√	√
EPI vaccinations	√	√	√	√
Antihelminthic drugs	√	√	√	√
Oral rehydration solution	√	√	√	√
Oxytocin/Misoprostol	√	√	√	√
Penicillin (Any)	√	√	√	√
Erythromycin	√	Out of stock	Out of stock	√
Doxycycline	√	√	√	√
Vitamin A	√	√	√	√
Vitamin K	√	√	√	√
Iron supplements	√	√	√	√

Health Facility	**Hoima Referral Hospital**		**Kiyuni (Gayaza) HCII**		**Kisiita HCIII**		**Kakumiro HCIV**	
Folic acid	√		√		√		√	
Insecticide treated bednets	√ (Not adequate)		Nil		Nil		Nil	
Hypertension drugs	√		√		√		√	
Antipyretics	√		√		√		√	
Injectable diazepam / valium	√		√		√		√	
Injectable magnesium sulphate or other anticonvulsant	Out of stock		√		√		√	
Injectable ergometrine	√		Nil		Nil		Nil (uses oxytocin)	
Tetanus anti-toxin injection	√		√		√		√	
Adrenaline injection	√		Nil		Nil		√	
Anti-protozoa drugs	√		√		√		√	
Anti-histamines	√		√		√		√	
Dermatological preparations (anti-fungal, anti-allergic or anti-inflammatory)	√		√		√		√	
Availability and Functionality of Medical Equipment								
A=Available; F=Functional	A	F	A	F	A	F	A	F
Table for gynaecological examination	√	√	Nil		√	√	√	√
Fetoscope	√	√	√	√	√	√	√	√
Autoclave	√	√	Nil		Nil		√	√
Pressure cooker for sterilisation	Nil	Uses autoclave	√	Not functional	Nil	Improvised cooker	Nil	
Speculum	√	√	√	√	√	√	√	√
Blood giving set	√	√	Nil		Nil		√	√

Health Facility	**Hoima Referral Hospital**		**Kiyuni (Gayaza) HCII**		**Kisiita HCIII**		**Kakumiro HCIV**	
Delivery Forceps	√	√	√	√	√	√	√	√
IV sets	√	√	√	√	√	√	√	√
Vacuum extractor	√	Not functional	Nil		Nil		Nil	
Manual vacuum aspirator	√	√	Nil		Nil		√	√
Dilatation and curettage kit	√	√	Nil		√	√	√	√
Operating table	√	√	Nil	No theatre	Nil	No theatre	√	√
Operating light	√	√	Nil		Nil		√	√
Anaesthesia equipment	√	√	Nil		Nil		√	√
Oxygen equipment	√	√	Nil		Nil		√	√
Bag valve mask and resuscitator	√	√	√	√	√	√	√	√
Blood pressure apparatus	√	√	√	√	√	√	√	√
Stethoscope	√	√	√	√	√	√	√	√
Thermometer	√	√	√	√	√	√	√	√
Weighing scale	√	√	√	√	√	√	√	√
Glucometer	√	√	Nil		Nil		√	No test strips
Infrastructure								
Regular/reliable running water	√		Not reliable		Not reliable		Not reliable	
Regular/reliable electricity	√ (reliable)		Not reliable		Not reliable		√ (reliable)	
Solar power	√ (few areas)		√		√		√	
Generator	√		Nil		Nil		√	
Any type of electricity	√		Solar only		Solar only		√	
Functioning refrigerator	√		√		√		√	

Health Facility	Hoima Referral Hospital	Kiyuni (Gayaza) HCII	Kisiita HCIII	Kakumiro HCIV
Functioning landline	√	Nil, uses callbox	Nil, uses callbox	Nil
Functioning mobile	√	Nil	Nil	√
Functioning 2-way radio communication	Nil, relies on telephone	Nil	Nil	Nil
Continuity of Services				
In-patient services 24/7	√	√	√	√
Emergency services 24/7	√	Basic	Basic	√
Official opening hours per day (in hours)	24 hrs	24 hrs	24 hrs	24 hrs
Personnel lives near HF	√	√	√	√
Access to a Referral Hospital				
Proximity of referral hospital (in hours)	Mulago (3–4 hrs)	Ntwetwe HCIV (30 min)	Kakindu HCIV (45 min) or Kakumiro HCIV (45 min)	Mubende RRH (1 hr) or Hoima RRH (1.5 hr)
Transportation possibility to referral hospital	No ambulance. Rely on private means	Yes, ambulance for emergencies	Private means	Ambulance
Cost of referral (both ways)	UGX 30,000 (USD 8.03)	UGX 20,000 (USD 5.35)	Not constant	Around UGX 20,000 (USD 5.35)
Personnel In-Service Training				
Personnel trained in life saving skills (number)	√ (several)	Nil	Nil	√ (3)
Personnel trained in IMCI (number)	√	√	√	√
Use of disposable gloves	√	√	√	√
Use of protective eye wear	√	Nil	Nil	√
Evidence of use of cleaning disinfectant in wards and casualty	√	√	√	√

Health Facility	**Hoima Referral Hospital**	**Kiyuni (Gayaza) HCII**	**Kisiita HCIII**	**Kakumiro HCIV**
Evidence of soap in wash basins, or hand sanitiser in wards	√	√	√	√
Hand washing	√	√	√	√
Use of autoclave	√	Nil	Nil	√
General state of building and state of cleanliness	Generally good	Good	Very good, has new blocks	Very old infrastructure
Cost of Health Care				
How much does a basic outpatient consultation cost	Free	Free	Free	Free
How much does diagnosis and treatment for malaria cost (with RDT use)	Free	Free	Free	Free
How much does an admission for a child cost?	Free	Free	Free	Free
General Questions				
How many people have access to this health care facility- the target population?	Entire Western region	23,452	Around 20,000	63,000
What are the 3–5 main health challenges facing the community	Poor health-seeking behaviour Challenges with emergency care High burden of communicable diseases Shortage of medical supplies and drugs Self-medication from private pharmacies	Malaria Unsafe drinking water Traditional medicine Poor health-seeking behaviour	Malaria HIV Unsafe drinking water Poor health-seeking behaviour	Poverty Use of traditional medicine Poor health seeking behaviour Limited awareness/ education Health infrastructure (lacks district hospital)

Health Facility	Hoima Referral Hospital	Kiyuni (Gayaza) HCII	Kisiita HCIII	Kakumiro HCIV
If you had 3–5 wishes to improve health care in the communities that you serve in, what would they be?	Health education Address staffing challenges Need at ambulance for emergency care Needs a blood bank	Health education Control malaria Safe drinking water	Malaria interventions Health education HIV interventions	Poverty alleviation Health education Improve infrastructure – needs a district hospital
What are the 5 most common diseases in children under 5 years?	Anaemia Malaria Acute respiratory infection Malnutrition Diarrhoeal diseases	Malaria Diarrhoea Respiratory tract infection Skin diseases	Malaria Upper respiratory tract infection Pneumonia Diarrhoeal diseases Skin diseases	Malaria Diarrhoeal diseases Acute respiratory infection Intestinal worms Malnutrition
What are the 5 most common diseases for all age groups?	HIV-related illness Malaria Hypertension Acute respiratory infections Diabetes Accidents/injuries	Respiratory infections Malaria Diarrhoeal diseases HIV/AIDS Sexually transmitted infections Also dysentery and TB	Malaria Respiratory infections HIV/AIDS Urinary tract infections Diarrhoeal diseases	Malaria Respiratory tract infections Diarrhoeal diseases Accidents/injuries Urinary tract infections N/B: Cases of HIV and TB are increasing
Is there good community cohesion to supporting health initiatives?	Generally good	Generally good	Generally good	Generally good

Health Facility	**Hoima Referral Hospital**	**Kiyuni (Gayaza) HCII**	**Kisiita HCIII**	**Kakumiro HCIV**
Are there measures in place at facility level to deal with disease outbreaks? If yes, specify	Yes, has emergency response team. Has an isolation unit at the hospital	Yes, has emergency response procedures coordinated at district level	Has emergency response procedures coordinated at district level	Has emergency response procedures coordinated at district level
Observation/notes	Well-equipped ICU Lacks a refrigerated mortuary	Generally small facility. Few patients	New buildings and good infrastructure	Small facility, congested and busy

Health Facility	**Mubende Referral Hospital**	**Kitenga HCIII**	**Maddu HCIV**	**Kyayi HCIII**
District	Mubende	Mubende	Gomba	Gomba
Ownership	Government	Government	Government	Government
Date of Interview	24/11/2017	24/11/2017	27/11/2017	27/11/2017
Full Name of Informant (s)	Dr Frank Chiduo	Annet Kayodi	Deogratius Kiyaga	Rose Nasirumbi
Position/Function	Hospital Director	Clinical Officer in Charge	Clinical Officer in Charge	Nursing Officer
Health Care Provider Availability				
Specialists (medical/surgical)	3	0	0	0
Medical officer	10	0	1	0
Clinical officer	12	1	3	2
Nursing officer	37	1	1	0
Nurse midwife	33	2	3	2
Enrolled nurses	39	3	4	3
Nursing assistant	15	0	2	2
Psychiatric nurse	3	0	1	0
Anaesthetist officer/assistant	5	0	0	0
Public health nurse	0	0	0	0
Physiotherapist	2	0	0	0
Laboratory technologist	3	1	2	0
Laboratory technician/assistant	9	1	4	2
Radiographer	4	0	0	0
Dentist/dental surgeon	0	0	0	0

Health Facility	Mubende Referral Hospital	Kitenga HCIII	Maddu HCIV	Kyayi HCIII
Dental officer/technician	4	0	1	0
Pharmacist	1	0	0	0
Pharmacy technician/dispenser	2	0	1	0
Allied health professional (other)	26	0	3	0
Allied nonhealth professional	22	0	2	2
Support personnel	35	2	2	2
Total	265	11	30	15
Service Availability				
Out-patient services	√	√	√	√
In-patient services	√	Nil (only maternity)	√	Observation only
24 hour emergency	√	√	√	Limited
Emergency surgery	√	Nil	Theatre not operational	Nil
Caesarean section	√	Nil	Nil	Nil
Assisted vaginal delivery	√	√	√	√
Blood transfusion	√	Nil	Nil	Nil
Neonatal resuscitation with bag and mask	√	√	√	√
Pharmacy	√	Drug store	Drug store	Drug store
Immunisation	√	√	√	√
Growth monitoring	√	√	√	√
IMCI (Integrated Management of Childhood Illnesses)	√	√	√	√
VCT for HIV/AIDS	√	√	√	√

Health Facility	Mubende Referral Hospital	Kitenga HCIII	Maddu HCIV	Kyayi HCIII
PMTCT of HIV/AIDS	√	√	√	√
Primary health care	√	√	√	√
Maternal health care	√	√	√	√
Ambulance service (functioning)	√ (1 functional)	Nil	√ (not fully functional)	Nil
Intensive care	√	Nil	Nil	Nil
Laboratory services	√	Basic	√	Basic
General Surgery	√	Nil	Nil	Nil
Orthopaedic surgery	√	Nil	Nil	Nil
Specialist services	√	Nil	Nil	Nil
Radiology	√ (X-ray & Ultrasound)	Nil	Nil	Nil
Bed Occupancy	100%	Not applicable	50%	Not applicable
Total beds	170	3 (maternity beds)	26	2 (observation)
Diagnostic Ability				
Malaria RDT	√	√	√	√
Malaria Microscopy	√	√	√	√
HIV RDT	√	√	√	√
HIV ELISA/Viral load	Send samples to national lab	Nil	Send samples to national lab	Collect samples
HIV CD4 count	√	Collect sample and send to regional hospital	√	Collect samples
TB diagnostic	√	√	√	√
Haematology	√	Nil	√	Nil
Biochemistry	√	Nil	√	Nil

Health Facility	Mubende Referral Hospital	Kitenga HCIII	Maddu HCIV	Kyayi HCIII
Parasitology	√	Nil	√	Basic
Availability of Drugs (always in stock)				
ACTs	√	√	√	√
Parenteral Quinine/Artesunate	√	Out of stock	√	√
IPT_p (Fansidar/SP)	√	√	√	√
ART (Zidovudine, Nevirapine, Efavirenz)	√	√	√	√
TB drugs	√	√	√	√
EPI vaccinations	√	√	√	√
Antihelminthic drugs	√	√	√	√
Oral rehydration solution	√	√	√	√
Oxytocin/Misoprostol	√	√	√	√
Penicillin (Any)	√	√	√	√
Erythromycin	√	Nil	√	Out of stock
Doxycycline	√	√	√	√
Vitamin A	√	√	√	√
Vitamin K	√	√	√	√
Iron supplements	√	√	√	√
Folic acid	√	√	√	√
Insecticide treated bednets	Nil	√	Nil	Nil
Hypertension drugs	√	√	√	√
Antipyretics	√	√	√	√

Health Facility	**Mubende Referral Hospital**		**Kitenga HCIII**		**Maddu HCIV**		**Kyayi HCIII**	
Injectable diazepam/valium	√		√		√		√	
Injectable magnesium sulphate or other anticonvulsant	√		√		√		√	
Injectable ergometrine	√		Nil		Nil		Nil	
Tetanus anti-toxin injection	√		√		√		√	
Adrenaline injection	√		Nil		√		√	
Anti-protozoa drugs	√		Nil		√		Out of stock	
Anti-histamines	√		√		√		√	
Dermatological preparations (anti-fungal, anti-allergic or anti-inflammatory)	√		√ (not adequate)		√		√	
Availability and Functionality of Medical Equipment								
A=Available; F=Functional	A	F	A	F	A	F	A	F
Table for gynaecological examination	√	√	Nil	Improvised bed	√	√	Nil	Improvised
Fetoscope	√	√	√	√	√	√	√	√
Autoclave	√	√	√	√	√	√	√	√
Pressure cooker for sterilisation	Nil		Nil		Nil		Nil	
Speculum	√	√	√	√	√	√	√	√
Blood giving set	√	√	Nil	Does not transfuse	Nil		Nil	
Delivery Forceps	√	√	√	√	√	√	√	√
IV sets	√	√	√	√	√	√	√	√
Vacuum extractor	√	Discouraged	Nil		√	Discouraged	Nil	

Health Facility	**Mubende Referral Hospital**		**Kitenga HCIII**		**Maddu HCIV**		**Kyayi HCIII**	
Manual vacuum aspirator	√	√	Nil		√	√	Nil	
Dilatation and curettage kit	√	√	Nil		√	√	Nil	
Operating table	√	√	Nil	No theatre	√	√	Nil	
Operating light	√	√	Nil		√	√	Nil	
Anaesthesia equipment	√	√	Nil		√	√	Nil	
Oxygen equipment	√	√	Nil		√	√	Nil	
Bag valve mask and resuscitator	√	√	√	Not functional	√	√	√	√
Blood pressure apparatus	√	√	√	√	√	√	√	Faulty
Stethoscope	√	√	√	√	√	√	√	√
Thermometer	√	√	√	√	√	√	√	√
Weighing scale	√	√	√	√	√	√	√	√
Glucometer	√	√	Nil		√	√	Nil	
Infrastructure								
Regular/reliable running water	Reliable		√		Reliable		Not reliable	
Regular/reliable electricity	Reliable		Not reliable		Reliable		No mains supply	
Solar power	√ (few areas)		√		√		√	
Generator	√		Nil		√		Nil	
Any type of electricity	√		Solar only		√		Solar only	
Functioning refrigerator	√		√		√		Nil	
Functioning landline	√		Nil		Nil		Nil	
Functioning mobile	√		Nil		√		√ (poor network)	

Health Facility	Mubende Referral Hospital	Kitenga HCIII	Maddu HCIV	Kyayi HCIII
Functioning 2-way radio communication	Nil	Nil	Nil	Nil
Continuity of Services				
In-patient services 24/7	√	Limited to maternity	√	Nil
Emergency services 24/7	√	Basic	√	Basic
Official opening hours per day (in hours)	24 hrs	24 hrs	24 hrs	8 a.m.–5 p.m.
Personnel lives near HF	√	√	√	√
Access to a Referral Hospital				
Proximity of referral hospital (in hours)	Mulago (2 hrs)	Mubende RRH (1 hr)	Masaka RRH (2 hrs)	Maddu HCIV (45 min)
Transportation possibility to referral hospital	Ambulance for emergencies	Private or public means	Private or public means	Private or public means
Cost of referral (both ways)	Free	Variable depending on modality	UGX 50,000–70,000 (USD 13.38–18.74)	UGX 20,000 (USD 5.35)
Personnel In-Service Training				
Personnel trained in life saving skills (number)	√ (several)	√ (1)	√ (1)	Nil
Personnel trained in IMCI (number)	√	√	√	√
Process of Health Care				
Use of disposable gloves	√	√	√	√
Use of protective eye wear	√	Nil	√	Nil
Evidence of use of cleaning disinfectant in wards and casualty	√	√	√	√

Health Facility	**Mubende Referral Hospital**	**Kitenga HCIII**	**Maddu HCIV**	**Kyayi HCIII**
Evidence of soap in wash basins, or hand sanitiser in wards	√	√	√	√
Hand washing	√	√	√	√
Use of autoclave	√	√	√	√
General state of building and state of cleanliness	Very good	Good. Two new blocks	Good	Good
Cost of Health Care				
How much does a basic outpatient consultation cost	Free	Free	Free	Free
How much does diagnosis and treatment for malaria cost (with RDT use)	Free	Free	Free	Free
How much does an admission for a child cost?	Free	Free	Free	Free
General Questions				
How many people have access to this health care facility- the target population?	Entire Central region	Around 15,000	25,632	7,500
What are the 3–5 main health challenges facing the community	Poor health seeking behaviour Changes in lifestyle Self-medication Traditional medicine High burden of diseases	Poverty High burden of communicable diseases HIV Malaria Poor health seeking behaviour	Inadequate medical supplies Poor accessibility Unsafe water Poor health seeking behaviour Traditional medicine	Unsafe water Use of traditional medicine Poor health seeking behaviour Poverty (nomadic lifestyle) Challenges of emergency care

Health Facility	Mubende Referral Hospital	Kitenga HCIII	Maddu HCIV	Kyayi HCIII
If you had 3–5 wishes to improve health care in the communities that you serve in, what would they be?	Health education Improve health infrastructure Improve access to safe water	Health education Infrastructure improvement Improve medical supplies	Health education Improve infrastructure Safe drinking water Increase medical supplies Needs ambulance	Safe water Health education Poverty alleviation Needs inpatient services
What are the 5 most common diseases in children under 5 years?	Malaria Acute respiratory infection Diarrhoeal diseases Intestinal worms Skin diseases N/B: Malnutrition cases are few	Malaria Respiratory tract infections Intestinal worms Diarrhoeal diseases Skin infections	Malaria Acute respiratory infection/pneumonia Diarrhoeal diseases Skin diseases Intestinal worms	Malaria Diarrhoeal diseases Pneumonia Diarrhoeal diseases Skin diseases
What are the 5 most common diseases for all age groups?	Malaria Respiratory infections HIV/AIDS Surgical emergencies Hypertension and Diabetes Also TB, STIs, accidents and injuries	Malaria Respiratory infections HIV STIs UTIs	Malaria Respiratory infections STIs UTIs HIV and TB Also injuries and cases of bovine TB	Malaria STIs HIV/AIDS Respiratory infections Diarrhoeal diseases
Is there good community cohesion to supporting health initiatives?	Generally good	Generally good	Generally good	Generally good
Are there measures in place at facility level to deal with disease outbreaks? If yes, specify	Yes, has emergency response team. Active surveillance for notifiable diseases	Can respond but limited capability. No isolation rooms.	Yes, has emergency response procedures coordinated at district level	Yes, can respond but limited capability

Health Facility	Mubende Referral Hospital	Kitenga HCIII	Maddu HCIV	Kyayi HCIII
Observation/notes	New buildings. Well equipped		Small facility, very busy. Many patients on HIV treatment	Small basic facility, newly renovated

Health Facility	**Sembabule HCIV**	**Lwengo HCIV**	**Lwanda HCIII**	**Mutukula Town HCIII**
District	Sembabule	Lwengo	Rakai	Kyotera
Ownership	Government	Government	Government	Government
Date of Interview	28/11/2017	29/11/2017	30/11/2017	30/11/2017
Full Name of Informant (s)	Dr Simon Kasibante	Judith Tugabirwe	Henry Muyinda	Clare Kisirisa
Position/Function	Medical officer in charge	Ag, nurse in charge	Ag, in charge	Clinical officer in charge
Health Care Provider Availability				
Specialists (medical/surgical)	0	0	0	0
Medical officer	2	2	0	0
Clinical officer	6	2	2	1
Nursing officer	4	6	1	1
Nurse midwife	5	4	2	1
Enrolled nurses	6	3	4	2
Nursing assistant	1	2	2	0
Psychiatric nurse	0	0	0	0
Anaesthetist officer/assistant	2	1	0	0
Public health nurse	0	0	0	0
Physiotherapist	0	0	0	0
Laboratory technologist	0	0	0	0
Laboratory technician/assistant	5	5	1	2
Radiographer	0	0	0	0
Dentist/dental surgeon	0	0	0	0
Dental officer/technician	1	1	0	0
Pharmacist	0	0	0	0

Health Facility	Sembabule HCIV	Lwengo HCIV	Lwanda HCIII	Mutukula Town HCIII
Pharmacy technician/dispenser	1	1	0	0
Allied health professional (other)	4	4	1	1
Allied nonhealth professional	1	2	1	1
Support personnel	4	3	2	3
Total	42	36	16	12
Service Availability				
Out-patient services	√	√	√	√
In-patient services	√	√	√	√
24 hour emergency	√	√	√ (basic)	√ (basic)
Emergency surgery	√	Basic	Nil	Nil
Caesarean section	√	Nil	Nil	Nil
Assisted vaginal delivery	√	√	√	√
Blood transfusion	Nil, still in the process of approval	√	Nil	Nil
Neonatal resuscitation with bag and mask	√	√	√	√
Pharmacy	Drug store	Drug store	Drug store	Drug store
Immunisation	√	√	√	√
Growth monitoring	√	√	√	√
IMCI (Integrated Management of Childhood Illnesses)	√	√	√	√
VCT for HIV/AIDS	√	√	√	√
PMTCT of HIV/AIDS	√	√	√	√
Primary health care	√	√	√	√

Health Facility	Sembabule HCIV	Lwengo HCIV	Lwanda HCIII	Mutukula Town HCIII
Maternal health care	√	√	√	√
Ambulance service (functioning)	Nil	Nil, relies on utility vehicle	Nil, relies of district hospital ambulance	Nil, relies on Kakuto ambulance
Intensive care	Nil	Nil	Nil	Nil
Laboratory services	√	√	√	√
General Surgery	Nil	Nil	Nil	Nil
Orthopaedic surgery	Nil	Nil	Nil	Nil
Specialist services	Nil	Nil	Nil	Nil
Radiology	Only ultrasound	Nil	Nil	Nil
Bed occupancy	35%-40%	50%-100%	50%	50%-70%
Total beds	57	11	11	5
Diagnostic Ability				
Malaria RDT	√	√	√	√
Malaria Microscopy	√	√	√	Nil
HIV RDT	√	√	√	√
HIV ELISA/Viral load	Send samples to national lab	Send samples to national lab	Send sample to the district laboratory hub	Send sample to the district laboratory hub
HIV CD4 count	√	√	Send sample to the district laboratory hub	Nil
TB diagnostic	√	√	√	√
Haematology	√	√	Nil	Nil
Biochemistry	√	√	Nil	Nil
Parasitology	√	√	Basic	Basic

Health Facility	Sembabule HCIV	Lwengo HCIV	Lwanda HCIII	Mutukula Town HCIII
Availability of Drugs (always in stock)				
ACTs	√	√	√	√
Parenteral Quinine/Artesunate	√	√	√	√
IPT_p (Fansidar/SP)	√	√	√	√
ART (Zidovudine, Nevirapine, Efavirenz)	√	√	√	√
TB drugs	√	√	√	√
EPI vaccinations	√	√	√	√
Antihelminthic drugs	√	√	√	√
Oral rehydration solution	√	√	√	√
Oxytocin/Misoprostol	√	√	√	√
Penicillin (Any)	√	√	√	√
Erythromycin	√	Out of stock	Out of stock	Out of stock
Doxycycline	√	√	√	√
Vitamin A	√	√	√	√
Vitamin K	√	√	√	√
Iron supplements	√	√	√	√
Folic acid	√	√	√	√
Insecticide treated bednets	Pregnant women only	Nil	Nil	√
Hypertension drugs	√	Frequent stock outs	√	√
Antipyretics	√	√	√	√
Injectable diazepam / valium	√	√	√	√

Health Facility	Sembabule HCIV		Lwengo HCIV		Lwanda HCIII		Mutukula Town HCIII	
Injectable magnesium sulphate or other anticonvulsant	√		√		√		√	
Injectable ergometrine	√		Nil		Nil		Nil	
Tetanus anti-toxin injection	√		√		√		√	
Adrenaline injection	√		√		Nil		Nil	
Anti-protozoa drugs	√		√		√		√	
Anti-histamines	√		√		√		√	
Dermatological preparations (anti-fungal, anti-allergic or anti-inflammatory)	√		√		√		√	
Availability and Functionality of Medical Equipment								
A=Available; F=Functional	A	F	A	F	A	F	A	F
Table for gynaecological examination	√	√	√	√	√	√	√	√
Fetoscope	√	√	√	√	√	√	√	√
Autoclave	√	√	√	√	Nil		Nil	
Pressure cooker for sterilisation	Nil		Nil		Nil	Improvised	Nil	Improvised
Speculum	√	√	√	√	√	√	√	√
Blood giving set	Nil		√	√	√	√	√	√
Delivery Forceps	√	√	√	√	√	√	√	√
IV sets	√	√	√	√	√	√	√	√
Vacuum extractor	Nil		Nil		Nil		Nil	
Manual vacuum aspirator	√	√	√	√	√	√	√	√
Dilatation and curettage kit	√	√	√	√	Nil		Nil	
Operating table	√	√	√	√	Nil		Nil	

Health Facility	**Sembabule HCIV**		**Lwengo HCIV**		**Lwanda HCIII**		**Mutukula Town HCIII**	
Operating light	√	√	√	√	Nil		Nil	
Anaesthesia equipment	√	√	√	√	Nil		Nil	
Oxygen equipment	√	√	√	√	Nil		Nil	
Bag valve mask and resuscitator	√	√	√	√	√	√	√	√
Blood pressure apparatus	√	√	√	√	√	√	√	√
Stethoscope	√	√	√	√	√	√	√	√
Thermometer	√	√	√	√	√	√	√	√
Weighing scale	√	√	√	√	√	√	√	√
Glucometer	Nil	Has chemistry analyser	√	No strips	√	No strips	Nil	
Infrastructure								
Regular/reliable running water	Reliable		Not reliable		Not reliable		Not reliable	
Regular/reliable electricity	Reliable		Reliable		Not reliable		Not reliable	
Solar power	√ (lab only)		√		√		√	
Generator	√		√		Nil		Nil	
Any type of electricity	√		√		√		√	
Functioning refrigerator	√		√		√		√	
Functioning landline	Nil		Callbox		Nil		Nil	
Functioning mobile	√		√ (personal phone)		√		√	
Functioning 2-way radio communication	Nil		Nil		Nil		Nil	

Health Facility	Sembabule HCIV	Lwengo HCIV	Lwanda HCIII	Mutukula Town HCIII
Continuity of Services				
In-patient services 24/7	√	√	√	√ (limited)
Emergency services 24/7	√	√	√	√
Official opening hours per day (in hours)	24 hrs	24 hrs	24 hrs	24 hrs
Personnel lives near HF	√	√	√	√
Access to a Referral Hospital				
Proximity of referral hospital (in hours)	Masaka RRH (2 hrs)	Masaka RRH (1 hr)	Rakai Hospital (30 min)	Kakuto HCIV (40 min)
Transportation possibility to referral hospital	Private or public means	Utility vehicle or private/public means	Private or public means	Private or public means
Cost of referral (both ways)	UGX 30,000 (USD 8.03)	Variable	Variable	At least UGX 20,000 (USD 5.35)
Personnel In-Service Training				
Personnel trained in life saving skills (number)	√ (3)	√ (3)	√ (3)	Nil
Personnel trained in IMCI (number)	√	√	√	√
Process of Health Care				
Use of disposable gloves	√	√	√	√
Use of protective eye wear	√	√	Nil	Nil
Evidence of use of cleaning disinfectant in wards and casualty	√	√	√	√
Evidence of soap in wash basins, or hand sanitiser in wards	√	√	√	√
Hand washing	√	√	√	√

Health Facility	Sembabule HCIV	Lwengo HCIV	Lwanda HCIII	Mutukula Town HCIII
Use of autoclave	√	√	√	√
General state of building and state of cleanliness	Good, some areas require renovation	Good	Good	Good
Cost of Health Care				
How much does a basic outpatient consultation cost	Free	Free	Free	Free
How much does diagnosis and treatment for malaria cost (with RDT use)	Free	Free	Free	Free
How much does an admission for a child cost?	Free	Free	Free	Free
General Questions				
How many people have access to this health care facility- the target population?	31,439	Around 30,000	30,412	At least 12,000
What are the 3–5 main health challenges facing the community	Poor access to safe water Use of traditional medicine Poor health seeking behaviour Infrastructure (lacks district hospital) Zoonotic diseases Home deliveries	Unsafe water Poverty Use of traditional medicine Accessibility of services Poor health seeking behaviour	Unsafe drinking water Poor health seeking behaviour Traditional medicine Bad roads Limited health services High disease burden	Border location – high mobility Home deliveries Cultural matters like polygamy Commercial sex work Gender based violence
If you had 3–5 wishes to improve health care in the communities that you serve in, what would they be?	Health promotion Improve infrastructure Improve accessibility to health services Safe drinking water Needs ambulance	Safe drinking water Poverty alleviation Improve access to services Health education Needs ambulance	Health education Improve access to safe water Improve health infrastructure	Health education Improve access to health services Improve health infrastructure

Health Facility	Sembabule HCIV	Lwengo HCIV	Lwanda HCIII	Mutukula Town HCIII
What are the 5 most common diseases in children under 5 years?	Malaria Diarrhoeal diseases Respiratory tract infection Skin infection	Malaria Respiratory tract infections Diarrhoeal diseases Skin infections N/B: Few cases of malnutrition	Malaria Respiratory infection Diarrhoeal diseases Skin diseases	Malaria Acute respiratory infection Diarrhoeal diseases Intestinal worms Skin infections
What are the 5 most common diseases for all age groups?	Malaria Respiratory tract infections STIs UTIs HIV related illnesses Also TB, hypertension, accidents and injuries	Malaria Respiratory infections UTIs Injuries/assault STIs Also HIV and TB	Malaria Respiratory infections Diarrhoeal disease STIs UTIs Also HIV and TB	Malaria STIs Respiratory infections HIV UTIs Accidents/injuries
Is there good community cohesion to supporting health initiatives?	Generally good	Generally good	Generally good	Generally good
Are there measures in place at facility level to deal with disease outbreaks? If yes, specify	Has emergency response procedures coordinated at district level	Has emergency response team. Also active surveillance for notifiable diseases	Yes, emergency procedures in place. Also active surveillance for notifiable diseases	Yes, emergency procedures in place. Also active surveillance for notifiable diseases
Observation/notes	Small rooms, congested, high patient load	Good infrastructure, not well equipped	New maternity wing that is well equipped	Small facility. New maternity wing that is well equipped. Located right at the border

ATTACHMENT A11.5 SUMMARY OF IMPORTANT HISTORICAL EVENTS

A table to illustrate a consolidation of the timelines specified by community members in FGD with PAC leaders and separately with females

Date	Settlement Name Village, Trading Centre or Town	Event as Recorded in the FGD Timelines with PAC Leaders and Separately with Females
1960	Kisenye	Floods, increase of animals (elephants, lions)
	Sembabule	Sembabule Health Centre level 4 constructed
1961	Lugala	Severe flooding
1962	Katikara, Kisenye	Uganda gains independence
1964	Kisenye, Bethlehem	War between Banyoro and Baganda, Baganda took over the two Banyoro Counties of Buyanga and Bugangaizi
1967	Kisenye	The return of two subcounties from Buganda to Bunyoro
	Nkooko Trading Centre	First health centre
1970	Lugala	Measles epidemic. TB and whooping cough outbreak
1971	Bigada, Mbirizi, Lukoma, Miti, Mutukula town, Bethlehem, Bulakati, Kagango, Kinvunikidde, Lukoma, Lwemisege, Mabale, Kyakudusi, Butiti	Amin's regime, Amin and Obote war (1971–1979)
1973	Lukoma	Outbreak of famine due to severe drought
1974	Miti	Construction of a man-made dam
1975	Kinvunikidde	Outbreak of measles
1978	Miti	Outbreak of foot and mouth disease
1979	Bulakati, Kabugimbi, Miti, Sembabule	HIV and AIDS killed many people and severe famine
	Lugala, Nabigasa	Tanzanian forces fought in the area to overthrow Amin
1980	Bethlehem	Arrival of first health facility, and famine
	Kabugimbi	Malaria cases increased
	Kyengera	Drought throughout Kyengera forced people to move to seek water sources for cattle
	Mabale	Severe drought leading to famine
	Mbirizi, Lukulavu, Serinya, Butiti, Mabale, Bethlehem, Bulakati, Miti	Liberation war (also known as bush war, civil war, Luwero war, resistance war) (1981–1986)
	Miti, Muyenje, Serinya	Drought and severe famine (1980–1983)

Date	Settlement Name Village, Trading Centre or Town	Event as Recorded in the FGD Timelines with PAC Leaders and Separately with Females
1982	Bigada	HIV outbreak in the village
	Kabugimbi, Kinvunikidde, Kyenda, Nabigasa, Nkooko Trading Centre	Severe drought and famine
	Miti	Measles outbreak
	Ssanje Katwe	NGOs with mobile treatment started in the area
1983	Bulakati	Severe famine
	Bulakati, Kyengera, Kinvunikidde	Outbreak of measles that killed many children and adults
	Kabugimbi	First deaths from Aids recorded
1985	Mbirizi	Public healthcare facility constructed
	Muyenje, Ssanje Katwe, Bethlehem, Lukulavu, Nsambya, Nyondo, Mbirizi, Miti, Mutukula town, Kyengera, Kinvunikidde	Outbreak of HIV and AIDS (1985–1988)
1986	Bulakati, Kagango	Outbreak of measles that killed many children
	Mutukula town	Election of new government, end of war with Tanzania (soldiers hide at Mutukula on the Tanzania border).
1987	Butiti	Many people died due to AIDS as a result of lack of drugs (1987–1995)
	Bigada, Ssanje Katwe	Serious measles outbreak, mass immunisation
1989	Kyenda	Mityana–Mubende highway tarmacked
	Lukoma	Heavy hailstones cause destruction of crops
	Mutukula town	Arrival of HIV treatment from South Africa
1990	Nkooko Trading Centre	Rumours of oil discovery in Bunyoro region
1991	Mabale	Serious drought (1991–1994)
1992	Butiti, Kinvunikidde, Lwemisege, Bethlehem, Muyenje, Serinya, Lukulavu	Famine due to prolonged drought
	Lwemisege, Miti, Mbirizi, Bethlehem	Measles outbreak
1994	Kabulasoke	Famine. Received heavy rains
	Kamusenene	Action AID donates dam
1996	Kyakudusi, Bulakati	Hailstones destroyed crops, rained for four days nonstop causing a deluge
1997	Katikara	River Kabaale flooded and killed many people
	Lugala	Kyebando dam built

Date	Settlement Name Village, Trading Centre or Town	Event as Recorded in the FGD Timelines with PAC Leaders and Separately with Females
	Mabale	Heavy rains led to flooding, outbreak of malaria, vaccination of children against measles and polio
1998	Kagango, Lukulavu, Mijunwa	Received heavy rains and flooding destroyed crops
	Miti	Children disabled due to polio acknowledged in society
	Nyondo	Measles outbreak
	Ssanje Katwe	Drought and starvation, World Vision helped with food and water
1999	Kabugimbi	First borehole constructed
	Kisenye	Floods in Kisenyi village, War between Banyoro and Bakiga tribes
	Lukulavu, Muyenje	Drought led to outbreak of famine
	Mutukula town	Mutukula Health Center level II opened
2000	Bulakati	Heavy rains associated with floods
	Buswabwera	Mpasaana Health Center Level I constructed
	Kabulasoke	Dam/water pond at Kabulasoke constructed. Famine
	Kagango	Kagango Health Center level II opened
	Kakende	First borehole constructed. Before this, water was taken from the swamps and rivers; much sickness was attributed to this.
	Kinvunikidde	Severe drought lasted for entire year, which led to famine
	Kisenye, Nkooko Trading Centre	Allied Defense Force rebels killed many, raped women and destroyed property
	Lukoma	Construction of a Tarmac road. Heavy rains caused flooding in the area
	Lukulavu	Construction of boreholes
	Lwemisege	Immunisation against measles became available, outbreak resolved
	Nabigasa	Hail stones destroyed gardens and killed one
	Nzoo, Kagango, Kyenda	High spread of HIV and AIDS and severe drought
2003	Bethlehem	Kituntu Valley Dam for water (World Bank Funding)
2004	Kakende	Immunisations against measles
	Kyenda	Heavy rains, plenty of food
	Lukoma	Community provided with village health teams
2005	Kyengera	Outbreak of measles
2006	Bulakati, Kyakudusi, Mabale	Drought leading to severe famine
2007	Kamusenene	First clinic opened

Date	Settlement Name Village, Trading Centre or Town	Event as Recorded in the FGD Timelines with PAC Leaders and Separately with Females
	Kisenye, Kyengera, Miti, Nzoo	Drought caused bushfire outbreak, famine
2008	Buswabwera	War between government forces and rebels of the allied democratic forces
	Kabulasoke	Outbreak of measles
	Kisala West	Strong hailstorms
	Sembabule	First government distribution of mosquito nets
2009	Bulakati, Kalembe, Njaza	Severe famine
2010	Butiti	Increased death of women giving birth at home
2011	Buswabwera, Muyenje	Heavy rains all year
	Muyenje	Drought and wind storm
2012	Kyengera	First clinic opened
2013	Kabaale-Kyabicwe	Borehole construction
	Kalembe	Dams constructed
	Lwemisege	Famine due to drought – significant impact as water sources dried up completely, food distributed by subcounty
2014	Kamusenene	Borehole constructed
	Lugala	Storm destroyed houses
	Lukoma, Nssambya	Drought leading to outbreak of famine
	Mijunwa	Shallow well constructed
	Muyenje	Hail stones affected people's crops leading to reduced food supply
2015	Kyajawe	High death rates among pregnant mothers as a result of limited access to maternity wards
	Lugala	Second dam was constructed in the village
	Nkooko Trading Centre, Nzoo	Heavy rains led to floods, which displaced people
	Nzoo	Chickenpox and Brucella outbreak
2016	Bethlehem, Bigada, Kabaale-Kyabicwe, Kabugimbi, Kamusenene, Kyenda, Miti	Drought and famine
	Kamusenene	Water dam construction
	Kyajawe	Many fell ill due to consumption of unsafe drinking water, children and women died due to lack of care
	Kyengera	Received heavy rains

Date	Settlement Name Village, Trading Centre or Town	Event as Recorded in the FGD Timelines with PAC Leaders and Separately with Females
	Bigada, Lukulavu, Kabugimbi, Kyakudusi, Butiti, Bethlehem, Kabonera, Lwemisege, Nabigasa	Severe earthquake
	Mijunwa	Evelyn clinic started
	Nabigasa	Magi clinic opened
	Nkooko Trading Centre, Nyondo, Nzoo	Heavy hailstorms destroyed property
2017	Katikara	Intensive care unit established and operation services at the local clinic
	Kyengera, Lukoma	Drought leading to severe famine
	Mijunwa	Borehole constructed
	Nsambya	Chicken pox outbreak

Appendix A12: Traffic Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
km	kilometre
m	metre
A	
AGI	aboveground installation
AOI	area of influence
B	
bajaj	three-wheeler motorcycle taxis
boda boda	motorcycle taxis
H	
HGV	heavy goods vehicle
R	
RoW	right-of-way
rural roads	roads that traverse rural areas, generally unsealed and often single tracks
S	
sealed road	road in Uganda that may be constructed of tarmac, bitumen or concrete
T	
trunk roads	national or international route linking two or more regional headquarters
U	
unsealed road	road in Uganda constructed from earth or gravel
UNRA	Uganda National Roads Authority
urban roads	roads that pass through cities, small towns and built-up areas
V	
VEC	valued environmental or social component

A12 TRAFFIC BASELINE REPORT

A12.1 Introduction

This baseline report describes traffic:

- AOI and study area boundaries
- methods
- baseline condition:
  - traffic baseline conditions
  - trend in condition and sensitivity to change
  - sensitivity rankings
- key considerations.

A12.2 Area of Influence and Study Area Boundaries

A12.2.1 Area of Influence Boundary

The AOI encompasses the transport network that connects key population centres, ports and airports to the AGIs, construction facilities and pipeline right-of-way (RoW).

The traffic AOI will be the roads that will be used by the project.

AGIs will remain operational over the project lifetime, so the temporal AOI will be approximately 25 years. At other locations, the temporal AOI is the construction period.

A12.2.2 Study Area Boundary

The study area boundary within Uganda is the same as the AOI boundary.

A12.3 Methods

A12.3.1 Secondary Data

A desktop review of the transport network using maps, satellite images, input from the project engineers and review of prior consultation activities with relevant authorities was used to identify the road network likely to be used for the project, the main settlements on the road network and the location of field surveys to collect traffic data.

A review of the types of road user was undertaken using information from the Uganda National Roads Authority (UNRA), the World Health Organization and data gathered through the social field surveys to identify the conditions experienced by users. Walking, cycling, public transport and typical forms of private transport were considered.

A12.3.2 Field Surveys

The traffic field survey was conducted between 20 January and 14 February 2018 using the Uganda Ministry of Works and Transport and UNRA standard form for manual classified counts.

The survey objectives were to determine baseline traffic volumes and flow characteristics at five locations within the EACOP AOI identified by the desktop review. These locations (Table A12.3-1 and Figure A12.3-1) were chosen on trunk roads that are planned to be used by the project as main access routes, i.e., national routes that would be used to transport equipment and materials toward project locations. Locations close to towns where transport routes converge were chosen to provide a spread of data within the AOI.

Figure A12.3-1 Location of Field Surveys

Table A12.3-1 Traffic Field Surveys

Survey Location (Towns)	Easting	Northing	Survey Period	Survey Method
Hoima	193980.9	10158875	One weekday count	10-hour manual classified count
Mubende	198221.2	10062786	One weekday count	
Kitenga	211354.7	10054913	One weekday count	
Masaka	238890.1	9965840	One weekend count and one weekday count	
Kyotera	214819.5	9929627	One weekend count and one weekday count	

NOTES: Coordinates based on Transverse Mercator 35°E S, International Terrestrial Reference Frame (2005)

At each survey location, field survey forms (one form for each hour) were used to record the following information:

- the road link name and the traffic count station
- a brief description of the surroundings of the traffic count station
- the survey date and time period
- the weather conditions, which could affect driver behaviour and traffic patterns
- the number of vehicles using the road, including bicycles and motorcycles, recorded by direction and vehicle type.

Information was also gathered during the social baseline surveys (including household surveys) and used to gain informal information on:

- the perceptions of road safety and the causes of accidents
- modes of travel.

For more information on the social surveys, see Appendix A11 Socio-economic and Health Baseline Report.

A12.3.3 Data Analysis

At the end of the survey, the total number of vehicle movements for each time period for each vehicle category was determined. The data was analysed for traffic flow characteristics.

The sensitivity of the receptors has been ranked according to the tables for the community safety, security and welfare, and social infrastructure and services valued environmental or social components VECs. The tables are presented in Appendix D.

A12.3.4 Data Considerations

The desk-based assessment, traffic field survey and social surveys provided sufficient information to accurately describe the traffic and road conditions, including all users of the road network.

A12.4 Baseline Conditions

The baseline conditions of traffic inform four VECs:

- social infrastructure and services
- community safety, security and welfare
- workers' health, safety and welfare
- community health.

Each of these is described below in terms of:

- ports and airports
- road network
- public transport
- walking and cycling
- road safety
- traffic flows.

A12.4.1 Baseline Condition of Traffic

A12.4.1.1 Ports and Airports

Ports

Uganda is a land-locked country and therefore relies on goods being transported through neighbouring countries. Ugandan ports handle a negligible amount of cargo, with 95% of total cargo being transported by road. However, the following shipping routes offer the potential for cargo arriving by road to travel across Lake Victoria or Lake Albert with onward travel via road and rail:

- Lake Victoria offers shipping cargo routes to Kenya and Tanzania, including a ferry that transports train wagons from Kampala to each of these countries.
- Nonrailhead ferries operate across Lake Victoria for standard cargo.
- Commercial boats are used to transport goods on Lake Albert between Uganda and Congo.
- An UNRA ferry operates from Wanseko in Buliisa district to Panyimur in Nebbi district.

Airports

Airports are an entry point into land-locked Uganda for people and nonbulk goods, including specialist components.

Uganda's capital, Kampala, is served by Entebbe International Airport, 40 km southwest of the city. At the time of writing, the airport is being upgraded and expanded to modernise and improve its passenger and cargo facilities. The airport provides connections to countries across Africa, the Middle East and Europe, and offers opportunities for freight and specialist workers to be transported to Uganda with onward transport by road.

Kabaale International Airport in the Hoima district of Uganda is being developed to serve the region's oil industry, including the planned oil refinery in Kabaale. The

airport will handle large passenger and cargo aircraft for transporting equipment and workers to the construction site and nearby oilfields.

There are also airstrips across the country that can accommodate smaller passenger and cargo aircraft. These can be used to reach more remote parts of Uganda, including the Tilenga development area which is served by existing airstrips at Bugungu and Pakuba in Murchison Falls National Park.

A12.4.1.2 Road Network

In Uganda, the road classification system has five levels, A–E, with A representing international trunk roads and E representing minor roads. Roads are described in relation to the function they perform and the environment through which they pass as being:

- trunk roads
- urban roads
- rural roads.

Trunk Roads

Many trunk roads in Uganda are unsealed. At the time of writing, some of these roads in the AOI are being upgraded to have sealed surfaces. In addition, enabling road networks are being put in place by UNRA to support oil and gas infrastructure development. This will include upgrading 11 roads and several bridges to become sealed roads.

The trunk roads in the AOI potentially used by the project are described below.

The Hoima–Buseruka–Ngogole road connects Hoima with Kyabalendere. It is a sealed road with spare capacity except for within Hoima town where congestion may occur (Figure A12.4-1).

Figure A12.4-1 The Hoima–Buseruka–Ngogole Road at Hoima with Typical Land Use Alongside

From Hoima, the A109 Hoima–Kampala road provides a good sealed surface, passing through Kiboga, Busunju, Mika and Kagiri. This road has good spare capacity, except when it reaches Kampala where congestion may occur.

The A109 Kampala–Fort Portal road is a sealed surfaced, leaving Kampala in a westerly direction passing through Mityana, Kitenga (Figure A12.4-2) and Mudende (Figure A12.4-3), crossing the pipeline route at KP125. This road has good spare capacity, except within Kampala where congestion may occur.

Figure A12.4-2 The A109 Kampala–Fort Portal Road through Kitenga Showing Land Use Alongside and Road Condition

Figure A12.4-3 The A109 Kampala–Fort Portal Road through Mudende with Typical Land Use Alongside and Road Condition

The Kampala–Masaka road is a sealed road in good condition, leaving Kampala in a southwest direction passing through Mpigi, Kamengo, Buwama and Lukaya, close

to Lake Victoria. This road has good spare capacity, except within Kampala where congestion may occur.

At Masaka, a trunk road meets the Kampala–Masaka trunk road, connecting Sembabule and Masaka. It is unsealed and, at the time of writing, is being upgraded to a sealed surface along the road's whole length. The road leaves Masaka in a northwest direction, passing through Kawoko, Kagologolo and Sembabule, and crossing the pipeline route at KP189. This road has good spare capacity throughout.

The Masaka–Mbarara trunk road also meets the Kampala–Masaka trunk road, heading west from Masaka with a good condition sealed road and good spare capacity. The road crosses the pipeline route at KP226.

From Masaka, the Masaka–Mutukula trunk route continues in a southerly direction to Kyotera and Mutukula at the Uganda–Tanzania border. This road provides a good condition sealed surface and is an important route between the border and Kampala (Figure A12.4-4). This road has good spare capacity, between Masaka and Kyotera with congestion likely to occur on the approach to the border.

Figure A12.4-4 Road through Kyotera with Typical Land Use Alongside and Road Condition

At the Uganda–Tanzania border (KP296), the Masaka–Mutukula road has unsealed sections and is in poor condition. There are high numbers of vehicles, street sellers, official border police, motorcyclists, pedestrians, stationary vehicles and buildings beside the road, making the area difficult for traffic to pass through.

Urban Roads

In cities, urban roads are often sealed and provide segregated pedestrian facilities.

Outside cities, urban roads are generally unsealed and the same road often varies in width owing to local constraints, such as watercourses and buildings, although generally they are wide enough for two vehicles abreast. These roads pass through small towns and built-up areas with busy zones where people move on foot or

motorcycle past numerous trading stalls on both sides of the road, and schools and other facilities.

Figure A12.4-5 illustrates a typical urban road through a village showing width, road condition and adjoining land uses.

Figure A12.4-5 Typical Urban Road through a Village

Rural Roads

Rural nontrunk roads are predominantly unsealed and often single track (Figure A12.4-6), requiring vehicles to move off the road to pass, unless passing places are provided. The road condition varies depending on the season, and frequency of maintenance. Adjacent land use varies between agriculture, forest and sparsely vegetated areas.

Figure A12.4-6 Typical Rural Road

Watercourse crossings are usually over corrugated metal pipe or concrete culverts. Roads that are not elevated above ephemeral watercourses can become flooded during the rainy season, restricting movements to and from small towns and remote villages. Where bridges are provided in remote areas, they are not always well maintained and the approaches can be in poor condition due to flooding.

Roads on steep terrain can be in poor condition depending on the drainage on surrounding slopes with water damage causing rutting.

A12.4.1.3 Public Transport

There is little public transport. As a result, many people walk long distances to use public transport.

Boda Boda and Bajaj

The social baseline survey showed that motorcycle taxis, boda boda, and three-wheeled motorcycle taxis, bajaj, are the most common form of transport, being used by the average Ugandan household for 75% of all journeys within urban areas. The survey also showed that a further 11% of household transport was by private motorcycle.

Buses

Kampala is preparing to introduce the first formal bus rapid transit system (National Transport Master Plan 2008–2023). This should improve travel times within Kampala and reduce health risks and pollution levels. Emphasis will be placed on high-capacity buses running on a small number of key routes that link with appropriate nonmotorised transport infrastructure and facilities. Minibuses also connect different suburbs of Kampala.

For intercity journeys, most towns have a form of taxi-park, with longer-haul minibuses departing to various destinations. These minibuses leave whenever they are full rather than following a timetable and often make unscheduled stops to pick up passengers. Larger buses also make intercity journeys.

Rail

There are no railways near the AOI that are available for freight or passenger use. Rift Valley Railways, Uganda Railways Corporation and Kampala City Council Authority run the Kampala passenger train service, which is limited to parts of the Kampala urban area.

A12.4.1.4 Walking and Cycling

Urban Areas

Many urban roads in Uganda have little or no infrastructure for pedestrians and cyclists. Often pedestrian access along designated footways is obstructed by traders, vehicles loading or parked, boda bodas and bajaj plying for trade, informal establishments, and pedestrians waiting to cross roads. In addition, open roadside drains create a safety hazard for pedestrians and cyclists, particularly in crowded urban streets and on unlit roads after dark.

The busy nature of the road infrastructure in urban areas and the lack of, or poor, maintenance of pedestrian crossings in Uganda discourage pedestrians from using designated crossing points. Some towns or areas of higher population density have pedestrian islands on the roads, allowing pedestrians to cross one lane of traffic at a time. In Kampala and other urban areas, there are few roads with formal traffic-light-controlled crossings.

Many market traders and customers rely on walking or cycling to access local markets in villages or urban areas.

Rural Areas

Walking and cycling are extremely important for rural peoples' livelihoods. Often, rural people travel along footpaths before they can access roads; these paths range in use and significance but can link whole communities with the road network. For individuals living in rural areas, travelling by foot or bicycle is important for gaining access to water, fuel, wood, fields and livestock, education, healthcare and work. The condition of footpaths and roads, and the traffic density, can therefore have an important effect on rural livelihoods.

The condition of Uganda's rural footpaths is highly variable and may change depending on the season.

District and community roads in rural areas have no provision for pedestrians and cyclists. There is the potential for pedestrian/cyclist–vehicle accidents, which are exacerbated by excessive vehicle speeds and at times of higher traffic. Where roads are poor and badly maintained, the shoulders of the roads can be rough and eroded. These conditions make it difficult to walk or cycle on the road shoulder, so pedestrians and cyclists use the road increasing the likelihood of accidents.

A12.4.1.5 Road Safety

Increasing levels of motorisation, combined with poorly maintained infrastructure has made nonmotorised transport increasingly unsafe in both urban and rural areas. In many cases, road designs do not accommodate pedestrians and nonmotorised vehicles, although road humps are often installed to reduce the speed of traffic. In rural areas, the nature of the roads is such that overtaking requires the vehicle, motorcyclist or cyclists to move to the side of the road in the area where pedestrians are travelling. Vehicles and motorcyclists also move onto the sides of the roads to avoid hazards such as potholes, gullies and runoff deposits.

Uganda has experienced considerable growth in recorded road crash fatalities over the last decade with 24 people killed per 100 road crashes. On average, Uganda loses 10 people per day in road traffic crashes, which is the highest level in East Africa (United Nations Economic Commission for Africa).

Figure A12.4-7 shows the national statistics trend between 2011 and 2015 for the cause of road traffic accidents in Uganda, highlighting that previous growth in accidents has stabilised in the most recent five-year period.

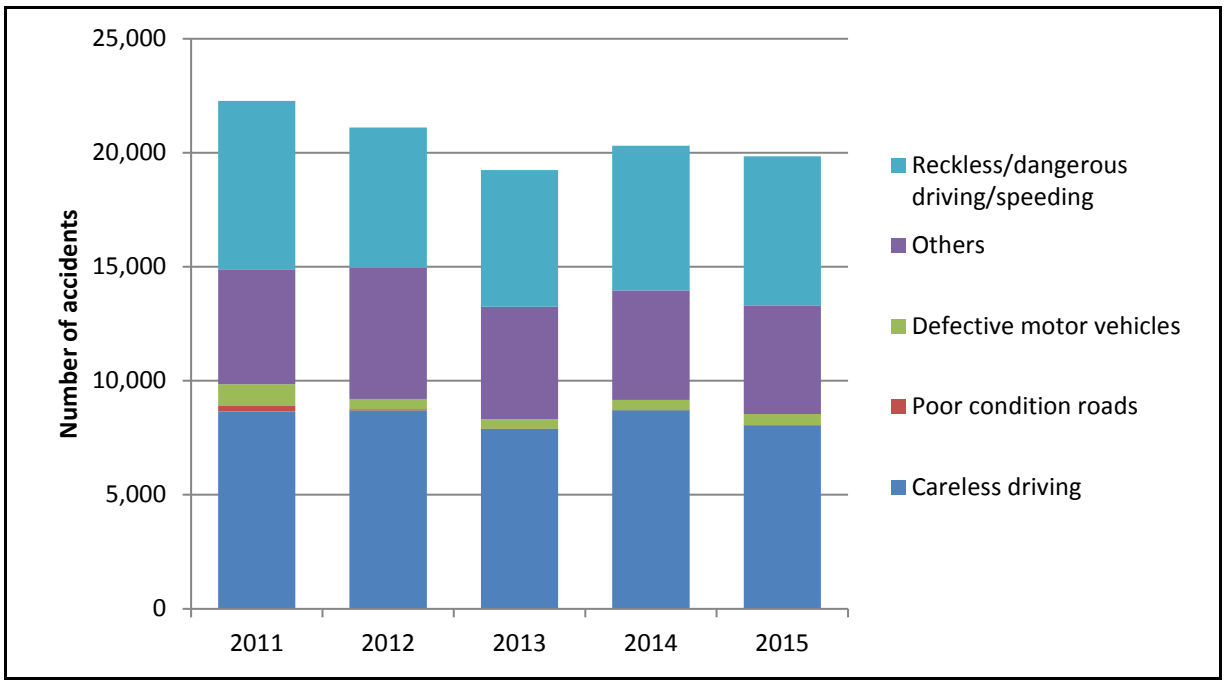

Figure A12.4-7 Causes of Traffic Accidents in Uganda

SOURCE: Uganda Police Force (Annual Traffic and Road Safety Report 2016)

Figure A12.4-7 shows that careless driving and reckless and dangerous driving are the principal causes of road accidents in Uganda. Outside the cities, drivers can drive at unsafe speeds owing to a lack of traffic-calming measures and low level of speed limit enforcement.

A12.4.1.6 Traffic Flows

Field Survey: Hoima

The traffic count in Hoima was taken along Butiaba road, which connects the towns to the northwest of Hoima and is used for transporting goods and accessing services such as schools and health centres.

The area is built up, with trading centres, markets, hotels, schools, health centres and other businesses. The areas beside the road are densely populated with both nuclear and linear settlements. The road is a single carriageway with one lane for each direction and a pedestrian pavement on one side. Traffic moves northbound toward Butiaba and southbound toward the centre of Hoima.

Table A12.4-1 shows the composition of the different types of vehicles for the weekday traffic counts.

Table A12.4-1 Weekday Traffic Composition at Hoima

Vehicle Type	Traffic Volume (Two Way) 08:00–18:00	Percentage of Vehicle Type
Cars and taxis	473	6.9
Light goods vehicles	505	7.3
Buses and minibuses[1]	50	0.7
Heavy goods vehicles	180	2.6
Motorcycles	5141	74.7
Bicycles	537	7.8
Daily traffic volumes	6886	100.0

NOTE: [1]Commonly referred to as commuter taxis

The most common vehicle type used on the road was the motorcycle, accounting for nearly 75% of traffic.

The data were used to determine the hourly variation of traffic flow throughout the day (Figure A12.4-8). The total volume of traffic in the 10-hour survey period was 6886 vehicles. Peak flow was 10:00–11:00 with a similar peak at 17:00–18:00. The total traffic flows were broadly consistent throughout the day with similar proportions of vehicle types in any given hour. HGV traffic was 2.6% of the total volume, reducing to 2.2% during the peak hour.

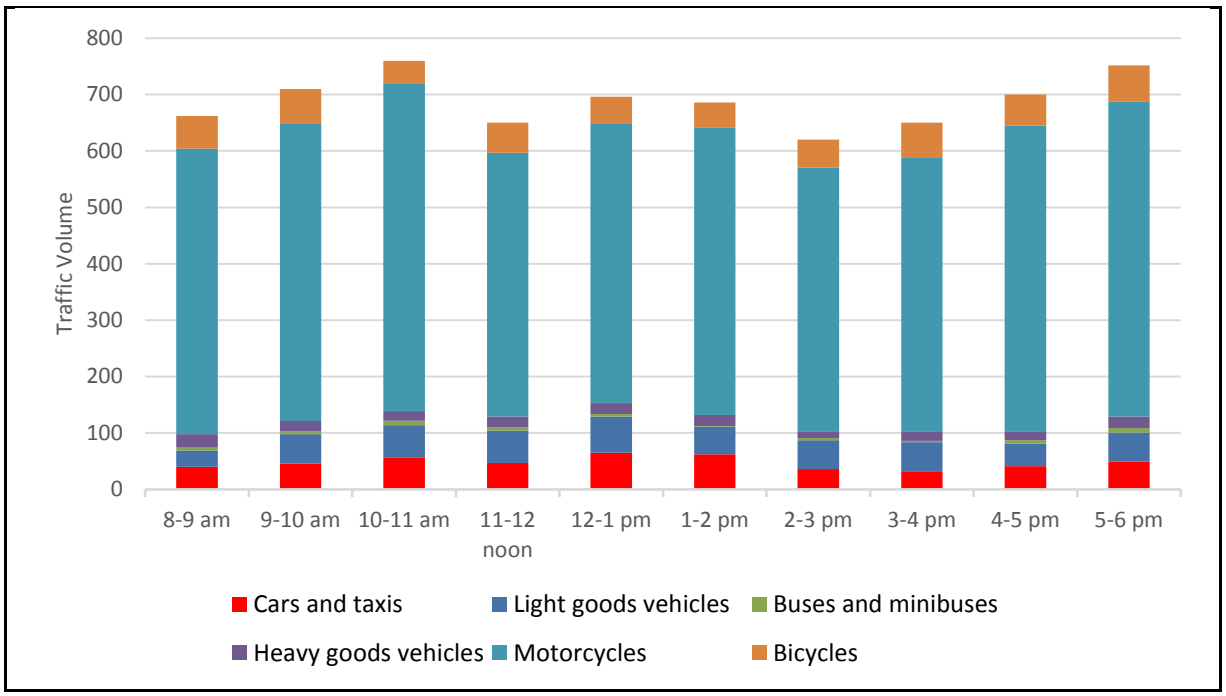

Figure A12.4-8 Traffic Peak Flow Variation: Hoima

Field Survey: Mubende

The traffic count in Mubende was along the Mubende–Kakumiro road. The road is used for transporting goods between different locations and accessing services such as schools and health centres.

The area is built up, with places of worship, a regional referral hospital, trading centres and other businesses. The area is densely populated with both nuclear and linear settlements. The road is a single carriageway with one lane for each direction. Traffic moves northbound toward Kakumiro and southbound toward the centre of Mubende. Table A12.4-2 shows the composition of different types of vehicles for the weekday traffic counts.

Table A12.4-2 Weekday Traffic Composition at Mubende

Vehicle Type	Traffic Volume (Two Way) 08:00–18:00	Percentage of Vehicle Type
Cars and taxis	511	6.6
Light goods vehicles	364	4.7
Buses and minibuses[1]	115	1.5
Heavy goods vehicles	398	5.2
Motorcycles	6142	79.5
Bicycles	191	2.5
Daily traffic volumes	7721	100.0

NOTE: [1]Commonly referred to as commuter taxis

The most common vehicle type used on the road was the motorcycle, accounting for nearly 80% of the traffic volume recorded.

The data were used to determine the hourly variation of traffic flow throughout the day (Figure A12.4-9). The total traffic volume recorded in the 10-hour period was 7721. There was general consistency in traffic volumes for most of the day with rain affecting motorcycle traffic and a resulting reduction in traffic volume until the rain subsided. HGV traffic was approximately 5% of the total volume for much of the day. Road construction earthworks were being undertaken close to the traffic count location. However, the number of HGVs recorded during the survey was not considerably different to that recorded elsewhere on major roads in the region. The proportion of each vehicle type was also reasonably consistent throughout the day, except during the period of rain.

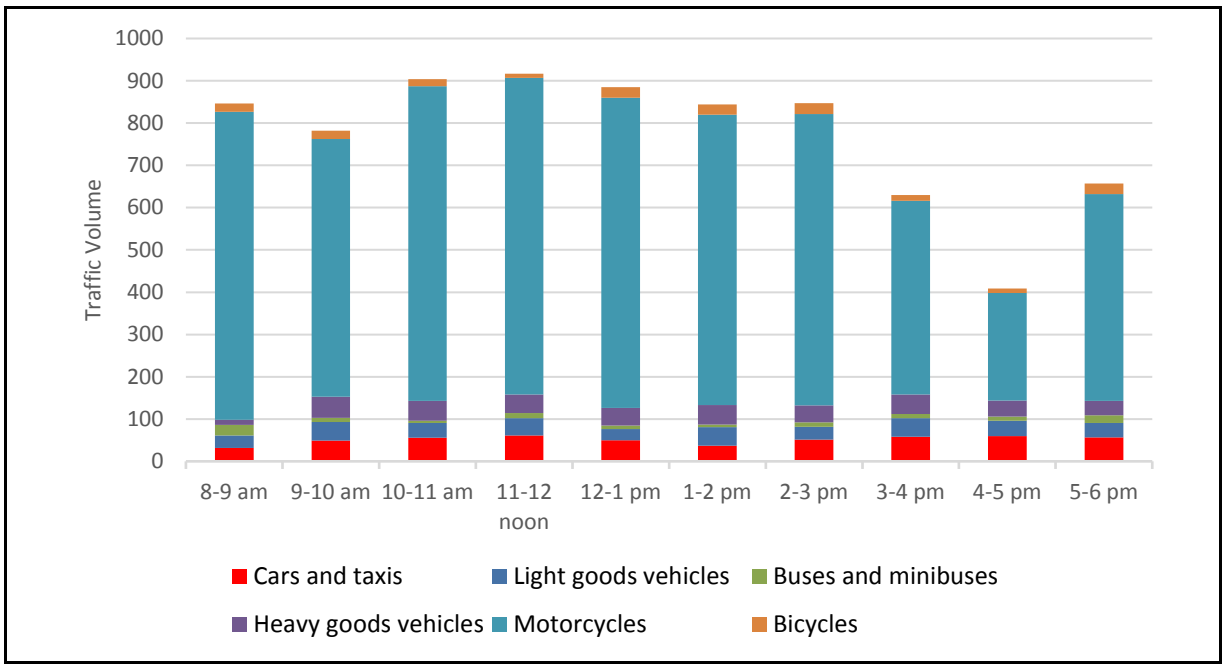

Figure A12.4-9 Traffic Peak Flow Variation: Mubende

Field Survey: Kitenga

The traffic count in Kitenga was along the Kampala–Fort Portal Road. The road is used for transporting goods and accessing services such as schools and health centres.

The land use next to the road includes coffee, banana, mango and cassava cultivation. The area is built up, with a trading centre, schools, restaurants and other centres. It is densely populated with both nuclear and linear settlements. The road is a single carriageway with one lane for each direction. Traffic moves northbound toward Fort Portal and eastbound toward Kampala.

Table A12.4-3 shows the composition of the different types of vehicles for the weekday traffic counts.

Table A12.4-3 Weekday Traffic Composition at Kitenga

Vehicle Type	Traffic Volume (Two Way) 08:00–18:00	Percentage of Vehicle Type
Cars and taxis	339	13.9
Light goods vehicles	336	13.8
Buses and minibuses[1]	475	19.5
Heavy goods vehicles	493	20.2
Motorcycles	738	30.2
Bicycles	59	2.4
Daily traffic volumes	2440	100.0

NOTE: [1]Commonly referred to as commuter taxis

The data were used to determine the hourly variation of traffic flow throughout the day (Figure A12.4-10). The most common vehicle type was the motorcycle accounting for 30% of the total volume recorded; however, they are less dominant here than in other survey locations. The total traffic volume during the 10-hour survey period was 2440. Traffic flows steadily increased throughout the day with similar proportions of vehicle types for each hour. HGV traffic was 20% of the total volume, increasing to 25% during the 17:00–18:00 peak.

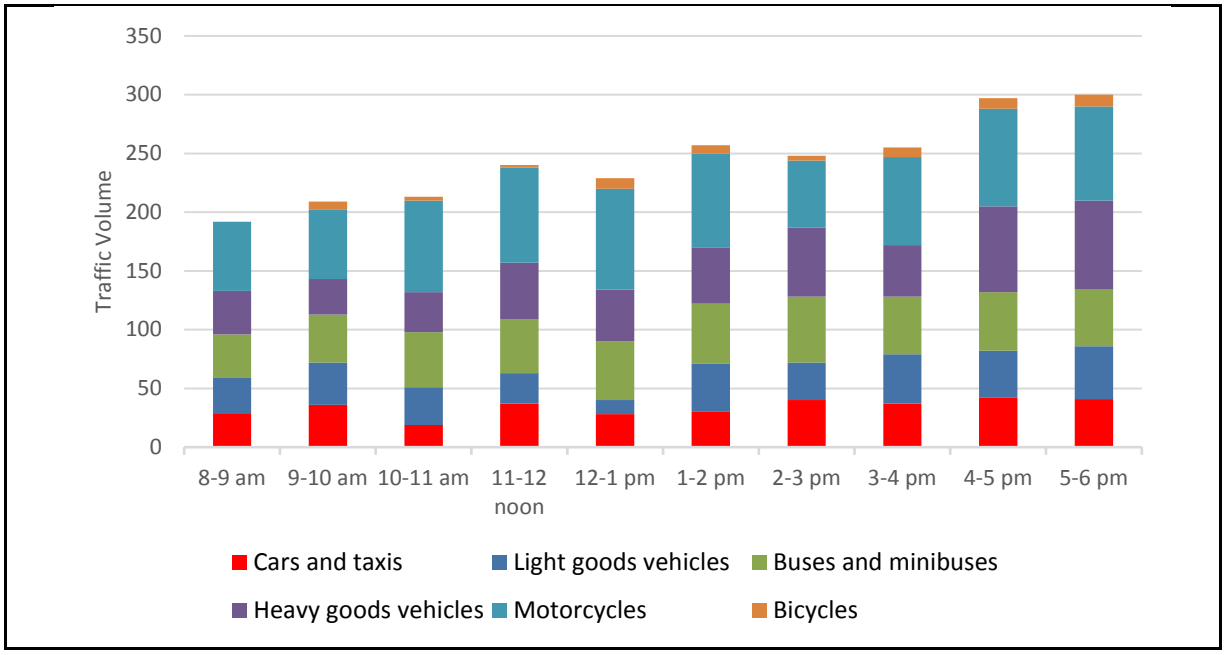

Figure A12.4-10 Traffic Peak Flow Variation: Kitenga

Field Survey: Masaka

The traffic count in Masaka was along the Masaka–Mbarara road. The road is used for transporting goods and accessing services such as schools and health centres.

The area is built up with trading centres, schools, residential houses and other businesses, and is densely populated with both nuclear and linear settlements. The trunk road has a single carriageway with one lane for each direction. Traffic moves southbound toward Mbarara and northbound toward Kampala.

Several factors with the potential to compromise road safety were observed at this location. These were:

- vehicles exceeding the speed limit
- different driver behaviour on approach to the junction
- drivers' overtaking behaviour, especially in long vehicles such as buses, trucks and trailers
- a steep gradient.

Table A12.4-4 shows the composition of different types of vehicles for the weekday and weekend traffic counts.

Table A12.4-4 Weekday and Weekend Traffic Composition at Masaka

Vehicle Type	Weekday		Weekend	
	Traffic Volume (Two Way) 08:00–18:00	Percentage of Vehicle Type	Traffic Volume (Two Way) 08:00–18:00	Percentage of Vehicle Type
Cars and taxis	1,649	16.0	1,904	17.7
Light goods vehicles	1,251	12.2	1,205	11.2
Buses and minibuses[1]	493	4.8	576	5.4
Heavy goods vehicles	721	7.0	671	6.2
Motorcycles	6,079	59.1	6,295	58.6
Bicycles	96	0.9	96	0.9
Daily traffic volumes	10,289	100.0	10,747	100.0

NOTE: [1]Commonly referred to as commuter taxis

The most common vehicle type was the motorcycle, accounting for nearly 60% of traffic.

The total traffic volume over a 10-hour period was 10,289 on a weekday and 10,747 on a weekend. The data show that traffic volumes were broadly consistent throughout the survey with similar proportions of vehicle types. HGV traffic was 7% of the total volume, increasing to 8% during the 16:00–17:00 weekday peak and around 6% during the 17:00–18:00 weekend peak. Figure A12.4-11 illustrates the hourly variations throughout the survey period for a weekday and a weekend.

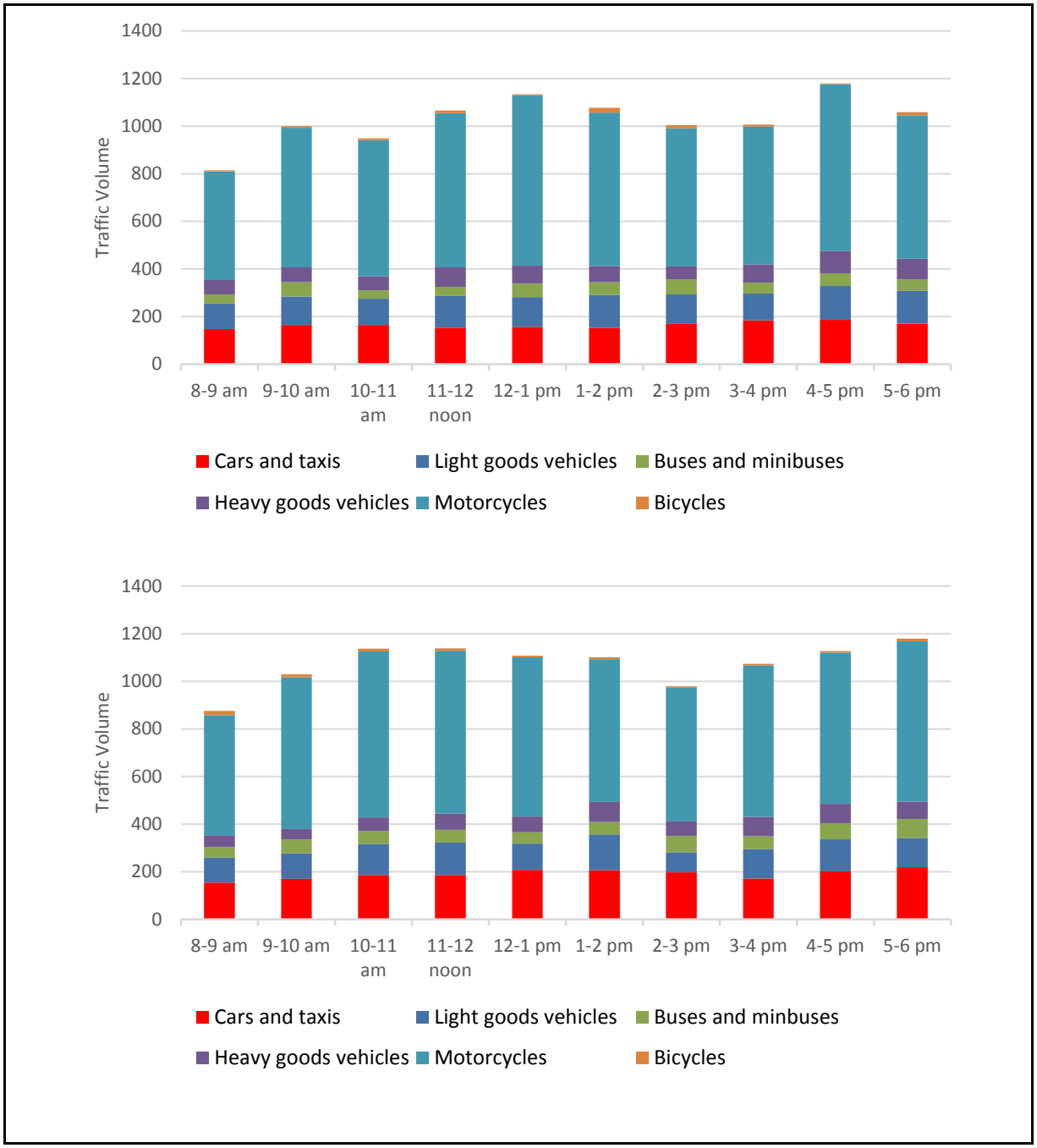

Figure A12.4-11 Weekday (top) and Weekend (bottom) Traffic Peak Flow Variation: Masaka

The survey showed little variation in vehicle numbers or types between the weekday and the weekend.

Field Survey: Kyotera

The traffic survey in Kyotera was undertaken on the south side of the town. The road provides good access for people, goods and services such as schools and health centres. The area is built up with hotels, motels, trading centres, health

centres and other businesses. The area is densely populated with both nuclear and linear settlements.

The road is a single carriageway with one lane for each direction. Traffic flows northbound toward Masaka and southbound toward Kakuto. The survey location is representative of the traffic travelling across the Uganda–Tanzania border at Mutukula.

Table A12.4-5 shows the composition of different types of vehicles for the weekday and weekend day traffic counts.

Table A12.4-5 Weekday and Weekend Traffic Composition at Kyotera

Vehicle Type	Weekday		Weekend	
	Traffic Volume (Two Way) 08:00–18:00	Percentage of Vehicle Type	Traffic Volume (Two Way) 08:00–18:00	Percentage of Vehicle Type
Cars and taxis	1,416	13.0	1,231	13.6
Light goods vehicles	333	3.1	264	2.9
Buses and minibuses[1]	355	3.3	386	4.3
Heavy goods vehicles	439	4.0	427	4.7
Motorcycles	7,802	71.9	6,339	70.0
Bicycles	506	4.7	403	4.5
Daily traffic volumes	10,851	100.0	9,050	100.0

NOTE: [1]Commonly referred to as commuter taxis

The most common vehicle type was the motorcycle, accounting for 71.9% of the total volume recorded on the weekday and 70.0% on the weekend.

The total traffic volume in the 10-hour survey period was 10,851 for the weekday and 9050 on the weekend. Traffic volumes were generally consistent throughout the weekday survey with slightly higher peaks around commuting times of 08:00–09:00 and 17:00–18:00 with an additional peak around 11:00–12:00. At the weekend, traffic volumes increased during the morning to a peak around 11:00–13:00 before falling slightly and levelling for the rest of the survey period.

Proportions of vehicle types were also reasonably consistent across both days. HGV traffic was around 4% of the total volume across the survey period and during peak hours on both a weekday and a weekend. Figure A12.4-12 illustrates the hourly variations throughout the survey period.

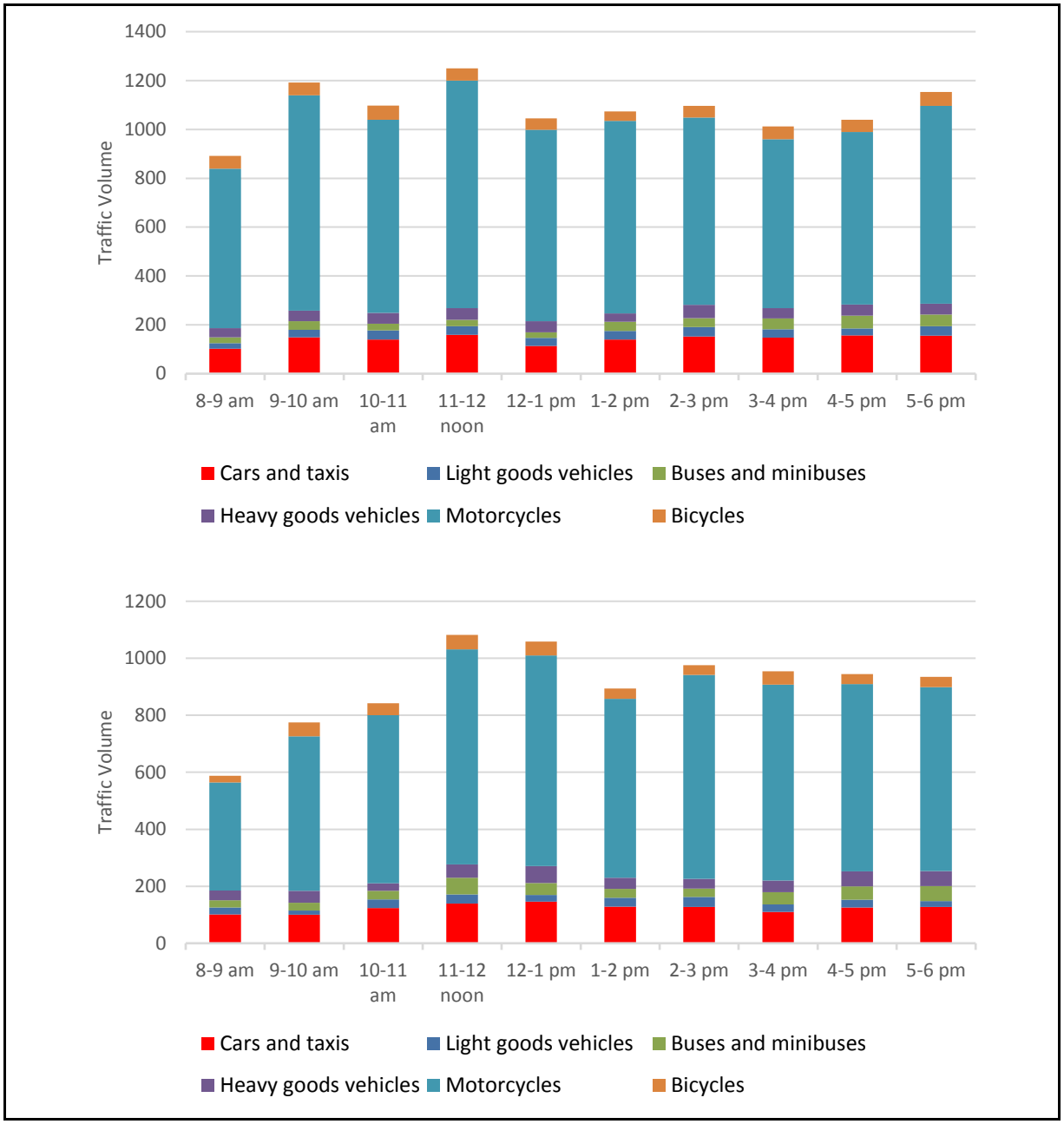

Figure A12.4-12 Weekday (top) and Weekend (bottom) Traffic Peak Flow Variation: Kyotera

The survey showed there was little variation in vehicle numbers or types between the weekday and the weekend.

A12.4.2Trend in Condition and Sensitivity to Change

A12.4.2.1 Road Condition

The National Transport Master Plan 2008–2023 is a programme aimed at improving the condition of Uganda's road network. The Ugandan government is upgrading unsealed trunk roads sections. These upgrades will focus on the trunk road network and roads to be used for oil industry activities.

Sealed roads are less likely than unsealed roads to degrade as traffic levels increase. Those parts of the network not being upgraded have the potential for higher rates of deterioration and are considered most sensitive to a change in traffic flows.

A12.4.2.2 Road Safety

Over recent years, initiatives have been implemented to promote road safety in Uganda. These have included advertising campaigns on radio and television and road safety literature. The number of recorded minor injuries has reduced each year between 2011 and 2015. Conversely, the number of people killed or seriously injured fell between 2011 and 2013, but has, at the time of writing, risen to levels similar to 2011 (Figure A12.4-13). This is likely to reflect the increase in the number of motorcycles for private or boda boda use (UNRA vehicle registrations). These vehicles have a poor safety record.

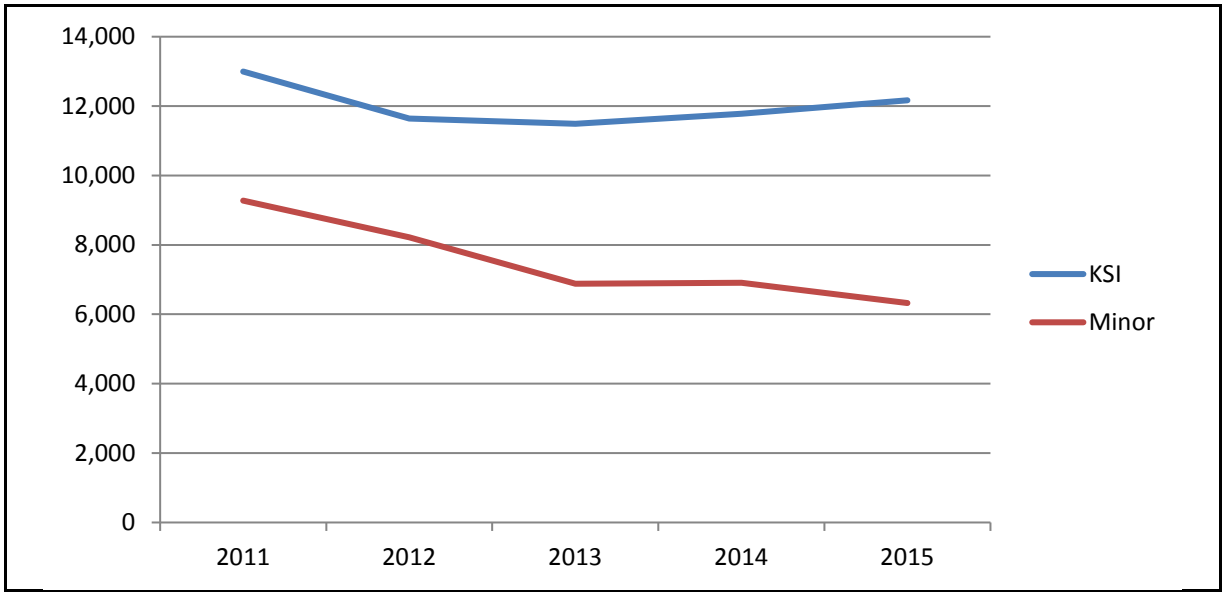

Figure A12.4-13 Severity of Traffic Accidents in Uganda

SOURCE: Uganda Police (Annual Traffic and Road Safety Report 2016)

Accident rates on roads that are upgraded should fall. Accident rates on roads that are not upgraded are likely to be most sensitive to increased traffic flows, with a likely detrimental impact on road safety.

A12.4.2.3 Traffic Congestion

The key areas for congestion in Uganda are in Kampala, Hoima, other major towns and on the approach to border crossings.

Congestion has increased over recent years owing to an increasing number of people working in the centre of Kampala and all major towns.

The roads most sensitive to change will be those already congested, as a small increase in traffic can be detrimental to journey times. The roads in Kampala, Hoima and other major towns are therefore sensitive to change. Other roads across the AOI are less sensitive to change, as they have spare capacity or are being upgraded by UNRA to support oil and gas infrastructure developments.

A12.4.3 Sensitivity Rankings

Based on the traffic surveys, engagement with stakeholders, trend in condition and sensitivity to change, the sensitivity of the traffic-related receptors within the AOI has been ranked (Table A12.4-6).

Table A12.4-6 Traffic-Related Receptor Sensitivity Ranking

Traffic-Related Receptor	Sensitivity Ranking	Rationale for Ranking
Road condition: National roads (upgraded or planned upgrade)	Medium (3)	The national road network is generally in moderate condition with some sealed roads experiencing deteriorating conditions.
Road condition: Access roads	Very high (5)	The road network is generally in poor condition with the majority of nontrunk roads being unsealed.
Road safety: National roads (upgraded or planned upgrade)	High (4)	Sealed roads have a lower risk of accidents because of the sealed surface. Poor road conditions are a major cause of accidents in Uganda. However, settlements are usually alongside the road, with vulnerable road users (pedestrians and cyclists) being particularly sensitive to increases in the number of heavy goods vehicles.
Road safety: Access roads	Very high (5)	Accident rates are very high in Uganda. Vulnerable road users (pedestrians and cyclists) are particularly sensitive to increases in the number of heavy goods vehicles.
Traffic congestion: Kampala, Hoima and major towns and Uganda–Tanzania border	Very high (5)	Where congestion is already experienced, a small change can be detrimental to journey times, compared to roads that have spare capacity.
Traffic congestion: Other roads	Medium (3)	Localised congestion can occur through areas of settlement where stalls, dwellings and pedestrians can cause narrowing of the road. A moderate to large increase in traffic volumes could be detrimental to journey times in these areas.

A12.5 Key Considerations

A12.5.1 Uganda

In many parts of the AOI, the road network condition will be improved by upgrades made by the government as part of its ongoing improvements.

Accident rates in Uganda are high, with pedestrians, children and cyclists considered particularly vulnerable.

Traffic levels are low, so congestion is rare except at the border with Tanzania and in Kampala or other major towns.

A12.6 References

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Appendix A13: Tangible and Intangible Cultural Heritage Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

A	
AGI	aboveground installation
AOI	area of influence
C	
CHU	cultural heritage Uganda
E	
EACOP	East African Crude Oil Pipeline
ESIA	environmental and social impact assessment
F	
FGD	focus group discussion
I	
ICH	intangible cultural heritage
IFC	International Finance Corporation
K	
KII	key informant interview
L	
LIDAR	light detection and ranging
M	
MCPY	main camp and pipe yard
microliths	small shaped flint, typically part of a composite tool such as a spear.
P	
polity	a form or process of civil government or constitution
R	
RoW	right-of-way
T	
TCH	tangible cultural heritage
V	
VEC	valued environmental component

A13 TANGIBLE AND INTANGIBLE CULTURAL HERITAGE BASELINE REPORT

A13.1 Introduction

This baseline report describes the tangible and intangible cultural heritage:

- area of influence (AOI) and study area boundaries
- methods
- baseline condition:
  - trends in condition and sensitivity to change
  - ecosystem services
  - sensitivity rankings
- key considerations.

Tangible cultural heritage (TCH) is defined as moveable or immovable objects, sites, structures, or groups of structures having archaeological, palaeontological, historical, cultural, artistic, and religious values (IFC 2012a).

Intangible cultural heritage (ICH) is defined as cultural resources, knowledge, innovations and practices of local communities embodying traditional lifestyles (IFC 2012b).

Cultural heritage provides continuity between tangible and intangible forms and between the past, present and future. People identify with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. Cultural heritage, in its many manifestations, is important as a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of people's cultural identity and practice (World Bank 2017).

A13.2 Area of Influence and Study Area Boundaries

A13.2.1 Area of Influence

The TCH AOI for the construction phase includes all construction areas:

- the right-of-way (RoW)
- aboveground installations (AGIs)
- main camps and pipe yards (MCPYs)
- access roads
- temporary work spaces (at crossings).

The area affected visually or by noise, dust and vibration or restriction of access beyond the physical footprint is also included in the AOI which extends to 100 m around the project footprint. It is unlikely that there will be discernible effects from noise, vibration or dust or restriction of access beyond this distance. This will be checked as part of the proposed programme of cultural heritage pre-construction

survey and assessment, based on the findings of the impact assessment for noise and air emissions and additional engineering studies for noise emissions.

During the operational phase, the TCH AOI includes:

- the RoW
- AGIs.

Visual and noise impact on TCH beyond the physical footprint is also included in the operational phase AOI, which extends to 100 m beyond the pipeline and AGIs. It is unlikely that there will be discernible effects from noise beyond this distance. This will be checked as part of the proposed programme of cultural heritage pre-construction survey and assessment, based on the findings of the impact assessment for noise emissions and additional engineering studies for noise emissions.

The AOI for ICH is more difficult to define. For example, a sacred site may have no clear boundaries, worshippers may come from various areas and it may not be clear whether the RoW or other project components will affect access. The construction and operation AOI for TCH has been used as a basis but has been extended in cases where, based on professional judgement, sites may be affected.

A13.2.2 Study Area Boundaries

For TCH, the study area is larger than the AOI and is a 2-km-wide corridor centred on the RoW, construction areas (including the MCPYs and AGIs) and access roads outside the corridor. A larger area was selected to assist with defining the types of TCH that may be encountered during construction and to enhance knowledge of the broader context, to assist with describing and assessing sites within the AOI.

Data for ICH were collected during social baseline data collection, using the study boundaries of the socio-economic and health baseline study (see Appendix A11), at two levels:

- district-level, comprising all the districts and wards traversed by the East African Crude Oil Pipeline (EACOP)
- project-affected community (PAC) level, comprising the sample PACs included in the social field survey.

A13.3 Methods

A13.3.1 Secondary Data

The baseline study utilised secondary data, which included consultation of the following data sources:

- information from publications and previous surveys
- information on known sites provided by the Department of Museums and Monuments of Ugandan Ministry of Tourism, Wildlife and Antiquities
- satellite and internet-based information on the location of churches and mosques based on Google Earth and Google Maps, which in turn use a published list of sites such as https://maps.me/catalog/attractions/amenity-place_of_worship-christian/country-uganda/

- information held in Uganda's national archives and museums
- aerial photography and light detection and ranging (LIDAR) data.

An initial list of potential TCH sites was developed from the above sources.

Many of the documentary data sources do not include accurate location data and, in some cases, there are contradictions between sources. Data accuracy for all TCH was verified or improved by triangulating data sources, while sites that proved to be outside the study area were removed from the initial list of sites.

Fifty-nine potential sites were identified by an examination of LIDAR. The field survey described in Section A13.3.2.2 visited 15 sites and found that all 15 were of natural or agricultural origin. Having gained an understanding of the features on the ground, the LIDAR data was re-examined and it was concluded that a large proportion of the features identified as potential TCH sites were likely to be the result of natural processes or agricultural activity. All LIDAR sites have been removed from the list of sites but those not visited during the field survey will be included in cultural heritage pre-construction survey and assessment.

The refined list of sites is presented in Attachment A13.2, along with sites identified from the field surveys described in Section A13.3.2.

The location of each site in the study area was categorised:

- **inside** the project footprint (within the pipeline RoW and within project components, AGIs, MCPYs, access roads and temporary work spaces)
- **close**, within the AOI (i.e., within 100 m of the 30 m RoW and project components)
- **outside**, over 100 m from the 30 m RoW and project components and not expected to be affected.

A13.3.2 Field Survey

Cultural heritage data were collected during two field surveys, described below.

A13.3.2.1 Social Baseline Field Survey

Between 2 November and 7 December 2017, the social team undertook consultations with a sample of PACs as part of the socio-economic and health baseline survey of the social study area, see Section A13.2.2 and A13.3.2.1 Appendix A11. This included:

- interviews with key stakeholders including community and religious leaders and traditional healers by means of key informant interviews (KIIs) and focus group discussions (FGDs)
- the cultural heritage component of the social survey, which asked PACs for information on intangible and tangible cultural heritage sites, including:
  - graveyards, churches and mosques
  - places such as sacred trees, groves and rocks
  - meeting sites
  - rivers and important ceremonial routes that are linked to local belief systems or associated with community histories
  - rituals, ceremonies, traditional healing and religious beliefs.

A13.3.2.2 Tangible and Intangible Cultural Heritage Field Survey

The cultural heritage team of local experts conducted a tangible and intangible cultural heritage field survey between January and February 2018. The objectives were to examine locations considered to have a high potential for cultural heritage assets based on the desktop study, including:

- ground truthing of potential TCH sites identified from secondary data in 10 sample areas along the pipeline route totalling about 100 km
- sample areas were selected based on previously identified sites from previous surveys, findings and studies; the LIDAR data and areas identified as having a high archaeological potential
- locations with evidence of abandoned settlements identified from satellite images and LIDAR data
- sites that the local community considered of ICH value based on the social field survey.

The field survey was mostly confined to the AOI but included locations in the study area, where needed, to assess their size or provide broader contextual information.

The ground truthing survey was undertaken by a walkover of locations to identify spreads of artefacts or other features on the ground surface. Multiple visits were made to locations where the evidence appeared to be particularly important or complex. Each site with confirmed TCH was recorded using a pro forma recording sheet, photographs and noting global positioning system coordinates. Any material observed on the ground was photographed and left in situ.

Informal meetings before undertaking the walkover were held with community leaders. These were valuable in establishing local knowledge of heritage features both tangible and intangible.

A13.3.3 Data Analysis

All sites identified during the field surveys were recorded in a geographic information system to identify their positions relative to the tangible and intangible cultural heritage AOI. Three categories of cultural heritage were defined based on the features identified by the studies:

- Category 1 – TCH:
  - archaeological sites
  - areas of high archaeological potential
- Category 2 – TCH with strong intangible elements:
  - cemeteries and graves, including Kingdom burial sites and regalia
  - religious places where worship associated with the main established religions is practised (such as churches or mosques)
- Category 3 – ICH with a less well-defined tangible component:
  - sites with an intangible component or traditional value, the importance of which is not always a factor of geography but of belief and ritual. Such sites may be used for music making, dance, storytelling and other rituals. This category may also include rituals that are not linked to any particular site but to a particular group of people.

Religious and other ICH valued environmental components (VECs) are more difficult to define, as these may have no fixed or easily mapped location, boundary or physical entity, and when they do (e.g., a sacred tree), the importance may be shared by people over a wider area. All the Category 3 features were identified during the social baseline field survey.

The sensitivity of Category 1 and 2 VECs has been ranked according to the table for cultural heritage sensitivity in Appendix D, Table D38. The significance of a Category 3 VEC is defined by the local community who visit, use or engage in an intangible practice that is not objectively measurable. It takes a greater amount of time and the development of relationships of confidence and trust to enable a valuation of the sensitivity associated with ICH, making it difficult to get a real sense of importance to the communities in a short time, see Section A13.3.4. Therefore, a numerical ranking of Category 3 VEC sensitivity is not provided. In general, owing to their community value, these intangible features are considered to have high sensitivities.

A13.3.4 Data Considerations

The desk-based assessment, tangible and intangible cultural heritage field survey and social baseline field survey provided information to identify and describe the Category 1, 2 and 3 features in the study area. There is confidence that the full range of types of cultural heritage features have been identified for Category 1 and 2. However, potentially not all the sites within each type were identified.

The identification of all types of Category 3 is influenced by:

- ICH features that may have no visible or physical presence
- elements of belief in this context are often extraordinarily private and not easily shared.

Concerns surrounding ethnicity or tribal affiliation are often unmentioned or ignored in KIIs or FGDs undertaken as part of the social baseline survey (see Section 13.3.2.1). The exception to this general statement may be at Mugasa, a sacred site identified as being specific to the Bunyoro.

This observation also applies to vulnerable minority groups such as pastoralists or hunter-gatherers who may occur in the AOI (see Appendix A11). The unwillingness of communities to speak about sensitive cultural heritage applies even more strongly to such minority groups who are very reluctant to speak in front of members of a majority group. FGDs were held with vulnerable groups and data was collected but eliciting such groups' ICH data was difficult because this requires trust, which is difficult to develop in the context of an environmental and social impact assessment (ESIA) FGD. The result of this is that the ICH of any such minority groups may be even less well-represented in the results of FGDs and KIIs, and thus less visible to this study. Despite these inherent limitations, a considerable amount of data was recorded during the surveys.

The social baseline field surveys generated good supporting information for the identification of ICH sites. However, every ICH site that could be affected will not have been identified as the social surveys were conducted on a sample of PACs, not every PAC within the AOI. Conversely, many of the ICH sites identified may not

be affected as precise location information was not provided during the KIIs or FGDs.

The collected baseline data is sufficient to:

- define the types of sites in each of the three categories that may be found along the pipeline route
- guide the preconstruction programme of further survey and assessment required to help identify areas with a high potential for additional sites, both tangible and intangible, in sections of the RoW not covered during the surveys
- identify the mitigation measures for cultural heritage sites that are encountered during construction.

A13.4 Cultural Heritage Baseline Conditions

A13.4.1 Baseline Condition of Tangible and Intangible Cultural Heritage

A13.4.1.1 Historical Background

The Great Lakes area of Uganda was wetter than it is today 10,000 to 5000 years ago but became drier throughout the second and first millennia BC. This change was accompanied by receding forests and wetland and increasing land clearance that continued until about 1000 AD, when the landscape became similar to how it is today.

Limited archaeological data are available for western Uganda before the second millennium AD. There are occasional sites containing microliths, but Neolithic material is apparently absent, although sites of this type are found in adjacent regions.

The Early Iron Age began around 500 BC. Linguistic history suggests that Sudanic-speaking societies moved into the area between Lake Victoria and the Great Lakes before 500 BC. They introduced ironworking and relied on an economy based on pastoralism and raising crops (Connah 1991).

Ntusi (outside the study area) is the earliest complex site examined in western Uganda. This is a late Iron Age site formed of large earthworks and mounds that date back to the 10th and 11th centuries (Reid and Meredith 1993). It contains house foundations, post-holes and indications of ironworking. The site appears to have functioned as a feasting and trading centre receiving goods brought in from the coast. The site expanded in size so that by the 13th and 14th centuries it covered more than 100 ha and had several smaller satellite sites.

The 12th century saw increasing aridity. Other large earthwork sites such as Bigo and the smaller Bwera (both outside the study area) present an economy dependent on cultivation and cattle breeding. Increasingly humid conditions in the 15th century led to population increases and consequent settlements and earthworks at Munsa, Kidengo, Kaswye and Nyiginya (all outside the study area). The return of arid conditions in the 16th century led to a decline in settlement centres and a reduction in large sedentary populations in the late 17th and early 18th centuries.

Drought and migration are the two key repeating themes in the history of western Uganda. This is seen in the environmental, archaeological, linguistic and oral history datasets (Reid and Meredith 1993). The Great Lakes were subject to periodic droughts during the second millennium AD that resulted in a prominence of pastoralism and population movement. The return to normal conditions and the movement of the population back to the affected areas resulted in new ethnic mixes and leadership providing opportunities for innovation and social change.

The area was a sparsely populated frontier region before the second millennium AD. Diverse mixed-farming communities gradually settled into the lush mountains north of the Katonga River between the 11th century and the end of the 15th century. This culminated in the growth of several small competing polities and the construction of earthwork sites. At the beginning of the 16th century, the shift to a drier climate coincided with the appearance of more dispersed settlement patterns with greater emphasis on pastoralism. This territory, now eastern Uganda, was split into the two kingdoms of Kitara and Buganda.

The Bunyoro kingdom emerged in the west of the area of the Kitara tribe. Bunyoro court histories identify three consecutive dynasties. The earliest dynasty was the Batembuzi, who imposed monarchical rule over the original Kitara society. The short-lived Bachwezi dynasty was said to have been ended by a “great drought”. The Babiito dynasty, which began in the late 16th and early 17th centuries, ruled at the time of European contact.

There are linguistic histories that show the movement of different groups into the area. Ethnic and social studies show the structure of the main kingdoms and the clan groups within them. The Buganda kingdom was established along the shores of Lake Victoria and into eastern Uganda. The Bunyoro kingdom was centred on the Great Lakes. It lost territory and power to Buganda and other kingdoms toward the end of the 19th century. At the time of European contact, Buganda was at the height of its power.

The ironworking industry was focused in the territory of Kitara. Mwenge is said to have been one of the most prolific ironworking regions of western Uganda; its boundaries remain preserved as a subcounty in Kyenjojo District.

Bantu speakers probably entered southern Uganda by the end of the first millennium. They had developed centralised kingdoms by the 15th or 16th century, and after independence from British rule in 1962, Bantu speakers constituted roughly two-thirds of the population in Uganda. Their languages, which may also have direct socio-ethnic relevance, are classified as either Eastern Lacustrine or Western Lacustrine Bantu. The Eastern Lacustrine Bantu speakers include the Baganda, the Basoga, and many smaller societies in Uganda. The Western Lacustrine Bantu speakers include the Banyoro, the Batoro, the Banyankole, and several smaller populations.

Nilotic language speakers probably entered the area from the north beginning about 1000 AD. Considered the first cattle-herding people in the area, they also practised crop cultivation. The largest Nilotic populations in Uganda are the Iteso and Karamojong ethnic groups, who speak Eastern Nilotic languages, and the Acholi, Langi, and Alur, who speak Western Nilotic languages.

After independence in 1962, there were conflicting local nationalisms and allegiances. Buganda's large population, extensive territory in the environmentally favoured south, and what was often perceived as a self-proclaimed superiority created a resistance among other Ugandan peoples. Nubians shared little sense of identification with other groups.

The 1960s and 1970s were a period of social and cultural changes driven by national and regional politics. Milton Obote from Northern Uganda forged an alliance of non-Baganda politicians to form the Uganda People's Congress. The Uganda People's Congress was dominated by politicians who wished to rectify a perceived regional inequality in favour of Buganda. This had substantial support from outside Buganda. Even at independence, the Buganda question remained unresolved. Before colonial rule, Buganda had been rivalled by the neighbouring Bunyoro kingdom. Buganda had conquered parts of Bunyoro and the British colonialists had formalised this in the Buganda Agreements. Known as the "lost counties", the people in these areas wished to revert to being part of Bunyoro.

These divisions brought some powerful influences into focus. For example, the army and police, which the British mandate had recruited almost exclusively from northern Uganda owing to their perceived suitability for these roles, alienated other ethnicities. In 1966, following a power struggle between the Obote-led government and King Muteesa, Obote suspended the constitution and removed the ceremonial president and vice-president. In 1967, a new constitution proclaimed Uganda a republic and abolished the traditional kingdoms. Obote was declared the president.

After a military coup in early 1971, Obote was deposed and General Idi Amin seized control of the country. Amin ruled Uganda for the next eight years. Amin's reign was ended after the Uganda-Tanzania War in 1979, in which Tanzanian forces, aided by Ugandan exiles, invaded Uganda. Museveni has been president since his forces toppled the previous regime in January 1986.

The social and ethnic repercussions of the political and military movements of more than a generation ago may still be perceived, sometimes in weakened forms, in cross-cutting social relationships in the present.

A13.4.1.2 Sites Identified Within the Study Area

Within the 2-km-wide study area, 66 features were located through secondary data reviews and the field surveys:

- three within the project footprint (inside)
- five within the AOI (i.e., within 100 m of the 30-m RoW and project components and may be susceptible to some form of impact [close])
- 58 within the 2-km study area but beyond 100 m of the RoW, and project components (i.e., beyond the area expected to be affected (outside).

See Attachment 13.1 and the table in Attachment 13.2.

A13.4.1.3 Cultural Heritage Features

The Category 1, 2 and 3 cultural heritage features are described below and shown on maps in Attachment 13.1 and in tables in Attachments 13.2 to 13.4. Site importance as identified by the project is presented in Attachment 13.2.

Category 1

Sites with Pottery Remnants

No known sites are in the study area, although there are many known sites outside the study area. Before the baseline surveys, limited detailed survey in the study area means that it is not possible to be definitive about the sites that are likely to exist. The pottery recorded indicates that a range of associated settlement sites may be present dating from the Stone Age through the early Iron Age up to recent times.

Ironworking Sites

One study focused on the ironworking tradition in the area (Iles 2010). There are 11 known ironworking sites within the study area. They comprise signs of slag, associated with furnaces, and potential ore mining sites. This ironworking material could date from the early Iron Age, up to the relatively recent past, see example in Figure A13.4-1.

Figure A13.4-1 KP103.2, Mubende: Spreads of Iron Slag (Site CHU393)

Rock Art Sites

One site with rock art has been identified within the study area (Kalyango cultural rock, near KP86) and there are other known sites outside the study area. The sites represent an activity that has been practised for millennia, back to the earliest settlement of the region, and which continues to this day. Any isolated rock outcrops found within the AOI may contain decorated rocks. Although the survey teams have looked for such evidence in the study area, it is not possible to conclude that all such examples have been recorded.

Category 2

Churches and Mosques

Forty-seven churches and mosques have been identified within the study area. Four are within 100 m of the RoW (close); these are the Pentecostal churches at KP11, 43 and 51 and the Fellowship church at KP26.4. There is the potential for more churches and mosques to be identified within the study area.

Graves and Cemeteries

Five cemeteries have been recorded within the study area, see example in Figure A13.4-2. Some graves may be found within the area of the family homestead, while others are in cemeteries. Two cemeteries have been identified within the project footprint (inside) and a third within 100 m (close). Two further cemeteries are in the study area. Most of the recorded graves are identified to particular individuals, with relatives living close by. It is likely that additional graves and cemeteries occur in the study area.

Figure A13.4-2 KP256 Kanoni: Cemetery with Concrete, Stone and Slag Graves (Site CHU162)

Category 3

Sacred Natural Sites and Trees

Sacred natural sites and trees were identified in the communities of Nkooko at Nkooko Hill, Nyondo and Kakuuto/Bigada during the social baseline surveys. In many communities, specific places were mentioned but the character of the place was not explained, such as Nyondo, and Kamusenene (both Mubende district), and at Buseruka (Hoima), a burial ground.

Traditional Dance

Traditional dances were implied by the description of rituals in Kakende (Hoima District) for exorcising evil spirits, along with rituals involving fire and the sacrifice of an animal. At Katikara traditional dances also involve wearing specific clothing made of white cloth.

People in the PACs undertake individual or small group rituals in case of illness, business, and marriage problems, which might involve dancing and drinking during the act accompanied with the uttering of secret words.

Rituals to Interact with Ancestors for Good Health and Prosperity

Rituals to ensure good health and prosperity are very closely linked to the ancestors (a common belief being that ancestors intervene with 'higher' or greater more remote gods to provide blessings or material benefits to the living) and such traditional rituals were mentioned in the PACs of Nyondo, Miti, Bulakati, Buswabera (for marriages), Nkooko and elsewhere.

Traditional Healing

Traditional healing is widely practised. The practitioner may operate from a village house but will visit specific areas to gather herbs and leaves that are essential ingredients for the healer's processes. Trees are also a source of medicinal materials, which may link to trees as a locus for ancestral spirits. Use of herbs is usually combined with rituals based on traditional African belief systems, for example at Bulakati (Sembabule), Kakende (Hoima), Nzoo (Kyankwazi), Mutukula (Kyotera), and Nyondo (Mubende). Traditional healing is also covered in the socio-economic and health baseline report (see Appendix A11).

Syncretism

The amalgamation of established religions (Islam and Christianity) and traditional African belief systems was mentioned explicitly in many PACs including, for example, the village of Katooke in Hoima District ("there are a number of people who go to churches but at the same time have shrines at their homes"). The tension between the main religions and traditional beliefs is sometimes acknowledged, as at Nzoo where traditional rituals or beliefs are "always secretly done…and others can't know when and how it happens".

In all instances prayers or rituals are offered to traditional spirits for many purposes ranging from bringing rain, healing the sick or cleansing troubled spirits, initiation to adulthood, and calming the spirits or ghosts of the ancestors.

Meeting Places

Sacred places still used for important meetings were mentioned at Katooke (where a shrine was mentioned, although this may not be a building so much as a less formal structure).

Rivers and Ceremonial Ways

Sacred streams, rivers and ceremonial ways were mentioned in Kayere, in association with sacred trees, but not elsewhere.

Twins

The birth of twins is commonly surrounded by a degree of spiritual ambivalence in traditional African belief systems; this was mentioned at Rwamutonga and at Nyondo and is likely to be observed in other PACs but was not mentioned in consultation meetings or interviews.

A13.4.2 Trend in Condition and Sensitivity to Change

Limited information exists on trends in condition of cultural heritage sites in the regions traversed by the project. Agriculture, expanding and new settlements, infrastructure, mining and other developments affect the cultural heritage baseline. Based on professional experience and opinion, and a precautionary principle that acknowledges that archaeological sites may be unique even if superficially similar to others, the definition adopted is that TCH is a finite resource and loss is considered nonreplicable by the project, but not under International Finance Corporation (IFC) definitions. IFC Performance Standard 8 (2012) defines replicable heritage as “tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites or structures.” Nonreplicable cultural heritage is defined by IFC such that it “may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site”. Based on professional experience, no sites within the AOI meet IFC criteria as nonreplicable. However, this does not diminish the potential archaeological interest of sites. Using a precautionary principle that acknowledges that archaeological sites may be unique, the approach adopted recognises that tangible archaeological heritage is a finite resource.

ICH is closely linked to individual and group identity and to all parts of a culture. ICH practices are not static; change is ongoing and further change is inevitable. ICH assets of value to the PACs are sensitive to change. This may be due to the movement of people in or out of the area, so that the resource loses value as the belief systems that gave the asset value are replaced. Intangible cultural heritage assets may have little resilience and can be lost entirely to a new generation but more commonly, change at a rate and in a direction that at a point in time is considered undesirable by members of a community who commonly assume that the situation regarding beliefs that they know in the present pertained in the past.

The older established religions like Islam and Christianity presently have an ambivalent relationship with traditional African beliefs in ancestral spirits, which may be further eroded.

A13.4.3 Ecosystem Services Provided

Cultural heritage generates a range of ecosystem services as set out below.

Cultural services:

- Provide a sense of self and the role of communities and individuals in the world; A sense of place and way of life is central to the effective functioning of many social systems in terms of agricultural production, craft production and trade, land ownership and inheritance and are based on and maintained by intangible heritage practices.
- Provide spiritual, sacred or religious values, inspiration for culture and design, and cognitive development.
- Support the effective functioning of other social activities in terms of agricultural production, craft production and trade, land ownership and inheritance.
- Build resilience in terms of ability to adapt to continuous social changes without loss of basic social functions.

A13.4.4 Sensitivity Rankings

Sensitivity rankings for Category 1 and 2 sites are provided in Attachment 13.2.

A13.5 Key Considerations

The key considerations are:

- The tangible and intangible cultural heritage identified is considered a representative sample. The sample represents the full range of features for categories 1, 2 and 3 likely to be encountered, though there is less certainty for Category 3.
- Religious structures are the most common Category 2 sites.
- No known nationally or internationally designated sites or critical cultural heritage have been identified.
- Three high sensitivity Category 2 features (cemeteries) are within the AOI of which two are within the RoW.
- The remaining Category 1 and 2 features within the RoW or the AOI are moderate sensitivity.
- Category 3 is closely linked to individual and group identity and therefore sensitive to cultural change.
- Many more features for each category are likely to be identified in the AOI.
- Identification of further Category 3 features requires active participation of local key informants based on establishing a sufficient degree of trust.

The Convention for the Protection of the World Cultural and Natural Heritage, 1972 and the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage refer to international human rights in respect of tangible and intangible cultural heritage and the importance of:

- the tangible and intangible cultural heritage as mainsprings of cultural identity and diversity
- maintaining access to and right to practice traditional cultural heritage and beliefs.

A13.6 References

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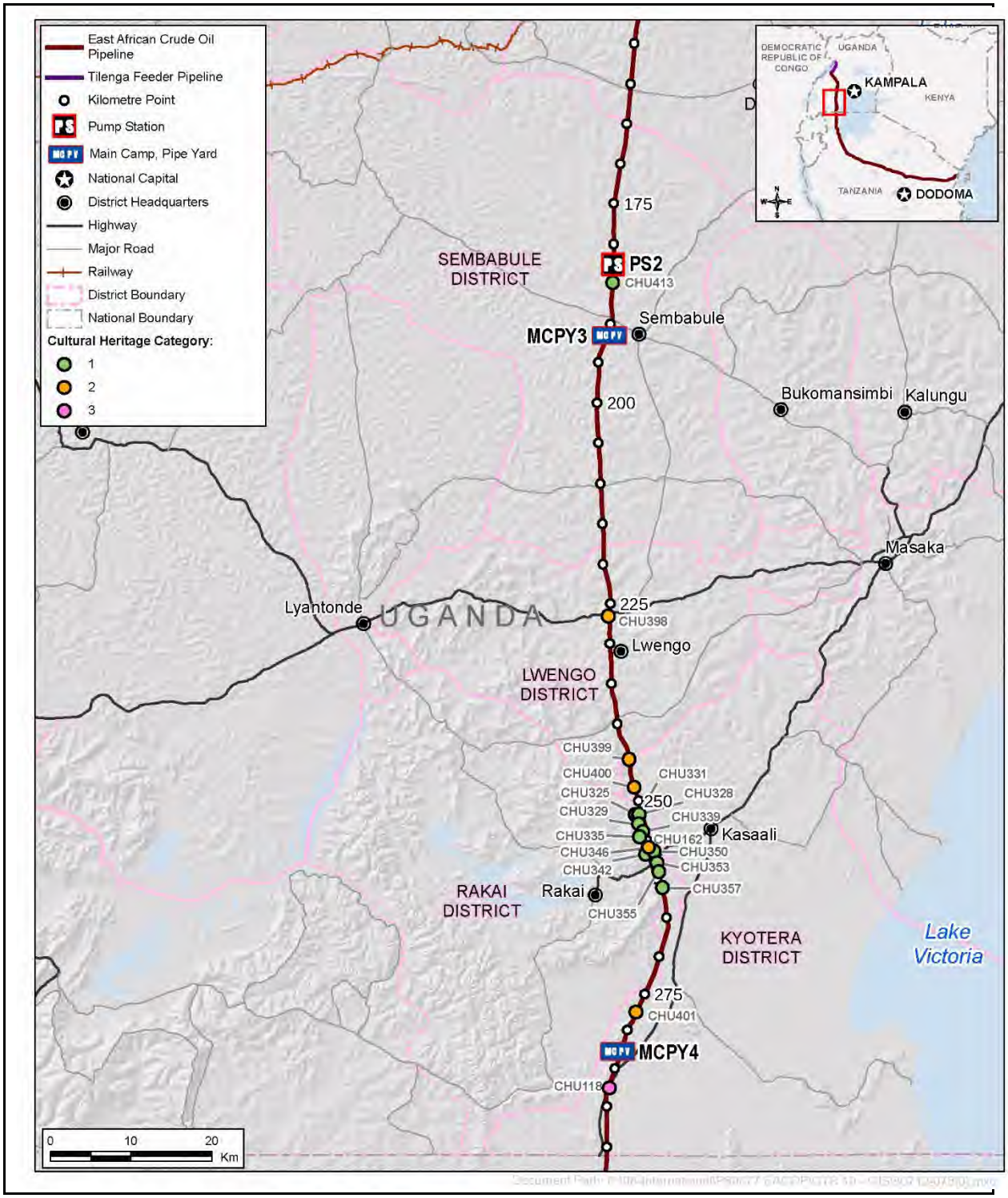
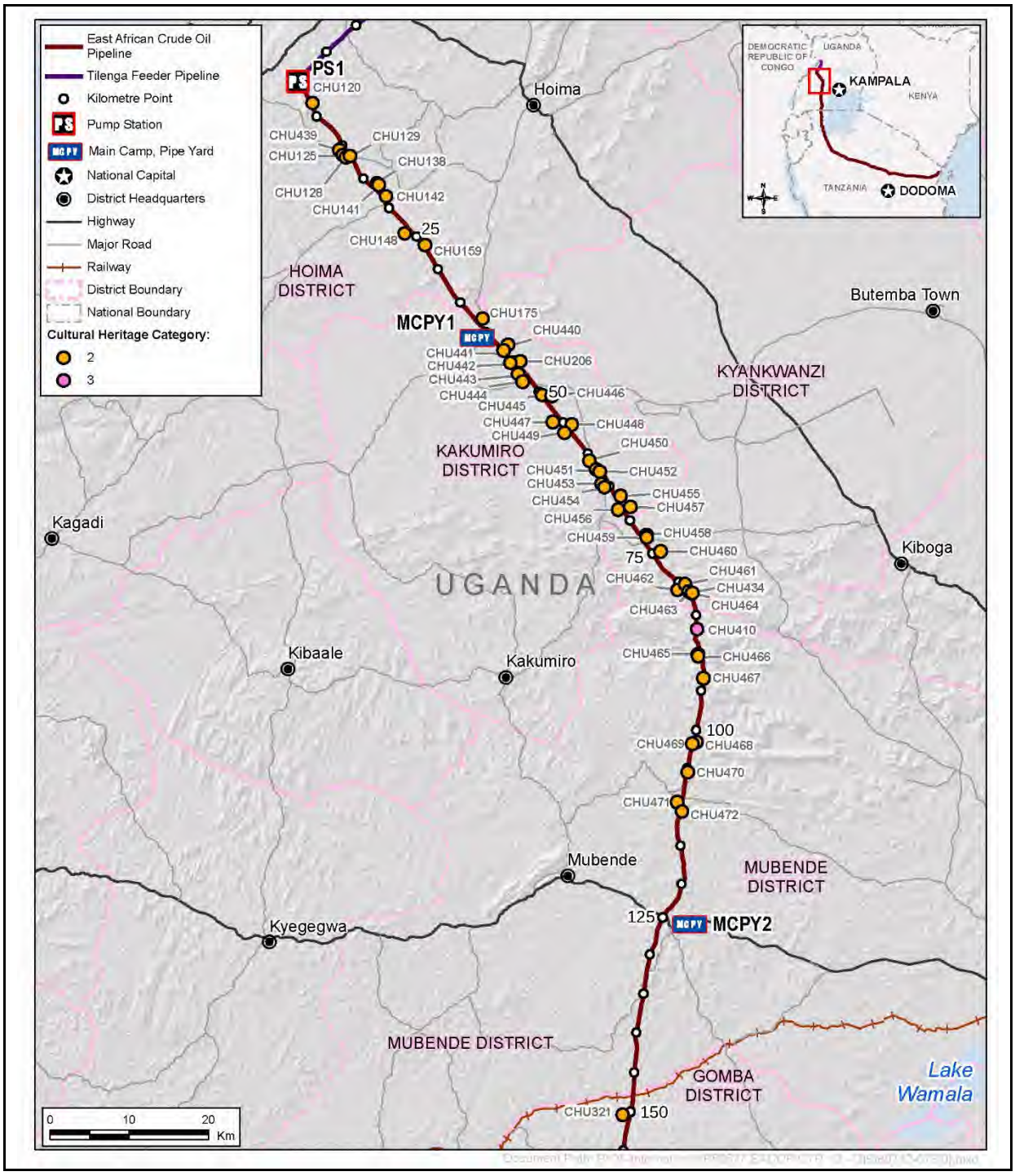
ATTACHMENT A13.1 MAPS




East African Crude Oil Pipeline
Tilenga Feeder Pipeline
Kilometre Point
Pump Station
Main Camp, Pipe Yard
National Capital
District Headquarters
Highway
Major Road
Railway
District Boundary
National Boundary
Cultural Heritage Category:
2
3
PS1
CHU120
Hoima
CHU439
CHU129
CHU125
CHU138
CHU128
CHU142
CHU141
25
CHU148
CHU159
HOIMA DISTRICT
MCPY1
CHU175
CHU440
CHU441
CHU442
CHU443
CHU444
CHU206
50
CHU446
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KAKUMIRO DISTRICT
CHU451
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CHU410
CHU465
CHU466
CHU467
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CHU468
CHU470
CHU471
CHU472
Mubende
MUBENDE DISTRICT
125
MCPY2
Kyegegwa
MUBENDE DISTRICT
GOMBA DISTRICT
CHU321
150
Lake Wamala
Kagadi
Kibaale
Kakumiro
Butemba Town
KYANKWANZI DISTRICT
Kiboga
UGANDA
DEMOCRATIC REPUBLIC OF CONGO
UGANDA
KAMPALA
KENYA
TANZANIA
DODOMA
0
10
20
Km

ATTACHMENT A13.2 CATEGORY 1, 2 AND 3 CULTURAL HERITAGE ASSETS RECORDED WITHIN THE STUDY AREA

Label	KP	Heritage Name	Category	Source	Tangible	Intangible Value	Sensitivity	Location[1]
CHU120	3	Itambiro Ya Bishaka Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU439	10.3	Apollo Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU125	11	Mosque	2	Satellite Imagery	Yes	Yes	6	Outside
CHU128	11	Butimba Christian Fellowship Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU129	11	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Close
CHU138	16	Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU141	17	Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU142	18	Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU148	23	Kyekyoleka Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU159	26.4	Fellowship Church	2	Satellite Imagery	Yes	Yes	6	Close
CHU175	38	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU440	43.1	Roman Catholic Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU441	43.15	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Close

[1] The location of each site in the study area was categorised:

- inside the project footprint resulting in a direct physical impact
- close, within the AOI, i.e., within 100 m of the 30 m RoW and project components
- outside, over 100 m from the 30 m RoW and project components and not expected to be affected.

Label	KP	Heritage Name	Category	Source	Tangible	Intangible Value	Sensitivity	Location[1]
CHU206	45	Catholic Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU442	45	Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU443	46.6	Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU444	47.7	Roman Catholic Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU445	50.6	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Close
CHU446	51.2	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU447	54.1	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU448	55.9	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU449	56.1	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU450	60.7	Buswabwera Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU451	62.2	Nsangyaboy Roman Catholic Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU452	62.7	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU453	64.2	Bisaka Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU454	64.8	Banikiro Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU455	66.8	Nsoano Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU456	68.1	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU457	68.8	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU458	72.8	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU459	73	Roman Catholic Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU460	75.3	Seventh Day Adventist Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU462	80.5	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside

Label	KP	Heritage Name	Category	Source	Tangible	Intangible Value	Sensitivity	Location[1]
CHU461	80.8	Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU463	81.9	Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU434	82.1	Taala Church	2	EACOP visit	Yes	Yes	6	Outside
CHU410	86.7	Kalyango rock-cultural rock	2 and 3	Social Baseline Survey	Yes	Yes	6	Outside
CHU465	90	Ponabungoma Roman Catholic Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU466	90.3	Nyanda Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU467	93.2	Kisagazi Seventh Day Adventist Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU468	101.6	Kijaagi Church of God	2	Satellite Imagery	Yes	Yes	6	Outside
CHU469	101.9	Kijaagi Parish Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU470	105.6	Kabulamuliro Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU471	109.5	Luong Seventh Day Adventist Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU472	110.6	Luong Pentecostal Church	2	Satellite Imagery	Yes	Yes	6	Outside
CHU321	150	Church of Uganda	2	Satellite Imagery	Yes	Yes	6	Outside
CHU413	184.8	Kraal	1	EACOP Social Baseline Survey	Yes	No	6	Inside
CHU398	226.5	Kyawagonya Cemetery	2	EACOP, 2018	Yes	Yes	8	Inside
CHU399	243.6	Kanga/ Rusheshe cemetery	2	EACOP, 2018	Yes	Yes	8	Inside
CHU400	248.2	Kituntu Cemetery	2	EACOP, 2018	Yes	Yes	8	Outside
CHU325	251	Kijumba, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU328	251	Kijumba, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU331	251	Kijumba, ironworking site	1	Iles, 2010	Yes	No	4	Outside

Label	KP	Heritage Name	Category	Source	Tangible	Intangible Value	Sensitivity	Location[1]
CHU329	252	Luteebe, ironworking site	1	Iles 2010	Yes	No	4	Outside
CHU339	253	Luteebe, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU335	254	Mpaama, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU346	255.9	Kanoni, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU162	256	Kanoni cemetery	2	EACOP, 2018	Yes	Yes	8	Outside
CHU342	256	Mukunyu, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU350	256	Kanoni, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU353	258	Lwanda subcounty HQ, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU355	259	Kituntu, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU357	261	Lusolo, ironworking site	1	Iles, 2010	Yes	No	4	Outside
CHU401	277.5	Kasoga Cemetery	2	EACOP, 2018	Yes	Yes	8	Close
CHU118	287.4	Shrine	2 and 3	Social Baseline Survey	Yes	Yes	6	Outside

ATTACHMENT A13.3 INTANGIBLE CULTURAL HERITAGE COMMUNITY LEADERS RESPONSES ON SACRED SITES

Nearest KP	District	Settlement Name	Sacred Place	Use	Frequency of use	Comments on Importance[2]
1.5	Hoima	Katooke	Mugasa	Bunyoro Kingdom officials	Occasionally	Cultural site for Bunyoro Kingdom
68	Kakumiro	Nkooko	Nkooko hill	Banyoro and Baganda	Occasionally	Rituals and worship of spirits
75	Kyankwanzi	Taala Forest	Church	Christians	Sundays	N/A
86.5	Mubende	Nyondo	Kalyango	Baganda	Occasionally	Rituals and worship of spirits
86.5	Mubende	Nyondo	Kikaawe	Baganda	Occasionally	Rituals and worship of spirits
86.5	Mubende	Nyondo	Buzinga	Baganda	Occasionally	Rituals and worship of spirits
111	Mubende	Kabulasoke	Clan graveyards	Clans	Frequently	High
114	Mubende	Kamusenene	Church of Uganda	Anglicans	Sundays	N/A
114	Mubende	Kamusenene	Itambiro	Not specified	2, 12 and 22 of each month	N/A
114	Mubende	Kamusenene	Born Again Pentecostal churches	Pentecostal	Sundays	N/A
114	Mubende	Kamusenene	Catholic church	Roman Catholics	Sundays	N/a
122	Mubende	Kalembe	Individual homes	Family members	Relative	Home cleansing

[2] These comments were made by respondents during KII and FGDs; N/A = information not available

Nearest KP	District	Settlement Name	Sacred Place	Use	Frequency of use	Comments on Importance[2]
122	Mubende	Lugala	John Mwesige shrine	Some believers	Occasionally	Important
122	Mubende	Lugala	Bisaka temple	Some believers	Occasionally	Important
216	Sembabule	Bulakati	A well	All people	Occasionally	Blessings
216	Sembabule	Bulakati	Shrines	All people	Frequently	Blessings and medical significance
225	Lwengo	Kinvunikidde	A stone	All people	Frequently	Blessings
225	Lwengo	Kinvunikidde	Shrines	All people	Frequently	Blessings and medical significance
247.5	Kyotera	Bethlehem	Wajjinja	All people	Frequently	Important
295.5	Kyotera	Mutukula	Sango bay forest	All people	Frequently	Important
MCPY4	Kyotera	Kakuuto / Bigada	Sacred trees	Many people who still practise traditional beliefs	Frequently	Important
MCPY4	Kabujimbi	Kabujimbi	Shrine at Kajaga	All people	Frequently	Important

ATTACHMENT A13.4 INTANGIBLE CULTURAL HERITAGE RITUAL LEADERS – RESPONSES REGARDING CEREMONIES

Nearest KP	District	Settlement Name	Ritual Ceremony	Description[3]	Timing
1.5	Hoima	Katooke	Marriage	Boy's parents visit girl's parents and negotiate on the dowry	Whenever money is available and both are ready for marriage
1.5	Hoima	Katooke	Worship spirits	Families gather in one place where there is a shrine, slaughter animals, sing while moving in circles and playing local instruments	Whenever they suspect a disease outbreak within or outside the village
29.5	Hoima	Kakende	Expunging Satan	A sacrificed animal, fire, chanting	As needed. Cost up to 2.5 million UGX
29.5	Hoima	Kakende	Twins born	This is a blessing in Uganda and is greatly celebrated by the communities.	N/A
35	Hoima	Kabaale-Kyabicwe	Marriage by Banyoro	Boy's parents' family visit the girls family to negotiate on dowry [4]	When the boy intends to marry
35	Hoima	Kabaale-Kyabicwe	Burial by members of the Alur group	After burial, they compact the soil and flatten the grave	After burial
35	Hoima	Kabaale-Kyabicwe	Marriage by members of the Alurs	Offer chicken to the girl's family first, followed by goats	Before taking the girl officially

[3] Based on the responses made in KII and FGDs; N/A = not available

Nearest KP	District	Settlement Name	Ritual Ceremony	Description[3]	Timing
41	Kakumiro	Katikara	Bi saka (meaning obscure)	They wear white Kanzu for men and the women put on white long dresses	They meet on 2, 12, 22 every month and every year they meet on 11 June
61	Kakumiro	Buswabwera	Marriage	Parents of boy visit home of girl's parents and negotiate on the dowry	Any time when money is available
68	Kakumiro	Nkooko	Pilgrimage (Kuramaga Kooki ha ibare)	Religious activity for Catholics	Every May
84.5	Hoima	Buseruka	Marriage	Boys parents visit girl's parents and negotiate on the dowry	Whenever money is available and both (boy and girl) are ready for marriage
86	Hoima	Rwamutonga (Busuruka subcounty)	Last funeral rights	The heir is given a spear and stick	After burial
86	Hoima	Rwamutonga (Busuruka subcounty)	Birth of twins	Families of the twin parents exchange or swap food which must be similar.	After birth
86.5	Mubende	Nyondo	Animal sacrifices at sacred places	Goats, sheep and chicken are slaughtered, and blood splashed around the place. People dance, sing, wear bark clothes, animal skins. Food and meat is cooked and served	Mostly dry season (some people every two months)

Nearest KP	District	Settlement Name	Ritual Ceremony	Description[3]	Timing
86.5	Mubende	Nyondo	Twins	Clan members gather at the home of the twin parents. They sing, cook and eat together the food that has been brought by both the husband and wife's parents as sign that they have become one. Siblings of the twins are not allowed to go to place where ceremonies are being held	Any time when they are born
86.5	Mubende	Nyondo	Funeral rights	The heir wears a bark cloth, is given a spear and is introduced to the people gathered at the deceased's home	Any time when one dies and funds are available to conduct the function
87.5	Hoima	Rwamutonga (Bugambe subcounty)	Twin ritual	Welcoming the twins in the family People kill animals and eat and drink together Naming the child	November- January during harvesting time
114	Mubende	Kamusenene	New Year's Day	Entry of every new year	1 January
114	Mubende	Kamusenene	Christmas	Birth of Jesus	25 December 2017
114	Mubende	Kamusenene	Birth of Bishaka	Birth of Bishaka the faith founder	11 June
114	Mubende	Kamusenene	Easter	Death of Jesus Christ	March/ April
122	Mubende	Kalembe	IDDI day	Muslim celebration	
122	Mubende	Kalembe	Christmas day	Celebrating the birth of Jesus Christ by Christians	25 December

Nearest KP	District	Settlement Name	Ritual Ceremony	Description[3]	Timing
122	Mubende	Kalembe	Easter day	Death of Jesus Christ celebrated by Christians	March/ April
122	Mubende	Kalembe	New Year's Day	Ushering in the New Year	1 January
247.5	Kyotera	Bethlehem	Wajjinja	Main ceremony	September to October every year
295.5	Kyotera	Mutukula	International AIDS day	Part of global day raising awareness about AIDS	1 December
295.5	Kyotera	Mutukula	Ramadan	Religious reasons (Muslims)	Dates vary
295.5	Kyotera	Mutukula	Eid	Religious reasons (Muslims)	20/21 August in 2018 but dates vary
295.5	Kyotera	Mutukula	Easter	Religious reasons	Dates vary but around March/April
295.5	Kyotera	Mutukula	Christmas	Religious reasons	25 December each year
295.5	Kyotera	Mutukula	Sundays	Religious reasons (Christians attend church on a Sunday)	Every Sunday
295.5	Kyotera	Mutukula	International women's day	Part of a global day celebrating women worldwide	8 March each year

Appendix A14: Climate Baseline Report

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
°C	degrees Celsius
%	percent
A	
AOI	area of influence
B	
BAU	business as usual
C	
CO_2e	carbon dioxide equivalent, a standard unit for measuring GHG emissions (carbon footprints). The impact of each different GHG is expressed in terms of the amount of carbon dioxide that would create the same amount of warming. A GHG emission consisting of different greenhouse gases can be expressed as a single number.
E	
ENSO	El Niño–Southern Oscillation
ESIA	environmental and social impact assessment
G	
GHG	greenhouse gas
K	
KP	kilometre point
M	
m	metre
m/s	metres per second
mm/a	millimetres per annum
$MtCO_2e$	million metric tonnes of carbon dioxide equivalent
R	
RCP	representative concentration pathway
T	
tCO_2e	tonnes of carbon dioxide equivalent
W	
W/m^2	watt per square metre

A14 CLIMATE BASELINE REPORT

A14.1 Purpose and Scope of Report

This baseline report describes the climate:

- area of influence (AOI) and study area of boundaries
- methods
- baseline conditions:
  - baseline condition
  - trends in condition and sensitivity to change
  - ecosystem services provided
- key considerations.

A14.2 Area of Influence and Study Area Boundaries

A14.2.1 Area of Influence Boundary

The spatial AOI climate change boundary is global. However, for the purposes of assessing the project contributions to national emissions, Uganda's borders are considered the spatial AOI.

The temporal AOI will extend throughout the life of the project, from construction to decommissioning, as all these phases will generate GHG emissions.

A14.2.2 Study Area Boundary

The study boundaries are the same as the AOI boundary, Uganda's territorial borders. Where available, climatic conditions local to the project area have been reviewed.

A14.3 Methods

A14.3.1 Secondary Data

Secondary data was sourced from published literature, unpublished technical reports commissioned for the project and websites.

Abundant literature is available on the state of the global climate, GHG emissions and related trends, most notably the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2014).

A14.3.2 Field Surveys

Social baseline surveys conducted during this ESIA captured anecdotal evidence of climate change trends observed by the local population, which were used in this baseline report to supplement other secondary data, see Appendix A11 Socio-economic and Health Baseline Report.

A14.3.3 Data Analysis

No data analysis was implemented for climate parameters. All data were obtained from secondary sources.

A14.3.4 Data Considerations

The following data considerations apply:

- Limited climate observation data are available at meteorological stations close to the proposed pipeline right-of-way. However, available data are likely to be representative of the local climatic conditions and sufficient to provide an understanding of the baseline condition and trends.
- All climate projections are uncertain, as they are based on modelling and emissions scenarios.

A14.4 Climate Baseline Conditions

A14.4.1 Baseline Condition of Climate

The tropical climate in Uganda is determined by the large-scale monsoon and the Intertropical Convergence Zone systems as they move north and south following the sun. In addition, the medium-scale systems influenced by the extensive physical features in the East African region like the Lake Victoria Basin, mountain ranges and the associated rift valleys, and the Congo Basin forest to the west has an important role in the temporal and spatial distribution and intensity of the weather systems in Uganda (MWE 2014).

A14.4.1.1 Air Temperature

Air temperature in Uganda is moderate throughout the year, with a mean daily temperature of 28°C. However, the mean daily temperature across the country ranges between 4°C in the southwestern area of Kabale and 30°C in northern and northeastern areas of Gulu, Kitgum and Moroto (MWE 2014).

Average annual minimum and maximum temperature vary little between years. However, the comparisons of long-term averages between 1951–1980 and 1981–2010 show increases in average annual minimum temperature of 0.5–1.2°C and 0.6–0.9°C for average maximum temperature (USAID 2013).

Assessment of air temperature along the pipeline route was conducted by Actimar (2016a). The data (see Figure A14.4-1) show that the area around KP100 experiences peaks of approximately 35°C average maximum temperature in February–March and September–October. Average maximum temperature throughout the year rarely dips beneath 30°C, with the lowest occurring in May. The average minimum temperature varies little throughout the year, ranging between approximately 9°C (June–July) and 11°C (March).

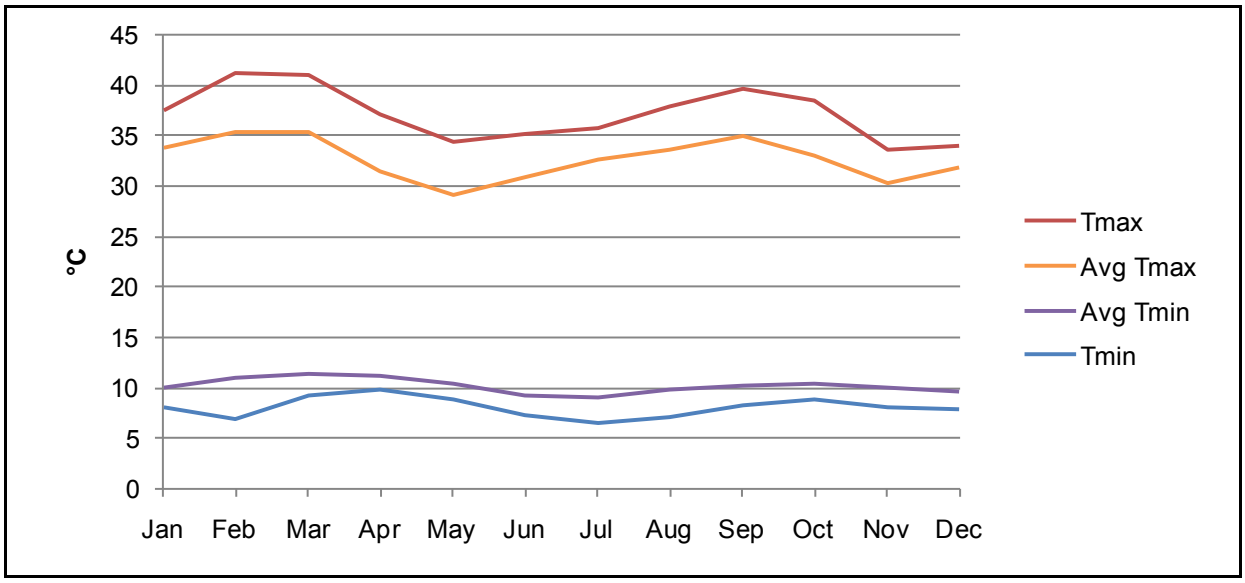

Figure A14.4-1 Air Temperature Range at KP100

SOURCE: Graphed from data in Actimar (2016a), Table 5-1, p45. Data are from CFSR hourly data series 1979–2010.

A14.4.1.2 Precipitation

Rainfall in Uganda ranges from 400 to 2200 mm/a. The southern regions of the country receive between 600 and 2200 mm/a, while the north receives between 400 and 1600 mm/a. Nationwide, Uganda receives an average of 1180 mm/a of rainfall. Figure A14.4-2 shows the mean annual rainfall across the country (MWE 2014).

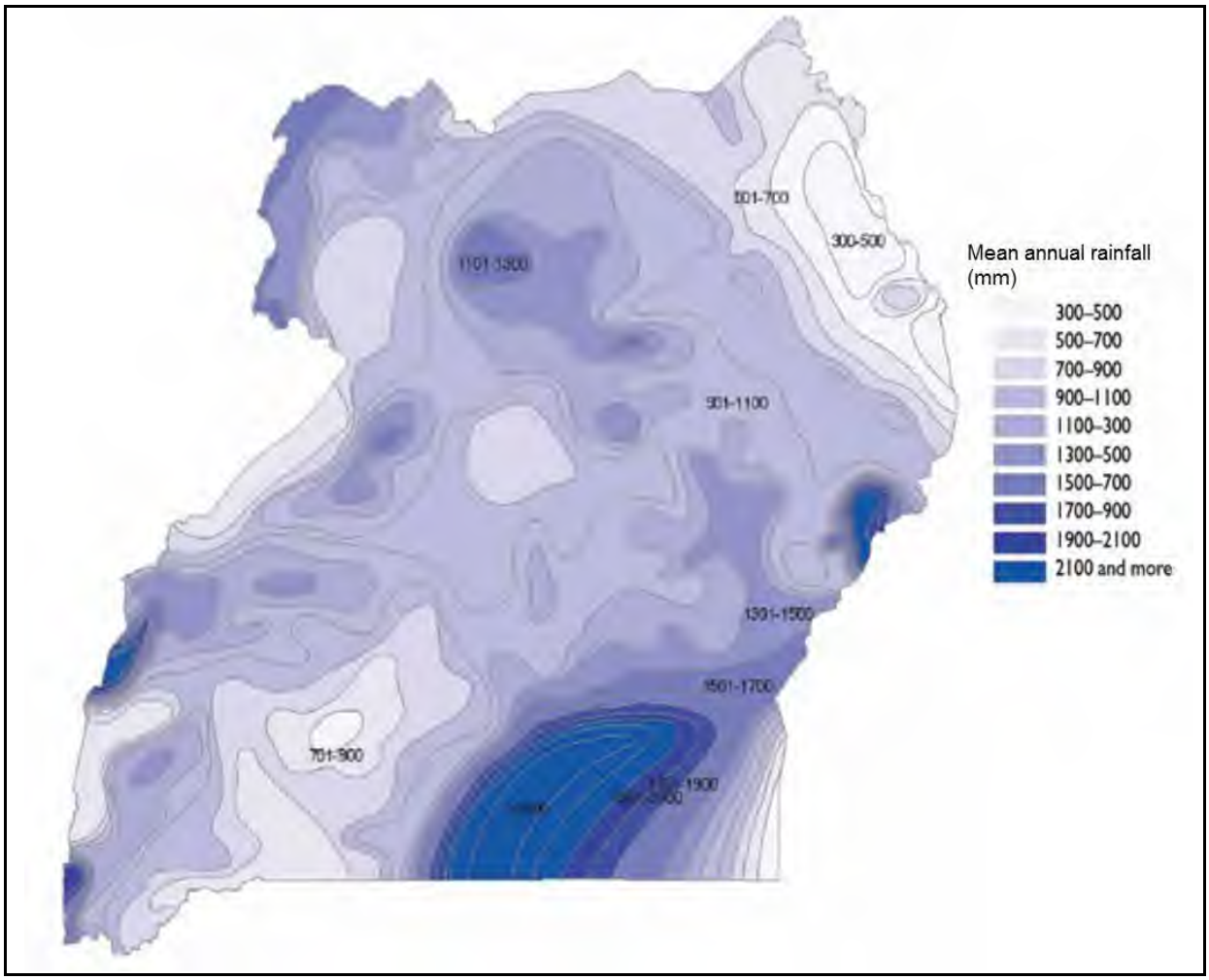

Figure A14.4-2 Mean Annual Rainfall

SOURCE: Modified from USAID (2013)

Precipitation in Uganda is seasonal. Its timing, intensity and duration vary considerably across the country. In general, Uganda experiences two modes of rainfall seasons: one long rainy season from late March to mid-October in the north; and a bimodal season from March–May and then from September–November in the western, central and eastern regions. Droughts sometimes occur in the dry season, affecting water availability for agriculture and the population.

Uganda also experiences the El Niño–Southern Oscillation (ENSO)[1] teleconnection pattern, which is the principal driving force of annual to inter-annual rainfall variability in the tropics. The effects of ENSO are most pronounced in Uganda during the period between September and December, when El Niño is often associated with floods, whereas La Niña is associated with droughts (MWE 2014). An example of the effects of El Niño and La Niña phenomena on precipitation in

[1] El Niño and La Niña are terms for climatic events originating in the tropical Pacific that recur every few years as part of a naturally occurring cycle. The name El Niño is used specifically for the anomalous sustained warming of sea surface temperature that occurs every few years, typically concentrated in the central-east equatorial Pacific. La Niña is the term adopted for episodes of cooler-than-normal sea surface temperature in the equatorial Pacific. (Met Office 2017, Internet site)

Uganda, from the 1997–1998 event, one of the strongest in recorded history (Wikipedia 2018, Internet site) is illustrated in Figure A14.4-3.

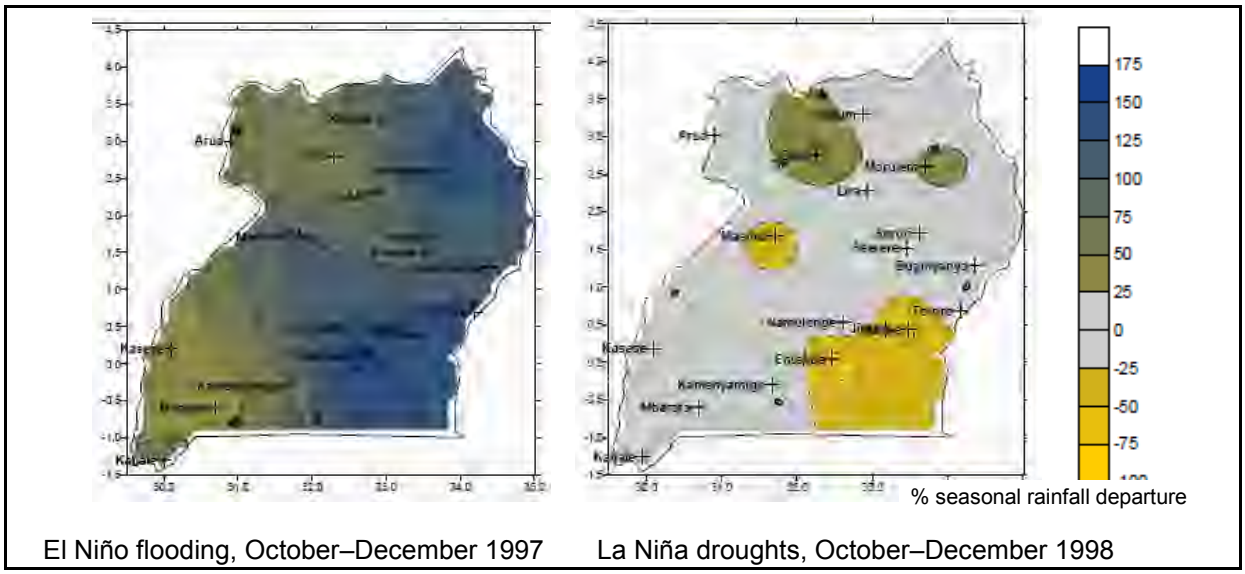

Figure A14.4-3 Effects of El Niño–Southern Oscillation on Precipitation

SOURCE: Modified from MWE (2014)

The timing of rainfall can vary considerably from year to year. The onset of the rainy seasons can be 15–30 days earlier or later, while the duration of the rainy season can change by 20–40 days from year to year (USAID 2013).

Actimar (2016a) assessed precipitation conditions along the pipeline route. The area around KP100 was found to experience two rainy seasons from March to May and August to November (see Figure A14.4-4). During these two seasons, the mean precipitation exceeds 100 mm/month and the maximum can exceed 250 mm/month. Rainfall occurs on 17 days/month on average (see Figure A14.4-5).

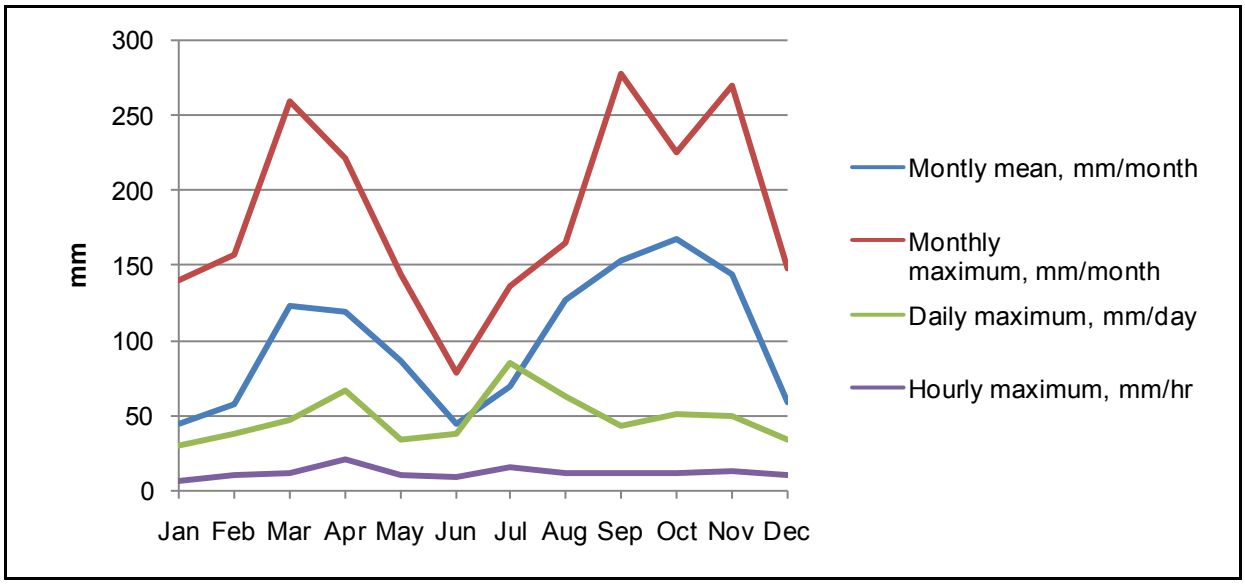

Figure A14.4-4 Precipitation at KP100

SOURCE: Graphed from Table 5-1 in Actimar (2016a). Data are from the TRMM dataset covering January 1998 to April 2015

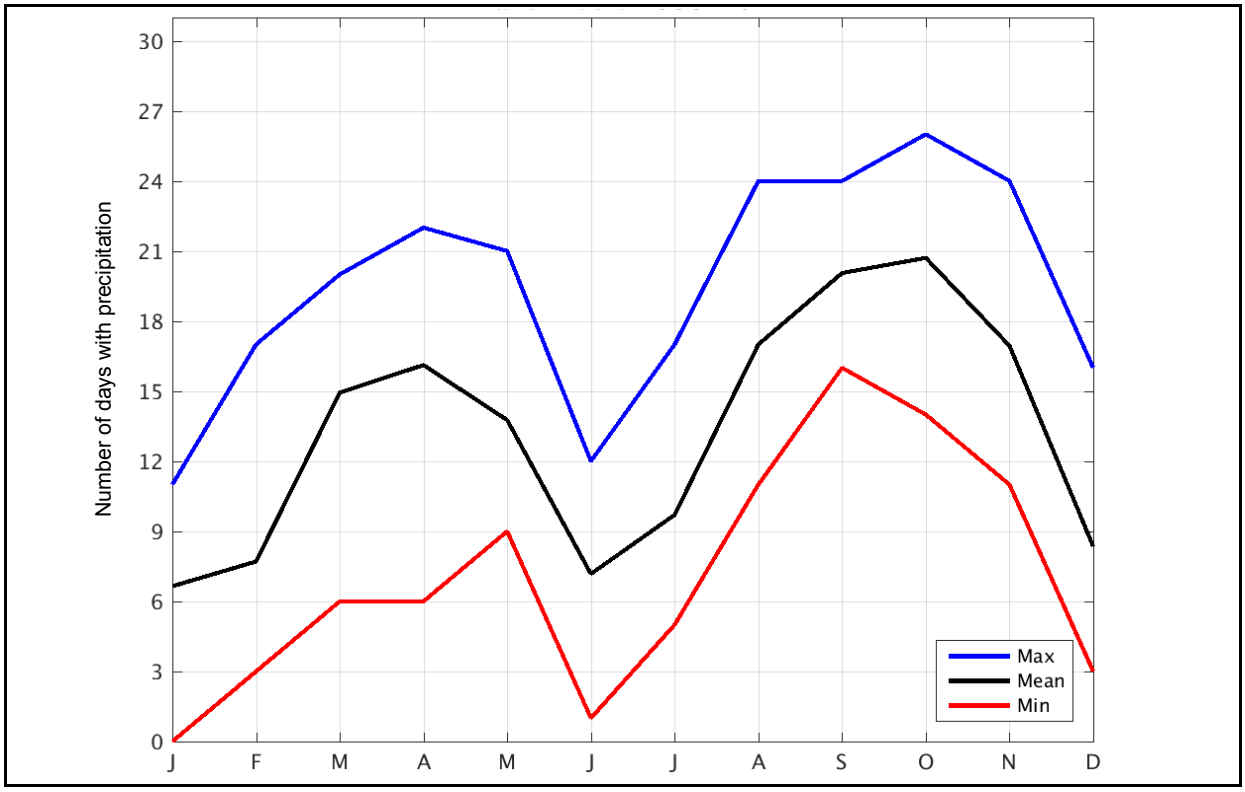

Figure A14.4-5 Minimum, Mean and Maximum Days with Precipitation at Lake Albert, 1998–2014

SOURCE: Actimar (2016a)

Based on precipitation statistics and flooding analysis, Actimar (2016b) reports the following trends along the pipeline route:

- Two rainy seasons occur near Lake Albert (KP0–250). However, the dry season in June, July and August is marked by flooding from water from northern regions and the preceding wet season.
- The Lake Victoria area (KP250–550) does not experience flooding events at the beginning of the year. Wet areas occur mainly in January.

A14.4.1.3 Humidity

Uganda's climate is equatorial, with moderate humid and hot climatic conditions throughout the year. Relative humidity reaches 100% almost everywhere throughout the year, except between July and October in the southwest of Lake Victoria where it remains above 85%.

A14.4.1.4 Solar Radiation

Local conditions play an important role in variability of daily solar radiation. The maximum daily peak of solar radiation occurs during the equinox periods in September–October and March–April (the latter period is characterised by slightly lower maximum daily peak observations due to a rainy season). The maximum daily peak of solar radiation along the pipeline route ranges from 800 W/m² in June to 950 W/m² in October.

A14.4.1.5 Wind

According to Actimar (2016a), maximum 1-hour mean wind speeds along the pipeline route in Uganda are 3–8 m/s and do not vary considerably throughout the year. Actimar describes the wind speeds in the region as "especially low".

A14.4.1.6 Greenhouse Gas Emissions

Uganda has one of the lowest levels of GHG emissions in the world, estimated at 1.6 tCO_2e per capita for 2014, totalling absolute emissions of 59.9 $MtCO_2e$ which is approximately 0.12% of the world total (Climate Watch 2018, Internet site).

The same data show that land use change and forestry was the leading source of GHG emissions, accounting for 43%, with agriculture close behind at 40%. The energy sector contributed 14% and the remainder of the emissions are from the industrial and waste sectors.

Approximately 93% of Uganda's energy needs are met by biomass, with 6% supplied by oil and 1% by electricity. Agriculture sector emissions are primarily driven by livestock production, inefficient animal waste management systems and the cultivation of organic soils (MWE 2014). Forested land has been shown to be decreasing, with forest degradation highest outside protected areas and in areas where agriculture has expanded (MWE 2015).

A14.4.2 Trend in Condition and Sensitivity to Change

Since 1960, mean annual temperatures have risen by 1.3°C, and annual and seasonal rainfall has decreased considerably across Uganda. Rainfall has also

become more unpredictable and evenly distributed over the year. Extreme events such as droughts, floods and landslides are increasing in frequency and intensity (MWE 2015).

Observations from 1970 to 2000 record an increase of the minimum and maximum temperature, with minimum temperature rising faster than the maximum. The minimum temperature increases are most pronounced in October–April of the El Niño phase of the ENSO cycle. During this phase, positive temperature anomalies of over 1°C can occur while during La Niña negative anomalies of up to –0.4°C can occur.

Climate change is particularly affecting agriculture, water, health and human settlement. In the 2007–2008 fiscal year, climate change damages were equivalent to 4.4% of the national budget, exceeding the budget allocation for the Environment and Natural Resource Sector (MWE 2015).

Climate variability and change in Uganda affect seasonal to interannual rainfall. This is reflected in shifts in the timing and duration of seasonal rainfall and intra-seasonal dry spells, and the intensity of rainfall, thunderstorms, lightning and hailstones. This can lead to floods, droughts and famine.

Climate projections developed for the country using the models used in the IPCC Fifth Assessment Report indicate an increase in near-surface temperature for the country. These are approximately +2°C in the next 50 years and +2.5°C in the next 80 years under representative concentration pathway (RCP) 4.5 (intermediate level of GHG emissions). Under RCP 8.5 (very high GHG emissions), the increases are approximately +2.5°C in the next 50 years and +4.5°C in the next 80 years. The models also predict a slight decrease in total annual rainfall in most of the country, with slightly wetter conditions over the west and northwest under both RCP 4.5 and RCP 8.5. Rainfall totals might drop considerably (–20% from present levels) over Lake Victoria (MWE 2015).

Floods lead to secondary impacts of landslides, soil erosion, silting of dams and drainage channels, bursting of dams and riverbanks, water logging in low-lying valleys and wetlands, outbreaks of epidemics in animals, crop diseases and pests. Droughts lead to secondary impacts including degraded grazing and agricultural lands leading to desertification. There can be drying of ponds, and reduced surface water, river flows and underground water levels, and increased wild fire outbreaks and dust storms.

According to a survey undertaken by Oxfam Uganda in 2012, climate change will have an impact on arabica coffee growing areas in Uganda, including the Rwenzori Mountains. Most areas will become less suitable, and those at altitudes less than 1500 m will be severely affected.

Anthropogenic GHG emissions, with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming since the mid-20th century. In recent decades, changes in climate have affected natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to a changing climate (IPCC 2014).

Between 1990 and 2014, Uganda's GHG emissions increased by 71%, as shown in Figure A14.4-6.

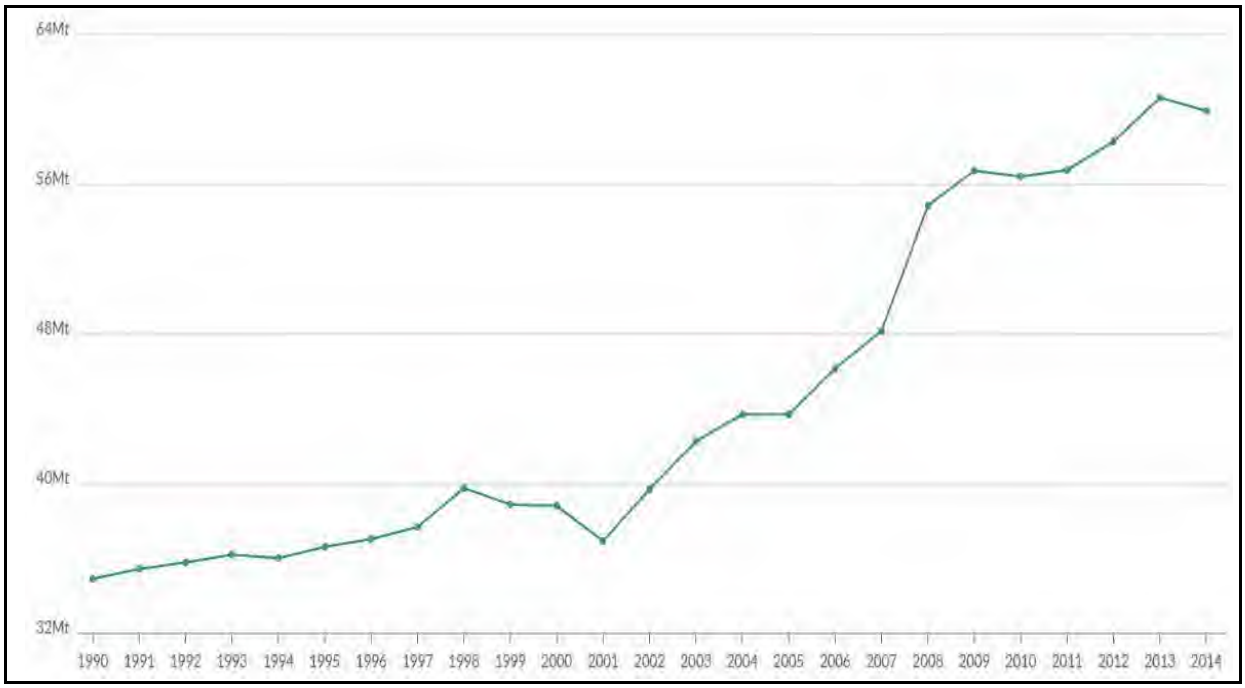

Figure A14.4-6 Trend in Uganda's Greenhouse Gas Emissions 1990–2014

SOURCE: Climate Watch (2018, Internet site)

Uganda's Intended Nationally Determined Contribution (INDC) report (MWE 2015), sets out long-term goals and adaptation strategies in relation to climate change mitigation. It prioritises specific measures in energy supply, forestry and wetlands to provide GHG emission reductions and adaptation measures. The cumulative impact of the emissions reduction measures is predicted to be a 22% reduction of overall national emissions in 2030, when compared to the business-as-usual (BAU) projection. The BAU emissions baseline for Uganda is 77.3 $MtCO_2e$ per year in 2030. A 22% reduction would reduce emissions to 60.3 $MtCO_2e$.

Continued GHG emissions will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in GHG emissions which, with adaptation, can limit climate change risks (IPCC 2014)

A14.4.3 Ecosystem Services Provided

Although this VEC does not provide ecosystem services directly, climate influences VECs that do provide services.

A14.5 Key Considerations

Key considerations related to the climate baseline are:

- the global climate has undergone unprecedented change[2] and continuing change is predicted by climate scientists. Uganda's climate has changed and further change is predicted.
- Uganda is vulnerable to increased climate variability and climate change. For example, the severity and frequency of extreme events such as droughts and floods are projected to increase.
- global anthropogenic GHG emissions, with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming of the global climate since the mid-20th century
- the Ugandan government has put in place measures to reduce the risks of the changing climate. These include mitigation measures (reductions in GHG emissions relative to a BAU scenario) and adaptation measures (reduction of the vulnerability of social and biological systems).

A14.6 References

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USAID African and Latin American Resilience to Climate Change (USAID). 2013. Uganda Climate Change Vulnerability Assessment Report.

[2] "Since the 1950s, many of the observed changes are unprecedented over decades to millennia" (IPCC 2014).

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Appendix B: Company Certificate of Registration

February 2020

Certificate issued on: 11-01-2017 16:21, No: BRS-FRNC-3-17/25695

Registration No: 80020000042006

THE REPUBLIC OF UGANDA

THE COMPANIES ACT

Certificate of Registration

(Section 253 of the Companies Act 2012)

I CERTIFY that TOTAL EASTAFRICA MIDSTREAM B.V has this day been registered as a foreign company under the Companies Act, 2012 with the following company number 80020000042006.

Dated at Kampala, this 11th day of January the year 2017.

REGISTRAR GENERAL REPUBLIC OF UGANDA

Signature: KARWANI RONALD DYLAN

Registrar of Companies

Printed on 16:22:58 11-01-2017

Appendix C: Stakeholder Engagement

February 2020

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C1 LISTS OF STAKEHOLDERS

C1.1 Stakeholders Consulted During the Scoping Phaseand Contact Information

Table C1.1-1 National-Level Stakeholders Consulted, Scoping Phase

Meeting	Date	Contact Name	Position	Contact Details
Uganda National Oil Company (UNOC)	19 May 2017	Proscovia	Chief Operating Officer	
Uganda Electricity Transmission Company Limited (UETCL)	19 May 2017	Buhanga Boneventura	Manager of Planning and Investments	Email: Bonventura.buhanga@uetcl.com
National Environment Management Authority (NEMA)	22 May 2017	Turyahikayo Enid	Environmental Inspector	Tel: 256-414-251064 Email: info@nemaug.org
Petroleum Authority of Uganda (PAU), Ministry of Energy and Minerals Development (MEMD) and Directorate of Petroleum and MEMD	22 May 2017	Jane Byaruhanga	Government Officer	Tel: +256 (0)7 84 81 24 48 Email: j.byaruhanga@petroleum.go.ug
Department of Museums and Monuments, Ministry of Tourism, Wildlife and Antiquities (MTWA)	23 May 2017	Jackline Nyiracyiza	Archaeologist	Tel: 0714644397 Email: jnyiracyiza@tourism.go.ug
Directorate of Employment and Occupational Health, Ministry of Gender, Labour and Social Development (MGLSD) and Directorate of MGLSD	23 May 2017	Karl Marx Musinguzi	Labour Officer	Tel: 0703044243
Directorate of Physical Planning and Urban Development, Ministry of Lands, Housing and Urban Development (MLHUD) and Chief Government Valuer's Office, MLHUD	24 May 2017	Jacquelyne Nassuna	Sociologist	Email: jnnassuma@gmail.com

*Please note that contact information was not always provided by stakeholders.

Table C1.1-1 National-Level Stakeholders Consulted, Scoping Phase

Meeting	Date	Contact Name	Position	Contact Details
Uganda National Roads Authority (UNRA)	24 May 2017	Charles Mwesige	Environmental Scientist	
Uganda Wildlife Authority (UWA)	29 May 2017	Justine Namara	Manager (EIA and Oil Monitoring)	Tel: 0700 510 544
National Forestry Authority (NFA)	29 May 2017	Paul Buyerah Musamali	Director of Corporate affairs	Tel: 0772 466 569
Directorate of Water Resource Management (DWRM), Ministry of Water and Environment (MWE)	29 May 2017	Joseph Odong	Water Officer	Tel: 0773 496 736
Wetlands Management Department (WMD), MWE	2 June 2017	Richard Kyambadde	Principal Wetlands Officer	
Note the Stakeholders listed below with names in italics requested that their details remain confidential in accordance with the Total General Specification on HRIAs (GS EP SDV 103).				
ACODE				
Action Aid Uganda				
Advocates for Natural Resources and Development (ANARDE)				
African Centre for Energy and Moniral Policy (ACEMP)				
Ecological Christian Association				
Global Rights Alert				
Greenwatch Uganda				
International Accountability Project				
Makerere University School of Law				

*Please note that contact information was not always provided by stakeholders.

Table C1.1-1 National-Level Stakeholders Consulted, Scoping Phase

Meeting	Date	Contact Name	Position	Contact Details
Minority Rights Group International				
National Association of Profession Environmentalists (NAPE)				
Uganada Consortium on Corporate Accountability				
Uganda Human Rights Commission				

Table C1.1-2 NGOs Consulted, Scoping Phase

Meeting	Date	Contact Name	Position	Contact Details
Civil Society for Oil (CSCO)	1 June 2017	Evelyne Busingye	Programme Officer (Water and Biodiversity, IUCN)	

Table C1.1-3 Local-Level Stakeholders Consulted, Scoping Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Hoima	Hoima District Health Authorities	19 April 2017		District Health Inspector	
	Hoima District Technical Planning Committee and Political Leaders	4 May 2017	Chiche Benson	Vice Chairperson	
	Buseruka Subcounty	8 May 2017	Tinkamayire Ali	Chairperson	Tel: 772410677
	Kiziranfumbi Subcounty	9 May 2017	Mugenyi Ibrahim Juma	Chairperson	Tel: 772954951

*Please note that contact information was not always provided by stakeholders.

Table C1.1-3 Local-Level Stakeholders Consulted, Scoping Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	Butimba Village (Kiziranfumbi Subcounty)	6 May 2017	Tugumisiirize Samuel	Chairperson	Tel: 782172938
Kakumiro	Kakumiro District Health Authorities	20 April 2017	Senteza Robert Augustine	DHO	Tel: 0702 393017 Email: sentezarobert@gmail.com
	Kakumiro District Technical Planning Committee and Political Leaders	4 May 2017	Peter Wasswa	Chairperson	Tel: 0704785628
	Nkooko Subcounty	5 May 2017	Hassan Musa	Chairperson	Tel: 0788067976
	Mpasaana Subcounty	8 May 2017	Evaristo B. Niwagaba	Chairperson	Tel: 0785369155
	Mpasaana Village (Mpasaana Subcounty)	6 May 2017	Andrew Kyamanywa	Chairperson	Tel: 775936054
	Kisiita Subcounty	5 May 2017	Jackson Alyampa	Chairperson	Tel: 0753366466
	Kisiita A Village (Kisiita Subcounty)	5 May 2017	Erias Kitabaluka	Chairperson	
Kyankwanzi	Kyankwanzi District Health Authorities	20 April 2017	Paul Okello	Assistant DHO	Tel: 0782455704 Email: ilagalapaul@gmail.com
	Kyankwanzi District Technical Planning Committee and Political Leaders	9 May 2017	Namanda Elizabeth	Chief Administrative Officer (CAO)	Tel: 772431680
	Ntwetwe Subcounty	10 May 2017	Tibanyendera Paul	Chairperson	Tel: 78337930
	Gayaza Subcounty	10 May 2017	Faiabuholo Maiia	Parish Councillor	
	Kisala West Village (Gayaza Subcounty)	11 May 2017	Daniel Barebwoha	Vice Chairperson	
	Nzoo Village (Gayaza Subcounty)	11 May 2017	Kazibwe Ronald	Chairperson	Tel: 753135926

*Please note that contact information was not always provided by stakeholders.

Table C1.1-3 Local-Level Stakeholders Consulted, Scoping Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Mubende	Mubende District Health Authorities	20 April 2017	Wilson Mubiro	DHO	Tel: 0772670556 Email: mubimwh@gmail.com
	Mubende District Technical Planning Committee and Political Leaders	9 May 2017	Charles Kiberu	CAO	Tel: 0772470371
	Kitenga Subcounty	10 May 2017	Edward Gamba	Chairperson	Tel: 772748311
	Nalyankajja Village (Kitenga Subcounty)	11 May 2017	Robert Tumusiime	Chairperson	Tel: 0754672929
	Madudu Subcounty	10 May 2017	Rosette Namakula	Vice Chairperson	Tel: 778869049
	Butoloogo Subcounty	11 May 2017	Milton Musiime	Chairperson	Tel: 774055312
	Kisagazi Village (Butoloogo Subcounty)	12 May 2017	Charles Mugwanya	Chairperson	
Gomba	Gomba District Health Authorities	24 April 2017	Christine Kahunzire	Assistant DHO	Tel: 0772315987 Email: kahunzire@yahoo.co.uk
	Gomba District Technical Planning Committee and Political Leaders	16 May 2017	Akileng Simon Peter	Deputy CAO	Tel: 772610655
	Maddu Subcounty	12 May 2017	Vincent Mugenyi	Chairperson	Tel: 701292367
	Kyetume Village (Maddu Subcounty)	13 May 2017	Edward Mugabi	Chairperson	

*Please note that contact information was not always provided by stakeholders.

Table C1.1-3 Local-Level Stakeholders Consulted, Scoping Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Sembabule	Sembabule District Health Authorities	26 April 2017	Charles Matovu	DHO	Email address: matovucharl@yahoo.com
	Sembabule District Technical Planning Committee and Political Leaders	16 May 2017	Bataringaya Willy	CAO	Tel: 772656997 Email: wbataringaya@yahoo.com
	Sembabule Town Council	15 May 2017	Kasekende Jude	Chairperson	Tel: 752598743
	Mijwala Subcounty	15 May 2017	Mwesigwa John	Chairperson	Tel: 752452604
	Lugusulu Subcounty	12 May 2017	Moses Mulindwa	Community Development Officer	Tel: 757801123
	Mabale Village (Lugusulu Subcounty)	13 May 2017	Mwebaze Fred	Chairperson	Tel: 755968462
	Lwebitakuli Subcounty	12 May 2017	Senyonjo Akabwai	Chairperson	Tel: 751840551
	Lutilwanjuki Village (Lwebitakuli Subcounty)	19 May 2017	Nicholas Bagala	Chairperson	Tel: 756565445
Lwengo	Lwengo District Health Authorities	25 April 2017	Joseph Mutyogoma	DHO	Tel: 0702 656176 Email: joemutyox@yahoo.com
	Lwengo District Technical Planning Committee and Political Leaders	17 May 2017	Godfrey Kuruhiira	CAO	Tel: 772859456
	Buganda Kingdom Representative	15 May 2017			
	Lwengo Subcounty	15 May 2017	Paul Nsubuga	SAS	Tel: 0701747592
	Lwengo Town Council	15 May 2017	Noor Ssembatya	Councillor	Tel: 0702604102
	Kinvunikidde Village (Lwengo Subcounty)	13 May 2017	Edward Lukyamuzi	Chairperson	
	Ndagwe Subcounty	16 May 2017	Robert Yiga	Chairperson	Tel: 784899026

*Please note that contact information was not always provided by stakeholders.

Table C1.1-3 Local-Level Stakeholders Consulted, Scoping Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Rakai	Rakai District Health Authorities	27 April 2017	Judith Nakayote	Biostatistician	Tel: 0704970824 Email: marionjudith83@gmail.com
	Rakai District Technical Planning Committee and Political Leaders	18 May 2017	Samomon Ssonko	CAO	Email: sonkosca@gmail.com
	Lwanda Subcounty	16 May 2017	Charles Muliira	Chairperson	Tel: 782937349
	Kifamba Subcounty	17 May 2017	Lubega Pius	Chairperson	Tel: 772486762
	Kakuuto Subcounty	17 May 2017	Harriet Nabbala	SAS	Tel: 0772312437
	Lukooma Village (Kakuuto Subcounty)	18 May 2017	Lukyamuzi Lawrence	Chairperson	Tel: 773378200
	Kasaali Subcounty	17 May 2017	Godfrey Kimera	Chairperson	Tel: 772382294
	Kasasa Subcounty	18 May 2017	Timothy Mbazira	Chairperson	Tel: 772398485
	Kamuli Village (Kasasa Subcounty)	18 May 2017	Muhame Kayemba	Vice Chairperson	Tel: 782387059
	Nabigasa Subcounty	19 May 2017	Vincent Kibazzi Kibandi	Chairperson	Tel: 0701366792

*Please note that contact information was not always provided by stakeholders.

C1.2 Stakeholders Consulted and Contact Information during the Baseline and Impact Assessment Phase

Table C1.2-1 National-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

Meeting	Date	Contact Name	Position	Contact Details
Ministry of Agriculture, Animal Industry and Fisheries (MAIIF)	27 November 2017	Paul Mwambu	Commissioner, Crop Inspection and Certification	Email: pmwambu3@gmail.com
Office of the Prime Minister	29 November 2017	Gerald Menhya	Assistant Commissioner, Disaster Preparedness and Management	Tel: 0772410252
Ministry of Water and Environment (MWE)	1 December 2017	Vicent Barugahare	Principal Wetlands Officer	Tel: 0774434969
Ministry of Tourism, Wildlife and Antiquities (MWTA)	4 December 2017	Domisiano Owor	Wildlife Officer	Email: owerdom@gmail.com
Chamber of Mines and Petroleum	6 December 2017	Elly Karuhanga	Chairmen, Chamber of Mines and Petroleum	
National Environment Management Authority (NEMA)	18 December 2017	Isaac Ntujju	Principal Environment Inspector	
UN Chief Security Advisor	25 November 2017	Jamshed Jazi	Chief Security Advisor	Email: jamshed.kazi@undss.org

*Please note that contact information was not always provided by stakeholders.

Table C1.2-2 NGOs Consulted, Baseline and Impact Assessment Phase

Meeting	Date	Contact Name	Position	Contact Details
World Vision	24 November 2017	Nangosha Elisha	World Vision ERO Project Manager	Tel: 0777152735

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Hoima	Buseruka Village (Buseruka Subcounty)	8 November 2017		Farmer	
	Katooke Village (Buseruka Subcounty)	9 November 2017	Patrick Bingi	Chairperson	
	Kakende Village (Kiziranfumbi Subcounty)	11 November 2017	Juliet Kyokuhairwe	Chairperson	
Kyankwanzi	Kisala West Village (Gayaza Subcounty)	17 November 2017	T Bikoramosha	Chairperson	Tel: 0759867239
	Nzoo Village (Ntwetwe Subcounty)	17 November 2017	Paul Tibayendera	Chairperson	
Mubende	Kagoma Village (Kitenga Subcounty)	13 November 2017	Haruna Katende	Chairperson	Tel: 0752514155
	Kyenda Village (Kitenga Subcounty)	16 November 2017	Joyce Nansamba	Women's Representative	
	Kalembe Village (Kitenga Subcounty)	18 November 2017	Christopher Kwefuga	Chairperson	Tel: 0787944470
	Kamusenene Village (Kitenga Subcounty)	18 November 2017	Tumwebaze Ssekate	Chairperson	

*Please note that contact information was not always provided by stakeholders.

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	Lulongo Village (Kitenga Subcounty)	17 November 2017	Tom Ssempiira	Chairperson	Tel: 0788447635
	Kidongo Village (Butoloogo Subcounty)	17 November 2017	Fred Kamanzi	Chairperson	
Gomba	Maddu Subcounty	2 November 2017		Speaker	
	Kyengera Village (Maddu Subcounty)	14 November 2017	Yosam Nayebare	Chairperson	Tel: 0776619292
Sembabule	Bulakati Village (Lwebitakuli Subcounty)	7 November 2017	Paul Mbaziira	Chairperson	Tel: 0757911272
	Muyenje Village (Mijwala Subcounty)	8 November 2017	Joseph Mutyaba	Chairperson	Tel: 0753491480
	Nsambya Village (Lugusulu Subcounty)	9 November 2017	Ssalongo Ssemwanga Nsibambi	Chairperson	Tel: 0752996335 Other: 0773167126
	Sembabule (Sembabule TC Subcounty)	9 November 2017	Getrude Nakabugo	Chairperson	Tel: 0752351522
	Mabale Village (Lugusulu Subcounty)	10 November 2017	Abaho Amos	Youth Representative	Tel: 0755622207
	Miti Village (Mijwala Subcounty)	10 November 2017	Gerald Mukasa	Chairperson	Tel: 0751908846
	Serinya Village (Lugusulu Subcounty)	10 November 2017	Vincent Lukyelibuga	Vice Chairperson	
	Njaza Village (Lugusulu Subcounty)	11 November 2017	Maureen Namala	Chairperson	Tel: 0753210651
	Kagango Village (Lugusulu Subcounty)	14 November 2017	Edson Kayondo	Vice Chairperson	Tel: 0754099035

*Please note that contact information was not always provided by stakeholders.

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Lwengo	Bukulula Village (Ndagwe Subcounty)	3 November 2017	Paskal Ndaula	Chairperson	
	Nanywa Village (Ndagwe Subcounty)	3 November 2017		Chairperson	
	Kiswaga Village (Ndagwe Subcounty)	3 November 2017		Chairperson	
	Kinvunikidde Village (Lwengo Subcounty)	6 November 2017	Edward Lukamuzi	Chairperson	Tel: 0750442274
	Mbirizi Village (Lwengo TC Subcounty)	6 November 2017	Twaha Kyeyune	Chairperson	Tel: 0752330809
	Lwemisege Village (Kifamba Subcounty)	1 November 2017	Deo Ssenyonjo	Chairperson	Tel: 0758859234
	Butiti Village (Lwanda Subcounty)	4 November 2017	Walusimbi Ssenoga	Secretary	Tel: 0753214159
	Kamuli Village (Kasasa Subcounty)	10 November 2017		Chairperson	Tel: 0774046024 Other: 0701604858
Kyotera	Mutukula Village (Kakuuto Subcounty)	30 October 2017	Fatuma Asiimwe	Chairperson	Tel: 0782551206
	Lukoma Village (Kakuuto Subcounty)	2 November 2017	Lawrence Lukyamuzi	Chairperson	Tel: 0773378200
	Lukulavu Village (Kakuuto Subcounty)	2 November 2017	Charles Matovu	Chairperson	Tel: 0782313995
	Kibonzi Village (Nabigasa Subcounty)	3 November 2017	Wanyi Kaloli	Chairperson	Tel: 0753523409
	Kyakudusi Village (Kasaali Subcounty)	3 November 2017	Madinah Nansubuga	Women's Representative	Tel: 0702261834

*Please note that contact information was not always provided by stakeholders.

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	Kabonera Village (Kakuuto Subcounty)	4 November 2017	Peter Mweruka	Chairperson	Tel: 0784073731
Kampala	Action Aid				
	Advocates for Natural Resources and Development (Anarde)				
	Advocates Coalition on Development and Environment (ACODE)				
	African Center for Energy and Mineral Policy (ACEMP)				
	International Accountability Project (IAP)				
	National Association of professional environmentalists (NAPE)				
	National Association of Women Organisations in Uganda				
Hoima	District Environmental Officer	10 November 2017	Gertrude Nsita	Environment Officer	
	District Land Expert	10 November 2017	Ireeba Mpaziyustus	District Land Officer/ Surveyor/ Physical Planner	Tel: 077 261 3167
	District Livestock Expert	10 November 2017	Ntume Banarbras	District Livestock Expert	Tel: 077 234 4738
	District Natural Resource Officer	10 November 2017	Joseline Nyangoma	Natural Resource Officer	

*Please note that contact information was not always provided by stakeholders.

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	District Agricultural Expert	13 November 2017	Catherine Kaija	District Agricultural Expert	Tel: 077 251 7106
	District Community Development Officer	15 November 2017	Stanley Mboineki	Community Development Officer	Tel: 077 257 4864
	District Land Expert	15 November 2017	John W Byaruhanga	District Land Officer/ Surveyor/ Physical Planner	
	District Agricultural Expert	16 November 2017	Moses Byenka	Agricultural Expert, Hoima District Farmers Association	Email: wodfaoffice@gmail.com Tel: 0753 377 677
	District Fishery Expert	16 November 2017	Godfrey Byaruhanga	Fishery Expert	
	District Kingdom Representatives	17 November 2017	Burhani Kyakuhaire	Minister for Culture	
	Hoima DHMT	21 November 2017	Dr Nicholas Kwikiriza	DHMT	Email: kwikiriza@gmail.com Tel: +256782783288
	Hoima Referral Hospital	21 November 2017	Winifred Mbalazi	Principal Nurse	Email: kyalituha@gmail.com Tel: +256782855213
	KII Guesthouses and Hotels, Hoima (Kahoora Division)	15 November 2017	Henry Kaliisa	Village Resident	
	KII Guesthouses and Hotels, Hoima (Kahoora Division)	16 November 2017	Grace Kasande	Hotel Owner	

*Please note that contact information was not always provided by stakeholders.

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Community Leaders, Katooke Village (Buseruka Subcounty)	17 November 2017	Patrick Biingi	Community Leader	Tel: 0788 145 480
	FGD Community Leaders, Kayere Village (Buseruka Subcounty)	17 November 2017	Julius Sunday Edema	Village Resident	Tel: 0782 922 560
	FGD Women, Katooke Village (Buseruka Subcounty)	17 November 2017	Daphaine Kobusinge	Village Resident	Tel: 0779 844 616
	KII Religious Leaders, Hoima (Kahoora Division)	17 November 2017	Sheik Musa Babanja	Chair Interreligious Council	
	KII Religious Leaders, Katooke (Buseruka Subcounty)	17 November 2017	Francis Mugisa	Religious Leader	Tel: 0781 677 421
	KII Traditional Hearers, Hoima (Kahoora Division)	17 November 2017	Simon Kyamanywa	Traditional Healer	
	KII Vulnerable Groups, Katooke (Buseruka Subcounty)	17 November 2017	Joseline Mukabarungi	Village Resident	
	SGI Natural Resource users, Katooke (Buseruka Subcounty)	17 November 2017	Peter Bajenda	Natural Resource User	Tel: 0781 347 643
	SGI Natural Resource users, Kayere (Buseruka Subcounty)	17 November 2017	Stephen Mbiidi	Village Resident	
	FGD Community Leaders, Nyamosoga Village (Buseruka Subcounty)	18 November 2017	Grace Mwesige	Village Resident	Tel: 0775 976 531
	KII Commercial Farmers, Katooke (Buseruka Subcounty)	18 November 2017	John Natukunda	Commercial Farmer	
	SGI Crop Farmers, Katooke (Buseruka Subcounty)	18 November 2017	Silvano Bagorora	Crop Farmer	

*Please note that contact information was not always provided by stakeholders.

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	SGI Natural Resource users, Nyamosoga (Buseruka Subcounty)	18 November 2017	Michael Onen	Natural Resource User	Tel: 0788 175 702
	FGD Women, Kayere Village (Buseruka Subcounty)	19 November 2017	Jane Kamatenesi	Village Resident	Tel: 0788 381 611
	FGD Women, Nyamasoga Village (Buseruka Subcounty)	20 November 2017	A Akugizibwe	Village Resident	Tel: 0781 395 769
	KII Community Health Staff, Katooke (Buseruka Subcounty)	20 November 2017	Hajara Nyakato	Health Worker	Tel: 0782 882 954
	KII Religious Leaders, Kayere (Buseruka Subcounty)	20 November 2017	Stephen Avadebo	Religious Leader	Tel: 0773 864 956
	KII Sex Workers, Nyamasoga (Buseruka Subcounty)	20 November 2017	Kyomukama Danisha	Bar Operator	Tel: 0780 884 660
	KII Teachers, Katooke Buseruka Subcounty)	20 November 2017	Richard Tugume	Teacher	
	KII Teachers, Nyamosoga (Buseruka Subcounty)	20 November 2017	Andoa Justus	Teacher	Tel: 0773 606 650
	SGI Crop Farmers, Kayere (Buseruka Subcounty)	20 November 2017	Alfred Chandia	Village Resident	Tel: 0787 894 837
	SGI Pastoralists, Katooke (Buseruka Subcounty)	20 November 2017	Edson Mugisha	Village Resident	
	SGI Pastoralists, Kayere (Buseruka Subcounty)	20 November 2017	Buine Omugisha	Pastoralist	Tel: 0780 180 727
	FGD Community Leaders, Kakende Village (Kiziranfumbi Subcounty)	21 November 2017	Julius Karuhnga	Village Resident	Tel: 0789 022 524

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Community Health Staff, Kabaale-Kyabicwe (Buhimba Subcounty)	21 November 2017	Mariat Ashaba	Health Worker	Tel: 0774 661 352
	KII Teachers, Kabaale-Kyabicwe (Buhimba Subcounty)	21 November 2017	Grace Birungi	Teacher	Tel: 0782 376 945
	SGI Pastoralists, Kabaale-Kyabicwe (Buhimba Subcounty)	21 November 2017	Desteo Karubanga	Farmer	Tel: 0781 076 009
	FGD Community Leaders, Kabaale-Kyabicwe (Buhimba Subcounty)	22 November 2017	John B Kyaligonza	Chairperson	Tel: 0774 582 745
	FGD Community Leaders, Kisenyi Village (Katikara Subcounty)	22 November 2017	Christopher Kayiizi	Chairperson	
	FGD Women, Kabaale-Kyabicwe (Buhimba Subcounty)	22 November 2017	Jenina Tukamubana	Village Resident	Tel: 0772 151 722
	FGD Women, Kakende Village (Kiziranfumbi Subcounty)	22 November 2017	Aida Birungi	Village Resident	Tel: 0785 838 362
	KII Chairmen, Kakende (Kiziranfumbi Subcounty)	22 November 2017	Patrick Bihemaiso	Village Resident	
	KII Police, Hoima (Kahoora Division)	22 November 2017	Esther Ikion	Records	Tel: 0782 496 696
	KII Traditional Hearers, Kakende (Kiziranfumbi Subcounty)	22 November 2017	Johnson Tukole	Traditional Healer	Tel: 0788 993 167
	SGI Crop Farmers, Kabaale-Kyabicwe (Buhimba Subcounty)	22 November 2017	Fred Ndyajunwa	Farmer	Tel: 0779 910 570
	SGI Crop Farmers, Kakende (Kiziranfumbi Subcounty)	22 November 2017	Henry Karamagr	Crop Farmer	Tel: 0773 870 940

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Guesthouses and Hotels, Hoima (Kahoora Division)	23 November 2017	Stephen Turunya	Village Resident	
	KII Teachers, Hoima (Kahoora Division)	23 November 2017	John Wanyama	Teacher	
	SGI Natural Resource users, Kakende (Kiziranfumbi Subcounty)	23 November 2017	Solomon Mugisa	Village Resident	Tel: 0779 224 747
	KII Business Owners, Hoima (Kahoora Division)	24 November 2017	Joy Nyirabungi	Business Owner	
Kakumiro	District Agricultural Expert	23 November 2017	Mergaret Mbabazi	Agricultural Expert	Tel: 0772 920 502
	District Community Development Officer	23 November 2017	Bernerd Kyesa	Community Development Officer	
	District Economic Affairs	23 November 2017	Willy Samba Magambo	Economist	Tel: 0772 914 038
	District Environmental Officer	23 November 2017	Mackline Nnamiyingo	Environment Officer	
	District Land Expert	23 November 2017	Zainab Kyakusinire	Physical Planner	Tel: 0772 405 470
	District Livestock Expert	23 November 2017	David Waiswa	Livestock Expert	Tel: 0771 602 681
	District Natural Resource Officer	23 November 2017	Patrick Sebuliime	Natural Resource Officer	
	Kakumiro DHMT	23 November 2017	Dr Senteza A. Robert	DHMT	Email: sentezarobert@gmail.com Tel: +256702393017

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	Kakumiro HCIV	23 November 2017	Dr Judith Tuhaise	In Charge	Email: judithtuhaise@gmail.com Tel: +256774686999
	District Police, Social Welfare and Probation Officers	24 November 2017	Charles Tumusiime	O/C Police	
	District Agricultural Expert	29 November 2017	Stephen Dyope Batesaki	Agricultural Expert	
	District Veterinary Officer	29 November 2017	Tadeo Asiimwe	Veterinary Officer	Tel: 0774 039 237
	SGI Crop Farmers, Kisenyi (Katikara Subcounty)	21 November 2017	Vincent Sseruba	Farmer	Tel: 0781 571 377
	SGI Natural Resource users, Kisenyi (Katikara Subcounty)	21 November 2017	Joseph Isingoma	Natural Resource User	Tel: 0779 985 715
	FGD Community Leaders, Kisenyi Village (Katikara Subcounty)	22 November 2017	Christopher Kayiizi	Chairperson	Tel: 0789 591 685
	FGD Women, Kisenyi Village (Katikara Subcounty)	22 November 2017	G Namuli	Village Resident	Tel: 0783 285 048
	KII Commercial Farmers, Kisenyi (Katikara Subcounty)	22 November 2017	Fred Magezi	Commercial Farmer	Tel: 0777 316 698
	KII Chairmen, Katikara (Katikara Subcounty)	23 November 2017	Akireho Banage	Chairperson	Tel: 0777 220 795
	KII Commercial Farmers, Nkooko (Nkooko Subcounty)	23 November 2017	Robert	Health Officer	
	KII Business Owners, Katikara (Katikara Subcounty)	24 November 2017	Roggers Byaruhanga	Business Owner	Tel: 0722 348 094

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Community Leaders, Katikara Village (Katikara Subcounty)	24 November 2017	Oliver Kablono	Village Resident	Tel: 0777 388 781
	KII Commercial Farmers, Katikara (Katikara Subcounty)	24 November 2017	Roggers Byaruhanga	Business Owner	Tel: 0722 348 094
	KII Police, Katikara (Katikara Subcounty)	24 November 2017	Charles Tumusiime	O/C Police	
	KII Religious Leaders, Katikara (Katikara Subcounty)	24 November 2017	Bishop Johnson Turyhikayo	Religious Leader	
	FGD Women, Katikara (Katikara Subcounty)	25 November 2017	Gorret Kobusinge	Village Resident	Tel: 0770 578 980
	KII Chairmen, Kisenyi (Katikara Subcounty)	25 November 2017	Christopher Kayiizi	Chairperson	
	KII Teachers, Katikara (Katikara Subcounty)	25 November 2017	Sebastian Gumisiriza	Teacher	
	SGI Crop Farmers, Katikara (Katikara Subcounty)	25 November 2017	Winfred Ahimbisibwe	Crop Farmer	Tel: 0788 778 586
	SGI Pastoralists, Katikara (Katikara Subcounty)	25 November 2017	Herriet Mbabazi	Pastoralist	Tel: 0782 989 916
	FGD Community Leaders, Buswabwera Village (Mpasaana Subcounty)	27 November 2017	Moshabe Kezekiya	Village Resident	Tel: 0775 612 301
	FGD Community Leaders, Nkooko Village (Nkooko Subcounty)	27 November 2017	Moses Bnjampora	Village Resident	Tel: 0777 221 440
	FGD Women, Buswabwera Village (Mpasaana Subcounty)	27 November 2017	Janet Nalweyiso	Village Resident	Tel: 0775 741 128

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Chairmen, Nkooko (Nkooko Subcounty)	27 November 2017	Tom Sensimbi	Village Resident	Tel: 0773 859 696
	KII Credit Access, Buswabwera (Mpasaana Subcounty)	27 November 2017	Bitrace Nakatte	Village Resident	
	KII Chairmen, Buswabwera (Mpasaana Subcounty)	27 November 2017	Andrew Kyamanywa	Chairperson	Tel: 0779 456 267
	KII Vulnerable Groups, Buswabwera (Mpasaana Subcounty)	27 November 2017	Bitrace Bakatte	Village Resident	
	SGI Crop Farmers, Buswabwera (Mpasaana Subcounty)	27 November 2017	Inid Kyarikunda	Crop Farmer	Tel: 0783138 231
	SGI Crop Farmers, Nkooko (Nkooko Subcounty)	27 November 2017	Paul Kutegeka	Crop Farmer	
	SGI Pastoralists, Nkooko (Nkooko Subcounty)	27 November 2017	Semat Kusaini	Pastoralist	Tel: 0753 296 342
	FGD Women, Nkooko Village (Nkooko Subcounty)	28 November 2017	Lydia Namawula	Village Resident	Tel: 0752 923 318
	KII Boda Boda Taxi's, Nkooko (Nkooko Sub County)	28 November 2017	Andrew Bigirwenkya	Boda Boda Driver	Tel: 0777 600 692
	KII Business Owners, Nkooko (Nkooko Subcounty)	28 November 2017	Aussi Lugo	Business Owner	Tel: 0772 859 439
	KII Commercial Farmers, Nkooko (Nkooko Subcounty)	28 November 2017	Innocent Mwebaze	Village Resident	
	KII Commercial Farmers, Nkooko (Nkooko Subcounty)	28 November 2017	Annet Nankomera	Community Linkage Facilitator	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Police, Nkooko (Nkooko Subcounty)	28 November 2017	Ibrahim Barughara	O/C Police	
	KII Religious Leaders, Buswabwera (Mpasaana Subcounty)	28 November 2017	Richard Ainebyoona	Religious Leader	Tel: 0785 990 156
	KII Teachers, Nkooko (Nkooko Subcounty)	28 November 2017	Grace Alituha	Teacher	Tel: 0782 864 345
	KII Traditional Healers, Buswabwera (Mpasaana Subcounty)	28 November 2017	Leonard Sekiwunga	Traditional Healer	Tel: 0783 138 231
	KII Youth Leaders, Nkooko (Nkooko Subcounty)	28 November 2017	Archled Kiwanuka	Village Resident	Tel: 0704 364 311
	FGD Community Leaders, Kyajawe Village (Mpasaana Subcounty)	29 November 2017	Stephen Twijukya	Village Resident	Tel: 0778 719 782
	FGD Women, Kyajawe Village (Mpasaana Subcounty)	29 November 2017	Jenina Tukamubana	Village Resident	Tel: 0772 151 722
	KII Boda Boda Taxi's, Kyajawe (Mpasaana Subcounty)	29 November 2017	Elais Kyamukama	Boda Boda Driver	
	KII Business Owners, Kyajawe (Mpasaana Subcounty)	29 November 2017	Fadson Twahirwa	Business Owner	
	KII Commercial Farmers, Kyajawe (Mpasaana Subcounty)	29 November 2017	Dan Naleba	Business Owner	
	KII Police, Kyajawe (Mpasaana Subcounty)	29 November 2017	Geofrey Pithua	O/C Police	
	SGI Crop Farmers, Kyajawe (Mpasaana Subcounty)	29 November 2017	Denis Rasimbazi	Crop Farmer	Tel: 0775 106 179

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Credit Access, Kyajawe (Mpasaana Subcounty)	29 November 2017	Hanifer Nantonjo	Village Resident	
	KII Credit Access, Katikara (Katikara Subcounty)	30 November 2017	Rosemary Ahaisibwe	Village Resident	
	SGI Pastoralists, Kyajawe (Mpasaana Subcounty)	30 November 2017	Godfrey Pensi	Pastoralist	
	KII Teachers, Kyajawe (Mpasaana Subcounty)	1 December 2017	Monday Devgratiun	Village Resident	Tel: 0787 310 001
	KII Religious Leaders, Nkooko (Nkooko Subcounty)	5 December 2017	Wilson Sekooza	Religious Leader	
	SGI Natural Resource users, Nkooko (Nkooko Subcounty)	5 December 2017	Jacob Asserey	Natural Resource User	
Kyankwazi	Kyankwazi DHMT	21 November 2017	Dr John B. Serebe	DHMT	Email: serbosco@yahoo.com Tel: +256772613223
	District Agricultural Expert	30 November 2017	Godfrey Ssebulime	Agricultural Expert	Tel: 0772 450 892
	District Community Development Officer	30 November 2017	Robert Mwebekalanzi	Community Development Officer	
	District Environmental Officer	30 November 2017	Dorothy Nankya	Natural Resource Officer	Tel: 0772 355 681
	District Land Expert	30 November 2017	John Matovu	Land Expert	
	District Natural Resources Officer	30 November 2017	Dorothy Nankya	Natural Resource Officer	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	District Police, Social Welfare and Probation Officer	30 November 2017	Silver Oketch	Child and Family Protection officer	
	Kiyuni (Gayaza) HCIII in Charge	22 November 2017	Nabassa Sarah	In Charge	Tel: +256784985017
	Kisiita HCIII	23 November 2017	Ibrahim Seuyole	In Charge	Tel: +256777658869
	FGD Community Leaders, Nzoo Village (Ntwetwe Subcounty)	29 November 2017	Dan Mwane	Village Resident	Tel: 0751 701 157
	FGD Community Leaders, Kisala West (Gayaza Subcounty)	1 December 2017	Bali Inda	Village Resident	Tel: 0757 580 832
	FGD Women, Nzoo (Ntwetwe Subcounty)	1 December 2017	Firista Nassazi	Village Resident	Tel: 0701 517 689
	KII Boda Boda Taxi's, Kisala West (Gayaza Subcounty)	1 December 2017	Joseph Busingye	Boda Boda Driver	Tel: 0753 430 886
	KII Chairmen, Kisala West (Gayaza Subcounty)	1 December 2017	Ezra Twahirwa	Chairperson	Tel: 0756 354 196
	KII Chairmen, Nzoo (Ntwetwe Subcounty)	1 December 2017	Ronard Kazibwe	Village Resident	Tel: 0753 135 926
	KII Commercial Farmers, Nzoo (Ntwetwe Subcounty)	1 December 2017	Richard Ssebulime	Village Resident	Tel: 0753 297 098
	KII Religious Leaders, Kisala West (Gayaza Subcounty)	1 December 2017	Bernerd Kabulabuza	Religious Leader	
	KII Religious Leaders, Nzoo (Ntwetwe Subcounty)	1 December 2017	Charles Ndawula	Religious Leader	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Teachers, Nzoo (Ntwetwe Subcounty)	1 December 2017	Edward Kasibante	Teacher	
	KII Traditional Hearers, Nzoo (Ntwetwe Subcounty)	1 December 2017	Sulaiman Bisaniiko	Traditional Healer	Tel: 0757 005 274
	SGI Crop Farmers, Nzoo (Ntwetwe Subcounty)	1 December 2017	Richard Ssebulime	Crop Farmer	Tel: 0753 297 098
	FGD Women, Kisala West (Gayaza Subcounty)	2 December 2017	M Birabwe	Village Resident	Tel: 0750 847 729
	KII Business Owners, Nzoo (Ntwetwe Subcounty)	2 December 2017	Darausi Garahwire	Business Owner	
	KII Business Owners, Kisala West (Gayaza Subcounty)	2 December 2017	Iorani Ahimbisibwe	Business Owner	Tel: 0706 793 187
	KII Commercial Farmers, Kisala West (Gayaza Subcounty)	2 December 2017	John Ahimbisibwe	Commercial Farmer	Tel: 0706 793 787
	KII Community Health Staff, Nzoo (Ntwetwe Subcounty)	2 December 2017	Nakate Deserante	Health Worker	Tel: 0755 541 004
	KII Teachers, Kisala West (Gayaza Subcounty)	2 December 2017	Erias Waswa	Teacher	Tel: 0755 656 174
	KII Vulnerable Groups, Kisala West (Gayaza Subcounty)	2 December 2017			
	KII Youth Leaders, Kisala West (Gayaza Subcounty)	2 December 2017	Gerald Binomugisha	Village Resident	Tel: 0750 032 626
	KII Youth Leaders, Nzoo (Ntwetwe Subcounty)	2 December 2017	Joseph Ahimbisibwe	Village Resident	Tel: 0759 750 750

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	SGI Pastoralists, Nzoo (Ntwetwe Subcounty)	2 December 2017	Rajab Zimurinda	Pastoralist	
	SGI Natural Resource users, Nzoo (Ntwetwe Subcounty)	5 December 2017	Hamudani Nsubuga	Natural Resource User	
Mubende	Mubende DHMT	24 November 2017	Dr Jude Kizza	DHMT	Tel: +256777136236 Email: judekizza@yahoo.com
	Mubende Referral Hospital Director	24 November 2017	Dr Frank Chiduo	Director	Tel: +255 687127981
	District Chief Administrative Officer	27 November 2017	Lillian Nakamatte	Chief Administrative Officer	
	District Labour Officer	27 November 2017	Vincent Kinene	District Labour Officer	Tel: +256 772 627 385
	District Biostatistician	28 November 2017	Ssenyonjo Robert Williams	Biostatistician	
	District Forestry Officer	28 November 2017		District Forestry Officer	
	District Land Expert	28 November 2017	Lillian Nakamatte	Chief Administrative Officer	
	District Natural Resources Officer	28 November 2017	Vincent Kinene	Natural Resource Officer	
	District Police, Social Welfare and Probation Officers	28 November 2017	Edward Muhairwe	Population Officer	Tel: 0776 800 805
	District Veterinary Officer	28 November 2017	James Mukasa Ssematimba	Veterinary Doctor	
	Mubende Farmers Association				

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	Office of District Officer				
	Kitenga HCII	24 November 2017	Annet Kayodi	In Charge	Tel: +236772971632
	FGD Community Leaders, Kalembe Village (Kitenga Subcounty)	28 November 2017	John Mary Nyanzi	Village Resident	Tel: 075 162 8483
	KII Boda Boda Taxi's, Mubende (Mubende TC Subcounty)	28 November 2017	Joseph Mbazira	Boda Boda Driver	Tel: 0702 719 224
	KII Business Owners, Mubende (Mubende TC Subcounty)	28 November 2017	Christopher Ssebuliba	Business Owner	Tel: 0704 919 717
	KII Commercial Farmers, Mubende (Mubende TC Subcounty)	28 November 2017	Geofrey Mugabi	Village Resident	
	KII Sex Workers, Mubende (Mubende TC Subcounty)	28 November 2017	Angel Mahoro	Village Resident	
	FGD Men, Kagoma (Kitenga Subcounty)	29 November 2017	S Kigongo Ssemugo	Village Resident	
	FGD Women, Kalembe Village (Kitenga Subcounty)	29 November 2017	Roseti Katusabe	Village Resident	Tel: 075 970 4795
	FGD Women, Kagoma Village (Kitenga Subcounty)	29 November 2017	Maria Mitembe	Village Resident	
	KII Business Owners, Kalembe (Kitenga Subcounty)	29 November 2017	Frank Ssebyala	Business owner	Tel: 070 033 0561
	KII Chairmen, Kagoma (Kitenga Subcounty)	29 November 2017	Haruna Katenda	Chairperson	
	KII Chairmen, Kalembe (Kitenga Subcounty)	29 November 2017	Christopher Kwifuga	Chairperson	Tel: 078 794 4470

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Credit Access, Kalembe (Kitenga Subcounty)	29 November 2017	Roseti Katusabe	Village Resident	Tel: 075 970 4795
	KII Religious Leaders, Kagoma (Kitenga Subcounty)	29 November 2017	John Ssenkaaba	Religious Leader	
	KII Teachers, Kagoma (Kitenga Subcounty)	29 November 2017	Josephine Namubiru	Head teacher	Tel: 077 234 3888
	KII Youth Leaders, Kalembe (Kitenga Subcounty)	29 November 2017	Moses Kataza	Village Resident	Tel: 0701 752 351
	SGI Pastoralists, Kalembe (Kitenga Subcounty)	29 November 2017	Sitivini Vyamouala	Village Resident	Tel: 078 560 9257
	FGD Community Leaders, Kyenda Village (Kitenga Subcounty)	30 November 2017	Austio Byakatonda	Crop Farmer	Tel: 075 748 1871
	FGD Women, Kyenda Village (Kitenga Subcounty)	30 November 2017	Adurini Kirabo	Village Resident	Tel: 0751 032 233
	KII Commercial Farmers, Kyenda (Kitenga Subcounty)	30 November 2017	Ritah Nazziwa	Midwife	Tel: 0773 836 512
	KII Credit Access, Kyenda (Kitenga Subcounty)	30 November 2017	Anifer Mamyonjo	Village Resident	
	KII Religious Leaders, Kyenda (Kitenga Subcounty)	30 November 2017	Haruna Katende	Chairperson	
	KII Teachers, Kyenda (Kitenga Subcounty)	30 November 2017			
	KII Youth Leaders, Kyenda (Kitenga Subcounty)	30 November 2017	Vincent Sserugo	Youth Chairperson	Tel: 070 605 9292

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Police Post, Kyenda (Kitenga Subcounty)	30 November 2017			
	FGD Community Leaders, Kabulasoke Village (Madudu Subcountiy)	1 December 2017	Ezekiel Tumwergge	Village Resident	Tel: 078 665 9882
	FGD Community Leaders, Kamusenene Village (Kitenga Subcounty)	1 December 2017	Tumwesige David	Village Resident	Tel: 077 509 3797
	FGD Women, Kabulasoke Village (Madudu Subcounty)	1 December 2017	Beatrice Nyiramwiza	Village Resident	Tel: 078 224 7944
	FGD Women, Kamusenene (Kitenga Subcounty)	1 December 2017	Margaret Namande	Village Resident	Tel: 077 803 8019
	KII Boda Boda Taxi's, Kabulasoke (Madudu Subcounty)	1 December 2017	Robinson Ndibika	Boda Boda Chairperson	Tel: 078 844 7670
	KII Business Owners, Kabulasoke (Madudu Subcounty)	1 December 2017	Scovia Naiga	Business Owner	Tel: 075 998 9588
	KII Business Owners, Kamusenene (Kitenga Subcounty)	1 December 2017	Verene Nalugo	Business Owner	
	KII Chairmen, Kabulasoke (Madudu Subcounty)	1 December 2017	Moses Hon Katuramu	Councilor	
	KII Police, Kamusenene (Kitenga Subcounty)	1 December 2017	Sam Byamukama	Village Resident	Tel: 078 251 4155
	KII Religious Leaders, Kabulasoke (Madudu Subcounty)	1 December 2017	Jonathan Musinguzi	Religious Leader	Tel: 078 923 8730

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Teachers, Kabulasoke (Madudu Subcounty)	1 December 2017	Jackson Bayiba	Teacher	Tel: 077 750 3662
	KII Youth Leaders, Kabulasoke (Madudu Subcounty)	1 December 2017	Abel Byaruhanga	Village Resident	Tel: 077 291 9167
	SGI Crop Farmers, Kabulasoke (Madudu Subcounty)	1 December 2017	Sadrti Kyomukangi	Crop Farmer	Tel: 077 940 5010
	FGD Community Leaders, Nyondo Village (Butoloogo Subcounty)	4 December 2017	Simon Musaasizi	Community Leader	Tel: 0702 688 466
	FGD Women, Nyondo (Butoloogo Subcounty)	4 December 2017	Jasi Mbabazi	Village Resident	Tel: 0753 884 122
	KII Chairmen, Nyondo (Butoloogo Subcounty)	4 December 2017	Fred Kamanzi	Chairperson	Tel: 0783 678 018
	KII Commercial Farmers, Nyondo (Butoloogo Sucounty)	4 December 2017	Joseph Semakula	Commercial Farmer	
	KII Religious Leaders, Nyondo (Butoloogo Subcounty)	4 December 2017	Joel Byakatonda	Religious Leader	Tel: 0777 324 431
	KII Traditional Hearers, Nyondo (Butoloogo Subcounty)	4 December 2017	Chriseston Lubinga	Traditional healer	
	KII Youth Leaders, Nyondo (Butoloogo Subcounty)	4 December 2017	Patrick Katamba	Youth Chairperson	Tel: 0756 194 960
	SGI Crop Farmers, Nyondo (Butoloogo Subcounty)	4 December 2017	Innocent Jumulimbise	Crop Farmer	Tel: 0705 999 397
	SGI Natural Resource users, Nyondo (Butoloogo Subcounty)	4 December 2017	Emmanuel Sekiwunga	Natural Resource User	

*Please note that contact information was not always provided by stakeholders.

Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	SGI Pastoralists, Nyondo (Butoloogo Subcounty)	4 December 2017	Gerald Sessonga	Pastoralist	
	KII Boda Boda Taxi's, Nyondo (Butoloogo Subcounty)	5 December 2017	Kusein Byamukama	Boda Boda Driver	
	KII Business Owners, Nyondo (Butoloogo Subcounty)	5 December 2017	Innocent Tumuhimbise	Business Owner	
	KII Community Health Staff, Nyondo (Butoloogo Subcounty)	5 December 2017	Samuel Nansima	Health Worker	Tel: 0705 277 806
	Artisanal and Small-Scale Miners Association, Bucuya				
	Community Members (Men), Bucuya				
	Village Administration, Community Members (Men and Women), Kyenda (Kitenga Subcounty)				
	Village Administration, Community Members (Men and Women), Kamusenene (Kitenga Subcounty)				
Gomba	Gomba DHMT	27 November 2017	Dr Kiwanuka George	DHMT	Email: georgekiwa@gmail.com Tel: +256782945122
	District Agricultural Expert	4 December 2017		Agricultural Expert	
	District Economic Affairs	4 December 2017	Luther Martin Kizito	District Planner	Email: kizitoluther@gmail.com Tel: 0752 625 745
	District Fishery Expert	4 December 2017	Kaddu Nsubugga	Fishery Expert	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	District Land Expert	4 December 2017	Mariam Nakibukka	Physical Planner	Email: nakiamariam@gmiail.com Tel: 078 416 3206
	District Natural Resource Officer	4 December 2017	Winnie Kyobating	Natural Resource Officer	Email: winnierubs@yahoo.com Tel: 077 296 7669
	District Police, Social Welfare and Probation Officers	4 December 2017	Aden Morgan Kawalya	District Community Development Officer	Email: morgan.aden@yahoo.com
	District Veterinary Officer	4 December 2017	Kaddu Nsubugga	Veterinary Officer	
	Kyayi HCIII	27 November 2017	Rose Nasirumbi	In Charge	Tel: +256779303265
	Maddu HCIV	27 November 2017	Deogratius Kiyaga	In Charge	Email: deokiyaga@gmail.com Tel: +256772427861
	FGD Community Leaders, Kyengera Village (Maddu Subcounty)	4 December 2017	Rev Nusaabua	Religious Leader	Tel: 078 794 2946
	FGD Women, Kyengera (Maddu Subcounty)	4 December 2017	Sharon Komugisha	Village Resident	Tel: 075 207 1646
	KII Business Owners, Kyengera (Maddu Subcounty)	4 December 2017	Deogratius Ssegawa	Business Owner	Tel: 077 340 1094
	KII Chairmen, Kyengera (Maddu Subcounty)	4 December 2017	Shawn Komugisha	Chairperson	Tel: 075 228 1646
	KII Credit Access, Kyengera (Maddu Subcounty)	4 December 2017	Sharon Komugisha	Village Resident	Tel: 0752 281 646
	KII Religious Leaders, Kyengera (Maddu Subcounty)	4 December 2017	Pastor George Kanzire	Religious Leader	Tel: 077 433 6680

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Teachers, Kyengera (Maddu Subcounty)	4 December 2017	Samuel Katamba	Head teacher	Tel: 078 272 1593
	SGI Pastoralists, Kyengera (Maddu Subcounty)	4 December 2017	Robert Nahuria	Business Owner	Tel: 077 673 9525
	Village Administration, Community Members (Men and Women), Bugula				
Sembabule	District Agricultural Expert	16 November 2017	Emmanuel Kawooya Kalungi	Agricultural Expert	Tel: 0772 351 701
	District Land Expert	16 November 2017	Stephen Mubiru	Land Management Officer	
	District Population, Housing and Social Development Expert	16 November 2017	Batte Frank Sekimpi	Population Officer	
	District Natural Resources Officer	18 November 2017	Francis Byarugaba	Senior Environment Officer	Tel: 0756 565 445
	District Community Development Officer	22 November 2017	Stella Karungi	Community Development Officer	
	Sembabule DHMT	28 November 2017	Dr Charles Matovu	DHMT	Email: matovucharl@yahoo.com Tel: +256772693561
	Sembabule HCIV	28 November 2017	Dr Simon Kasibante	In Charge	Tel: +256752555447
	FGD Community Leaders, Bulakati Village (Lwebitakuli Subcounty)	17 November 2017	Flugyensla Luegelmwa	Village Resident	Tel: 0759 188 733
	FGD Women, Bulakati Village (Lwebitakuli Subcounty)	17 November 2017	Margaret Haggirinya	Chairperson	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Chairmen, Bulakati (Lwebitakuli Subcounty)	17 November 2017	Mbazira Paul	Chairperson	
	FGD Community Leaders, Miti Village (Mijwala Subcounty)	20 November 2017	Hassi Ssemaudis	Chairperson	Tel: 0752 984 071
	FGD Women, Miti Village (Mijwala Subcounty)	20 November 2017	Faridah Namukasa	Village Resident	Tel: 0752 575 192
	FGD Community Leaders, Muyenje Village (Mijwala Subcounty)	20 November 2017	Joseph Mutyaba	Chairperson	Tel: 075 349 1480
	FGD Women, Muyenje Village (Mijwala Subcounty)	20 November 2017	Gerturde Nabasamba	Village Resident	Tel: 0752 791 505
	FGD Women, Nsambya Village (Mijwala Subcounty)	20 November 2017	Rose Nakibuka	Village Resident	Tel: 0705 540 697
	KII Business Owners, Miti (Mijwala Subcounty)	20 November 2017	Nanyunja Zulaika	Business Owner	Tel: 075 441 2515
	KII Business Owners, Muyenje (Mijwala Subcounty)	20 November 2017	Peregirino Kananora	Business Owner	
	KII Chairmen, Nsambya (Mijwala Subcounty)	20 November 2017	Sarah Naluwmbe	Vice Chairperson	Tel: 0754 178 283
	KII Religious Leaders, Nsambya (Mijwala Subcounty)	20 November 2017	Maria Yasente Nakawuka	Religious Leader	Tel: 0753 085 756
	KII Religious Leaders, Serinya (Lugusulu Subcounty)	20 November 2017	Julius Bamukunda	Religious Leader	
	KII Teachers, Muyenje (Mijwala Subcounty)	20 November 2017	Rose Nansamba	Chairperson	Tel: 075 551 2630

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	SGI Pastoralists, Miti (Mijwala Subcounty)	20 November 2017	John Buterere	Village Resident	Tel: 0785 303 786
	KII Boda Boda Taxi's, Miti (Mijwala Subcounty)	21 November 2017	Abdallah Kitaata	Boda Boda Driver	
	KII Business Owners, Nsambya (Mijwala Subcounty)	21 November 2017	Godfrey Wasswa	Business Owner	
	KII Chairmen, Miti (Mijwala Subcounty)	21 November 2017	Gerald Mukasa	Chairperson	
	KII Chairmen, Nsambya (Mijwala Subcounty)	21 November 2017	Ssemwanga Ssalongo	Chairperson	Tel: 0752 996 335
	KII Chairmen, Sembabule (Sembabule TC Subcounty)	21 November 2017	Gertrude Nakabugo	Chairperson	Tel: 075 235 1522
	KII Teachers, Sembabule (Sembabule TC Subcounty)	21 November 2017	Freedom Katusiime	Teacher	Tel: 0775 468 005
	SGI Crop Farmers, Miti (Mijwala Subcounty)	21 November 2017	M Revhanya	Crop Farmer	Tel: 0756 738 223
	SGI Crop Farmers, Nsambya (Mijwala Subcounty)	21 November 2017	Amina Nakazzi	Crop Farmer	Tel: 0751 015 861
	SGI Pastoralists, Miti (Mijwala Subcounty)	21 November 2017	William Mwebaze	Village Resident	Tel: 0757 812 633
	FGD Men, Sembabule (Sembabule Subcounty)	22 November 2017	Jude Kasercende	Chairperson	Tel: 0752 598 743
	FGD Women, Kagango Village (Lugusulu Subcounty)	22 November 2017	Oliver Nakayiwa	Councilor	Tel: 075 750 8482

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Women, Sembabule Village (Sembabule TC Subcounty)	22 November 2017	Gertrude Nakabugo	Chairperson	Tel: 075 235 1522
	KII Business Owners, Kagango (Lugusulu Subcounty)	22 November 2017	Benon Ssemboze	Business Owner	Tel: 0755 767 108
	KII Business Owners, Sembabule (Sembabule TC Subcounty)	22 November 2017	Myers Kwehangana	Business Owner	Tel: 0785 001 644
	KII Chairmen, Kagango (Lugusulu Subcounty)	22 November 2017	Francis Mulindwa	Chairperson	
	KII Chairmen, Serinya (Lugusulu Subcounty)	22 November 2017	Vincent Ssentongo	Chairperson	Tel: 075 172 4953
	KII Commercial Farmers, Kagango (Lugusulu Subcounty)	22 November 2017	Nantaayi Annet	Nurse	Tel: 0758 527 355
	KII Community Health Staff, Sembabule (Sembabule TC)	22 November 2017	Francis Namuyingo	Nurse	
	KII Credit Access, Serinya (Lugusulu Subcounty)	22 November 2017	Vincent Ssempijja	Village Resident	Tel: 0751 724 953
	KII Teachers, Kagango (Lugusulu Subcounty)	22 November 2017	Bisamu Apollo Ainebyona	Director of Studies	Tel: 0754 564 887
	FGD Community Leaders, Mabale Village (Lugusulu Subcounty)	23 November 2017	Joy Natamba	Village Resident	
	FGD Community Leaders, Njaza Village (Lugusulu Subcounty)	23 November 2017	Moreen Namala	Village Resident	Tel: 075 321 0651
	FGD Men, Serinya (Lugusulu Subcounty)	23 November 2017	Sebastian Meduusa	Village Resident	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Women, Mabale (Lugusulu Subcounty)	23 November 2017	Kanottiri	Village Resident	Tel: 075 090 7671
	FGD Women, Serinya (Lugusulu Subcounty)	23 November 2017	Hamibah Nantume	Village Resident	Tel: 075 457 0765
	KII Boda Boda Taxi's, Njaza (Lugusulu Subcounty)	23 November 2017	Charles Tibamanya	Boda Boda Driver	
	KII Chairmen, Mabale (Lugusulu Subcounty)	23 November 2017	Fred Mwebaze	Chairperson	Tel: 075 596 8462
	KII Chairmen, Njaza (Lugusulu Subcounty)	23 November 2017	Maureen Namara	Village Reason	Tel: 075 321 0651
	KII Youth Leaders, Mabale (Lugusulu Subcounty)	23 November 2017	Abaho Amos	Youth Chairperson	Tel: 0755 622 207
	KII Youth Leaders, Njaza (Lugusulu Subcounty)	23 November 2017	Frank Abahd	Village Resident	Tel: 078 380 9975
	SGI Pastoralists, Mabale (Lugusulu Subcounty)	23 November 2017	Mishack Ngungu	Village Resident	Tel: 0759 559 516
	SGI Pastoralists, Njaza (Lugusulu Subcounty)	23 November 2017	William Kalema	Pastoralist	Tel: 075 280 4772
	Community Members (Women), Sembabule (Sembabule TC)				
	Village Administration, Community Members (Men and Women), Serinya (Lugusulu Subcounty)				

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Lwengo	District Chief Administrative Officer	13 November 2017	Anatoli Bukera	Principal Assistant secretary	
	District Community Development Officer	13 November 2017	Joseph Mazinga	Community Development Officer	
	District Environmental Officer	13 November 2017	Francis Byarugaba	Senior Environment Officer	
	District Police, Social Welfare and Probation Officer	13 November 2017	Musimenta Obadia	District Internal Security Officer	
	District Veterinary Officer	13 November 2017	Samuel Mukuye Mugenyi	Veterinary Doctor	
	District Kingdom Representatives	14 November 2017	Francis Serungogi	Buganda Kingdom Focal Person for Lwengo Town Council	
	District Agricultural Expert	17 November 2017	Bail Kashangyeyo	District Agricultural Expert	
	District Entomology Officer	17 November 2017	Olive Oamali	District Entomology Officer	Tel: 0772 612 047
	Lwengo DHMT	29 November 2017	Dr Joseph Mutyogoma	DHMT	Tel: +256702656176
	Lwengo HCIV	29 November 2017	Judith Tugabirwe	In Charge	Tel: +256703461048
	FGD Community Leaders, Bukulula Village (Ndagwe Subcounty)	13 November 2017	Jamil Bukenya	Teacher	Tel: 0774 325 373

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Women, Bukulula Village (Ndagwe Subcounty)	13 November 2017	Mary Nnakamulagi	Councilor	Tel: 0787 109 590
	KII Business Owners, Bukulula (Ndagwe Subcounty)	13 November 2017	Ali Katongole	Business Owner	
	KII Chairmen, Bukulula (Ndagwe Subcounty)	13 November 2017	Nagirinya Margaret	Chairperson	
	KII Community Health Staff, Bukulula (Ndagwe Subcounty)	13 November 2017	John Paul Mpitumukiza	Nurse	Tel: 0788 305 134
	KII Teachers, Bukulula (Ngadwe Subcounty)	13 November 2017	Jamil Bukenya	Teacher	
	KII Traditional Healers, Bukulula (Ngadwe Subcounty)	13 November 2017	Maria Nakatte	Traditional Birth Attendant	
	KII Boda Boda Taxi's, Bukulula (Ngadwe Subcounty)	15 November 2017	John Kawalya	Boda Boda Chairperson	
	KII Commercial Farmers, Kinvunikidde (Lwengo Subcounty)	15 November 2017	Solomon	Farmer	
	FGD Community Leaders, Kinvunikidde Village (Lwengo Subcounty)	16 November 2017	Frank Muwebi	Youth Chairperson	Tel: 0759 505 783
	FGD Community Leaders, Mbirizi Village (Lwengo TC)	16 November 2017	Christopher Ssekadu	Village Resident	Tel: 0753 160 257
	FGD Women, Kinvunikidde Village (Lwengo Subcounty)	16 November 2017	Molly Musabe	Village Resident	Tel: 0706 132 605
	FGD Women, Mbirizi Village (Lwengo TC Subcounty)	16 November 2017	Eva Namanda	Village Resident	Tel: 070 466 2722

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Chairmen, Kinvunikidde (Lwengo Subcounty)	16 November 2017	Edward Lukyamuzi	Chairperson	Tel: 0758 895 913
	KII Chairmen, Mbirizi (Lwengo TC Subcounty)	16 November 2017	Kyeyune Thwaha	Chairperson	Tel: 0752 330 809
	KII Commercial Farmers, Kinvunikidde (Lwengo Subcounty)	16 November 2017	Alex Owokuhaisia	Village Resident	Tel: 0754 760 660
	KII Guesthouses and Hotels, Mbirizi (Lwengo TC Subcounty)	16 November 2017	Hamidu Ndyanabo	Village Resident	
	KII Religious Leaders, Mbirizi (Lwengo TC Subcounty)	16 November 2017	James Zaake	Senior Pastor	
	SGI Natural Resource users, Kinvinikidde (Lwengo Subcounty)	16 November 2017	Edward Lubyenwega	Natural Resource User	
	KII Boda Boda Taxi's, Mbirizi (Lwengo Subcounty)	17 November 2017	Ahamed Bukenya	Boda Boda Driver	
	KII Commercial Farmers, Mbirizi (Lwengo TC Subcounty)	17 November 2017	Paul Byamugisha	Medical Doctor	
	KII Credit Access, Mbirizi (Lwengo Subcounty)	17 November 2017	Stephen Waliggo	Village Resident	
	Cultural Leaders, Community Leaders (Men), Wajinja Cultural Site				
	Village Administration Community Members (Men and Women), Mbirizi (Lwengo Subcounty)				

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Rakai	District Agricultural Expert	7 November 2017	Yusuf Lubega Wakatuntu	District Production Officer	
	District Chief Administrative Officer	7 November 2017	Alex Kwizera	Chief Administrative Officer	
	District Community Development Officer	7 November 2017	Ruth Namyanja	Senior CDO, Directorate of Community Services	
	District Economic Affairs	7 November 2017	Jackson Matovu	Commerce Officer	
	District Environmental Officer	7 November 2017	Richard Bikande Kalungi	Environment Officer	
	District Kingdom Representatives	7 November 2017	Godfrey Kimbugwe	Deputy Prime Minister of Kooki Kingdom	
	District Land Expert	7 November 2017	Peter Ssenkungu	Land Expert	
	District Natural Resource Officer	7 November 2017	Sylvia Mirembe	Natural Resource Officer	
	District Population, Housing and Social Development Expert	7 November 2017	Henry Segawu	Population, Housing and Social Development Expert	
	District Community Development Officer	9 November 2017	Sylvia Nassolo	Community Development officer	
	Rakai DHMT	1 December 2017	Rasto Muhangi	DHMT	Email: rastomuhangi@gmail.com Tel: +256704661440

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	OEASSI				
	FGD Women, Lwemisege Village (Kifamba Subcounty)	8 November 2017	Noe Najjing	Village Resident	Tel: 0759 273 234
	KII Chairmen, Lwemisege (Kifamba Subcounty)	9 November 2017	Deogratius Ssenyonjo	Chairperson	
	KII Community Health Staff, Lwemisege (Kifamba Subcounty)	9 November 2017	Betty Nansubuga	Health Worker	
	KII Boda Boda Taxi's, Butiti (Lwanda Subcounty)	12 November 2017	Bonifance Ssekitoleko	Boda Boda Driver	
	FGD Women, Butiti Village (Lwanda Subcounty)	13 November 2017	Gyanuiira Makagaayi	Village Resident	Tel: 0702 137 590
	KII Chairmen, Butiti (Lwanda Subcounty)	13 November 2017	Kabanda Vincent	Chairperson	
	KII Teachers, Butiti (Lwanda Subcounty)	13 November 2017	Kabanda Vincent	Chairperson	
	KII Traditional Hearers, Butiti (Lwanda Subcounty)	13 November 2017	Ssekitoleko Christopher	Traditional Healer	
	Lwanda HCIII	30 November 2017	Henry Muyinda	In Charge	Email: henrylab2009@gmail.com Tel: +256783688066
Kyotera	District Livestock Experts	7 November 2017	Mujaasi David	District Livestock Officer	
	District Chief Administrative Officer	8 November 2017	Robert Kyambaddle	Principal Internal Auditor	
	District Education Officer	8 November 2017	Mathias Kigoye	District Education Officer	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	District Environmental Officer	8 November 2017	Olivia Nakaliri	Physical Planner	
	District Fishery Expert	8 November 2017	Joseph Bwanika	Fishery Expert	
	District Natural Resource Officer	8 November 2017	Olivia Nakaliri	Physical Planner	
	District Population, Housing and Social Development Expert	8 November 2017	Judith Nakayote	District Planner	
	Kyotera DHMT	30 November 2017	Dr Wangumbiizi George	DHMT	Email: waggumbulizigeorge@gmail.com Tel: +256772 876320
	KII Business Owners, Kyotera (Kyotera Subcounty)	5 November 2017	Henry	Business Owner	
	FGD Community Leaders, Mutukula Village (Kakuuto Subcounty)	6 November 2017	Hadissa Mbabazi	Business Community	Tel: 0771 034 814
	FGD Women, Mutukula Village (Kakuuto Subcounty)	6 November 2017	Betty Namoyiga	Councilor	Tel: 0782 982 069
	KII Boda Boda Taxi's, Mutukula (Kakuuto Subcounty)	6 November 2017	Katende Bakari	Chair of Boda Boda Association	
	KII Business Owners, Mutukula (Kakuuto Subcounty)	6 November 2017	Manzi George William	Produce Seller	
	KII Chairmen, Mutukula (Kakuuto Subcounty)	6 November 2017	Charles Ssali	Senior Town Clerk	
	KII Community Health Staff, Mutukula (Kakuuto Subcounty)	6 November 2017	Mathias Bongoli	Health Assistant	
	SGI Crop Farmers, Mutukula (Kakuuto Subcounty)	6 November 2017	Denis Kaleaa	Crop Farmer	Tel: 0772 999 977

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Chairmen, Mutukula (Kakuuto Subcounty)	7 November 2017	Asiimwe Fatumah	Village Resident	Tel: 0782 551 206
	KII Commercial Farmers, Mutukula (Kakuuto Subcounty)	7 November 2017	Haddya Namayanja	Business Community	Tel: 0782 292 370
	KII Community Health Facility, Mutukula (Kakuuto Subcounty)	7 November 2017	Namakula Flavia	Nurse	
	KII Religious Leaders, Mutukula (Kakuuto Subcounty)	7 November 2017	Father Migadde Gerlad	Religious Leader	
	KII Teachers, Mutukula (Kakuuto Subcounty)	7 November 2017	Richard Burungu	Teacher	Tel: 0772 873 410
	SGI Pastoralists, Mutukula (Kakuuto Subcounty)	7 November 2017	Geofrey Luzibiza	Pastoralist	Tel: 0775 638 189
	FGD Community Leaders, Lukulavu Village (Kakuuto Subcounty)	8 November 2017	Friday Ssemugolwa	Village Resident	Tel: 0788 049 812
	FGD Community Leaders, Ssanje Katwe (Kasasa Subcounty)	8 November 2017	Alex Kskeeo	Local Leader	Tel: 0752 215 010
	FGD Women, Lukulavu Village (Kakuuto Subcounty)	8 November 2017	Mariam Hakanwag	Village Resident	Tel: 0779 515 441
	KII Youth Leaders, Ssanje Katwe (Kasasa Subcounty)	8 November 2017	Francis Mutaaya	Village Resident	Tel: 0778 933 143
	FGD Women, Ssanje Katwe (Kasasa Subcounty)	8 November 2017	Aisha Masazi	Village Resident	Tel: 0704 896 191
	KII Community Development Officer and Women's Chair, Kyotera (Kyotera TC Subcounty)	8 November 2017	Jane Francis	Women's Council Chairperson	Tel: 070 398 8111

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Teachers, Mutukula (Kakuuto Subcounty)	8 November 2017	Mathias Kigoye	Education Officer	
	KII Business Owners, Ssanje Katwe (Kasasa Subcounty)	9 November 2017	Samuel Mugisha	Business Owner	
	KII Commercial Farmers, Ssanje Katwe (Kasasa Subcounty)	9 November 2017	Ruth	Nurse	
	KII Credit Access, Ssanje Katwe (Kasasa Subcounty)	9 November 2017	Patricia Nabukalu	Village Resident	
	KII National Water and Sewage Corporation, Ssanje Katwe (Kasasa Subcounty)	9 November 2017	Joan Namugenyi	Office Assistant and Customer Relations Manager	
	KII Religious Leaders, Lukulavu (Kakuuto Subcounty)	9 November 2017	Kiyimba Jamira	Head of Muslim Community	
	KII Teachers, Lukulavu (Kakuuto Subcounty)	9 November 2017	Kasiita Ismail	Principal (Secondary School)	
	SGI Pastoralists, Lukulavu (Kakuuto Subcounty)	9 November 2017	Not specified		
	FGD Community Leaders, Lukoma Village (Kakuuto Subcounty)	10 November 2017	K Buterere	Village Resident	Tel: 0789 518 584
	FGD Women, Kabonera Village (Kakuuto Subcounty)	10 November 2017	Margaret Nadela	Village Resident	Tel: 0703 219 254
	FGD Women, Lukoma Village (Kakuuto Subcounty)	10 November 2017	Kositasia Mompijja	Village Resident	
	KII Business Owners, Kabonera (Kakuuto Subcounty)	10 November 2017	Rahima Wakyanja	Business Owner	

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Chairmen, Kabonera (Kakuuto Subcounty)	10 November 2017	Peter Mweruka	Chairperson	
	KII Chairmen, Lukoma (Kakuuto Subcounty)	10 November 2017	Lawrence Lukyamuzi	Chairperson	
	KII Guesthouses and Hotels, Kabonera (Kakuuto Subsounty)	10 November 2017	Julius Bawnnika	Village Resident	
	KII Police, Kabonera (Kakuuto Subsounty)	10 November 2017	George Ojwary	Police Chief	
	KII Teachers, Kabonera (Kakuuto Subsounty)	10 November 2017	Maureen Brigitte	Teacher	
	KII Traditional Hearers, Lukoma (Kakuuto Subsounty)	10 November 2017	Namakula Giraida	Traditional Healer	
	KII Youth Leaders, Kabonera (Kakuuto Subsounty)	10 November 2017	Mary Namweuka	Village Resident	Tel: 0702 051 406
	SGI Crop Farmers, Lukoma (Kakuuto Subsounty)	10 November 2017	Nalubega	Crop Farmer	Tel: 0787 212 842
	KII Teachers, Ssanje Katwe (Kasasa Subsounty)	11 November 2017	Francis Kizza	Teacher	
	FGD Community Leaders, Bethlehem Village (Nabigasa Subcounty)	14 November 2017	Antony Kasuka	Chairperson	Tel: 0703 276 158
	FGD Women, Bethlehem Village (Nabigasa Subcounty)	14 November 2017	Shamim Nalwgo	Village Resident	Tel: 0701 128 292
	FGD Women, Kyakudusi Village (Kasaali Subcounty)	14 November 2017	Hadija Namugenua	Village Resident	Tel: 0700 341 574

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Table C1.2-3 Local-Level Stakeholders Consulted, Baseline and Impact Assessment Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	KII Business Owners, Kyakudusi (Kasaali Subcounty)	14 November 2017	Vincent Sselwanga	Business Owner	
	KII Business Owners, Bethlehem (Nabigasa Subcounty)	14 November 2017	Ahmed Mutebi	Business Owner	
	KII Chairmen, Kyakudusi (Kasaali Subcounty)	14 November 2017	Kayiwa Joseph	Chairperson	
	KII Commercial Farmers, Bethlehem (Nabigasa Subcounty)	14 November 2017	Bashir Semakula	Clinical Officer	
	KII Community Health Staff, Bethlehem (Nabigasa Subcounty)	14 November 2017	Bashir Semakula	Clinical Officer	Tel: 0783 817 339
	SGI Crop Farmers, Bethlehem (Nabigasa Subcounty)	14 November 2017	Martin Kajjubi	Manager of Aquaculture Farm	
	SGI Natural Resource Users, Bethlehem (Nabigasa Subcounty)	14 November 2017	Idris Nkalubo	Natural Resource User	Tel: 0752 258 521
	Mutukula HCIII	30 November 2017	Clare Kiririsa	In Charge	Tel: +256754962526
	Community Members (Men and Women), Mutukula (Kakuuto Subcounty)				
	Village Administration, Community Members (Men and Women), Lukoma (Kakuuto Subcounty)				

*Please note that contact information was not always provided by stakeholders.

C1.3 Stakeholders Consulted and Contact Information During Pre-Submission Phase

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Hoima	Hoima District Technical Planning Committee/ Political Leaders	6 June 2018	Luno Aliguma	Community Development Officer	Tel: 0782 482 122
	Kigorobya Subcounty	6 June 2018			
	Kigorobya Town Council	6 June 2018			
	Kiziranfumbi Subcounty	6 June 2018	Mugengi Ibrahim Juma	Chairperson	Tel: 0772 984 951
	Kakende Village (Kiziranfumbi Subcounty)	9 June 2018	Charles Ngoboka	Kakende Chairperson	Tel: 0781 824 609
	Kijugunya Village (Buhimba Subcounty)	9 June 2018	Kiiza Abdul	General Secretary	
Kakumiro	Kakumiro District Technical Planning Committee/ Political Leaders	12 June 2018	Kiiza Abdul	General Secretary	
	Mpasaana Subcounty	8 June 2018	Fred Sebwileera	Sub County Chief	Tel: 0782 872 099
	Kisiita Subcounty	9 June 2018	Naijuko Caroline	Agricultural Officer	
	Nkooko Subcounty	11 June 2018	Tadeo Kasamba	Kibijoli Parish Chief	Tel: 0775 634 191
	Katikara Subcounty	12 June 2018	Venancie Nyakoojo	Health Assistant/ Chairperson Land Committee	

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	Kisiita Town Council	9 June 2018	Aryampe Jackson	Chairperson	
	Kyajawe B Village (Mpasaana Subcounty)	8 June 2018	Rushogoza Israel	Village Resident	
Kyankwanzi	Kyankwanzi District Technical Planning Committee/ Political Leaders	7 June 2018	Ibrahim Kabuuka	District Environmental Officer	Tel: 0777 896 750
	Ntwetwe Subcounty	7 June 2018	Sekamatte Vicent	Speaker	
	Kisala West Village (Gayaza Subcounty)	7 June 2018	Boaz Twinomujuni	Village Resident	
Mubende	Mubende District Technical Planning Committee/Political Leaders	13 June 2018	Geoffrey Kamya	Fisheries Officer	Tel: 0772 545 308
	Butoloogo Subcounty	14 June 2018	Mukze Mutabau	Chairperson	Tel: 0704 326 778
	Kitenga Subcounty	14 June 2018	Johon Mulindwa	Vice Chairperson	Tel: 0700 174 878
	Madudu Subcounty	18 June 2018	Habiyeremye Edward	Chairperson	
	Kasambya Village (Bagezza Subcounty)	12 June 2018	Asiimwe Livingstone	Village Resident	
	Kisagazi Village (Butoloogo Subcounty)	14 June 2018	Twebaze Emmanuel	Village Resident	
	Kyenda Village (Kitenga Subcounty)	16 June 2018	Habimana Benjamin	Chairperson	

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Kibaale	Kijaguzo Village (Kasambya Subcounty)	16 June 2018	L.Z. Ssekbambolo	Village Resident	Tel: 0788 833 912
Mubende	Lugala Community Meeting	29 August 2018	Charles Tumuhairwe	Village Resident	
	FGD Community Leaders, Lugala Village (Kitenga Subcounty)	29 August 2018			
	KII Chairmen, Lugala Village (Kitenga Subcounty)	29 August 2018	Godfrey Sewanyana	Chairperson	
	KII Religious Leaders, Lugala Village (Kitenga Subcounty)	29 August 2018	Mukwaya Josephat		
	KII Traditional Healers, Lugala Village (Kitenga Subcounty)	29 August 2018	John Mwesige		
	FGD Community Leaders, Mijunwa Village (Kitenga Subcounty)	31 August 2018			
	FGD Women, Lugala Village (Kitenga Subcounty)	31 August 2018			

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Women, Mijunwa Village (Kitenga Subcouny)	31 August 2018			
	KII Business Owners, Mijunwa Village (Kitenga Subcounty)	31 August 2018	Kato Hussein	Village Resident	
	SGI Crop Farmers, Lugala Village (Kitenga Subcounty)	31 August 2018	Edward Ssazi	Village Resident	
	SGI Crop Farmers, Mijunwa Village (Kitenga Subcounty)	31 August 2018	Edward Rutabishunga	Village Resident	
	SGI Pastoralists, Mijunwa Village (Kitenga Subcounty)	31 August 2018	Ezekiel Mwesigye	Village Resident	
Gomba	Mijunwa Community Meeting	30 August 2018	Faisal Zziwa	Village Resident	
	Gomba District Technical Planning Committee/ Political Leaders	19 June 2018	Rubaraza Kyobutungi	District Natural Resources Officer	Tel: 0772 967 669
	Maddu Subcounty	15 June 2018	Abaho Emmanuel	Vice Chairperson	
	Kyetume Village	15 June 2018	Mugabi Edward	Chairperson	

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Sembabule	Sembabule District Technical Planning Committee/ Political Leaders	14 June 2018	Byarugaba Francis	Natural Resource Officer	
	Lugusulu Subcounty	15 June 2018	Minsaki Busula		
	Sembabule Market Zone (Sembabule TC)	14 June 2018	Sylvia Ndibalekera	Village Resident	
	Serinya A and B Villages (Lugusulu Subcounty)	15 June 2018	Gertrude Nagirinya	Village Resident	
	Bulakati Village (Lwebitakuli Subcounty)	16 June 2018	John Bosco Bukenya	Village Resident	
Lwengo	Lwengo District Technical Planning Committee/ Political Leaders	13 June 2018	Daniel Odonga	Physical Planner	Tel: 0772 491 180
	Kinvunikidde Village (Lwengo Subcounty)	13 June 2018	Charles Ssemwanga	Village Resident	

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
Rakai	Rakai District Technical Planning Committee/ Political Leaders	6 June 2018	Edward Kamya	District Chief Administrative Officer	Tel: 0775336422
	Kifamba Subcounty	6 June 2018	Sylvia Nassolo	Community Development Officer	Tel: 0782 488 506
	Lwanda Subcounty	6 June 2018	Charles Mwliida	Chairperson	Tel: 0782 937 349
	Kamuli Village (Lwanda Subcounty)	6 June 2018	Kato Charles		
Kyotera	Kyotera District Technical Planning Committee / Political Leaders	7 June 2018	Michael Kawessi	District Chief Administrative Officer	Tel: 0772 921 971
	Kasasa Subcounty	8 June 2018	Wilberforce Kibira	Senior Assistant Secretary	
	Kakuuto Subcounty	11 June 2018	Stephen Ssebunnya	Sub County Chairperson	Tel: 0772 921 951
	Nabigasa Subcounty	13 June 2018	Vincent Kayondo	Councillor	Tel: 0702 628 863
	Lukoma Village (Kakuuto Subcounty)	9 June 2018	John Mary Nsamba		
	Kabonera Village (Kakuuto Subcounty)	11 June 2018	Peter Mweruka	Chairperson	Tel: 0784 073 731
	Bukalasa Village (Kasaali Subcounty)	12 June 2018	Nalongo Nasamula	Village Resident	
	Kabugimbi Community Meeting	24 August 2018	Fred Yoga	Village Resident	
	FGD Community Leaders, Kabujimbi	23 August 2018	Betty Mampijja	Village Resident	

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	Village (Kakuuto Subcounty)				
	FGD Women, Kabugimbi Village (Kakuuto Subcounty)	24 August 2018			
	KII Business Owners, Kabujimbi Village (Kakuuto Subcounty)	24 August 2018	Ssentogo John	Village Resident	
	KII Chairmen, Kabujimbi Village (Kakuuto Subcounty)	24 August 2018	Jackson Walugembe	Vice Chairperson	
	KII Religious Leader, Kabujimbi Village (Kakuuto Subcounty)	24 August 2018	William Kebegumira	Religious Leader	
	KII Traditional Healers, Kabujimbi Village (Kakuuto Subcounty)	24 August 2018	Mirugwe Emmanuel	Village Resident	
	SGI Crop Farmer, Kabujimbi Village (Kakuuto Subcounty)	24 August 2018	Masagazi Matia	Village Resident	
	SGI Pastoralists, Kabujimbi Village (Kakuuto Subcounty)	24 August 2018	Diana Kembabazi	Village Resident	
	FGD Community Leaders, Bigada Village (Kakuuto Subcounty)	25 August 2018			

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Women, Bigada Village (Kakuuto Subcounty)	25 August 2018			
	KII Chairmen, Bigada Village (Kakuuto Subcounty)	25 August 2018	Joseph Kasujja	Chairperson	
	KII Religious Leaders, Bigada Village (Kakuuto Subcounty)	25 August 2018	Sister Mukulu		
	KII Traditional Healers, Bigada Village (Kakuuto Subcounty)	25 August 2018	Getrude	Village Resident	
	SGI Crop Farmers, Bigada Village (Kakuuto Subcounty)	25 August 2018	Richard Binywera	Village Resident	
	Bigada Community Meeting	26 August 2018	Judas Semanda	Village Resident	
	Nabigasa Community Meeting	27 August 2018	Mukasa Kase	Village Resident	
	FGD Community Leaders, Nabigasa Village (Kakuuto Subcounty)	27 August 2018			

*Please note that contact information was not always provided by stakeholders.

Table C1.3-1 Local-Level Stakeholders Consulted, Pre-Submission Phase

District	Meeting	Date	Contact Name	Position	Contact Details
	FGD Women, Nabigasa Village (Kakuuto Subcounty)	27 August 2018			
	KII Beekeeper, Nabigasa Village (Kakuuto Subcounty)	27 August 2018	Gerald Ssansi	Village Resident	
	KII Chairmen, Nabigasa Village (Kakuuto Subcounty)	27 August 2018	Ventino Mwesigwa	Chairperson	
	KII Religious Leader, Nabigasa Village (Kakuuto Subcounty)	27 August 2018	Mugumya Protas	Village Resident	
	KII Traditional Healers, Nabigasa Village (Kakuuto Subcounty)	27 August 2018	Madalane Nakasette	Village Resident	
	SGI Crop Farmers, Nabigasa Village (Kakuuto Subcounty)	27 August 2018	Evaristo Kiyemba	Village Resident	
	SGI Pastoralists, Nabigasa Village (Kakuuto Subcounty)	27 August 2018	Kasekende Asuman	Village Resident	

*Please note that contact information was not always provided by stakeholders.

C1.4 Additional Stakeholders Consulted for the Cumulative Impact Assessment

National Consultees[1]	**Town Council Consultees**
Ministry of Agriculture, Animal Industry and Fisheries	Buseruka Town Council
Ministry of Tourism, Wildlife and Antiquities	Kigorobya Town Council
Ministry of Lands, Housing and Urban Development	Lwengo Town Council
Ministry of Water and Environment	Kasaali Town Council
Ministry of Energy and Mineral Development	Kyotera Town Council
National Environment Management Authority	Sembabule Town Council
Uganda Chamber of Mines and Petroleum	**Subcounty Consultees**
Uganda National Roads Authority	Gayaza Subcounty
Uganda Electricity Transmission Company Limited	Ntwetwe Subcounty
National Water and Sewage Corporation	Mpasaana Subcounty
District Consultees	Nkooko Subcounty
Hoima District Office	Kisiita Subcounty
Kakumiro District Office	Madudu Subcounty
Kyankwanzi District Office	Kitenga Subcounty
Gomba District Office	Mijwala Subcounty
Mubende District Office	Lugusulu Subcounty
Sembabule District Office	Ndagwe Subcounty
Lwengo District Office	Nabigasa Subcounty
Rakai District Office	Kasasa Subcounty
	Kakuuto Subcounty
	Kifamba Subcounty

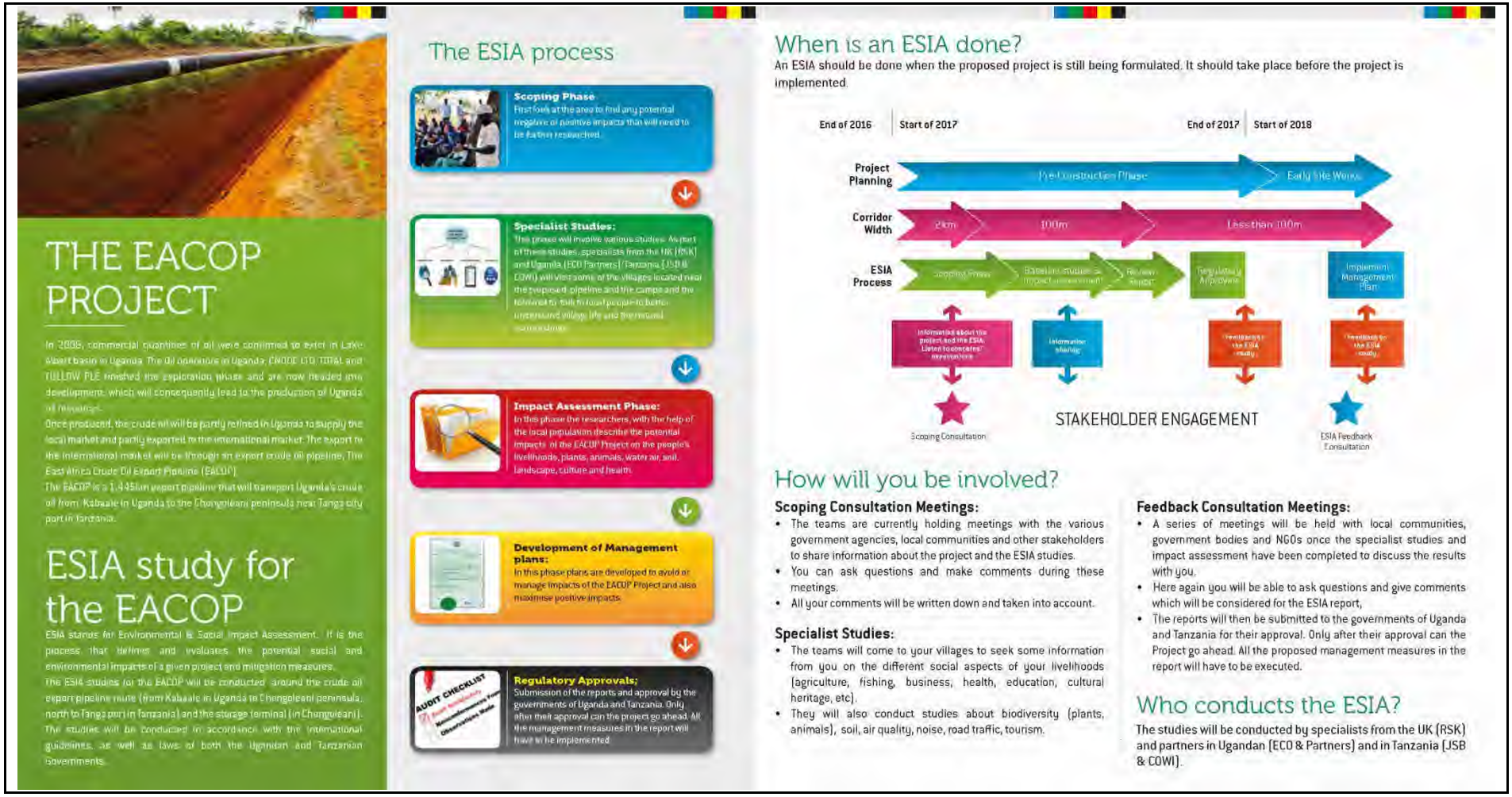
[1] The following stakeholders were consulted for the cumulative impact assessment (CIA). Contact details are available in the tables above.

*Please note that contact information was not always provided by stakeholders.

C2 STAKEHOLDER MATERIALS

C2.1 BID EISA Brochure and Project Brochure

BID EISA Brochure



THE EACOP PROJECT

In 2006, commercial quantities of oil were confirmed to exist in Lake Albert basin in Uganda. The Oil operators in Uganda; CNOOC LTD, TOTAL and TULLOW PLC finished the exploration phase and are now headed into development, which will consequently lead to the production of Uganda's oil resources.

Once produced, the crude oil will be partly refined in Uganda to supply the local market and partly exported to the international market. The export to the international market will be through an export crude oil pipeline, The East Africa Crude Oil Export Pipeline (EACOP).

The EACOP is a 1,445km export pipeline that will transport Uganda's crude oil from Kabaale in Uganda to the Chongoleani peninsula near Tanga city port in Tanzania.

ESIA study for the EACOP

ESIA stands for Environmental & Social Impact Assessment. It is the process that defines and evaluates the potential social and environmental impacts of a given project and mitigation measures.

The ESIA studies for the EACOP will be conducted around the crude oil export pipeline route (from Kabaale in Uganda to Chongoleani peninsula, north to Tanga port in Tanzania) and the storage terminal (in Chongoleani). The studies will be conducted in accordance with the international guidelines, as well as laws of both the Ugandan and Tanzanian governments.

The ESIA process

Scoping Phase
First look at the area to find any potential negative or positive impacts that will need to be further researched.

Specialist Studies:
This phase will involve various studies. As part of these studies, specialists from the UK (RSK) and Uganda (ECO Partners) (Tanzania (JSB & COWI) will visit some of the villages located near the proposed pipeline and the camps and the railroad to talk to local people to better understand village life and the natural surroundings.

Impact Assessment Phase:
In this phase the researchers, with the help of the local population describe the potential impacts of the EACOP Project on the people's livelihoods, plants, animals, water, air, soil, landscape, culture and health.

Development of Management plans:
In this phase plans are developed to avoid or manage impacts of the EACOP Project and also maximise positive impacts.

Regulatory Approvals:
Submission of the reports and approval by the governments of Uganda and Tanzania. Only after their approval can the project go ahead. All the management measures in the report will have to be implemented.

When is an ESIA done?

An ESIA should be done when the proposed project is still being formulated. It should take place before the project is implemented.

How will you be involved?

Scoping Consultation Meetings:

- The teams are currently holding meetings with the various government agencies, local communities and other stakeholders to share information about the project and the ESIA studies.
- You can ask questions and make comments during these meetings.
- All your comments will be written down and taken into account.

Specialist Studies:

- The teams will come to your villages to seek some information from you on the different social aspects of your livelihoods (agriculture, fishing, business, health, education, cultural heritage, etc).
- They will also conduct studies about biodiversity (plants, animals), soil, air quality, noise, road traffic, tourism.

Feedback Consultation Meetings:

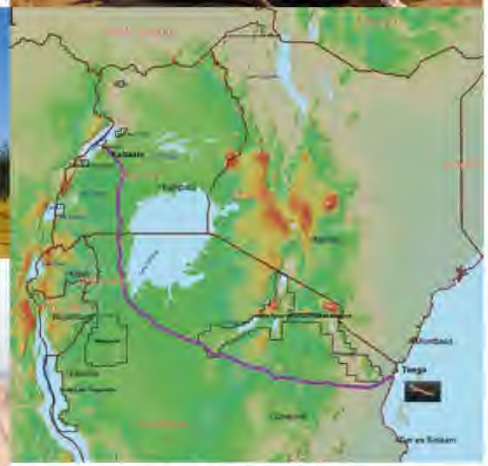
- A series of meetings will be held with local communities, government bodies and NGOs once the specialist studies and impact assessment have been completed to discuss the results with you.
- Here again you will be able to ask questions and give comments which will be considered for the ESIA report,
- The reports will then be submitted to the governments of Uganda and Tanzania for their approval. Only after their approval can the Project go ahead. All the proposed management measures in the report will have to be executed.

Who conducts the ESIA?

The studies will be conducted by specialists from the UK (RSK) and partners in Ugandan (ECO & Partners) and in Tanzania (JSB & COWI).

Social and Environmental Studies to be conducted

- PHYSICAL ENVIRONMENT
  - Surface Water
  - Underground Water
  - Soil
  - Air Quality
  - Noise
  - Landscape
- SOCIO-ECONOMIC ENVIRONMENT
  - Socio-Economic
  - Community and Livestock Health
  - Traffic
  - Education
  - Culture and Archaeology
- BIODIVERSITY
  - Protected Areas and Sensitive Habitats
  - Plants and Animals
  - Fish and Fisheries



The EACOP route from Kabaale (Uganda) to Chongoleani Tanga (Tanzania)

UNOC TOTAL TULLOW OIL

For more information please contact:

EACOP PROJECT IN UGANDA
TEAM - Total East Africa Midstream,
Course View Towers, Plot 21, Yusuf Lule Road,
P.O.Box 34867, Kampala – Uganda
Tel: 0800216500 (Toll free) or +256 (0) 204 916 000
Email: EACOP.info@total.com

EACOP PROJECT IN TANZANIA
TEAM – Total East Africa Midstream,
369 Toure Drive, Ground Floor, Kilwa House, Oysterbay
P.O. Box 23917 Kinondoni Dar-es-Salaam, Tanzania
Tel: +255 (0) 222 296 742
Email: EACOP.info@total.com

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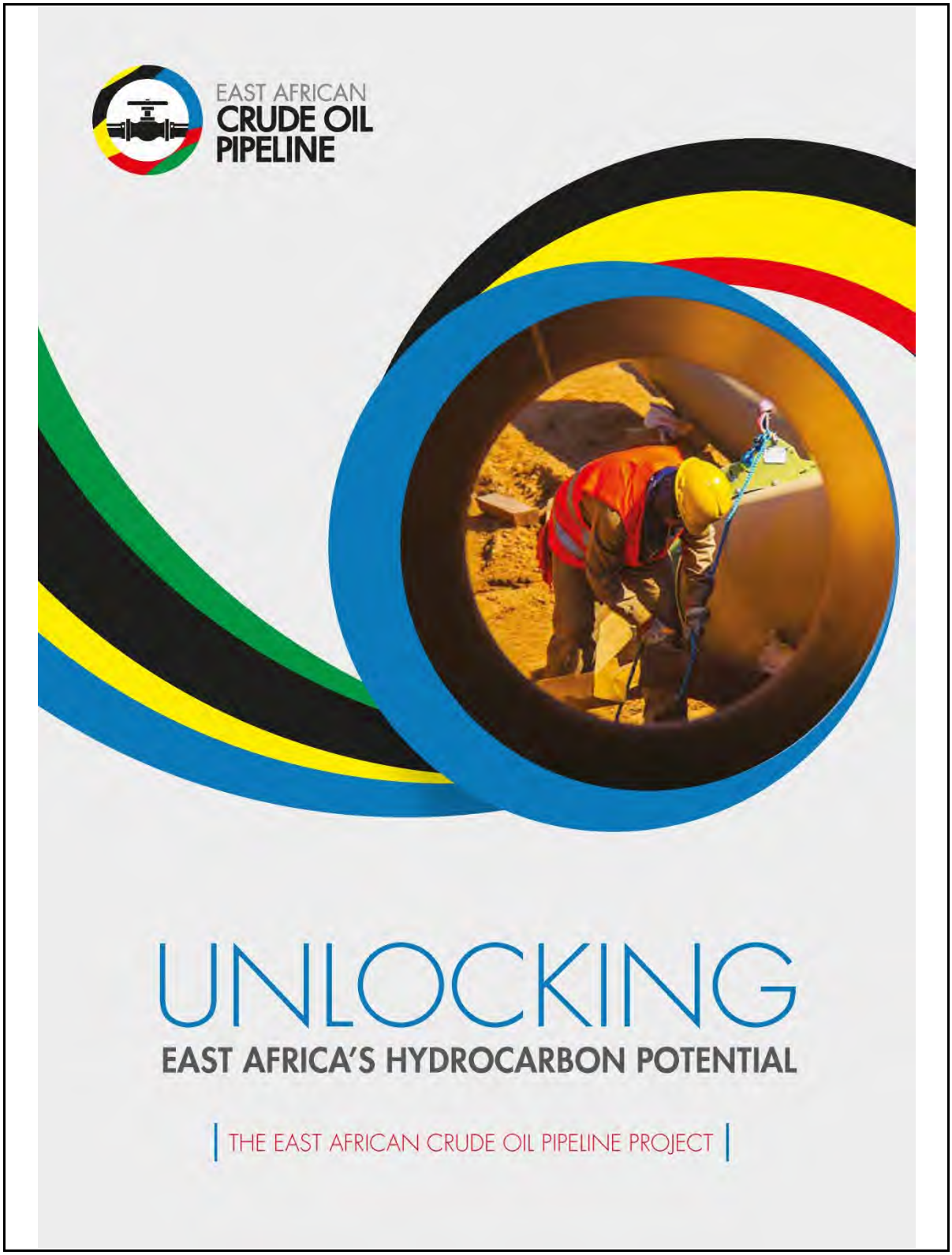
EAST AFRICAN CRUDE OIL PIPELINE

Environmental and Social Impact Study (ESIA)

The longest electrically heated pipeline in the world.

Project Brochure



THE EAST AFRICAN CRUDE OIL PIPELINE (EACOP)

In 2006, commercial quantities of oil were confirmed to exist in Lake Albert basin in Uganda. The Oil companies in Uganda; CNOOC LTD, TOTAL and TULLOW PLC finished the exploration phase and are now headed into development, which will consequently lead to the production of Uganda oil resources.

Once produced, the crude oil will be partly refined in Uganda to supply the local market and partly exported to the international market. The export to the international market will be through an export crude oil pipeline; The East Africa Crude Oil Export Pipeline (EACOP). This pipeline will be constructed and operated through a Pipeline Company with shareholding from the Uganda National Oil Company, the Tanzania Petroleum Development Corporation and the three oil companies, CNOOC, TOTAL and TULLOW.

The EACOP Project

The EACOP is a 1,445km crude oil expart pipeline that will transport Uganda's crude oil from Kabaale in Uganda to the Chongoleani peninsula near Tanga port in Tanzania.

- The pipeline route was selected by the Government of Uganda as the least cost and most robust route.
- Due to the viscous and waxy nature of Uganda's crude oil, the pipeline will need to be heated along the entire route, making the EACOP the langest electrically heated pipeline in the world.
- The pipeline will be buried to minimize the impact on the environment.
- Some facilities will be above ground and will be designed to ensure minimal environmental and social impact.
- The project will be compliant with the Ugandan and Tanzanian national legislations and international requirements.
- The Marine Export Storage Terminal and the Load-Out Facility will be located north of Tanga port over the Chongoleani peninsula.

EACOP Schedule

1,445km	1.2m	216Kbd	6	2	53

The Construction Phase

Once the Final Investment Decision (FID) is undertaken, the pipeline construction will start and last about 36 months.

The construction will comprise of:

1. Construction of the Pipeline

The construction will be undertaken as shown in the diagram below. Once ready, the pipeline is carefully placed in the pre-dug trench or, in some cases it will require to be bored under waterways or roads by using horizontal drilling.

2. Construction of the Temporary Facilities

Other facilities will be built such as;

- Coating plants & Pipes Storage Yards
- Construction of additional Work space (Fuel, Helipad, Waste)
- Hydro-test dams, access roads, borrow pits.

3. Construction of the Marine Terminal and the Jetty

The crude oil, transported by the pipeline will be stored in the Terminal located on Chongoleani in Tanga bay, before being shipped and sold in other countries. Vessels will be thus loaded with the crude oil at a sheltered deep-water site.

Land Access

Land will be required to construct the EACOP and related facilities. This land will be acquired on either a temporary or permanent basis.

Temporary Access to Land

- within an approximately 30m wide right of way for construction
- for temporary above ground facilities (like construction camps)
- Land required for temporary basis will be leased for approximately 1-4 years and returned to owners in a fully reinstated condition

Permanent Access to Land

- Land required on a permanent basis for above ground installations (Pumping Stations, Pressure Reduction Stations and the Marine Storage Terminal) and for the permanent Right of Way will be acquired.
- After construction, EACOP will need land easements along the pipeline corridor with some restrictions in safety zones.

The EACOP project is committed to:

- Compliance with applicable national legislation and international requirements.
- Ensuring that all landowners and users living along the pipeline corridor will be treated with respect and compensated fairly.
- Vulnerable people identified and assisted as necessary.
- Secure agreements with each affected household, deliver compensation and livelihood restoration programs and help households move out of the area (for those who choose in-kind compensation for resettlement, help them move into their new land).

Committed to the Protection of the Environment
The EACOP project will ensure that health, safety, security, social, economic and environment are addressed throughout the planning, construction, and operational phases of pipeline operations.
The pipeline's route has been selected to avoid the most environmentally sensitive areas like national parks and the high population density areas
Facilities will be carefully located and operated to reduce any potential physical and ecological impacts.
We have developed a biodiversity charter which sets the principles of our work. According to this charter, we carry out all EACOP activities while:
• AVOIDING unnecessary impact to the ecosystem, the biodiversity and the local communities.
• MINIMIZING any unavoidable impact to the ecosystem, the biodiversity and the local communities.
• RESTORING Rehabilitating the impacted areas and managing their restoration
• OFFSETTING any residual impact seeking a net positive gain
THE MITIGATION HIERARCHY
AVOID
MINIMISE
RESTORE
OFF SET
Committed to Socio-Economic Development
We consider national content as key for the success of our operations. We will therefore promote national participation by;
• Reinforcing the use of Ugandan and Tanzanian workforce and contractors through training programs and support to local companies
- strengthening of local skills and capacities
- creating direct and indirect employment
- supporting local content and local procurement
• Contributing to human development participating in local development programs (road safety, access to energy, capacity building ...)
• Reinforcing infrastructures
Employment Creation
The pipeline will create short term (2-3 years) employment for both highly skilled professionals, semi-skilled and casual labourers. It is expected that casual workers who will be involved in the construction phase of the proposed project will be sourced locally from each district and this will further promote the development of local capacity.
About 10,000 people will be employed during the construction phase.
Committed to Stakeholder Engagement
The EACOP Project is committed to meaningful engagement with all of its stakeholders based on the principles of participation, respect for human rights, non-discrimination, empowerment, transparency and accountability. Stakeholder engagement will therefore be conducted in order to:
• Establish lasting, positive relationships with stakeholders.
• Provide project information to enable stakeholders contribute meaningfully all along the process
• Work co-operatively with stakeholders to understand their concerns and seek solutions.
• Commit towards the addressing of stakeholder concerns in a fair and effective manner.
• Pro-actively consult in an open based dialogue appropriate for the different stakeholders.
UNOC
TOTAL
EACOP PROJECT IN UGANDA
EACOP PROJECT IN TANZANIA
EAST AFRICAN
CRUDE OIL
PIPELINE
CKING
OCARBON POTENTIAL
E OIL PIPELINE PROJECT
UNLO
EAST AFRICA'S HYDR
THE EAST AFRICAN CRU

C2.2 Posters

1
PIPELINE CONSTRUCTION
RSK
Eco & Partner Consult
EAST AFRICAN CRUDE OIL PIPELINE
2
1445 KM LONG PIPELINE FROM THE LAKE ALBERT BASIN OIL FIELDS IN UGANDA TO THE INDIAN OCEAN COAST IN TANZANIA
UPSTREAM BULISAA
8 Districts
24 Sub counties
8 Regions
24 Districts
Jetty and Load Out Facility
Marine Storage Terminal
296 km
1149 km
INDIAN OCEAN
UPSTREAM KINGFISHER
UGANDA
TANZANIA
RSK
Eco & Partner Consult
EAST AFRICAN CRUDE OIL PIPELINE

3

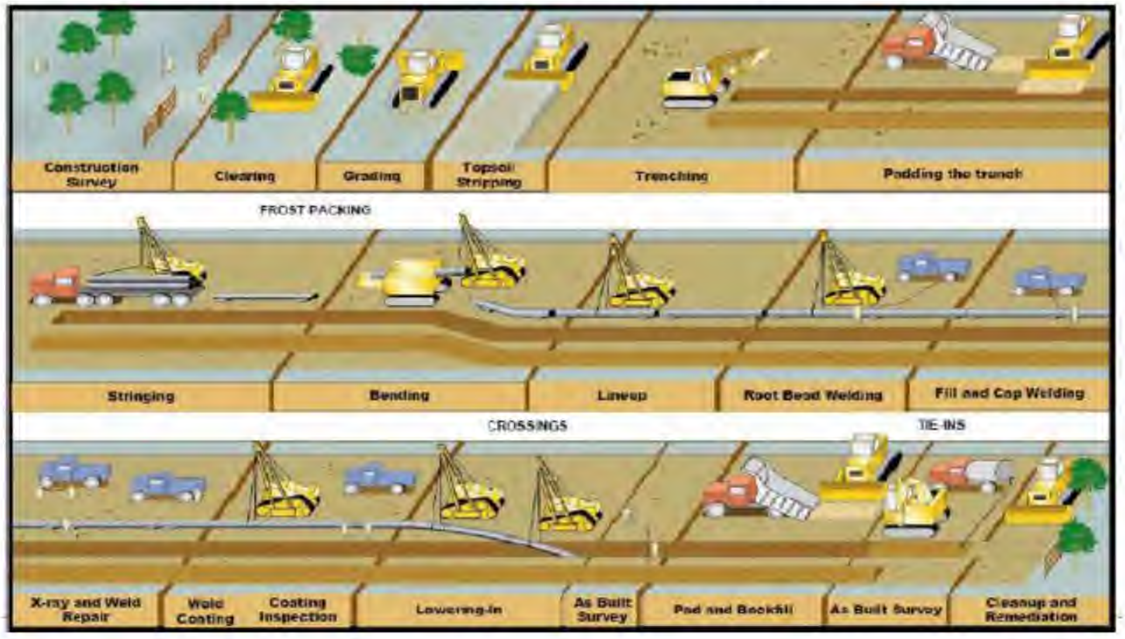
MARINE STORAGE TERMINAL (MST) AND LOAD-OUT FACILITY (LOF) LOCATED NORTH TO TANGA CITY PORT OVER THE CHONGOLEANI PENINSULA

RSK Eco & Partner Consult

EAST AFRICAN CRUDE OIL PIPELINE

4

STAGES OF CONSTRUCTION OF THE PIPELINE

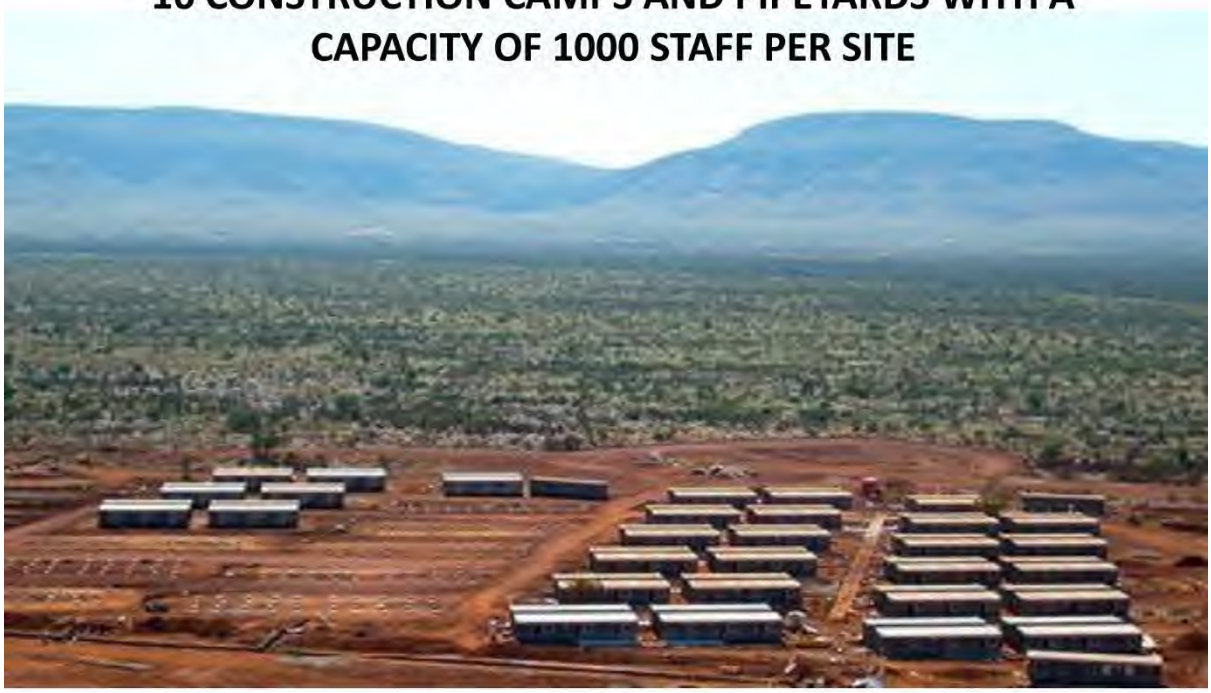


RSK Eco & Partner Consult

EAST AFRICAN CRUDE OIL PIPELINE

5

16 CONSTRUCTION CAMPS AND PIPEYARDS WITH A CAPACITY OF 1000 STAFF PER SITE



RSK Eco & Partner

EAST AFRICAN CRUDE OIL

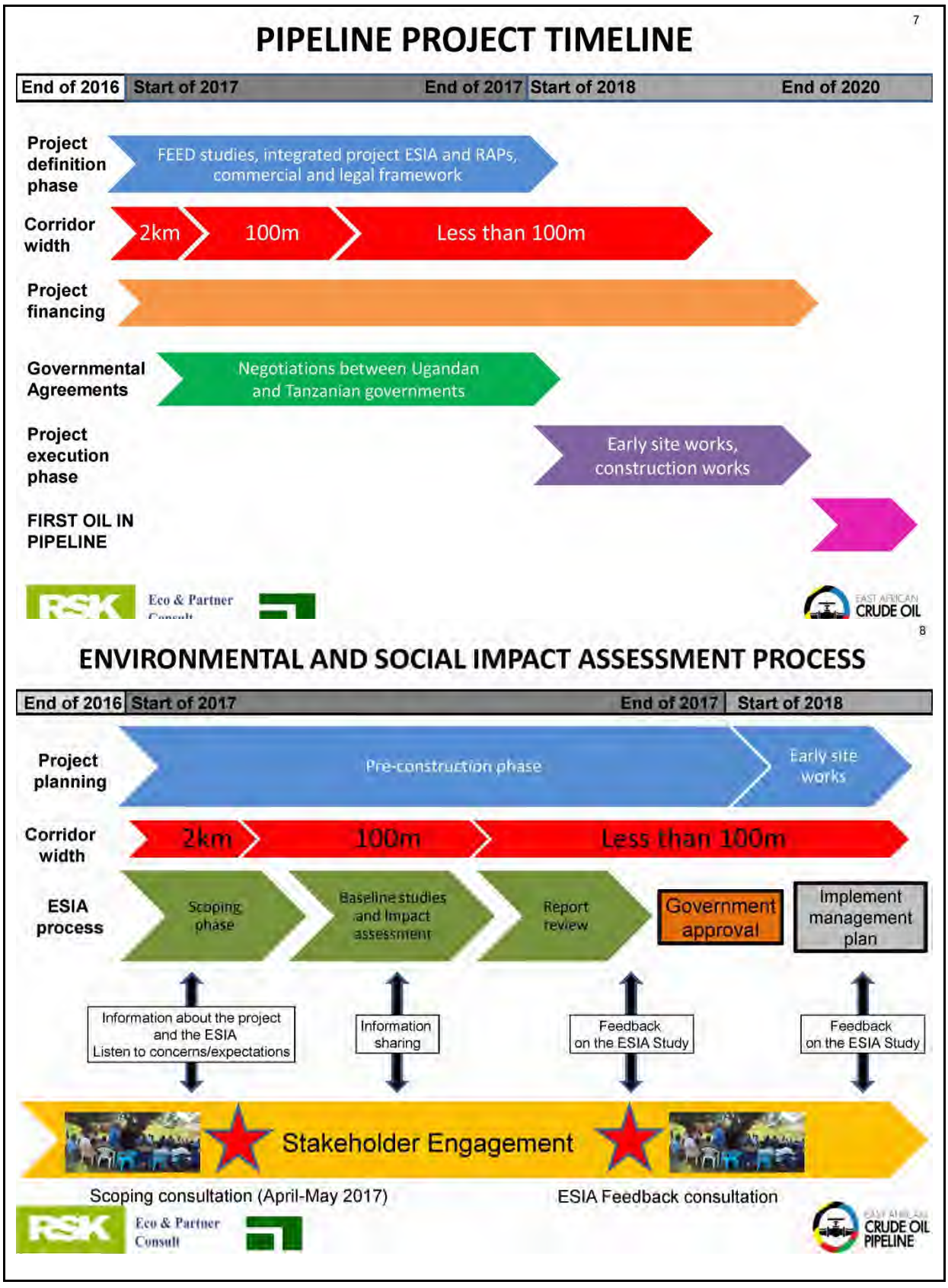
6

PERMANENT ABOVE GROUND FACILITIES

TEMPORARY ABOVE GROUND FACILITIES

RSK Eco & Partner Consult

EAST AFRICAN CRUDE OIL PIPELINE


7
PIPELINE PROJECT TIMELINE
End of 2016
Start of 2017
End of 2017
Start of 2018
End of 2020
Project definition phase
FEED studies, integrated project ESIA and RAPs, commercial and legal framework
Corridor width
2km
100m
Less than 100m
Project financing
Governmental Agreements
Negotiations between Ugandan and Tanzanian governments
Project execution phase
Early site works, construction works
FIRST OIL IN PIPELINE
Eco & Partner Consult
EAST AFRICAN CRUDE OIL
8
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROCESS
End of 2016
Start of 2017
End of 2017
Start of 2018
Project planning
Pre-construction phase
Early site works
Corridor width
2km
100m
Less than 100m
ESIA process
Scoping phase
Baseline studies and Impact assessment
Report review
Government approval
Implement management plan
Information about the project and the ESIA
Listen to concerns/expectations
Information sharing
Feedback on the ESIA Study
Feedback on the ESIA Study
Stakeholder Engagement
Scoping consultation (April-May 2017)
ESIA Feedback consultation
Eco & Partner Consult
EAST AFRICAN CRUDE OIL PIPELINE

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SOCIAL AND ENVIRONMENTAL STUDIES

Physical environment

- SURFACE WATER

- UNDERGROUND WATER
- SOIL

- AIR QUALITY
- NOISE
- LANDSCAPE

Socio-economic environment

- SOCIO-ECONOMIC

- COMMUNITY AND LIVESTOCK HEALTH

- TRAFFIC
- EDUCATION
- CULTURE AND ARCHAEOLOGY

Biodiversity

- PROTECTED AREAS AND SENSITIVE HABITATS
- PLANTS AND ANIMALS

- FISH AND FISHERIES

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POTENTIAL BENEFITS

Job opportunities

Economic development opportunities

Improvement of roads

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POTENTIAL NEGATIVE IMPACTS

Disturbance to wildlife and vegetation

Impact on land leading to potential economic displacement

Impact on health and well-being: noise and traffic

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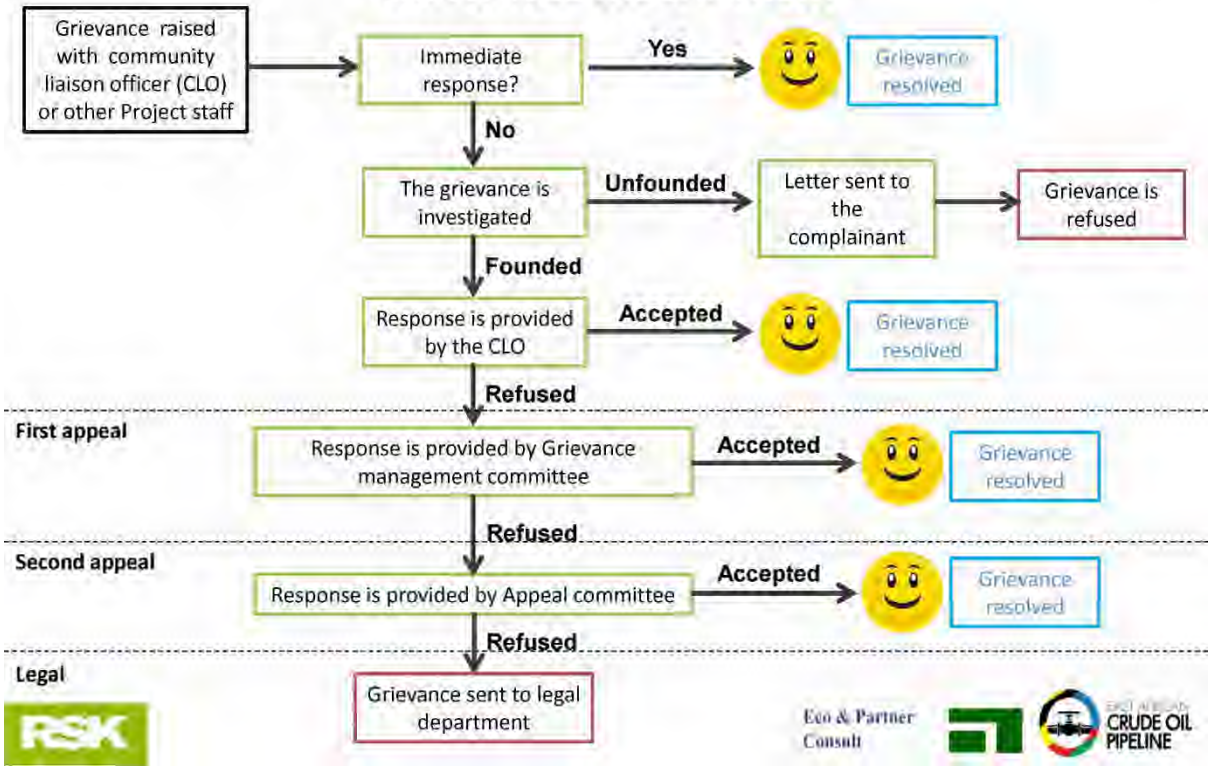
GRIEVANCE MECHANISM



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C3 STAKEHOLDER CONCERNS

C3.1 Scoping Phase Stakeholder Concerns

Table C3.1-1 National Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Socio-economic and Health				
Economy and standard of living	Skills and technology transfer during the project How will Ugandans benefit from the project, e.g., number of jobs created, and the potential negative side effects of these benefits, e.g., those employed by the project may have less time for other commitments such as crop cultivation?	Benefits for local people were explained in terms of employment opportunities, particularly during the construction phase.	Ministry of Gender, Labour and Social Development	See Section 8.11 (Economy) and Section 8.12 (Local Economy Nonland Based Livelihoods)
Infrastructure	How will material be transported during pipeline construction? What are the plans of the projects for the construction and use of roads for maintenance purposes during the projects' operational phase?	Stakeholders were advised that a previous study on infrastructure has identified gaps in the transport sector for the movement of project-associated materials and equipment and that this matter requires additional assessment. Stakeholders were advised that a road adjacent to the pipeline would not be feasible and could damage sensitive environments.	Ministry of Works and Transport	See Section 2 (Project Background and Description) and Section 8.17 (Social Infrastructure and Services)

Table C3.1-1 National Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Land and property	Compensation following land acquisition with emphasis on compensation to stakeholders for loss of property, crops and access to land itself (both above- and underground) The reduction of the 30-m construction corridor to 10-m during the operational phase of the project with emphasis on keeping the original 30-m corridor in place for export purposes	Stakeholders were advised that maintaining the 30-m corridor during the pipeline operational phase would require justification on the projects' part.	Ministry of Works and Transport Uganda National Oil Company (UNOC)	See Section 8.15 (Land and Property)
Land acquisition and compensation	Compensation needs to be carried out in a fair and timely manner Land is a sensitive issue hence sensitisation of communities about the land acquisition process should be a continuous process District compensation rates tend to be low and not updated for years. It's important the project makes sure a fair compensation process is carried out	Stakeholders were informed that IFC principles will be applied together with national regulation in terms of compensation Rates will be identified at a later stage during separate research.	NEMA Ministry of Lands, Housing and Urban Development Ministry of Gender, Labour and Social Development	See Section 8.15 (Land and Property)
Project Induced In-migration (PIIM)	PIIM and movement of labour from one construction camp to another along the pipeline	The majority of in-migration will be associated with the construction, rather than operational, phase. Stakeholders were informed that movement of labour is inevitable for linear projects.	Ministry of Gender, Labour and Social Development Uganda Wildlife Authority (UWA)	See Section 8 (Impact Identification and Evaluation – Normal Construction and Operations)

Table C3.1-1 National Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Workforce	Ensuring equal opportunities during project recruitment, e.g., inclusion of women and people with disabilities	Calls for equal opportunities were recorded for further consideration.	Ministry of Energy and Minerals Development (MEMD) UNOC Ministry of Works and Transport	See Section 8.16 (Workers' Health, Safety and Welfare)
Physical Environment				
Surface water: watercourses, wetlands and water bodies (ephemeral and permanent)	Emphasis on providing notice to affected stakeholders before water abstraction and surface water surveys Ensuring that water obstructions do not result in flooding and associated danger to life and property	Concerns of stakeholders in relation to surface water were recorded for further consideration.	Directorate of Water Resources Management (DWRM)	See Section 8.6 (Surface Water)
Biodiversity				
Habitats of conservation importance (terrestrial and aquatic)	Ensure that not only area of the pipeline is studied but as well watercourses and wetlands which may potentially connect to protected areas, e.g., Sanga Bay, Lake Mburo Emphasis on need to assess ecosystems which are habitats for species especially during the construction phase Identification of biodiversity sensitive areas such as forests, wetlands, wildlife reserves within the pipeline route	Concerns of stakeholders were recorded for further consideration and study in ESIA Current ESIA role will be to assess the habitats and sensitive areas and their role in support of species The mitigation hierarchy will be used throughout from design to operations and decommissioning.	UWA DWRM NFA	See Section 8.2 (Biodiversity: Habitats of Conservation importance)

Table C3.1-1 National Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Project and ESIA-Related				
ESIA studies and mitigation measures	Loss of biodiversity in areas of endemism with questions around whether the projects can consider methods such as underground tunnelling to minimise impacts in such areas Query on whether previous ESIA studies been conducted on a similar scale Enquiry on the process for the technical review and delivery of the ESIA reports Emphasis on conducting separate ESIAs for the feeder pipeline and main oil export pipeline	Stakeholders were informed that the mitigation hierarchy would be implemented in the context of biodiversity, which may include rerouting of the pipeline or tunnelling using horizontal directional drilling. Stakeholders were advised that experiences from other pipeline projects, such as those in India and China, would be drawn upon. Technical reviews will be coordinated by NEMA, a workshop is planned, and the projects and RSK will make a presentation during the workshop to explain the scoping report and ToR and ESIA report after. The concern about separate ESIAs was noted, it will be subject to dedicated discussions.	UWA UNOC NEMA MEMD DWRM	See Section 8 (Impact Identification and Evaluation – Normal Construction and Operations)

Table C3.1-1 National Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Project information	What are the energy sources for heating the pipeline? What is the current status of the feeder pipeline? What is the design for temporary facilities, pipe manufacturing, pipeline diameters and handling of crude oil at the marine storage terminal (MST) in Tanga? What are the provisions for oil spill prevention? Compliance with local content requirements was emphasised It was suggested that a team of government review agencies be taken along the proposed pipeline route to better appreciate likely impacts Recommendations surrounding procurement of bent pipes for certain sections of the pipeline route	Stakeholders were informed that crude oil and diesel generators would heat the pipeline. Stakeholders were informed that conversion and transfer of ownership of temporary facilities would need to be managed properly. Emphasis on participation of government review studies was noted with an assurance that this could be arranged during ESIA studies. Pipeline diameters of both feeder and export pipelines were stated to be the same. In terms of oil spill prevention, design of the pipeline and additional measures will allow detection of leaks at early stages.	Ministry of Internal Affairs National Environment Management Authority (NEMA) MEMD UNOC Ministry of Works and Transport	See Section 2 (Project Background and Description)
Stakeholder engagement (ESIA related)	Recommendation to include different government agencies, UWA, Nature Uganda and Makerere University in stakeholder engagement and to conduct project awareness campaigns in parallel with ESIA studies The social scope is too detailed and may provide baseline that is irrelevant to the project, e.g., human rights	Recommendations to include particular stakeholders during stakeholder engagement and the need to conduct awareness campaigns in parallel with the ESIA studies were noted.	National Forest Authority (NFA) UWA	See Section 7 (Stakeholder Engagement)

Table C3.1-1 National Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Stakeholder engagement (project related)	Project team to inform DWRM about which water bodies will be crossed by the pipeline and which of these will be subject to open-cut method during construction.	Details of streams and rivers affected by the project would be provided upon completion of geology and geophysical (G&G) surveys.	DWRM	See Section 7 (Stakeholder Engagement)

Table C3.1-2 District Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Socio-Economic and Health				
Community health	Pipeline workers leaving behind pregnant women and fatherless children Elevated cancer rates from polycyclic aromatic hydrocarbons (PAH) exposure and spillages Recommendation to expedite pipeline construction to avoid constraining district health systems How to best manage health services for pipeline workers	Stakeholders were assured that possible project- related health impacts will be considered as part of the health impact assessment (HIA). Stakeholders were informed that their concerns would become part of the HIA report and used to inform mitigation measures.	District Health Authorities of Gomba, Kakumiro, Kyankwanzi, Sembabule and Rakai Technical and Political Leaders of Gomba, Mubende and Rakai District	See Section 8.18 (Community Health)
Community safety, security and welfare	Negative impacts of construction camps in affected districts particularly the spread of HIV and AIDS, breakdown of families, defilement, rape, commercial sex work and general sexual misbehaviour. How will these impacts be minimised?	Stakeholders were assured that concerns would be included in HIA report. Stakeholders were informed that clear management plans will be developed and implemented to manage potential social effects arising during construction.	District Health Authorities of Gomba Technical and Political Leaders of Gomba, Mubende and Rakai District	See Section 8.19 (Community Safety, Security and Welfare)
Economy and standard of living	Questions about whether EACOP will procure supplies from local communities. Emphasis on equal share of benefits resulting from the project, e.g., a portion of oil revenues should be provided to affected districts	Stakeholders were informed that the ESIA would recommend sourcing from local producers as far as possible. Stakeholders were informed that there inquiry on share on benefits was noted	Technical and Political Leaders of Gomba District	See Section 8.11 (Economy) and Section 8.12 (Local Economy Nonland-Based Livelihoods)

Table C3.1-2 District Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Infrastructure	How will existing roads be used? What are the plans for construction of new roads for the project alongside the improvement of health facilities in project- affected areas?	Stakeholders were advised that the project would use and maintain existing roads wherever possible. Stakeholders were informed that ideas about improving health facilities would be shared with the project team for consideration.	Technical and Political Leaders of Kakumiro and Rakai District District Health Authorities of Lwengo	See Section 2 (Project Background and Description) and Section 8.17 Social Infrastructure and Services)
Land and property	How much land will be taken and where? How will displacement of local people and compensation for loss of land and communal assets be managed? Owing to the shortage of available land, a recommendation was made to route the pipeline route through national wildlife reserves. Will there be loss of natural resources (wood, water, grazing land) because of pipeline construction?	The stakeholders were informed the project will require 30 m during construction but this will reduce to 10 m during operation Stakeholders were advised that resettlement procedures would be followed in accordance with national and IFC guidelines. Stakeholders were further advised that resettlement would be avoided as far as possible in accordance with international best practice. Stakeholders were informed that specific details about compensation are yet to be determined but that specific teams on the project will be tasked with dealing with this issue.	District Health Authorities of Gomba and Mubende Technical and Political Leaders of Kyankwanzi, Kakumiro and Rakai District	See Section 8.15 (Land and Property)

Table C3.1-2 District Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Project induced in-migration (PIIM)	Impacts associated with large in-migration of people resulting from the project, i.e., disease outbreaks and strains on public health services and medicinal supplies. How will EACOP support district health sectors to overcome these impacts? How in-migration will be managed more generally.	Stakeholders were informed that the raised concerns would be incorporated into the HIA report and used to develop mitigation measures.	District Health Authorities of Gomba, Sembabule and Rakai	See Section 8 (Impact Identification and Evaluation – Normal Construction and Operations)
Workforce	Compliance with national content requirements and ensuring the employment of local people wherever possible How will skilled and unskilled local people be included in the project? Will there be future training opportunities?	Stakeholders were assured that the project is committed to the employment of local people, capacity building and training where possible. Stakeholders were informed that the project will generate a large number of short-term jobs, for both skilled and unskilled personnel, and a limited number of jobs during operations.	District Health Authorities of Kakumiro Technical and Political Leaders of Kakumiro, Gomba and Mubende District	See Section 2 (Project Background and Description)
Archaeology and Cultural Heritage				
Tangible and intangible cultural heritage	Treatment of cultural sites affected by the project	Stakeholders were informed that specialist teams will record and map culturally sensitive areas and develop management plans to deal with their treatment.	Technical and Political Leaders of Hoima District	See Section 8.20 (Tangible and Intangible Cultural Heritage)

Table C3.1-2 District Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Physical Environment				
Air quality and climate change	Environmental degradation as a result of pipeline construction and questions about types of gases that may be emitted, What is the correlation between changing weather patterns and discovery of oil? Adverse environmental impacts will not be mitigated appropriately	Stakeholders were advised that environmental impacts will be examined and mitigation measures developed as part of the ESIA process. Stakeholders were informed that currently there is no proof of correlation between changing weather patterns and Ugandan oil discoveries	District Health Authorities of Kakumiro and Kyankwanzi	See Section 8.9 (Air Quality)
Surface water: watercourses, wetlands and water bodies (ephemeral and permanent)	How will the pipeline cross water bodies?	It was explained to stakeholders that where the pipeline crosses wetlands and waterbodies, these will be restored in environmentally appropriate ways and disturbance minimised.	Technical and Political Leaders of Kyanwanzi District	See Section 8.6 (Surface Water)
Soils	Will the heated pipeline have negative impact on ground conditions?	Stakeholders were informed that this is not the first heated pipeline in the world. Reference made to examples of heated pipeline. Stakeholders were assured that the technology (insulation) used to construct the pipeline would contain the heat and therefore not impact on humans, animals and crops	Technical and Political Leaders of Hoima District	See Section 8.5 (Soils)

Table C3.1-2 District Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Biodiversity				
Flora and fauna species of conservation importance (terrestrial and aquatic)	Damage to the unique environment in the project area from the project	Stakeholders were informed that ESIA specialist studies will be undertaken to study the biodiversity and biophysical environment, and a mitigation hierarchy will be used to avoid, minimise, restore and if necessary, offset any identified negative impacts.	Technical and Political Leaders of Hoima District	See Section 8.3: (Biodiversity: Flora and Fauna Species of Conservation Importance)
Habitats of conservation importance (terrestrial and aquatic)	How will the project affect wetland areas?	Stakeholders were advised that studies will be conducted by specialist teams to identify potential project impacts on the physical environment including wetland areas and to guide the design of mitigation measures.	Technical and Political Leaders of Mubende District	See Section 8.2 (Biodiversity: Habitats of Conservation Importance),
Legally protected, and internationally recognised areas	The pipeline route should be through national wildlife reserves due to lack of human settlements there and shortage of land elsewhere	The IFC standards were explained to stakeholders, and it was emphasised that biodiversity hotspots will be avoided as much as possible in this context.	Technical and Political Leaders of Buliisa District	See chapter 6, See Section 8.4 (Biodiversity: Legally Protected, Internationally or Nationally Recognised Areas)

Table C3.1-2 District Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Project and ESIA-Related				
ESIA studies and mitigation measures	What types of surveys will be conducted and what will be their duration? How prepared is EACOP to mitigate likely project impacts and possible mitigation measures?	Stakeholders were assured that EACOP will be prepared and equipped to mitigate project impacts. Stakeholders were informed that possible mitigation measures will be developed in the next phases of the ESIA process.	District Health Authorities of Sembabule Technical and Political Leaders of Kakumiro District	See Section 8 (Impact Identification and Evaluation – Normal Construction and Operations)
Project information	What is the total number of pipelines associated with the project and what are the 30-m and 10-m right-of-way? What will be the exact pipeline route? Which parties are responsible for establishing the pipeline corridor, project timeline (start and duration of construction) and pipeline infrastructure (wellheads, trench, water intake stations)?	It was explained to stakeholders that a 30-m right- of-way will be required for the construction of the pipeline and that this may be reduced to 10-m during the operational phase. Responsible parties identified were EACOP, the Government of Uganda and Consultant	District Health Authorities of Rakai Technical and Political Leaders of Gomba, Rakai and Kyankwanzi District	See Section 2 (Project Background and Description)

Table C3.1-2 District Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Stakeholder engagement (ESIA related)	What will be the feedback mechanism including access to project documents (hard and soft copies) (scoping reports, stakeholder engagement plan, ESIA reports) and which stakeholders are being consulted? The inclusion of additional stakeholders in the next project phase (town councils, politicians) and the conduct of future engagements (provisions in terms of lunch and transport refunds, use of local languages at subcounty and community levels and involvement of local leaders) was recommended Regular meetings throughout the project lifecycle were requested	Stakeholders were informed that there is set criteria for selecting stakeholders and the next phase of the ESIA will focus on communities rather than districts and subcounties. Stakeholders were advised that findings would be collated and provided to them in June or July 2017. Stakeholders were informed that those identified as key stakeholders would be consulted throughout the ESIA process. Recommendations were received with thanks and recorded for further consideration.	District Health Authorities of Lwengo, Kakumiro, Kywankwanzi, Sembabule, Mubende Technical and Political Leaders of Kyankwanzi, Kakumiro, Gomba, Mubende, Rakai District	See Section 7 (Stakeholder Engagement)
Stakeholder engagement (project related)	Communities are anxious about the project (both positive and negative impacts) and have big expectations. What are the next steps for the project?	High expectations and anxiety surrounding project noted. Stakeholders were informed that the next steps would involve the finalisation of the scoping phase by the end of June and the start of baseline studies in August or September 2017.	Technical and Political Leaders of Mubende, Kyankwanzi District District Health Authorities of Hoima	See Section 7 (Stakeholder Engagement)

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Socio-Economic and Health				
Community health	Will the project create health impacts such as hearing damage, an increase in prevalence of HIV and AIDs, elevated cancer rates, contaminated water supplies, strained local health services and how will the project mitigate these impacts, e.g., ensuring sufficient volumes of drugs are stocked in health centres?	Stakeholders were assured that the ESIA would conduct a HIA and develop an associated management plan to minimise health risks associated with construction camps. Stakeholders were informed that the HIA would evaluate the current capacity of government-run health centres.	Technical and Political Leaders of Luguusulu and Mpasaana Subcounty Lwengo Town Council	See Section 8.18 (Community Health)
Community safety, security and welfare	Pipeline bursting and people falling into trench during construction Construction workers impregnating women, engaging in illegal sexual acts and leaving fatherless children behind Construction camps depleting local resources and land demarcation resulting in local conflicts What mitigation measures will be put in place to ensure safety of the population in project area and security of the pipeline? How will waste generated from construction activities be disposed of? Emphasis on involving women and children in resettlement and compensation procedures	During construction phase, safety signs will be put up at the work site and the area will be fenced off to prevent children and animals from falling into the trenches. Stakeholders concerns, particularly in relation to construction camps, were acknowledged. Stakeholders were informed that strict codes of conduct that will be implemented in construction camps. Stakeholders were informed about the grievance mechanism that will be established to ensure that concerns can be lodged and dealt with accordingly. Stakeholders were reassured that safety issues linked to influx will be examined in impact assessment studies and given full consideration.	Technical and Political Leaders of Kisiita, Mpasaana, Madudu and Lwanda Subcounty Lwengo Town Council	See Section 8.19 (Community Safety, Security and Welfare

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Economy and standard of living	What are the economic benefits of project for affected districts? What will employment opportunities be (number and type of jobs to be created)? Will there be other benefits (health clinics)? What will the recruitment process look like? Will there be procurement of local supplies in project area? Can local people become custodians of the pipeline?	Stakeholders were assured that the ESIA would recommend the use of local workers and contractors through training programmes, creation of direct and indirect employment opportunities for local people and procurement of local goods and services. Stakeholders were informed that the pipeline will generate many short-term jobs (during construction) and a limited number of jobs during operation (less than 1000) and that both skilled and unskilled people will be required for these jobs. Stakeholders were informed that details regarding recruitment processes would be disclosed at the appropriate time and that information about job opportunities would be advertised to Ugandans first.	Technical and Political Leaders of Buhimba, Kiziranfumbi, Gayaza, Lwebitakuli, Kisiita, Mpasaana, Kitenga, Madudu, Maddu and Lwengo Subcounty Sembabule Town Council	See Section 8.11 (Economy) and 8.12 (Local Economy Nonland-Based Livelihoods)
Infrastructure	Will there be upgrading of existing infrastructure to support pipeline construction (roads, health centres) How will EACOP deal with disruption to access roads?	Stakeholders were informed that there are plans to upgrade, or at least maintain, roads that will need to be used by the project, but that there are no confirmed plans to upgrade other facilities.	Technical and Political Leaders of Gayaza, Kisiita, Nkooko, Mpasaana, Kitenga and Lwanda Subcounty	See Section 8.19 (Social Infrastructure and Services)

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Land and property	What land will be required for the project and how will land acquisition will be managed? What will the compensation process look like (who will be compensated, compensation process, how compensation rates will differ according to land ownership titles, whether both the 30-m and 10-m corridor will be compensated for)? What will the resettlement process look like (will vulnerable groups be given special consideration, will economic activities of people be accounted for)? Level and kind of disruption and displacement to expect Land values set at district level are unfair and valuers often cheat local people leading to conflicts and disagreements Emphasis on ensuring that all family members are involved when determining compensation to avoid the exclusion of women and children	Stakeholders were informed that they would be eligible for compensation if EACOP requires their land for pipeline operations. Stakeholders were also informed that the process of RAP will take place where project-affected people will be notified and the process of land acquisition takes place during this process Stakeholders were assured that the rights of both landowners and land users would be considered for compensation consistent with national legislation and international standards. Stakeholders were promised that compensation would be paid in a fair and timely manner. It was explained that there would be temporary land acquisition for the 30-m corridor and permanent land acquisition for the permanent aboveground installations (AGIs) such as pump stations and block valves. Complaints about unfair land values and the importance of involving all family members in the compensation process were acknowledged and noted.	Technical and Political Leaders of Buhimba, Gayaza, Luguusulu, Lwebitakuli, Kisiita, Kakuuto, Kifamba, Mpasaana, Madudu, Maddu, Lwengo, Lwanda and Ndagwe Subcounty Sembabule Town Council Lwengo Town Council	See Section 8.15 (Land and Property)

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Land-based livelihoods	Will local people be able to grow crops and construct houses above the land where the pipeline is buried? Will the project impact on soil fertility and will crops be destroyed during, or as a result of, pipeline construction? Will livelihood restoration cover all socio-economic activities (particularly those of cattle grazers, firewood gatherers)? What initiatives are planned to replace damaged vegetation and trees and how will the project affect water systems and fisheries?	Stakeholders were informed that they would not be able to build structures or plant deep-rooted shrubs and trees above the pipeline but that shallow-rooted plants will be permitted.[2] Stakeholders were informed that the project does not affect soil fertility and all crops that will be destroyed because of construction will be compensated. Stakeholders were assured that livelihood restoration measures would be implemented in parallel to compensation or resettlement and in accordance with international standards. Stakeholders were further assured that the project team would avoid water sources and fisheries wherever possible and, where unavoidable, mitigate the potential impacts.	Technical and Political Leaders of Buhimba, Kiziranfumbi, Mpasaana, Kitenga, Maddu, Lwanda and Ndagwe Subcounty Sembabule Town Council	See Section 8.13 (Land-Based Livelihoods)

[2] This information has been superseded by more up-to-date information. Stakeholders were also informed that, as the project was still in the design phase, project requirements could still change and these changes would be communicated at the appropriate time.

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Workforce	Will those working in construction camps require drugs and medical aid from local health facilities? How will local communities meet increased demands in terms of food production? Compliance with local content requirements and opportunities for local people to benefit from the project Emphasis on involving the community with regards to jobs and businesses Local leaders are to be involved in the project recruitment process for casual workers.	Stakeholders informed that construction camps will be self-contained with medical facilities, drugs and medical equipment to avoid burden on local health services. Stakeholders were assured the project will be emphasising local content and employment opportunities for affected persons. Stakeholders were assured that comments about the involvement of local leadership in recruitment of casual labourers would be communicated to the project.	Technical and Political Leaders of Kiziranfumbi, Gayaza and Lwengo Subcounty	See Section 8.16 (Workers' Health, Safety and Welfare)
Archaeology and Cultural Heritage				
Tangible and intangible cultural heritage	How will peoples' cultural heritage be protected if affected by the project?	Stakeholders were informed that specialist studies will identify cultural and other sensitive sites and that plans will be developed for identification, avoidance and potential mitigation.	Technical and Political Leaders of Biiso Subcounty	See Section 8.20 (Tangible and Intangible Cultural Heritage)
Biodiversity				
Habitats of conservation importance	Fish in Lake Albert will be affected by operations during pipeline construction	Stakeholders were advised that pipeline construction will not affect fish but that a consultant will evaluate the potential of indirect impacts on fish.	Technical and Political Leaders of Biiso Subcounty	See Section 2 (Project Background and Description) and Section 8.14 (River and Lake-Based Livelihoods)

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Physical Environment				
Air quality and climate change	What are the mitigation measures for climate change? Will the project pollute the environment, disturb rainfall patterns and cause a drought? Will the project increase heat levels in some districts leading to questions about interventions to mitigate this?	The ESIA will undertake specialist studies to examine potential impacts from air emissions and climate change on the physical environment so that appropriate mitigation measures can be identified. Stakeholders were assured that the project is committed to having as minimal an impact on the environment as possible.	Technical and Political Leaders of Lugusulu Subcounty	See Section 8.9 (Air Quality)
Noise levels	How will the project address noise pollution during pipeline construction?	Stakeholders were informed that noise and disruption would only take place for a short time, as the pipeline will be built in sections. The possible mitigation measures against noise were described in terms of restricting working times to daylight hours and using buffers for sensitive locations.	Sembabule Town Council	See Section 8.10 (Acoustic Environment)
Surface water: watercourses, wetlands and water bodies (ephemeral and permanent)	Leakages into Lake Victoria, rivers and other water sources may be affected during pipeline construction How will local communities be helped in water-stressed areas during pipeline construction	Stakeholders were assured that materials used for pipelines are safe and do not corrode or leak. Stakeholders were informed that there would be emergency response plans that would be implemented to manage leakages and other emergency events. Stakeholders were further informed that any damages to or loss of existing water sources during construction will be repaired or alternative water sources will be provided.	Technical and Political Leaders of Kakuuto and Maddu and Kitenga Subcounty	See Section 8.6 (Surface Water)

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Soils	The project may damage soil fertility.	Stakeholders were advised that the pipeline would be insulated to ensure that practically no heat would be emitted. Stakeholders were further advised that the underground pipe will not damage soil fertility or the ability of crops to grow.	Technical and Political Leaders of Kihungya Subcounty	See Section 8.5 (Soils)
Biodiversity				
Flora and fauna species of conservation importance (terrestrial and aquatic)	The presence of non-indigenous trees may result in increased water consumption Indigenous trees should be replanted if non-indigenous trees are removed during pipeline construction	Comments of stakeholders were noted for further consideration.	Technical and Political Leaders of Kiziranfumbi Subcounty	See Section 8.3 (Biodiversity: Flora and Fauna Species of Conservation Importance)
Project and ESIA-Related				
ESIA studies and mitigation measures	What socio-economic and environmental mitigation measures will be put in place (for environmental preservation, to combat climate change)? Is there an arrangement in the event that the pipeline breaks down? Are spills expected to extend beyond the pipeline corridor? Concerns were raised about the implementation of the ESIA based on past experiences	Stakeholders were informed that mitigation measures will be proposed in the ESIA. In the event if pipeline breaks down maintenance will be performed. In case of a spill, Spill response management plans will be applied Stakeholders were further informed that, based on previous projects, the impacts of spills could extend beyond the pipeline corridor. Stakeholders were assured that ESIA will also consider cumulative and transboundary impacts.	Technical and Political Leaders of Buhimba, Kakuuto, Kitenga, Madudu, Lwengo, Lwanda and Kisiita Subcounty Lwengo Town Council	See Section 8 (Impact Identification and Evaluation – Normal Construction and Operations)

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Project information	Who are the project partners? What are EACOP's corporate social responsibility (CSR) activities? What does the right-of-way look like (particularly regarding size and implications for compensation, whether it will be permanent or temporary)? Start and duration of project construction How will the pipeline be heated? What are the motivations for project and reasons for proposed pipeline route? Recommendation that EACOP considers helping community to plant trees as one of CSR initiatives Some political leaders pledged to sensitise communities about the project and offered support to the project	The project target is to start operating the pipeline in 2020. The pipeline route was explained in terms extensive route studies with the aim of finding the safest route, easiest to build and has the least impact on people and wildlife. Stakeholders were informed that the project partners are Tullow, CNOOC, Total, the Government of Uganda and the Government of Tanzania. The stakeholder recommendations regarding CSR initiatives will be reported to the project team.	Technical and Political Leaders of Buhimba, Lwebitakuli, Kisiita, Nkooko, Kakuuto, Kifamba, Kitenga, Maddu, Lwengo and Ndagwe Subcounty Sembabule Town Council Lwengo Town Council	See Section 2 (Project Background and Description)
Stakeholder engagement (ESIA related)	Will the project have community liaison officers (CLOs), a grievance mechanism? How will language barriers be overcome and how will the ESIA reports will be communicated to stakeholders? Stakeholders emphasised the need to communicate with those affected by project land take in a timely manner.	Stakeholders were informed that the project team intends to recruit CLOs that local people can be comfortable with and that recruitment recommendations for CLOs would be communicated to them. The grievance mechanism was explained to stakeholders.	Technical and Political Leaders of Luguusulu, Lwebitakuli, Kakuuto, Kifamba and Madudu Subcounty	See Section 7 (Stakeholder Engagement)

Table C3.1-3 Subcounty Level Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Stakeholders	ESIA Reference
Stakeholder engagement (project related)	Stakeholders to be provided with as much information about the project as possible to be given out, i.e., maps indicating the pipeline route and corridor to leaders	Stakeholders were informed that maps would be made available when the final pipeline route has been selected and authorisation has been given for the pipeline route to be made public.	Technical and Political Leaders of Kisiita and Nkooko Subcounty	See Section 7 (Stakeholder Engagement)

Table C3.1-4 Village Local Council and Community Members Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Socio-Economic and Health				
Community health	What measures will be introduced to combat risk of HIV and AIDS spreading as a result of in-migration, and spread of dangerous emissions during construction? Has the project considered disease outbreaks, water shortages and women being impregnated during project construction?	Stakeholders were advised that plans would be designed to ensure proper management of emissions. Stakeholders were informed that the ESIA process will develop measures and management plans to mitigate negative impacts.	Village Communities of Kisiita A, Mpasaana and Kinvunikidde	See Section 8.18 (Community Health)
Infrastructure	Will infrastructure be developed in conjunction with the project (water supply, electricity, hospitals, schools, communications and irrigation)? Will roads pass over the pipeline?	Comments from stakeholders regarding the provision of facilities and improvement of infrastructure will be reported to the project team.	Village Communities of Butimba, Kisala West, Nzoo, Mpasaana and Lukooma	See Section 8.17 (Social Infrastructure and Services)

Table C3.1-4 Village Local Council and Community Members Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Land and property	What will the compensation mechanism be (eligibility for compensation, how compensation will be made, length of time for payment to be made, applicable compensation rates, land valuation methods, how different groups will be treated such as landlords and tenants)? What will consultations before land acquisition consist of, will land take be permanent or temporary and can land be used after construction (to grow crops, replant trees)? What are the opportunities to contest land take? What will happen to property and infrastructure within the 30-m right-of-way? Will land above pipeline turn to wasteland or desert after construction or during operation? Will construction vehicles damage properties due to their weight and noise?	Stakeholders were advised that a resettlement action plan (RAP) would be completed in accordance with international standards, which requires compensation and/or resettlement equal to or better than previous conditions. Stakeholders were assured that the project would work with the government to ensure fair resettlement and compensation activities. Stakeholders were advised that every landholder and land user will be included in the RAP study and that land valuation will be determined using various methods and involve consultation. Land restoration will be carried out after the construction phase to restore land to its previous state and the land can be used for growing seasonal crops and grazing after restoration. A mitigation measure will be put in place to avoid property and infrastructure within the 30-m right-of-way	Village communities of Butimba, Kisala West, Nzoo, Mabale, Kisiita A, Mpasaana, Nalyankajja, Kisagazi, Kinvunikidde, Kyetume, Lutilwanjuki and Lukooma	See Section 8.15 (Land and Property)

Table C3.1-4 Village Local Council and Community Members Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Land-based livelihoods	The pipeline may impact on crops and livestock What is planned for land reinstatement after the pipeline is constructed? What are the plans for pastoralists during the project construction phase? Can people operate businesses in or near to construction camps?	Stakeholders were advised that they should be able to grow crops and graze cattle (but not plant trees) within the 10-m corridor and above the pipeline once buried[3]. Stakeholders were assured that that the heating of the pipeline will not affect the land because of the pipes' insulation and coating.	Village communities of Butimba, Nalyankajja, Kisagazi, Kinvunikidde and Kyetume	See Section 8.13 (Land-Based Livelihoods)
Archaeology and Cultural Heritage (Terrestrial and Marine)				
Tangible and intangible cultural heritage	What will happen if pipeline route crosses graveyards and how will graveyards will be catered for? What measures will be implemented in the event that burial sites or cultural sites are destroyed?	Stakeholders were informed that if graves cannot be avoided, they would be relocated in accordance with the wishes of family members and local authorities. Stakeholders were further advised that compensation for removal or relocation of graves and cemeteries will be carried out in accordance with national requirements.	Village communities of Nzoo and Kinvunikidde	See Section 8.20 (Tangible and Intangible Cultural Heritage)

[3] At this time this information has been superseded by more up-to-date information. Stakeholders were also informed that since the project was still in the design phase project requirements could still change and that these changes would be communicated at the appropriate time.

Table C3.1-4 Village Local Council and Community Members Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Biodiversity				
Habitats of conservation importance (terrestrial and aquatic)	Potential oil spills may destroy aquatic life in lakes and other waterbodies	It was stated that ESIA studies will seek to understand the local physical environment and develop mitigation plans to assist with the management of emergency events such as oil spills. Stakeholders were advised that crude oil is waxy and hence will not necessarily travel very far in the event of a spill.	Serula A Village Community	See Section 8.2 (Biodiversity: Habitats of Conservation Importance)
Physical Environment				
Air quality and climate change	The heated pipeline may have a negative impact on local rainfall patterns. What measures to prevent spread of harmful air emissions will be implemented?	Stakeholders were advised that plans would be designed and implemented to manage negative environmental impacts of the pipeline, including air emissions.	Village communities of Kisiita A and Mpasaana	See Section 8.9 (Air Quality)
Groundwater	Will the project destroy swamps and damage local water supplies? What will happen if the pipeline intersects wells?	Stakeholders were assured that oil spills are unlikely but that, in the event of an oil spill, the oil would not spread far due to its waxy nature. Stakeholders were informed that an emergency response team would be mobilized to minimise damage from potential oil spills.	Village communities of Mpasaana and Lutilwanjuki	See Section 8.7 (Groundwater)

Table C3.1-4 Village Local Council and Community Members Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Project and ESIA-Related				
ESIA studies and mitigation measures	What management plans for mitigating negative project impacts, i.e. on the environment, will be developed?	It was explained that various management plans will be developed to mitigate negative impacts including emergency response plans, mitigation hierarchies for biodiversity and social management plans for construction camps.	Village communities of Kisiita A	See Section 8 (Impact Identification and Evaluation – Normal Construction and Operations)
Project information	What are the possible pipeline routes (number of potential routes particular villages affected)? What is the project timeline? Will there be safe zones? What CSR initiatives are being planned? What will the project right-of-way look like (width, whether permanent or temporary)? How will damages to the pipeline be dealt with? What is the Government of Uganda's plans for oil (why being exported, why selling crude rather than refined products, oil prices)? Requests for maps displaying affected areas	Stakeholders were informed that the width of the project right-of-way is 30 m for construction and 10 m for operation[284]. Stakeholders were advised that the pipeline route was still being finalised at the time of the meetings between May-July 2017; after this, the villages near the pipeline can be confirmed. It was explained that Uganda must export oil because its domestic market is not large enough. Stakeholders were advised that project would only commence after ESIA and G&G studies are complete, and NEMA has approved the ESIA.	Village communities of Butimba, Kisala West, Kisiita A, Nalyankajja, Kisagazi, Kinvunikidde, Kyetume, Lutilwanjuki and Lukooma	See Section 2 (Project Background and Description)

[4] At this time, this information has been superseded by more up-to-date information. Stakeholders were also informed that since the project was still in the design phase project requirements could still change and that these changes would be communicated at the appropriate time.

Table C3.1-4 Village Local Council and Community Members Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Stakeholder engagement (ESIA related)	Calls for future consultations to provide refreshments, transport allowances Can future meetings include visual materials (e.g., DVDs containing information about the project) CLOs and the grievance mechanism, who to trust in relation to the project, communication channels and stakeholders consulted Emphasis on developing strong relationships between ESIA teams and local leaders	Suggestion to include visual elements in future consultations will be implemented. Request for refreshments and transport allowances were noted for consideration. Stakeholders were advised that there are toll- free telephone lines available for those wishing to express grievances and concerns.	Village communities of Kisala West, Mabale, Mpasaana, Nalyankajja, Kisagazi, Kinvunikidde, Lutilwanjuki, Lukooma and Butimba	See Section 7 (Stakeholder Engagement)

Table C3.1-5 Traditional Leadership Stakeholder Concerns, Scoping Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Project and ESIA-Related				
Project information	What will the project timeline be and key milestones alongside proposed pipeline route down to the parish level?	Stakeholder were informed that the scoping phase would end in June 2017, after which baseline studies and impact assessment will take place and would be completed in November with the submission of the ESIA report to NEMA in 2018. Stakeholders were advised that timelines may change.	Nsamba Felix Kabajjo (Muteesa – Mawogola, leader of Buganda on behalf of Kabak and Buganda Kingdom)	See Section 2 (Project Background and Description)

C3.2 Baseline and Impact Assessment Phase Stakeholder Concerns

Table C3.2-1 National Level Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Socio-economic and Health				
Land acquisition and resettlement and compensation	Where will the displaced persons be relocated? They should not be relocated along park boundaries. Issues relating to displacement and relocation of project affected persons need to be critically reviewed. Compensation of PAPS and handling of grievances should be effective. Some aggrieved persons may resort to acts of sabotage and this may impact the operations of the pipeline. The 30 m corridor is a sizeable piece of land and raises a number of social impacts. Are there measures to mitigate issues related to land acquisition such as compensation for losses that may occur, providing alternative livelihood activities for those that may be significantly impacted?	Stakeholders were advised that a detailed Resettlement Action Plan will be developed indicating how project affected persons will be handled. The plan will be shared with the Ministry. Concerns from stakeholders were noted. Stakeholders were informed that the 30 m corridor will be temporarily acquired during construction phase and only 10 m permanently acquired by the Government as the Right of Way. Stakeholders were advised that there are plans to allow land owners and users within the 10 m corridor to conduct restricted activities like livestock grazing and the growing of shallow-rooted seasonal crops, but this is yet to be confirmed by the Government.[5]	Ministry of Tourism, Wildlife and Antiquities Office of the Prime Minister Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	See Section 8.15 (Land and Property)

[5] At this time, this information has been superseded by more up-to-date information. Stakeholders were also informed that, as the project was still in the design phase, project requirements could still change and that these changes would be communicated at the appropriate time.

Table C3.2-1 National Level Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Biodiversity				
Habitats of conservation importance (terrestrial and aquatic)	There are some ecosystems that may be affected that are interconnected and are migratory routes for some species.	The proposed pipeline is considering avoidance of a range of environmental and social sensitivities and at some sections the pipeline may be constructed along the existing infrastructure corridors.	Ministry of Water and Environment (MWE)	See Section 8.2 (Biodiversity: Habitats of conservation Importance)
Project and ESIA-Related				
ESIA studies and mitigation measures	When will the studies be completed? Has the Scoping Report been approved? It should be shared with the Ministries. If there is a separate ESIA for the associated facilities, this too needs to be shared. Gender issues should be taken into consideration- are there women on the study team? How is the Area of Influence defined for this study? Who conducts the audit to ensure grievances are effectively closed out? A legal framework should be reviewed and included in the ESIS. It should include the Illiterates Protection Act and the Spouse Act. Wetlands, rivers and lakes in proximity to the pipeline need to be listed as fish (including migratory) species can be affected. Guidance	Stakeholders are informed that the tentative date is March 2018. Stakeholders were informed that the SR was approved by NEMA, and is mandated to submit copies to various Ministries, Departments and Agencies. The ESIA for associated facilities and will be shared with Ministries. Stakeholders are assured that women have been and will be engaged in the ESIA studies. Stakeholders were assured that the proposed grievance mechanism will be provided. Stakeholders were informed that there is a chapter in the ESIA aimed at the review of existing laws, regulations and standards. Acts will be included and relevance to project evaluated. Stakeholders were advised that maps of critical habitats and rivers will be shared with Ministries.	Ministry of Water and Environment (MWE) Ministry of Tourism, Wildlife and Antiquities Chamber of Mines and Petroleum Ministry of Agriculture, Animal Industry and Fisheries Office of the Prime Minister National Environment	See Section 8 (Impact Identification and Evaluation – Normal Construction and Operations)

Table C3.2-1 National Level Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
	can be offered by the Ministry as these habitats are important. There is a National Policy for Disaster Preparedness in Uganda and District Disaster Management Committees and a Department of Disaster Preparedness and Management. There is need to liaise with these departments. The study team should evaluate offsite effects and propose measures on how they can be managed. The project design should aim at identifying and mitigating risks. Areas that may be impacted in the case of an oil spillage or fire outbreak should be mapped. There is need for EACOP to engage the Chief of Defence to identify security ramifications of the project. The local content plan needs to emphasise with a clear strategy for skills transfer. There is need to explain the role of the OPM in the project. Information related to potential risks and hazards can be provided by OPM. Project shouldn't increase vulnerability or exposure to risks in the area of influence.	Other recommendations and concerns were noted. Where possible, the project team will liaise with other Departments and Committees.	Management Authority	

Table C3.2-1 National Level Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Project information	There is a need to share a detailed map indicating administrative units so we can advise on the critical areas that the pipeline can be route through. How is the pipeline going to be secured against vandalism? This could lead to environmental pollution. What mechanisms are in place to prevent and handle oil leakages? Will there be periodic assessments for unforeseen impacts?	Stakeholders were informed that detailed information relating to the pipeline corridor can only be optimised following completion of the ESIA studies and geological and geotechnical studies. Stakeholders were assured that there will be various layers of security ranging from the local communities that will be crossed by the pipeline corridor to the lead agency in charge of security (oil and gas police). Stakeholders were informed that Environmental and Social Management Plans (ESMPs), including Oil Contingency Plans and Emergency Response Plans will guide on how such issues will be handled and be shared with government departments for input/review, following completion of the ESIA. These plans will be regularly tested.	Ministry of Water and Environment (MWE) Ministry of Tourism, Wildlife and Antiquities Chamber of Mines and Petroleum Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) Office of the Prime Minister National Environment Management Authority (NEMA)	See Section 2 (Project Background and Description) and Section 9 (Unplanned Events)

Table C3.2-1 National Level Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	EACOP and RSK Responses	Stakeholders	ESIA Reference
Stakeholder engagement (ESIA related)	The Chamber of Mines can play a positive role during engagement of the local communities. Local communities need to be adequately sensitised to they make decisions from an informed point of view. Will there be a monitoring team involving stakeholders at various levels (agencies, local governments etc.)? EACOP should run radio programs to sensitise communities as information could be relayed quickly	Stakeholders were advised that community sensitisation will be an ongoing process throughout the project cycle. Stakeholders were informed that a monitoring team will be further discussed with the Authorities. Recommendations to run radio programs to sensitise communities about the project were noted.	Chamber of Mines and Petroleum Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	See Section 7 (Stakeholder Engagement)

Table C3.2-2 Village Local Council and Community Members Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Socio-Economic and Health				
Community health	How will community water sources be handled in the 30km corridor? Can the proposed pipeline affect water quality downstream from the project? What measures will be put in place to minimise the spread of communicable diseases? What will be the impact of the pipeline on community health, particularly children? Are there health impacts for people beyond the corridor, during the operation phase of the project? Concerns over spread of diseases such as HIV & AIDS, unwanted pregnancies and accidents	Stakeholders were advised that alternative community water sources will have to be established. Water quality will be monitored regularly to detect any changes. Stakeholders were informed of a Camp Management Plan that will minimise interaction between construction workers and communities. Stakeholders were informed that the pipeline will be insulated and designed in such a way that no heat will be emitted. Any potential health impacts will be evaluated following completion of study.	Village Communities of Kamusense, Lukulavu, Njaza, Kagoma, Sembabule. Miti, Kinvunikidde, Bulakati, Bukulula, Ssanje Katwe, Lukoma, Mbirizi, Kayere, Nyamosoga, Buswabwera, Katikara, Kisala West, Nyondo, Mabale, Kalembe, Kyenda, Mutukula, Kyakudusi, Bethlehem, Serinya, Kagango, Kabulasoke, Kyajawe, Kabaale-Kyabicwe, Katooke and Kisenyi	See Section 8.18 (Community Health)

Table C3.2-2 Village Local Council and Community Members Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Community safety, security and welfare	How will the local community be able to report crimes such as rape committed by the project workers? There is concern over the protection of girls as there have been previous incidents of underage pregnancies due to interactions between project workers and local communities. There is a concern that there will be an increase in the number of conflicts related to land, yet residents have been living in harmony. Some of the projects monitored by the World Bank such as the road construction works have generated a number of social issues. How will this project be different? Sources of materials such as stones and murram need to be evaluated to minimise impacts related to sourcing of construction materials. Concerns over marital conflicts, domestic violence, high crime rates, theft and insecurity and land conflicts	Stakeholders were advised that project workers that commit a criminal offence will be handled in accordance with the laws of Uganda. Stakeholders were informed that a Grievance Management Mechanism will be in place involving Community Liaison Officers and Local Leaders to address issues related to misbehaviour of project workers. Stakeholders were informed there will be Camp Management Plans and Journey Management Plans to minimise interaction between project workers and the local community. Stakeholders were assured that the land acquisition process will be conducted in a transparent way involving local leaders to verify land ownership, minimising conflicts over land. Stakeholders were informed that Management Plans are being developed to minimise impacts due to project activities. Stakeholders were advised that sources of construction materials will be included in a logistics study commissioned by the pipeline team.	Village communities of Kyengera, Lulongo, Mutukula, Kinvunikidde, Bulakati, Lukoma, Mabale, Kagango, Kalembe, Nkooko, Kyajawe, Kabaale-Kyabicwe, Kisenyi, Kisala West, Kayere, Buswabwera, Nzoo, Katooke and Nyondo	See Section 8.19 (Community Safety, Security and Welfare)

Table C3.2-2 Village Local Council and Community Members Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Economy and standard of living	Will local people, including women, youths and unskilled workers be considered for employment? Local people should be considered for non-technical jobs. How will local people benefit from the proposed project? Concerns were raised with regards to social cohesion, population pressure and poorly paid workers	Stakeholders were advised that women will be considered for employment and youths from local communities will be prioritised for employment. Job opportunities will range from casual, unskilled, semi-skilled to skilled labour. Stakeholders were advised that local people will be prioritised for non-technical jobs. Technical jobs will be advertised nationally and internationally. Stakeholders were informed that there will be both direct (job opportunities) and indirect benefits (infrastructure improvement like upgrading on roads) to local people.	Village communities of Kamusene, Kibonzi, Kinvunikiide, Kyakudusi, Kyengera, Lukoma, Lukulavu, Llongo, Mabale, Mbirizi, Bulakati, Kobonera, Nsambya, Kakende, Kisala West and Kyajawe	See Section 8.11 (Economy) and Section 8.12 (Local Economy Nonland-Based Livelihoods)
Infrastructure	Will there be access roads to the pipeline construction? What will happen if the pipeline crosses the road? Worries were expressed about destruction of roads	Stakeholders were informed that some sections of the existing roads will be upgraded and a few access roads constructed. Management plans are being developed to minimise impacts due to project activities.	Village communities of Lukulavu, Nanywa, Kabulasoke and Nzoo	See Section 8.17 (Social Infrastructure and Services)
Land and property	Will project affected persons be compensated before commencement of construction works? Will both tenants and land-owners be compensated? The compensation rates are likely to be influenced by the government, which will	Stakeholders were advised that compensation for land take or losses will be before commencement of works. Delays may occur due to the approval process by the Office of the Chief Government.	Village communities of Kalembe, Kibonzi, Kinvunikidde, Kyakudusi, Kyenda, Kyengera,	See Section 8.15 (Land and Property)

Table C3.2-2 Village Local Council and Community Members Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
	impact on affected people. We call on EACOP to engage the affected people during decision making. What will happen to persons whose entire plot is located in the 30m corridor? Does a resettled person have a choice of where to go? There is concern over being forcefully removed from a property without being compensated. Will there be a livelihoods restoration programme for the resettled persons or will they just be given houses? Concerns were raised with regards to loss or property and buildings, worries over compensation and resettlement were expressed	Stakeholders were informed that both tenants and land owners will be compensated. Stakeholders were informed that people may be resettled. Stakeholders were informed that issues related to resettlement will be handled following the completion of the Resettlement Action Plan. Stakeholders were informed that there will be no forceful acquisition of land. Project affected persons will be approached and informed of any procedures that will be used for land acquisition. Stakeholders were informed that a livelihood restoration programme will be in place for resettled persons.	Lukulavu, Lwemisege, Mabale, Miti, Muyenje, Njaza, Bulakati, Nanywa, Bukulula, Kiswaga, Butiti, Kabonera, Kagango, Nsambya, Serinya, Sembabule, Kakende, Kidongo, Kamusenene, Bethlehem, Nyondo, Buswabwera, Mbirizi, Kisenyi Kisala West, Kabaale-Kyabicwe, Nkooko, Kabulasoke, Nyamasoga and Muyenje	

Table C3.2-2 Village Local Council and Community Members Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Land-based livelihoods	There are concerns that the pipeline may affect food crops that are grown above the pipeline How will watering points and cattle crossing points for cattle be handled? Will residents be allowed to graze cows over the pipeline route? Concerns were raised about land degradation, destruction of crops and damage to livelihoods	Stakeholders were assured that the pipeline will be two metres below ground and will be well insulated so as to minimise impacts on human activities. Stakeholders were advised that studies will map out all watering points and mitigation measures provided before commencement of the project. Stakeholders were informed that discussions over the user rights within the EACOP corridor are still ongoing and the government will communicate a final decision.	Village communities of Bethleham, Lukulavu, Kabonera, Kagoma, Kyenda, Kabulasoke, Nkooko, Kabaale-Kyabicwe, Nzoo, Nyondo, Kyengera, Miti, Ssanje Katwe, Mbirizi, Nyamosoga, Kisenyi, Kalembe, Kibonzi, Lukoma and Mabale	See Section 8.13 (Land-Based Livelihoods)
Archaeology and Cultural Heritage (Terrestrial and Marine)				
Tangible and intangible cultural heritage	How will grave sites within the 30 m corridor be handled? Concern about destruction of cultural heritage	Stakeholders were assured that such grace sites will be mapped and if they cannot be avoided, they will be relocated with the consent of the affected persons.	Village communities of Kalembe, Miti, Muyenje, Kabonera, Serinya and Bethlehem	See Section 8.20 (Tangible and Intangible Cultural Heritage)

Table C3.2-2 Village Local Council and Community Members Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Physical Environment				
Air quality and climate change	Concerns were raised about pollution and seasonal climate changes		Village communities of Njaza, Kyenda, Kisala West, Nzoo, Katikara, Nkooko, Miti, Kisenyi and Katooke	See Section 8.9 (Air Quality)
Groundwater	What will happen if the pipeline is routed through community water sources such as valley dams or boreholes? Concern were raised about contamination of water sources	Stakeholders were advised that water sources will be mapped prior to construction and avoided, and, in the case they cannot be avoided, alternative water sources will be provided.	Village communities of Kagango, Lukoma and Kagoma	See Section 8.7 (Grounwater)

Table C3.2-2 Village Local Council and Community Members Stakeholder Concerns, Baseline and Impact Assessment Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Project and ESIA-Related				
Project information	Will the pipeline construction works be confined to the 30 m corridor? When did the mapping of the proposed route commence and can the residents be provided with a map indicating it? Is there adequate oil resource for Ugandans before it is exported? How will complaints/ concerns related to the project be handled? Concerns were raised about damage to oil pipeline and oil spillages	Stakeholders were informed that construction works will be within the 30 m corridor. Stakeholders were advised that mapping for the project commenced years ago using satellite imagery and photography. The actual route will only be optimised following the finalisation of the ESIA studies. Stakeholders were informed that crude oil produced from the Lake Albert development area is to be transported and exported to international markets, contributing to government renevue. Stakeholders were assured that there will be Community Liaison officers located at various points along the pipeline route.	Village communities of Kalembe, Lulongo, Mbirizi, Miti, Nkooko, Katooke and Butiti	See Section 2 (Project Background and Description)
Stakeholder engagement (ESIA related	Why do you intend to split the community members into smaller groups during the FGD's?	Stakeholders were informed that FGD's are intended to get an in depth understanding of the issues affecting a particular section of society.		See Section 7 (Stakeholder Engagement)

C3.3 Pre-Submission Phase Stakeholder Concerns

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Socio-Economic and Health				
Community health	Worries about PIIM on health facilities and services. Can any boreholes be handed over to communities following the decommissioning of camps? The EACOP project team should work closely with the District Health Office as such projects are associated with a number of public health issues. What measures will be in place to ensure the community has access to water, should a community water source be affected by the project? How has the developer planned to mitigate health impacts such as dust and noise? Will project team conduct AIDS/ HIV awareness programs in PACs? Will the project have sanitary facilities for workers at work sites? Sanitation at camps (as evidenced at the road construction workers' camps) tend to be poor.	An influx management strategy is being developed to minimise impacts associated with influx. The project team will liaise closely with local authorities on issues related to influx management. Permits for water abstraction have certain conditions of approval that have to be fulfilled, before handing over the boreholes. The prioritised mitigation for community water sources is avoidance. If a source cannot be avoided, then an alternative water source will be provided before commencement of construction activities. Water irrigation to supress dust will be regularly undertaken. HIV/AIDS awareness programs will be conducted within PACs. There will be mobile toilets for project workers and sanitary facilities within camps. Any waste discharged will be subject to a discharge permit from DWRM.	Kyankwanzi District, Lwengo District, Rakai District, Gomba District and Kakumiro District Local Governments. Katikara and Kakuuto Sub Counties. Village communities of Kisala West, Kijugunya, Kisagazi, Kyetume, Bigada, Lugala and Kyajawe B	See Section 8.18 (Community Health)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Infrastructure	Are there plans to upgrade health facilities in these areas? Are there plans to set up access roads and upgrade existing roads to the pipeline corridor? Districts should be informed, well in advance, if any education institution is to be relocated. In instances where public utilities such as water sources and schools are affected, will the project establish alternatives for the PACs? Will the project construct some water sources for the communities?	The EACOP project has no plans to upgrade health facilities within affected areas. Camps will have an onsite clinic to minimise impacts on health facilities. The EACOP project team will liaise with the existing government structures throughout the project cycle. A few access roads may be constructed to the pipeline corridor. The Government of Uganda is currently undertaking upgrade of some of the major roads within the proposed pipeline corridor. Education institutions have been avoided. In case of any changes and an education institution is affected, the district authorities will be engaged. In case the facility cannot be avoided, an alternative will be provided in consultation with the PACs and leaders. If a community water source is affected by the project, an alternative water source will be provided.	Hoima District, Kyankwanzi District, Mubende District, Rakai District, Kyotera District, Lwengo District and Kakumiro District Local Governments. Mpasaana, Kitenga, Butoloogo, Kakuuto and Lwanda Subcounties. Village communities of Kisala West, Kyenda, Kabonera, Bukalasa, Bigada and Kyajawe B.	See Section 2 (Project Background and Description) and Section 8.17 (Social Infrastructure and Services)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Economy and standard of living	Local communities should be prioritised for employment, most especially for the non-technical jobs. We have been informed that the recruitment agency (Q-Sourcing) subjected applicants to a rigorous technical interview and majority were dropped. What level of education will be considered when recruiting workers for the project? How will local persons sell commodities to project workers if there will be restricted movement to and from the camp? How will the local people be recruited for work? Youths should be considered for employment.	Employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity will be communicated in such a way as to make these employment opportunities available to as many people as possible. Recruitment of workers for non-technical jobs will prioritise local communities. We will follow up with the recruitment agency to establish why applicants were dropped. All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity will be communicated in such a way as to make these employment opportunities available to as many people as possible. Local persons can be mobilised to engage in agricultural produce that will be procured through a preferred supplier. The supplier can then deliver the produce to the camp. Local persons will be prioritised for non-technical jobs. Project team will liaise with local leaders and identify the most suitable recruitment procedures.	Hoima District, Kakumiro District, Gomba District, Lwengo District, Rakai District and Kyankwanzi District Local Governments. Nkooko, Kitenga, Butoloogo, Maddu, Maduddu, Kasasa, Kakuuto, Lugusulu and Mpasaana Subcounties Village communities of Kisala West, Kyajawe B, Kasambya, Kijugunya, Kisagazi, Kyetume, Kijaguzo, Kyenda, Kamuli, Kabonzi, Kabonera, Bukalasa, Kinvunikidde, Serinya A, Serinya B, Kabugimbi, Nabigasa and Kakende	See Section 8.11 (Economy) and Section 8.12 (Local Economy Nonland-Based Livelihoods)
Land and property	During the land acquisition, what size of the pipeline corridor will be acquired and as such considered for	A 30m corridor will be acquired and affected land owners and /or users will be compensated for loss of property and land	Hoima District, Mubende District, Gomba District, Rakai	See Section 8.15 (Land and Property)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
	compensation? Concerns over delayed compensation and resettlement. Who will be compensated for loss of land? Tenants (bibanja holders) or land owners? Will the land for the proposed activities be acquired on a permanent basis? The resettlement process should take into consideration the entire and not the single housing unit that may affected. Can affected persons choose where to be resettled? Will local governments be compensated for land take within lakeshores and wetlands? When affected persons are being compensated for losses incurred, they should be paid a lump sum amount and not instalments. Experience from past projects show compensations rates to be unfair. Surveys should be carried out to ensure compensation is fair. Can a house or crops be planted within a right of way?	take. The EACOP project team will liaise with existing local government structures. Affected land users and owners will be compensated for property and/or land that will lost due to project activities. The proposal is that the Government of Uganda (through the Uganda land Commission) to take over ownership of the land that will be acquired for the EACOP project. The Resettlement Action Plan, which will be developed, will provide the most financially feasible alternatives for handling such cases. The PAPs will be engaged to identify the most appropriate and financially feasible alternative. The Government of Uganda will provide guidance on how public land acquisition will be handled. The EACOP project will provide compensation for losses as a result of physical and or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards. There will be no construction of houses or planting of trees permitted within the right of way.	District, Sembabule District, Kyotera District and Kyankwanzi District Local Governments. Kiziranfumbi Mpasaana, Kisiita, Ntwetwe, Kitenga, Butoloogo, Maduddu, Lwanda, Kifamba, Kasasa, Nabigasa, Lugususlu and Kiziranfumbi Subcounties. Village communities of Kijungunya, Kyajawe B, Kakende, Kisala West, Kasambya, Kijugunya, Kisagazi, Kamuli, Kabonzi, Lukoma, Kabonera, Bukalasa, Sembabule Market Zone, Serinya A, Serinya B, Bulakati, Nabigasa, Kabugimbi, Mijunwa and Kisiita Town Council.	

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Land-based livelihoods	During the construction phase, alternative routes will be established for livestock crossing. Will these routes be maintained following completion of the construction phase or animals will be allowed to move freely along the pipeline corridor? How will mature fruit trees be compensated. Trees are livelihoods and produce fruits on an annual basis. Alternative routes should be identified for affected wildlife, cattle and PA in places like Sango Bay where people use footpaths to collect water. Are there plans to train local farmers so they can supply food products that can be procured by the project	During the operation phase, livestock will move freely across the pipeline corridor. The project will provide compensation for losses, on the basis of rates validated by the Chief Government Valuer (CGV). Communities will be sinsitised on the requirements that should be compiled with to supply goods and services to the project.	Hoima District, Lwengo District and Kyotera District Local Governments. Lugusulu Subcounty. Village communities of Kisala West, Nabigasa, Mijunwa and Kabonera	See Section 2 (Project Background and Description) and Section 8.13 (Land-Based Livelihoods)
River and lake-based livelihoods	How many rivers will be crossed by the pipeline route?	Nine rivers will be crossed by the export pipeline in Uganda. Some of the rivers include Kafu, Juma ngabo (that feeds into Wambabya),	Hoima District	See Section 8.14 (River and Lake-Based Livelihoods)
Community safety, security and welfare	Experience from infrastructural developments is that they are associated with kidnaps and human sacrifices. There is a fear within communities that such acts may crop up due to the proposed project. Social risks (such as increased prevalence of HIV/AIDS, use of child	There will be no kidnapping of children and human sacrifices due to the proposed project. Communities will be sensitised to ensure this fear is addressed. Social risks have been evaluated and mitigation measures proposed in the report. Additionally, the project team and contractors will liaise with the existing local	Kyankwanzi District, Rakai District and Kakumiro Local Governments. Mpasaana, Maddu, Maduddu and Nkooko Subcounties. Village communities of Kisala West, Kasambya,	See Section 8.19 (Community Safety, Security and Welfare)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
	labour, transactional sex, teenage pregnancies) that are likely to emanate from the project activities can be managed by the District officers such as the Labour Officer, CDO and Information Officer. How shall we work with the EACOP project Community Liaison Officer to ensure such risks are minimised? The vulnerable persons may not have their grievances addressed due to the high levels of corruption within the judicial system. How will the project safeguard the community against con artists and fraudsters? Worries about family breakages due to project workers eloping with wives. There is a likelihood of increased accidents in the area due to increased traffic. What will be done to minimize accidents? How will the communities benefit from the proposed project? How will increase crime rates be managed?	government structures to address issues related to social risks. There are various levels of handling grievances within the grievance redress mechanism. The courts of law are the last option. The EACOP project team channel of communication is through Community Liaison Officers (CLOs). The CLOs will provide telephone contacts to local communities. During recruitment of workers from local areas, leaders will be involved to minimise incidents of fraud. There are a number of plans to minimise interactions between workers and local communities. Project vehicles will be installed with IVMS to ensure compliance with set speed limits for community areas. There are going to be a number of potential benefits from the project and these include; employment opportunities, infrastructure development, local content and skill transfer, increase in foreign exchange. The project team will liaise with local authorities to manage crime levels due to the project activities.	Serinya A, Serinya B, Kinvunikidde, Butoloogo, Bigada and Kijugunya.	

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Archaeology and Cultural Heritage (Terrestrial and Marine)				
Tangible and intangible cultural heritage	How will intangible cultural resources be affected? How many cultural sites have been identified as likely to be impacted and in which particular areas? The study team should engage cultural institutions, notably Bunyoro Kitara Kingdom. How will grave sites be handled? There are cultural resources in this area like the Chwezi trees. What will be done when these are to be crossed by the pipeline? There are some people who have started setting up non-existent gravesites within the proposed pipeline corridor with an aim of defrauding the project. This is not a good practice and all those involved should stop since affected graves will have to be verified before compensation.	Impacts on cultural resources (including intangible) are included in Section xx of the report. Noted, cultural institutions will be engaged. Affected burial sites will be relocated, with consent from the affected persons. Cultural resources have been mapped out and the prioritised mitigation measure is avoidance. In case the resource cannot be avoided, then relocation will be considered with consent of the affected persons. Valuation reports include detail of affected resources and assets. There should be no attempt to set up graveyards where there no persons buried at such locations.	Hoima District and Gomba District Local Governments. Lwanda Subcounty. Village communities of Kisala West, Bukalasa, Sembabule Market Zone, Lugala, Nabigasa, Kabugimbi, Mijunwa, Serinya A and Serinya B.	See Section 8.20 (Tangible and Intangible Cultural Heritage)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Biodiversity				
Habitats of conservation importance (terrestrial and aquatic)	What measures are in place to ensure loss of biomass (especially tree cover) due to project activities is addressed? The District has a tree planting project and if this can be funded by EACOP, it may help to address this issue. How many wetlands and forests will be crossed by the proposed pipeline corridor in Mubende District? Will there be compensation for such resources? If a forest resource is impacted, compensation should not be limited to the forest owner as there many beneficiaries of such a resource. In ecologically sensitive areas, what will be the size of the construction corridor?	Mitigation measures related to loss of biodiversity are outlined in Section xx of the ESIA report. No net loss for biodiversity is being prioritised by the project. The footprint will be reduced to a 20m corridor to minimise impacts in such areas.	Kakumiro and Mubende Districts. Kitenga Subcounty. Village community of Kasambya.	See Section 2 (Project Background and Description) and Section 8.2 (Biodiversity: Habitats of Conservation Importance)
Physical Environment				
Groundwater	How will the risk associated with potential contamination of water sources be handled? Will communities be provided with alternative water sources? What measures are in place to address issues related to potential loss of water sources for local communities?	Mitigation measures to address the risk of water contamination are included in Section xx of the ESIA report. Community water sources will be avoided by the pipeline route. In case avoidance is not possible, then an alternative water source will be provided before construction commences.	Kakumiro District. Katikara Subcounty	See Section 8.7 (Groundwater)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Project and ESIA-Related				
ESIA studies and mitigation measures	How will local governments ensure that the proposed mitigation measures are enforced? Local governments should be engaged not through meetings but in issues related to grievance management and resettlement process. Results of the geophysical and geological surveys should be shared with the Local Governments. Roles of the local governments should be clearly spelt out in the Environmental and Social Management Plans. There is a fear that grievance management committees may be ineffective due to corruption and may not address vulnerable groups. In the proposed grievance redress mechanism, the aggrieved party should be provided with an acknowledgement to indicate that a grievance has been recorded.	The District Environment Officers are mandated to conduct regular inspections and monitoring to ensure that mitigation measures are implemented. Local governments will be part of the grievance redress mechanism (through a Grievance Management Committee that will be established at the District) and during the resettlement process, technical officers at the district will part of the process. Surveys will be discussed with Ministry of Energy and Mineral Development to identify the most appropriate method of transmitting the data to local governments. Roles of government departments will be included in the report. There are various levels of redress for aggrieved persons and as such, the affected person should be able to appeal. The aggrieved party will be provided with an acknowledgement form to indicate that a grievance has been received and recorded.	Hoima District, Mubende District, Sembabule District and Kyankwanzi District Local Governments. Nkooko and Lugusulu Subcounties. Village communities of Kyajawe B and Kijugunya	See Section 2 (Project Background and Description) and Section 8 (Impact Identification and Evaluation)
Stakeholder engagement	There should be a mechanism to ensure that all communities along the proposed pipeline corridor are eventually engaged to minimise	During the ESIA studies, communities along the pipeline were sampled to obtain a representative sample within the study scope. However, the EACOP project has a	Hoima District. Kakumiro District, Sembabule District and Kyankwanzi	See Section 7 (Stakeholder Engagement)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
	grievances that may crop up as a result of some directly affected communities not being engaged. Pre-construction engagements should be conducted with affected communities to ensure that communities are empowered on what contractors are obliged to do. There is a need to have such engagements held regularly at the subcounty levels. Stakeholder engagements with local communities should be conducted in local languages (including reading material). Local governments should take lead during sensitization of local people on the proposed project. A concern was raised that local leaders are not given adequate information about the actual location of the proposed pipeline corridor. There should be sensitisation before resettlement and compensation processes commence. District authorities were not involved in the land acquisition for the proposed camp in Kitenga subcounty.	team of Community Liaison Officers (CLOs) that is engaging directly affected communities. Noted. Pre-construction engagements will be conducted. The EACOP project team will liaise with leaders at subcounties (LCIII) regularly. Engagements within local communities are held in local languages. Reading materials are translated to local languages. Local government officials will participate in the sensitisation of communities. The project team will communicate planned community engagements to the leaders. The proposed pipeline route will only be firmed up following completion of the ESIA studies and geotechnical surveys. PACs will be sensitised on the planned resettlement and related compensation processes. The relevant District authorities will be involved in the land acquisition process for the camp.	District Local Government. Mpasana, Lugusulu and Nkooko Subcounties. Kisiita Town Council. Village communities of Kasambya and Kabonera.	

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
Project Information	When is the production of crude oil likely to commence? Why it is being exported? We do not have enough energy sources in the country. We are not certain of the particular areas (in the subcounty) where the pipeline will be routed. Can you confirm the specific route? If government is to revert the 20m strip of the land acquired for construction of the pipeline to the previous land owners, what measures will be put in place to ensure that only permitted activities are undertaken within this corridor? Are there any CSR programmes for the affected communities? How can local companies that would like to supply goods and services in the oil and gas sector be registered to the National Suppliers' Database? Where are offices of Petroleum Authority of Uganda (PAU) located? Worries over secondary resettlement? How long will the construction phase take? Following acquisition of land, will the government restrict activities within the 30-m corridor?	The production of oil is dependent on the establishment of support infrastructure (such as the CPF, pipelines/flow lines, refinery). These should be developed prior to commencement of the production of crude. Once produced, the crude oil will be partly refined in Uganda to supply the local market and partly exported to the international market. There are some ongoing studies (G&G and ESIA) that will confirm the pipeline route. During the pre-construction survey, leaders will be provided with the final pipeline route. The acquisition of the entire 30m corridor is being considered by the Government of Uganda. There is currently no budget for CSR projects along the EACOP until a Final Investment Decision (FID) has been reached. The proposed surveys and ESIA studies will guide the FID. Offices of the Authority are located in Entebbe. Information on how an application can be conducted is obtained online by accessing the PAU website. Cumulative impacts have been evaluated and the most appropriate mitigation measures will be implemented.	Hoima District, Gomba District, Kakumiro District, Kyankwanzi District, Lwengo District, Sembabule District and Mubende District. Nkooko, Kakuuto and Mpasaana Subcounties. Local Government. Village communities of Kasambya, Kakende, Kijugunya, Kijaguzo Kisagazi, Kyenda, Lukoma, Kabonera, Bukalasa, Bulakati, Sembabule Market Zone, Lugala, Bigada, Nabigasa, Kabugimbi, Mijunwa and Kyajawe B.	See Section 2 (Project Background and Description)

Table C3.3-1 Village Local Council and Community Members Stakeholder Concerns, Pre-Submission Phase

Topic	Concerns and Questions Raised	Responses	Relevant Stakeholders	ESIA Reference
	What measures are in place to handle plastic waste? What security measures have been put in place to guard the pipeline from vandalism? Since the proposed pipeline requires heating, are there plans to install electricity supply to areas without energy sources for heating the pipeline? Will the oil deplete after some time?	Construction phase will take between two and three years. Negotiations are still ongoing between the various government agencies on how the 30-m corridor of land will be managed. Generated waste will be segregated at site and a NEMA-licensed waste handling company will be procured to collect and dispose of the waste. An extensive pipeline monitoring and control system will be implemented to detect abnormal situations. The source of energy for heating the pipeline will be the CPF in Buliisa District. It is estimated that the oil resource will be depleted after three decades.		

C4 RECORDS OF STAKEHOLDER ENGAGEMENT

PDF reports follow for:

- scoping phase
- baseline and impact assessment phase
- pre-submission phase.

APPENDIX C4.1 RECORD OF STAKEHOLDER ENGAGEMENT

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
19 April 2017	LC5 – Local Government	Hoima District Health Authorities	Male	District Health Officer (DHO)	When is the Project starting?	Explained that concerns processes (ESHIA) needed to be completed prior to start of Project.
			Male	District Health Officer (DHO)	Is the Pipeline going to pass under any lakes?	Not anticipated at this point. It is only traversing land.
			Male	District Planner	How will influx be managed when people come in looking for work?	Concern acknowledged and this will be part of the impact assessment process.
			Male	District Planner	Are people along the pipeline route going to be displaced?	This depends on the final pipeline route. It is not determined yet. The resettlement team will be better placed to answer this question.
			Male	District Planner	Communities are anxious about the project.	Noted. Stakeholder engagement is a vital process within a project.
20 April 2017	LC5 - Local Government	Mubende District Health Authorities	Male	District Health Officer (DHO)	Consideration should be given to including community development officers, subcounty chiefs and health assistants in next phase of HIA.	The HIA team has taken note of this and will continue to interact with the DHMT on the workshop.
			Male	District Health Officer (DHO)	How will spillages be managed?	It is typical of projects to have plans concerning emergency response and environmental management plans. We do not have any details regarding these plans at the moment though.
			Male	Biostatistician	How will compensation for land be handled?	We do not have any specific details about this at the moment but specific teams within the project will be tasked with these issues.
20 April 2017	LC5 - Local Government	Kakumiro District Health Authorities	Male	District Health Officer (DHO)	Will the DHMT (and other stakeholders) receive copies of the HIA?	Unfortunately, the report cannot be shared with any stakeholders outside of the project.
			Male	District Health Officer (DHO)	I am concerned about environmental degradation as a result of pipeline construction.	As part of the ESHIA process, the project will also look at environmental impacts and develop mitigation measures for these impacts.
			Male	District Health Officer (DHO)	Will all impacts be considered, e.g., potential cancers from PAH exposure and spillages?	All potential health-related impacts will be considered as part of the HIA.
			Male	District Health Officer (DHO)	How are the communities to be engaged? Propose that a robust community engagement process be developed	Community engagement is usually a priority in these types of projects. We are sure it will be a priority in this project as well.
			Male	District Health Officer (DHO)	Please ensure that local people are employed by the project, where possible.	This concern is noted and will be communicated to the relevant people within the project.
20 April 2017	LC5 - Local Government	Kyankwanzi District Health Authorities	Male	District Vector Control Officer (DVCO)	Other pipeline projects should be studied as benchmarks for this one; primary concern is elevated cancer rates caused by leakages	The literature review will look at similar projects and all risks will be taken into account.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	District Vector Control Officer (DVCO)	Do you have any project documents that you can share and leave behind with the meeting participants?	Unfortunately not. We may have in future but not during this meeting.
			Male	District Vector Control Officer (DVCO)	Stakeholders have noticed changing weather patterns and droughts since oil has been discovered. Is there a correlation between the two?	Weather changes have been prevalent in neighbouring countries as well. No proof at present that this is correlated to the oil discovery.
24 April 2017	LC5 - Local Government	Gomba District Health Authorities	Female	Assistant District Health Officer (ADHO)	Is there a likelihood of getting support from EACOP for the health sector to cater for the large influx of people?	The company will most likely cater for the health of its workers.
			Female	Assistant District Health Officer (ADHO)	Will the health data for the people in the project camp be shared with the district health management team?	A system will be set up on how the health data will be managed and shared with relevant authorities.
			Male	District Health Inspector (DHI)	Will there be compensation for the people whose land is affected by the EACOP?	Resettlement procedures will be followed according to national guidelines.
			Male	District Health Inspector (DHI)	The DHMT is concerned about disease outbreaks as a result of the influx of people in the district	The pipeline will follow international standards and, in the unlikely event of the leakages, there will be protocol on how to contain and manage the situation.
			Male	District Health Inspector (DHI)	Will the DHMT be allowed access to the project camp health clinic?	We encourage the DHMT to have a dialogue with the project team when the project starts to discuss this with them.
25 April 2017	LC5 - Local Government	Lwengo District Health Authorities	Male	District Health Inspector (DHI)	Can the EACOP project help to improve the health facilities in the affected areas as part of CSR so that the people in those areas can also feel the impact of the project?	While the project may occasionally improve health facilities in some areas as part of CSR, this may not be possible in all the districts where the pipeline will pass due to limited resources. However, the idea will be shared with the project team for consideration.
			Male	District Health Officer (DHO)	For future engagements on this project, we expect participants invited for the meetings to be provided with at least lunch and a transport refund. The previous stakeholder engagement by this project did not go well, as most people who were invited were not provided with lunch or a transport refund even when some of the people had travelled from the subcounty to the district level. People are complaining and planning to boycott any future meetings if this issue is not looked into.	The current guidance is not to provide facilitation, however your concerns will be taken back to the project team.
26 April 2017	LC5 - Local Government	Sembabule District Health Authorities	Male	District Health Inspector (DHI)	What is the plan to ensure that people will not build structures on top of the pipeline. How will you monitor the entire pipeline corridor?	A community engagement team will explain the rights of usage within the pipeline corridor.
			Male	District Health Inspector (DHI)	We hope that for the upcoming workshop with the entire DHMT during the baseline, there will be facilitation in terms of lunch and transport refund. Otherwise people will not be motivated to attend the meeting.	Feedback will be provided to the project team for a decision.
			Male	District Health Inspector (DHI)	Being a big project, it is likely to cause an influx of people in the district and likely to affect the health services especially the medicines which are supplied based on district population data. How will this be mitigated?	This concern will be part of the health impact assessment report to inform the project team on possible mitigation measures.
			Male	District Health Inspector (DHI)	What strategies will be used to mitigate and contain the likely spikes in HIV rates due to the influx of many people?	This concern will be part of the health impact assessment report to inform the project team on possible mitigation measures.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	District Health Inspector (DHI)	If it is going to be a heated pipeline, how will you mitigate the hazard resulting from that heat on the ecosystem?	The pipeline will be constructed in accordance with international guidelines and the heat will not be felt on the surface to cause any damage to vegetation. It will be about half of the boiling water temperature to allow for the oil to flow.
			Female	Biostatistician	If there is going to be a health camp for the pipeline workers? Will the data from the clinic be shared with the DHMT? Previously, the road construction people have not shared the health data from their camp despite having shared data collection forms with them.	We encourage the DHMT to approach the clinic camp management and request for this kind of information if needed.
27 April 2017	LC5 - Local Government	Rakai District Health Authorities	Male	Assistant District Health Officer (ADHO)	What will be the average duration of the pipeline construction in the district?	Average duration of the pipeline construction is estimated at 1–2 months in each district.
			Male	Assistant District Health Officer (ADHO)	After the construction of the pipeline, will the workers leave or stay in the district?	This is always dependent on individual people's decision. However, it is expected that the expatriate workers would most likely not stay in the district.
			Male	Assistant District Health Officer (ADHO)	How will we manage to deliver health services to the increased number of people in the district? How will the pipeline project help us to mitigate that impact?	This concern will be part of the HIA report to inform mitigation measures in consultation with the DHMT.
			Male	Assistant District Health Officer (ADHO)	How will we mitigate the likely increased social vices, e.g., commercial sex work, as a result of the pipeline project?	This concern will be part of the HIA report to inform mitigation measures in consultation with the DHMT.
			Male	Assistant District Health Officer (ADHO)	The pipeline workers are likely to leave behind pregnant women and fatherless children.	This concern will be part of the HIA report to inform mitigation measures in consultation with the DHMT.
			Male	Assistant District Health Officer (ADHO)	Will you provide a budget for the workshop in July/August? Otherwise, it will not be possible for the DHOs office to organise this workshop without facilitation, e.g., for communication and refreshments.	This concern will be discussed with the EACOP project team.
			Male	Assistant District Health Officer (ADHO)	Who will manage the health services for the pipeline workers?	The project will most likely have a clinic within the project camp to provide basic health services for its workers.
			Male	Assistant District Health Officer (ADHO)	The pipeline construction should be expedited in a short time to avoid constraining the health system in the districts.	As earlier indicated, it is anticipated that it will not take more than two months in each district.
			Male	Assistant District Health Officer (ADHO)	The district health system is already constrained; it cannot handle a large influx of people	Concern has been noted and will be included in the HIA report to inform mitigation measures.
			Male	Assistant District Health Officer (ADHO)	Rakai district is going to be divided into two districts in the coming financial year. Of the six subcounties where the pipeline is passing, four will be in the new district of Kyotera while two will remain in the old district of Rakai.	Thank you for the information.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
4 May 2017	LC5 - Local Government	Hoima District Technical Planning Committee/Political Leaders	Male		How do we get to access the detailed scoping plan? This will enable us to prepare the communities at the right time.	During the ESIA process, there will be disclosure of the ESIA findings once the draft impact assessment has been prepared. However, we would like to detail district*wide summary findings of the scoping stakeholder engagement and feed it back to you, most probably in June or July.
			Male		I am concerned about biodiversity. There are many species at all levels within the realm of biodiversity, so I am concerned that the uniqueness of this environment will not be damaged. Will cultural sites be moved if they are found?	ESIA specialist studies will be undertaken to study the biodiversity or biophysical and socio-economic environment. A chance finds procedure will be developed for cultural heritage in the event that during construction a site is found. The mitigation hierarchy is avoid, minimise, restore and offset.
			Female		At what stage do you share your findings?	During the disclosure phase before submittal to NEMA
			Male		Biodiversity is very difficult to attach a value to, as we have many areas of high biodiversity.	Your comment is noted. The ESIA process will undertake in-depth studies of biodiversity aspects.
			Male		What is the involvement of local expertise?	The mitigation measures of the impact assessment will propose capacity building and skills development based on findings from the socio-economic studies. Also for the developer to establish a local hiring policy for skilled and unskilled labour and to build the capacity of local suppliers to enable them to undertake the requisite procurement procedures
			Female		How much land will be taken and where exactly? There is going to be a big impact here from all the proposed developments. We constantly receive phone calls and questions from people in Hoima about the land take for the proposed feeder, Kingfisher pipeline and the export pipeline.	Until the studies are completed, we do not know the exact line of the pipeline. The studies and the G&G survey will inform the final decision. The ESIA in question is related to the feeder and the export pipeline not the Kingfisher feeder. Nevertheless, this ESIA will consider the cumulative impacts of all the proposed developments including those beyond the oil sector. There will be a 30-m RoW during construction for temporary land take during construction and a 10-m corridor (with easement access) once the pipeline is buried. We will note your comment regarding the request for further information on the development to provide accurate information to the Hoima residents.
			Female		I am concerned about the heat of the pipe in the ground.	The pipe will be coated which will prohibit the heat radiating beyond the coating. It will not affect the soil above or around the pipeline.
			Female		Will there be an explosion?	The ESIA findings will feed in to the engineering and design of the infrastructure and the best available technology will be used. The developer works hard to prevent a pipeline incidents in their other oil developments, but in the unlikely event of a pipeline emergency it will communicate plans and drills with local emergency personnel, such as fire and police departments, to ensure our response to an incident is well coordinated and effective.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male		Will sulphate gases be emitted?	We are designing the infrastructure using best practice and the best available technology.
			Male		Will there be foundations in the trench?	Yes, there will be foundations below the pipeline.
			Male		These developments will be a veritable change to our livelihoods of the people of Hoima forever in all socio-economic and environmental aspects. This is the first time anyone has come to talk with us.	Your comment is noted, and the feeder and export pipeline ESIA will study cumulative impacts.
			Female		We understand that the Kingfisher pipeline will also be having an 'export' pipeline. How many pipelines are there going to be? We are all confused.	Kingfisher will have its own feeder pipeline, which will then feed in to the EACOP export pipeline. There will only be one export pipeline, which is what this ESIA will be studying along with the feeder pipeline to Buliisa. There will be a refined product pipeline from the refinery; however, this is subject to a separate study undertaken by the Government. However, your comment is well noted.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
4 May 2017	LC5 - Local Government	Kakumiro District Technical Planning Committee and Political Leaders	Male	Accountant	How prepared is EACOP to mitigate the likely impacts of the proposed project?	They are very prepared, and willing, and they will also be able to prepare themselves more once they have the results of this ESIA.
			Male	Chairperson	Why should this project be called EACOP? It is not East African; it is Ugandan. Won't other countries exploit our oil and then we will lose it as a country? Why is the project endeavouring to avoid houses and land? Is it because the Government does not want to compensate people? Do not try to avoid, rather do a long-term lease so that there can be some inheritance for our children. When it comes to employment, priority must be given to the local people. I would like local people to be the ones to dig. We do not want a situation where other people benefit when youths in our area have no jobs.	The project team has been thinking of the pipeline in a regional context. Uganda is landlocked, and the crude oil must get to a port somehow, to be sold on the international market. So, a route needed to be found through Kenya or Tanzania. Tanzania was the best for several reasons, once of which was safety - so there is no threat to the oil, or to Uganda's stake in it. Also, there is quite a bit of oil exploration going on in the whole East African region, so this pipeline could be placed to be the main export pipeline for all of the oil. It is international best practice to avoid any resettlement of people, if possible. Often, too much resettlement can mean a project does not go ahead. However, where people must be moved the project partners, including the Government of Uganda, will compensate fairly. The project agrees, and priority will be given to local content. However, the trench will be dug by an excavator, which you may know or have seen – a big yellow digger.
			Male	District Planner	Local leaders must be utilised to mobilise and sensitise the residents through various radio programmes. This will carry more meaning. The District Chairperson should be hosted on the radio to explain more about the project.	The project team really appreciates your willingness to be involved, and we will take that into consideration when planning. Currently, the project team will handle public relations.
			Female	Human Resource Officer	Besides the sampled subcounties, which other subcounties are affected by the pipeline project?	We actually have not sampled subcounties. We are seeing and meeting with each and every affected one. So, the ones in this district are Kasiita, Mpasaana, and Nkooko. We are seeing Nkooko today.
			Male	Accountant	Is EACOP following the existing roads to construct the pipeline or will they have completely new and different routes? How will compensation of communal assets be handled? Will it be cash or replacement compensation? This sensitisation campaign should also target institutions like schools.	At the moment, the plans are to use, and maintain, existing roads where safe and feasible, and to build only a very few kilometres of new road. The RoW is actually used as the road for the construction traffic as much as possible. It will be a mix of the two, most likely, so that there is something for any eventuality. The resettlement planning team will go into more detail with you. Perhaps when the project receives the go-ahead there will be a bigger sensitisation campaign, that would include schools, but for the moment we would like to continue to discuss with you. Thank you for your suggestion.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
5 May 2017	LC3 - Lower Local Government	Kisiita Subcounty	Male	Gombolola Internal Security Officer (GISO)	What sort of environmental impact could the heating of the pipeline cause?	There is a famous heated pipeline in Alaska that is about 30 years old and has been monitored extensively to determine environmental impact. The findings show that there is none, because the pipeline and its coating acts like a flask, so it keeps heat on the inside.
			Female	Police	Do we need to register for job opportunities, or have any registrations?	Unskilled and short-term labour jobs don't need any certificates, but for any skilled job advertised, the people applying should have the appropriate paperwork.
			Male	Health Worker	Will the 30 m be fenced, or will the 10 m be fenced? How will you deal with roads? The fencing of the pipeline construction corridor during construction might disrupt certain services like access roads. How will this be addressed? Why did you choose Kisiita and Mpasaana? Why not other villages?	The 30 m will be fenced during construction to give a visual boundary to the construction corridor for both the construction team and the local residents. The fence will need to be animal-proof, but there will be crossing points where needed, so where well-used cattle tracks are, and where roads are. The villages are sampled randomly to start to give us an idea of people's perceptions and concerns here. During baseline data collection, we will do some other villages too.
			Male	Teacher	How are you going to find everyone for these meetings? How will you make sure that everyone who needs to hear hears? (Asking in relation to the confusion about Kisiita A Village meeting date, which was caused by the SAS)	Stakeholder engagement, at this point, aims to reach groups such as this subcounty technical committee, mainly. Villages are also so important, but as we had a good representation from the village, it doesn't matter at this point about some communication mistakes. When it comes to the exact pipeline footprint, we will need to find everyone, with your help.
			Male	Gombolola Internal Security Officer (GISO)	How long will the construction phase of the project take? Will the landowners and land users be compensated for temporary land acquisition during the construction phase?	The whole construction, from Buliisa to Tanga, will take 2–3 years. To come through here may only take about six weeks of intense work then some testing and rehabilitation, so it is a very short-term impact. Both the landowners and land users will be compensated for the land needed temporarily and permanently.
			Male	Health Worker	I have a fear that people will be conning us, that they will pretend to be with your teams but that they will ask us for money to register and be part of EACOP. Is it possible for you to meet again with more local leaders and other people at subcounty level, to give them this warning?	We will continue to engage with leaders throughout this process, but please could you also, as the SC leadership, warn people that nobody from our teams will ever, ever, ever ask residents for money to do any surveys or research. If people ask for money, they are the con artists and you shouldn't trust them.
			Male	Gombolola Internal Security Officer (GISO)	I am worried about speculation. Where exactly will the pipeline pass? Can you show us? We want to be able to monitor and sensitise people.	We agree and are also very worried. The final route will be determined through this ESIA, with the design team, and will be communicated at that point. In the meantime, speculation is not worth it; it would be like gambling.
			Male	Chairperson	Can the leaders be provided with a map indicating the pipeline corridor? The sensitisation should be enhanced considering this is a project of this magnitude is new to the residents in the subcounty. The EACOP team should consider helping the community plant trees as one of its CSR projects.	As soon as the corridor has been determined we will be able to engage with you about it, and there will surely be a way in which to indicate it visually at some point. We will also be engaging with more people as we go along, with your leadership. It would be good to find out more about your tree-planting initiatives, and we will record that comment as a suggestion.
5 May 2017	LC3 - Lower Local Government	Nkooko Subcounty	Female	Chief	Is it possible for the subcounty leadership to be provided with a map indicating the proposed pipeline corridor within the subcounty? Is it possible to get a list of all of the villages that are affected?	It will be possible for you to have a map once the route has been determined and the authorisation has been given. These sorts of things will become public documents. You will be engaged before then, though.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Speaker	How long will the construction phase take to be completed within our subcounty? If you could tell us, it would provide an approximate time of how long the 30-m corridor will be leased from people. For permanent AGIs such as the pump station, will the land where they will be located be permanently acquired by EACOP? Are there plans to upgrade certain infrastructure like roads and health centres to support the construction of the pipeline?	We are not sure yet, because the contractor will need to put his logistical plan together. But, possibly a few months. It will need to be acquired permanently for pumping stations, block valve stations and other permanent infrastructure. There are plans to upgrade the roads that will need to be used, but we are not sure yet about any other facilities. That will have to be determined through this survey, and the subsequent management plans.
5 May 2017	LC1 - Village Local Council and Community Members	Kisiita A Village			Won't our roads and houses be cut off if they fall within the 30-mcorridor? If yes, what are the plans?	Studies will identify all sensitive areas and assets and appropriate measures will be put in place to mitigate any negative impacts on the community and families.
					Why can't people be given cash instead of being resettled by the Government?	Consultations will be carried out with the affected people to decide on the mode of compensation but experience has shown that people tend to misuse cash compensation.
					What measures will be put at the refinery to avoid dangerous emissions from spreading and affecting people around and beyond? What is the safe zone like?	Plans will designed to ensure that smoke and other emissions from the refinery are properly managed in accordance with the laws of the land. Safe zone is not yet determined but once studies are complete then this shall be communicated to the public.
					Will there be opportunities for training locals when the project starts? Camp jobs should only be given to the locals only.	This will be forwarded to the developers to make decisions
					How many pipeline routes are going to be there? Is it only one or many?	There will be one export pipeline route.
					Why don't you provide us with sodas and transport refund?	The policy does not allow for such kind of allowances but this concern will be forwarded on.
					How much will the locals be paid to avoid issues of exploitation, like what has happened before? Is there a standard rate? How have you planned to manage pipeline workers who may become dangerous to our girls and women?	This will be communicated at an appropriate time but this concern will be forwarded to the developers to take it into consideration. There will be management plans designed to address such social challenges when time comes.
					Why don't you consider us for allowances when we come to such meetings?	Our policy currently allows us to provide only water and biscuits.
6 May 2017	LC1 - Village Local Council and Community Members	Mpasaana Village	Female	Vice Chairperson	What happens to people whose properties are damaged by the line?	They will be compensated, in cash or in kind, depending on the advice from the specialist resettlement team, and the results of discussions between the affected person and the project partners. All rates and offers, and discussions, are guided by the laws of the Government of Uganda and by international best practice.
			Male	Councillor	How will residents of Mpasaana benefit? Who will be considered for jobs?	The project team has said that it values local content and wishes to ensure that local people benefit from the short-term jobs. Any available jobs will be advertised through your leadership. Also, the pipeline construction will need associated services like barbers and snack providers, and national focus will be brought to your village.
					In this meeting, we have people from very many villages because we were all called here. Will this carry on, or will only the people who are affected be called for meetings? We know that you have done the mapping already, so we want to know.	We apologise that the communication was misleading. Only Mpasaana residents were directly invited. However, this is an open meeting, and we are glad that you chose to come. Mpasaana was just selected randomly, as a sample. Going forward, there will be more specific consultations with interest groups and no general invitations extended to villages.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Councillor	You came here and spoke about the benefits. Why did you not speak about the negative effects, such as diseases, community health, air pollution, HIV and women being impregnated?	We are sorry that you feel that our "negative impact" poster did not cover all of these aspects. You are right, we need to look at the possibility of all of the impacts that you have mentioned, and we have teams who have done, and will do, just that. This ESIA process will develop mitigation measures.
					I have come to attend, but I came from very far. We're happy to know, but will there be a transport allowance for us?	We are sorry that you have made such an effort, but we are pleased that you now know more about the project. We have water and biscuits to offer only.
			Male	Coordinator for Crime Preventers	The projects will come with a good amount of money and there will be some development in the area, so there will also be security concerns.	Thank you for raising this. We agree that there could be an increase in interest from bad elements, and there needs to be mitigation measures in place.
			Female	Teacher	I need clarification on the compensation issue. In other companies, compensation is done before construction begins. How will this company handle it? How will you handle employment? How will you ensure that outside people are not used?	It will be handled before construction, for land and dwellings lost, and during construction if there is any unintended or unanticipated damage to crops or property. Some outside people will need to be employed, because of the skills needed, but the focus will be on local content for unskilled work.
			Male	Councillor	Within the 30-m corridor, 10 m will be sold permanently. Could people rather rent this to the company on a long-term lease if they are not interested in selling?	That is an interesting point; we will note it and take it to the developer for discussion. We will get back to you much later in the process, or during the RAP, with comments.
			Female	Vice Chairperson	Experience shows that whenever a pipeline passes through, the area becomes a wasteland or a desert, especially with a heated pipeline. How will you stop this?	That is interesting; it has not been our experience. Perhaps during construction the area is a bit dry and dusty because the good moist topsoil has been stripped to one side, but after construction, the rehabilitation ensures that the land is the same as before, or better. Perhaps it is a coincidence that pipelines that you have seen have been in very dry countries? Also, the heated pipeline is like a flask, hot on the inside and cool on the outside, and has not effect on the environment.
					Query about the construction process. Kibaale, by name, means "very rocky area". So, we expect blasting, which could damage people and houses.	I would agree that there could be some blasting expected. I have seen your rocky outcrops. Contractors usually use blast mats to ensure that there is no fly rock, but they would still survey the blast radius and warn people to step out of that zone for a short time. They would check to see whether there had been any fly rock and compensate accordingly.
			Female	Teacher	Will compensation happen before, during, or after construction? For example, what if my classrooms are affected or classrooms are damaged by the blasting? Are there dangers during construction? If someone is injured by construction, how will compensation happen?	It will take place before construction if there is a building, or land, that the project team knows will be affected. If your classroom were to be damaged by fly rock, for example, the compensation would be during construction.
			Female	Teacher	Will jobs only be for men or will women be considered?	Women will most certainly be considered.
			Male	Church Priest	We are facing a load-shedding problem, where we don't have electricity. We have small businesses in this village that rely on power, and if you use our electricity to keep the oil flowing you will take it away from us. The pipe could explode and affect the soil and water. How would you rectify this?	The project team does not intend to take electricity from the national grid at all. They are aware of power shortages, and we will note that you rely on electricity to run businesses. Thank you.
					Will there be a socio-economic benefit to the people? Will people who have the pride of being in the oil region have social amenities constructed for them? Will we get electricity, hospitals and schools? So at least we can be different from people who don't have oil in their areas.	The revenue generated for the Ugandan Government by this pipeline could go towards developments such as those. We are not aware of how the government will choose to allocate the revenue. We won't be in the area for long enough, only for a few months, to warrant that sort of expenditure.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
					The oil could destroy swamps and that is where we get our water. We are using one borehole to supply all of the water for this village. Is there a programme to supply water to us?	Thank you so much for telling us about this. A spill is unlikely, but if it does occur ,the oil is really waxy and doesn't spread easily. An emergency response team would come in to cleanup any spill. During construction, wetlands will be treated with care if they cannot be avoided.
					You've said that this is a multi-million-dollar project, so will there be employment chances? Can you cater to educate and train people, and change their lives? Can you provide us with irrigation?	It is an expensive project to implement, which is why the multi-million-dollar was mentioned. That is all borrowed money that must be paid back, so there is not a lot of spare money being made just yet. That money will come from oil revenue one day, and then the Government of Uganda will need to choose how to allocate. However, there will be some on-the-job training for unskilled workers.
			Male	Councillor	There are persons using wetlands and they have obtained valid user permits from NEMA. In case the pipeline is routed through such a wetland, will wetland users with valid permits be compensated?	We will need to discuss that with NEMA, but we would imagine that any legal land uses with permits would be looked at favourably and would be compensated for in some way.
6 May 2017	LC1 - Village Local Council and Community Members	Butimba Village			Some time back, officials from a ministry came and said a 130-m corridor was required. Why are you telling us something different now?	A response was not able to be given during the meeting; however, the response now is as follows: Current stakeholder engagement is regarding the EACOP project; the previous stakeholder engagement you had might be for the product pipeline from the refinery.
					You have talked about the G&G coming to do work. How will residents distinguish between those people coming to do the work and those coming to take our land?	Before anyone from the developer or commissioned by the developer comes to the communities, we follow the requisite protocol with letters and phone calls. Before going on any land, we seek permission from the landholder. G&G is a separate ESIA and the process will require thorough stakeholder engagement with the communities where it is going to take place.
			Male	Secretary of Parish	How long will it take to pay compensation and what is the project timeframe?	Depending on whether or not the project is given the go ahead, a RAP will have to be completed first but compensation would be paid before construction as per IFC guidelines. Alongside this, livelihood restoration programmes will be implemented.
				Mayor	We have many villages here. Can we have a map of those that will be affected? Rather than making people come from afar to meetings and it may not even involve them.	The ESIA studies must be completed first to assist in choosing the best route for the pipeline with the least destruction to the socio-economics and environment. We do not know yet.
					What happens if the pipeline is buried and someone tries to siphon off some fuel? There may be an explosion.	Crude oil is viscous and needs to be heated to move, so an explosion would not take place. Besides, the pipeline is coated and insulated to prevent it being damaged. If the pipe is damaged, there are block valves to stop the flow and the pipeline is monitored 24/7 remotely.
					For the pipeline, do you wish to compensate like for the refinery?	If the project is given the go ahead based on the independent ESIA report, a RAP will be developed and completed to international standards that require compensation or resettlement equal to or better than previously. A livelihood restoration plan also has to be developed. The developer will work with the Government to ensure fair resettlement activities are undertaken.
					So many people are coming here to talk to us and we do not know who to trust anymore. Why does the company not employ some of our own people as CLOs to give us accurate information?	Your comment is well noted and usually a developer of such a project would employ local CLOs
				Treasurer	Can people close to a pipeline get an insurance policy in the event that anything happens so that they can make claims?	A grievance mechanism in the process of being set up would address any such issues.

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				Treasurer	Given that the pipeline goes through our communities, can we not be given special treatment such as clean water, good schools and clinics?	Your comment is noted.
					Some people came in and marked stones in the ground for the pipeline. Is this the pipeline route?	Clarification was sought when this was undertaken and it was established that it was the utility corridor. It was explained that this corridor would take refined fuel from the refinery at Kabaale through to Kampala.
					Can the community have an opportunity to see a similar development?	Your comment is noted
					Could the community possibly see a DVD of a similar kind of pipeline?	An excellent suggestion, your comment is well noted.
			Male		Can Hoima District apply for international compensation rates?	There are no international set compensation rates just guidelines. The ESIA will be undertaken to IFC standards.
			Male	Reverend	We are so confused here. Can the community have a schedule and a coordinated approach by all the developers and disseminate a schedule of the oil development plans?	This is a good comment and other stakeholders in Hoima have said the same. Your comment is well noted. Developments of these kinds often have a protracted timeline due to the insecurity of funding. Therefore, it is difficult to put a fixed timeframe on it. The ESIA scoping phase will finish in June.
			Female		Once the pipeline is covered, will we be able to have crops or will there be permanent land take?	There will only be permanent land take for the permanent AGIs. You will be able to grow crops but no trees and have no structures on a 10-m corridor above the pipeline.
8 May 2017	LC3 - Lower Local Government	Buseruka Subcounty	Male	Chairperson	Why do you talk about a 30-m RoW when we have been told it will be a 130-m RoW?	The feeder pipeline to Buliisa and the export pipeline will require a 30-m RoW during construction. This is the crude oil pipeline. The Government refined-product pipeline, which is a separate project to this, requires a 130-m RoW.
			Male	Chairperson	How many pumping stations are on the export pipeline?	As the design stands, there are now two pumping stations.
			Male	Chairperson	What is the resettlement process?	If EACOP needs to use your land for oil operations, you will be eligible for compensation. A Resettlement Action Plan will be prepared that focuses on relocating all individuals displaced from their land as a result of the project. The exact details of resettlement, including the location of resettlement communities, will be determined in due course based on the ESIA and other specialist studies. Right now, we are initiating the ESIA studies.
			Male	Chairperson	From the Government resettlement, they have witnessed that it is better to be 'resettled'; those who were given money have nothing now. Those identified vulnerable (elderly) were 'resettled' within the subcounty at Kyakbwaga. Other lessons learnt: people were not sufficiently sensitised and Government timelines were not realistic – they would say six months and then two years later.	Your comments are noted.
			Male	Parish Chief	Why is the grievance mechanism top down and not bottom up?	The grievance mechanism is in the process of being established and your comment is noted. Usually grievance redress committees within the community are set up in due course. The EACOP project is just setting up now.
			Male	Parish Chief	How has the pipeline prepared to mitigate against the socio-economic impacts?	The ESIA will identify socio-economic impacts in terms of health, economics, livelihoods, influx and appropriate mitigation will be recommended based on best practice and lessons learnt from similar projects within similar contexts.

			Female	Vice Chairperson	For those who are affected, how long will the compensation payment take to be paid?	After the ESIA, a Resettlement Action Plan will be prepared that focuses on relocating all individuals displaced from their land as a result of the project. The exact details of resettlement, including the location of resettlement communities, will be determined in due course based on the ESIA and other specialist studies. But, yes, if compensation is chosen is appropriate for the HH, it will be paid before construction.
			Female	Vice Chairperson	In case my house is within the 30-m RoW could I have the choice of resettlement rather compensation?	The RAP discussed earlier will set out the appropriate options. As per international standards and, yes, resettlement will be an option as long as there is available land elsewhere.
			Female	Vice Chairperson	For compensation, will they consider rates from the districts or from the communities?	Compensation will be paid according to the district rates but the developer will work with the Government to do it in a fair way.
8 May 2017	LC3 - Lower Local Government	Mpasaana Subcounty	Male	Chief	Local leaders should be involved in the recruitment process of casual workers. This will boost the income of the locals. Community leaders and residents want to information on matters related to infrastructural development and resettlement plans for the persons that may be affected. Will it be possible for the project team to allow the community neighbouring a workers camp to access a water source being used by the camp residents? There can be situations where the camp people have water and the neighbouring community has no nearby water sources. How will security along the pipeline route be provided? A 2-m depth seems shallow and there are concerns over terrorism attacks and fire outbreaks.	The recruitment management plan will be developed before construction starts, but not during this ESIA. We will take your comment forward, and we agree that the most sensible way to recruit would be to involve leaders. This stakeholder engagement will continue throughout the ESIA, so you will get the updated and latest information as we go. We do not know at this stage how the camps will be managed, but we will note your request. Uganda has established the oil and gas police especially to manage the long-term operation of this pipeline. The Ugandan Government is a project partner, so do not expect terrorism incidents, but we will acknowledge your concern.

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			Male	Sec. for Works	Shall people be compensated equally for their lost property or will rates differ? For example, will EACOP give everyone UGX 1 million for their land? Will the compensation for land take be a single uniform figure regardless of the size of land and location along the pipeline?	The project team will work with a specialist valuer and a specialist resettlement consultant, and will be guided by the laws and compensation rates of the Government of Uganda, as well as by international best practice. The compensation values will not be the same, but will rather be determined fairly.
			Male	Chairperson	How will the exportation of the crude oil benefit Ugandans and people of Mpasaana in particular? The crude oil is going to pass through Tanzania to access the market but will we benefit from this oil? Won't Uganda be cheated?	The Ugandan Government is a project partner, and its key aim is to ensure that Uganda people benefit, primarily through an increase in revenue and the development of supporting industries.
			Female	Sec. for Gender	Do we need permission from the EACOP team to grow shallow-rooted crops or conduct restricted activities within the 10-m corridor? There is a concern that the electrically heated pipeline will affect our crops and lead to poor food harvests. How will the pipeline be constructed through watercourses? The main water sources for the residents in Mpasaana are water streams.	The pipe will be coated, which means it will be insulated, and act almost like a flask (that we have tea or coffee in to keep it warm): hot on the inside and cool to the touch. This is not the first heated pipeline in the world, and there have been years of monitoring on others with no effects on soils or animals.
			Male	Parish Chief	After laying the pipeline, will a person be allowed to construct a house over it? What will be the recruitment procedure for persons with some level of skills in the subcounty? Will the office of the Chairman LCIII be involved in the recruitment process? There is a need for clarity on how the recruitment process will be undertaken as we need most of the workers for the pipeline section through our subcounty to be from our area. Will more health centres be constructed in the area to cater for the project workers but at the same time offer health services to the local residents? Currently, there are road upgrade works being undertaken in Mpasaana subcounty. How are these road works related to the proposed pipeline activities? If a person is affected by both pipeline and road upgrade works, do they get compensated for both? How will the pipeline corridor be marked?	No houses or deep-rooting plants (especially trees) will be allowed, within the 10-m permanent corridor. The long-term use of those 10 m is still being discussed. There will be clarity about recruitment processes at the appropriate time. Local content is being firmly promoted and discussed. Of course, the project team will work with your leaders to establish the best ways in which to recruit the people that could be needed. The camps will be self-contained units, and will move with the bulk of the work team. The project will not be in one place for long enough to require additional facilities, but we understand your question, and will record it. There will be some road upgrades, and some road maintenance, during the project, but there are no definite plans at the moment. There will be some visual indication, but the exact mode has not yet been decided. It will need to be locally appropriate.
			Male	Chairperson NRM	How exactly shall Mpasaana subcounty benefit from the pipeline project? Can the project team consider constructing new subcounty offices for us? In cases where the affected person has a small piece of land and it is the household's source of livelihood, will compensation for such persons be done in a timely manner to minimise effects of economic displacement? What plans are in place to address impacts of the proposed project on community water sources? Mpasaana subcounty is within a water-stressed area. Can there be affirmative action to train some of the educated youths in pipeline-related work?	We will note your concern, but must explain that this project is not a long-term one, and so will not necessarily be doing infrastructure investment of that type. The laws of Uganda on compulsory land acquisition provide that affected people shall first be fairly and adequately compensated before their land is taken away. A study is being done of current water sources, so that any impact can be mitigated. We note that you are water stressed. Thank you for telling us. That is very helpful. There is a focus on local employment, but the types of skills and number of casual workers needed will only be known just before construction.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Female	Sec. for Gender	In case our rivers and streams fall within the 30-m pipeline corridor, is there a way that these can be avoided. If they cannot be avoided then what will happen? Since the Government is going to compensate for the land taken permanently, will the landowners first need to get permission to grow the allowable crops within the 10-m corridor?	The main objective of the project is to avoid going through these kinds of resources, but if that is not possible there will be mitigation measures put in place to ensure that you have continued access to either that resource or to a suitable alternative. The way on which the acquisition of the 10 m will be done is still being discussed, but your query will be noted and added to the list of things that we need to investigate. The point is to have as little impact on your lives in the long term as possible.
			Male	Animal Husbandry Officer	We can only have a meaningful discussion about likely impacts after we have been given the exact locations where the pipeline corridor will be established.	It is lovely to have an animal husbandry officer here too, thank you for coming. We do realise that it is difficult to speak of specific impacts, but we are interested in general ones at the moment. Like "red flags", so what is most important to you for us not to damage?
			Female	Councillor	There are rumours that only persons with land titles will be compensated for any land take. Can we get EACOP's position on this?	We will be able to give you EACOPs position on this. As far as EACOP is concerned, there will be some form of compensation for any land user, be they an owner with a title or a tenant with no papers.
9 May 2017	LC3 - Lower Local Government	Kiziranfumbi Subcounty	Female	Community Developmen t Officer	The ongoing road construction is a concern. A lot of trees have been cleared and the environmental impact is being very much felt. With this additional pipeline project, more trees will be destroyed.	Your comment is well noted. The ESIA will respect the mitigation hierarchy: Avoid: Modify the initial project in order to avoid area with significant social and environmental aspects Minimise: If impossible to avoid, all is done to minimise as much as possible the effect of the project Restore: After minimisation, residual impacts are restored. Offset: If impossible to restore fully, measures are defined to compensate the project's residual impact. This option is least desired for our project and will be implemented only if other steps can't be applied. The pipeline's route has been selected to avoid the most environmentally sensitive areas like national parks. If in the unavoidable situation that trees are uprooted, there will be the offset mechanism, e.g., one tree destroyed, three trees replaced, as an example. The ESIA will also consider cumulative impacts of other projects going on in the same location.
			Male	Sec. For finance, planning and admin.	Assistance is required to coordinate the environmental impact on our subcounty with all these different companies coming in. There is the road development, people are clearing land for sugar cane plantations and the refinery pipeline, and now this export pipeline.	Your comment is noted, but the ESIA for the export pipeline will address the potential environmental impacts and the developer is committed to working with its stakeholders to address project-specific issues as they arise.
			Male	Sec. For finance, planning and admin.	After the pipeline is buried is the land holder allowed to do planting? We heard that the pipe will burst so we are concerned not to do anything on the top.	In general, people will not be able to settle in the RoW, and activities within the RoW will be restricted. Certain activities, such as building of structures and planting of deep-rooted trees and shrubs will be prohibited on the RoW. However, shallow-rooted plants will be permitted. Explosions are rare with pipelines and the pipe will be monitored 24/7 remotely to ensure any anomalies are detected.
			Male	Sec. for Finance, Planning and Admin.	Shall we have local people working in the pump stations and at the block valves?	The pipeline will create short-term employment for both highly skilled professionals and unskilled labourers. It is expected that temporary workers involved in the construction phase of the proposed project will be sourced locally from each county, which will promote the development of local content. Linked to this will be the different companies engaged directly by the pipeline project, which will further create employment for nationals, as it is expected that their capacity will grow to provide services and goods for the proposed project. There will be a small amount of permanent employment after construction.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Chairperson	We have many plantations of non-indigenous trees (pine and eucalyptus) (planted in the 1960s under a Government scheme to counter stagnant water in swamp areas). However, they use a lot of water, which we need. We want indigenous trees planted but they cost a lot more than the non-indigenous trees.	Your comment is well noted.
			Male	Chairperson	Will we have the opportunity to supply local goods?	Yes, you will and the ESIA mitigation will recommend local procurement capacity building to assist local companies in preparing the requisite procurement documents to be able to compete in the procurement process of service provision.
			Male	Sec. for Finance, Planning and Admin.	Which is better a pipeline on top or under the ground?	The export pipeline has been selected, as it will cause the least socio-environmental impacts. Pipelines aboveground restrict movement and are visually distasteful.
9 May 2017	LC5 - Local Government	Kyankwanzi District Technical Planning Committee and Political Leaders	Female	Natural Resources Officer	Which villages will be consulted?	Kisala West (Gayaza) and Nzoo (Ntwetwe). Just because we are going to these villages does not mean that the pipeline will be going through or near them. We are working to a 2-km corridor. The criteria for selecting these villages had to be representative owing to time constraints and the linear nature of the proposed project, so types of land use were used: AGI proposed locations; identified sensitive locations such as known cultural heritage sites and biodiversity hot spots. In the next phase of the studies, we will be focusing much more on communities but for this round of SE we focused on districts and subcounties.
			Male		We need to understand clearly which pipeline this is?	This pipeline is the export pipeline carrying crude oil. It requires a 30-m RoW. Not to be confused with the Government refinery pipeline from Kabaale to Kampala which requires a 133-m RoW
			Male	Engineer	Who will be responsible for the pipeline corridor?	The land will be rehabilitated to how it was, as far as possible, before construction. After this, the developer is working out the best land access arrangements with the land user: either purchase the land or provide easement access.
			Male	Deputy CAO	How will the pipeline cross waterbodies?	The pipeline will undercut through wetlands and waterbodies. The waterbody will be restored in the environmentally appropriate manner and according to international standards.
			Male	District Planner	Ntwetwe Town Council will also need to be included in your stakeholder engagement.	Your comment is well noted. This is scoping stage of the ESIA and we will incorporate it in to the next phase and add it to the SEP.
			Male	Probation & Social Welfare	What will land access be once the pipe is belowground?	The developer is working out the best land access arrangements with the land user: either purchase the land or provide easement access. Shallow-rooted crops will be allowed.
			Male	Probation & Social Welfare	How far can a dwelling be from the pipeline?	10–15 m
			Male		Technical people here in the district need to be included in the process. We would like to know why PAU is not accompanying you.	The ESIA considers the technical stakeholders here around the table key to the project. A SEP has been developed and your names and contact details will be added. This is an independent ESIA performed independently and without influence of the Government and the developer.
			Male		The population is psychologically expecting large things from the pipeline. There are big expectations.	Your comment is noted. Appropriate stakeholder engagement will be undertaken.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Female	Chief Admin. Officer	We would like to have feedback – what is your mechanism for feedback?	ESIA disclosure before submittal to NEMA. We would also like to collate all the findings for each district and feed them back to you in June or July. This is separate to the ESIA but we appreciate it is important to provide feedback as you are giving us time now and in the future and findings may assist you for your works too.
			Female	Chief Admin. Officer	What are we to expect as the next steps?	Next steps: the scoping will be completed by June and the baseline studies are scheduled to initiate in August and September. We are working on a timeline of submitting the ESIA towards the end of the year. However I am cautious to provide definite timings, as projects like these can be delayed due to external influences beyond our [the consultants] control.
9 May 2017	LC5 - Local Government	Mubende District Technical Planning Committee and Political Leaders	Male	Vice Chairperson	What are the environmental effects on our wetlands? How are the locals going to be involved when it comes to jobs for the pipeline project? Politicians need to be involved right from the start because they have a lot of influence on the project. They can influence positively or negatively. We propose that politicians be part of the stakeholder engagement teams to legitimise the process.	There are obviously likely impacts as a result of this project. However, detailed studies are going to be conducted by specialist teams, and impacts will be profiled and management plans designed to address some of the negative impacts on the environment. Local employment procedures will be developed in consultation with various stakeholders and these will be published at an appropriate time for every stakeholder to know. Yes, this is well noted and all leaders will be involved and consulted. This will be forwarded to the relevant authorities to assess the logistical requirements and other decisions but the fact is that leaders will be involved in every aspect of the project as required by the laws of Uganda.
			Male	District Environment Officer	Why are scoping reports not shared with the districts? After scoping, the ToRs are not shared with the district and, to make it worse, the final EIA reports are not shared with the district. This makes it difficult for them to make meaningful reviews and to ascertain whether their comments were incorporated or not.	This concern is well noted and will be sent through to the relevant authorities for action. This is very sensitive project where stakeholders must be brought on board and it is our hope that these reports will be shared with relevant officers within the district. This feedback will nevertheless be shared with government authorities.
			Male	Sec. for Finance, Planning and Admin.	The EACOP project MUST involve local leaders if they want to succeed because they will be supportive and will easily mobilise the communities.	Yes, local leaders will be brought on board as and when it is required and necessary.
			Male	Chief Administrative Officer (CAO)	We call upon the EACOP management to share timelines for particular activities so that the people can be in the know. This will avoid or minimise the huge expectations.	This is well noted and will be shared with the EACOP team. We need to first go through this ESIA process to even start thinking of timelines.
			Male	District Planner	Hard copies for the project should be circulated plus emails and telephone contacts so that people are able to send through their concerns as the project progresses.	These will be circulated as and when they are developed and people will be provided with official communication contacts at an appropriate time.
			Male	Labour Officer	Will the project recruit locally or will companies come with their own workers? Camps come with serious social issues such as spread of HIV and AIDS, defilement, rape and general sexual misbehaviour. What plans are there to minimise some of these negative effects?	Clear management plans will be developed to address some of the social issues that have been raised.
10 May 2017	LC3 - Lower Local Government	Gayaza Subcounty	Male	Chairperson	How will you deal with people with different land ownerships (e.g., *mailo*, *kibanja*, leaseholder)?	The rights of both landowners and land users will be considered in the valuation and compensation for loss of land and assets in line with legislation and international standards. We will work with subcounty leaders in performing these activities and the Government will undertake the compensation. Those with vulnerabilities will be given particular attention.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Chairperson	If we do not know where the pipe is going, how will we cope with the fear?	We note your comments. As soon as the studies have been completed, this will inform the final pipeline route, and landholders and users will be informed.
			Male	Councillor	Will local people be employed?	The developer is committed to the following and the ESIA mitigation will recommend such too: To reinforce the use of local workers and contractors through training programmes and support to local companies by: • strengthening of local skills and capacities • creating direct and indirect employment • supporting local content and local procurement.
			Male	Councillor	We heard the pipeline scorches the land.	The 60-cm pipe will be insulated to keep heat in, rather like a thermos flask with hot water. Heat will not radiate out and scorch the ground. We recognise that appropriate sensitisation will be needed.
			Male	Parish Chief	Why did you pick the villages that you are going to see tomorrow?	The criteria for selecting these villages had to be representative owing to time constraints and the linear nature of the proposed project, so types of land use were used: AGI proposed locations, and identified sensitive locations such as known cultural heritage sites and biodiversity hot spots. In the next phase of the studies, we will be focusing much more on communities but for this round of SE we focused on districts and subcounties.
			Male	Community Developmen t Officer	The BIDS look attractive and the project sounds good. But the problem is these construction camps will bring problems like UNRA, which did not always pay compensation.	Resettlement activities will be undertaken if the project is given the go ahead. Compensation will be paid in a timely and fair way according to international standards and we will work with the Government of Uganda to do so in a fair way.
			Male	Health Worker	Will all these people on the work camp require drugs and medical aid from the local clinic?	The construction camps will be self-contained. They will have their own medical facilities, drugs and other necessary equipment medical equipment so they will not be a burden on local facilities.
			Male	Councillor	If the pipeline passes some places, will there be local benefits like clinics?	The ESIA impact mitigation will present appropriate mitigation and management measures for those impacts identified using a hierarchy of avoid, minimise, restore and offset. The developer will be committed to implementing these, and the lender will be auditing to ensure implementation has been undertaken. With regards to benefits to the community, I cannot speak on behalf of the developer.
10 May 2017	LC3 - Lower Local Government	Ntwetwe Subcounty	Male	Chairperson	Will there be job opportunities for local people?	The pipeline will generate thousands of short-term jobs during construction, but this period will only last 2–3 years. During the operations phase there will be a limited number of jobs (less than 1000). The pipeline will create short-term employment for both highly skilled professionals and unskilled labourers. The proposed developer expects that temporary workers involved in the construction phase of the proposed project will be sourced locally from each county, which will further promote the development of local content. The ESIA mitigation will recommend that a local recruitment policy be adopted for project-affected people and others to incorporate the above. Also linked to this will be the different companies engaged directly by the pipeline project, which will further create employment for nationals, as it is expected that their capacity will grow to provide services and goods for the proposed project.
			Male	Chairperson of the Court	How will the project assist the subcounty in supporting the population increase? Do you have plans for CSR?	The ESIA will propose appropriate mitigation to any adverse impacts. CSR is not part of the ESIA process and would be taken up by the developer if the project will go ahead.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Assistant Secretary	There have been many problems with UNRA rehabilitating roads and staff taking advantage of women, impregnating them and leaving them with children. How do we know this will not happen on this project?	We have heard this complaint a lot. This is a private developer and not a Government project. There will be strict codes of conduct for workers living in construction camps and there is a grievance mechanism being put in place. If anyone has a grievance, there is a process to ensure that it is recorded and dealt with appropriately. So, we ask you please use this.
			Male	Chairperson of the Court	We fear that the environment will be polluted.	The ESIA will undertake specialist biophysical and biodiversity studies. Based on this, potential impacts will be identified and appropriate mitigation put forward with a hierarchy to avoid, minimise, restore and offset. The developer wants to have minimal impact on the environment.
			Male	Chairperson of the Court	Most communities have developed their own bylaws that help govern their communities. Will the construction camps have a similar system of laws?	Yes The ESIA recognises that construction camps with lots of people could pose a challenge. Thus, the mitigation will propose codes of conducts, curfew timings and camp rules. We have just stayed in the developer's camp in Buliisa which had similar strict systems.
			Male	Veterinary Officer	We need to understand if the *kibanja* or squatters on the *mailo* land will get any compensation.	Under the international performance standards, everyone is entitled to compensation even if they are a *kibanja*.
			Male	Veterinary Officer	We kindly ask that you involve the local leaders once you know the route.	Your comment is noted.
10 May 2017	LC3 - Lower Local Government	Kitenga Subcounty	Male	Vice Chairperson	Communities should be sensitised about the impacts of the pipeline being routed through their lands. The subcounty leadership supports the project, as it will lead to upgrade of roads as already evidenced in parts of Gomba and Kakumiro Districts. Will feeder roads in our area be upgraded? We have heard from certain circles that the main roads near sections of the pipeline route will be upgraded. What will the recruitment procedure be for the workers to engage in non-technical work? As political leaders, we pledge to sensitise the communities about the project and offer support to the project.	Thank you so much for your report. The idea is to upgrade, or at least to maintain, any roads that will be needed and used during this project. The recruitment procedure will be developed only once the ESIA is approved, but it will involve local leadership.
			Male	Chairperson	The subcounties and parishes through which the pipeline will be routed in Mubende District are populated sections of the district. That means many people will be affected. How will the compensation for the affected persons be conducted? The land tenure system in this area involves landowners (with land titles) and land users (tenants). Who will be compensated in such a situation? As local leaders, we will be happy if our people are offered jobs and these shouldn't be restricted to only non-technical work but also technical work as we have educated and trained persons in the area. Electric power is still a challenge to our area, as the neighbouring areas are connected to the national grid but Kitenga subcounty is not yet connected. We expect the first oil in 2020, but the pace at which the activities are being done seems slow if up to now environmental studies are only just commencing.	Compensation frameworks and offers will be developed in line with Ugandan rates and laws, but also taking international best practice into account. Both owners and tenants will receive some sort of compensation. Local content is being emphasised. During recruitment, these are the people that you will need to help the project identify. We have noticed that power is an issue, and are aware that we should not add to the burden.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Female	Sec. For Works	We welcome the project to the subcounty. Exporting crude will not be a welcome idea to the residents of Kitenga Subcounty, as they already have a bad experience where high-voltage electricity transmission lines were constructed through the area and yet the area is not connected to the national grid.	The Ugandan Government, a project partner, is building a refinery in Hoima specifically for Ugandan consumption, so we are not expecting a repeat of the electricity situation.
			Male	Councillor	What plans are in place to repair or restore roads that may be damaged during the construction of the pipeline? Will people be allowed to graze their animals over the pipeline corridor even after being compensated for the same land?	Any roads that are used extensively by project vehicles will be maintained and repaired during use. Yes, the plan is that shallow rooting crops, and grazing, will be the allowed land uses on the 10-mcorridor.
			Female	Parish Chief	Will the pipeline route follow the existing road network? How will persons in water-stressed areas such as Nalyankanja village be helped in case the existing water sources in such areas are damaged during the construction of the pipeline?	The pipeline route does not follow any existing road network. There are often very busy linear settlements, residences, along roads, so to follow a road network would not only have been bad from an engineering design perspective, but also from a resettlement perspective. If any existing water sources are damaged or made unavailable during construction, they will be repaired, or alternative ones will be provided.
10 May 2017	LC3 - Lower Local Government	Madudu Subcounty	Male	Senior Assistant Secretary (SAS) ("Sub-County Chief")	In this subcounty, there are a lot of land conflicts and wrangles and therefore any penetration of the community by EACOP team MUST be communicated before entry. In this subcounty, there are many cases of gender-based violence where women and children are the majority victims. Therefore when it comes to resettlement and compensation, women and children MUST be involved. Which people are going to dig the trenches and what procedures will be put in place for local employment? Open system should be encouraged in this project.	Yes, local leaders will always be informed about the visit of the various EACOP teams, and as often as possible this will be coordinated through Eco & Partner. Thank you so much for telling us. The RAP team will be able to take this into consideration when engaging, and we will also let our human rights consultant know to focus on this specifically. The trenching will be done by excavators. However, other jobs will require unskilled labour and these jobs can be communicated through the leadership when they are available.
			Male	Chairperson	The likely things that are going to be affected are coffee, houses, trees and food crops. These are the things that local people depend on for their livelihood. Won't this compensation be delayed even though this is what people depend on for their survival?	The law requires that before land is taken for development, the affected person must first be compensated and all the laws of the land will be followed in all of the land acquisition processes.
			Female	Community Development Officer (CDO) - Sub-County (LC3)	The biggest dependants on the environment are women and children. They depend on water sources and trees for firewood. If these are destroyed, what plans are there to replace them, even if there is going to be compensation. Much domestic violence happens when women and children cannot gather resources. Such projects are associated with cases of misbehaviour such as defilement, adultery and having fatherless children. What plans will be put in place to address these kinds of social issues?	Thank you for telling us about this dynamic. We will ensure that all of the resources are mapped and captured in the ESIA, and will propose mitigation measures in kind as well as in cash. There will be camp management plans to address the outside labour force issues, and now that you have made us aware of your concerns we will also do further research and propose mitigation measures in the ESIA.
			Male	Parish Chief	People in this subcounty don't own land titles but they own *kibanja* and with mere sales agreements. How will EACOP handle this? Will only those with titles be paid and those without left out?	Both land users and owners will be considered when it comes to compensation. The compensation will be structured in different ways, but both users and owners have rights that are recognised by EACOP.
			Male	Sec. for Works	There are many tribes within this subcounty and where the pipeline will pass. How will the issue of language barriers be handled?	Community liaison officers from the local areas will be recruited to work on behalf of the companies.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Female	Vice Chairperson	Now that landowners will be allowed to use the 10-m corridor, what happens in case the pipeline team wants to re-enter or access the site and crops are destroyed in the process? Will we be compensated again for crops?	Discussions are still being had about this matter. The 10-m corridor will have restricted use placed upon it, and there will always need to be easy access to it for maintenance.
			Male	Sec. For Production	People keep on selling land and moving on. What happens to those who buy land after construction and they do not actually know where the pipeline passed, and so don't know where to build? What plans does the project have for this scenario?	The permanent pipeline corridor will be marked in some way to provide a visible indication of the area on which there is restricted land use. In fact, the 10-m corridor may not be able to be sold on to other people, but these issues are still being debated, so please be patient with us.
			Male	Parish Chief	How will the locals who are illiterate or aren't familiar with legal paperwork be helped to deal with the legal documents when it comes to land take?	The RAP team will develop a plan for consultation to ensure that it is adequate. All critical documents could be translated, and translators could be present where necessary. The RAP specialist will have done this work before, and know how critical it is that everyone understands, no matter what their level of literacy. We could suggest a capacity building exercise as a mitigation measure.
			Female	Vice Chairperson	Won't the electricity that is going to heat the pipeline adversely affect people?	There won't be a big buzz of electricity running through the ground. The pipe will be insulated, and it is that that carries any heat source. When we know more about the design, we would be happy to share it with you.
11 May 2017	LC1 - Village Local Council and Community Members	Kisala West Village			Are you the ones to decide the compensation rates?	The first step is successful completion of the ESIA. One of the most important objectives of pipeline routing is to avoid the requirement to move any people physically. Priority in the design and location of infrastructure will be to avoid physical displacement. If EACOP needs to use your land for oil operations, you will be eligible for compensation. A Resettlement Action Plan will be prepared that focuses on relocating all individuals displaced from their land as a result of the project. The exact details of resettlement, including the location of resettlement communities, will be determined in due course.
					As we are having a meeting in this village, does it confirm that the pipeline will pass here?	No, the studies and the G&G survey will determine the final route. The selection of this village was from a 2-km corridor and was selected as a sample village because of its land use, and proximity to a forest and wetland.
					What is the recommended distance?	The RoW created will be 30 m; this can be reduced to 20 m for limited distances thus 15 m from the line of the pipeline or 10 m.
			Male	Chairperson	Those who are going to be interrupted, how will we benefit as a community?	The ESIA impact mitigation will present appropriate mitigation and management measures for those impacts identified using a hierarchy of avoid, minimise, restore and offset. The developer will be committed to implementing these and the lender will be auditing to ensure implementation has been undertaken. With regards to benefits to the community, I cannot speak on behalf of the developer.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
					Having confirmed where the pipeline is, will local communities benefit from employment opportunities?	The pipeline will generate thousands of short-term jobs during construction, but this period will only last 2–3 years. During the operations phase there will be a limited number of jobs (less than 1000). The pipeline will create short-term employment for both highly skilled professionals and unskilled labourers. The proposed developer expects that temporary workers involved in the construction phase of the proposed project will be sourced locally from each county, which will further promote the development of local content. The ESIA mitigation will recommend that a local recruitment policy be adopted for project-affected people and others to incorporate the above. Also linked to this will be the different companies engaged directly by the pipeline project, which will further create employment for nationals, as it is expected that their capacity will grow to provide services and goods for the proposed project.
					We have heard about this development of the pipeline. Will that mean it will attract other developments? For example we need a mobile telephone mast.	You are quite right. When developments start, they often attract other developments and service providers. This is a positive indirect benefit.
					How do we know you are who you are? Is there a representative from the district?	A response was not able to be given during the meeting; however, the response now is as follows: We have gone through the protocol of first introducing ourselves to the district and requesting for approval to consult with you. We also consulted with your subcounty before coming to the village level. During these meetings, we extended the invitation to the district leaders and subcounty leaders to join the meeting if they could. We have letters acknowledging that the local leaders are aware of this meeting and some of them are present.
11 May 2017	LC1 - Village Local Council and Community Members	Nzoo Village			If the pipeline goes through someone's plot of land that is very small, say 50 x 150 ft, have you thought about this person and how will they survive?	The first step is successful completion of the ESIA. One of the most important objectives of pipeline routing is to avoid the requirement to physically have to move any people. Priority in the design and location of infrastructure will be to avoid physical displacement. If EACOP needs to use your land for oil operations, you will be eligible for compensation. A Resettlement Action Plan will be prepared that focuses on relocating all individuals displaced from their land as a result of the project. The exact details of resettlement, including the location of resettlement communities, will be determined in due course.
					Will the communities have any benefits?	The ESIA impact mitigation will present appropriate mitigation and management measures for those impacts identified using a hierarchy of avoid, minimise, restore and offset. The developer will be committed to implementing these, and the lender will be auditing to ensure implementation has been undertaken. With regards to benefits to the community, I cannot speak on behalf of the developer.
					What will happen if the pipeline goes through our gravesites?	If graves cannot be avoided, they will be relocated according to the wishes of family members and local authorities to ensure that the relocation is satisfactory. Compensation for removal and relocation of graves and cemeteries will be carried out in line with national legal requirements.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Sec. for Information	How will compensation be undertaken? Will it be temporary or permanent?	The first step is successful completion of the ESIA. One of the most important objectives of pipeline routing is to avoid the requirement to physically have to move any people. Priority in the design and location of infrastructure will be to avoid physical displacement. If EACOP needs to use your land for oil operations, you will be eligible for compensation for both temporary and permanent land acquisition even if you are a *kibanja*. A Resettlement Action Plan will be prepared that focuses on relocating all individuals displaced from their land as a result of the project. The exact details of resettlement, including the location of resettlement communities, will be determined in due course.
					The Government set up a coffee development programme. Our trees have grown, but what will we do if the pipeline takes them out? They have taken years to grow.	The developer will work with the district for fair compensation rates. Usually tree age and type is taken in to consideration. There will also be livelihood restoration plans alongside resettlement and compensation.
					If someone does not have a land title, will they receive compensation?	Everyone regardless of having a title or being a *kibanja* will be identified in the RAP and requisite compensation or resettlement will be undertaken.
					Can a road pass over the pipeline?	The pipeline will be buried to a depth of 1.8–2 m. Sometimes it will be buried much deeper to go under rivers or roads. The reason for this is sometimes these areas become shallow after years of erosion or newly dug ditches.
					Will us local communities who have no skills be eligible for employment	The pipeline will generate thousands of short term jobs during construction, but this period will only last 2–3 years. The pipeline will create short-term employment for both highly skilled professionals and unskilled labourers.
11 May 2017	LC3 - Lower Local Government	Butoloogo Subcounty	Male	Veterinary Officer	We are going to disseminate the information to the locals, but what they will ask us is whether they will be compensated for their lost property during construction.	Yes, all the affected property or assets will be compensated in accordance with the laws of Uganda and with international requirements.
			Male	Chairperson	If my assets are destroyed, who will determine the amount to be paid? Will I go to the company direct and negotiate directly, or have to seek redress through other means?	Discussions and consultations with the affected person will be carried out during the RAP phase, and the rates will be arrived at in accordance with the laws of Uganda and international requirements. If any assets that were not identified are destroyed later on during construction then that is what the CLOs will help with.
			Male	Agricultural Officer	In this subcounty, there are many land wrangles and disputes and any stranger in the area may be attacked. Now, when exactly will your teams do their studies so that we, the leaders, can be in a position to alert them, otherwise they may be mistaken as land grabbers.	ALL EACOP teams have been briefed that before they access any community, they have to let the relevant leaders know. Community members will be informed about the entry of the specialists, through Eco & Partner.
			Male	Chief	When shall we have the specific map for Butoloogo Subcounty indicating or showing the exact affected parishes and villages?	The next few months of this ESIA aim to identify the exact alignment.
			Male	Councillor	Now that the pipeline is going to pass through Butoloogo, will the residents be able to access jobs? If yes, what will be the procedures?	Companies will develop local employment procedures that will be communicated to all stakeholders.
			Male	Chief	There are a lot of cases of gender-based violence in this subcounty. We recommend that when it comes to compensation, all family members should be involved. Otherwise, women and children will be left out and this and it could cause a lot of suffering.	The Resettlement Action Planning Teams will be able to interact with communities on these very issues and plans will be developed to address these needs. We agree that all household decision makers should be consulted. There will also be a focus on human rights and gender equality.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Councillor	In this subcounty, the majority of residents do not have land titles. They are squatters or tenants with land sales agreement. When it comes to compensation, who will be paid? The landowner or land user?	This project will recognise the rights of both the owners and the users, and will discuss compensation accordingly, during the RAP.
			Male	Councillor	When it comes to compensation, who will be paid? Is it the landowner or land user? Because here there are both landowners and users.	This project will recognise the rights of both the owners and the users, and will discuss compensation accordingly, during the RAP.
			Male	Health Worker	Specifically about health, what are the likely hazards of this project on people's health?	This is not a hazardous project. Pipeline construction is almost like any other building site with some dust and noise. However, possible health impacts are taken seriously and there will be a specialist report compiled that we will be able to share with you towards the end of this year.
			Female	Councillor	Currently, the drugs that are sent to the health centres are not sufficient. What plans does the project have to ensure that drugs are stocked in health centres that can also be used by the pipeline workers?	Thank you for mentioning this shortage. The health impact assessment will capture the current situation in local government run health centres and will propose any mitigation measures if impacts are identified.
11 May 2017	LC1 - Village Local Council and Community Members	Nalyankajja Village			There are landlords and tenants here. How will the project deal with these two groups?	The project will deal with both the landlords and tenants as provided for in the laws of Uganda and in accordance with international requirements. Each group is recognised as having rights, and the compensation will be determined during the Resettlement Action Plan.
			Male	Security Officer	Here we grow coffee. How long will it take to replace destroyed coffee after pipeline construction?	The RAP team will be able to work on these sorts of livelihood restoration plans. I understand that a coffee plant takes about five years to mature, so perhaps there could be nurseries started during the RAP process to get trees growing, but these are suggestions and plans that you need to think about.
			Male	Security Officer	When it comes to employment, we don't want scenarios of Buliisa where the locals are being left out of jobs. What plans will you have to ensure that locals in Mubende get employment? We need priority when it comes to local employment.	There will be skilled jobs that will be competed for nationally, and unskilled jobs that will require local labour. Local employment procedures will be developed and implemented.
					We have heard on the radio that government is planning to change the law on compulsory land acquisition so that they can take land forcefully. If they take the land by force, where shall we go for redress?	At the moment, this project will be following international best practice in terms of land acquisition, while working with the Chief Government Valuer's Office. There has been no discussion of an alternative forced land grab, because the international funders do not approve of that in their projects.
					We hope this project will not be like previous projects where foreigners and speculators came to our area and earned more money than the residents did during compensation, because they grabbed land. There was a lot of corruption and inequality. These things must be avoided in the pipeline project.	We agree that corruption and inequality is not desirable, and your leaders have already expressed their concerns that this process be free of conflict and corruption. All landowners and land users will be considered in the process, so it could also be up to you and your leaders and neighbours to protect your land from land grab, if possible.
					You talked of replacing assets that will be destroyed during pipeline construction. Shall we be given cash or will you build new houses?	International best practice does not advocate for cash compensation only. There is always a concern that ready money can be misused, and that this misuse can cause suffering. However, consultations will be carried out during the RAP process, to solidify a compensation framework.
					People keep on selling land and moving on. What happens to a new landowner who may not be aware of the exact location of the pipeline and may use a grader to clear his land and in the process damage the pipeline? Are there plans to mark the pipeline corridor?	The pipeline corridor will be marked, but we do not know at this stage what kind of marking will be used.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
					We implore the next teams to have good working relationships with the locals and leaders for successful implementation of the project.	This is good advice and all the teams will take it up. We want to build these relationships with you during the ESIA so that you feel confident that all impacts have been identified.
					If a public road falls within the 30-m corridor, what will happen to people's movements?	The project will ensure that an alternative option is provided so that your lives are not unnecessarily disrupted.
					Which other villages will be affected by the pipeline project apart from the villages we have heard on radios?	Studies are still ongoing. Once they are finalised, we will be able to identify the villages affected and undertake further consultation.
					If I had a plot of land 50 by 100 and most of it falls within the 30-m corridor and only a small portion is remaining, will I be at liberty to sell it to you as it will no longer be of any value to me?	These sorts of scenarios will be discussed and solved during the RAP process. The concept is that you should not be left worse off.
					Shall we be allowed to use the 10-m corridor for things like grazing?	Yes, at the moment the idea is that grazing will be allowed.
					If the pipeline breaks, what effect will it have on people and the environment?	There will be mitigation measures designed into the pipeline operating system. The idea is that there will be feedback to a control centre, which will allow any potential issues to be identified and dealt with before there is any impact on either people or the environment. The oil is waxy; it does not flow like other oils and should not pose a risk.
12 May 2017	LC3 - Lower Local Government	Lugusulu Subcounty	Male	Community Development Officer	Will landowners be compensated?	If anyone will lose any land or assets they will be fully consulted and compensated. This compensation will be done according to national laws and international standards. Full replacement values for affected land and assets (including no depreciation for structures) will be applied during the valuations in line with international standards. A range of compensation options will be considered including in-kind replacements of land and assets (where appropriate and possible) and cash compensation. Under the international standards, livelihoods of affected persons need to as a minimum be restored to pre-project levels and, where possible, improved. Therefore, the pipeline company will be offering within compensation packages livelihood restoration entitlements to affected persons and community.
			Male	Community Development Officer	When will the villages be identified that will be affected by the pipeline?	As soon as the ESIA is completed, NEMA has reviewed the document and a green light has been given, (if not before) the villages will be notified and the RAP will be detailed.
			Male	Community Development Officer	Are there community liaison officers?	EACOP is in the process of expanding its team and identification of CLOs is in the process. Usually in projects like these, the developer identifies CLOs from each area local to the development.
			Male	Community Development Officer	When discussing effects of the project, I do not remember you talking about HIV and AIDS. It is a serious issue here and the characters of your workers will put our sisters in danger. So, we need to sensitise the population.	The ESIA socio-economic studies incorporate a health impact assessment and management plan. Your comment is noted.
			Male	Community Development Officer	My major worry is that when the pipeline passes, it will disturb the rainfall pattern and cause a drought.	There is no relation between meteorology and geological formation of oil reserves. The two do not affect each other. Uganda, along with other countries in eastern Africa, is experiencing a drought at the moment.
			Female	Councillor	Who are the partners?	CNOOC, Total, Tullow, Government of Uganda, Government of Tanzania
			Male	Councillor	When UNRA did the roads, they did not compensate the people in a timely way and when they did pay the value of their assets were much higher than the payment made. How do we know this will not happen with this project?	This is a corporate–government joint-venture partnership and the actions will be undertaken to IFC standards (international best practice), which requires timely consultation and resettlement actions.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Parish Chief	We export electricity in Uganda and the price of electricity is very high for us people. If we now export crude oil, will we be expecting the prices of fuel to rise?	Your comment is noted. The ESIA process will consider economics and impacts associated with the projects on the economics of the communities, e.g., inflation but setting of prices is beyond us. If anything if there is a refinery in the country, prices should be more reasonable because fuel is not being imported.
			Male	Veterinary Officer	Will you consult more communities?	During the next phase of the ESIA, we will be focusing the stakeholder engagement on the communities much more and the studies will be more in depth.
12 May 2017	LC3 - Lower Local Government	Lwebitakuli Subcounty	Male	Councillor	What kind of disruption and displacement will occur?	There will be temporary land acquisition for the 30-m corridor. For the AGIs such as the construction camps, coating yard and fly camps, there will temporary land acquisition. Permanent land acquisition will be required for the permanent AGIs such as the pump station and block valves. Access for the 10-m corridor is in the process of being negotiation with the Government Valuing Office to decide on the best way. Basically, there are two options either buying the land permanently or leasing the land on a wayleave basis. Each affected person and community (e.g., village where community land is affected) will be provided with an agreement to review and on this basis the negotiation will occur. Land values and compensation offered for other assets and structures affected will be in line with rates and entitlements contained within the Resettlement Policy Framework and Resettlement Actions Plans that will be disclosed. After signing the agreements, compensation will be paid before displacement and taking access to the land (unless temporary disturbance payments are made in agreement with the affected person or party).
			Male	Councillor	Will local people be employed?	The pipeline will generate thousands of short-term jobs during construction, but this period will only last 2–3 years. During the operations phase, there will be a limited number of jobs (less than 1000). The pipeline will create short-term employment for both highly skilled professionals and unskilled labourers. The proposed developer expects that temporary workers involved in the construction phase of the proposed project will be sourced locally from each county, which this will further promote the development of local content. The ESIA mitigation will recommend that a local recruitment policy be adopted for project-affected people and others to incorporate the above. Linked to this will be the different companies engaged directly by the pipeline project, which will further create employment for nationals, as it is expected that their capacity will grow to provide services and goods for the proposed project.
			Male	Parish Chief	When they decided on the current route, when did they survey the land and whose permission did they seek?	The JV partners have been in discussions and negotiations with the Government authorities. A fly through was undertaken and aerial filming undertaken also use of satellite imagery. Districts were visited and informed before a recent drive through conducted by the engineering team.
			Male	Parish Chief	Will people without land titles be compensated?	Everyone will be compensated.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Parish Chief	The value set by the district is not fair. And where permanent land take has taken place and compensation undertaken, the land user will have nothing.	Your comment is noted. Valuation of land and assets affected by the project will be carried out in line with national legislation and international standards. Compensation for land will be equivalent to the full replacement value of land and assets, probably based on the market rate for land in the area, plus any transactional costs associated with acquiring new land. Any assets and built structures will be valued for replacement and depreciation will not be considered. The market value of land will be determined using surveys of affected land and assets, studies on local values for land, valuation rates published by Government authorities (e.g., district rates) and in agreement with Government authorities. Standard land values for specific areas will be agreed, and project affected people in these areas would be offered the same value plus compensation for any improvements to the land and assets lost (e.g., economic trees, fencing, water boreholes, and structures).
			Male	Councillor	Has the three-year construction phase started?	No, it has not. The construction phase will start once and if the ESIA is approved by NEMA, the government authority. We are in the pre-construction phase.
			Male	Assistant Forest Officer	You mention a lot of studies; biophysical and biodiversity and socio-economic studies. Will our people have the opportunity to be employed from this county because we have the expertise too?	Your comment is noted. RSK is working with Eco & Partner, a Ugandan consulting firm that is employing many Ugandans for the studies. There are more Ugandans working than ex pats.
			Male	Assistant Forest Officer	What is the life span of the project?	Once the oil from Lake Albert has run out (about three decades from now), it is possible that other discoveries of oil may have been made in Uganda or in the surrounding countries. The actual physical life of the pipeline is much longer than that required for Lake Albert crude oil export. Generally when pipelines have been built (and paid for), it is much cheaper for any other crude oil to be exported through the pipeline, so even some much smaller oil fields may become economically viable. Once all the relevant parties at the time decide that the pipeline is not required then the abandonment phase will begin.
			Male	Assistant Forest Officer	With the population growing and the land divided further for inheritance, if my son inherits the land with a pipe in it what will happen?	Whoever the ownership is passed to, the agreement will pass over to them too.
			Male	Chairperson	The project will need to communicate to those affected by the land take in a timely manner.	The project is working to international standards, which require timely actions.
			Male	Chairperson	How will the subcounty benefit?	ESIA focuses on mitigation measures to avoid, minimise, restore and offset identified impacts. I cannot speak on behalf of the developer in terms of CSR benefits to host districts and subcounties.
12 May 2017	LC1 - Village Local Council and Community Members	Kisagazi Village	Male	Resident	How will government help those whose land is affected to continue surviving? Land is our major source of livelihood.	All those who will be affected will be compensated in accordance with the laws of Uganda and in line with international best practice.
				Resident	In this village, we have landlords and tenants. How will government deal with these two groups when it comes to compensation?	This project will cater for the rights of both the landowners and tenants or land users.
					What happens to my mango trees that are cleared during construction? I will want to replant them afterwards but will I be allowed to?	The temporary area taken for construction will be rehabilitated so that you can replant, but the permanent corridor will not be available for any deep rooting crops, such as fruit trees. You will be compensated for the impact through the RAP process.
				Vice Chairperson	Who will decide the amount to be paid for my lost assets? Is it the company decision or can I decide how much to be paid?	The amount to be paid will be determined in accordance with the land laws and rate of this county.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
12 May 2017	LC3 - Lower Local Government	Maddu Subcounty		Vice Chairperson	When will this project start? Why don't you show us the map so that we know who is affected?	The various studies that are going to take place will inform the exact date for the project kick off and the exact route. We will bring that information back to you as soon as we have it.
					Here, the majority of people do not have land titles. We have heard rumours that only those with land titles will be paid? Is that true?	The truth is that both the landowners and users will be catered for in accordance with the laws of Uganda and international requirements and practices.
					Not all locals have the capacity to go to court. How shall we communicate with the company if we have issues? Will there be telephone lines to reach the CLOs?	Yes, there will be toll-free lines accessible to all the people. These will be publicised as soon as the grievance mechanism is established and as soon as some CLOs are appointed.
			Female	Councillor	This area is water stressed; what plans are there to ensure that the pipeline workers do not finish the already scarce water? Will you create more water points?	There are specialist studies as part of this process that will deal with water availability and analyse any projected impacts. Please remember that this is not a long-term project, and that the construction teams will go past very quickly.
			Female	Business Man/Woman	Will the contractors use locals or will they come with their own workers?	There will be skilled and unskilled jobs available, which will be advertised to Ugandans first. The project team will work through your leadership if there are any jobs that could be available near your village.
			Female	Councillor	We have narrow roads and we anticipate a lot of traffic when the project starts. What will happen to our children who are used to fewer vehicles? What plans will be there to ensure that there are no accidents in the area?	Strict speed limits will be observed, and any project access roads will be well controlled, with crossing points if needed. There will also need to be sensitisation campaigns for your children.
			Male	Sec. for Production	For the pipeline project, which prices or rates will be used for compensation? Will they use the 1962 rates as they did for the road construction project? It was sad that our coffee, beans and such like were valued cheaply and we don't want a repeat of this.	We will need to work with the chief government valuer's office to establish what will work best for everyone.
			Female	Sec. for Works	You have talked of a 30-m and a 10-m corridor; will both be compensated for?	Any displacement will be handled during the RAP process, but the current idea is that there are to be two different frameworks: one for the temporary 30 m during construction and one for the long-term restrictions on the 10 m.
			Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	Apart from the CLOs that will be recruited during the project, are there plans to have other project structures developed, like project steering committees, as it happens for subcounty projects?	Thank you for mentioning this idea. It is interesting for us to know what you usually do. This is a short construction project, so we wouldn't want to take up too much of your time, but if you're volunteering to meet with us under your normal duties that would be super.
			Male	Speaker	There is proposal to come up with a law that allows government to acquire land in a compulsory manner and to pay the affected people after the land has been taken. Will the pipeline project follow that law if the law is passed before the project kicks off?	We are aware of this proposal and will continue to monitor whether or not it comes into effect, at which point there will be further engagement with the Government of Uganda about the approach that we need to use as an international project team. Please do not be concerned at the moment.
			Male	Parish Chief	Here a big part of the land is not titled. What will happen to the majority of people that do not have land titles?	We are aware of this possibility, and will work with you and your leaders to identify who the rightful users of land are, and to ensure that everyone is captured in the process. Please do think about perhaps writing agreements about land use between you, now, so that at least you have something in writing for us to work with.
			Female	Parish Chief	What will be the specific benefits for this sub county when the pipeline is constructed?	There will be some short-term jobs, some road upgrades, some chances to supply support services like foods, but the main benefits will be through the revenue base created that should filter down to subcounties.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Vice Chairperson	Was surveying of the pipeline route completed? And when will the project kick off? When will village sensitisations about the project start?	There has been no formal survey of the route. So far, a few engineers have done the narrowing down of this 2-km buffer over the last five years. We still do not know the exact route, so the land survey that you are interested in will only take place once that has been established. It is hoped that the approval process and RAP process and appointment of a contractor will allow the project to start towards the end of next year, 2018. When we know the route, we will be able to work through you and with you to sensitise all the affected villages. In the meantime, we've selected one village randomly, Kyetume, to discuss the possible impacts with in order to get feedback.
			Female	Sec. for Works	You have talked of block vales and pump stations that will be aboveground and permanent. Won't these have effects on cows and goats? Won't the water sources or dams be affected during pipeline construction?	Thank you Miriam, this is a good point. We all know how curious cows and goats are. The permanent aboveground infrastructure will be protected from nosey cows and goats, because we do not want them to chew bits off the infrastructure. But, there won't be any effects on their health or movements. The team will try to avoid and protect water sources. For those that cannot be avoided or protected, there will be alternatives provided.
13 May 2017	LC1 - Village Local Council and Community Members	Mabale Village	Male	Councillor	Will the plants on the surface above the pipeline be scorched?	The pipeline will be insulated in foam and then cased to prevent heat radiating out, rather like the properties of a thermos flask.
			Male	Councillor	Will people be compensated even if they do not have a title?	Everyone, landholders and land users, will be incorporated in the RAP. For the RAPs, the project first needs to collect comprehensive data and information about the affected land, assets (i.e., structures) and people affected by the project's land requirement first, so they can then assess possible impacts and undertake valuations.
			Male	Councillor	We have concern that communication to us for this meeting was not good. Few people have been informed today, yet many people will be affected.	We followed the appropriate protocols and contacted the districts and subcounties with a letter. We had no contact information for village level, hence the radio message, and we were rather dependent of the district to inform. We now have your telephone number and we will be able to contact you for future stakeholder engagement. We apologise profusely but hope we can make a way forward for our next meetings of many.
			Male	Councillor	You talked about transparency of the process of resettlement. We hear the word 'transparency' talked about a lot but actions are then not transparent. Where will people go if they have a grievance?	The EACOP project and the JV partners are open to public scrutiny and comment, thus accountability and transparency (through policies and procedures among other aspects) are paramount to their social licence to operate. A grievance procedure for this project is in the process of being set up. Stakeholder grievances and complaints will be able to be communicated through a variety of channels including a dedicated hotline, email address, text service and postal address. The procedure is such that however complex the grievance, facilitation will be provided to get it resolved. So we encourage you to use these contact mechanisms on the BID.
			Male	Councillor	If someone refuses the pipe to cross their land, what happens?	Forced land take will not happen. If anyone will lose any land or assets, they will be fully consulted and compensated through a iterative process of timely communications providing the landholder/user time to review and understand. Compliance to IFC standards will be undertaken.
			Male	Occupational Safety Specialist	I have occupational health and safety skills, could I apply for a job on the project? Will my skills be required?	Your comment is noted and your skills would be required for a project like this. The proposed developer expects that temporary workers involved in the construction phase of the proposed project will be sourced locally from each county, which will further promote the development of local content. The ESIA mitigation will recommend that a local recruitment policy is adopted for project-affected people and others in the host subcounties.
			Male	Occupational Safety Specialist	Will community leaders assist in a compensation disputes?	Resettlement activities will be undertaken in full collaboration and consultation with the requisite district or subcounty and town leaders.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Resident	What happens if, at the time of compensation, you feel that your land is worth more than it has been valued?	The market value of land will be determined using various methods, including surveys of affected land and assets, studies on local values for land, valuation rates published by Government authorities(e.g., district rates) and in agreement with Government authorities (e.g. Chief Government Valuers, Regional or Districts Valuers). Standard land values for specific areas will be agreed and project-affected people in these areas would be offered the same value plus compensation for any improvements to the land and assets lost (e.g., economic trees, fencing, water boreholes, and structures).
13 May 2017	LC1 - Village Local Council and Community Members	Kinvunikidde Village	Male	Resident	I have heard you say that the pipeline will be electrically heated. What is the effect of that heat on the people?	There is no heat effect because the pipes will be coated and insulated and all the heat will remain inside. It is like a flask where heat remains only inside.
				Resident	What if my house falls within the 30-m corridor, where will I sleep with my family? Will you give us another house?	If it is impossible to avoid the house then discussion with the affected person will be entered into to decide how best to undertake a resettlement exercise.
				Resident	If my house falls within the 30-m corridor, will the project resettle me to the place of their choice or they will give me money and I look for another place?	Such big projects always want to avoid cash compensation because of misuse by project-affected people. However, there will be discussions with the affected person on how best to compensate.
				Resident	What happens when more of my things are destroyed by the project after they have valued and I have signed?	There will be CLOs who will be within communities to receive such cases and manage the redress.
				Resident	Who determines the rates of compensation for the lost assets? Do I determine it myself as a project-affected person or does the project decide how much I should get?	There will be CLOs who will be within communities to receive such cases and manage the redress.
			Male	Teacher	In this area, we have landlords (title holders) and tenants of *biabanja* holders. How will the project deal with these two individuals? Will only those with titles be paid and *bibanja* holders left out?	Both landowners and land users will be catered for by the project as provided for in the laws of Uganda and international requirements.
			Male	Teacher	There are a lot of costs involved in constructing the pipeline up to Tanzania like construction costs and compensation. Why can't the Government just refine everything and then sell outside Uganda using trucks?	A lot of feasibility studies were done by the Government of Uganda, and the Tanzanian route was finally zeroed down to. Note that there is limited domestic and regional market for refined products and that is why some of the crude will be exported to international markets.
				Resident	What corporate social responsibility (CSR) initiatives will the project put up in this subcounty? So that the residents can forever benefit from them?	This is well noted and it shall be forwarded to the developers.
				Resident	How will the project ensure that the workers that will come to work in the area do not disintegrate or break families for reasons like adultery, fornication, defilement and HIV and AIDS?	Studies will come up with management plans for such fears and these will be implemented to the letter.
				Resident	Why take all this time to determine where the final pipeline route? These should have been done long ago and this could save government a lot of money for compensation because people are going to build many houses and other things and yet this could have been avoided.	Yes, studies have to be done to ensure that the final pipeline route does not have serious impacts on the community and environment. However, when time comes, the affected people will be notified and engaged.
			Male	Chairperson	Many companies like MTN Zain have come into our areas but they come with their own workers. Will the pipeline project prioritise the locals when it comes to job opportunities?	EACOP is emphasising local content promotion in both jobs and businesses. When the time comes, procedures for all these will be communicated.

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			Male	Chairperson	We have seen heavy trucks and vehicles that are going to work on the project. Won't these bring cracks to our houses because of their weight and noise?	The reason why baseline studies will be carried out is to compare the changes that might occur as a result of the project. For example, the baseline will indicate the current status of a house before pipeline construction and after to see if there has been any change or not.
			Male	Chairperson	Why doesn't Uganda sell only refined products and not crude?	Ugandan market and regional markets are not enough for the oil in Uganda. That is why a little will be refined in our own refinery and the rest of the crude exported to outside markets.
				Resident	We have seen projects like electricity companies that tell us about certain sizes of land but they end up taking more. Are sure that the pipeline project will only take 30 m only?	Yes, in some cases, the land may stretch as far as 40 m and this will be catered for when it comes to compensation. The additional land may be as a result of trucks getting stuck or some area is geologically sensitive.
				Resident	What plans does the project have if burial and cultural sites are destroyed?	Specialist teams will move around recording and mapping such sensitive areas and management plans will be developed to deal with such sites.
					You have talked of compensation, why can't government enter into agreement with the landowner and pay rent for the lost land (10 m) on an annual basis than paying at once such that even children and grandchildren can benefit after I have died?	This is well noted and it will be shared with authorities.
					Most people here do not have radios and are busy in their gardens. Why don't you use another communication channel for your activities to mobilise the residents?	Yes, this is noted and in future we shall use more effective means of communication now that we have got the telephone contacts of the chairman.
13 May 2017	LC1 - Village Local Council and Community Members	Kyetume Village	Male	Chairperson	I have 30 acres. What if a lot of that space is covered by the construction? Will I receive other land or be permanently displaced?	All 30 acres should not be affected. We will try to avoid this at all costs, as permanent displacement is not favoured, but we can discuss further as soon as we know the finally proposed route that we can work with. The RAP specialists will engage with you, and will develop compensation concepts with you and with the Government of Uganda.
			Male		I am a cattle keeper. You have shown us a map of the entire route through Buliisa to the Tanzanian border, but are you here because we're on the actual route, or will there be changes?	We are sure that the route comes through this subcounty and you could be one of the closest villages to where it may pass, but the corridor is still very wide, so we want to identify impacts with you to inform the ESIA.
					Where there are many people there are many bad habits. What happens if my daughter is raped?	We will take all camp management steps to avoid anything as awful as that, but if it were to happen it would immediately be treated as a criminal case and handed over to the authorities.
					Will I receive compensation if I am affected? What will the rates be? Where will our animals graze if land is taken?	You will most certainly receive some form of compensation, as will anyone who loses access to assets or who is displaced. This will be developed with the RAP team once we have project approval. We need to work with Government rates at the moment.
			Male	Councillor	I am not willing to give up my property. I have many houses and dams. Will the government give me an option to refuse for the pipeline to come through my property? I am aware of government delays in programme implementation so what happens if you move us and then we wait for years for the project to start?	Thank you for asking this question. It is a scary prospect, to think of having to give up your land, even temporarily, for a project. However, the project is in the interests of the country, and everyone will need to think how they can do their best to help. The RAP will deal with all land acquisition and compensation questions, so please keep thinking about what would be best. The idea is not to move anybody until the project team is sure of construction dates and timelines, to avoid just the scenario that you have mentioned.
					What will the criteria be for selecting labourers? Will you employ local labourers or will you bring them in? What type of jobs will people be able to do?	We will work with your leaders, and will not bypass them as we look for casual labourers and for any locally sourced skilled labour that we need. People will need to do general labour, operating machines, providing support services.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
					We noticed that the only people who were compensated when the road works came through were those with titles. What will happen in this case?	The project team recognises the rights of both those people with title and those without, and compensation will be developed for both groups.
			Male	Vice Chairperson	Need to clarify if the permanent 10 m will be acquired through a purchase or a lease. Plantations take a long time to reach maturity. What will the interim compensation be?	We are not sure yet. The long-term acquisition is being debated at the moment. People have mentioned leases to us in previous meetings so we have this on our list of queries to flag first with the project team. The RAP will work out crop and tree compensation too, and the compensation rates usually take the growth period into account, but we will raise this as a point of concern.
					If the construction camp is here will I be able to do my business within the camp, or right outside it, or will there be restrictions?	The camp management plans that will be developed will provide more clarity. Usually the camps are quite strictly controlled areas, but we understand your desire to have access to a market for your goods.
					If the camp is put very close to my home, will I be able to remain in my home or will I be relocated and compensated?	The impacts will need to be assessed, with you, such as noise, dust, visual impact, and then a decision will need to be made. The normal rule is to minimise any displacement, so you would probably not be moved unless there was a very good reason for you not to stay.
15 May 2017	LC3 - Lower Local Government	Mijwala Subcounty	Female	Councillor	If our house is destroyed by the pipeline and we get compensation that is lower than it is worth, what do we do?	The developer will work with the Government to ensure that resettlement activities and compensation are undertaken in fair and timely manner to international standards. Compensation rates will be based on the valuations of land and asset surveys yet to be carried. The district will set the compensation rate. Any proposed compensation rates for land per area will be reviewed with the Government and relevant community representatives to determine if they meet full replacement value criteria and whether any adjustments are needed. In addition to compensation for affected assets, eligible people will also be entitled to other allowances such as accommodation, disturbance and transport allowances under national legal requirements and for livelihood restoration assistance.
			Female	Vice Chairperson	What will you do if pipeline passes through dams?	Our mitigation management hierarchy is firstly to try to avoid the impact; secondly if unavoidable it is to minimise the impact, thirdly if we cannot minimise the impact then we try to restore; and lastly if we cannot restore then we propose to offset. For example, if one tree is destroyed, the management plan would recommend replacement of, say, three trees. An example was also given of land required for the Buliisa project incorporated a borehole thus another borehole was made in a different place.
			Male	Sub-Accountant	After excavating a trench and the pipe is in the ground and it is covered, how will the communities know where it is?	Generally, buried pipelines are marked by different signs, placards or stakes to indicate their presence, approximate location and product carried, and the name and contact information of the company that operates the pipeline. The primary function of these aboveground markers is to identify the location of the pipeline to help the public understand the location of pipelines and prevent excavation damage accidents.
			Female	Chairperson	There are sometimes cemeteries and burial grounds. What distance from the pipe can they be and what will you do if you find any graves?	A 30-m RoW will be created. If cemeteries and graves cannot be avoided, they will be relocated according to the wishes of family members and local authorities to ensure that the relocation is satisfactory. Compensation for removal and relocation of graves and cemeteries will be carried out in line with national legal requirements. This also applies to archaeological sites. If the exact location is not known, the contractor will have a 'watch' who will be looking out for archaeological sites. If they come across one during the construction, the works will be stopped until they can avoid it or they have to move the site.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
					We have heard the presentation and the ESIA process but I am really concerned that projects of this type bring impacts because of the influx and one such impact is HIV and AIDS. What arrangements will be put in place for this?	Thank you for your comment it is noted. We are well aware that influx is a potential issue and our studies will look in to the extent of an impact and how it could impact on host communities. For the worker construction camps, the workers will consist of local people and our mitigation will recommend codes of conduct. Added to which all services such as health will be supplied within the camp so that there is not a burden on the community. Camps will be located outside of communities.
			Female	Health Worker	What is scoping?	Scoping is small studies of the biophysical, biodiversity and socio-economic environments. However, they just scope issues and concerns. This determines the next phase of baseline studies.
15 May 2017	Traditional Leadership	Buganda Kingdom	Male	King's Representative	What is the current proposed plan on the ground down to parish level? Where is it exactly going? There is misinformation on where it will pass.	The studies and the G&G surveys will determine the final route. These route selections thus far have predominantly been performed via a fly through and remote satellite data assisting in selecting the route. There was a drive through several weeks ago where the engineering design team ground truthed some of the locations. However no final route has been decided and there have not been any markers laid on the ground.
			Male	King's Representative	What is the time frame?	We are in the scoping phase, which will take us until June. The baseline studies and impact assessment will take until approximately November and final submittal to NEMA maybe in the new year. However, I say this with caution, as projects like this often slip due to external circumstances. But just to give you an idea of the extended ESIA process. If the project is approved, the construction phase will start and it is projected to last three years, with operation in 2020. Again, this is a projection and timelines could change.
			Male	King's Representative	Currently what does EACOP have on the ground? And what are the projected milestones?	EACOP is in its infancy and it is just starting up, as these studies will drive the project.
15 May 2017	LC3 - Lower Local Government	Sembabule Town Council			I had a question about compensation but you answered it in your explanation. What I would like to know is when will the project start?	The project is in pre-construction phase or planning phase, and this will continue until all the studies have been done including the G&G ESIA. If the Government has approved that and the ESIA is satisfactory, the permit to go ahead will be granted.
			Male	Town Clerk	Will the final 10-m RoW be fenced off?	Until the pipeline is buried, the construction site will be fenced and warning signs will be posted around the area to avoid access to people and thus accidents. The access will be limited. The project contractors will progress with a speed of 1 km per day by section of 10 km, with a plan not to block the local population more than 3–4 weeks (from the clearing of the area to the site rehabilitation) over a distance of 10 km. During these weeks, you will not be able to cross the 10 km, which will be fenced to avoid any risk of accident. Temporary bridges will be set up for people or animal herds to cross the building site. During operation, how the 10-m corridor is accessed is still under negotiation with the Chief Valuer's Office. But, as it stands now, we understand that there will be no fence as it is not wanted to restrict access.
					During the operation phase, can we use the land afterwards and fence our areas off?	During operation, how the 10-m corridor is accessed is still under negotiation with the Chief Valuer's Office.
					You talked of the 10-m RoW during operation. How far will we be able to build a house and plant trees from this 10-m RoW?	For the pipeline, a RoW, an agreed corridor with permanent rights to land, will be required by the project. Along this RoW, it will not be possible to build houses, dwellings and structures or plant deep-rooted shrubs and trees. The width of the final RoW, the type of permanent land access that will be required for the RoW (e.g., permanent acquisition, easement or wayleave) and the activities that will be allowed along the RoW is under discussion by EACOP with the relevant Government representatives in Uganda.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Sec. for Finance, Planning and Admin.	We are grateful for the project description and the possibility that it may come here. However, we are concerned that many developments take place around here and employers say they will pay and then they do not pay. How do we know this will not happen with this project?	The EACOP project is open to public scrutiny and comment. The joint venture partners take their interactions and the way they operate seriously. They have procedures and policies which must be followed and are under scrutiny. A grievance procedure for this project is in the process of being put place if you have any concerns or questions. Please use it.
			Male	Vice Chairperson	How will the compensation be undertaken for the 30-m RoW and the 10-m RoW? Will it be two separate compensation actions?	After the ESIA is complete, the RAP will be detailed as we discussed. For the 10-m RoW, during the operation phase it will need to be established over which for an agreed corridor permanent rights to land will be required by the project. The width of the final RoW, the type of permanent land access that will be required for the RoW (e.g., permanent acquisition, easement or wayleave) and the activities that will be allowed along the RoW is under discussion by EACOP with the relevant Government representatives in Uganda.
			Male	Accounts Assistant	Which subcounties does the route of the pipeline follow right now?	In Uganda, it crosses 8 districts and 22 subcounties. Please remember the final route will be decided once the studies are complete.
			Male	Engineer	We would like as much information as possible on the project.	Today we have bought the BIDS and we will be coming back with more information over the period of the ESIA. Added to which EACOP will in the fullness of time recruit CLOs from districts who will become the conduit for updates and information.
			Male	Veterinary Officer	What happens if you displace indigenous trees?	The mitigation hierarchy is such: avoid, minimise, restore or, if those three are unavoidable, offset. So if one tree has to be destroyed an agreed number will have to be replaced. The specimen of the tree will be indigenous.
			Male	Veterinary Officer	How will you deal with the noise pollution?	You are quite right, noise pollution is a potential impact but we have to analyse it in perspective. The noise and the disruption will only be taking place for a short period of time because the pipeline will be built section by section and they will be moving constantly. Noise mitigation measures proposed in other projects I have worked on, for example, are using baffles in sensitive locations, e.g., near a hospital, so restricting the working times to daylight hours. The type of noise will be predominantly the movement of trucks.
			Male	Veterinary Officer	How will you restore people's livelihoods especially if they have been saving water and other staples up to survive the year?	To meet international standards, the company will also be offering livelihood restoration measures parallel or before to compensation and resettlement to project affected people to ensure standards of living are improved, where possible, and as a minimum restored to pre-project levels.
			Female	Secretary	Who will be in charge of the 10-m corridor?	How the 10-m RoW is accessed and managed is still under negotiation between the developer and the Chief Valuer's Office.
15 May 2017	LC3 - Lower Local Government	Lwengo Subcounty	Male	Senior Assistant Secretary (SAS) (Subcounty Chief)	We wish that you could come up with a detailed map showing which parts of the subcounty will be affected. How did you even zero in on who to consult now?	We know the proposed route, with a very wide corridor, more than 2 km. During the ESIA, we will narrow that corridor down, perhaps even by the end of this year. We chose villages that are fairly near the current area of study, so that we can start to gauge their feelings.
			Male	Councillor	Are you planning to ambush people and cheat them? You don't even know the exact route of the pipeline yet, but you are going to rush to start work!	No, that is not the intention of the project at all. We have months and months ahead of work on this ESIA, and then more months ahead on the resettlement planning. Nobody is going to be cheated or ambushed. Please do not worry.

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			Male	Sec. for Growth	How will people indirectly affected by the project be treated?	We all need to understand, please, that the people who first need to benefit from jobs are those who will have their livelihoods compromised temporarily. Then people who are indirectly affected should benefit from road upgrades, and business opportunities as they supply support services to this project.
			Male	Speaker	If you need more land than the 30 m, how will these cases be dealt with? We have experience from electricity projects where more land is needed and it is just taken.	The design will try to take all of these eventualities into account so that land can be obtained before the project starts. But, if there is a new need for extra land (for more pipe storage, for example) the same land acquisition process will be employed, and you will be made an offer.
			Female	Community Development Officer Sub-County (LC3)	Will the CLOs be recruited from the community?	The idea is to recruit people who you are comfortable with, but we are not sure yet of procurement and human resources plans for people who need a specific skill set. We will need to ask the project team on your behalf and feed the information back to you.
			Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	You will take our titles away, but how long will it take to get them back? We have had bad experiences with UNRA where people still today have not got their titles back, and UNRA has lost them so now there is no proof of title.	I understand how frustrating that must be for you. The document control in this project is expected to be really good, so perhaps a copy could be made available to you while the original is endorsed. But, I cannot speak on behalf of the team, as these are practical issues. Please bring this up again during the RAP process, and in the mean time we will feed this information through to the project team.
			Male	Speaker	Another problem is that the valuers cheat farmers by undervaluing their properties. Many times, there are disagreements between these people. We hope that this project will be extra careful to appoint valuers who properly relate to and are honest with residents and act professionally. You have talked of compensating both landowners and tenants whose land may be affected. However, we want to tell you that companies normally come and tell us this, but when it comes to compensation they change their minds and the tenants get nothing and end up losing their livelihoods and being treated unfairly.	The grievance mechanism and all of the external audits that will be done are in place for exactly this kind of situation. Professional and registered valuers will be used, not one-off people. We understand that you have had really terrible experiences with other companies, and assure you that this project recognises both tenants and land owners.
			Male	Sec. for Growth	We hope that when it comes to job the locals will benefit. We do not want scenarios where workers are ferried from other areas and countries like has happened with the road and electricity projects here in Lwengo. We hope there will be transparency when it comes to all jobs and businesses. What about a trainee engineer who I know who needs to be mentored?	The project team is emphasising local content and jobs for affected people, so they will communicate through you when there are employment availabilities.
			Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	What about the future value of the land? What if I have left it undeveloped but have plans to develop it? I will need to be compensated for earnings that I will lose in the future. Inflation needs to be factored in too.	Normally we cannot take future value into account. But, you will be able to raise this again in the RAP process.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
15 May 2017	LC3 - Lower Local Government	Lwengo Town Council	Male	Town Clerk	Our worry is that the workers from the pipeline will have a lot of money and they will engage themselves in sexual relationships with girls and people's wives. Our worry is the diseases like HIV and AIDS which may be spread given the number of people that will be within Lwengo Town. This is because we have bad experience of road construction companies where young girls and women have contracted HIV and AIDS. We expect pipeline workers to have a lot of money and our girls will be attracted.	Our team of health impact specialists is collecting data to look at the health and community matters at the moment, and to suggest mitigation measures to ensure that there aren't these cases as a result of this project. We will need to do lots of community sensitisation about how these workers are only going to be here for a couple of weeks and that there is no long-term prospect for a young woman! Also, camp management plans will be developed to restrict movement of workers.
			Male	Speaker	You have talked of the 30-m and 10-m corridors for land acquisition; which corridor will be compensated? Projects like this take long to kick off and yet valuations are done early. What happens if my trees at the time of valuation were young and they are mature by the time the project starts. How much will I be paid?	Compensation will be done for the whole 30-m RoW. All land users and landowners will be compensated. The RAP will inform the land acquisition plan, but first this ESIA must inform the terms of reference for the RAP. We must look at payments in cash and in kind, and make sure that payments are made fairly and on time.
			Male	Sec. for Finance, Planning and Admin.	We expect the affected people to be compensated, but how will the town council benefit from the project?	The Town Council benefits through job creation, jobs for its people, access to more markets , and road upgrades. The project in general will contribute to Ugandan revenue, which we hope will filter down to the town councils.
			Male	Councillor	The project is starting from Buliisa, perhaps all the workers may be recruited and ferried from Buliisa and Lwengo may lose out.	It would be very expensive to transport labour for hundreds of kilometres from Buliisa to come to work here. We are hoping to mitigate any problems by employing people locally.
			Male	Assistant Town Clerk	Which exact villages will be affected in Lwengo Town? We have had bad experience with similar projects, like electricity transmission line and road projects where valuers were corrupt, arrogant and biased. They would request money from project-affected people to do any valuations. We encourage the pipeline project to be transparent and valuers to be professional to avoid community resistance of the project.	We are not sure of the route at this stage. All we know is that we will be going through your Town Council. We are aware that you would like to know sooner rather than later, so as soon as there is a definite corridor to work with we will be able to engage with you. We will try to do better than the other developers. We understand how that could be a cause of major distress, and we have no plans to use substandard valuers.
			Male	Speaker	The valuers of previous projects were not professional and used to miscount the affected assets, crops and trees for the project-affected people. Valuers generally cheated project-affected people; what plans will the pipeline project have to avoid a repeat of this?	We will propose to the RAP team that they sensitise people about the methods used in valuations, so that people are very aware of the way in which valuers should be behaving. We also do not want to repeat any mistakes.
16 May 2017	LC5 - Local Government	Sembabule District Technical Planning Committee and Political Leaders	Male	Chief Administrative Officer (CAO)	What does the project need from us at district level? I have seen the presentation once before but we need to know how we can assist best.	ESIA team will be in touch with you for the next phase of the studies to keep you abreast of development with the process and to seek your permission to go to communities. The Developer is just starting out but in the fullness of time CLOs will be employed to be a conduit between the community and the developer.
			Male	Chief Administrative Officer (CAO)	We work all days of the week and are happy to receive you on Mondays and Fridays but we support you. We will not stop you from visiting the subcounties and the communities.	Thank you, your comment is noted.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
16 May 2017	LC5 - Local Government	Gomba District Technical Planning Committee and Political Leaders	Male	Production Officer	We understand the pipeline will be going through Gomba, we need to understand what is expected of us at district level short term and long term? What contribution do you want of us? What benefits will the subcounty and importantly the district get? An agreement with the Government has been made between the oil-producing districts and the benefit sharing but not with us a host district to the pipeline.	The RSK and Eco & Partners team will be focusing on the ESIA studies and stakeholder engagement and for this we see you, the district, as key stakeholders and the official gatekeeper to the subcounties and communities. Thus we will be coming back to talk with you to inform you of our activities and you are a key stakeholder within our stakeholder identification. With regards to the developer, the project is just starting up but, in the fullness of time, mechanisms will be put in place to engage districts and subcounties (local government and lower local government) and the developer. In terms of the ESIA, your comment relating to benefits is noted and agreements between the Government, the developer and the host districts is beyond us. However, you have made valued points and they will be recorded.
			Male	Production Officer	There needs to be a binding document between the district and the developer to stipulate that there will be an agreed number of workers from each district.	Your comment is noted. The ESIA will recommend that a local recruitment policy is applied and clauses put in to procurement documents of contractors to also employ local people.
			Male	Production Officer	But what about the districts that host the pipeline? We too should be getting a revenue from the taxes that should be provided to the district to spend how we see fit. We don't want clinics and schools forced on us; we want to choose how to allocated funds as we see fit. Benefits from the oil must be shared otherwise there could be a scenario like in other resource cursed countries. We need long-term sustainable development in districts.	Your comment is noted and will form part of the scoping findings. ESIA incorporated mitigation measures identified and a management plan. Mitigation is identified to avoid, minimise, restore or offset identified impacts. We also look at regional, national and transboundary potential impacts and propose appropriate mitigation measures.
			Male	Deputy CAO	What will the mandate be regarding local content of unskilled labour? There are many unskilled people in the subcounty.	The ESIA will recommend a local recruitment policy and procurement considerations. The pipeline will generate thousands of short-term jobs during construction, but this period will only last 2–3 years. The pipeline will create short-term employment for both highly skilled professionals and unskilled labourers. During the operations phase, there will be a limited number of jobs (less than 1000). The proposed developer expects that temporary workers who will be involved in the construction phase of the proposed project will be sourced locally from each county and this will further promote the development of local content.
			Male	Senior Assistant Secretary (SAS) (Subcounty Chief)	I have seen many well-written ESIAs and management plans but the issue we have found especially with the roads project is the auditing during construction. For example there has been no culverts constructed on a stretch of the newly constructed road so the erosion and run off in some areas runs directly in the direction of dwellings. Furthermore during construction we have seem many more adverse environmental impacts which are not mitigated appropriately when it actually comes to construction.	Thank you your comment is noted. The developer is working to international performance standards - IFC. IFC will send auditors on a regular basis and if there is not compliance funding will be stopped. I understand you have a national auditing Department as well. Having worked with Tullow in Buliisa I witnessed a focus of Government auditors on the oil and gas industry. It was very rigorous. As such I can only assume that perhaps the Government auditors focused more on the oil and gas rather than the roads projects with UNRA.
			Male	Security Officer	We have seen many projects where workers on these projects come and break families up and there is 'immoral' behaviour' and health implications such as HIV/AIDS.	We have heard this complaint a lot and in particular associated with the upgrading of the roads. To manage this, the ESIA will propose that workers in the construction camps will have a code of conduct and will be living with in a 'contained community' within the construction camp. Movement of workers will be closely monitored. We recently experienced this in the construction camp in Buliisa. But your comment is noted. Furthermore, the ESIA studies are undertaking health impact assessment as health implications and necessary mitigations are integral to the report
			Female	Sec. for Education and Health	How can our technical people here be engaged? We have an engineering specialist; we have environmental specialists.	The developer is committed to employment of local Ugandans as well as capacity building and training. I cannot speak on behalf of the developer about employing technical people at district level. Recommendations and

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						mitigations will be made. A word of caution the project cannot take your technical people from the committee at district level as it would leave a gap in your technical staff!
			Male	Deputy CAO	A fibre optic cable was laid along the main road from Tanzania. A Tanzanian company was laying the cable and brought all its employees from Tanzania and did not employ any local people. How do we know this will not happen again?	Your comment is noted. The ESIA mitigation management plan will recommend employment of local staff from project affected communities. The developer is committed to employing local people and is subject to scrutiny by stakeholders as well as IFC thus I do not think it is comparable.
			Female	Sec. for Education and Health	Sensitisation relating to HIV and AIDS needs to be undertaken not just at district level but also at subcounty and community levels. Local leaders should be mobilised and involved to assist.	Your comment is noted. The ESIA mitigation will encourage full engagement and necessary participation of local leaders and community mobilisers.
			Male	RDC's office	Relating to compensation, I am concerned that many people have titles and many don't. In fact, some title holders have bogus documents. Will those people without titles, yet have stayed on the land a very long time be entitled to compensation?	If anyone will lose any land or assets, they will be fully consulted and compensated. This compensation will be done according to national laws and international standards. Full replacement values for affected land and assets (including no depreciation for structures) will be applied during the valuations in line with international standards. A range of compensation options will be considered including in-kind replacements of land and assets (where appropriate and possible) and cash compensation. Under the international standards livelihoods of affected persons need to as a minimum be restored to pre-project levels and, where possible, improved.
			Male	Deputy Speaker	We need to have regular meetings along the life of the project. What happens is at the beginning of the projects the district is involved but once a project is underway, we get left behind and we are forgotten.	The ESIA process has identified Gomba District as a key stakeholder. We will be consulting you throughout the process.
			Male	Deputy Speaker	Please explain again the 30-m RoW and the 10-m RoW.	A 30-m RoW will be required for the construction period. During operation, it will be reduced to a 10-m RoW. Along this RoW, it will not be possible to build houses, dwellings and structures or plant deep-rooted shrubs and trees. The width of the final RoW, the type of permanent land access that will be required for the RoW (e.g., permanent acquisition, easement or wayleave) and the activities that will be allowed along the RoW is under discussion by EACOP with the relevant Government representatives in Uganda.
			Male	Community Development Officer (CDO) - District (LC5)	The project needs local buy from the communities and the way to do this is sustainable development surrounding the pipeline which is associated with the pipeline. If people's livelihoods are uplifted they will love the pipeline and protect it and be proud of it. Affirmative action has to take place otherwise there could be sabotage of the pipeline.	Your statement is noted. The ESIA will recommend to source from local producers as far as it is possible noting supply would have to match the demand. The construction camps will be housing up to 1000 people and will require large amounts of food.
			Male	Deputy Speaker	Can the construction camps be given to the communities close by for usage as schools or hospitals?	Your comment is noted. The camps are not hard wall, they are temporary in purpose so may not be as you imagine and fit for purpose after their usage, which could ensue liability issues on the developer.
			Male	Chairperson	When you arrived, I wanted to close the borders to the pipeline route, likening it to history and the construction of the East African railway line whereby the Indian 'coolies' building the line experienced resistance from the indigenous populations because they were not involved in the construction and likewise our district does not receive benefits from the central Government. However, I have listened to the presentation and your answers and my concern for local communities being considered for employment have been satisfied. What remains is the Government needs to undertake benefit sharing even for the host districts of the pipeline and not just Buliisa where the oil is extracted.	Comments noted

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
16 May 2017	LC3 - Lower Local Government	Ndagwe Subcounty	Male	Chairperson	As the subcounty, we buy and distribute mango seedlings and trees to our farmers for free so that we can tax them after they harvest. How will the subcounty be compensated for this loss? You can't just pay the farmers, because there are our trees for tax purposes. Will the permanent facilities like pump stations and camps be handed over to the landowners or the subcounty at the end?	Thank you for telling us about this interesting system. We may need to arrange a separate meeting with you during the baseline survey so that we are better able to understand the relationship between you and the farmers. The idea would be to avoid big plantations of fruit trees, but if they cannot be avoided then perhaps alternative land could be found to grow other trees so that none of your future taxes are lost. The pump stations will remain the property of EACOP, and the manager of the pipeline. That land will be purchased permanently. The land that the camps will be one will only be leased from individuals, so will be handed back to those individuals after use, and after rehabilitation. There are no plans to leave any camp infrastructure behind.
			Male	Chairperson NRM	You have talked of recruiting CLOs. Will these people be volunteers like the local council chairpersons, or will they be paid? What if a CLO does not receive any grievances, will they still be paid? When will the project kick off?	The CLOs will be employees, paid once every two weeks most probably, whether they receive any grievances or not. The project should start sometime towards the end of 2018, but it all depends on this ESIA and the approval and funding process, and resettlement, so we have a lot to get done.
			Female	Vice Chairperson	If the pipeline disturbs our roads, what will happen? If the pipeline passes through someone's home, will that person be paid and resettled in the community or will they just be put on a train or lorry and be taken elsewhere? Will they be resettled outside of their original home?	This is a serious concern, and I am so sorry that you feel as though you could just be put on a lorry and taken away. The RAP team will work through all of these concerns with you, but I can say that the plan is always to resettle people within their communities, or at least at a place of their choice within reason, and close to their original home.
			Male	Councillor	Will there be jobs for the people of this subcounty?	Yes, there will be. Almost all jobs will be advertised to Ugandans first, and specifically the jobs for general labour will be advertised at sub county level.
			Male	Chief	Will there be royalties going to the subcounties that the pipeline passes through? Will the companies working on the pipeline be in a position to lend us their graders and other equipment to use since we have scarce equipment in this area and we have lots of projects to do? You spoke of fencing the 30-m corridor during construction. What kind of fence is it? Metallic or live/farm?	There won't be any royalties paid directly to the sub county. Those kinds of benefits will need to be passed down to you from National level. We do not control any minerals, we are just here to see that the pipeline gets built in a responsible way. There probably won't be an opportunity to let anyone else use machinery, because this is such a fast project. Also, there would be all sorts of insurance matters to deal with. It will be metallic fencing, to a specification that will allow it to last right through construction.
			Male	Chairperson	Will there be disturbance allowance to the sub county governments like Ndagwe? In the event that another mineral is discovered during this process will the central government or the local government benefit?	A disturbance allowance is given to the person who is being disturbed, not to the sub county. As we have said, we do not control any minerals; we are just here to see that the pipeline gets built in a responsible way. If any mineral is found as we go the contractor will be asked to move on to the next trench, and the relevant authority will be called in to advise.
			Male	Chief	This project is called EACOP but the pipeline is only going through two countries is East Africa. Will all of East Africa benefit? What is the deal?	Great question, and good observation. You may have heard that there is other oil being found in other east African countries. The anticipation is that they will all build their own pipelines to the refinery in Hoima, and that from there this export pipeline will be the main line to Tanga.
			Male	Agricultural Officer	What will the role of the agricultural department be in the implementation of this project?	We would really like to work with you on land use, alternative land, agricultural activities, livelihood restoration ideas, and when the RAP team looks as crop compensation rates you'll need to be involved.
			Male	Chairperson	We request that we as leaders are taken to where the oil has been found so that our knowledge can be expanded.	Request noted.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
16 May 2017	LC3 - Lower Local Government	Lwanda Subcounty	Male	Chairperson of the Water Board	How will water pipes and other service lines be replaced or compensated for if they are affected? Where exactly will the line pass through Lwanda, so that we can discuss the infrastructure that will be damaged?	During the baseline impact assessment, we'll map the infrastructure with you and then the contractor will be given the same map showing where he needs to protect any services, or where he needs to allow crossing points. If any services damaged the project will need to repair it within a reasonable time frame. I'm so pleased that you've been here to listen to the presentation and ask questions. We will need to work with you. We also need to know the exact line of the pipeline, but that information isn't ready yet, so please be patient.
			Female	Accounts Assistant	There are landlords and tenants here. Will the project deal with both of these groups when it comes to compensation?	Yes, the project will recognise and prepare compensation offers for all land users and landowners who will lose access to land or resources. Both groups are recognised.
			Female	Community Developmen t Officer Subcounty (LC3)	There is going to be an influx of people and this will come with social problems. The children may want to be near the construction site to watch what is going on. What plans are there to mitigate all of the potential dangers?	Thank you for bringing this up. It is good for us to know that you've identified this as an issue. We will need your help, please, to prevent children from getting in the way on any of the construction. There will be a fence, and there will be sensitisation, but we won't be able to babysit. There will be a management plan in place to deal with all health and safety, so we'll take this into consideration when writing it.
			Male	Gombolola Internal Security Officer (GISO)	How will the youths be engaged to participate in all of the processes, from now? Why do you have to carry out baseline studies? Who will be employed to carry them out?	All groups will be engaged, from now. You're sitting here at this meeting! During the baseline, we'll do focus groups with specific population groups. So, the baseline, why do we do it? Well, because it's the right thing to do! We've been contracted to do an ESIA, to find out how the social and biophysical environment is now, and to identify how we may have an effect on it, and to mitigate. Gone are the days of just ploughing through and displacing people and wrecking the environment. This is the responsible way to develop. Our team will be doing the surveys. At some stage, and mainly during the RAP, there will need to be a team of fieldworkers to do the surveys with us. We'll engage with the sub counties when this takes place.
			Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	Uganda is a decentralised country where the lower local governments are independent and can make decisions, plan, budget, and approve and make policies and bylaws. How will this independent subcounty benefit from the pipeline project, as we will be supervising it?	There will be some jobs available, and people will be able to provide support services, but the main impact will be revenue generated, that National will be able to feed down to sub counties for their development plans.
			Male	Agricultural Officer	Will there be a disturbance allowance for us?	For the people who are directly affected, and lose land or homes, there will be a disturbance allowance. Not for anyone else.
			Male	Councillor	We see that the project will compensate many people, but why didn't the pipeline follow the existing road network so as not to have to compensate. You would have saved. We are scared that the heat from the pipeline will affect our crops.	So, do people here often settle along roads, mainly? That is what we have noticed, and what is called "linear settlement". The reason I say this is that the actually pipe couldn't run under a road, because it needs to be easily accessible for maintenance, and also couldn't run alongside a road because there would have been a huge resettlement impact. In addition, the pipeline needs to have as many straight lines as possible, for long distances, so can't follow all of the curves. You can be proud that you'll be part of the longest heated pipeline in the world, but this is not the first heated pipeline. There is one in Alaska that has existed for over 30 years, so there has been time to monitor its impacts and there has been none. Please do not worry about any wellbeing impacts, on you or on your animals or crops. It is like a flask: warm on the inside but normal on the outside.

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17 May 2017	LC3 - Lower Local Government	Kakuuto Subcounty	Female	Sec. for Finance, Planning and Admin.	We would like to know which villages the pipeline is going through?	Until all the studies for the ESIA have been undertaken and the G&G surveys [and ESIA] then the 2-km corridor will be narrowed to 100 m and finally 30 m. Until then, we only know the 2-km corridor. By the time of our baseline studies, the corridor will have narrowed.
			Male	Chairperson	What do the studies actually consist of? What does 'studies' mean?	Studies are across the biophysical, biodiversity and socio-economic environments. Studies encompass either talking with people, or identifying/counting birds, looking at the different plants.
			Female	Sec. for Finance, Planning and Admin.	At compensation stage, what things will you consider for resettlement and compensation?	Any landholder or land user, regardless of them having a title or not, if they lose any land or assets they will be fully consulted and compensated. This compensation will be done according to national laws and international standards.
			Male	Community Development Officer Subcounty (LC3)	Will you consider compensation for people with no title?	All people will be compensated or resettled even if they do not have a title or they are *kibanja* (customary users). A Resettlement Action Plan will be prepared and all affected people will be considered within the document.
			Male	Community Development Officer Subcounty (LC3)	For your environmental assessment, which areas will you consider - will it be the entire subcounty?	Environmental studies are being undertaken in the 2-km corridor and it goes beyond this in special circumstances. Socio-economic studies will not just be within the corridor, as we look at trading centres and traffic routes.
			Female	Senior Assistant Secretary (SAS) ("Subcounty Chief")	Do we expect impacts to spill beyond the corridor?	From other similar projects certainly with socio-economic aspects, they will be beyond the corridor if you think of trading centres they will incur a positive impact because of more trade. Along roads where project vehicles are travelling, dwellings may incur increased frequency of traffic. We also look at cumulative impacts, such as what other projects and developments are going on in the region. We also look at potential transboundary impacts.
			Male	Chairperson	If the pipeline route goes through a water point, what will happen will you offset?	The mitigation hierarchy is avoid, minimise, restore or offset so firstly we would advise to avoid. If this is not possible and the route did need to go through then yes the mitigation would be to construct another water point.
			Male	Chairperson	The pipeline route will be going through very many villages; are you going to consult these villages?	Yes, we will. We are just at the scoping stage of our study. We have identified stakeholders at national, district, subcounty and a few villages. However, for the next part of the study, we will be consulting with you again but we will also be focusing our studies on the communities within a 30-m corridor.
			Male	Health Worker	I have concern that if the pipeline route goes through a school, a school takes up a very big area, what will happen? How much can the pipeline route change?	The pipeline can be bent to a degree and it can be set on a course to avoid to a degree but it is minimal.
			Female	Sec. for Finance, Planning and Admin.	Can you explain the open cutting of rivers again please?	The pipeline construction of rivers will take place most probably in dry season when the water levels are low. However, they will cut through the rivers, taking care to stockpile vegetation so it can be restored when finished.
			Male	Town Clerk	I am worried about Lake Victoria, and the possibility that the pipe may leak in to the river nearby.	The engineering and materials used are such that the pipelines are very safe and will not corrode or leak. The only thing that will cause pipelines to leak is interference from third parties, whether deliberate or accidental. In the unlikely event of an incident, there are hundreds of valves along the length of the pipeline that can be immediately activated by the central control room stop the flow of a pipeline quickly upon a release. There will also be detailed emergency response plans, whereby resources are immediately deployed to reduce the impacts of any release

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17 May 2017	LC3 - Lower Local Government	Kifamba Subcounty	Male	Rep. Councillor	Fear that when such projects come they impact on land users more than land owners because they do not have titles. How will compensation work?	If EACOP needs to use your land for oil operations, both land holders and land users will be eligible for compensation. A Resettlement Action Plan will be prepared and focuses on relocating all individuals displaced from their land as a result of the project. The exact details of resettlement, including the location of resettlement communities, will be determined in due course.
			Male	Chairperson	Will compensation payment be done in the same way for titled land as for customary land?	This compensation will be done according to national laws and international standards. Full replacement values for affected land and assets (including no depreciation for structures) will be applied during the valuations in line with international standards. A range of compensation options will be considered including in-kind replacements of land and assets (where appropriate and possible) and cash compensation. Under the international standards, livelihoods of affected persons need to as a minimum be restored to pre-project levels and, where possible, improved. The developer will be offering within compensation packages livelihood restoration entitlements to affected persons and community.
			Female	Community Development Officer Subcounty (LC3)	You spoke about CLOs, will they be a single person or people and where will they come from?	The developer will engage CLOs in the fullness of time. Right now, the focus is on the ESIA. CLOs usually come from the local areas and become the link between the communities and the developer.
			Male	Councillor	My understanding is that you called us together today as leaders. What do you want of us in the future? Is there a way to facilitate the future engagement with communities?	The ESIA process identified stakeholders at all levels of society: national, district, subcounty and community level. You are integral to our stakeholder engagement and we will be consulting you throughout the process, providing you with information as well as getting your concerns and information about your communities. When we come back for the baseline studies your assistance with meeting the communities will be very helpful and we will be in touch.
					Will compensation be paid prior to the works being carried out. Usually we have found that payment is made after the works.	Payments and resettlement actions will be undertaken prior to construction.
			Male	Chairperson	I don't think you can answer it but why is the Government exporting the oil can we not have a refinery?	A refinery will be built at Kabaale and a refined oil pipeline will be constructed from the refinery to Kampala. Thus a proportion of the crude oil will be refined and proportion exported as crude oil. The scenario is like farming maize and matoke, you keep some products for the household and you sell any surplus to make some money.
			Male	Chairperson	When will the project begin?	The studies are projected to be completed by the end of the year and the assessment submitted to NEMA early 2018. But timings of projects of this scale can be influenced by external circumstances to make them slip so I am cautious to give any firm timelines. Added to which NEMA has to approve the impact assessment. Once this has been undertaken the RAP has to be detailed and compensation and resettlement activities undertaken.
			Female	Community Development Officer Subcounty (LC3)	Having a refinery will it mean that we will be able to get refined or semi refined by product? I make candles and I have to buy imported products.	The refinery and the refined product pipeline is not part of this ESIA so it is difficult to say what the plans are for the refined crude oil.

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17 May 2017	LC3 - Lower Local Government	Kasaali Subcounty	Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	We propose that you permanently acquire the construction corridor to avoid situations where more land is needed, as has happened with the transmission lines. They used more land than they requested and we were further disturbed. There is mixed land use and land tenure here, such as communal, mailo, leasehold, tenants. Some of the tenants have documentation, but most do not. How will the project handle those people? For example, the Catholic Brothers have land, and the Catholic Church. When will the construction phase start? Which other sub counties in Rakai will be affected? Will the locals be given priority when it comes to jobs?	Thank you for telling us about the power line project. We have heard that more land was needed than anticipated. The width needed for construction purposes, and the width needed for permanent operation of the line, have both not been decided yet. But, we will make a note that you would like not to be disturbed again and again. That's reasonable. The project team recognises all land users, and as such all users will be compensated in some way for their loss of access to resources. The construction should start sometime towards the end of 2018, but all of these approval processes and drawing-up of management plans need to happen first. Nabigasa, Kakuuto, Kasasa, Kifamba, Lwanda
			Male	Speaker	What plans will be in place to avoid extra marital affairs, HIV and AIDS transmission, and defilement?	There will be tight camp management plans, sensitisation campaigns, influx management plans, health campaigns, and with your help most importantly the project will try to minimise any exposure to dangerous behaviour. We will need the community to assist with the sensitisation, though.
			Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	Will there be an effect of the heated pipeline on the soils and neighbouring people?	You will have the longest heated pipeline in the world, but not the first. There is one in Alaska that has existed for the last 30 years, and so has been monitored for the same period. There are no effects on the soil or crops or animals or people. It acts like a flask, warm on the inside but no effect on the outside.
			Male	Speaker	In a case where a school falls within the pipeline corridor will another school be built first, or will it only be built after construction, or will it just be demolished and not built? What if the corridor goes near to a school? What will the effect be on the pupils? What will happen after construction if the pipe breaks and you need to fix it and you come onto the land and destroy crops?	The first option is to avoid, so to not affect the school. If there is no option but to go close to it then the necessary mitigation measures will be put in place to protect students from dust, and to allow their safe passage to school, so as not to disturb their schooling. Please remember that the team will go past quickly, so it would be a very short-term impact. If, in an extraordinary case, the line has to go through a school, the RAP will decide on the best way in which to handle things so as not to halt any education. The permanent servitude will have restrictions placed on it, so it is unlikely that there would be any recompense, but if your own private property were to be damaged then you would need to use the grievance mechanism.
17 May 2017	LC5 - Local Government	Lwengo District Technical Planning Committee/Political Leaders	Female	District Planner	As a district, we are worried about compensation. Many people will flock to our offices with complaints and grievances, and who will compensate us to deal with these grievances and to sensitise the people?	Well, we assume that dealing with your community is part of your job as an office bearer. The project will appoint CLOs, who will be the people who should receive any complaints and grievances, so you won't need to deal with them unless you choose to.
			Male	Vermin Control Officer	Why did you prefer the long route to Tanga rather than the shorter route to Mombasa? Will ordinary residents of Lwengo benefit from the project, because you have said that the trenching will be done by machines, so how will there be any work? Of course, the CLO jobs will go to skilled people, so how will the unskilled benefit?	For economic reasons, reasons of collaboration, safety reasons, and environmental and social reasons, Tanga is the best option. This has taken years to decide, so has been a well-considered decision. Please remember that this is a short term, a quick, construction project, and that the main benefits are going to be from the newly maintained roads, and from any support services that you can provide, but also from Ugandan revenue generated and filtered down to districts.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Environmental Officer	We as a district are going to host the pipeline. Will there be royalties associated with this? We have fears of HIV and AIDS, extra marital affairs and general bad social impacts. What plans do you have in place? You have talked of workers camps, but what about facilities for their families like schools and health centres? When you finish here, will those facilities be handed over to the district for further management?	There won't be royalties paid to any districts by the pipeline project team. Perhaps national government is best placed to answer this question. There will be labour and camp management plans in place, as well as sensitisation plans for the communities that the project will come into contact with. We will need your help, though, to encourage your communities not to engage in any dangerous behaviour. The project is short term, so there is no need for facilities for families. This is a travelling group of construction teams, going like a train, not a long-term project in one area.
			Female	Legal Officer (FIDA)	We have had experiences in Hoima where residents were told that their foods were not good and were rejected by oil companies, because they didn't meet the standards. What plans are there to ensure that locals can participate in the supply services?	Perhaps the procurement plans could be made available. We will need to discuss this. But, we do know that camp managers struggle with the reliability of both the supply and quality. You need to remember that the camp managers need to be sure that they can supply all of their residents with the right quantity and quality of food.
			Male	Security Officer	There is a concern about the protection of the local people who may be disturbed by the misbehaviour of the workers, who may engage in extra marital affairs with people's wives, and rape young girls. What plans will you have in place? I propose that when the project is about to start we have an extraordinary stakeholder meeting involving the security committee and the developer, so that we can jointly discuss security procedures and collaborate on security systems for smooth implementation. Will you use private security companies or will you depend on government security? Will there be corporate social responsibility programmes for the project?	We know this is a concern, because of experiences that you have had with other construction projects. There will be labour and camp management plans in place, as well as sensitisation plans for the communities that the project will come into contact with. We will need your help, though, to encourage your communities not to engage in any dangerous behaviour. Thank you for this suggestion. It is interesting to know how you envisage the collaboration happening. There will need to be some sort of security for machines and camps, but the exact mode has not been discussed yet. There will be a CSR element, but at what level we are not yet sure.
			Male	Environmental Officer	We suggest that all of your information be shared with stakeholders, especially about the quality requirements that you have for us to provide the camps with food and supplies, so that we can prepare people to benefit.	Perhaps the procurement plans could be made available. We will need to discuss this.
			Female	Legal Officer (FIDA)	In the subcounties of Lwengo and Ndagwe, there are a lot of land conflicts and disputes. How will compensation for such a project be handled? How will disputes be handled? Are there mechanisms that will handle these before compensation? I have been involved in Hoima so I know about the disputes there.	Thank you so much, it is really good to know that you're aware of the possible land issues. The RAP will handle the planning and management of the land acquisition, and the grievance mechanism, along with District Resettlement Committees and Resettlement Planning Committees, with be the disputes and adjudication method.
			Male	Security Officer	You need to identify the land issues and disputes as early as possible so that the project is not delayed. This will help us come up with a durable solution for you for this project.	Thank you for pointing this out. We agree, but must get environmental authorisation before that sort of planning can really get going.
			Male	Production Coordinator	When will be know the exact location of the pipeline route? How will you compensate for the 30 m and the 10 m? Will there be different rates?	As you know, we do not know the route yet. The study area is still 2 km wide, but we wanted to give you an indication of the sort of visual impact and impact on land that there may be. The full width needed for construction will be compensated on a temporary basis, and then the full width needed for permanent maintenance purposes will be acquired using method still to be decided.
			Male	Physical Planner	How will the 10-m corridor be marked so that people can easily see it and not cause any harm to the pipe? Will there be a safe zone on either side of the 10-m corridor?	The corridor will be marked, in a suitable fashion. The permanent width needed for a right of way will include a safe zone, but we are not sure what that width is just yet.
			Male		Will the company or the district recruit the CLOs?	The company will, with the help of the leadership at district, subcounty and village level. This needs to be an inclusive process.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
18 May 2017	LC1 - Village Local Council and Community Members	Lukooma Village		Resident	Where will the construction camp be exactly?	Once we have completed the ESIA studies and the G&G ESIA, the routing of the pipeline and the location selection of the associated AGI facilities will be finalised until then we are working within a 2-km corridor.
				Resident	Will we be considered for jobs if do not have skills?	Yes, you will. The proposed developer expects that temporary and unskilled workers who will be involved in the construction phase of the proposed project will be sourced locally from each county and this will further promote the development of local content. The ESIA mitigation will recommend that a local recruitment policy be adopted for PAPS and others to incorporate the above. Linked to this will be the different companies who will be engaged directly by the pipeline project and they will further create employment for nationals, as it is expected that their capacity will grow to provide services and goods for the proposed project.
				Parish Chief	What is the reason for taking crude oil from Uganda to Tanzania?	For this project, the crude oil which will be produced will be partly refined in Uganda to supply the local market and partly exported to the international market. It is rather like your garden: you keep some vegetables and beans for the household and surplus is sold.
					Is it really profitable to send the crude oil in the pipeline all the way to Tanzania?	If we would have to transport the oil by using tanker trucks, we would need 2000 trucks every day on the roads which would generate risks for road safety, environment and social issues. Transporting oil by rail or road is significantly more expensive than by pipeline and presents much higher risk (from road accidents or from derailments). Transporting oil by rail or road can be viable for small volumes over shorter distances, especially if the rail and road infrastructure is already in place. Pipelines are safe, efficient and, because most are buried, largely unseen.
					We are concerned that what happened in Nigeria – destruction of the environment – will happen here.	This is noted and other stakeholder have raised the same concern. Through the ESIA, we consider cumulative impacts and then we propose mitigation and management plans to manage the potential impacts.
			Male	Chairperson	100 ft or 30 m for the RoW: is that the only piece of land you will need? Will you not need reserves?	30-m RoW yes as well as land take for aboveground AGIS as well as borrow pits for road rehabilitation
					What happens if the 30-m RoW goes through my house?	You will be compensated or resettled. Resettlement Action Plans (RAPs) will be prepared which set out a comprehensive plan to address the physical and economic displacement of project-affected people (i.e., landowners and users and their assets), including describing the proposed compensation and livelihood restoration options. For the RAPs the project first needs to collect comprehensive data and information about the affected land, assets (i.e., structures) and people affected by the project's land requirement first, so they can then assess possible impacts, undertake valuations and determine compensation and livelihood restoration measures.
					When will the project start?	Once the ESIA studies and the G&G ESIA are complete and NEMA approves the project then the project pre-construction will start.
					If we have the choice of resettlement, will the Government choose where they resettle us or will there be another way?	Resettlement Action Plans (RAPs) will be prepared which set out a comprehensive plan to address the physical and economic displacement of project-affected people (landowners and land users and their assets), including describing the proposed compensation and livelihood restoration options, which the PAP can choose from.
					I'm always seeing oil being transported. Why is the EACOP project transporting it by pipeline?	Transporting oil by road is significantly more expensive than by pipeline and present much higher risk from road accidents with community health and safety implications. Transporting oil by road can be viable for small volumes

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						over shorter distances, especially if the rail and road infrastructure is already in place.
					You have talked about compensation and the district rate. The power line recently went through my plantation of eucalyptus trees. The actual market price for construction per pole was 3000 UGX; when it came to payment, I got about 500 UGX per pole. I had about 1000 trees cut and made terrible losses.	I am really sorry to hear that. We are the ESIA consultants and the RAP will be undertaken once the ESIA is finished or before. If anyone will lose any land or assets, they will be fully consulted and compensated. This compensation will be done according to national laws and international standards. Full replacement values for affected land and assets (including no depreciation for structures) will be applied during the valuations in line with international standards. A range of compensation options will be considered including in-kind replacements of land and assets (where appropriate and possible) and cash compensation. Under the international standards, livelihoods of affected persons need to as a minimum be restored to pre-project levels and, where possible, improved. Therefore, the pipeline company will be offering within compensation packages livelihood restoration entitlements to affected persons and community.
					Are you going to construct roads?	No, this is a pipeline project. Roads will be used to transport construction materials and they will be reinstated to their previous state. There is a small amount of access roads being constructed to the RoW but we are not constructing roads. This is not an UNRA project.
			Female		I hear you could resettle the vulnerable like me I am a senior citizen. Will you construct the houses for us?	The RAP will set this out but, usually, yes, that happens. We are ESIA consultants not RAP consultants.
					Can you resettle people and pay compensation?	Again we are ESIA specialists not RAP specialists but from work I have done elsewhere, yes resettlement does incorporate cash compensation as well.
					Will you be communicating with the affected people where the pipeline will pass?	Yes, as soon as the RoW is reduced to 100/30 m, we will be consulting systematically with the communities along the pipeline.
					There are 'lower' people down here. Are you going to get people to represent them? What is their security apart from the district leaders?	Your comment is noted. Communities are identified in our SEP and we will be communicating with you over the course of the ESIA. The client will in the fullness of time will get CLOS who will be from the districts and will be the liaison between the community and the client to keep you informed.
18 May 2017	LC5 - Local Government	Rakai District Technical Planning Committee and Political Leaders	Male	Community Development Officer District (LC5)	My question is about compensation and the resettlement component how fair and just will it be? I have witnessed that when it actually comes to it people are paid 'peanuts'.	Thank you your comments are noted. The compensation rates are those set by the district. The developer does not have land compensation rates yet. Compensation rates will be based on the valuations of land and asset surveys to be carried out still. Valuation of land and assets affected by the project will be carried out in line with national legislation and international standards. Compensation for land will be equivalent to the full replacement value of land and assets, probably based on the market rate for land in the area, plus any transactional costs associated with acquiring new land. Any assets/built structures will be valued for replacement and depreciation will not be considered. The market value of land will be determined using various methods, including surveys of affected land and assets, studies on local values for land, valuation rates published by Government authorities(e.g. District rates) and in agreement with Government authorities (e.g. Chief Government Valuers, Regional or Districts Valuers).
			Male	Community Development Officer District (LC5)	If people are resettled or 'displaced', I am very concerned that they lose their cultural values.	Your comment is noted and will form part of our baseline studies.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Community Development Officer District (LC5)	I have heard your presentation but I want to stress there are many cross cutting issues in development projects like this (e.g., gender, health, HIV). How will you mainstream these in the development?	As part of our assessment, there will be a dedicated health impact assessment. Gender is incorporated in the scoping studies now and will be incorporated in the social baseline studies so these are salient issues all considered in this ESIA.
			Male	Community Development Officer District (LC5)	You have discussed benefits and negative aspects. I feel development brings more harm with exploitative practices such as child labour, no PPE and these projects do not cater for all categories of people like the disabled.	The developer takes HSSE very seriously and contractors will be expected to comply with these standards.
			Male	Community Development Officer District (LC5)	Also along with these projects comes destruction of social behaviour and culture.	Your comment is noted and the ESIA will consider cultural values and community social cohesion and propose mitigation measures.
			Male	Assistant District Health Officer (ADHO)	My concern is that we will export this oil and yet the price of fuel is really high. There needs to be a change in price.	I cannot speak on behalf of the Government about prices of fuel.
			Male	Assistant District Health Officer (ADHO)	We had, for many years, a refugee camp in Rakai District; it bought the district a real 'headache', it compromised the resources which were already really short, it compromised the health of host communities and the refugees themselves.	The construction camps will be self-sufficient with their own clinics and canteens. An amount of water would have to be abstracted in agreement with the district but on the whole the purpose of the construction camps are not to be a burden on local communities. Furthermore, the ESIA mitigation would recommend a code of conduct for workers and movement of workers to local communities would be monitored through procedures.
			Male	Assistant District Health Officer (ADHO)	There is vast amount of commercial sex here in Rakai and therefore STDs, HIV. . . We will need extra resources to cope with these problems because our budget.	The construction camps will be away from communities and movement of workers will be monitored.
			Male	Assistant District Health Officer (ADHO)	Please tell us when the construction camp goes – how many years will it be around?	The construction period is for three years but this does not mean that the camps will be around for the entire period.
			Male	Assistant District Health Officer (ADHO)	What happens to the pipes at their end of life? Will they be left to corrode in ground?	The oil well has a life of 30 years. Other discoveries of oil may have been made in Uganda or in the surrounding countries, e.g., southern Sudan. The actual physical life of the pipeline is much longer than that required for Lake Albert crude oil export. Generally, when pipelines have been built (and paid for), it is much cheaper for any other crude oil to be exported through the pipeline, so even some much smaller oil fields may become economically viable. Once all the relevant parties at the time decide that the pipeline is not required, the abandonment phase will begin. With a buried pipeline, it might cause less environmental impact to flush it clean and leave it buried in the ground. It will all be subject to environmental scrutiny and governments approvals at the time.
			Male	Community Development Officer District (LC5)	What will the terms and conditions of payment be? Will vulnerable people be assisted in completing the administration and understanding documents provided to them in relation to resettlement?	The ESIA will identify vulnerable people (individuals and groups) which will inform the RAP.
			Male	Education Officer	If the pipe is underground, how will you detect if there is a leak?	The pipeline will be monitored 24/7 remotely. It can be controlled remotely and there are block valves to also control the flow.
			Male	Water Officer	If the engineering designs are out, why don't we sensitise people who will be affected?	Firstly, ESIA studies have to be undertaken as well as G&G ESIA before the final route is decided as the studies will inform any sensitive locations are locations that need to be avoided.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Water Officer	I suggest you don't just speak to the district but you also speak with the subcounties and the communities.	The baseline studies will be focusing more at community level.
			Male	Councillor	What is the distance reserve between the pipeline and the houses?	There is a 30-m RoW for construction and a 10-m RoW for the operation.
			Male	Councillor	Can you tell me which roads you are exactly doing and why can't we choose which roads that you are upgrading with tarmac?	We are not from UNRA - this is a pipeline project. Roads used for transporting construction material will be rehabilitated.
18 May 2017	LC3 - Lower Local Government	Kasasa Subcounty	Male	Chief	What exactly is our role as local government in this? You need us to help you make this successful but what is our role? Is there an organised compensation strategy for this project? During the data collection for the baseline, will you need support of lower local government staff or are you going to try to do it alone? We would not advise that.	We will need your help, but mostly during the construction phase. The exact details of how we will need to work with you are still to be decided. All the help and cooperation that you give us during the ESIA phase will be used as a guideline on how you are engaged in the construction phase, so please feel free to volunteer any help or information. We do not want to work alone during the baseline data collection phase, so again we would be grateful if you, in your official capacities, were to volunteer to help your communities by working with us.
			Male	Gombolola Internal Security Officer (GISO)	What sort of materials will be used to cover the pipeline? Concrete? We may have stubborn and curious people opening up the ground and damaging the pipeline. There are areas where there are no human settlements, we call this the cattle corridor. How will security of the pipeline in those areas be controlled?	The design has not been finalised yet, but there isn't usually a solid covering. The pipe itself is thick, well coated, well insulated, and very strong. Usually it just sits in nice soft sand (bedding material), and then is covered with compacted subsoil, and then with topsoil. The oil and gas police will need to manage any security threats to the line. Security has not been thought of as major issue in Uganda, because the government is a joint venture partner.
			Male	Parish Chief	We heard that the pipeline was going to go to Mombasa and now you are telling us it is going to go through Tanzania. Are there going to be two routes, or is Mombasa not an option, or are you going to change the route? Will you pay for the 30-m corridor during construction?	There have been many different options discussed over the last few years, but the Tanga option is the chosen one, which means that Mombasa is no longer an option. Yes, there will be compensation for people displaced from the temporary construction corridor.
			Male	Sec. For Works	The electricity transmission line project caused a lot of suffering for the tenants here, and for those owners without land titles. How will the pipeline handle tenants when it comes to compensation?	This project recognises both tenants and owners, and each group will be compensated appropriately.
			Male	Speaker	You don't have enough time to do all of this. Why can't the land surveying and compensation start now? That would help people to be sensitised? How will the security of the pipeline be guaranteed? For how long will the pipeline transport the crude oil? For how many years? What assurance is there that after exporting the crude Ugandans will have enough oil for their use? We don't want to have situations like our electricity where the power goes on and off and we export it to people and we don't have any.	The ESIA really needs to be run first, and approval gained. There will be land surveying soon, though, and a resettlement specialist will be appointed, so please be patient with us. The oil and gas police have been established to deal with the long-term security of the pipeline. The pipeline has a long lifespan, and the current oil reserves, those for which there are licences, should last approximately 25 years. The refinery will process all oil products for Uganda's use, and the crude oil that is left over will be exported. The Ugandan government is protecting its people with the financial deals.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Female	Community Development Officer (CDO) - Sub-County (LC3)	We have seen people like your teams coming now, at the beginning of the project, and being respectful and making promises, but after the project starts they turn around and change completely. I hope that this does not happen, and that the people working on this project are not like those. If this project is to be successful, we need the involvement of local leaders and technical staff, and we should be utilised when conducting any and all community meetings. There should be budget made available for this help. When it comes to jobs, we urge the EACOP team to involve locals, especially our graduates, in jobs like data collection. The subcounty should be involved in the recruitment process.	The developer will ask the subcounty for help when it comes to identifying people for jobs. We have no intention of making any promises at this stage, and can assure you that this will be a professional project team involved. We agree that we need the sub county to be involved, but we can't assure you that you will be employed, as you have so clearly said, because you are already in positions of service to your community. This will need to be discussed, sensibly.
			Male	Vice Chairperson	Will the heated pipeline cause health problems? Will I be compensated for any damage to crops on the 10-m corridor after the construction is finished and I am using it again?	You will have the longest heated pipeline in the world, but not the first. There is one in Alaska that has existed for the last 30 years, and so has been monitored for the same period. There are no effects on the soil or crops or animals or people. It acts like a flask, warm on the inside but no effect on the outside. The permanent corridor, which we understand to be approximately 10 m at the moment, will have restrictions placed on it which will probably mean that no compensation will be offered to anyone if the operator needs to access the corridor.
			Female	Sec. for Education and Health	Wil compensation be before or after construction starts? If the pipeline breaks, who will be responsible?	Compensation should take place before construction. That is international best practice, and what the project plans to do. The RAP process will make it clear to you. The pipeline operator will be responsible for any breaks, or leaks, unless there is human interference with criminal intent, and then it will be treated as a criminal case. The company will repair the pipeline, though.
			Female	Community Developmen t Officer Subcounty (LC3)	Will you establish a project committee with the subcounty? This is what is usually done with all projects.	Thank you for letting us know about this. We will need to discuss with the client and project team.
18 May 2017	LC1 - Village Local Council and Community Members	Kamuli Village			I am a widow and have many children at home. Will there be job opportunities for them or will you come with your workers?	There will be some job opportunities.
					What is the temperature of the pipeline? What will the effect be on the soils?	The temperature is about 50°Celsius, so like warmish water that you would use to bathe a baby. You will have the longest heated pipeline in the world, but not the first. There is one in Alaska that has existed for the last 30 years, and so has been monitored for the same period. There are no effects on the soil or crops or animals or people. It acts like a flask, warm on the inside but no effect on the outside.
					We have few water sources here and would like to know whether there will be alternative sources during construction if the pipeline goes through the water sources?	If any water sources are damaged, they will either be repaired or replaced. If the line goes through a water source temporarily then there will be an alternative source provided.
					We have landlords and tenants here. How will these two groups be treated when it comes to compensation?	The project team recognises all land users, and as such all users will be compensated in some way for their loss of access to resources.
					What is the effect of the hot pipeline on people?	There are no effects on the soil or crops or animals or people. It acts like a flask, warm on the inside but no effect on the outside.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
					What if the project values my land and takes my land and they end up not paying me? Where can I go for help?	The grievance mechanism will help you deal with this eventuality, but please be reassured that this project does not intend to disadvantage anyone. It would be unethical.
					Will the displaced people look for their own new land and places or will the company look for places for them to go?	We would appreciate your suggestions and input to any new land that you may need to be relocated to, but the company will be responsible for the payments and logistics.
					I was born in December 1937 and I have lived here since I was a young man. I was given the land by the owner without any document. Will the project deal with only those with land titles and leave people like us out, even though we have lived here for so many years?	The project team recognises all land users, and as such all users will be compensated in some way for their loss of access to resources. Also, special attention will be paid to vulnerable people.
					The people at grassroots level suffer a lot when it comes to compensation. Why can't it be that you, who have come here and met us, also deal with compensation and with grievances? It is very costly for the poor to chase up their money, and no we know you.	Thank you for thinking so highly of us! There do need to be separate people contracted in this process, to prevent any conflicts of interest, but we will record your comment. Please be reassured that any people employed to deal with compensation, and grievances, will be professional and helpful.
					We have heard that the pipeline route will be along the low lands, in the bottom of valleys and through the swampy areas and along the cattle corridor where there are no people. Is that the route?	That is not the case. In fact, the route has not been decided yet, so anyone telling you where they think it is just guessing. Please be careful of these people. If you are shown maps or told details by anyone other than the project team, please could you consider reporting it to us so that we can monitor misinformation, and sensitise the people who are spreading it.
					How will graveyards, burial sites and cultural sites be handled? Will the project resettle them and bear the costs or will nothing be done?	These will be treated with care and respect. The suitable cultural considerations will be used, and the project will handle any relocations needed.
					What happens if I have rented out my land for a short period of time and the pipeline is within that land. Who do you deal with, me or the tenant? When will the project start? Will compensation be made before or after construction?	Both you and the tenant will need to be involved in discussing compensation, to suit both of you. The project should start sometime before the end of 2018. Compensation, as international standards dictate, will be done before construction.
					What happens if the place you resettle me to is a dry place, whereas here I have a good climate and I am doing very well?	We wish you to avoid that kind of situation. The rule is that you should be in a situation either the same or better than you were before relocation. So, with you we would identify a suitable area for you to be relocated to. However, if you choose a dryer area, then livelihood restoration plans would consider the climate and propose suitable livelihood options for you.
					Am I allowed to have my own valuer during the compensation process, or will we have to depend on government valuers? We don't trust government valuer.	The project will provide registered valuers, but if you wish to have your own valuer you could organise that. We would not advise it, though, because it would be an unnecessary cost for you, as the project valuer would have your best interests at heart too.
					We have outdated compensation rates here in Rakai. They were last changed maybe in the 1970s. What rates will be used for this project for compensation?	The Land Act mandates every district to compile and review compensation rates annually. The district rates will be used, and discussions will be held with the chief government valuers office if any rates need to be further evaluated.
19 May 2017	LC1 - Village Local Council and Community Members	Lutilwanjuki Village			If I find the pipeline is passing through my land, when will I be given compensation. What would the timeline be so that I could find somewhere else?	All payments will be made in compliance with the periods stated in national legislation, prior to construction. The PPT intends to give as much notice as they can for vacating land after the payment of compensation. Minimum notice periods after payment of compensation to vacate land under the national legal framework would also be adhered to in the project planning as a minimum.

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					In case the pipeline passes through my land and my crops like coffee and seasonal crops get destroyed, what amount of compensation will I receive?	Any proposed compensation rates for land per area will be reviewed with the Government and relevant community representatives to determine if they meet 'full replacement value' criteria and whether or not any adjustments are needed. In addition to compensation for affected assets, eligible people will also be entitled to other allowances such as accommodation, disturbance and transport allowances under national legal requirements and for livelihood restoration assistance.
					In case the pipeline passes through my land and I have no title, I inherited it from my parents, will I be compensated?	Everyone would be compensated, landholders and land users.
					Are you going to focus at all on grassroots communities? Sometimes the grassroots just gets left out of the process and discussions are only left with a few. We are losing respect for leaders because of this, so let us involve communities and local people.	For scoping, we have engaged at national, district and subcounty levels and we have incorporated a sample of communities. For the baseline studies and beyond, we will be engaging a lot more villages within the corridor.
					There are many con men around how will we combat this in respect to our land?	The developer will in due course be employing community liaison officers who will be the conduit of information between the developer and the communities. They will provide up-to-date information and it is only these people with whom you should trust. Currently we are undertaking the ESIA studies - no decision about the final route will be made. Please organise yourselves and help each other to combat conmen.
				Deputy Speaker	How come the Government enlisted the district to set the rates of compensation?	As I understand the system, it has always been like this and the developer has to comply with this.
					When I look at the BID, I see there are opportunities for employment but will us unskilled people be able to get jobs? And how will we know when the jobs become available?	The pipeline will generate thousands of short term jobs during construction, but this period will only last 2–3 years. The pipeline will create short-term employment for both highly skilled professionals and unskilled labourers. During the operations phase, there will be a limited number of jobs (less than 1000). The proposed developer expects that temporary workers involved in the construction phase of the proposed project will be sourced locally from each county, which will further promote the development of local content. The ESIA mitigation will recommend that a local recruitment policy be adopted for project-affected people and others to incorporate the above. Also linked to this will be the different companies who will be engaged directly by the pipeline project and they will further create employment for nationals since it is expected that their capacity will grow to provide services and goods for the proposed project. Our commitments are to reinforce the use of local workers and contractors through training programmes and support to local companies by: • strengthening local skills and capacities • creating direct and indirect employment • supporting local content and local procurement.
			Male	Chairperson	We at UETCL construct a power line here recently the company negotiated directly with the landholders the rate of compensation why is this not undertaken?	The developer has to work with the Government on compensation and resettlement and in line with IFC.
					I saw that they had discovered oil in Uganda - does that mean that our fuel prices will drop? Why is it being transported to Tanzania?	I cannot speak about fuel prices in Uganda now or in the future. But the Government is constructing a refinery in Kabaale (Hoima) and a refined product pipeline which will stretch from the refinery to Kampala. Thus some of the crude oil will be refined and some will be exported. This is rather like your agriculture: some is kept for the household and surplus is sold to generate a revenue.

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					What will happen if the pipeline goes through our wells? We have shallow ones and deep ones?	Our mitigation hierarchy is firstly to avoid impact then minimise then restore and if we cannot do any of the above it is to offset. Offset means if I have to take out one tree, the offset recommendation would be to plant, say, three of the same trees.
					How much can the pipeline bend to avoid?	Not much because of the coating
					May I suggest you use a megaphone to better mobilise people. Also we listen to CBS radio station or Mbabule and Buddu radio stations not the one that this meeting was advertised on.	Your comment is noted. What is a good time for us to meet you?
					May I also say as long as there are good relations with the communities and individuals then this will work.	Your comment is noted and the ESIA process recognises the importance of the stakeholder input at all levels of society.
					We have seen projects displace people and then compensation not paid. How do we know this will not happen?	This is a private-sector developer that will be working to IFC standards.
19 May 2017	LC3 - Lower Local Government	Nabigasa Subcounty	Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	Will people be allowed to grow crops or do anything on the 20 m that will be returned to the landowner or user after construction? You said the affected people will be paid in accordance with the laws of Uganda. However, the problem is that the ordinary people do not understand these laws and therefore they cannot claim their rights. Why don't you sensitise them about the laws so that when it comes to dealing with them, they are informed and can be able to agree or not agree when it comes to compensation I recommend that there should be brochures talking about how the landowners and users will be compensated so that our people understand.	The land that is returned to you will be yours to do with as you wish. That is a very good idea, and we will see how the RAP specialist team can assist with that sensitisation.
			Male	Speaker	When will the temporary acquired land be handed over to the owner or user? (After how long?) There are some tenants here who do not have documents or agreements, how will they be handled? Is it possible for someone without a tenancy agreement go to court to get an affidavit to support ownership so that he can present it as evidence in order to access compensation?	Yes, the land that is needed for constriction only will belong to the original landowner, and will be handed back as soon as construction is over and the testing of the line has taken place. We don't have timeframes yet. We will have those once a contractor has been appointed. All owners and tenants are recognised as land users by this project, and the appropriate compensation will be formulated during the RAP. Please take any measures that you see fit to obtain documentation that proves your status as an owner or user. We will do the due diligence during the RAP, and check all ownership or tenancy claims. Documentation, obviously, does help.
			Male	Senior Assistant Secretary (SAS) ("Subcounty Chief")	We appreciate some of the benefits that may come along with this project like road upgrades. But when will this project kick off and how long will it take to construct it? What will the short-term and long-term effects of the electrically heated pipeline be on the neighbouring communities? We have heard that telephone masts have impacts on the neighbouring people.	Construction is expected to start towards the end of 2018. It should take about two years, but please be aware that the project moves like a train so the two years is for the total construction, not just in your area. The teams will be in your area for just a few weeks at a time. You will have the longest heated pipeline in the world, but not the first. There is one in Alaska that has existed for the last 30 years, and so has been monitored for the same period. There are no effects on the soil or crops or animals or people. It acts like a flask, warm on the inside but no effect on the outside.

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19 May 2017	National Government	Uganda Electricity Transmission Company Limited (UETCL)			Why did they not leave it as a 1-km corridor to cater for transmission lines and any other wayleaves, such as railways and roads? Additionally, the extra width would be important for the security of the pipeline.	The pipeline will only require a 30-m construction corridor and, due to the level of detail required to inform the assessment, it would not be possible to maintain a 1-km corridor for the ESIA phase. The 100-m corridor will usually provide enough room for any possible reroutes that may be required during detailed engineering.
					There has been talk of a shared corridor, which would reduce the need to buy more land. If you need to heat the pipeline, you will need electricity. Everything should be in one plan, otherwise you will end up displacing people.	We shall make a note of this suggestion.
					What kind of maintenance is allowed along the pipeline?	Maintenance and inspection is undertaken by pigs, which travel up the length of the pipeline. Different pigs are used for different tasks, including maintenance.
					How long is the anticipated construction period?	Based on the current schedule, construction is due to begin in 2018 and will be complete by 2020.
					We shall need coordinates of the project area in order to know whether it will affect our powerlines. Yes, we shall be interested in knowing the pipeline's alignment.	The route has not yet been frozen, however it would be possible to provide a map showing where the pipeline passes.
					Do you have any details regarding the location of current and future planned powerlines and stations?	Yes, all of this information is available as shapefiles on our website.
19 May 2017	National Government	Uganda National Oil Company (UNOC)			What will be energy source for heating the pipeline for a period of 25 years? The gas from the oil fields does not seem sustainable for such a period.	Crude oil and diesel-powered generators will be used in the heating process.
					UNOC is strategically storing reserves of oil at present before the elections in Kenya, as it sees this as a potential risk.	This is noted.
					A number of questions about the camps and pipe storage yards, including: • How is the waste going to be managed? • How will the waste be categorised?	EACOP is currently looking at waste management options in country and there will be more detail in the ESIA. The ESIA will also consider influx management, including issues around the camps.
					Have previous Total and Tullow studies been used as a benchmark or incorporated into the ESIA process? The data collected can reduce the time frame of this ESIA.	Previous studies will be used in order to inform the baseline, although additional data will still be needed as EACOP is situated in areas where no previous work has been undertaken by Tullow and Total.
					Some of the studies focus on one direction; for instance, some reports focus on the impact of noise on people and do not cascade it to animals or even the actual structures that are being developed.	The purpose of the scoping phase is to identify all potential environmental and social impacts and ensure they are covered in the ESIA. The impacts of project activities will be considered across all baseline aspects.
					Is there any process within the ESIA to continuously monitor the impact? The study should ensure continuous data collection so that the developer identifies impacts as they happen.	The ESIA will identify monitoring requirements for both construction and operation and these will be detailed in specific plans.
					Given that the stakeholders have different levels of understanding, is there an opportunity for an abridged stakeholder engagement so that the discussion can identify elements that hadn't been thought about? Is there a forum that brings together the different stakeholders?	There currently isn't a plan for a workshop that brings all stakeholders together.

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					How does the ESIA cater for what communities will get out of the project, and what can the project contribute as a shared value with the communities? How will communities be left in a situation where they will, for example, have improved access to healthcare facilities?	A grievance mechanism will be put in place and also a resettlement action plan to help address such concerns.
					UNOC operates throughout the oil industry process, up- and downstream.	This is noted.
					UNOC has a stake in the industrial park attached to the refinery. Regarding the refinery, there is currently a due diligence exercise being undertaken and a decision on whether or not it will go ahead is likely to be made soon.	This is noted.
					Ultimately, UNOC would like to acquire blocks itself and operate independently of IOCs. It is currently looking for partners to work with upstream and launch an exploration company.	This is noted.
					Regarding EACOP, UNOC is currently negotiating an agreement with IOCs and, once agreed, will be more visible.	This is noted.
					Some communities might not understand the media presented. Will there be popularised versions of presentation materials? There is a concern about peoples' expectations of the project. If they are not informed, it could impact the project and possibly lead to hostility from communities during project implementation. The developer should try as much as possible to inform communities continuously.	This is noted.
					If there are resources from which communities could derive value, that would be a key area of concern, e.g., forest reserves and rivers. A lot of information on the project area should be gathered, in addition to continuous monitoring and communication with communities.	This is noted.
					The study should look at other large-scale projects that are tagged to the EACOP project, such as the refinery, industrial park and any other upcoming projects. You may talk about the utility corridor from Hoima although not in detail. The utility corridor is to be integrated with the refinery, storage facilities and the industrial park.	This is noted.
					Given the gap in critical services required by the industry, it is likely that other people [service providers] might come into play.	This is noted.
22/05/2017	National Government	National Environment Management Authority (NEMA)	Male	In-County PM	The combined ESIA for Tanzania and Uganda, it is very important that it is acceptable to both countries.	Noted
			Female	Environmental Inspector	I would have expected a list of stakeholders. We would like to see the spectrum of stakeholders and advise of further ones.	We have detailed a SEP and a stakeholder register which is a 'living' document' and will be constantly added to. We can include them with the minutes of this meeting.
			Female		I would have expected to see a time frame to this ESIA. We are very busy here with multiple projects (a lot of pressure with different infrastructure projects) - we need to be prepared for it.	Scoping will be submitted by the end of June and hoping to have the final ESIA approved before June 2018. The schedule has not yet been finalised possibly January 2018 for the draft ESIA. This should be April 2018 (for approval of final ESIA), not June. However, I know the schedule is still being finalised.

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			Female		Impacts or effects? An impact can be both positive and negative. If it is defined at the beginning then it is clear. It is better to use the term impacts: we do not want to confuse people and this is the terminology we are used to.	Noted
			Female	Environmental Inspector	Does this ESIA capture all the aboveground installations including the construction camps?	A response was not able to be given during the meeting. However, the response now is as follows: Yes, this ESIA will capture all the aboveground installations including the construction camps.
			Male	PEI	For the associated infrastructure (upstream pipeline projects), we have asked Total to work with CNOOC. The feeder pipelines both run through very sensitive areas. The approach to the feeder pipeline ESIAs (Buliisa and Kingfisher) should be consistent. NEMA would prefer for the feeder pipeline to be a separate report or as separate volumes with a detailed assessment as an appendix. The approach needs to be made clear at scoping stage.	Total is working with CNOOC for the feeder, and we will discuss with CNOOC about separate volumes.
			Female		The two feeders should have alignment in the mitigation and then this can be aligned with the export pipeline to find synergies and synchronise. I think the feeder needs to be handled differently and therefore two ESIAs.	This is noted.
			Male	PEI	We are not going to consider whether it is two ESIAs now.	Noted
			Male	In-County PM	Have borrow pits in the area been identified? Or have the contractors got their own source?	The ESIA will define what happens when there is new land take. We will develop a framework for the contractor.
			Female	Environmental Inspector	How the project addresses compensation needs to come out clearly. What will the RoW ownership be? The RAP needs to be integrated into the ESIA. The RAP itself is a decision process before NEMA approval the issues of ownership of land has to be clearly addressed.	Another contractor will be developing the RAP.
			Female	Environmental Inspector	We need to know the composition of the team. The national team and local expertise must be taken care of.	Comment noted
			Male	PEI	We have national laws. While we appreciate RSK's skills, the consultant must justify that they cannot find skills locally. Total has not demonstrated building capacity sufficiently to date. It is very difficult to see what Ugandan inputs are. The ESIA needs to clearly demonstrate Ugandans' input in the process. Any expat has to be certified to work in Uganda. You need to apply to NEMA demonstrating your skills and expertise. You are breaking the law, you need approval of NEMA; technical issues are clear now you need to clean up the team. We will be picking up on this. All the people on the surveys including Ugandans need to be registered. It is law and well known. You have time to sort it out.	Comment noted. We (Eco & Partner) have had problems with some of our staff who are really good who are not willing to do the registration. Names and requisite information and the applications were made and submitted for consideration (RSK).
			Female		My comment is that the ESIA is not a scientific study	Noted
			Male	PEI	I see an issue between Uganda and Tanzania laws relating to licensing, approving and monitoring. The experts need to say the points of synergies and how the laws of the two countries link. The ESIA is working to IFC but also need to understand in terms of Ugandan law and Tanzanian Law and how they differ between the two countries.	Noted

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			Male	PEI	The TOC – how will the volumes be undertaken? Geographically? You must let us know what to expect.	Noted
			Female		What is the EPF? This is the first time I have heard this terminology. We need to bring everyone on board with the terminology.	It is the Export Pipeline Facility.
			Female		You talked about three ESIAs. This overall report for both countries, where will it be submitted?	It will be submitted to the lender.
			Male	PEI	With regards to this overall report, the entities in Uganda will need to reviewed before it is submitted as we will need to be satisfied with the content and be comfortable with it prior to it being submitted.	Noted
			Female	Environmental Inspector	What is being undertaken in Tanzania?	Exactly the same ESIA. I have just come from the biodiversity studies in Tanzania.
22 May 2017	National Government	Petroleum Authority of Uganda (PAU)	Female	Government Officer	During community engagements, it would be important to highlight the positive social impacts related to the project as well as negative, because this will guard against the perception that such projects are only associated with negative social impacts. That is part of our communication strategy at this authority.	It was explained that two sets of posters were used, one for positive impacts and the other for negative impacts, to ensure a balanced view was provided.
			Female	Government Officer	What is the anticipated timeline for the project? The project schedule should be submitted to this authority. A timeline would be required by 24 May.	This is noted.
			Female	Government Officer	The Buliisa [Tilenga] feeder pipeline is an upstream project and the export pipeline is a midstream project. These components should have two different ESIA reports submitted to NEMA, as these activities are now governed by different regulatory regimes. There is also a concern that combining the project may cause confusion with local communities. As such we expect two different reports: one for the feeder line and the other for the export line. However, studies can be conducted concurrently to take advantage of the synergies.	This is noted.
			Female	Government Officer	The Petroleum (Refining, Conversion, Transmission and Midstream Storage) Act, 2013 should be included and reviewed in the ESIA legal framework, as it is the enabling legislation for all midstream activities.	This is noted.
			Female	Government Officer	Proposed team's CVs should be attached to the scoping report, and all team members should be registered with NEMA.	This is noted.
			Female	Government Officer	Key institutions and stakeholders should be engaged at the impact assessment phase.	This is noted.
			Female	Government Officer	The scoping report should list the key institutions responsible for oversight of this project. The presentation mentions lead agencies, but should also include principal agencies such as NEMA.	This is noted.

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			Female	Government Officer	Government is in the process of finalising the new EIA regulations. We would appreciate if a Gantt chart of the EIA activities could be provided, so that regulators remain up to date on the EIA, and how this fits in with the upcoming legislation. PAU is not sure of the timeline for production of the new regulations, but understand that there will be some significant changes to existing regulations.	This is noted.
			Female	Government Officer	PAU would like to see more formal stakeholder engagement in the ESIA process, in addition to scoping and draft ESIA stage.	This is noted.
			Male	HSE Officer	A list of stakeholders to be consulted should be included in addition to the principal agency, NEMA.	This is noted
23 May 2017	National Government	Ministry of Gender, Labour and Social Development	Male	Labour Commissioner	This ministry will be reviewing all ESIAs from now forwards and will be reviewing all matters related to social. NEMA has accepted that it will review environmental issues and we will review social issues. The World Bank takes social impact assessment seriously and the issues of social safe guards need to be standalone. The mandate for environmental assessment is very different from social assessment. Social issues need to be brought to the fore; very little is known about social impact assessment and issues relating to social and those relating to environmental should be packaged separately. We are working to separate social impact assessments from environmental impact assessments. This may happen in the next year. World Bank stopped funding for the Fort Portal Road due to noncompliance relating to issues of worker rights, community involvement, community health and safety, and gender-based violence. World Bank has rolled out a checklist for social safeguards. In the first presentation, it states there are “no major social & environmental constraints”. In our view based on what is happening on the ground, we insist that this is not true. There are major social constraints. In addition, the project is traversing a wide area across various cultures which need to be taken in to consideration. There is the issue of rights of the most vulnerable groups; I hope the ESIA will provide strategies for the identified vulnerable groups. Furthermore, transboundary issues: how will they be addressed? Will international standards be applied or will the project rely on agreements from the two countries on issues surrounding labour etc. Want to ensure standards in Tanzania and Uganda are the same if possible. Humanity in its entirety [children, youth, elderly, disabled] needs to be addressed. Furthermore the close-knit communities who rely on their land for their livelihood and will be affected by the project need to be communicated with clearly and in a timely manner if they are to take ownership of the pipeline RoW during operations. How will influx be addressed? An agreement was made with northern corridor countries allowing people to come and work in Uganda. Those allowed are technicians, managers, professionals and artisans. If it is not articulated to prospective workers what the criteria for employment will be, there will be potential conflict between locals and foreign workers. How many hours will workers be working? What percentage of females will be employed? Furthermore, those with HIV and AIDS have the right to access any work place. Stakeholders	Your comments are well noted. The ESIA will be undertaken to the national regulation and IFC standards. Social issues will be identified separately to 'environmental issues' and of course there are those interlinked issues such as natural resource issues which cross cut both environmental and social issues. But they will be presented in one report as per Ugandan legislation. This is scoping phase, whereby we are identifying issues and concerns and this will determine the terms of reference for the next phase - baseline studies. Once this is complete the impact assessment will be undertaken and appropriate impact mitigation identified and management mechanisms. Trans boundary impacts will be identified also those of influx. Our scoping studies revealed very clear definitions of vulnerable groups including people with disabilities and this will be incorporated and further studied in the next phase. Stakeholder engagement is key to the ESIA process and we have a dedicated stakeholder engagement plan (SEP) with a stakeholder register.

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					that need to be considered are trade unions. How easily will it be for communities to participate and contribute to the ESIA process? Wants to ensure the project "empowers communities to make a difference" It is important the communities be given representation.	
			Female		Gender mainstreaming is of prime concern - what will the gender strategy be? Gender-based violence is a concern in projects like these also what mechanisms will be put in place for HIV and AIDS and the vulnerability of communities affected by the project? Whilst it is understood that the impact assessment may propose gender equity strategy what surety do we have that this will actually be implemented? Gender concerns must be addressed holistically. Project should take affirmative action and ensure women are just as employable as men and are part of the process. This project will interface with natural resources - environmental capital and people derive a living from these capital resources, there will be a destruction of livelihoods across men, women and youth - a mitigation strategy will need to be applied. If people lose their productive capital, e.g., land, they cannot solely rely on compensation. They will require entrepreneurial training; if not, they will end up destitute. Have you considered issues of child labour?	We are currently undertaking scoping studies and mitigation will be undertaken once the impact assessment has been completed which will address strategies for gender and gender related issues such as gender-based violence. Child labour will also be further studied during the baseline phase. We will promote in kind payment rather than compensation and a livelihood restoration plan will be undertaken.
			Male	Labour Officer	Please can I draw your attention to PS 2 of the IFC Performance Standards?	Your comment is noted and this ESIA will be working to IFC standards
			Male		Have you considered emergency preparedness and community safety? Specifically, has the project considered how they will address hot tapping?	This aspect will be included in the ESIA and appropriate mitigation such as management plans and capacity building/sensitisation will be identified.
			Male		For the VECs, have you involved the communities?	Yes, the VECs have been and will be discussed and further explored with communities.
			Female		I refer to slide 14 and I would like to say that sometimes environmental issues are not economic but you have to understand the impact beyond monetary terms. Further community participation in the project is really important. Also with regards to vulnerable groups such as youth, women, persons with disabilities what considerations will be put in place? Perhaps providing them with affirmative action.	Your comments are noted and the ESIA process will involve communities. Mitigation measures will recommend that there are robust mechanisms put in place for continued community participation
			Male	Labour Commissioner	The role of this ministry needs to be appreciated and this Ministry's obligations under our mandate are clearly defined. I think the consultant is accustomed to the standards set by the World Bank. We want you to keep in contact with us and just take head of what we have advised. We have stopped ESIAs which were given clearance by NEMA because they did not satisfactorily address gender issues and social issues - there were glaring gaps. Since the World Bank stopped the funding to the roads project, it is paramount that social issues are adequately addressed in the ESIA. But I am confident this will be the best SIA the Ministry will see. I suggest a retreat away from Kampala to discuss the SIA and to keep on the right track.	This is noted.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
23 May 2017	National Government	Department of Museums and Monuments	Female	Cultural Specialist	National sites in the project area?	Yes there are sites such as Kibiro Salt garden on the UNESCO tentative list as well, Ntusi and Bigo bya Mugenyi dating to (AD 11th–14th century) – in Sembabule, Sangobay close to Lake Victoria early stone age type site; Buliisa (Biiso) there are traditional sites from the Bunyoro Kingdom - trees/hills – important to the Bunyoro people.
			Female	Archaeologist	What should be done in such a scenario?	Avoidance methodology should be employed to try as much as possible to avoid these sites.
			Female	Archaeologist	What kind of intangible cultural heritage?	Tangible and intangible cultural heritage are inseparable. For example, a sacred hill- what makes it specialist is the intangible.
			Female	Archaeologist	Sites that may be located in the project area • Kaiso–Tonya should be considered since it's a fossil site. Paleontological studies conducted at Kaiso Tonya as a consequence of the oil activities revealed the presence of the oil in the region so important to preserve these sites. • Before approaching Kibiro, there is a spiritual site and there is a contact person. The contact number will be provided by Mrs Besigye N. Jackline, a senior archaeologist of the department. Detailed survey before approaching Kibiro is recommended. • There is also a hot spring just below the Kibiro Cultural Village and Kibirro salt village important to conserve. • Other sites such as Baker's view should be considered. Important to Identify other sites that may not be known by the department during scoping	This is noted.
			Female	Archaeologist	How are cultural heritage sites categorised?	• Archaeology • Palaeontology • History • Traditional sites (i.e., King's tomb/living culture)
			Female	Archaeologist	Formulation of chance finds procedure	The department is represented on the committee that monitors oil related activities in regards to cultural heritage. There is a standalone chance finds procedure at the department that is provided to consultants to attach on their EIA reports. The underground cultural heritage can only be preserved through chance find procedure. Little archaeological research has been conducted in Uganda in the field of cultural heritage. 90% of the archaeology is not known. This is due to instabilities that started in 1962 (Kabaka crisis) to 1970s. This forced researchers to the neighbouring Kenya and Tanzania so the data base available in Uganda may not be as rich as compared to the mentioned two countries. A chance finds procedure may be formulated after comparing what is available with Total Uganda and that of the Department of Museums and Monuments (DMMs). If found weak then a new one could be formulated for this project. DMMs however encountered a scenario in monitoring oil related activities where an officer from DMMs was contacted to monitor after the activity has already been implemented. It means the CFP were not followed. The Monuments Act is in place though under review and will be handled over to the specialist.

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					Have you considered all other heritage as important?	Depending on what is identified that is when value is attached. But everything depends on where and how the heritage has been located. Some sites have been however categorised into national, community, regional or international and that is how value is attached. But where heritage is underground follow CFP.
24 May 2017	National Government	Ministry of Lands, Housing and Urban Development (MLHUD)	Female	Sociologist	It looks like you will do a thorough job in terms of social. There are so many activities ongoing in Buliisa and Hoima. Have you found out what other activities are ongoing in these two districts? How will you deal with communities and stakeholder fatigue and confusion between all the different projects? How will you work with the communities in terms of human rights?	A SEP has been developed and stakeholders identified in a stakeholder register. Methods of how to communicate are also specified in the SEP. A CIA will also be undertaken as part of the ESIA which will look at all the other large ongoing or future planned developments within the area of influence and beyond. We held stakeholder engagements in Hoima and we could see that consultation fatigue was evident and certainly confusion between the utility corridor and the export. Results from this round of stakeholder engagement has assisted in identifying the best way to communicate with stakeholders and certainly some stakeholders have said how they prefer to be communicated with. There will be a separate human rights study conducted as part of the ESIA.
			Male	Governor	Thank you for the presentation. We have been involved from the beginning because of the land acquisition. There are many projects going on related to infrastructure, roads, pipelines including the white product pipeline (refined oil pipeline), feeder pipelines and the export pipelines. The affected people need to be handled careful to reduce their stress levels. We as a department are committed to assist you. We appreciate that this is scoping stage and you largely will not have answers yet nevertheless let's ask the team questions.	Your comment is noted.
			Female	Geographer	It is understood that the pipeline route will intersect with rivers that feed in to major rivers or major rivers themselves. The construction of the pipeline will interrupt the flows of these rivers which may cause floods further downstream that could impact on settlements. Have you made any arrangements for resettling people during the construction period?	Your comment is noted. There is a biophysical team looking at water and I will share this information with them. Rivers will be open cut with the exception of one in Tanzania. But the FEED is being undertaken and the studies will also feed in to the design so it is very good to know information like this so that it can be further studied.
			Male	Principal Urban Development Officer	My concern is the construction camps; there are four in total? How permanent or how temporary are they? I recommend that the site plans be shared and approved by the local authorities to assess whether synergies can be made.	Camps will be socially responsible. They will be self-contained and self-sufficient and constructed at a distance from communities. Water abstraction access will be negotiate with communities. There will be a clinic, a canteen and other services for the workers within the camp. Workers will have a code of conduct and movement in and out of the camp will be monitored. At the moment a number of alternatives for each construction camp is being looked at. Appropriate decommissioning or leaving the camp facilities will be assessed.
			Female	Environmental Scientist	I realise that this is scoping but I hope that you about setting up a grievance mechanism so people will not feel cheated.	A grievance management system has been identified and it is in the process of being set up. Stakeholders were informed of the process. However if your ministry has one we would be interested in you sharing it with us.
			Female	Sociologist	When you talk about construction camps people think about military camps - how long will these facilities be around?	The construction camps are not permanent facilities.
			Female	Physical Planner	There is an issue building up surrounding natural resources. The country exports electricity yet electricity bills are high. How will the oil production affect the economy?	We cannot answer on behalf of the Government.

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			Female	Physical Planner	Will construction camps be located away from the major settlements? Will the camps be the company or government projects? How will water be provisioned for?	Construction camps will be constructed by EACOP. They generally are planned to be away from major settlements. The FEED team are looking at siting options currently. Water extraction will be negotiated with the communities or districts to find the best alternative.
			Female	Physical Planner	Anxieties will come from where the pipeline will cross settlements - need proper packaging of information dissemination and the right understanding of leaders to be able to communicate to populations.	Your comment is noted and full disclosure is being undertaken in appropriate languages both written and spoken. We are using posters and project BIDS. Community leaders have been identified in this round of engagement and some district technical and political teams have specified how they want to be engaged in the future.
			Female	Physical Planner	The potential PAPS need to be focused on with screening for vulnerabilities, if cash is paid some will not know how to invest and they spend it all so there is real social devastation. I want you to favour land for land options.	The ESIA process identified vulnerable categories of the population through the consultative process and this is fed in to the RAP. Please could you let us know your views on how best to deal with the land take from widows within the context?
			Male	Governor	A lot of communities have been devastated by natural forces. Rivers have washed whole communities and anything along the way with it. Changes in the rivers would potentially affect communities.	Your comment is well noted.
			Male	Governor	South West Uganda (including Rakai) faces earthquakes will surveys detect these sensitivities and would the pipeline be affected by such natural forces?	On the ground, studies have started and river crossings are part of the studies such as the Kafu River.
			Male	Governor	If it is not buried deeply, are we sure vegetation will survive after the laying of the pipeline? Won't trees roots penetrate the pipeline. What will be done to restore the vegetation?	Deep-rooted trees will not be permitted in the 10-m RoW and land will be restored as near as possible to its pre-construction condition with a few exceptions, e.g., deep-rooted plants and no dwellings.
			Female	Sociologist	I am concerned about the baboons, monkeys and the chimpanzees. When you go up that way, you see them. They have nothing to eat and they are being forced out of their natural habitat because it is being tampered with. Will this increase? Do we have a plan? Some are harmful to human beings, what will happen to them?	A biodiversity assessment and studies is being undertaken as part of the ESIA which will address primates.
24 May 2017	National Government	Uganda National Roads Authority (UNRA)	Male	Environmental Scientist	If the feeder and export lines ESIA report is submitted to the authorities as one report, will all issues be addressed?	A response was not able to be given during the meeting. However, the response now is as follows: Yes all issues will be addressed.
			Male	Environmental Scientist	There is a need to elaborate what will be done at the coating plants. What activities will be undertaken and what are the likely impacts?	A response was not able to be given during the meeting. However, the response now is as follows: The coating plant activities and impacts will be included in the ESIA.
			Male	Environmental Scientist	How will the wastewater that will be used during the hydrotesting of the pipeline be disposed of? Can the engineering designs consider using gas or air for pre-testing the integrity of the pipeline?	A response was not able to be given during the meeting. However, the response now is as follows: A water study is ongoing for the project and part of the output will be plans for the abstraction and disposal of hydrotest. A contractor hydrotest management plan will be approved prior to any hydrates activities. Testing with air or gas will be further investigated by engineers; it might be part of the overall pipeline testing programme.
			Male	Environmental Scientist	What mechanism will be in place to detect crude oil leakages and how fast can they be responded to?	Pressure detection systems are in place for the pipeline, these will detected any pressure reduction (i.e., leaks) – the relevant section will then be isolated using block valves.
			Male	Environmental Scientist	There is a concern over the security of the proposed pipeline as some elements may engage in cold-tapping (persons attempting to steal crude oil) as in Nigeria. What measures will be in place to ensure the pipeline's safety?	This is noted.
			Male	Environmental Scientist	What will be the energy source for heating the pipeline? Will it be generated or from the national grid?	The source of energy for heating the pipeline is still being looked at.

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			Male	Environmental Scientist	The ESIA report should include an analysis of alternatives that were considered before the final route was zeroed on.	This is noted.
			Male	Environmental Scientist	The engineering designs should take into considerations that the rift valley is tectonically active and this may impact on the proposed pipeline.	The engineers will take seismicity into account when designing the pipeline, and there are ongoing studies looking at issues such as fault crossings.
			Male	Environmental Scientist	For purposes of cumulative impact assessment, UNRA can share with the EACOP team a list of roads, “critical oil roads”, that are being upgraded in the sections which may be part of the pipeline route corridor. This can be provided in the form of shapefile, although these have to be formally requested by Total. It should also be possible to provide a shapefile that shows all future proposed roads and existing roads. In some cases, it will also be possible to include certain information about existing roads such as condition, build type and traffic count data.	This is noted.
			Male	Environmental Scientist	Will this assessment also incorporate issues related to the development of the proposed utility corridor? The proposed utility corridor will have electricity transmission lines, roads, railway lines and will have a corridor width of 106 m.	A response was not able to be given during the meeting. However, the response now is as follows: Questions about the utility corridor are best addressed to representative of the Government of Uganda, the developer of the utility corridor.
			Male	Environmental Scientist	What measures will be put in place at major road crossings especially in relation to testing the integrity of the proposed pipeline? How long will the roads be blocked during pretesting?	A response was not able to be given during the meeting. However, the response now is as follows: The integrity of the pipeline, such as hydrotesting, may not require any measures to be put in place at major road crossings and blockage during testing. If there are any measures needed, they will be specific to the road crossing and will be developed when the locations of the road crossings are finalised and prior to the testing.
			Male	Environmental Scientist	If road diversions are to be considered during the construction of the pipeline, then these have to be carefully selected given the axle load of some of the heavy trucks.	This is noted.
			Male	Environmental Scientist	Considering the logistics (500,000 tons of material) to be transported, how will these be transported? The weight of these materials will cause impacts on the roads and there are concerns related to increased traffic volumes.	These issues will be taken into consideration as part of the ESIA.
			Male	Environmental Scientist	Pipeline maintenance works may cause conflicts with the local communities. Who pays for crops that will be damaged along the 10-m corridor during the execution of maintenance works?	Maintenance typically will not require access to the pipeline and will be undertaken using different types of pigs, which is a piece of equipment that travels inside the pipeline.
			Male	Environmental Scientist	There is a new standard gauge railway line being constructed between Hoima and Rwanda.	This is noted.
			Male	Environmental Scientist	UNRA had previously assumed that the export pipeline would go through Kenya, not Tanzania. As such, the current route was not taken into consideration when preparing recent road development programs.	This is noted.
			Male	Environmental Scientist	Uganda Biodiversity Fund is an important stakeholder that EACOP should consider engaging with. Seem to have an interest in the forest reserve close to Hoima, and they are currently “up in arms” about possibility of routing the utility corridor through the forest reserve.	This is noted.
			Male	Environmental Scientist	We went along existing murram roads, which were already present in the reserve. There was a possibility of going around the reserve, although this wasn’t considered a viable option.	How was road routing through Bugoma Forest considered?

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			Male	Environmental Scientist	UNRA is currently constructing only one road that has to implement IFC standards, the requirements for the majority of roads do not necessitate the same levels of stakeholder engagement.	During recent stakeholder engagement, UNRA was raised numerous times, with many people taking issue with road construction process.
			Female	Environmental Scientist	How many roads are going to be crossed by the pipeline?	A response was not able to be given during the meeting. However, the response now is as follows: This is not defined at the current stage.
			Female	Environmental Scientist	Along the 10-m corridor, how will the developer ensure that only shallow-rooted crops are grown? There are land transactions and the new land owner may not be aware of this requirement.	A response was not able to be given during the meeting. However, the response now is as follows: Land access agreements will make clear the land use requirements on the operations corridor. Stakeholder awareness campaigns will be undertaken. Periodic monitoring along the pipeline will take place during the operational period.
			Female	Sociologist	What plans are in place to relocate socio-cultural sites that the project construction activities may encounter? These should be relocated in accordance with Performance Standard 8 of the IFC.	This is noted.
			Female	Sociologist	How will the restoration of vegetation cover that will be destroyed during the construction phase be conducted? Will the contractors work with local communities during restoration?	A response was not able to be given during the meeting. However, the response now is as follows: Restoration to be addressed in a dedicated management plan. Baseline data collection is required to inform the choice of plants for restoration.
			Female	Sociologist	The project poses social risks to communities especially with regard to transmission of sexually transmitted diseases such as HIV and AIDS, child abuse as there will be a migrant labour force. What plans will be put in place to mitigate against such risks?	A response was not able to be given during the meeting. However, the response now is as follows: The ESIA team has engaged a dedicated team of health specialists who will examine the potential disease risks linked to the pipeline construction and operation. Concerns about diseases, and recommendations regarding how the issue can be addressed, will be highlighted in the ESIA report. The Environmental and Social Management Plan will include requirements of construction contractors to ensure management of these risks.
			Male	Environmental Scientist	What is considered as a safe distance corridor from the buried pipeline? Or can we assume that the pipeline will not have any incidents that may affect people close to it?	A response was not able to be given during the meeting. However, the response now is as follows: The pipeline is a low-pressure crude oil line with safety offsets to be determined by pipeline engineers. It will be safe to conduct everyday activities in the vicinity of the buried pipeline.
			Male	Environmental Scientist	How does the pipeline design incorporate social issues, especially in regard to the physical location of the communities?	When designing the pipeline route, social sensitivities such as proximity of houses are taken into consideration and the pipe is routed to have as small an impact as possible.
			Male	Environmental Scientist	How will the major national roads be crossed by the proposed pipeline route?	Crossings are still being designed by the engineering team.
			Male	Environmental Scientist	A number of heating stations are proposed to be established along the pipeline and this raises a concern of heat emission to the environment. Will these facilities be insulated so that heat is not transmitted to the environment?	A response was not able to be given during the meeting. However, the response now is as follows: The buried pipeline will be insulated to maximise heat retention within the pipe and minimise heat loss to the soil.
			Male	Environmental Scientist	What will be used to protect the integrity of the proposed pipeline?	A response was not able to be given during the meeting. However, the response now is as follows: The pipeline will have an anti-corrosion coating on the interior of the pipe. The external coating will be waterproof and thereby protect the outside of the pipe. In addition, the insulating coating will further protect the pipe from damage. The security of the pipe will be monitored by fibre optic cable.
			Male	Environmental Scientist	Are there plans to cross River Nile, so as to transport crude from north of the Nile to the export line? Or the project will limit itself to field developments south of the Nile?	A response was not able to be given during the meeting. However, the response now is as follows: There are no plans for this project to cross the Nile River.

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29 May 2017	National Government	Directorate of Water Resources Management (DWRM)	Male	Assistant Commissioner	There is a need for the proposed open cut method across seasonal and smaller water streams to be elaborated. What is entailed in the proposed method?	This is noted.
					What will be the source of energy for the heated pipeline?	A response was not able to be given during the meeting. However, the response now is as follows: The heating sources are still being defined. Potentially crude oil or diesel will be used as a source for electricity generation to heat the pipeline.
					The team should identify the water systems that are likely to be affected for effective guidance from the Directorate.	This is noted.
					There is a need to involve the Directorate throughout the process for purposes of providing the EACOP team with the current and anticipated water use along the proposed pipeline route. When permits are being issued, all these have to be taken into consideration.	This is noted.
					During literature review, the Environmental Sensitivity Atlas for the Albertine Graben, 2010 should be considered.	This is noted.
			Male		There is a need for the project team to inform the Directorate which streams and rivers will be crossed by the pipeline and on which of these, the open cut method will be used. This has implications on the downstream and upstream users of these surface watercourses.	Details of the streams and rivers will be provided following the completion of the geophysical and geotechnical studies. The river crossing technique will depend on the stream profile and all this will be discussed with the Directorate and other relevant authorities.
					How will the security of the pipeline be provided?	A response was not able to be given during the meeting. However, the response now is as follows: There will be routine security monitoring of the pipeline. Fibre optic cable will detect activity near the pipe and intrusions.
					Are there mechanisms in place to compensate the local communities that will be affected?	A response was not able to be given during the meeting. However, the response now is as follows: A land access and compensation process will be applied to those affected by the project.
					How will impacts on existing infrastructure (like boreholes, dams, schools) be addressed?	A response was not able to be given during the meeting. However, the response now is as follows: We shall follow the mitigation hierarchy when refining the route of the pipeline with avoidance as a priority. Studies will be carried out to identify existing infrastructure and avoid it but if they cannot be avoided, compensation will be carried accordingly.
			Male	Water Officer	There is a need for clarification on block valve stations. How many will be erected? Will there be a block valve station at every watercourse crossing along the pipeline?	A response was not able to be given during the meeting. However, the response now is as follows: The pipeline design is ongoing and the number of block valves will be determined as part of the work.
			Male	Water Officer	Permits associated with water use at facilities like camps should be sought from the Directorate. These include water abstraction permits, construction permits, wastewater discharge permit among others.	This is noted.
			Male	Water Officer	There is a need for the Directorate to be provided with a holistic view of the water demands including upstream and midstream projects. This will minimise conflicts over water use with other stakeholders.	This is noted.
			Male	S.W.A	The engineering designs seem to indicate that only block valve stations will be installed at points where the pipeline will cross surface water bodies. Will that be the only safety measure in place? Will spill recovery kits be in place?	A response was not able to be given during the meeting. However, the response now is as follows: The development of an oil spill contingency plan will be finalised prior to operations. The oil spill contingency plan will consist of intervention equipment to contain oil in the event of a spill. However, the oil is very viscous and waxy and solidifies quickly so can't spread far in case of a spill.

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			Male	S.W.A	The Directorate expects comprehensive baseline studies for surface water resources that will be crossed by the proposed pipeline. The baseline will be used for monitoring purposes.	This is noted.
29 May 2017	National Government	National Forest Authority (NFA)			We need to see the lower part of the pipeline that is close to the lake. It seems to cover other forests such as Malamagambo, Kaiso and Kigona (Sango Bay ecosystem).	This is noted.
					What about lakes, rivers and rocky areas? Have they been considered?	A response was not able to be given during the meeting. However, the response now is as follows: Yes, they have been considered and studies are currently under way to identify watercourses and wetlands along the pipeline route. The mitigation hierarchy will be used to avoid or minimise the impacts. Rocky areas are also being considered as such areas can present a constraint for routing.
					Will there be a road running alongside the pipeline?	A response was not able to be given during the meeting. However, the response now is as follows: The project is committed to using existing roads as far as feasible. In places where no roads exist, access roads will be built during the construction phase. There are no plans to construct a road along the pipeline.
					How will the proponent access the pipeline to undertake maintenance and repair?	A response was not able to be given during the meeting. However, the response now is as follows: The project is committed to using existing roads as much as possible. The need for access for maintenance during operations will be considered as part of the pipeline design stage.
					You mention two major rivers, both of which are located in Tanzania. However, in Uganda there is also Katonga River. How will the pipeline cross such areas?	The preliminary studies have identified two major river crossings and for the time being the plan is to undertake open-cut crossing and horizontal directional drilling. However, engineering studies are ongoing and the ESIA will identify other sensitivities.
					Can we get a KML or shapefile of the pipeline route?	A response was not able to be given during the meeting. However, the response now is as follows: The route is yet to be determined and studies are still ongoing to identify the exact route. However, it is important to note that information is sensitive and not being distributed to prevent speculation and issues of land grabbing.
					There could be other forest reserves that have not been captured by the study, and providing the route information would help to identify them.	At the moment, the route is still being defined, and is subject to change as studies continue to establish the final 30-m construction corridor.
					Will the pipeline pass through the escarpment? If so, then it is likely Budongo Forest will be impacted.	A response was not able to be given during the meeting. However, the response now is as follows: No, the route won't pass through Budongo forest. We are trying to avoid ecologically sensitive places like forests, wildlife reserves, lakes and rivers.
					What will you do to the endemic species that you come across? We know that there is a processing plant in Kabaale. Is the project transporting crude oil or processed products? Is the cost of constructing the pipeline less than cost of the processing plant?	A response was not able to be given during the meeting. However, the response now is as follows: The current biodiversity studies will inform the project of any species along the proposed pipeline corridor. Surveys include consideration for endemic species. The EACOP pipeline is to transport crude oil and not refined products. We cannot respond on behalf of the government regarding the refinery and costs.
					The scoping report should be able to show the cumulative impact of having all these related projects in this area. When it comes to access routes some of the other forests beyond the pipeline footprint might be affected. Will there be another ESIA for access routes?	A response was not able to be given during the meeting. However, the response now is as follows: The current ESIA will address access routes.

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					What plans are there to mitigate the separation of habitats resulting from transport routes created during the construction phase?	A response was not able to be given during the meeting. However, the response now is as follows: Habitat fragmentation will be considered as part of the ESIA and mitigation measures will be developed if appropriate.
			Male		Does the ESIA relate to any studies on the viability of the pipeline, and will this ESIA try to look into the project's viability? We would like to know if there it is possible that the pipeline could be used for something else. We also expect that the scoping report or ESIA report will highlight something on the decommissioning process. The SEA (strategic environmental assessment) is a source of baseline information. Is this study getting some information from it? You might find a salt component in some of the areas where the pipeline traverses water bodies. Has the effect of such areas on the pipeline been considered? You mention the African wild dog and propose to study a large area. What is the use of information from these areas that are outside the 30-m construction corridor?	A response was not able to be given during the meeting. However, the response now is as follows: The ESIA concentrates on the potential environmental and social effects of the proposed project and does not consider the viability of the project. At present, the EACOP project is planned to carry crude oil. Decommissioning will be covered in the ESIA. The SEA is being used as a reference source for the ESIA study. The pipeline is being designed to take account of the various ground conditions encountered along the route. There is the potential for impacts outside the construction corridor so the project baseline studies aim to collect information on biodiversity resources across the potential area of influence of the project
					The study should look into the potential impact of contractors' activities on forests, such as mining of sand.	The ESIA will provide guidelines for contractors to follow and shall include an action plan to specify appropriate impact management measures.
					We have not heard anything about seismic activity.	Geophysical and geotechnical studies will be undertaken to identify risks related to seismic activity.
					How far will the heated oil flow in the event of a leak? When you mention that the pipeline is buried at a depth of 2 m, is that 2 m to the top of the pipeline or to the bottom of the trench?	Studies are still ongoing to determine how far the oil would flow if a leak were to occur. The burial depth is measured from the bottom of the trench.
					The ecosystem study should consider insurance and the transboundary nature of the ecosystems. How will insurance take care of these?	A response was not able to be given during the meeting. However, the response now is as follows: The meaning of the term 'insurance' is unclear. The transboundary nature of biodiversity resources will be considered in the ESIA.
			Male		Is Uganda also responsible for the Tanzanian section, and are there synergies that can benefit other countries?	A response was not able to be given during the meeting. However, the response now is as follows: No, each country will carry out its own ESIA. A common approach will be adopted to the two national ESIAs to ensure that each country can benefit from the work done in the other country and to ensure consistency. The approach that will be used for the ESIA is of an internationally acceptable standard and could be suitable for application in other situations.
					What is the expected period of construction?	The expected construction period is two years with first oil anticipated in 2020.
			Male		Regarding the legality of the pipeline crossing forest reserves, it is okay, considering it is a government project; however, if crossing a forested area can be avoided, it would be better. On compensation of people living in forested land, you may compensate for the destruction of crops and property. However, it is necessary to confirm that these are enclaves and not cases of encroachment. Enclaves are those areas that were inhabited by communities at the time the forest reserves were gazetted.	This is noted.
			Male		Could you provide data on the particular section of the pipeline	This is noted.

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					route that crosses forest reserve? The proponent might need to get acquainted with the updated Uganda forests map. There are also cases where people are issued licences to plant trees.	
					Will the construction activities avoid large trees?	A response was not able to be given during the meeting. However, the response now is as follows: The project will follow the mitigation hierarchy with a priority for avoidance. This includes avoidance of forest areas where feasible with other constraints. At the small-scale, pre-construction surveys will be undertaken that will allow individual trees to be avoided as far as possible.
29 May 2017	National Government	Uganda Wildlife Authority (UWA)			Will there be only one pumping station in Uganda? We are also interested in the location of these facilities.	Engineers are still defining these locations; however, they will be specified in the ESIA.
					What type of footprint are we talking about for the aboveground installations? We need to understand the level of impact and significance of such facilities.	These are not clearly defined at the moment as the designs are not finalised. It will not be as big as the CPF.
					You talked of a depth of 2 m for burial of the pipeline. It is likely that the pipeline itself will displace a lot of soil once it has been buried. What will the proponent do with the excess soil that remains?	This is one of the questions that are being addressed by the engineering and ESIA teams.
					Can you explain the open-cut crossing that is proposed along the swamp sections?	If the swamp is seasonal, the construction team will wait until the dry season. For permanent wetlands, the construction team will install barriers on either side of the wetland, and flow the water through pipes to maintain the natural drainage. The fish will be removed using electro-fishing, and construction will be carried out between the barriers. However, the exact construction techniques have not been finalised.
					What about main roads, will you destroy any roads during construction?	The project will undertake tunnelling along road crossings.
					How do you propose to undertake hydrotesting? How will you manage the water and where will it be released?	This is not yet confirmed by the engineers, although there will be hydrotesting.
					Which facilities will test whether there are leaks during the operation phase?	Leaks will be detected when there is a drop in pressure within the pipeline.
					What volumes of oil can be detected in the event of a leak? It is possible that a minor leak releasing a small amount of oil could go undetected and cumulatively result in a large amount of oil released. There is an example of a pipeline in Nigeria where a leak was discovered long after it had occurred.	The project will also rely on local communities to provide information on potential leaks.
			Male		How will the proponent make ensure that both local and national concerns are communicated to all the contractors working along pipeline given the size of the project area?	A response was not able to be given during the meeting but the response now is as followed: Stakeholder concerns are forming an integral part of the ESIA. Mitigation measures will be developed to address concerns and minimise impacts as far as feasible. Mitigation measures identified in the ESIA will be communicated to contractors as part of the Environmental and Social Management Plans.
					How long will this construction take?	Construction will take two to three years with first oil anticipated in 2020.
					Will the construction team open a different section of the pipeline at a time or will there be one long trench? How long will construction last at each spread?	A response was not able to be given during the meeting but the response now is as followed: The construction activity will be transient in nature. The number of construction spreads will be defined during detailed design. It is anticipated that there will be 1–2 construction spreads in Uganda. Construction activities will progress sequentially with different teams following one another and responsible for clearing of the construction

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						corridor, excavation of the pipe trench, installation of the pipeline and backfill of the trench. The precise speed of construction will depend upon a number of factors such as ground conditions and weather.
					We need to see the pipeline route in relation to Bugungu wildlife reserve. If it is outside the reserve, how far is it? An improved map should show the protected areas located near the pipeline. Among the sensitive areas, we have protected areas as well as areas of dispersal, such as that of Lake Mburo national park which stretches all the way to Rakai. We have an ecological unit responsible for developing distribution maps.	This is noted.
					What do you have in mind when you talk about avoidance features?	These include forests (at a macro level), trees that should not be cut down, cultural and archaeological sites, and social avoidance features such as structures.
					Why does the pipeline take crude to Kabaale if that area has been reserve for the refinery?	This was a decision made by the Government. However, the plan is that whatever is not refined at Kabaale will be sent to the export markets.
					How do you define sensitive habitats? During one Ugandan hydropower project, the environmental impact study failed to determine that a certain species of plant was endemic to the project area and resulted in a controversy in which the project was almost cancelled. For this reason, the study needs to adequately determine endemism. While there is substantial literature on the Albertine area, it is unlikely you will find as much information outside it. Regarding the Rapid Botanical Survey, I did not see any local experts. I know some local experts who are working extensively in this kind of work. What happens after evaluation of the ecosystem services? Will there be mitigations for the foregone ecosystem services? We hope our comments will enrich the second stage so that these issues are taken into account. The pipeline will fragment existing wildlife corridors, but it is just as likely undeclared corridors will be affected. The study needs to identify these corridors and investigate how they will be affected. This project could attract a public hearing although NEMA is mandated to decide. Will you have one public hearing or several?	This is noted. Most likely there will be several: one in Kampala and others along the pipeline route.
					How far away from the pipeline will the technical studies go? The 2-km corridor might be too wide an area for soil studies, for example. If the area is too wide, there is a risk of losing the details. Studies such as underground biodiversity will also be affected as they tend to be site-specific.	A response was not able to be given during the meeting but the response now is as followed: A specific potential AOI is identified for each environmental component. The AOI varies with the valued environmental or social component under consideration. Some will require studies of smaller AOIs than others.
					How will you manage the spread of invasive species, considering you will most likely use the same equipment which will carry soils and possibly disperse some seeds?	The impact of invasive is an important one and applies to both land and sea movements. The project will prepare a specific action plan for control of invasive species.
					Seasonality will affect how you undertake studies. How will you ensure you have that demarcation?	We shall rely on the respective leads from in-country partners.

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					Have you started any baseline studies?	A response was not able to be given during the meeting but the response now is as followed: Yes they are currently on-going.
			Male		In your presentation on the cumulative impact assessment, you spoke of existing projects. Have you contacted the Directorate of Geological Survey and Mines and hydropower (Ministry of Energy and Mineral Development)? They might have some plans for projects within the protected areas which could have a bearing on the cumulative impact assessment.	A response was not able to be given during the meeting but the response now is as followed: This is a helpful suggestion. A number of stakeholders are being contacted in order to obtain information on projects that will help define the cumulative impact assessment.
					It is difficult to have data on the entire project area, as our rangers are not scattered across the landscape. We have information on areas where UWA has been called to undertake rescues (such as sites of crocodile attacks and problem animals). The staff at Lake Mburo National Park should be able to provide information on the Minziro-Sango Bay area. Lake Mburo is a nucleus within the same ecosystem as those areas.	This is noted.
					We mentioned Sango Bay, wetland species, several swamps, the Mayanja River system, Katonga River system, and the Lubigi River system as well as the extensive wetland papyrus swamps that surround them. They should also include the Shoebill Storks that breed in wetlands and all species threatened by the conversion of wetlands.	This is noted.
1 June 2017	NGO	Civil Society Coalition on Oil in Uganda (CSCO)	Male		As CSCO, we have expectations from the developer and the consultant. We want to know what the project is about, what studies are going to be conducted, how do you intend to engage partners, tools of engagement so that the partners can influence the way things are being done for the benefit of society.	This is noted.
			Male		How is the EACOP team envisioning CSCO and community participation in the project? Can we monitor activities being undertaken?	A response was not able to be given during the meeting. However, the response now is as follows: The interest is noted. Stakeholder engagement will continue through project development and implementation. The precise nature of stakeholder engagement in later stages will continue to be developed.
			Male		Beyond this meeting, what should we expect assuming NEMA does not give us a copy of the scoping report? What is the level of detail required in order for CSCO to engage the team effectively?	Engagement is provided for throughout the ESIA process as per the National Environment Act, and included a public hearing.
			Male		The study should consult the Albertine Graben Physical Development Plan.	This is noted.
			Male		Regarding the social baseline, we often have a challenge determining whether the project has left people poorer or better off. There is a need to establish the poverty levels.	This is noted.
			Male		These projects tend to cause family instability and break up of families. Is there a way the study will assess these issues?	A response was not able to be given during the meeting. However, the response now is as follows: Yes – the social study being undertaken as part of the ESIA will address these issues.
			Male		The local governments have a responsibility in monitoring. You may need to capture aspects of capacity of local governments to monitor the impacts and implementation of mitigation measures.	This is noted.
			Male		Regarding health, issues related to waste and diseases have been talked about. But the project will attract young men who	A health risk assessment is one of the studies that will be undertaken prior

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					will leave their families and this will likely result in a number of social impacts, such as prostitution. The study needs to look into that.	to the project.
					What happens after the 25-year life span of the project? Will the pipeline be decommissioned and if yes, who does the decommissioning?	There shall be an agreement with the Government on what to do with the facilities after decommissioning.
			Male		Will the 10-m corridor right of way include roads that the pipeline maintenance teams can use?	A response was not able to be given during the meeting. However, the response now is as follows: Access requirements for maintenance will be developed during the further engineering stages.
			Male		There is a total disregard to the human influx in the social issues; there should be a plan to address that.	Human influx will be included among the issues that will be analysed by the study.
			Male		There is no mention of coordination with government agencies. There are cases in which district local governments do not know about the projects that are being carried out in their areas. The Government has a framework for handling resettlement and compensation and some aspects of a grievance management system. The project should make use of these rather than introduce something new.	This is noted.
			Male		The information provided does not show the environmental and ecological aspects, and does not show high sensitivity areas. It is in the best interest of any consultant to give all information that will be relevant.	Ecologically sensitive areas will be included in the ESIA report; the study is still at scoping stage.
			Male		The pipeline route map does not show the specific conservation areas that could be traversed by the pipeline, the study should also consider what needs to be protected on privately owned land.	This is noted.
			Male		Where will borrow pits be located, and what is the distance of these proposed facilities from the pipeline corridor?	A response was not able to be given during the meeting. However, the response now is as follows: The location of borrow pits will be determined closer to the construction stage.
					Are the feeder lines part of the export pipeline? Will the project establish a grievance mechanism? Is the map you have presented the same map that appeared in the papers?	A response was not able to be given during the meeting but the response now is as followed: The Buliisa–Kabaale (Tilenga) feeder pipeline is part of EACOP but the Kingfisher is not currently under EACOP. The project is in the process of developing a grievance mechanism that will be used. The project team are unaware of which map appeared in the papers. The map shown at the meeting is the project map.
			Female	Chairperson CSCO	What sort of assistance will be offered to the resettled persons? The team composition does not mention archaeologists. Additionally, I did not see anything about movements of wind in relation to emissions.	There are archaeologists on the team.
			Male	Executive Director	Are we to understand that the lifespan of the project will be 25 years?	A response was not able to be given during the meeting. However, the response now is as follows: Yes, that's the expected oil production estimate even though the pipeline has been designed for longer.
			Female	Program Advisor	We would like to see a pragmatic cost-benefit analysis undertaken as part of this study. In an attempt to avoid resettlement costs, the project may be driven to fragile ecosystems that have low population densities.	This is noted.
			Female	Program	It was also stated that there would be two rounds of	The reference to two engagements does not mean we shall go to the

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				Advisor	stakeholder engagement; however, we do not feel it is possible to have active engagement by having only two rounds of engagement. There should be an engagement mechanism that will make the process practical and involve the affected communities.	stakeholders only two times. This is an initial meeting to introduce the project. We are preparing to undertake field studies to collect the information CSCO might require. This engagement was meant to listen to the concerns of the coalition.
			Female	Program Advisor	Impacts related to fragmentation of communities and loss of social capital for persons that may be resettled should be addressed by the study.	This is noted.
					We expected RSK and EACOP team to provide us with detailed information about the proposed project. We cannot talk about such a new concept and complex process based on limited information. We cannot discuss such a complex project based on a map. The legislation is clear that sufficient information should be given to those that are going to be consulted. The kind of information presented would not be allowed in other countries.	Today we are showing maps that present general information, as the detailed studies are still underway. There are other technical maps showing the LIDAR details but we cannot present these at the moment.
					The composition of the team is okay, but we do not know how long the ESIA process will take and there is a risk of collecting insufficient information. Some people come from the field and make generalisations about the project area. Also some species take a lot of time to be recorded. It would be important to examine the proposed ESIA team composition and the terms of reference.	What we are doing is building a picture of the landscape along the pipeline route. If we don't see particular animals, we shall discuss with the team of specialists, and where necessary take a precautionary approach and a risk-based approach.
					Regarding impacts, issues of compensation and resettlement are the biggest issues in Uganda. Local communities are weak compared to the companies, and the government often forcefully evicted and this leads to suffering of the affected persons. For example, for Karuma Dam, people were displaced in 2012, and up to now, they are not duly compensated and the project is set to end next year. How will you guarantee that those affected by the project will be resettled and compensated in a timely manner? If the compensation is a long process, by the time they are paid the money has lost its value.	This is noted.
					There should be a framework for tracking resettled persons, as they tend to settle near or within protected areas.	This is noted.
					The project should have developed a project brief. Some information should have been provided in the project brief. The purpose of the project brief is to give information for stakeholders to be consulted.	This is noted.
			Male	Extractions Coordinator	Will there be other opportunities for consultation or is the box ticked and done? As far as we are concerned, this is more of an information-sharing session and not a consultative meeting.	We are aware that two engagements will not be enough, and for important issues we are willing to organise more engagements with stakeholders.
			Male	Extractions Coordinator	You mentioned that many studies will be conducted. Are we as civil society sure that we shall get draft reports to which we can provide our input, and will the report be made public?	A response was not able to be given during the meeting. However, the response now is as follows: Stakeholder consultation will continue during the development of the ESIA. Once submitted to NEMA, the report is a public document that should be reviewed by anyone interested.
			Male	Extractions Coordinator	How did you arrive at selecting the particular villages for consultations at scoping stage if the pipeline corridor width has not been narrowed to 100 m?	Villages sampled were within the 100 m–2 km corridor for purposes of characterising stakeholder concerns at scoping stage.

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					A consultation meeting should have the stakeholders that are informed about the proposed project, and photos should be taken during the meeting.	It should be noted that gathering of certain information is still ongoing, and that procurement of contractors and engineers has not been finalised. We shall be happy to share this information when it is available.
					We would like detailed information on what is included in the associated facilities so as to evaluate the application of IFC Performance Standards on associated facilities.	This is noted.
					Who will be the implementing agency for land acquisition? We know that in Tanzania it is the TPDC. Land for land compensation has its issues in Uganda.	This is noted.
					Can the team elaborate more on IFC Performance Standard 7 (Indigenous Peoples)?	We are carrying out a human rights assessment that will address the presence or absence of indigenous people.
					Also can you define what you mean by security in your presentation? What is entailed in the security component among the social themes?	The mention of security in the presentation was with reference to ensuring the security of communities during the construction and operation of the pipeline. This is one of the considerations of the social study that is being undertaken as part of the ESIA.
					How do you intend to undertake gender impact assessment?	A response was not able to be given during the meeting. However, the response now is as follows: Gender will be considered as part of the social studies that contribute to the ESIA.
			Male		Is there a mechanism to track the project -affected people long after they have been displaced?	A response was not able to be given during the meeting. However, the response now is as follows: The land access process will address any issues of resettlement and will allow for monitoring of resettled peoples to ensure that their livelihoods are maintained to at least the same level as prior to the project.
			Male		We shall need the study to present a list of consultants to avoid conflict of interest.	This is noted.
			Male		Targeted assistance for the vulnerable groups, what will the process involve?	A response was not able to be given during the meeting. However, the response now is as follows: Identification of vulnerable groups is part of the initial stakeholder engagement process. Targeted engagement will continue with these groups. The ESIA will consider vulnerable groups in the assessment.
			Male		The map you provided does not include GPS data and this kind of information will not help to give meaningful concerns. It does not show protected areas on the Uganda-Tanzania pipeline route.	This is noted.
			Male		How will you access the proposed pipeline route if service roads are not part of the project? Who is responsible for constructing the service roads?	Regarding service roads, the EACOP project team is in discussions with the Government, as it has the mandate to manage road facilities.
			Male		There is a need to take stock of the biomass that will be destroyed. There is a need for cost-benefit analysis of this relative to the project. We would like to see the issue of trade-offs addressed.	This is noted.
			Male		On the social component, we do not see a framework for addressing human conflict in relation to the project. Could this be provided? There is a need to be explicit about the potential triggers of conflict.	This is noted.
			Male	Coordinator	You have indicated that there will be a heating process as part of the pipeline operation; however the section on impact assessment has not shown any thermal impacts.	This is noted.

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			Male	Coordinator	Considering the project will involve transportation of heavy load materials (logistics) the study should consider the nature of roads vis-à-vis public use.	This is noted.
			Male	Coordinator	Cultural institutions should be included among stakeholders to be consulted especially on issues related to history and culture.	This is noted.
			Male	Coordinator	Important legislation has been left out, such as the National Physical Planning Standards and Guidelines. Why leave out reference to the strategic environmental assessment?	This is noted.
			Male	Coordinator	You have listed the IFC performance standards; however, the IFC also provides guidelines for infrastructure development of that nature.	This is noted.
			Male	Coordinator	There is need to develop an environmental sensitivity atlas for the area that is covered by the pipeline.	This is noted.
					Consultations are a key component of the studies. In a similar engagement by Total/Tullow in September 2015 for the upstream project, the team said they would come back and consult and to this date, we are still waiting to hear from them.	Studies for the upstream projects are still ongoing.
			Male	ESIA liaison	Information disclosure under infrastructure projects can either be proactive or reactive. Are we going to retain the presentations that have been shared with us today?	Information will be shared with stakeholders proactively as it is refined and the pipeline corridor footprint established.
			Male	ESIA liaison	But if your problem is to guard against confusion, how will you guard against recorded information and will you not create more confusion if limited information is given to stakeholders?	Useful information will be shared whenever it is available.
			Female	Biodiversity Lead	Given the nature of the project, it is surprising that only subjected to a limited EIA. It should also consider the strategic environmental assessment.	The project is being subjected to an environmental and social impact assessment in accordance with the legal framework in Uganda.
			Female	Biodiversity Lead	On the aspect of cross-border participation, what are the provisions and strategy for transboundary consultations?	A response was not able to be given during the meeting. However, the response now is as follows: Transboundary impacts will be considered as part of the ESIA. As relevant, stakeholders will be engaged on transboundary issues
			Female	Research Associate	The study should indicate the names and number of rivers and forest reserves to be traversed.	This is noted.
			Female	Research Associate	Will the Buliisa [Tilenga] feeder line cross the Nile? If so, the study will need to consult neighbouring countries such as Southern Sudan and Egypt.	The Buliisa feeder line does not cross the Nile.
			Female	Research Associate	The EIA regulations require that the consultant submit a project brief, which is quite different from a scoping report. The project brief would have had most the information that we require.	This is noted.
			Female	Research Associate	Regarding labour, please consider employing locals.	This is noted.
					Much of the study focuses on direct benefits and ignores the indirect benefits. From that aspect, we will need an economic analysis of the opportunity cost of how certain resources are being affected. For instance wetlands contribution to a community, opportunity cost of displacing persons and so on.	This is noted.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
					It will be important for the developer to build trust in order for us to have meaningful engagement and see us as people who can add value to the process.	This is noted.
					In addition to crops being predominant in the areas along the pipeline route, there are also wetlands and other ecological resources.	This is noted.
					What is the plan for disposing of material from the construction sites (waste management)?	A response was not able to be given during the meeting. However, the response now is as follows: A waste management plan will be developed for the project.
					It appears that the pipeline will cross Kagera River, one of the longest tributaries to the Nile. Do you intend to consult the Nile Basin Initiative on issues related to transboundary impacts?	A response was not able to be given during the meeting. However, the response now is as follows: We have been in consultations with DWRM, as it is the body concerned with water management.
			Male		What will be the make of the pipeline? This needs to be considered in the EIA. Can you elaborate how you will address greenhouse gas emissions and land use change? Uganda has a target to reduce greenhouse emissions by 2030.	A response was not able to be given during the meeting. However, the response now is as follows: The line pipe will be made of carbon steel with an outer protection coating. A suitable pipe manufacturer will be determined at a later date.
			Male		Most of the laws concerning the environment and social impacts are under review or obsolete. For instance, the Third Schedule to the National Environment Act is likely to grow in scope. Some of these issues might need to be included in the EIA report.	This is noted.
			Male		The study does not seem to have an elaborate social impact assessment. The team might need to look at the draft bill on social impact assessment.	This is noted.
2 June 2017	National Government	Wetlands Management Department (WMD)	Male	Principal Wetlands Officer	In addition to the National Environment Act, there is a need to consider the National Wetlands Policy, Forest and Tree Planting Act and Riverbanks and Wetlands Regulations.	This is noted.
			Male	Principal Wetlands Officer	There is a need to map out all the important biodiversity areas along the pipeline route.	This is noted.
			Male	Principal Wetlands Officer	There is a need to have a wetland specialist on the team. In terms of an ecosystem, a wetland cannot be covered by a hydrologist or a biodiversity specialist.	This is noted.
			Male	Principal Wetlands Officer	Wetlands along the proposed pipeline corridor should be mapped out. Some of the wetlands are of international importance, some are national and others are locally important.	This is noted.
			Male	Principal Wetlands Officer	What will the pipeline be made of?	A response was not able to be given during the meeting. However, the response now is as follows: Carbon steel with an outer protection coating.
			Male	Principal Wetlands Officer	Protected areas are not the only areas of conservation; there is a need to evaluate all habitats along the pipeline corridor.	This is noted.

Meeting Date	Stakeholder Group	Meeting	Gender	Position	Questions or Concerns	Response Provided
			Male	Principal Wetlands Officer	The engineering designs should consider a suspended pipeline over wetlands instead of horizontal directional drilling (HDD). Experience from other infrastructural projects such as roads has shown that construction through a wetland takes between six months to two years and this causes a disconnect of organisms in the wetlands. Where roads have been suspended over wetlands, there is a temporary disruption, but thereafter, the wetland is able to function properly.	This is noted.
			Male	Principal Wetlands Officer	Developer should provide the ministry with volumes of water that will be required for the entire scope of activities (camps, pipeline, construction activities). Thereafter, as a Ministry, we can advise on how and where the water will be abstracted.	This is noted.
			Male	Principal Wetlands Officer	There is a need for another engagement, after the study has confirmed the coordinates of the route and affected wetlands identified.	This is noted.
			Male	Regional Wetlands Coordinator	Are VECs the same as sensitive ecological areas?	VECs include species and plants of concern, endemic species among others that may be impacted upon by a number of projects in the same environment.
			Male	Regional Wetlands Coordinator	When will the stakeholders have site visits to acclimatise with wetlands that may be affected?	A response was not able to be given during the meeting. However, the response now is as follows: Stakeholder engagement will continue throughout the project. The request has been noted.
			Male	Assistant Commissioner	Has the study team identified the fragile ecosystems that are going to be traversed along the pipeline?	A response was not able to be given during the meeting. However, the response now is as follows: Specific biodiversity studies are being undertaken that will consider all types of ecosystems and their potential interaction with the project.
			Male	Assistant Commissioner	As a country, we do not have detailed biodiversity data along the stretch where the pipeline route is proposed to pass. We therefore need to pay attention not to destroy resources that may be important to livelihoods.	This is noted.
			Male	Assistant Commissioner	Are there plans to achieve no net loss in critical habitats? For whatever is destroyed, will there be offsets created?	A response was not able to be given during the meeting. However, the response now is as follows: The mitigation hierarchy will be applied (avoid, minimize restore, compensate/offset). Specific consideration will be given as to whether critical habitat is present and appropriate mitigation and management measures developed to ensure no net loss of such habitat.
			Male	Assistant Commissioner	How long will construction last in a particular place?	A response was not able to be given during the meeting. However, the response now is as follows: The construction activity will be transient in nature Construction activities will progress sequentially with different teams following each other and responsible for clearing of the construction corridor, excavation of the pipe trench, installation of the pipeline and backfill of the trench. The precise speed of construction will depend upon a number of factors such as ground conditions and weather.
			Male	Regional Wetlands Coordinator	There is a concern over erosive forces following the construction of the pipeline. Across wetlands and narrow/seasonal streams, what measures will be put in place to ensure the soils over the pipeline are not eroded away?	A response was not able to be given during the meeting. However, the response now is as follows: The pipeline design will take account of the erosion potential of ground crossed by the pipeline. In addition, as part of site reinstatement, erosion control structures will be installed and measures will be undertaken to control erosion following construction.

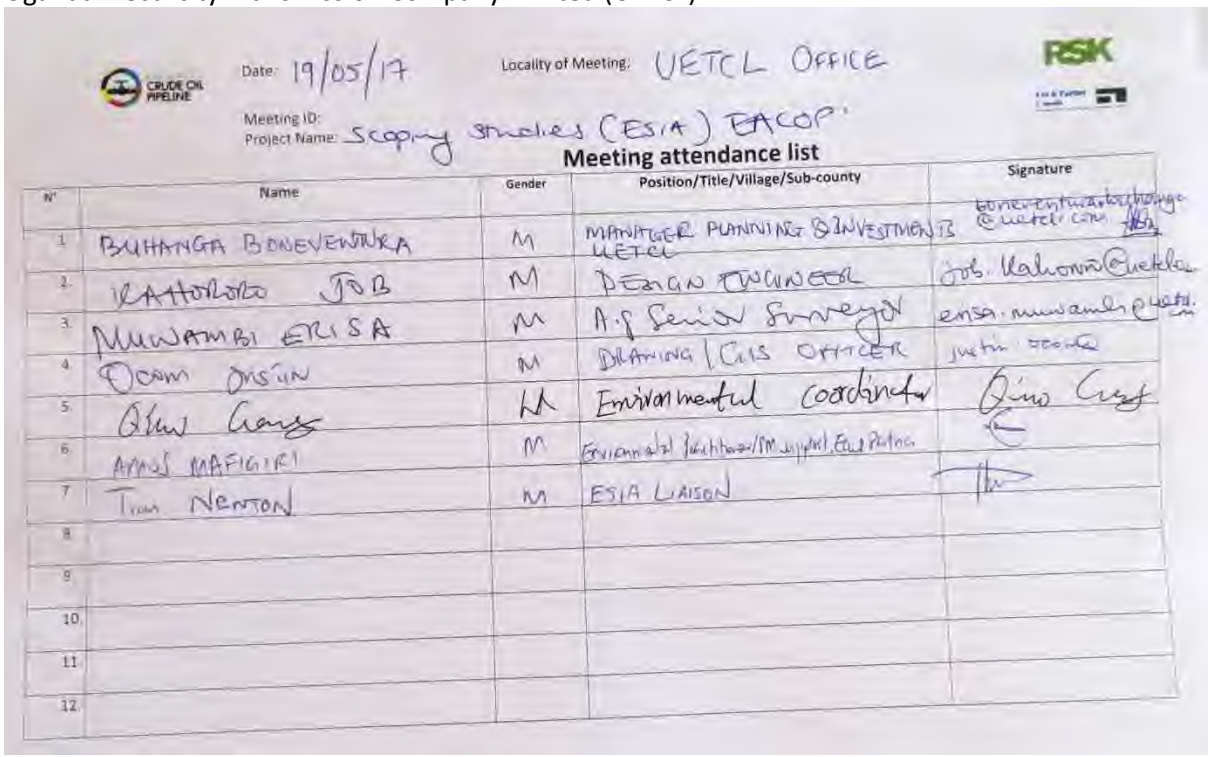
RECORDS OF STAKEHOLDER ENGAGEMENT ATTENDANCE LISTS

NATIONAL MEETINGS
Uganda Electricity Transmission Company Limited (UETCL)
Uganda National Oil Company (UNOC)
National Forest Authority
Uganda Wildlife Authority
Ministry of Lands, Housing and Urban Development
National Environment Management Authority (NEMA)
Petroleum Authority of Uganda (PAU)
Ministry of Gender
Department of Museums and Monuments
Directorate of Water Resource Management (DWRM)
Uganda National Roads Authority (UNRA)
Wetlands Management Department (WMD)
Civil Society for Oil (CSCO)
DISTRICT MEETINGS
Hoima District Technical Planning Committee and Political Leaders
Hoima District Health Authorities
Kakumiro District Technical Planning Committee and Political Leaders
Kyankwanzi District Technical Planning Committee and Political Leaders
Kyankwanzi District Health Authorities
Mubende District Technical Planning Committee and Political Leaders
Mubende District Health Authorities
Gomba District Technical Planning Committee and Political Leaders
Gomba District Health Authorities
Sembabule District Technical Planning Committee and Political Leaders
Sembabule District Health Authorities
Lwengo District Technical Planning Committee and Political Leaders
Lwengo District Health Authorities
Rakai District Technical Planning Committee and Political Leaders
Rakai District Health Authorities
SUBCOUNTY MEETINGS
Buseruka Subcounty (Hoima District)
Kiziranfumbi Subcounty (Hoima District)
Nkooko Subcounty (Kakumiro District)
Mpasaana Subcounty (Kakumiro District)
Kisiita Subcounty (Kakumiro District)
Ntwetwe Subcounty (Kyankwanzi District)
Gayaza Subcounty (Kyankwanzi District)
Kitenga Subcounty (Mubende District)
Madudu Subcounty (Mubende District)
Butoloogo Subcounty (Mubende District)
Maddu Subcounty (Gomba District)
Sembabule Town Council (Sembabule District)
Mijwala Subcounty (Sembabule District)
Lugusulu Subcounty (Sembabule District)
Lwebitakuli Subcounty (Sembabule District)
Lwengo Subcounty (Lwengo District)
Lwengo Town Council (Lwengo District)

Ndagwe Subcounty (Lwengo District)
Lwanda Subcounty (Rakai District)
Kifamba Subcounty (Rakai District)
Kakuuto Subcounty (Rakai District)
Kasaali Subcounty (Rakai District)
Kasasa Subcounty (Rakai District)
Nabigasa Subcounty (Rakai District)
VILLAGE MEETINGS
Butimba Village (Kiziranfumbi Subcounty, Hoima District)
Mpasaana Village (Mpasaana Subcounty, Kakumiro District)
Kisiita A Village (Kisiita Subcounty, Kakumiro District)
Kisala West Village (Gayaza Subcounty, Kyankwanzi District)
Nzoo Village (Gayaza Subcounty, Kyankwanzi District)
Nylyankajja Village (Kitenga Subcounty, Mubende District)
Kisagazi Village (Butoloogo Subcounty, Mubende District)
Kyetume Village (Maddu Subcounty, Gomba District)
Mabale Village (Lugusulu Subcounty, Sembabule District)
Lutilwanjuki Village (Lwebitakuli Subcounty, Sembabule District)
Kinvunikidde Village (Lwengo Subcounty, Lwengo District)
Lukoma Village (Kakuuto Subcounty, Rakai District)
Kamuli Village (Kasasa Subcounty, Rakai District)

NATIONAL MEETINGS

Uganda Electricity Transmission Company Limited (UETCL)



CRUDE OIL PIPELINE

Date: 19/05/17 Locality of Meeting: UETCL OFFICE

RSK

Meeting ID:
Project Name: Scoping Studies (ESIA) EACOP

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	BUHANGA BONEVENTURA	M	MANAGER PLANNING & INVESTMENTS UETCL	boneventura.buhanga@uetcl.com
2	KATHOLOLO JOB	M	DESIGN ENGINEER	Job.Kathololo@uetcl.com
3	MUWAMBI ERISA	M	A.g Senior Surveyor	erisa.muwambi@uetcl.com
4	OCAM ORSIN	M	DRAFTING / CAD OFFICER	[illegible]
5	[illegible]	M	Environmental coordinator	[illegible]
6	AMOS MAFIGIRI	M	Environmental Facilitator/PM support, Field Patrol	
7	Tim NEWTON	M	ESIA LIAISON	
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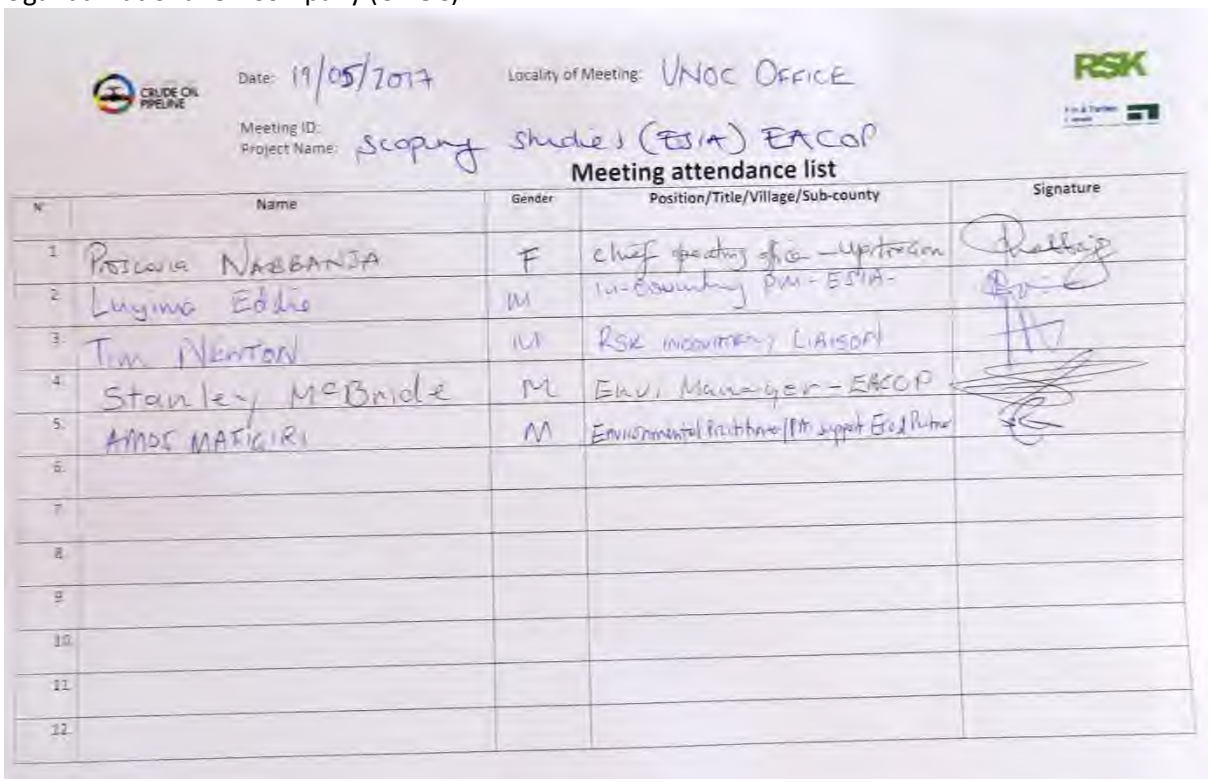
Uganda National Oil Company (UNOC)



CRUDE OIL PIPELINE

Date: 19/05/2017 Locality of Meeting: UNOC OFFICE

RSK

Meeting ID:
Project Name: Scoping Studies (ESIA) EACOP

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	PRISCOVIA NABBANJA	F	chief operating officer – upstream	
2	Luying Eddie	M	In-Country PM - ESIA	
3	Tim NEWTON	M	RSK Independent LIAISON	
4	Stanley McBride	M	Envi. Manager – EACOP	
5	AMOS MAFIGIRI	M	Environmental Facilitator/PM support Field Patrol	
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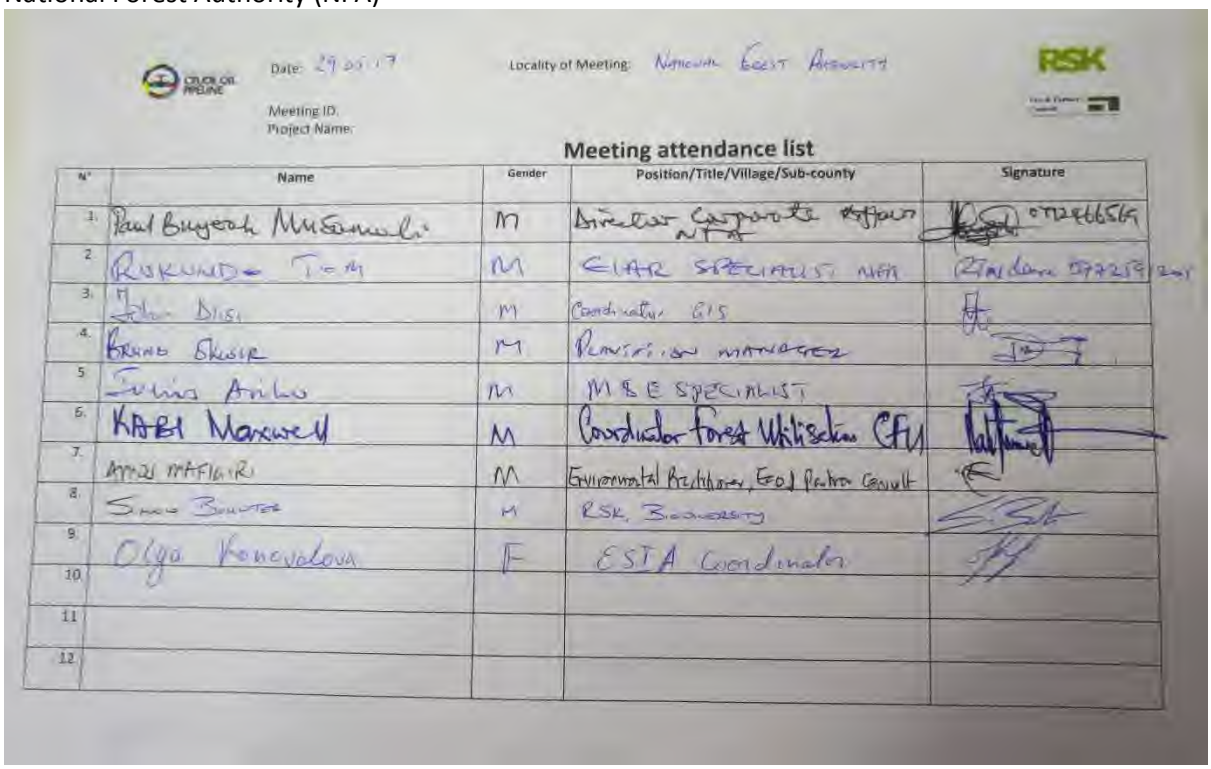
National Forest Authority (NFA)



CRUDE OIL PIPELINE

Date: 29/05/17 Locality of Meeting: National Forest Authority

Meeting ID:
Project Name:

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Paul Buyeeh Musamali	M	Director Corporate Affairs NFA	0772466564
2.	Rukundo Tom	M	GIAR SPECIALIST NFA	0772259
3.	[illegible] Dilsi	M	Coordinator GIS	
4.	Bruno Okwir	M	Permission manager	
5.	Julius Aribo	M	M&E SPECIALIST	
6.	KABI Maxwell	M	Coordinator Forest Utilisation CFU	
7.	AMOS MAFIGIRI	M	Environmental Practitioner, EIA Partner Consult	
8.	Simon Bunter	M	RSK, Boundary	
9.	Olga Yonovalova	F	ESIA Coordinator	
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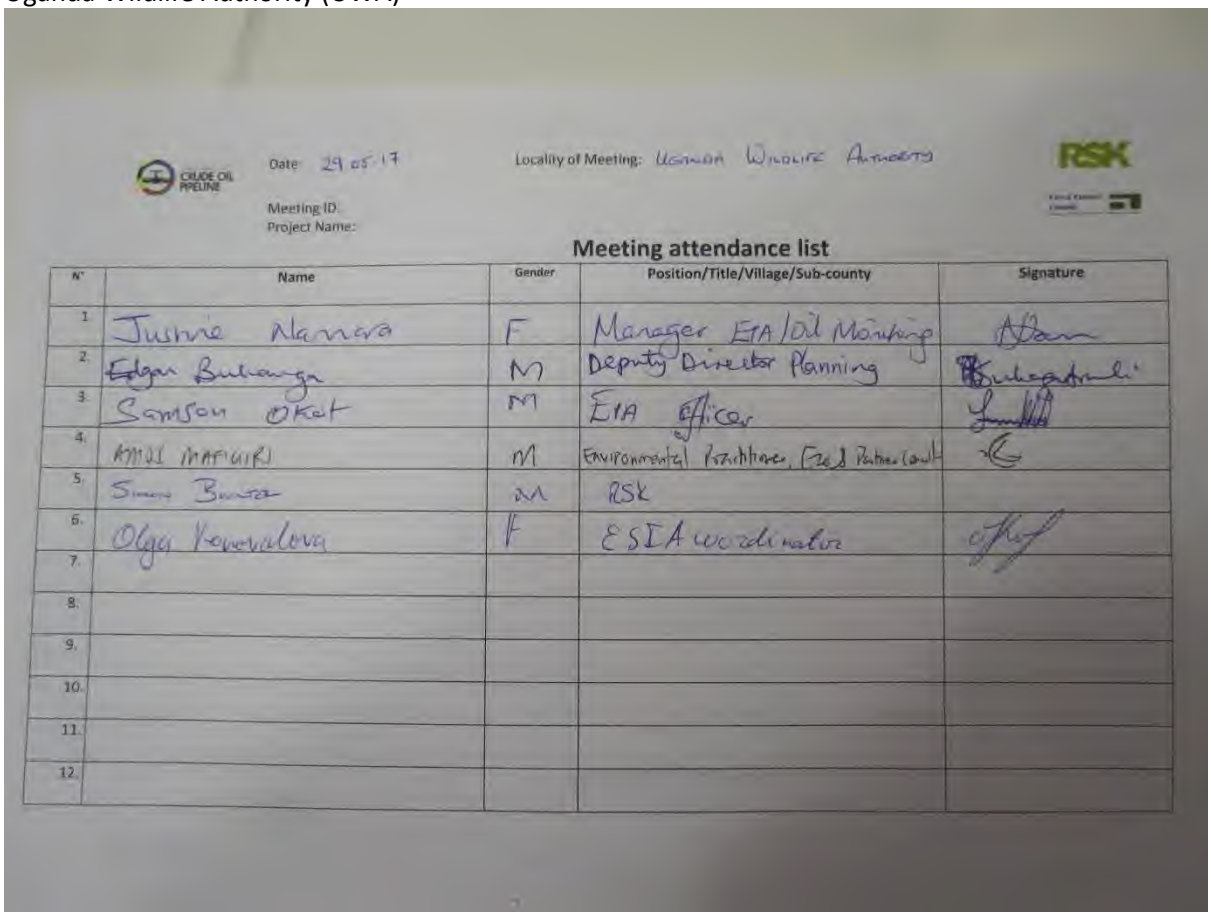
Uganda Wildlife Authority (UWA)



CRUDE OIL PIPELINE

Date: 29 05 17 Locality of Meeting: Uganda Wildlife Authority

Meeting ID:
Project Name:

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Justine Namara	F	Manager EIA/Oil Mining	
2.	Edgar Bukenya	M	Deputy Director Planning	
3.	Samson Okot	M	EIA Officer	
4.	AMOS MAFIGIRI	M	Environmental Practitioner, EIA Partner Consult	
5.	Simon Bunter	M	RSK	
6.	Olga Yonovalova	F	ESIA coordinator	
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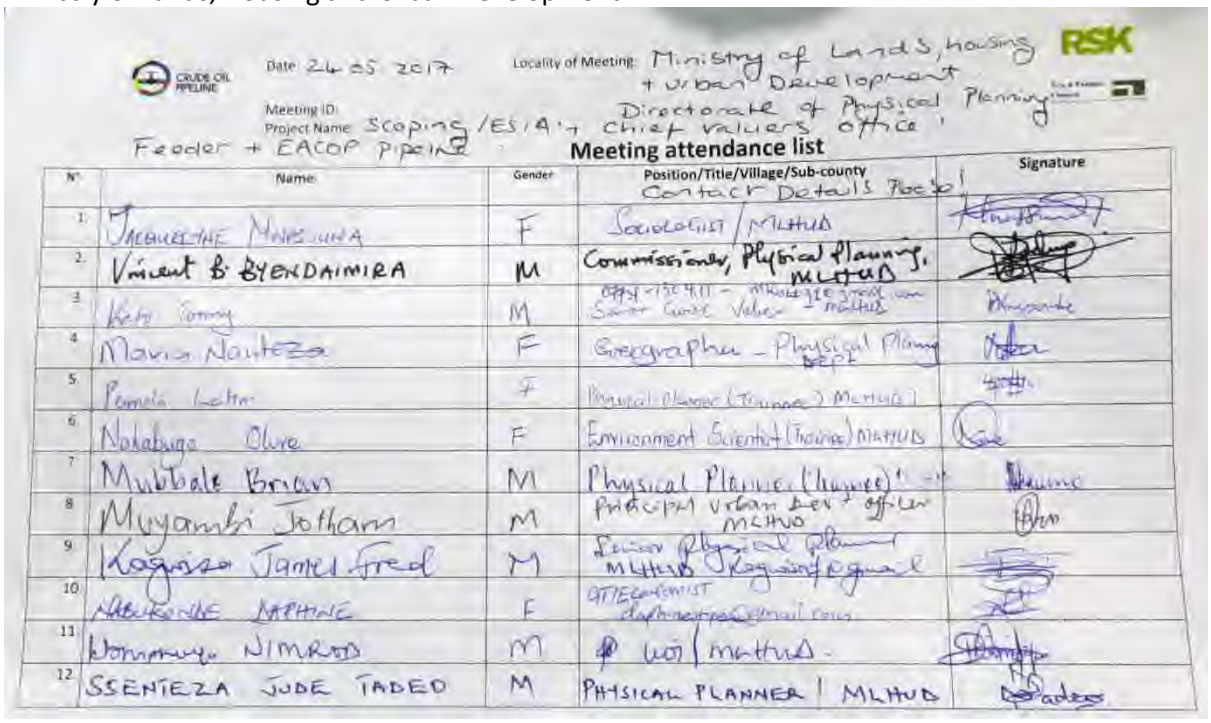
Ministry of Lands, Housing and Urban Development



CRUDE OIL PIPELINE

Date: 24 05 2017

Locality of Meeting: Ministry of Lands, Housing + Urban Development Directorate of Physical Planning, Chief Valuers office

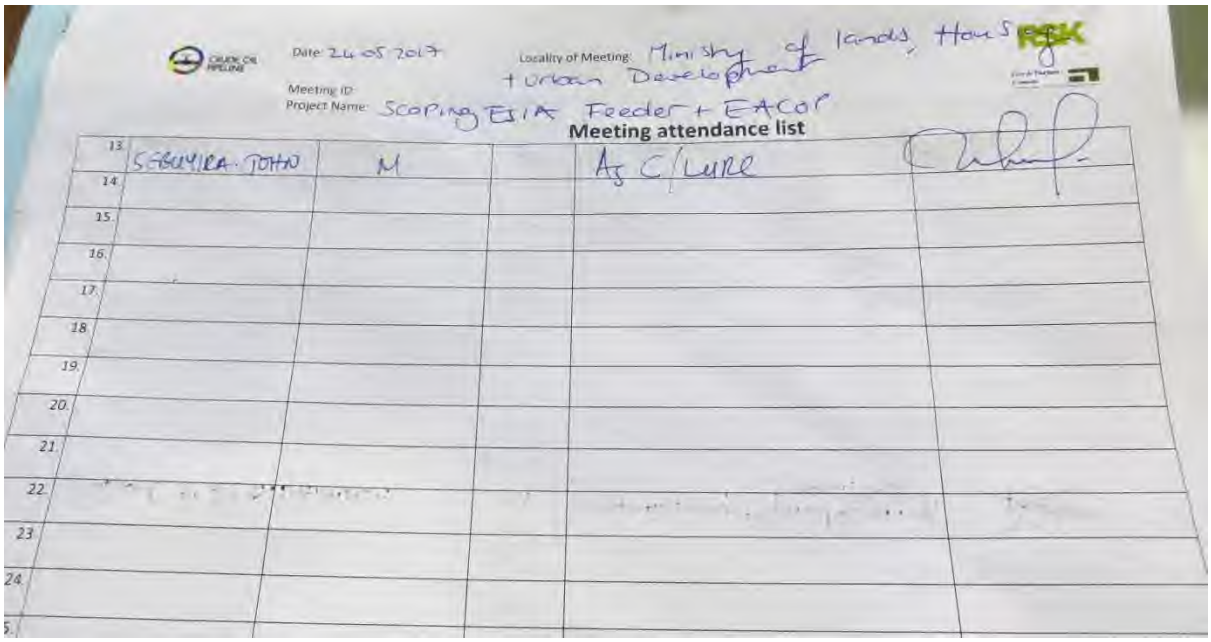
Meeting ID:

Project Name: Scoping/ESIA + Feeder + EACOP pipeline

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county Contact Details Plot No.	Signature
1.	NAGUREETHE NAMBUNA	F	Sociologist / MLHUD	
2.	Vincent B. BYENDAIMIRA	M	Commissioner, Physical Planning, MLHUD	
3.	[illegible] Tommy	M	[illegible] MLHUD	
4.	Maria Nantezza	F	Geographer - Physical Planning DEPT	
5.	Pamela Letta	F	Physical Planner (Trainee) MLHUD	
6.	Nakabuga Olive	F	Environment Scientist (Trainee) MLHUD	
7.	Mubbale Brian	M	Physical Planner (Trainee)	
8.	Muyambi Jotham	M	Principal Urban Dev't officer MLHUD	
9.	Kaguzo James Fred	M	Senior Physical Planner MLHUD Kaguzo@gmail	
10.	NABUKENDE MARTHINE	F	GIS Geologist [illegible]	
11.	Kamanyu NIMROD	M	GIS / MLHUD	
12.	SSENTEZA JUDE TADEO	M	PHYSICAL PLANNER / MLHUD	



CRUDE OIL PIPELINE

Date: 24 05 2017

Locality of Meeting: Ministry of Lands, Hous + Urban Development

Meeting ID:

Project Name: Scoping ESIA Feeder + EACOP

RSK

Meeting attendance list

13.	SSEMUYIRA JOHN	M		Ag C/LURE
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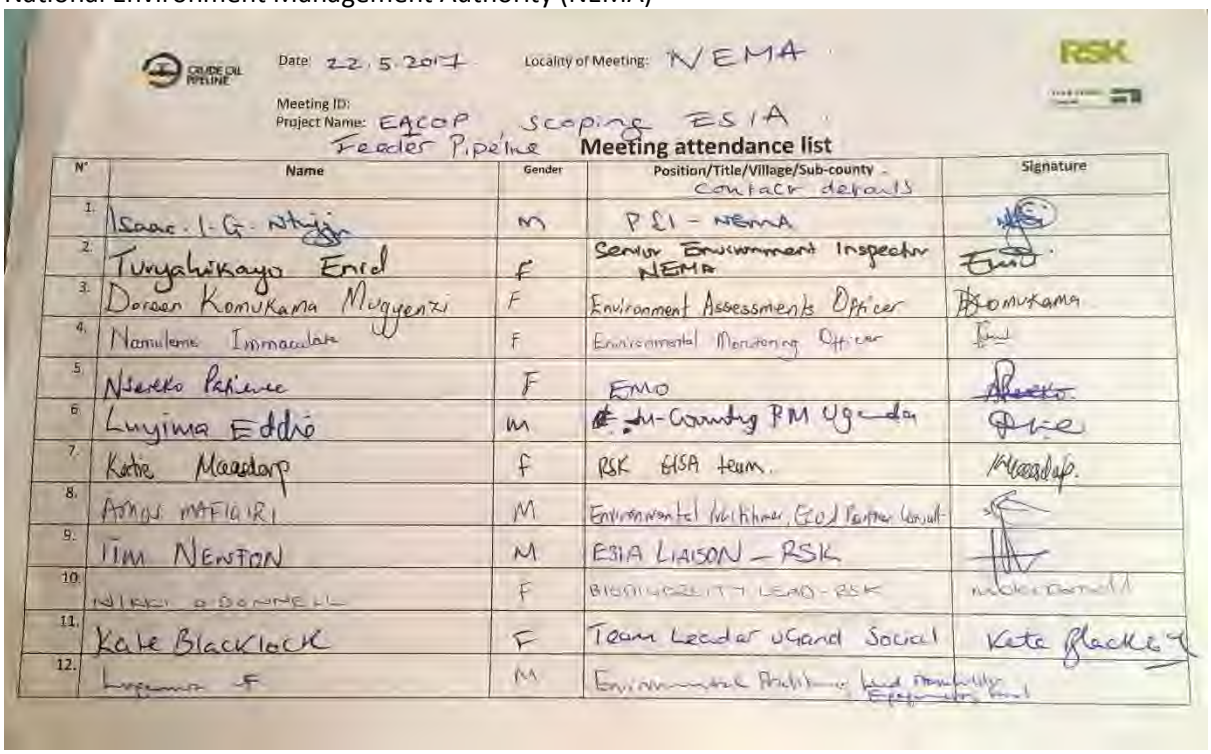
National Environment Management Authority (NEMA)



CRUDE OIL PIPELINE

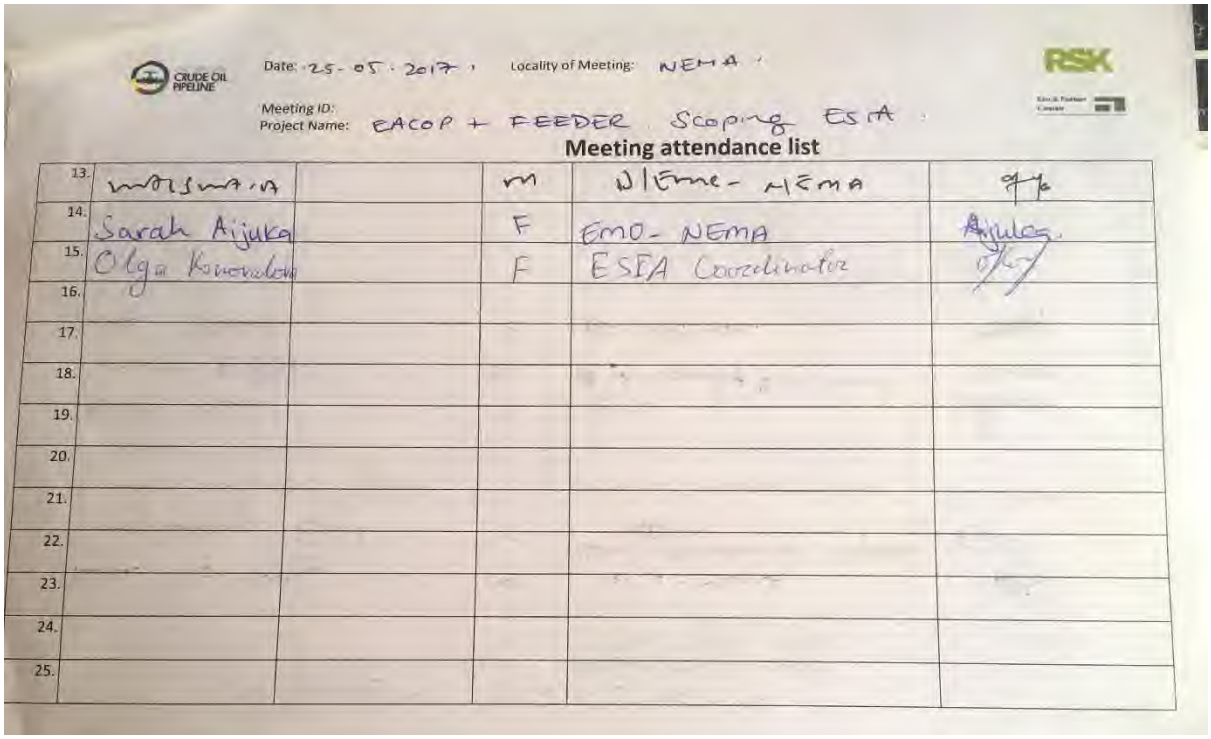
Date: 22.5.2017 Locality of Meeting: NEMA

RSK

Meeting ID:
Project Name: EACOP, Scoping ESIA Feeder Pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county - contact details	Signature
1.	Isaac. I. G. Ntujju	M	PEI - NEMA	
2.	Turyahikayo Enid	F	Senior Environment Inspector NEMA	Enid.
3.	Doreen Komukama Muggenzi	F	Environment Assessments Officer	Komukama
4.	Namulema Immaculate	F	Environmental Monitoring Officer	
5.	Nsereko Patience	F	EMO	
6.	Lugima Eddie	M	Sub-County PM Uganda	
7.	Katie Meredarp	f	RSK ESIA team.	Meredarp.
8.	AMOS MAFIGIRI	M	Environmental Ecologist, GIS Remote Consult-	
9.	TIM NEWTON	M	ESIA LIAISON – RSK	
10.	NIKKI O'DONNELL	F	BIODIVERSITY LEAD - RSK	
11.	Kate Blacklock	F	Team Leader Uganda Social	Kate Blacklock
12.	Lugemwa F	M	Environmental Practitioner Lead Practitioner Environmental	



CRUDE OIL PIPELINE

Date: 25.05.2017 Locality of Meeting: NEMA

RSK

Meeting ID:
Project Name: EACOP + FEEDER Scoping ESIA

Meeting attendance list

13.	MOSES M.		M	W/Emc - NEMA	
14.	Sarah Ajuka		F	EMO - NEMA	Ajuka.
15.	Olga Kamoukova		F	ESIA Coordinator	
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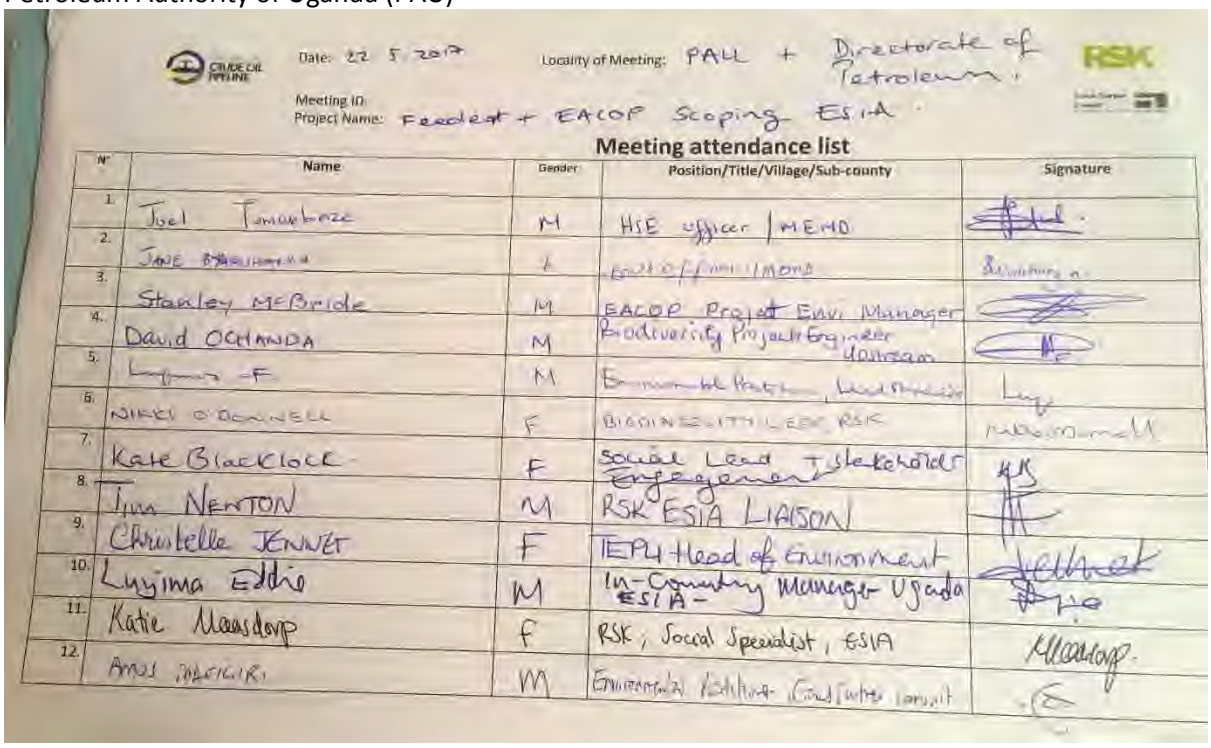
Petroleum Authority of Uganda (PAU)



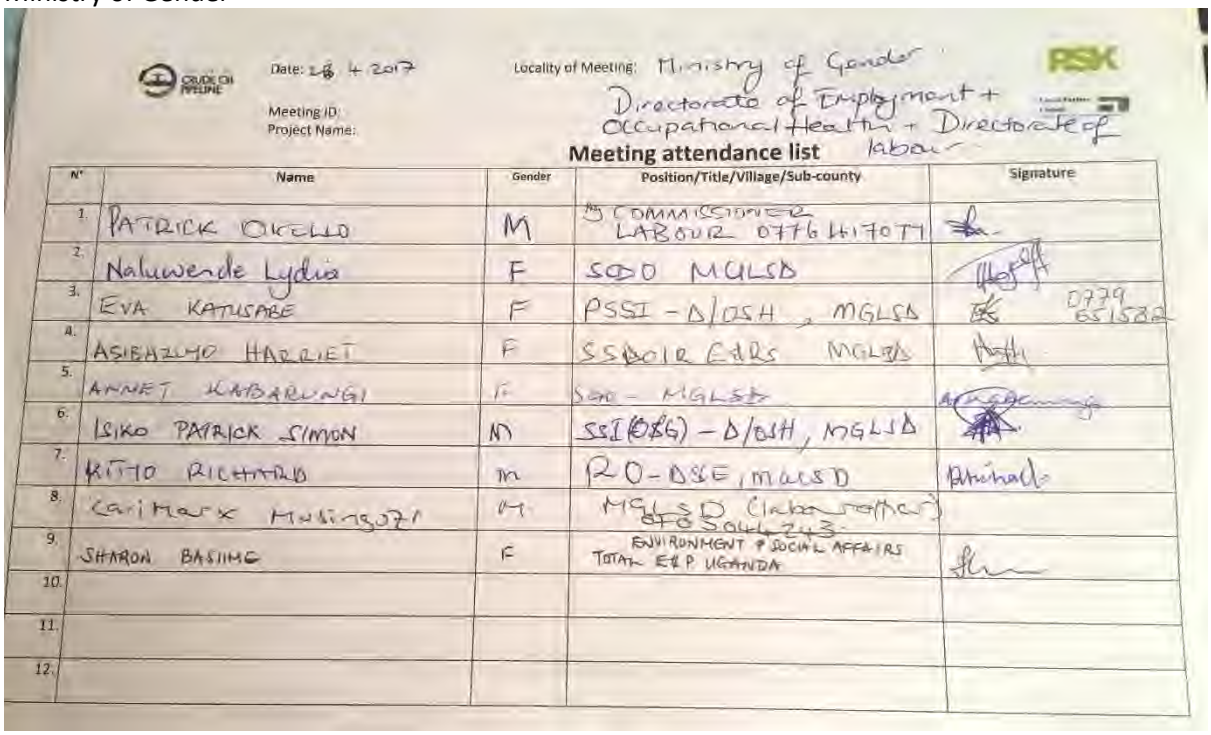
Date: 22 5 2017 Locality of Meeting: PAU + Directorate of Petroleum.

Meeting ID:
Project Name: Feedlot + EACOP Scoping ESIA.

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Joel Tumwebaze	M	HSE officer / MEMD	
2.	[illegible]	[illegible]	[illegible]	
3.	Stanley McBride	M	EACOP Project Envi Manager	
4.	David OCHANDA	M	Biodiversity Project Engineer Dalhousie	
5.	[illegible] -F	M	[illegible]	[illegible]
6.	NIKKI O'DONNELL	F	BIODIVERSITY LEAD, RSK	[illegible]
7.	Kate Blacklock	F	Social Lead Stakeholder Engagement	
8.	Tim NEWTON	M	RSK ESIA LIAISON	
9.	Christelle JENNET	F	TEPU Head of Environment	
10.	Lyyima Eddie	M	In-Country Manager Uganda ESIA -	
11.	Katie Maasdorp	F	RSK, Social Specialist, ESIA	Maasdorp.
12.	Amos [illegible]	M	[illegible]	

Ministry of Gender



Date: 28 4 2017 Locality of Meeting: Ministry of Gender Directorate of Employment + Occupational Health + Directorate of labour

Meeting ID:
Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	PATRICK OKELLO	M	COMMISSIONER LABOUR 0776 411701	
2.	Naluwende Lydia	F	SDO MGLSD	
3.	EVA KATUSABE	F	PSSI - D/OSH, MGLSD	0779 651582
4.	ASIBAZIYO HARRIET	F	SSBOIR EARS MGLSD	
5.	ANNET KABARUNGI	F	SDO - MGLSD	
6.	LSIKO PATRICK SIMON	M	SSI(OSG) - D/OSH, MGLSD	
7.	KITTO RICHARD	M	RO - BSE, MGLSD	
8.	Karl Marx Mwesigwa	M	MGLSD Clerk [illegible] 0705011243	
9.	SHARON BASIIMC	F	ENVIRONMENT & SOCIAL AFFAIRS TOTAL E&P UGANDA	
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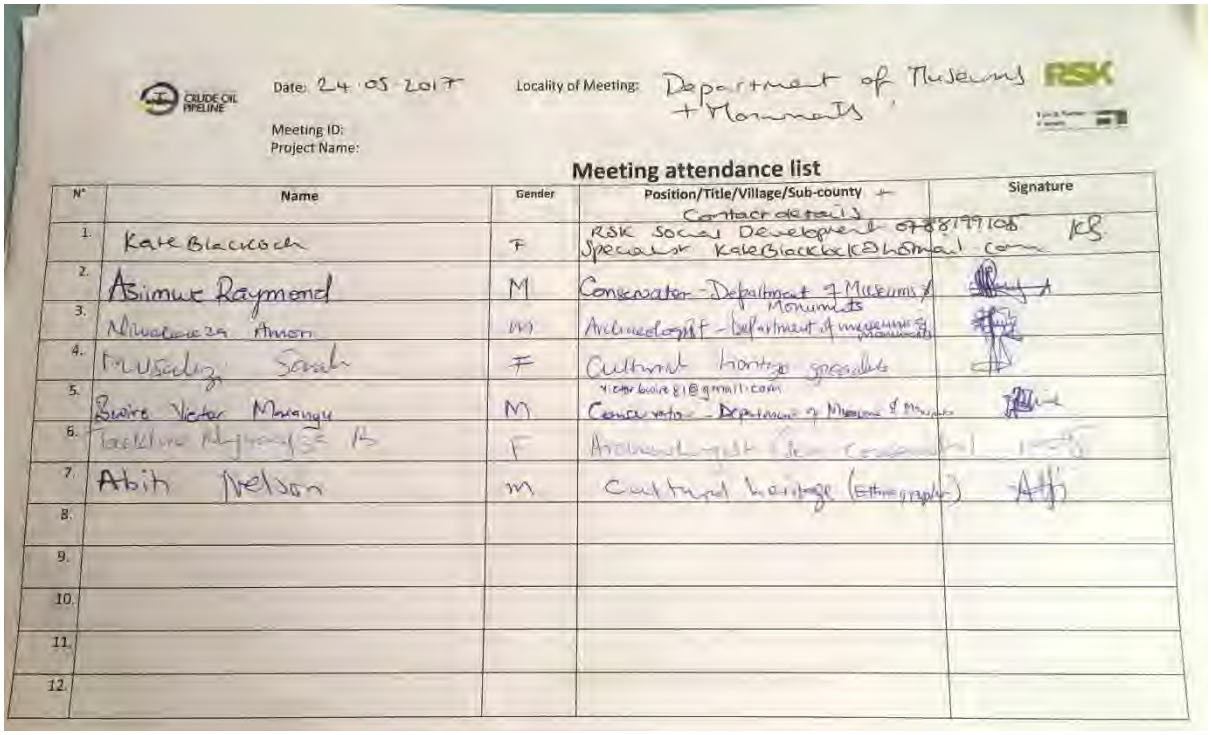
Department of Museums and Monuments



CRUDE OIL PIPELINE

Date: 24-05-2017 Locality of Meeting: Department of Museums + Monuments

RSK

Meeting ID:
Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county + Contact details	Signature
1.	Kate Blackock	F	RSK Social Development Specialist 0788199108 KateBlackock@hotmail.com	KB
2.	Asiimwe Raymond	M	Conservator - Department of Museums & Monuments	
3.	Mwaaaaa Amon	M	Archaeologist - Department of Museums & Monuments	
4.	Nyusaba Sarah	F	Cultural heritage specialist	
5.	Bwire Victor Mwangu	M	victorbwire81@gmail.com Conservator - Department of Museums & Monuments	
6.	Tacklina Nyiramugisha	F	Archaeologist (Geo Consultant)	
7.	Abiti Nelson	M	Cultural heritage (Ethnography)	
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Directorate of Water Resource Management (DWRM)

CRUDE OIL PIPELINE

Date: 29-05-17 Locality of Meeting: DWRM Offices, Entebbe

RSK

Meeting ID:
Project Name: ESIA PUBLIC CONSULTATION FOR THE EACOP PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Kawondo Edward	M	Water officer	
2.	Mulongo Joseph	M	Water officer	
3.	Katsiike Winfred	F	Hydrogeologist	
4.	Okwarut Daniel Samson	M	Water officer (Tralna)	
5.	OJWANG HAGGAI	M	Water officer trainee	
6.	Albert Orijabo	M	Assistant Commissioner	
7.	AJOK SUSAN	F	Water officer	
8.	OKELLO LAWRENCE	M	SWO	
9.	Emor Stephen	M	SWA	
10.	Kandago Patrunde	M	WO	
11.	Nabukera Juliet	F	WO	
12.	KYATENGERWA CHRISTELLE	F	WO	

CRUDE OIL PIPELINE

Date: 27 OCT 2017 Locality of Meeting: DWRM OFFICE / ENTEBBE

RSK

Meeting ID:
Project Name: SCOPING LEVEL CONSULTATIONS FOR THE EXPORT PIPELINE

Meeting attendance list

13.	Bwoba Ambrose		F	Water Officer	
14.	Katumba Cathy			[illegible]	
15.	Wadamba Sylivia		M	Hydrologist, Eco & partner	
16.	Magoya Robert		M	Hydrogeologist, ECO & Partner	
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Uganda National Roads Authority (UNRA)

CRUDE OIL PIPELINE

Date: 24. 05 2017 Locality of Meeting: UNRA Head Office, Kampala

RSK

Meeting ID:
Project Name: SCOPING LEVEL CONSULTATIONS FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Mwesige Charles	M	ENVIRONMENTAL SPECIALIST	
2.	Esther Kithi Mwaiya	Female	Sociologist	
3.	Daphne Mayanja Butamwa	Female	Jr. Environment Specialist	
4.	Brian Emmy Kamya	M	Environment Specialist	
5.	Tim Newton	M	ESIA CONSULTANT - RSK	
6.	Michael Dada	M	CIVIL ENGINEER/ ESIC PARTNER	
7.	Olga [illegible]	Female	ESIA Engineer - AECOM	
8.	Jan Maintz	M	Environmental Specialist	
9.	[illegible]	M	Environmental Partner	
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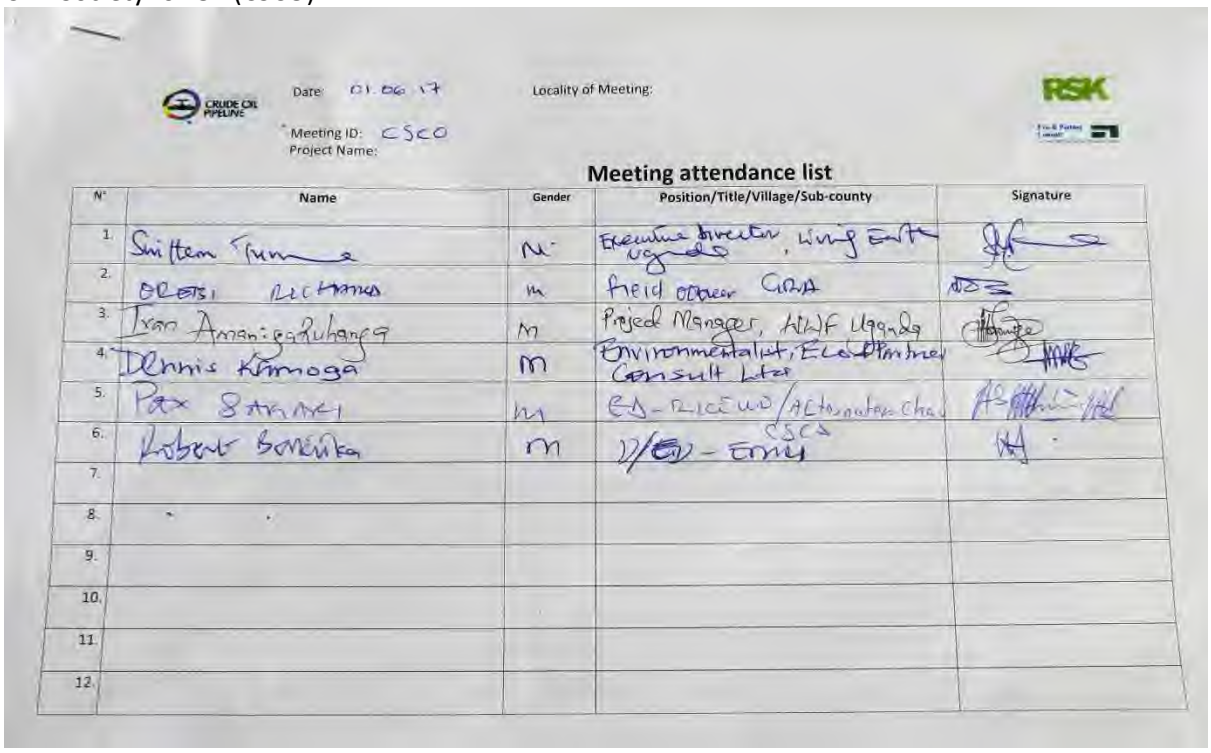
Civil Society for Oil (CSCO)



CRUDE OIL PIPELINE

Date: 01.06.17

Locality of Meeting:

Meeting ID: CSCO

Project Name:

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Smittem Frumence	M	Executive Director, Living Earth Uganda	
2.	ORETSI RICHARD	M	Field officer CSCO	
3.	Ivan Amanigaruhanga	M	Project Manager, WWF Uganda	
4.	Dennis Kimooga	M	Environmentalist, Eco Partners Consult Ltd	
5.	Pax Stanley	M	EIA - RICE WO / ALTERNATE CHAIR CSCO	
6.	Robert Sonenka	M	V/CEO - ERMS	
7.				
8.				
9.				
10.				
11.				
12.				

CRUDE OIL PIPELINE

Date: 01.06.17

Locality of Meeting:

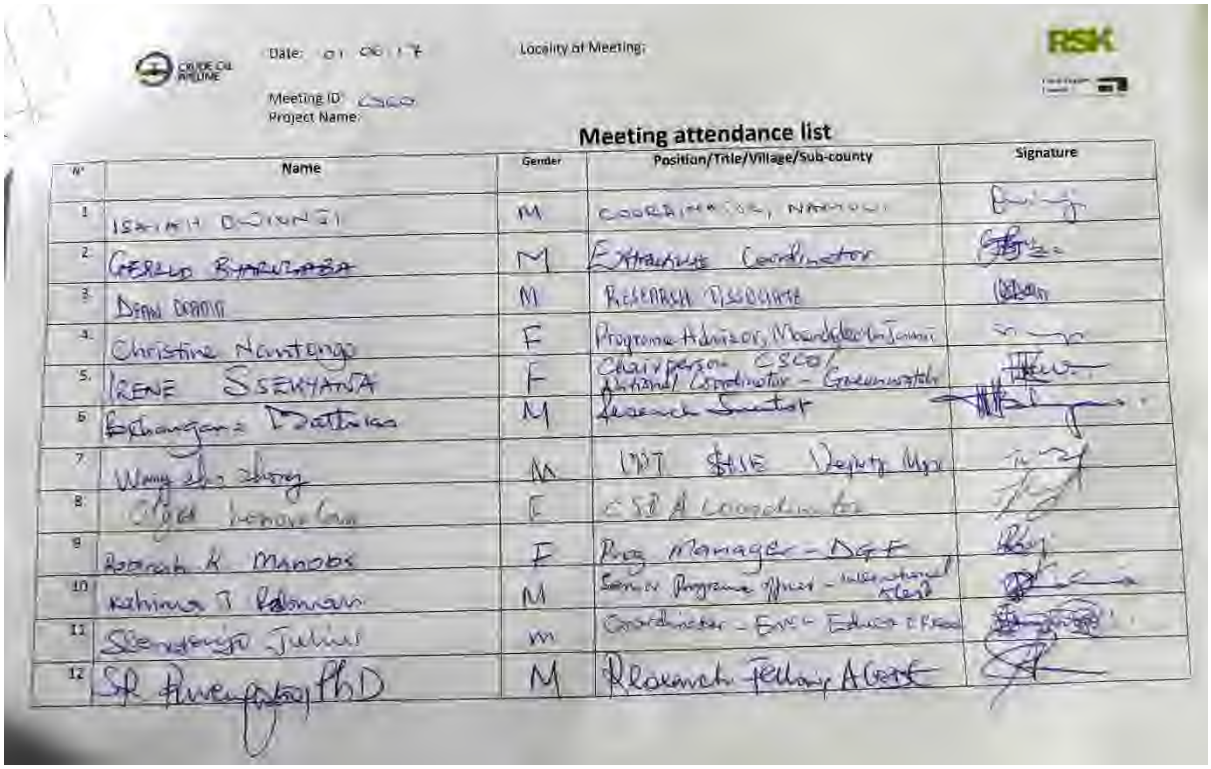
Meeting ID: CSCO

Project Name:

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	AMAZI MATIOURI	M	Tri-Country Wetlands Project Support, Eco Partners Consult	
2.	FRANK LUTEMA	M	Wetland Project Officer Eco Partners	
3.	Rosemary Akurut	F	Environmentalist	
4.	Evelyn Busingye	F	Programme Officer Water & Biodiversity - IUCN	
5.	Florence Kyalimpa	F	Research Associate, ACODE	
6.	Edward Natamba	M	Sec. CSCO / SOWIPA	
7.	Ken Owen Mwesigwa Bachwa	M	Nature Governance Institute / CSCO	
9.	HENRY M. BAZIRA	M		
9.	[illegible]	F	Research Intern ACODE	
10.	Elizabeth Lion	F	Stakeholder Engagement TZ and Social studies	
11.	[illegible]	F	EIA	
12.	Twebaze Paul	M	ESIA Consultation	



Date: 01 06 17 Locality of Meeting:

Meeting ID: CSCO

Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	ISAIMA DIGUNGI	M	COORDINATOR, NAMOLI	
2	GERALD BYARUGABA	M	Extension Coordinator	
3	DEAN DOBSON	M	RESEARCH ASSOCIATE	
4	Christine Nantongo	F	Programme Advisor, Mondelez International	
5	IRENE SSEKYANZA	F	Chairperson CSCO/ National Coordinator - Green Watch	
6	Ekwangan Dativa	M	Research Student	
7	Wang Shu Zhong	M	UPT SISE Deputy Mgr	
8	Ogol Ivanov Leo	E	CSR & Corporate Affairs	
9	Rosette K MANOBE	F	Prog Manager - DGF	
10	Kahinda T Robinson	M	Senior Programme Officer - International Alert	
11	Ssenyonjo Julius	M	Coordinator - Env. Educ. & Pro	
12	SR Ruwenzori PhD	M	Research Fellow, AGRF	

Wetlands Management Department (WMD)

Date: 2 06 2017 Locality of Meeting:

Meeting ID:

Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	KWAMIGABE Rweland	M	Principal ISMWandoPhys-MWE	
2	Apio Sylvia	F	ASO (MWE) WMD	
3	Mbogga Nicholas	M	Regional Wetlands Coordinator	
4	Mafumbo Julius	M	AC/MWE/DEIA	
5	Lugwa F	M	Environment Protection Police	
6	Jim Bwire	M	RSK Bukwaya	
7	CHARITY TUSHEMEREIRWE	F	EAOOP ESIA ENGINEER	
8				
9				
10				
11				
12				

DISTRICT MEETINGS

Hoima District Technical Planning Committee, Health Authorities and Political Leaders

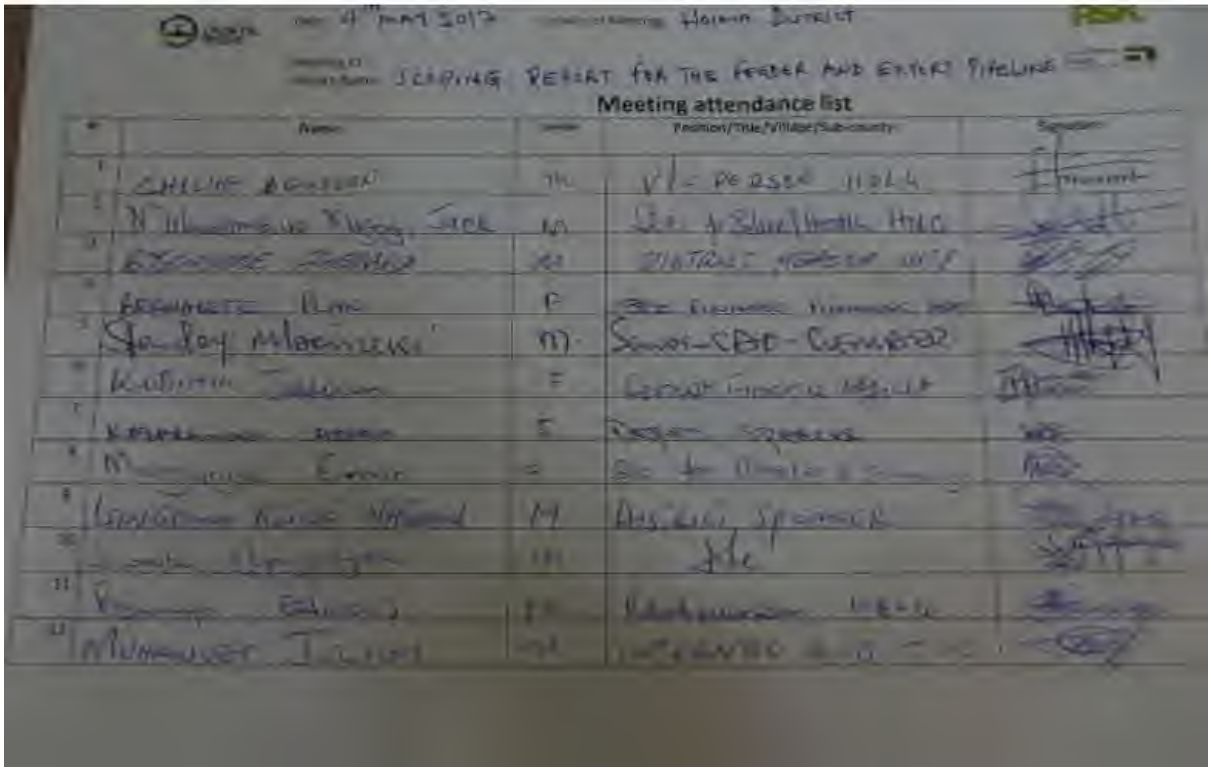
Country: UGANDA | City/town/village: HOIMA | Easting (X): | Northing (Y):
Date: 19-04-2017 | Template filled in by:
Names of organisations/localities:
Hoima District Local government

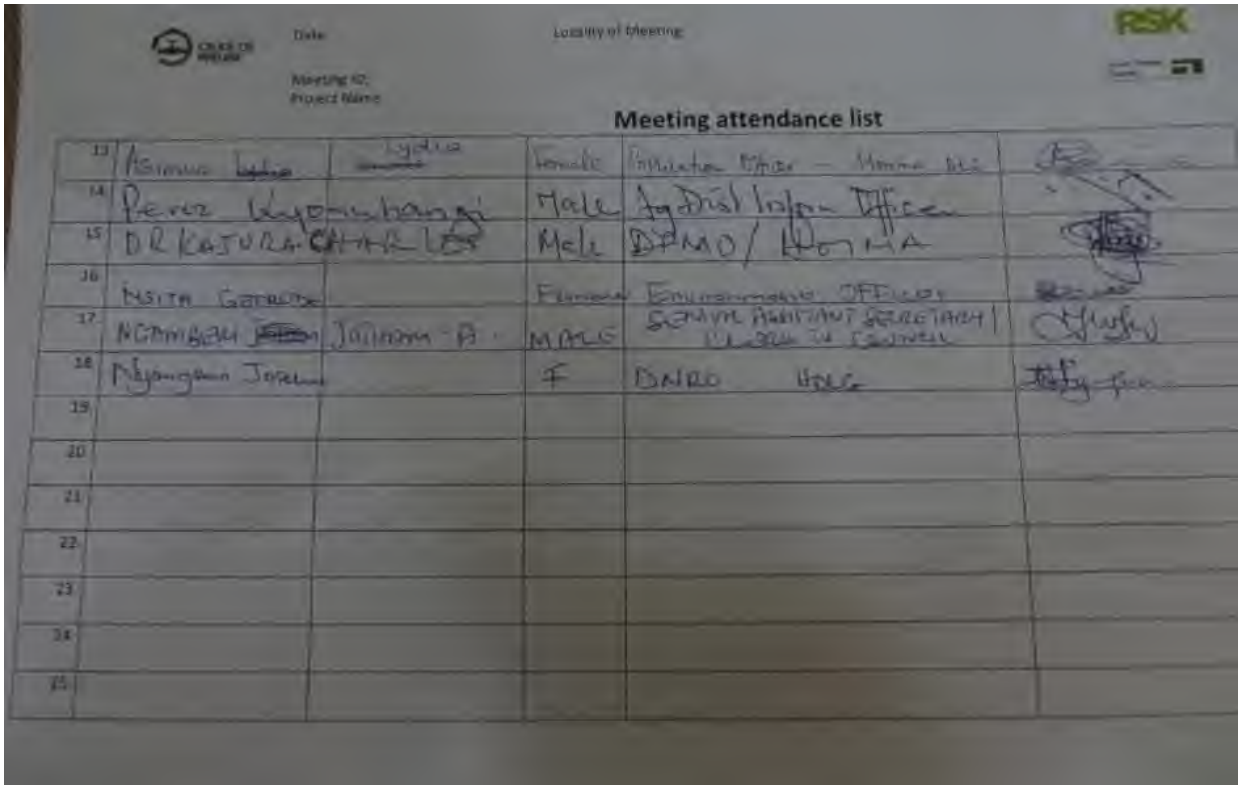
Number of attendees: 2
Notes/reasons for interacting:
Health impact assessment introductory meeting

STAKEHOLDER INFORMATION

First name	Last name	Gender	Position	Organisation	Contact details
John	[illegible]	M	District Planner	Hoima District Local Government	[illegible]
FREDRICK	BYENUME	M	DISTRICT HEALTH INSPECTOR	- do -	0772 495 byenume

To be sent to Grace Rigby (GRigb





Date

Location of Meeting

Meeting ID:
Project Name:

RSK

Meeting attendance list

13	Asiimwe [illegible]	Lydia	Female	Immunization Officer – Mama Kit	
14	Peter Kayondwanga		Male	Ag Dist Inform Officer	
15	DR KAJURA [illegible]		Male	DHMO / HOMA	
16	MSITA GODFREY		Female	Environmental Officer	
17	NGAMBEH [illegible]	Johnson B.	MALE	SENIOR ASSISTANT SECRETARY / CLERK TO COUNCIL	
18	Nyangoma Joel		F	DARO Hosp	
19					
20					
21					
22					
23					
24					
25					

Kakumiro District Health Authorities

Country: UGANDA City/town/village: KAKUMIRO Easting (X): Northing (Y):
Date: 30th-Oct 2017 Template filled in by: Bonnie K
Names of organisations/localities:
KAKUMIRO DISTRICT

Number of attendees:
Notes/reasons for interacting:

STAKEHOLDER INFORMATION

First name	Last name	Gender	Position	Organisation	Contact details
SENTEZA	ROBERT MUGUNTINE	M	Ag. DISTRICT HEALTH OFFICER	KAKUMIRO DISTRICT	0770/0752 - [illegible]
PASCAL BEBWA	ASIIMWE	M	Ag. BIOSTATISTICIAN	KAKUMIRO DISTRICT	0773272367 [illegible]
SAKWA	DAVID	M	Ag. HOSHC CHILD CONSERVATIONIST	KAKUMIRO DISTRICT	[illegible]
MBABAZI	ASSUMPTA	F	Ag. ADHO (MCH) Maternal Child Health	KAKUMIRO DISTRICT	mbabazima [illegible]

To be sent to Grace Rigby (GRigb

CRUDE OIL PIPELINE RSK

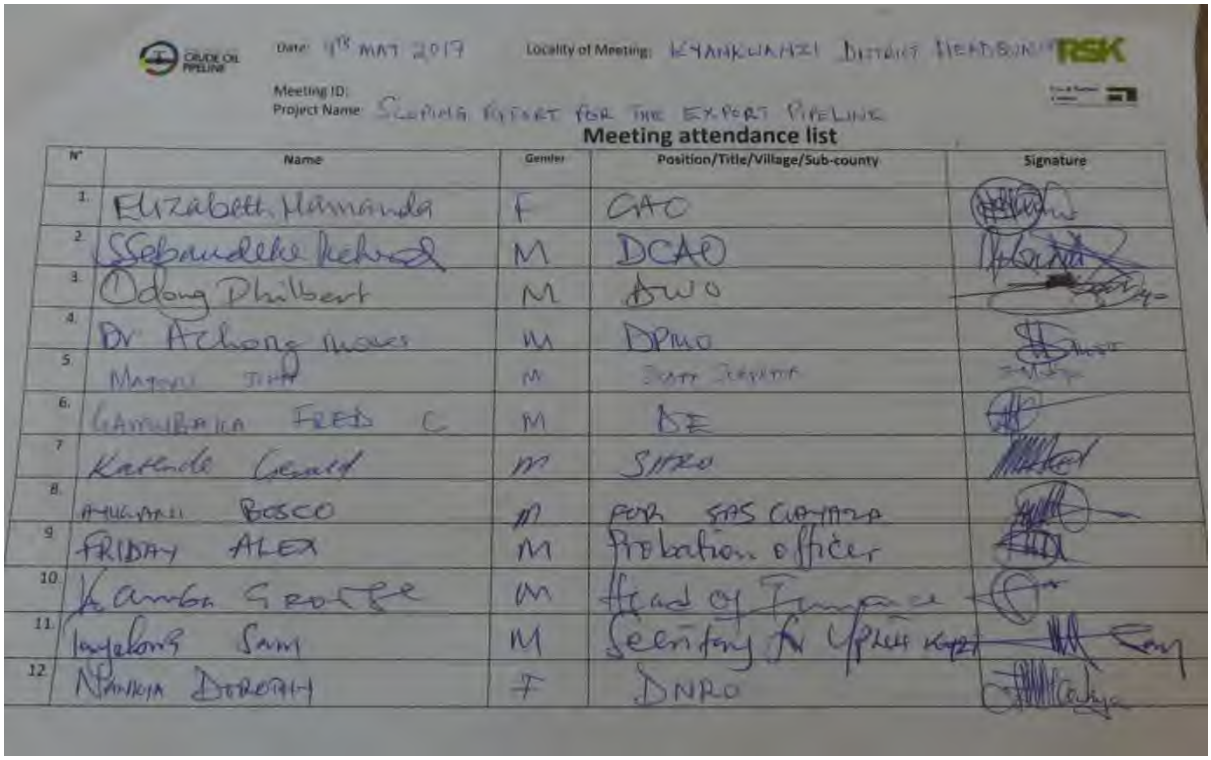
Kyankwanzi District Technical Planning Committee, Health Authorities and Political Leaders

City/town/village: Kampala Easting (X): Northing (Y):
Date: 20th Oct 2017 Template filled in by:
Name of organisations/localities:
KYANKWANZI DISTRICT
Number of attendees:
Aims/reasons for interacting:
Project Impact Assessment

STAKEHOLDER INFORMATION

name	Last name	Gender	Position	Organisation	Contact details
RUTH	KANGUNZI	F	ADHO - MCH	KYANKWANZI DLG	0772676924
Ibrahim	Ssemakula	M	HANDICAP	Kyankwanzi DLG	0782-286488
MOSES	NTEGE	M	DEVELOPMENT	KYANKWANZI DLG	0772977446
Robert	Mukabya	M	Director	Kyankwanzi DLG	
PAUL	OKELLO	M	PIO	Kyankwanzi DLG	0782657021

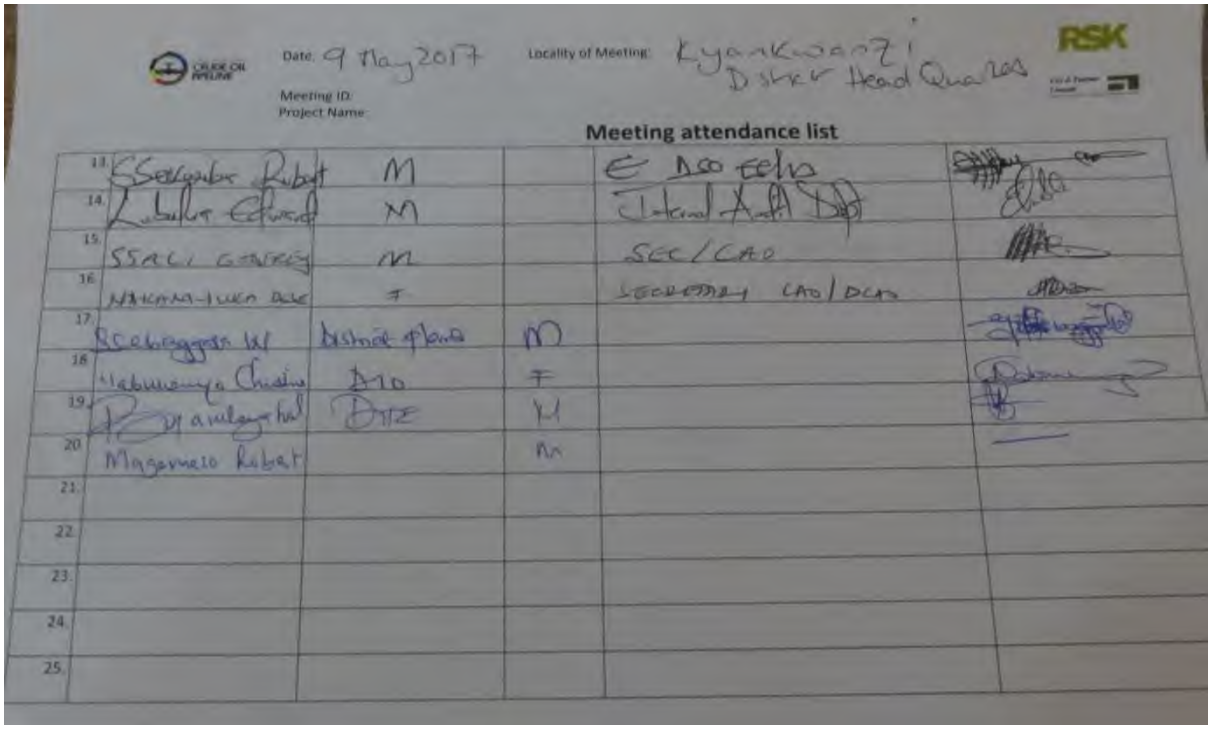
To be sent to Grace Rigby (GRigby@rsk.co



Date: 4th MAY 2017 Locality of Meeting: KYANKWANZI DISTRICT HEADQUARTERS
Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Elizabeth Namanda	F	CAO	
2.	Ssebandeke Richard	M	DCAO	
3.	Odong Philbert	M	AWO	
4.	Dr Achong Moses	M	DPHO	
5.	Mayanja John	M	Town Clerk	
6.	Kamubanga Fred C	M	DE	
7.	Kakande Gerald	M	SWO	
8.	Ahimbisibwe Bosco	M	For SAS Company	
9.	Friday Alex	M	Probation officer	
10.	Kamba George	M	Head of Finance	
11.	Isingoma Sam	M	Secretary for Health	
12.	Nankya Dorothy	F	DNRO	



Date: 9 May 2017 Locality of Meeting: Kyankwanzi District Head Quarters

Meeting ID:
Project Name:

Meeting attendance list

13.	SSengonjo Robert	M		Executive	
14.	Lubulwa Edward	M		Internal Audit Dept	
15.	SSALI GODFREY	M		SEC/CAO	
16.	NAKAMATUKA ALICE	F		LECTURER CAO/DCAO	
17.	Ssebaggala W	District Planner	M		
18.	Nabulwanya Christine	ATO	F		
19.	Ayulegaha	DTE	M		
20.	Magomelo Robert		M		
21.					
22.					
23.					
24.					
25.					

Mubende District Technical Planning Committee, Health Authorities and Political Leaders

Country: UGANDA City/town/village: Mubende Easting (X): Northing (Y):

Date: 21st April 2017 Template filled in by:

Names of organisations/localities:

Mubende District Local Government

Number of attendees:

Notes/reasons for interacting:

STAKEHOLDER INFORMATION

First name	Last name	Gender	Position	Organisation	Contact details
Robert	Ssenyonjo	M	Biostatistician	Mubende DLG	07015382 07765382
[illegible]	Nakamatuka	F	[illegible] FP	Mubende DLG	[illegible]
Wilson	Mubiru	M	DHO	Mubende DLG	0772-6705 07[illegible]-9619

To be sent to Grace Rigby (GRig

CRUDE OIL PIPELINE

Date: [illegible]

Locality of Meeting: [illegible]

RSK

Meeting ID:

Project Name: [illegible]

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	[illegible]	M	[illegible]	
2.	[illegible]	M	[illegible]	
3.	[illegible]	M	[illegible]	
4.	[illegible]	M	[illegible]	
5.	[illegible]	M	[illegible]	
6.	[illegible]	F	[illegible]	
7.	[illegible]	M	[illegible]	
8.	[illegible]	M	[illegible]	
9.	[illegible]	M	[illegible]	
10.	[illegible]	M	[illegible]	
11.	[illegible]	M	[illegible]	
12.	[illegible]	M	[illegible]	

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

Meeting ID:

Project Name:

Meeting attendance list

13.	BALINDA KHASSIM	M	INSPECTOR OF SCHOOLS	
14.	SSERUBOGE JAMES	M	AG. DISTRICT PRODUCTION OFFICER	
15.	NFUNDO LA PASCHALINE	M	Kitenga Subcounty Secretary	
16.	Beyunga Moses	F	RDC - Masaka	
17.	[illegible]	M	Sec for Planning	
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				

Gomba District Technical Planning Committee, Health Authorities and Political Leaders

Country: UGANDA | City/town/village: GOMBA | Easting (X): | Northing (Y):

Date: | Template filled in by:

Names of organisations/localities:

GOMBA DISTRICT LOCAL GOVERNMENT

Number of attendees:

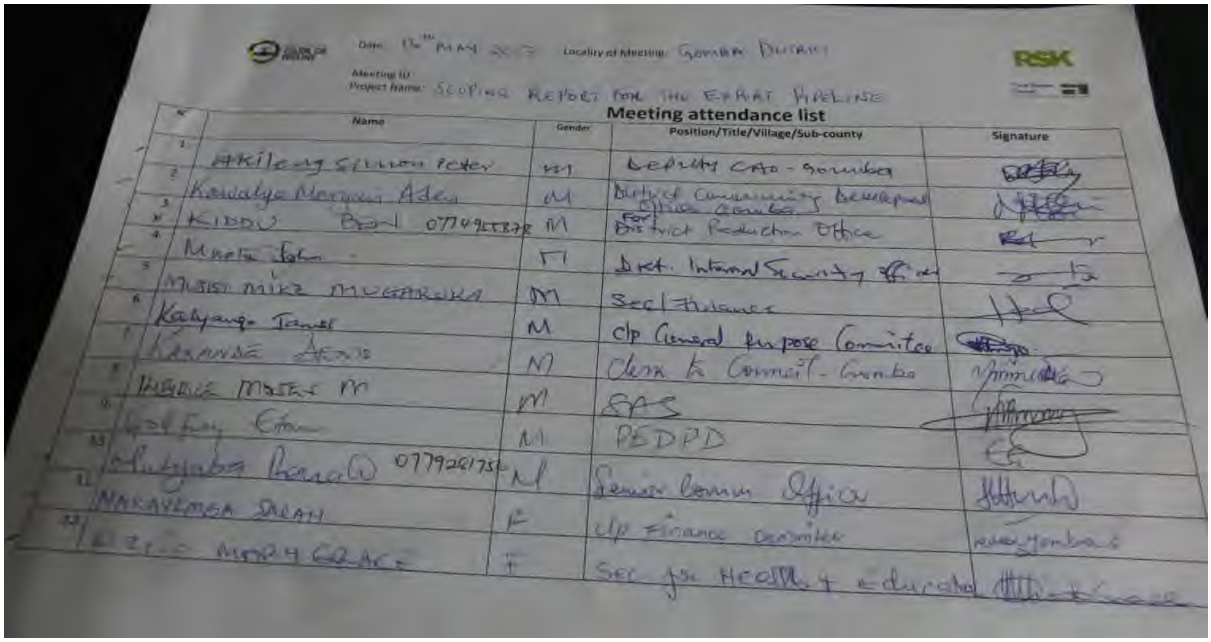
Notes/reasons for interacting:

STAKEHOLDER INFORMATION

First name	Last name	Gender	Position	Organisation	Contact details
FRED	MUGERA	M	[illegible]	[illegible] GOMBA DISTRICT	07710[illegible]
Christine	KATUREEBE	F	AHHO-MCH	Gomba District	07[illegible]

To be sent to Grace Rigby (GRigby@rsk.co.uk)

RSK



Date: 15th MAY 2023 Locality of Meeting: GOMBA DISTRICT

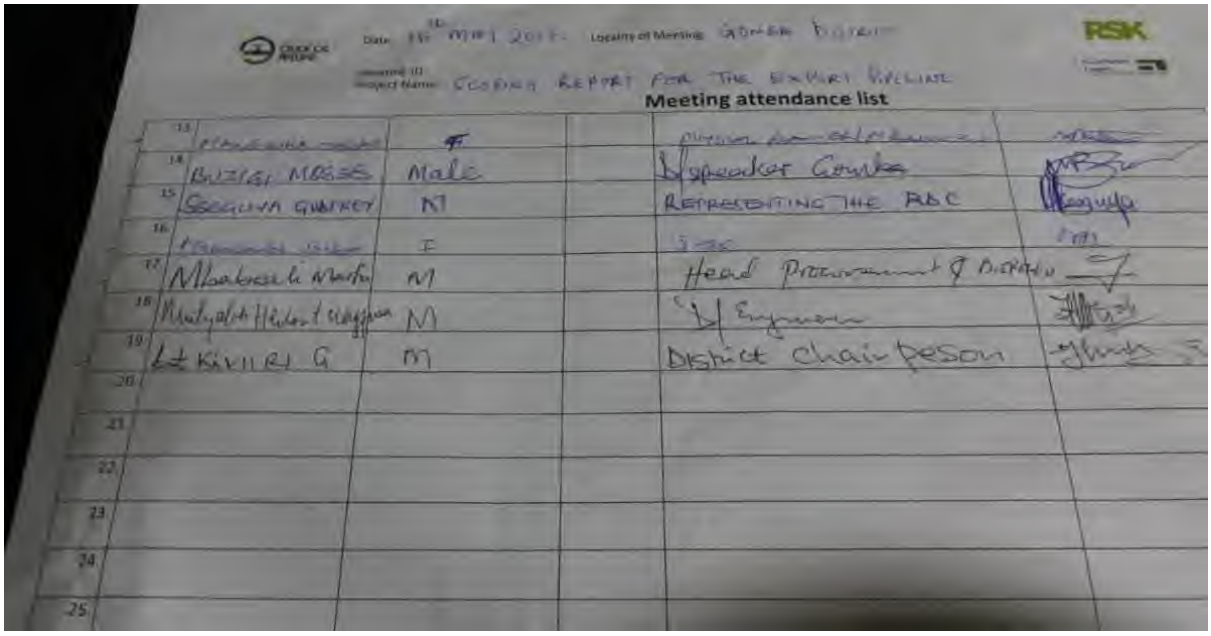
Meeting ID

Project Name: SCOPING REPORT FOR THE EACOP PIPELINE

RSK

Meeting attendance list

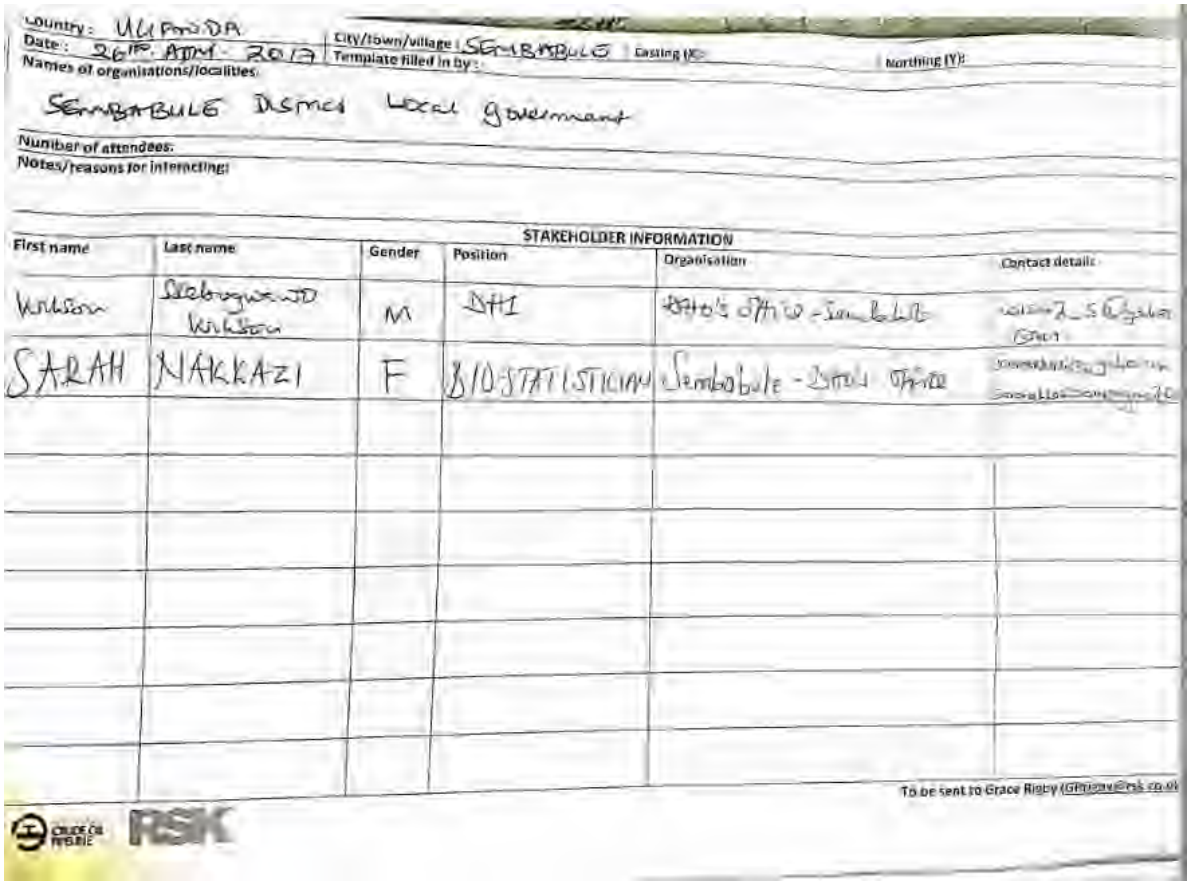
#	Name	Gender	Position/Title/Village/Sub-county	Signature
1	AKileng Sillion Peter	M	Deputy CAO - Gomba	
2	Kawalya Morgan Ades	M	District Community Development Officer Gomba	
3	KIDDU Brad 0774[illegible]	M	For District Production Office	
4	Mwesa John	M	Dist. Internal Security Officer	
5	MUSISI MIKE MUGERWA	M	Secl Finance	
6	Kalyango Jamal	M	clp General purpose Committee	
7	Kasanse Denis	M	Clerk to Council - Gomba	
8	Patrick Mbale M	M	SAS	
9	Godfrey Edau	M	PEDPO	
10	Ssebyobo Ronald 0779281756	M	Senior Comm Officer	
11	NAKAYEMBA SARAH	F	clp Finance Committee	
12	[illegible]	F	Sec for Health & Educatio	



Meeting attendance list

13	[illegible]	F	[illegible]	[illegible]
14	BUZIGI MOSES	Male	Speaker Cowks	
15	SSEGUYA GODFREY	M	REPRESENTING THE RDC	
16	[illegible]	F	[illegible]	[illegible]
17	Mbabazi Martin	M	Head Procurement & District	
18	Mutyaba Hellen Teopista	M	[illegible] Engineer	
19	Lt KIYIRI G	M	District Chairperson	
20				
21				
22				
23				
24				
25				

Sembabule District Technical Planning Committee, Health Authorities and Political Leaders



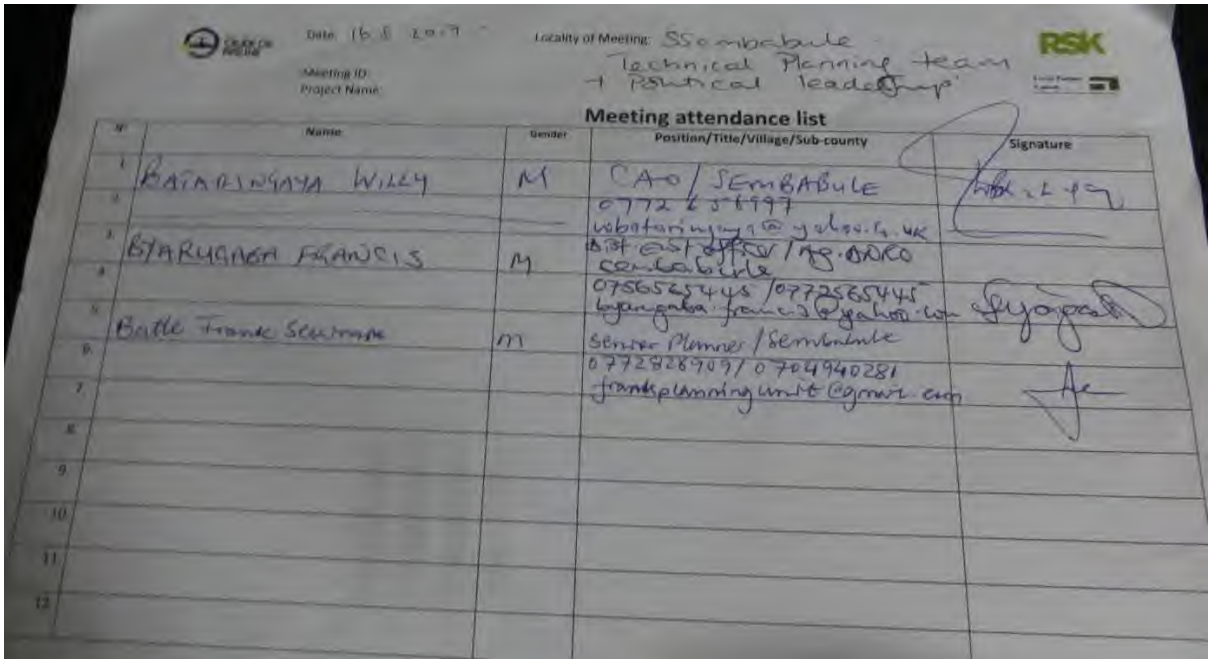
Country: UGANDA
Date: 26TH APRIL 2017
City/town/village: SEMBABULE
Easting (X):
Northing (Y):
Template filled in by:
Names of organisations/localities:
SEMBABULE DISTRICT LOCAL GOVERNMENT
Number of attendees:
Notes/reasons for interacting:

STAKEHOLDER INFORMATION

First name	Last name	Gender	Position	Organisation	Contact details
Wilson	Ssebagwanto Wilson	M	DHI	DHO's Office - Sembabule	[illegible]
SARAH	NAKKAZI	F	D/DISTRICT STATISTICIAN	Sembabule - District Office	[illegible]

To be sent to Grace Rigby (GRigby@rsk.co.uk)

Grace Rigby RSK



Date: 16.8.2017 Locality of Meeting: Ssembabule Technical Planning team + Political leadership

Meeting ID:
Project Name:

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
1	BAHARINGAYA WILLY	M	CAO / SEMBABULE 0772 [illegible] 997 [illegible]	
2				
3	BYARUGABA FRANCIS	M	DIST EST OFFICER / MBARARA CONSULTANT 0756565445 / 0772565445 byarugaba.francis@yahoo.co.uk	
4				
5	Batte Frank Ssekimpi	m	Senior Planner / Sembabule 0772989097 / 0704940281 franksplanningunit@gmail.com	
6				
7				
8				
9				
10				
11				
12				

Lwengo District Technical Planning Committee, Health Authorities and Political Leaders

Country: UGANDA Date: City/town/village: LWENGO Easting (X): Northing (Y):

Template filled in by: [illegible]

Names of organisations/localities: LWENGO DISTRICT LOCAL GOVT

Number of attendees:

Notes/reasons for interacting:

STAKEHOLDER INFORMATION

First name	Last name	Gender	Position	Organisation	Contact details
HAKAWOOTA	IDAMITAH	F	BIOSTATISTICIAN	LWENGO DISTRICT LOCAL GOVT	0789 046961 / 0703924750
MUGABI	DAVID	M	DISTRICT HEALTH INSPECTOR	LWENGO DISTRICT LOCAL GOVERNMENT	[illegible]
					0772374562
					0700545231
					[illegible] @gmail.com
JOSEPH	[illegible]	M	DHO	LWENGO DLG	0701 [illegible]
					[illegible]

To be sent to Grace Ngoy (Gitnoy@rsk.co.uk)

GRACE ON PURPOSE RSK

Date: [illegible] Locality of Meeting: [illegible]

Meeting ID:
Project Name: [illegible]

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
1	[illegible]	M	[illegible]	
2	[illegible]	M	[illegible]	
3	[illegible]	M	[illegible]	
4	[illegible]	M	[illegible]	
5	[illegible]	F	[illegible]	
6	[illegible]	M	[illegible]	
7	[illegible]	M	[illegible]	
8	[illegible]	M	[illegible]	
9	[illegible]	F	[illegible]	
10	[illegible]	M	[illegible]	
11	Odonga David	M	Physical Planner	
12	[illegible]	F	[illegible]	

Date:

Locality of Meeting:

Meeting ID:
Project Name:

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
13	[illegible]	M	[illegible]	
14	[illegible]	F	[illegible]	
15	[illegible]	M	[illegible]	
16	[illegible]	M	[illegible]	
17	[illegible]	F	[illegible]	
18	[illegible]	F	[illegible]	
19	[illegible]	M	[illegible]	
20	[illegible]	M	[illegible]	
21	[illegible]	M	[illegible]	
22	[illegible]	F	[illegible]	
23	[illegible]	F	[illegible]	
24	[illegible]	M	[illegible]	
25	[illegible]	F	[illegible]	
	Mubiru Isma	M	HR	
	[illegible]	M	[illegible]	

Rakai District Technical Planning Committee, Health Authorities and Political Leaders

Country: UGANDA | City/town/village: RAKAI | Easting (X): | Northing (Y):
Date: 28th APR. 2017 | Template filled in by:
Names of organizations/localities: RAKAI DISTRICT LOCAL GOVERNMENT
Number of attendees:
Notes/reasons for interacting:

STAKEHOLDER INFORMATION

First name	Last name	Gender	Position	Organisation	Contact details
Iludia	Nakayote	F	Statistician	Rakai DLG	0704970824
HARRIET	NAKAFEERO	F	HEALTH INSPECTOR	RAKAI DLG	0771 [illegible]
RASTO	Kaweesa Mulungi	M	ADHO	RAKAI DLG	0701 [illegible]

To be sent to Grace Rigby (GRrigby@rsk.co.uk)

Date: 18th MAY 2017 | Locality of Meeting: RAKAI DISTRICT HEADQUARTERS
Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county / CONTACT DETAILS	Signature
1.	Benon MUGABI	M	District C/person Rakai	
2.			benonmugabi54@gmail.com	
3.			0758416059	
4.	LUBEGA IN YUSUFU	M	DAO / AgPAO Rakai	
5.			yubeka@gmail.com	
6.	Bukenya Idris K	M	D/CAO	
7.			0772559435	
8.	Mulumba Deogratias	M	DCDO 0772983507	
9.	Mukenya Rasto K	M	ADHO RAKAI	0704661416
10.	Nanyanja Rahie	F	SCDO Rakai	
11.	SSekyondwa Lawrence	M	EO	
12.	MUGWANYA MICHAEL	M	S STAFF ADMIN DEPARTMENT	

CRUDE OIL PIPELINE

Date: 18th MAY 2017 Locality of Meeting: RAKAI DISTRICT HEADQUARTERS

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

13	Kimbowa TB	0772624431	Male	Ag Assistant police officer	
14	Ihaweesa Godfrey	0782408956	Male	Lobo - Lwanda	
15	Kimmira Stephen	0759144847	Male	District Water officer	
16	Matovu James	0772961340	M	Ag Head of Finance	
17	Nakabuye Olivia	0772686400	Female	District Accountant	
18	Namwenge Betty	0774146611	Female	Senior Records officer	
19	Nannuli Paula	0703037614	Female	Finance Committee	
20	Ssabiiti Peter	0774355777	Male	District Health officer	
21	Nabbakooza Josephine	0703067035	Female	District Woman Councillor	
22	Bakkabulindwa Godfrey	0782386689	Male	District Councillor Rakai	
23	Bamuloosa Joseph	0756550894	Male	District Councillor	
24	Matovu William Tumwesigye	0759466451	Male	District councillor	
25	Namato Margret	0701095367	Female	"	

CRUDE OIL PIPELINE

Date: 18TH MAY 2017 Locality of Meeting: RAKAI DISTRICT

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Mugisha Paul	M	Community Liaison officer	
2.	Kyazike M. Esther	F	see	
3.	Lwanga Chris	M	Secretary finance	
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				

SUBCOUNTY MEETINGS

Buseruka Subcounty

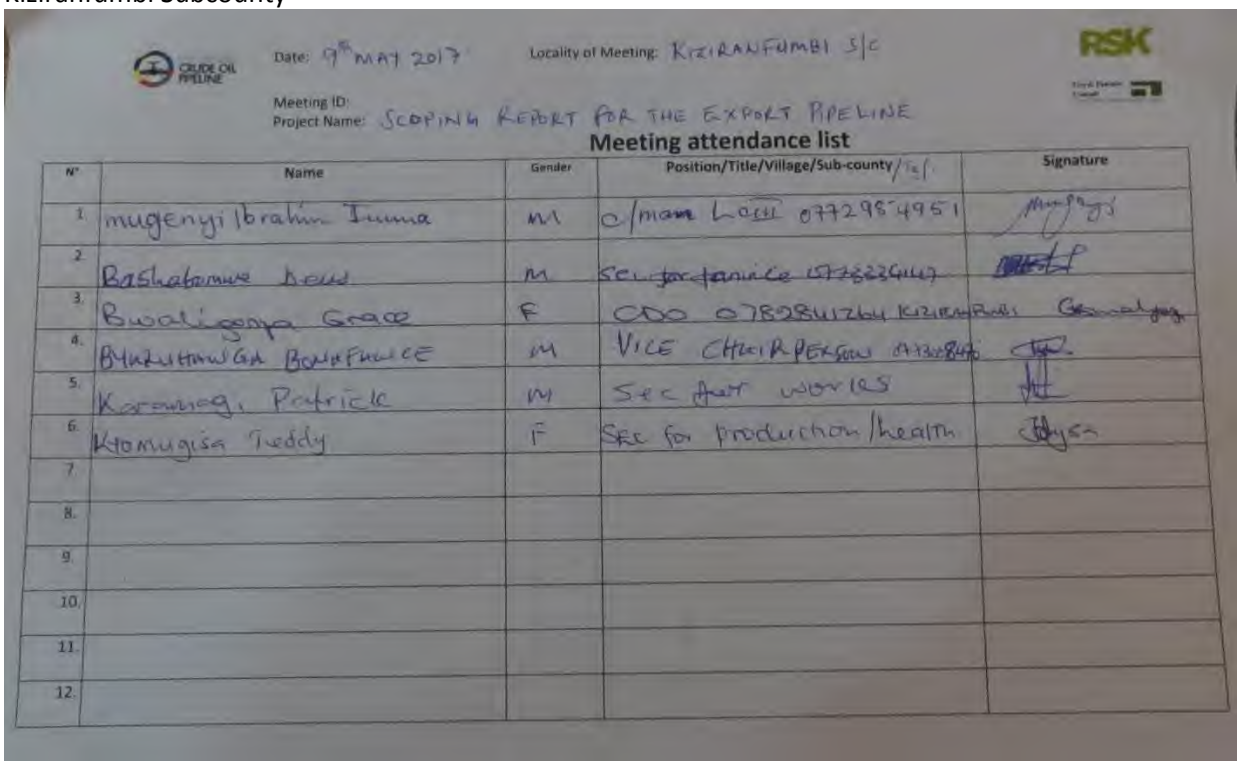
Date: 8TH MAY 2017. Locality of Meeting: BUSERUKA S/C HEADQUARTER

Meeting ID:
Project Name: SCOPING REPORT FOR THE FEEDER PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	KASEKU AUNET 0756654591 0778735921	F	WOMAN COUNCILLOR KABAHLE PARISH/ VICE CHAIRPERSON LC III BUSERUKA S/C	
2.	NYAMAZABU PEISCH 0755908624	F	FEMALE YOUTH COUNCILLOR SEC for Gender & WOMEN	
3.	KASIGWA RASHID 0777128435	M	PARISH Chief KABAHALE, BUSERUKA S/C	
4.	BUSINGE RUSOKOZA WILFRED 0772340930	M	Sub Accountant. Buseruka S/C	
5.	TUMUHAMWE DAVIS	M	Parish chief Nyakabingo	
6.	TIBAIJUKA JOHNBOSCO 0782555604	M	HTR BUSERUKA S.S	
7.	PACUTHO JUSTINE 0773558666	F	SECRETARY BUSERUKA S/C	
8.	AMARTHA CAB 0752114928	M	C/P Disability Buseruka S/C	
9.	BENJO SIRASI	M	MAKE YOUTH COUNCILOR EDUCATIONAL SECTOR SEC.	
10.	TINKAMANYIRE ALI 0772501622	M	C/PERSON III BUSERUKA S/C 0774487599	
11.	MUSINGUZI MOSES 0772471378	M	SAS BUSERUKA	
12.	KIBURARA JOHN 0772916167	M	FISHERIES OFFICER	

Kiziranfumbi Subcounty



Date: 9TH MAY 2017 Locality of Meeting: KIZIRANFUMBI S/C

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	mugenyi Ibrahim Iruma	M	c/man LCIII 0772984951	
2.	Bashabomwe Dew	M	Sec for finance 0782234147	
3.	Bwaliggya Grace	F	CDO 0782841264 KIZIRANFUMBI	
4.	BYAKUTAMWIGA BONIFANCE	M	VICE CHAIRPERSON 0782841264	
5.	Karamagi Patrick	M	SEC for WORKS	
6.	Kyomugisa Teddy	F	SEC for production/health	
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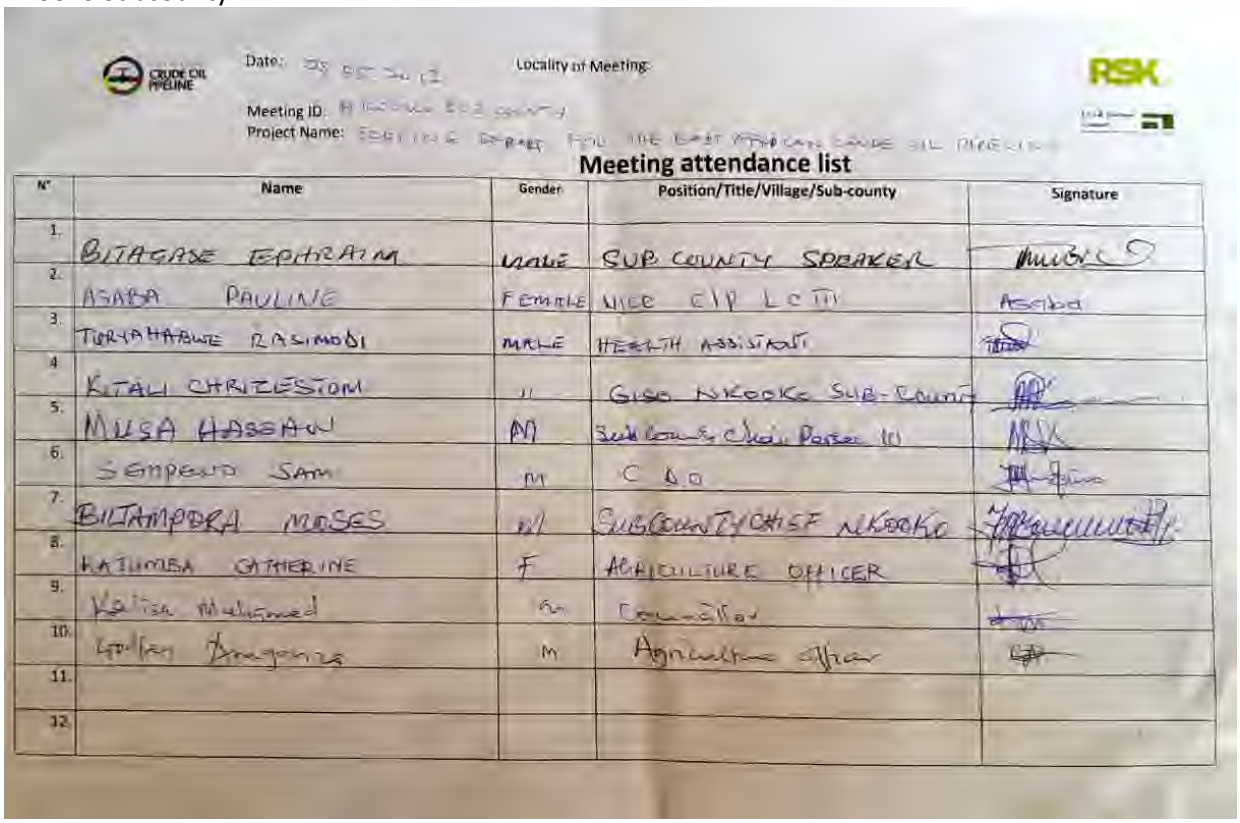
Nkooko Subcounty



CRUDE OIL PIPELINE

Date: 05 DEC 2017 Locality of Meeting:

Meeting ID: NKOOKO SUB COUNTY

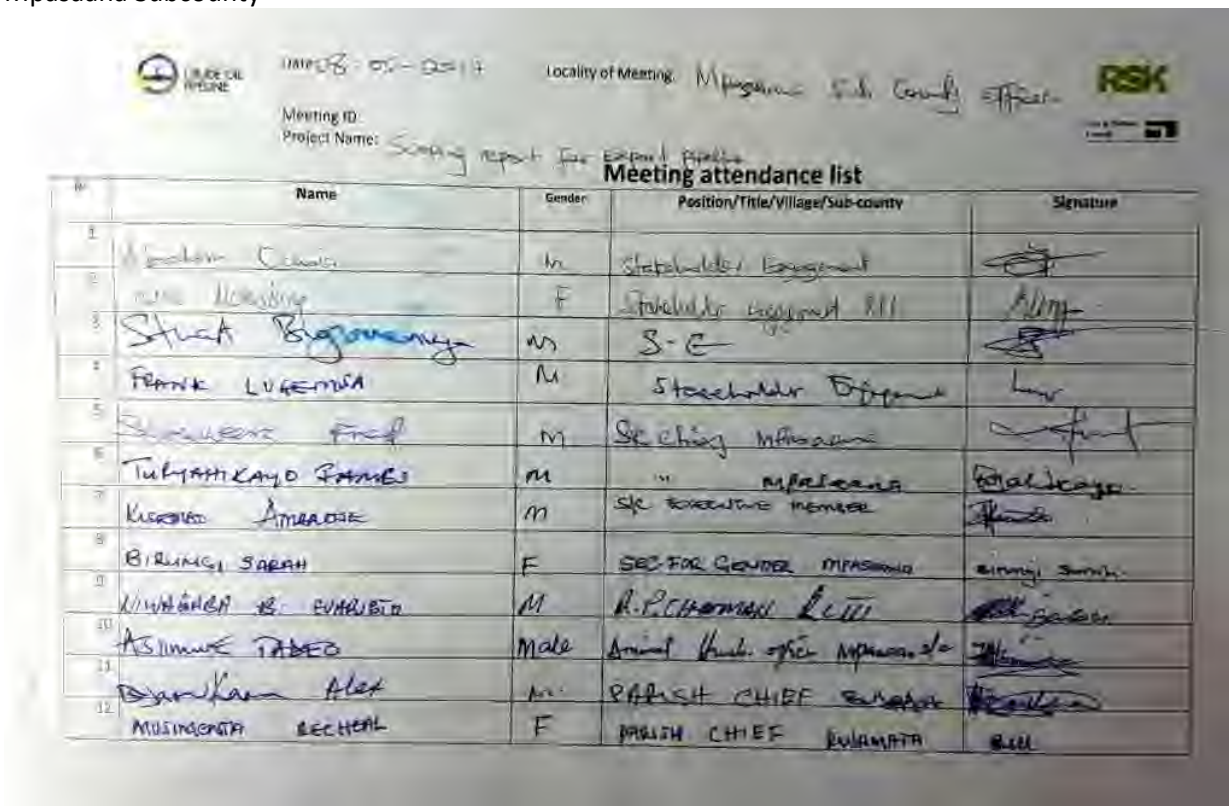
Project Name: SCOPING REPORT FOR THE EAST AFRICAN CRUDE OIL PIPELINE

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	BIYAGAZE EPHRAIM	MALE	SUB COUNTY SPEAKER	
2.	ASABA PAULINE	FEMALE	VICE CIP LC III	
3.	TURYAHABWE RASIMODI	MALE	HEALTH ASSISTANT	
4	KITALI CHRIZESTOM	"	GISO NKOOKO SUB-COUNTY	
5.	MUSA HASSAN	M	Sub County Chief Parish III	
6.	SEMPEWO SAM	M	C D O	
7.	BITAMPORA MOSES	M	SUBCOUNTY CHIEF NKOOKO	
8.	NAIUMBA CATHERINE	F	AGRICULTURE OFFICER	
9.	Kalisa Muhamed	M	Councillor	
10.	Godfrey Bwogora	M	Agriculture officer	
11.				
12.				

Mpasaana Subcounty



CRUDE OIL PIPELINE

Date: 28-05-2017 Locality of Meeting: Mpasaana Sub County Office

RSK

Meeting ID:

Project Name: Scoping report for Export Pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	Nyakana Dennis	M	Stakeholder Engagement	
2	Nuwagira Hellen	F	Stakeholder Engagement Ass	
3	Stuart Byagwaneza	M	S-E	
4	FRANK LUGEMWA	M	Stakeholder Engagement	
5	Bwambale Fred	M	Scribing Mpasaana	
6	TURYAHIKAYO FAMES	M	" Mpasaana	
7	KUGONZA AMBROSE	M	SIC EXECUTIVE MEMBER	
8	BIRUNGI SARAH	F	SEC FOR GENDER MPASAANA	
9	KWAGARA B. EVARISTO	M	R.P.CHAIRMAN LCIII	
10	ASIIMWE TABEO	Male	Animal Husb. offic Mpasaana S/c	
11	Byamukama Alex	M	PARISH CHIEF BUKABOOLE	
12	MUSINGUZA BECHEAL	F	PARISH CHIEF KWAMATA	

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

Meeting ID:

Project Name:

Meeting attendance list

13.	Twijumuze	Vanansio	M	C/man Nkm mpansa S/C	
14.	Venansio	Twijumuze	M	Councillor.	
15.	TUSHABOMWE	OBED	M	D/C - mpazzana s/c	
16.	Peace Purisi		F	councillor Binikwa	Peace
17.					
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Kisiita Subcounty

CRUDE OIL PIPELINE

Date: 05-05-2017

Locality of Meeting: Kisiita Sub County offices.

RSK

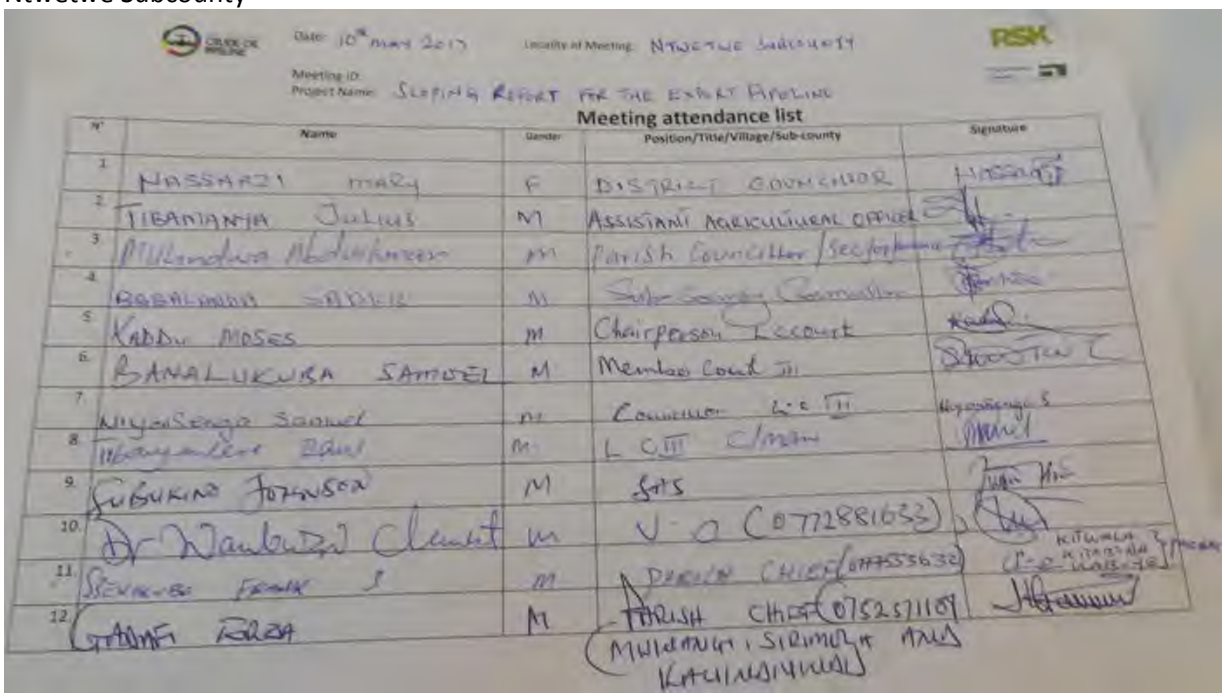
Meeting ID:

Project Name: Scoping report for the feeder Pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Ivan Lwanyaga	male	Sclchief / Ag. Town clerk	
2.	WAMALA EDWARD	MALE	Assistant Kisiita	
3.	Banongo Julius	male	Cllr Kisiita/Kahikara	
4.	MSEKEDO RUSICO	Male	Kfm	
5.	[illegible] JUSTINE	FEMALE	NURSING OFFICER KISIITA HCIII	
6.	NAKAKWA DOREEN	FEMALE	OFFICE ATTENDANT	
7.	BAKAMWESA DOREEN	FEMALE	DC KISIITA POLICE STATION	
8.	[illegible] James	M	Councillor	
9.	NAIWUKO CAROLINE	FEMALE	AGRICULTURE OFFICER	
10.	[illegible]	M	Sec Finance & Planning Kisiita	
11.	AMPA JACKSON	MALE	LC 3 Kisiita	
12.				

Ntwetwe Subcounty



Date: 10th May 2017 Locality of Meeting: NTWETWE SUBCOUNTY

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPART PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	NASSAAZI MARY	F	DISTRICT COUNCILLOR	
2.	TIBAMANYA JULIUS	M	ASSISTANT AGRICULTURAL OFFICER	
3.	MULondwa Abdulkareem	M	Parish Councillor/Secretary	
4.	BABALANDA ABDU	M	Sub County Councillor	
5.	KADDU MOSES	M	Chairperson LCCourt	
6.	BANALUKWA SAMUEL	M	Member Court III	
7.	NIyonSenga Samuel	M	Councillor L.C III	
8.	Mbanyalera Paul	M	L C III C/man	
9.	SUBUKWA JOHNSON	M	SAS	
10.	Dr Wambuzi Claudi	M	V.O (0772881633)	
11.	SSEMWOGERERE FRANK	M	PARISH CHIEF (0775556326)	
12.	[illegible]	M	PARISH CHIEF (0752571109) (MWIDANGA, SIRIMIZA AND KACHWASIYAMBI)	

KITUMBA S/A NTWETWE SUB-COUNTY

Date: 10-05-2017 Locality of Meeting: Ntwetwe Sub County Kyankwanzi District

Meeting ID:
Project Name:

Meeting attendance list

13.	Mukardengo Edgar		F	Member Local Council court	
14.					
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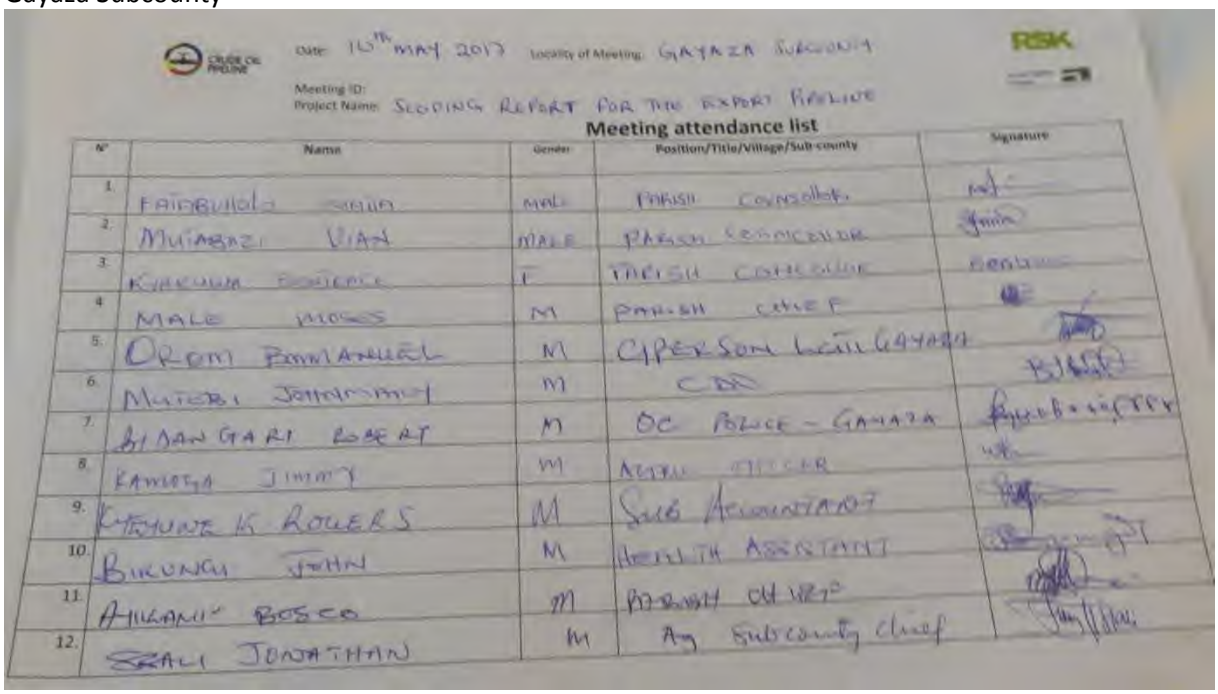
Gayaza Subcounty



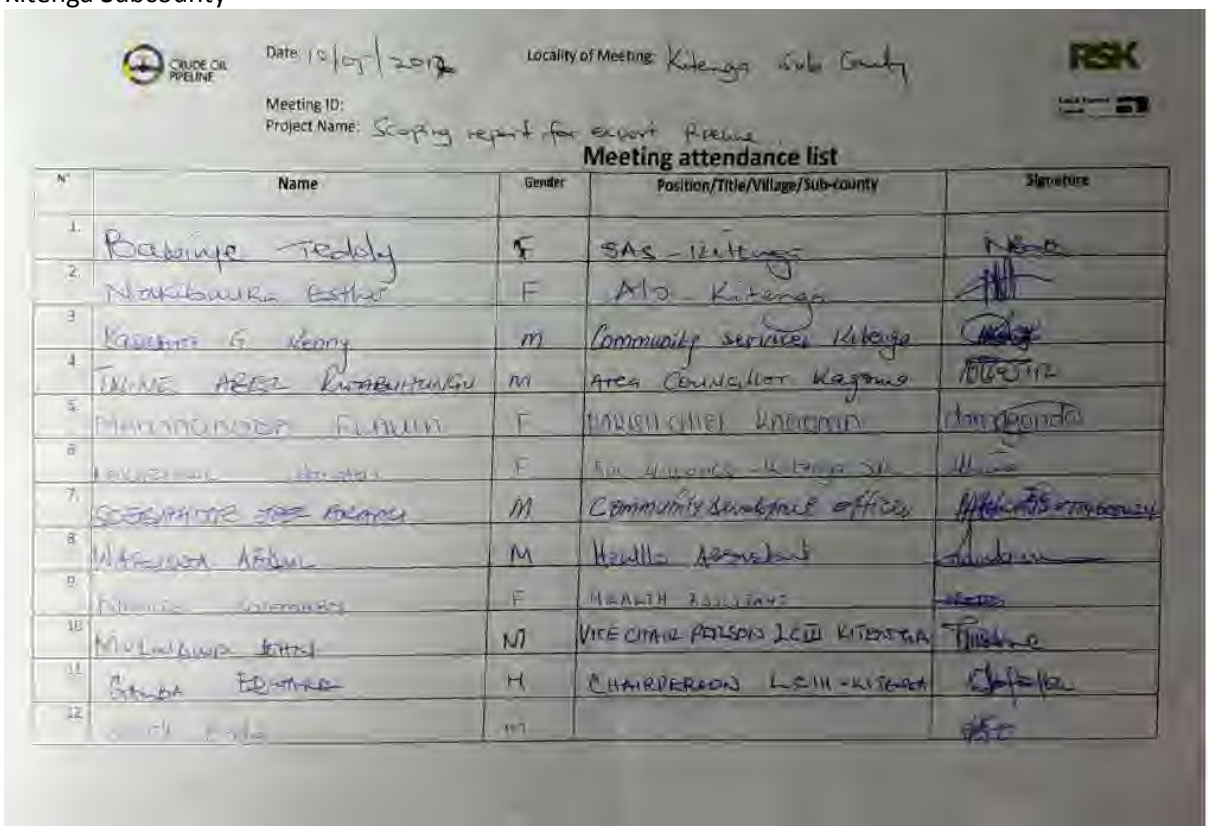
Date: 16th MAY 2017 Locality of Meeting: GAYAZA SUBCOUNTY

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	FAIDBULLAH [illegible]	MALE	PARISH COUNSELLOR	
2.	MUIMBAZI VIAN	MALE	PARISH [illegible]	
3.	KYAKUWA [illegible]	F	PARISH COUNCILLOR	
4.	MALE MOSES	M	PARISH CHIEF	
5.	OROM EMMANUEL	M	CIPER SOM LCIII GAYAZA	
6.	MUTEBI JOHNMARY	M	CDR	
7.	BISANGARI ROBERT	M	OC POLICE - GAYAZA	
8.	KAMUGA JIMMY	M	[illegible]	
9.	KYEYUNE K ROGERS	M	SUB ACCOUNTANT	
10.	BIKUNGU JOHN	M	HEALTH ASSISTANT	
11.	AMUGANI BOSCO	M	PARISH CHIEF	
12.	SSALI JONATHAN	M	Ag Subcounty chief	

Kitenga Subcounty



Date: 10/07/2017 Locality of Meeting: Kitenga Sub County

Meeting ID:
Project Name: Scoping report for export Pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Babirye Teddy	F	SAS - Kitenga	
2.	Nakibuuka Esther	F	AO - Kitenga	
3.	Kabenge G. Kenny	M	Community services Kitenga	
4.	Tumwe Abel Kwebihungu	M	ATC Councillor Kagoma	
5.	[illegible]	F	Parish Chief Kitenga	
6.	[illegible]	F	[illegible]	
7.	[illegible]	M	Community Development officer	
8.	[illegible]	M	Health Assistant	
9.	[illegible]	F	Health Assistant	
10.	[illegible]	M	Vice Chair Person LCIII Kitenga	
11.	[illegible]	M	Chairperson LCIII - Kitenga	
12.	[illegible]	M		

Madudu Subcounty

CRUDE OIL PIPELINE

Date: 10/05/2017 Locality of Meeting: Madudu Sub County

RSK

Meeting ID:

Project Name: Scoping report for Export Pipeline

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	NKaluba Judah	M	SAS MAHAU SUBCOUNTY	
2.	Hakiganaye Edward	M	C/Person LC III Madudu	
3.		M	Senior Production Officer	
4.		M	SEC Works & Technical	
5.		F	SEC for Education	
6.		F		
7.		F	Community Development Officer	
8.		M	P/C Kibuukamaliro	
9.	NSAMBA HENRY	M	HEALTH ASSISTANT	
10.		M	Parish Chief	
11.		M	Police Attendant	
12.		M	Secretary Finance	

Butoloogo Subcounty

CRUDE OIL PIPELINE

Date: 11/05/2017 Locality of Meeting: Butoloogo Sub County

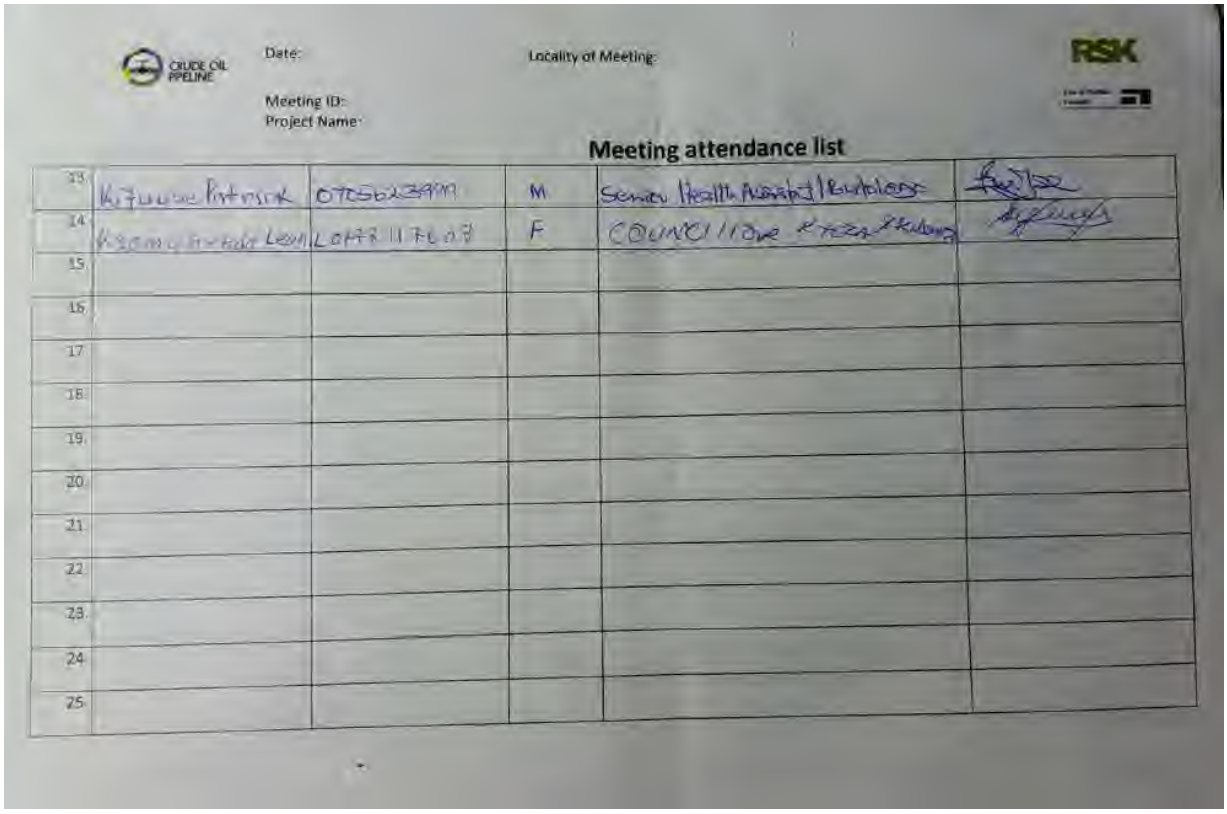
RSK

Meeting ID:

Project Name: Scoping report for export pipeline

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
1.		M	Environmental Officer	
2.		M	Chief Land Valuer	
3.		M	C/Person LC III Butoloogo	
4.		M	Councillor Kyegegwa	
5.		M	S/C Town Council Butoloogo	
6.		M	DEO Butoloogo Sub county	
7.		M	Agricultural Officer Butoloogo	
8.		M	FEDPD Specialist	
9.		M	Health worker Butoloogo HC	
10.		M		
11.		M		
12.		M		



CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

Meeting ID:
Project Name:

Meeting attendance list

	Name		Gender	Position/Title/Village/Sub-county	Signature
13	[illegible]	0705623990	M	Senior Health Assistant/Environ	
14	[illegible]	[illegible]	F	COUNCILLOR [illegible]	
15					
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Maddu Subcounty

CRUDE OIL PIPELINE

Date: [illegible]

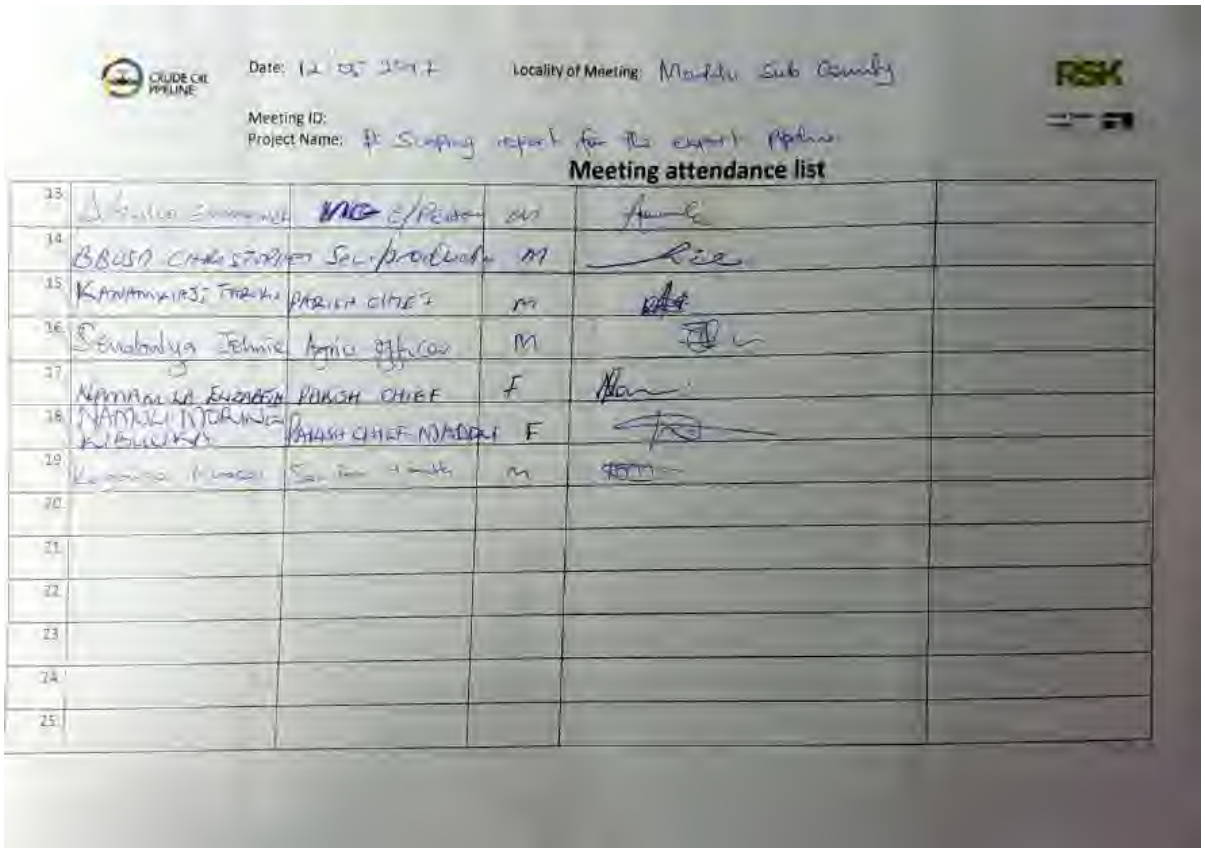
Locality of Meeting: Maddu Sub-county

RSK

Meeting ID:
Project Name: Stakeholder meeting in the Kenya Pipeline

Meeting attendance list

	Name	Gender	Position/Title/Village/Sub-county	Signature
1	[illegible]	M	Sub-county Medical Officer of Health	
2	[illegible]	M	Speaker Maddu S/C	
3	[illegible]	M	Chairman LC3 Maddu S/C	
4	KYOMYA MARIAM REBECCA	F	Secretary Works	
5	[illegible]	F	[illegible]	
6	[illegible]	F	[illegible]	
7	[illegible]	F	[illegible]	
8	[illegible]	M	Pharmacist [illegible]	
9	[illegible]	M	Parish chief Ingalagala	
10	[illegible]	M	Health Asst	
11	[illegible]	M	RDC Maddu	
12	[illegible]	M	Sec SC	



Date: 12 05 2017 Locality of Meeting: Mwaku Sub County

Meeting ID:
Project Name: ESIA Scoping report for the export Pipeline

Meeting attendance list

13	[illegible]	[illegible] C/Person	[illegible]		
14	BAGSA CHARLES STANLEY	Sec. Production	M		
15	KANYAMANJI THOMAS	PARISH CHIEF	M		
16	Ssebabulya Jethro	Agric Officer	M		
17	NAMWAMA ELIZABETH	PARISH CHIEF	F		
18	NAMAGGI MARIAM KIBUUKA	PARISH CHIEF NJADDA	F		
19	[illegible]	[illegible]	M		
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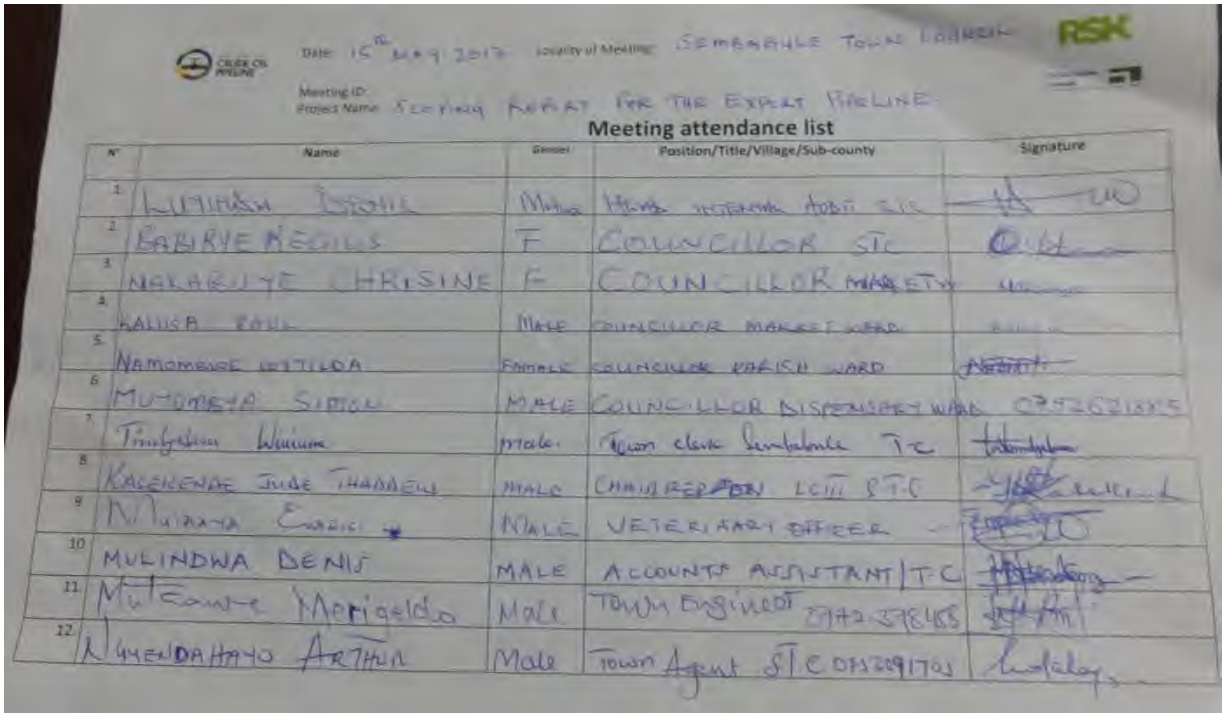
Sembabule Town Council

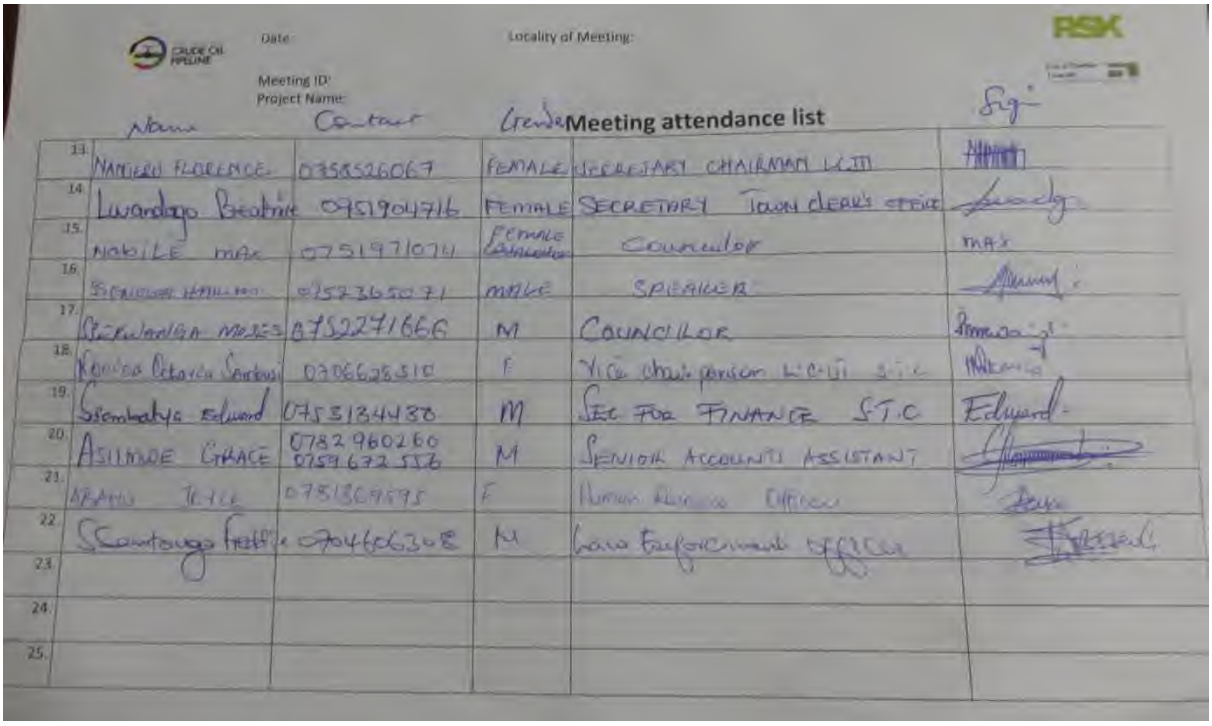


Date: 15th MAY 2017 Locality of Meeting: SEMBABULE TOWN COUNCIL

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	LUMUMBA [illegible]	Male	[illegible]	
2	BABIRYE MECCIAS	F	COUNCILLOR STC	
3	NAKABUYE CHRISINE	F	COUNCILLOR MARKET	
4	KALUSA [illegible]	MALE	COUNCILLOR MARKET WARD	
5	NAMOMBWE MATILDA	FEMALE	COUNCILLOR PARISH WARD	
6	MUTUMBA SIDIQU	MALE	COUNCILLOR DISPENSARY WARD	0752621815
7	Tinkyekwa William	male	Town clerk Sembabule TC	
8	KASEKENDE JUDE THADDEUS	MALE	CHAIRPERSON LCIII S.T.C	
9	NUWAMA [illegible]	MALE	VETERINARY OFFICER	
10	MULINDWA DENIS	MALE	ACCOUNTS ASSISTANT/T.C	
11	Mutamba Mariqelda	Male	TOWN ENGINEER	0742-378485
12	NUWENDAHAYO ARTHUR	Male	Town Agent ST.C	0752091705



Date: Locality of Meeting:

Meeting ID:
Project Name:

Meeting attendance list

	Name	Contact	Gender		Sig
13.	NAMUEDU FLORENCE	0755526067	FEMALE	SECRETARY CHAIRMAN LC III	
14.	Lwandogo Beatrice	0751904716	FEMALE	SECRETARY TOWN CLERK'S OFFICE	
15.	NABILE MAX	0751971074	FEMALE	Councilor	MAX
16.		0758365071	MALE	SPEAKER	
17.		0752271666	M	COUNCILOR	
18.		0706626510	F	Vice chairperson LC-III S.C.	
19.	Ssembatya Eduard	0753134430	M	SEC FOR FINANCE ST.C	Eduard
20.	ASIIMWE GRACE	0782960260 0759672556	M	SENIOR ACCOUNTS ASSISTANT	
21.		0751309595	F	Human Resource Officer	
22	SSantongo	0704606308	M	Local Enforcement officer	
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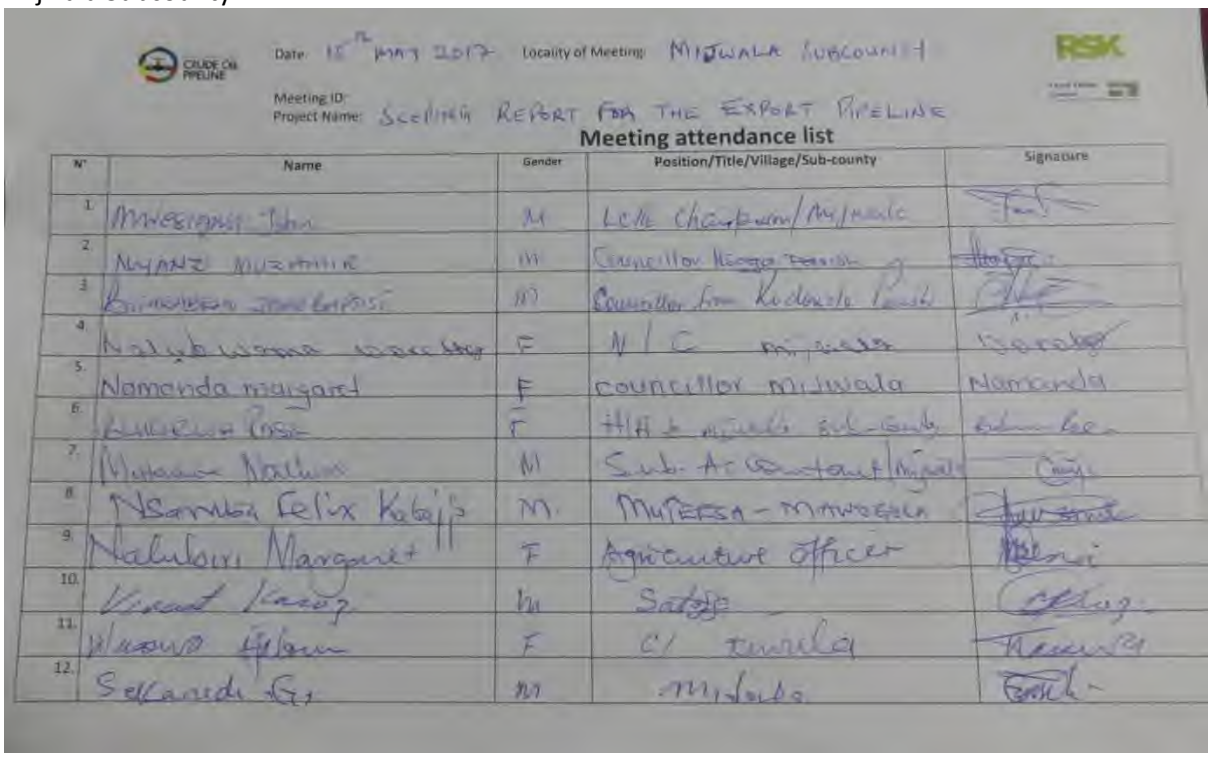
Mijwala Subcounty

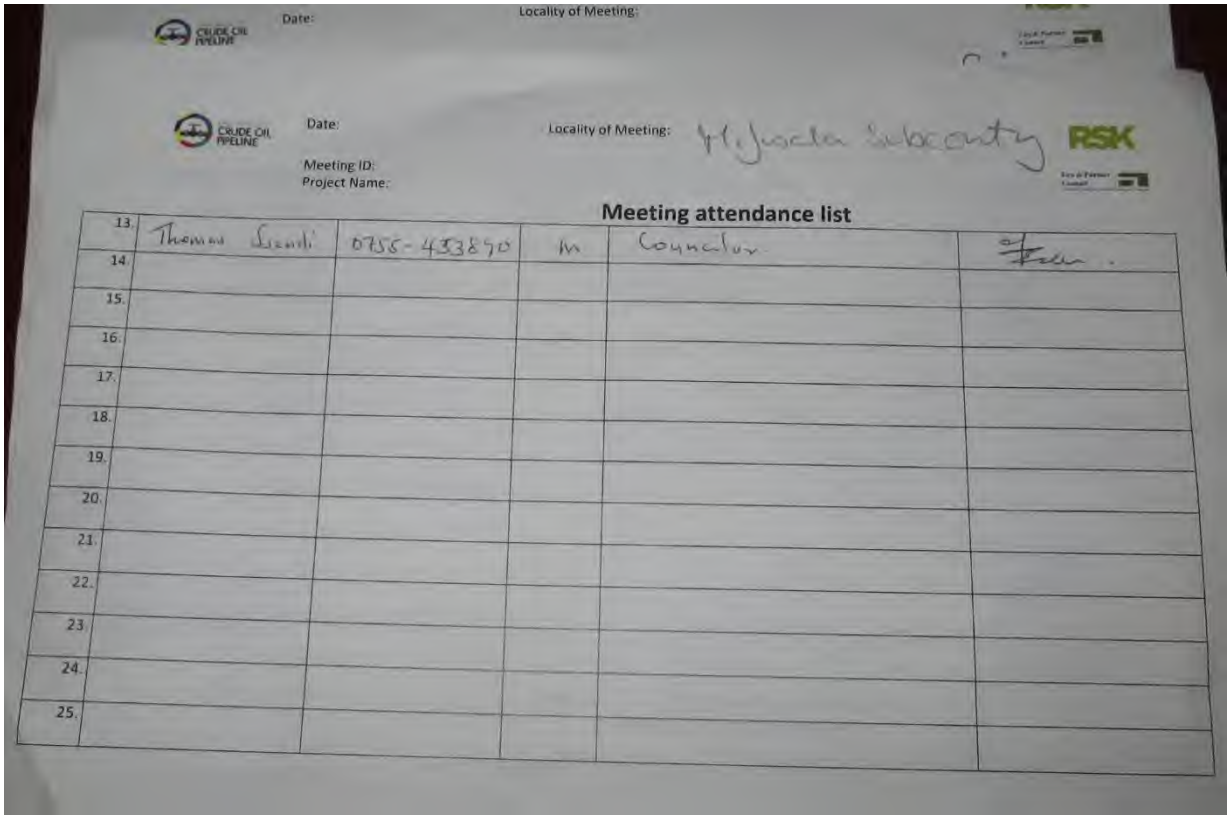


Date: 15th MAY 2017 Locality of Meeting: MIJWALA SUBCOUNTY

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.		M	LCIII Chairperson/Mijwala	
2.	NYANZI MUZAMILIR	M	Councillor Nkoggo	
3.		M	Councillor from Kidondo Parish	
4.		F	N/C	
5.	Namanda margaret	F	councillor Mijwala	Namanda
6.		F	HH & Mijwala Sub-County	
7.		M	Sub-Accountant/Mijwala	
8.	Ssamula Felix Kabaja	M.	MUFEESA - MANAGER	
9.	Nalubowi Margaret	F	Agriculture Officer	
10.		M	Sabaja	
11.		F	C/ Kimuli	
12.	Sekandi Ez	M	Mijwala	



Date:

Locality of Meeting:

Date:

Locality of Meeting: Kyejucla Subcounty

Meeting ID:
Project Name:

Meeting attendance list

13.	Thomas Ssenti	0755-433890	M	Councilor	
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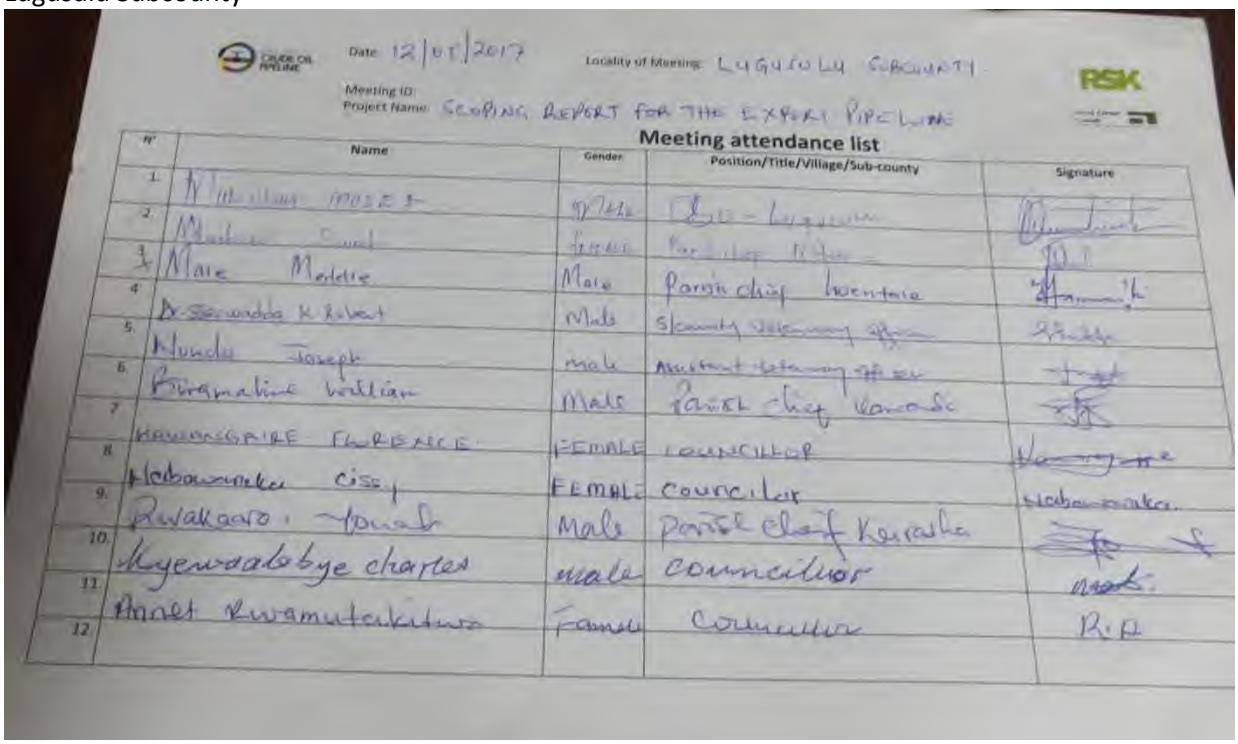
Lugusulu Subcounty



Date 12/07/2017

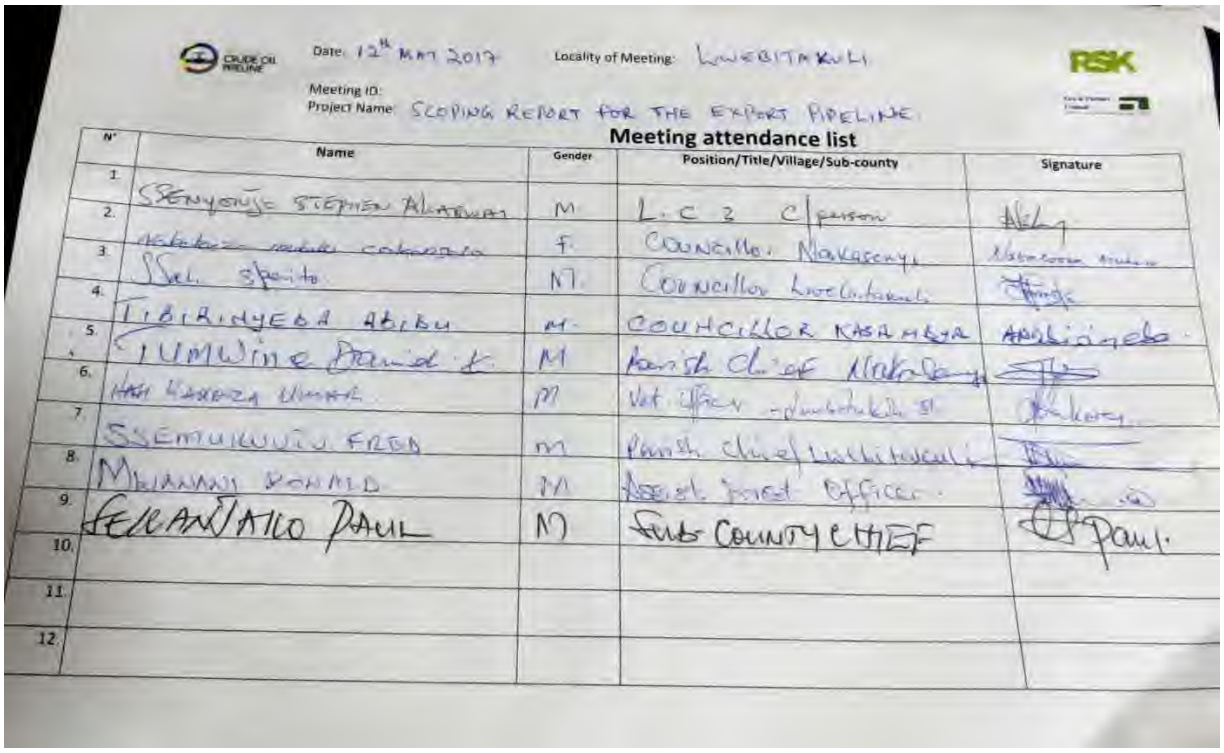
Locality of Meeting: LUGUSULU SUBCOUNTY

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	William MOSES	MALE	LC - Lugusulu	
2.	Member Council	FEMALE	Parish Chief Nyaka	
3.	Male Maddie	Male	Parish chief Iwemeria	
4.	Dr. Ssewadda K. Robert	Male	S/county Veterinary office	
5.	Mundu Joseph	male	Assistant Veterinary officer	
6.	Kiyamabine William	Male	Parish chief Kaseke	
7.	KAWUMUGABIRE FLORENCE	FEMALE	COUNCILLOR	
8.	Nabawanuka Cissy	FEMALE	Councilor	Nabawanuka.
9.	Rwakgaro Yonah	Male	Parish Chief Kasaka	
10.	Kyewaalabye charles	male	councillor	
11.	Annet Kwamutakitwa	Female	Councillor	R.A
12.				

Lwebitakuli Subcounty



Date: 12th MAY 2017 Locality of Meeting: LWEBITAKULI

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE.

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	SSENYONJO STEPHEN ALATWAM	M	L.C 3 Chairman	
2.	[illegible]	F	COUNCILLOR MAKASENYI	
3.	SSekitto	M	Councillor Lwebitakuli	
4.	TIBIRINYEBA ABIBU	M	COUNCILLOR KABAMBA	
5.	IUMWINE Dennis K.	M	Parish Chief of Makasenyi	
6.	HAJI KAWOZA UMAR	M	Vet Officer - Lwebitakuli SC.	
7.	SSEMUKUNJU FRED	M	Parish Chief Lwebitakuli	
8.	MUHAMAD MOHMED	M	Asst. Inst Officer.	
9.	KERANYATO PAUL	M	Sub County Chief	Paul.
10.				
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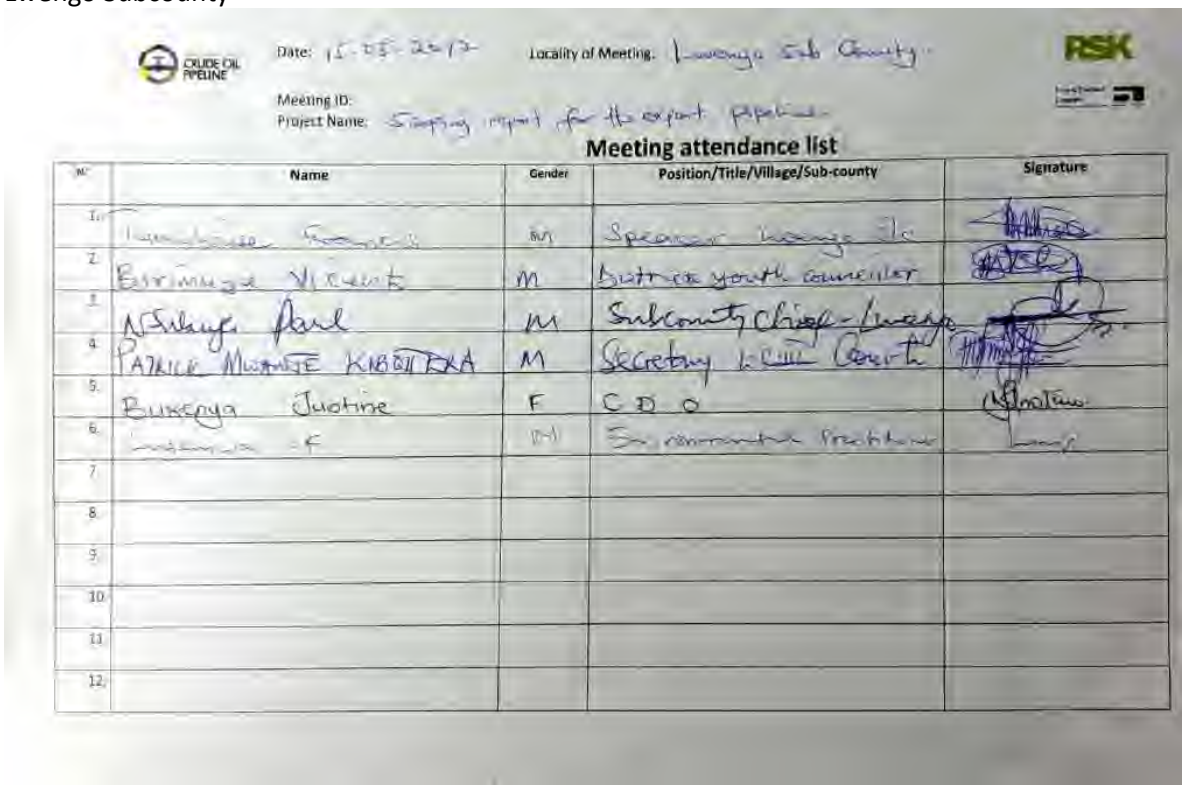
Lwengo Subcounty



Date: 15-05-2017 Locality of Meeting: Lwengo Sub County.

Meeting ID:
Project Name: Scoping report for the export pipeline.

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	[illegible]	M	Speaker Lwengo DC	
2.	Byarunga Vincent	M	Butenga youth councilor	
3.	Nsubuga Paul	M	Subcounty Chief - Lwengo	
4.	PATRICK MUSINGUZE KABUTURA	M	Secretary LC III Court	
5.	Buregya Justine	F	C D O	
6.	[illegible]	M	Environment Practitioner	
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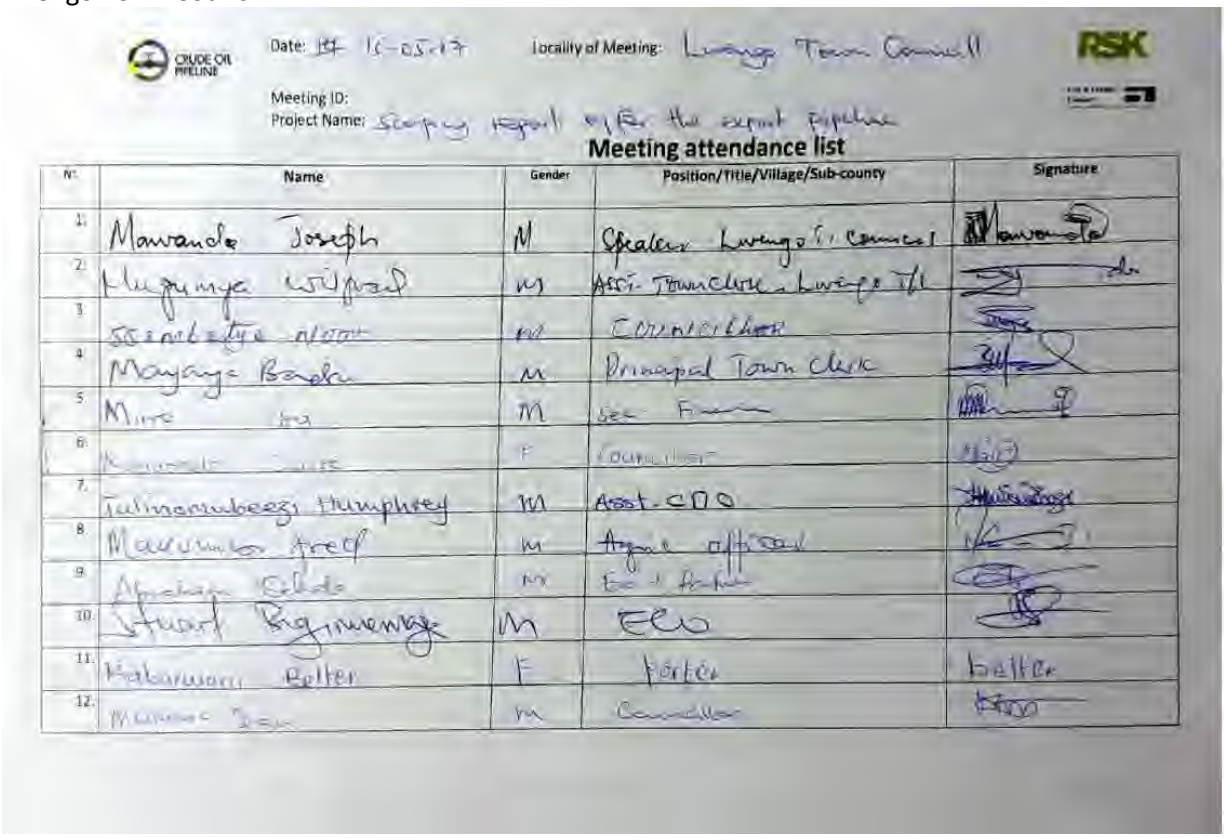
12.				

Lwengo Town Council



CRUDE OIL PIPELINE

Date: 15-05-17 Locality of Meeting: Lwengo Town Council

RSK

Meeting ID:

Project Name: Scoping report for the export pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Mawanda Joseph	M	Speaker Lwengo T. Council	
2.	Lugumya Wilfred	M	Asst. Town Clerk - Lwengo TC	
3.	Ssenkeyiya Moses	M	Councillor	
4.	Mayanja Baale	M	Principal Town Clerk	
5.	Mine Ivy	M	See Form	
6.		F	Councillor	
7.	Tulinamubeezi Humphrey	M	Asst. CDO	
8.	Muwumba Fred	M	Agric officer	
9.	Agaba Caleb	M	Ec + Fisheries	
10.	Stuart Byamwenge	M	ECO	
11.	Nakawuki Esther	F	Porter	Esther
12.		M	Councillor	

Ndagwe Subcounty

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

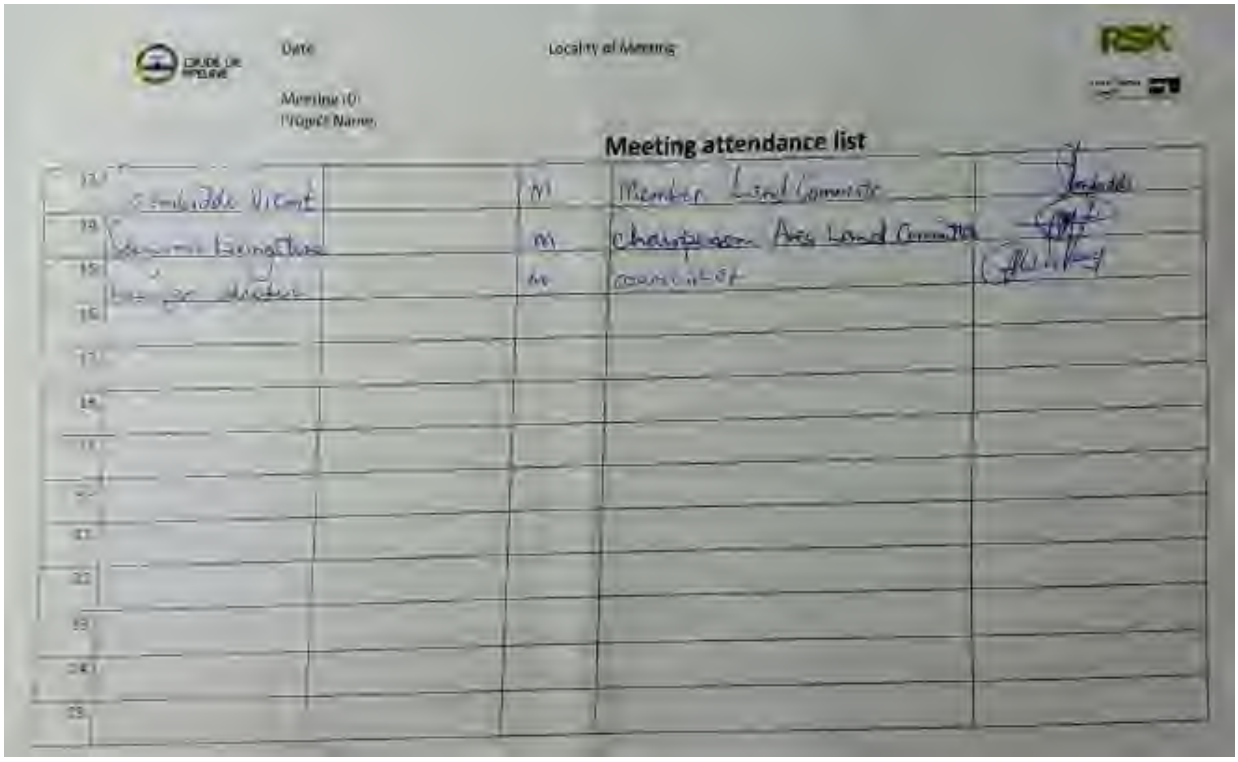
RSK

Meeting ID:

Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.		M		
2.		F		
3.		M		
4.		M		
5.		M		
6.		M		
7.		M		
8.		M		
9.		M		
10.				
11.				
12.		F		



Date:

Locality of Meeting:

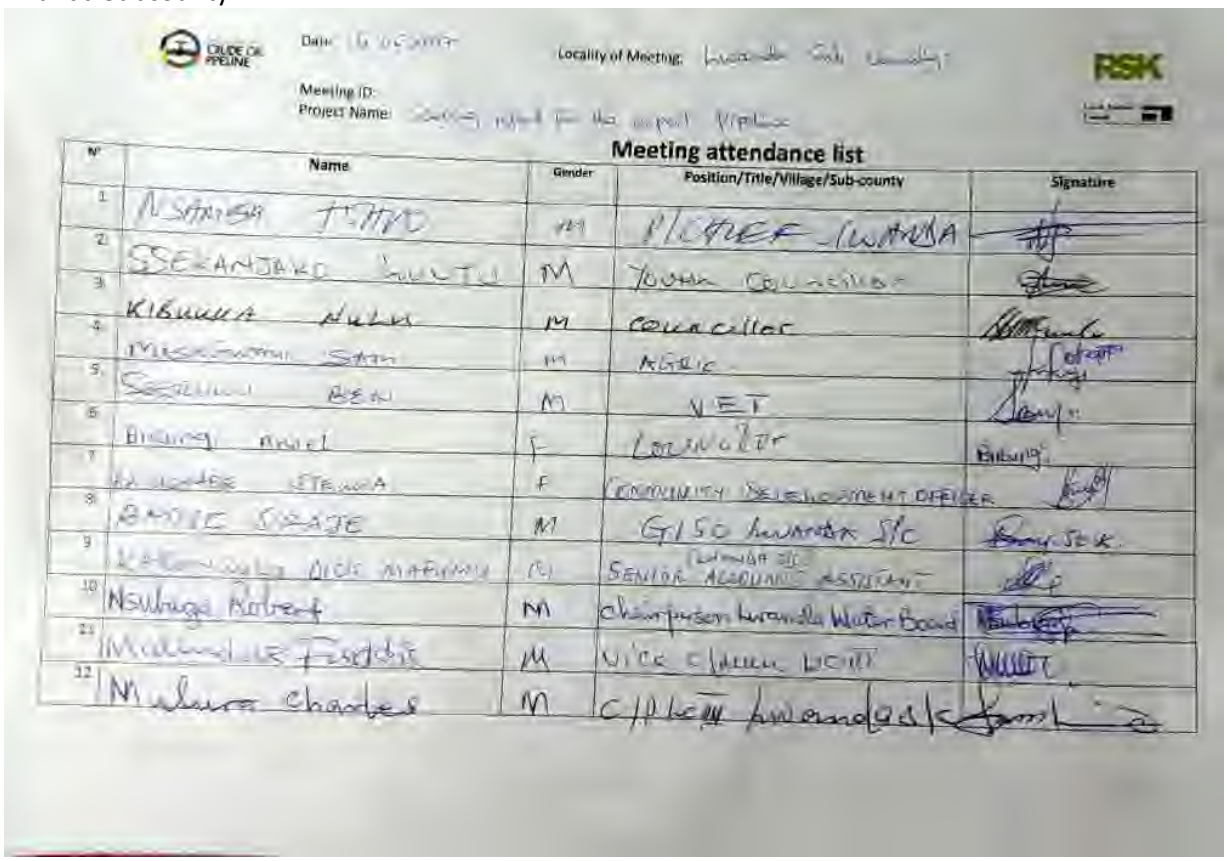
Meeting ID:

Project Name:

Meeting attendance list

17	Ssemakula Vincent	M	Member Land Committee	
18	[illegible]	M	Chairperson Area Land Committee	
19	[illegible]	M	Councillor	
20				
21				
22				
23				
24				
25				

Lwanda Subcounty



Date:

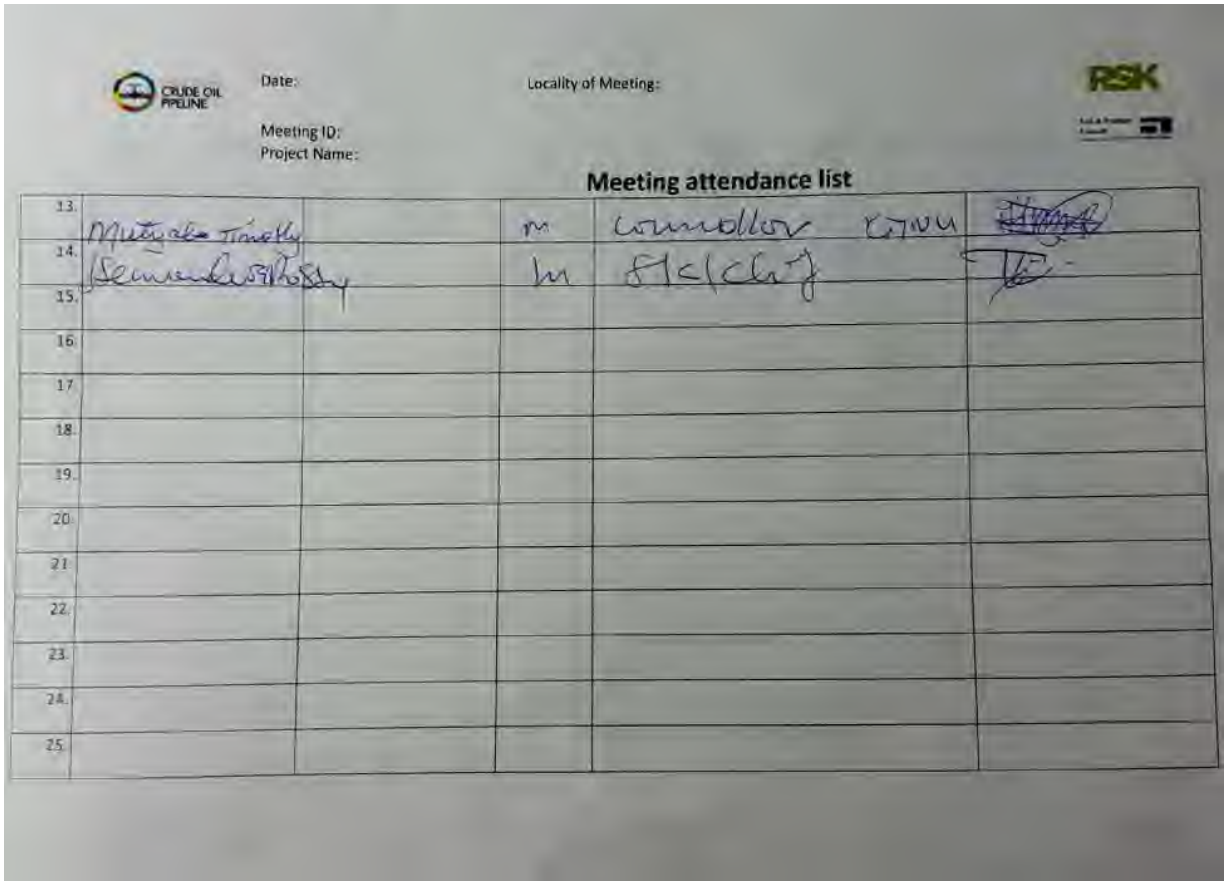
Locality of Meeting: Lwanda Sub County

Meeting ID:

Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	[illegible]	M	[illegible]	
2	[illegible]	M	[illegible]	
3	[illegible]	M	Councillor	
4	[illegible]	M	[illegible]	
5	[illegible]	M	[illegible]	
6	[illegible]	F	[illegible]	
7	[illegible]	F	[illegible]	
8	[illegible]	M	[illegible]	
9	[illegible]	M	[illegible]	
10	[illegible]	M	[illegible]	
11	[illegible]	M	[illegible]	
12	[illegible]	M	[illegible]	



CRUDE OIL PIPELINE

Date:

Locality of Meeting:

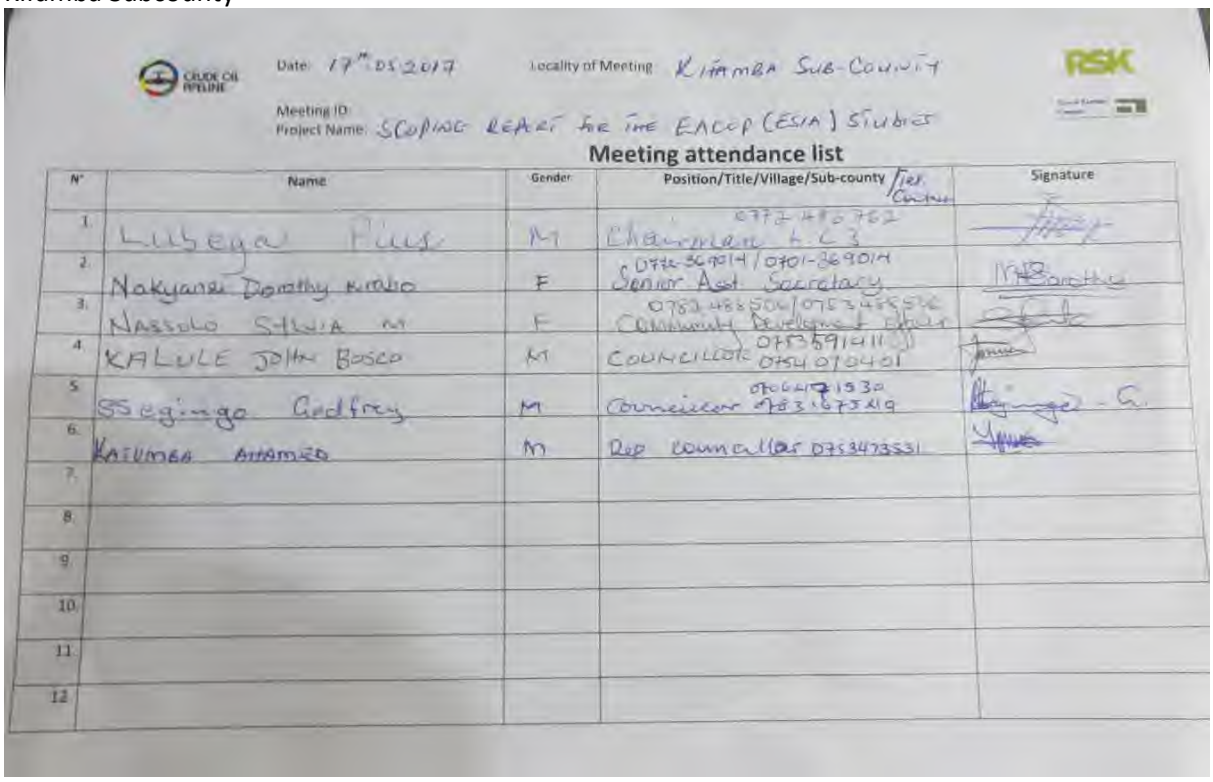
RSK

Meeting ID:
Project Name:

Meeting attendance list

13.	Mutyaba Timothy		M	Councillor Kakuu	
14.	Semwanga Robby		M	Sic/Chief	
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					

Kifamba Subcounty



CRUDE OIL PIPELINE

Date: 17th 05 2017

Locality of Meeting: KIFAMBA SUB-COUNTY

RSK

Meeting ID:
Project Name: SCOPING REPORT FOR THE EACOP (ESIA) STUDIES

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county /Tel. Contact	Signature
1.	Lubega Fills	M	Chairperson L.C 3 0772 496 762	
2.	Nakyanzi Dorothy Kimbo	F	Senior Asst. Secretary 0772 364014 / 0701-369014	
3.	NASSOLO SYLVIA M	F	Community Development Officer 0782 483 504 / 0753 483 504	
4.	KALULE JOHN BOSCO	M	COUNCILLOR 0753 591411 0754 070401	
5.	Ssegingo Godfrey	M	Councillor 0706417930 0783 673 819	
6.	KAIUMBA AHAMED	M	Rep Councillor 0753473331	
7.				
8.				
9.				
10.				
11.				
12.				

Kakuuto Subcounty

CRUDE OIL PIPELINE

Date:

Locality of Meeting: Kakumiro Sub County

RSK

Meeting ID:
Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	NABEKU [illegible]	Female	SENIOR [illegible]	
2.	SSali Charles	Male	[illegible]	
3.	Kibuuka [illegible]	Male	HEALTH [illegible]	
4.	Kikumoto Sylvia	Female	Sec for finance / Kakumiro egmoto 7 @ gmail.com	
5.	[illegible] STEPHEN	Male	CHAIRMAN LC III KAKUMIRO S/C	
6.	[illegible]	Male	C Dev - Kakumiro	
7.	Mbabazi Beatrice	Female	Secretary for Production	
8.	Nakayenga Zakari	Female	Sec for Health Production Nakumiro	
9.	NAMIGA JANE	Female	PARISH CHIEF KAKUMIRO	
10.	KIHIMBA AUGUSTINE	MALE	PARISH CHIEF SANGOBAY	
11.	BABIRYE RITAH	FEMALE	PARISH CHIEF KYEBISAGAZI	
12.	~~Kaegete Joan~~	~~Female~~	COUNCILLOR	

Kasaali Subcounty

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

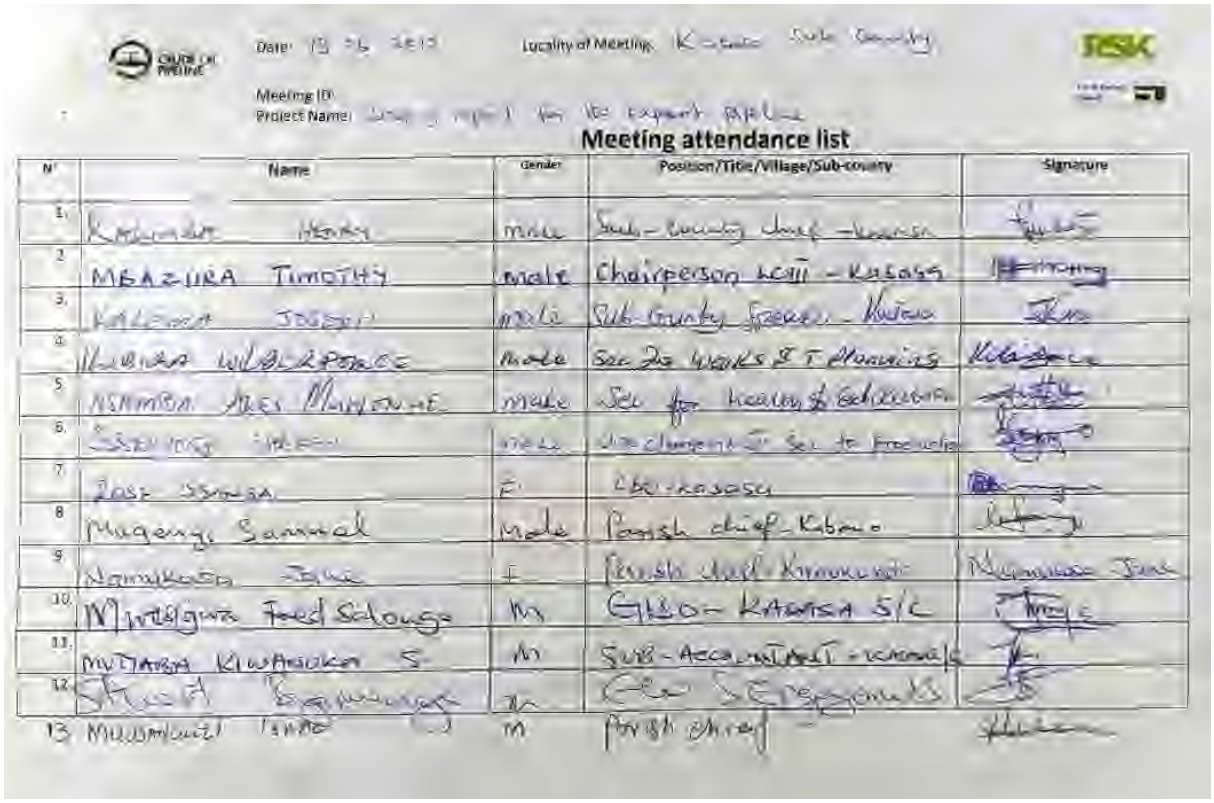
RSK

Meeting ID:
Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	KALEGA BAKER	M	Senior Resident Engineer	
2.	KIMERA GODFREY	M	C/MAN LC III KAKUMIRO	
3.	SSEMAKULA EDWARD	M	Sub-county Council Speaker	
4.	MUSIIGE AUGUSTINE	M	Vice chairman LC III - Kasaali	
5.	KYOMUHENDO MOSES R	M	Assistant Commissioner Social Services	
6.	NAKIGANYA ANGELLA	F	Parish chief	
7.	NAMUTEBI JOYCE	F	Sec/Gender Councillor	
8.	LUGEMWA F	M	Environmentalist Kasaali	
9.				
10.				
11.				
12.				

Kasasa Subcounty



CRUDE OIL PIPELINE

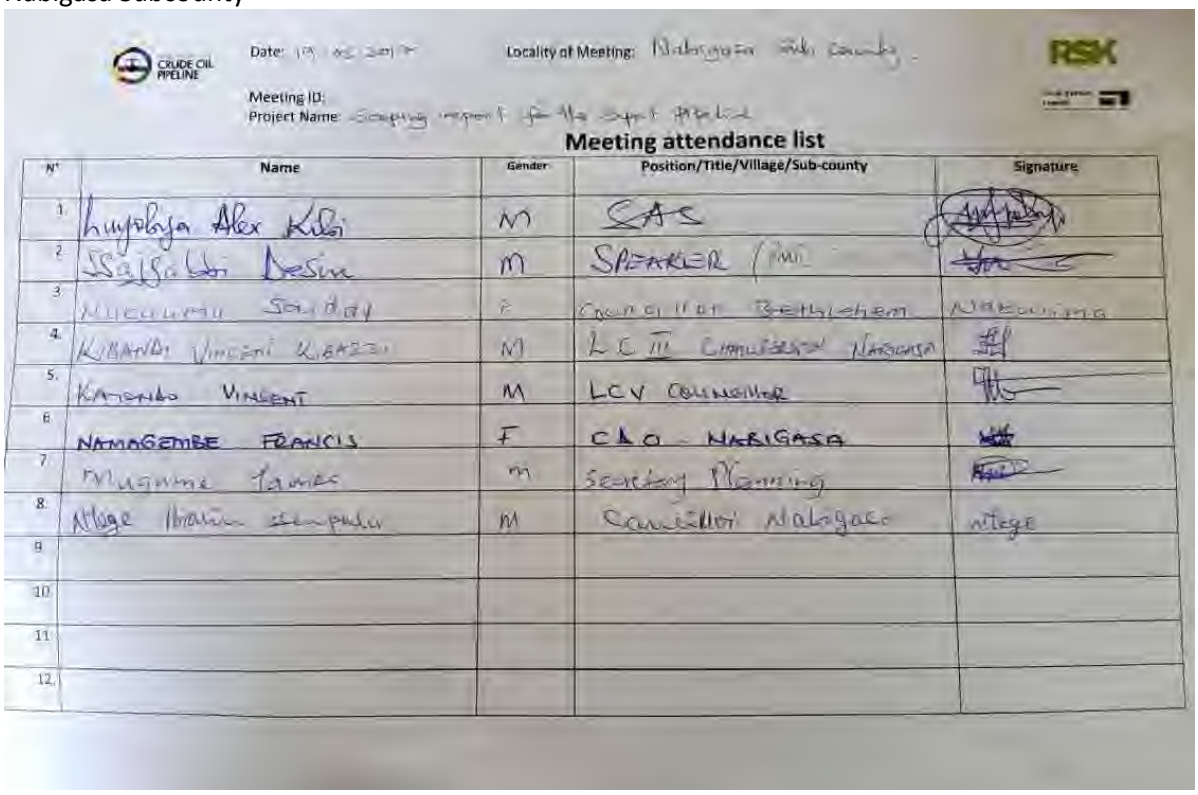
Date: 13 -6- 2018 Locality of Meeting: K-[illegible] Sub County

Meeting ID:
Project Name: [illegible]

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	K[illegible] Henry	male	Sub-County chief - Kwania	
2.	MBAZIIRA TIMOTHY	male	Chairperson LC III - Kwania	
3.	[illegible] Joseph	male	Sub-County Speaker - Kwania	
4.	[illegible] WILBERFORCE	male	Sec 2a WORKS & T Planning	
5.	NSAMBA MOSES MUWONGE	male	Sec for Health & Education	
6.	[illegible]	male	Sec Community & Sec to Production	
7.	[illegible]	F	LCC-Kwania	
8.	Mugenyi Samuel	male	Parish chief - Kibuno	
9.	Namukasa Jane	F	Parish chief Kimukuzi	
10.	Mutebi wa Kadongo	M	GISO - KWANIA S/C	
11.	MUTAMBA KIWANUKA S.	M	SUB-ACCOUNTANT - KWANIA	
12.	[illegible]	M	CAO [illegible]	
13.	MUSISI [illegible]	M	Parish Chief	

Nabigasa Subcounty



CRUDE OIL PIPELINE

Date: [illegible] Locality of Meeting: Nabigasa Sub County

Meeting ID:
Project Name: Scoping report for the Crude Pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Kyabaja Alex Kisi	M	SAS	
2.	Ssalabi Desire	M	SPEAKER (PWD)	
3.	Nuwamanya Sunday	F	Councillor Bethlehem	Nuwamanya
4.	KIBANDA Vincent KIBAZO	M	LC III Chairperson Nabigasa	
5.	KAMANDA VINCENT	M	LCV COUNCILLOR	
6.	NAMAGEMBE FRANCIS	F	CAO - NABIGASA	
7.	Muganwa James	m	Secretary Planning	
8.	Ntege Ibrahim Sempala	M	Councillor Nabigasa	ntege
9.				
10.				
11.				
12.				

VILLAGE MEETINGS

Butimba Village

Meeting attendance list

	Name	Gender	Position/Title/Village/Sub-county	Signature
1				
2				
3				
4				
5				
6	READY JANE	F	KIDOMC L.T	
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Meeting attendance list

	Name	Gender	Position/Title/Village/Sub-county	Signature
1				
2			Kihohoro	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Date: Locality of Meeting:

Meeting ID:
Project Name:

RSK

Meeting attendance list

13			M		
14			M		
15			M		
16			M		
17			F		
18			M		
19			M		
20			F		
21			F		
22			F		
23			M		
24			M		
25			M		

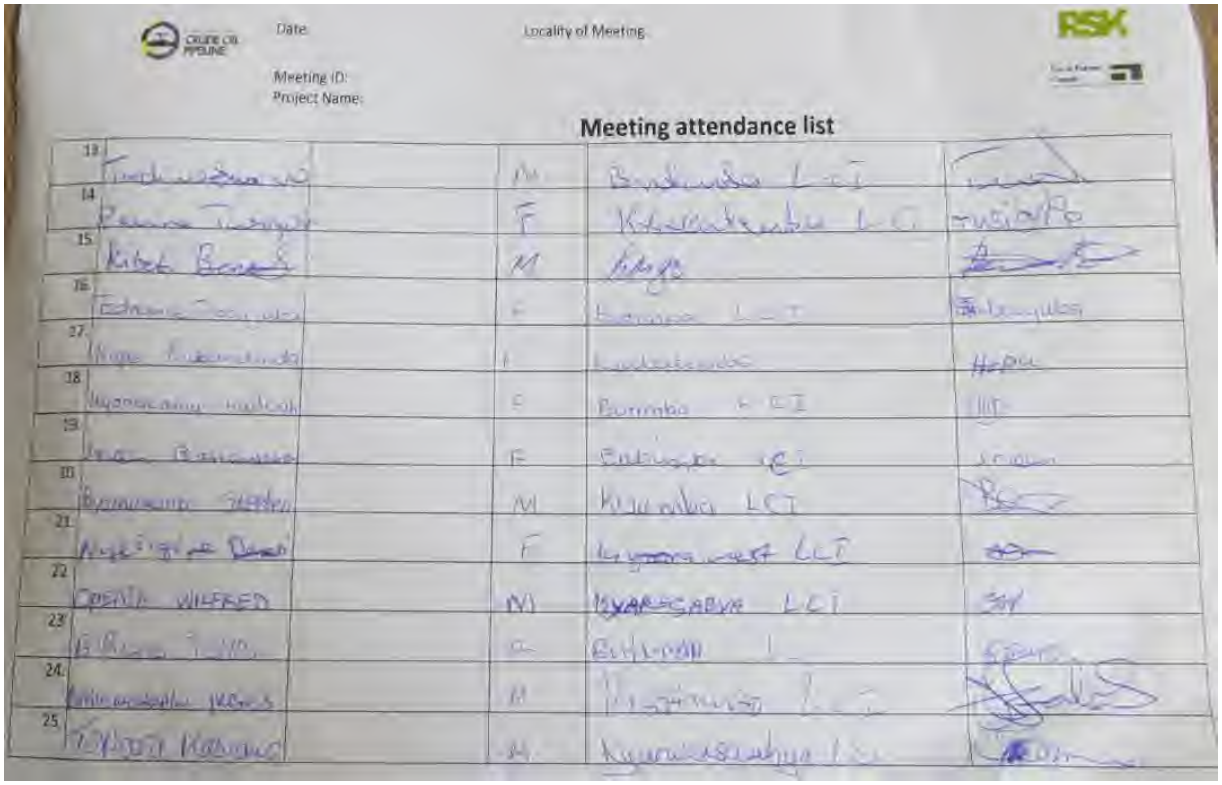
Date: Locality of Meeting:

Meeting ID:
Project Name:

RSK

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
1				
2		M		
3		M		
4		M		
5		F		
6		M		
7		F		
8		F		
9		M		
10		M		
11		M		
12		M		



Date:

Locality of Meeting:

Meeting ID:
Project Name:

Meeting attendance list

13		M		
14		F		
15		M		
16		F		
17		M		
18		F		
19		F		
20		M		
21		F		
22		M		
23		M		
24		M		
25		M		

Date:

Locality of Meeting:

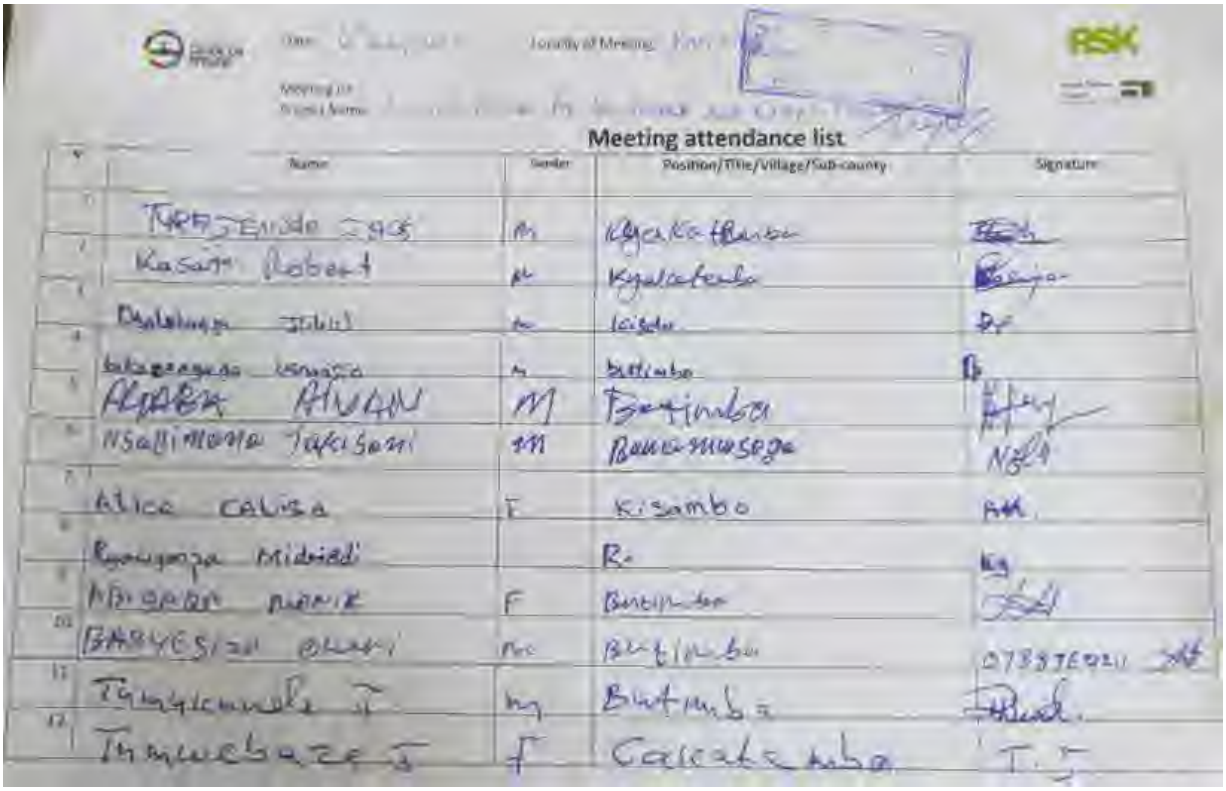
Meeting ID:
Project Name:

Meeting attendance list

Nr	Name	Gender	Position/Title/Village/Sub-county	Signature
1		F		
2		M		
3		F		
4		M		
5		F		
6		F		
7		M		
8		M		
9		M		
10		F		
11		M		
12		M		

Meeting attendance list

	Name	Gender	Position/Title/Village/Sub-county	Signature
1				
2	Turyamubona Justus	M	Butimba	
3	Abigonzeire D	M	Rwamuzaga	
4	Mbabazi Wallace	M	Kittiguta	
5	Agaba Johnson	M	Kyakalebar	
6	Kagabo Simon	M	Kyarubamba	Kyakagambi
7	Twinamyeomwe Medadi	M	Rwamuzaga	
8	Nabiganza John	M	Kyaaka	
9	Bwambale Godfrey	M	Kinyaga	
10	Kwitwanoma Augustine	M	Kanungyeamwiryo	Kwitwanoma
11	Muhwezi Twebaze	M	Kyatwenzatya	
12	Biramire W.	M	Kyarwenzatya	
13	Bahemuka Emmanuel	M	Kyarwenzamba	



Meeting attendance list

	Name	Gender	Position/Title/Village/Sub-county	Signature
1				
2	TURYAMUBONA JUSTUS	M	KYAKATEMBA	
3	Kasaija Robert	M	Kyakatemba	
4	Byaruhanga Julius	M	Icibobo	
5	Bakengesa Ismail	M	Butimba	
6	ALIABA ALWANI	M	Bwijimbo	
7	NSabimana Takisani	M	Rwamuzaga	
8	Alice Calisa	F	Kisambo	
9	Kwizera Medadi		R.	
10	MBABAZI MARIA	F	Butimba	
11	BABYESIZA OLIVER	M	Butimba	0783376211
12	Twinamukama T.	M	Butimba	
13	Tumwebaze T.	F	Cakakatemba	

Date: Locality of Meeting:

Meeting ID:

Project Name:

Meeting attendance list

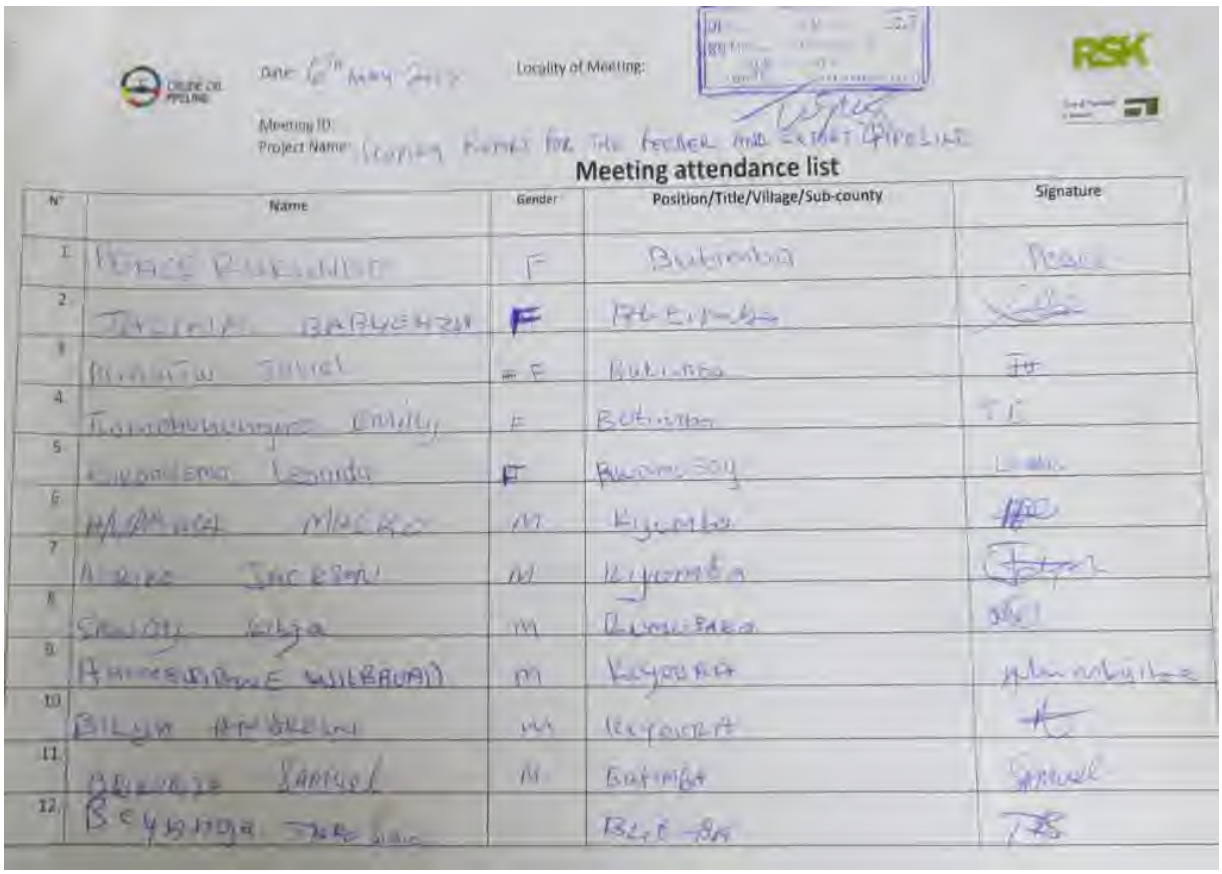
	Name	Gender	Position/Title/Village/Sub-county	Signature
1	CBasweke	M	Rwamuzaga	CBasweke
2	KARigira Cathbert	M	Rwamuzaga	
3	Ykarikdug4	M	Butimba village	
4	MBUMBA BETTY	F	Butimba Kisoro	MBumba
5	ROBERT MUCUNGUZI	M	C/Person LC1 Kibundaga	
6	Nshimiyimana Sanctus	M	Butimba LC1	
7	Benedicte Byenkya	M	Butimbaamba LC1	BByenkya
8	Sabastiano Kanyagara	M	Rwamuzaga LC1	S Kanyagara
9	Kisaka Richard	M	Kyarukiranga	
10	Kyaligi Racheal	F	Kyarukamba LC1	Kyaligi
11	Kabalyeba	M	KI HoHaLO	Kabalyeba
12	Vianney Cyiza	M	Ki Cyiza	
13	Tumwesigye Ruth	F	Butimba	

Meeting attendance list

	Kyarukamba Village	-			
	Rwamuzaga	-			
	Kipoog	M	Farmer		
		F	Farmer		
	Butimba	F			
	Kyarukamba	M		J.	
	Butimba	M	Farmer		
	Rwamuzaga	M			
	BUTIMBA	F	FARMER		
	Kyarukamba	F	FARMER		
	Butimba	M	FARMER		
	Kyarukamba LC1	M	President		
	Kyarukamba village	M	Farmer		

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	Kasirwa Takemoto	F	Butimba	
2	MUGISHA PATRICK	F	Kamwenge LCI	
3	NORI David	M	Rwamwanja LCI	
4	Fatuma Tibenderana	F	Butimba	
5	Joy Tibenderana	F	Kyakatemba	
6	Baraneesidia	F	Kyakatemba	
7	Mucungezi Eria	M	Kyakatemba LCI	
8	Bagakuheka [illegible]	M	Kyakatemba LCI	
9	Kwangaki Agnesitini	M	Butimba LCI	
10	Makday [illegible]	M	Butimba LCI	
11	ONEGA FRANCIS	M	Kyarwenzankya LCI	
12	Wambabazi [illegible]	M	Kijumba LCI	



Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	[illegible]	F	Butimba	
2	[illegible]	F	[illegible]	
3	[illegible]	F	Butimba	
4	[illegible]	F	Butimba	
5	[illegible]	F	[illegible]	
6	[illegible]	M	Kijumba	
7	[illegible]	M	Kijumba	
8	[illegible]	M	[illegible]	
9	[illegible]	M	Kyakatemba	
10	[illegible]	M	[illegible]	
11	[illegible]	M	Butimba	
12	[illegible]		[illegible]	

Mpasaana Village

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

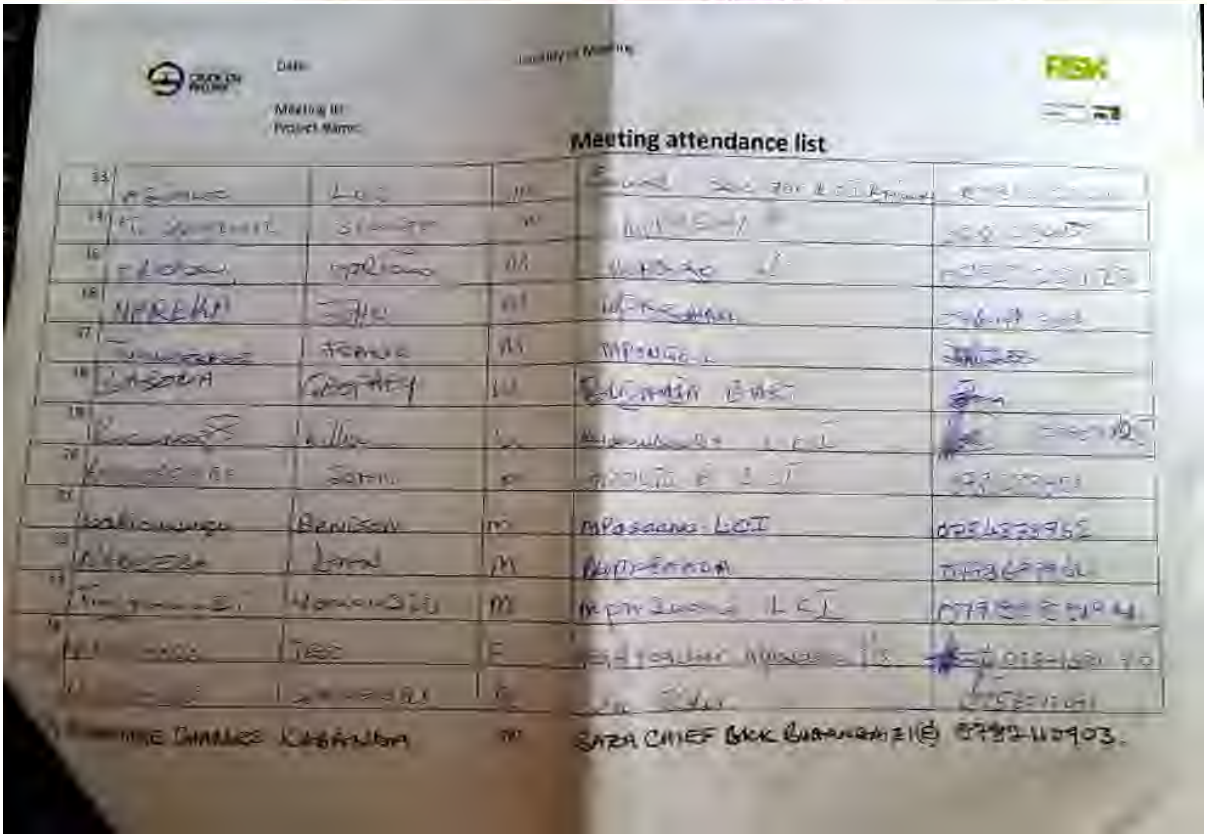
Meeting ID:
Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	Kanchura - B.	M	Mpanga - B.	
2	TEMBEYA SEEC.	M	TEACHER KAMWERABYAMA LC	
3	Nyakiera Edward	M	Councillor Bwera Kateko	
4	ASHABA RODGERS.	M	Crime Cordinator Coventers	0785386
5	NKUSI GIYE RONALD	M	MPPBDO	0774133917
6	MYAMWERA FABIANO	M	Kibilo VAISI	—
7	ISOMYA Tusiimirire	M	MPESENE	—
8	ISYAMUGISHA PATRICK	M	MPASAMA	0789001432
9	Tayebwa Ben-Edw	M	MPESENE	
10	MUSINGUZI GEORGE	M	Mpapamira	0783379580
11	[illegible]	M	[illegible]	
12	Binaisa SPENCER	M	KYAJAWE B	0772266563

PROJECTION ANTENNA
23rd MAY 2017
0774562269

DATE 05/05/17



Date:

Meeting ID:
Project Name:

Meeting attendance list

13	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

Meeting ID:
Project Name:

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	[illegible]	M.	[illegible]	[illegible]
2.	[illegible]	M	[illegible]	[illegible]
3.	[illegible]	M	[illegible]	[illegible]
4.	[illegible]	M	[illegible]	[illegible]
5.	[illegible]	M	[illegible]	[illegible]
6.	[illegible]	M	[illegible]	[illegible]
7.	[illegible]	M	[illegible]	[illegible]
8.	[illegible]	M	[illegible]	[illegible]
9.	[illegible]	M	[illegible]	[illegible]
10.	[illegible]	M	[illegible]	[illegible]
11.	[illegible]	M	[illegible]	[illegible]
12.	[illegible]	M	[illegible]	[illegible]

[illegible]

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

Meeting ID:
Project Name:

RSK

Meeting attendance list

13.	[illegible]	[illegible]	M	[illegible]	[illegible]
14.	[illegible]	David	M	[illegible]	[illegible]
15.	[illegible]		Male	[illegible]	[illegible]
16.	[illegible]		Male	[illegible]	
17.	[illegible]	[illegible]	M	[illegible]	[illegible]
18.	[illegible]		M	[illegible]	[illegible]
19.	[illegible]	[illegible]	M	[illegible]	[illegible]
20.	[illegible]	[illegible]	M	[illegible]	[illegible]
21.	[illegible]	[illegible]	M	[illegible]	[illegible]
22.	[illegible]	[illegible]	M	[illegible]	[illegible]
23.	[illegible]	[illegible]	M	[illegible]	[illegible]
24.	[illegible]	[illegible]	M	[illegible]	[illegible]
25.	[illegible]	[illegible]	M	[illegible]	[illegible]

CRUDE OIL PIPELINE

Date: 6/02/2019 Locality of Meeting: Mpeeketwe Village

Meeting ID:
Project Name: Scoping Report for Export Pipeline

RSK

Meeting attendance list

Nº	Name	Gender	Position/Title/Village/Sub-county	Signature
1	Buhaila Hamdan	M	Local Resident	
2	[illegible]	F	Local	
3	[illegible]	M	[illegible]	
4	[illegible]	M	[illegible]	
5	[illegible]	M	[illegible]	
6	[illegible]	M	[illegible]	
7	[illegible]	F	[illegible]	
8	[illegible]	M	[illegible]	
9	[illegible]	M	[illegible]	
10	[illegible]	M	[illegible]	
11	[illegible]	M	[illegible]	
12	[illegible]	M	[illegible]	

CRUDE OIL PIPELINE

Date:

Meeting ID:
Project Name:

Locality of Meeting:

RSK

Meeting attendance list

13.	Tugume Kesitt	m	Kyamatubu LC1	0779683140
14.	Makiri Hamidah	F	Kyamatubu LC1	
15.	Nabamana Shakik	F	Kyamatubu	
16.	Innocent	M	Kyamatubu Tank	
17.	[illegible]	M	[illegible]	
18.	MUHONSEWA [illegible]	M	0776278564	
19.	BAGAYO ISAAA		0780326765	
20.	BUGEMBE-Hassan	M	0785292217	
21.	Mukasa James	M	0779 6078 94	
22.	Isaac mugisha	M	0785 2391 52	
23.	[illegible]	M	0782321453	
24.	[illegible]	M	[illegible]	
25.	Mubangizi [illegible]	M	0789784429	

Kisiita A Village

CRUDE OIL PIPELINE

Date: 05/05/2017 Locality of Meeting: Kisiita A Village

Meeting ID:
Project Name: Scoping report for Crude Pipeline

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Kabishaka Emmanuel		Kya-Legend	
2.	Yonzi Jeff			
3.	Kisembo Isaac		Kisiita A	
4.	Derrick Mwesi	M	Kisiita A	
5.	Agaba Jerry		Kisiita A	
6.	Mwesige James	M	Kisiita A Resident (Boda)	
7.	Eric Sabiti	M	Kisiita A resident	
8.	Tweyambe Emmy	M	Kisiita A	0705912719
9.	[illegible]	M	Kisiita A	0784671611
10.	[illegible]	M	Kisiita A	
11.	Emmanuel Jack	M	Kisiita A	0753453725
12.	[illegible]	M	Kisiita A	0758383813

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

Meeting ID:
Project Name:

RSK

Meeting attendance list

13.	Birungi Mary	meeting	0777967658	Kisiita A	Birungi
14.	Epsebei	meeting		Kisiita A	
15.	Tweyambe	Sansio		Kisiita A	
16.	Gabiwenda J	meeting		Kisiita A	Gabiwenda
17.	Kabatoro	meeting		Kisiita A	
18.	Mariga	meeting	0784[illegible]	Kisiita A	
19.	[illegible]	meeting	337 0758[illegible]	Kisiita A	
20.	Akiteintuli	meeting	0777394275	Kisiita A	
21.	[illegible]			Kisiita A	
22.	Amukire Abel	meeting	0[illegible]	Kisiita A	
23.					
24.					
25.					

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

Meeting ID:
Project Name:

Meeting attendance list

13	SEMAZZE BAMBA			KISITA A	
14	Agaba A.			Kisiita	
15	MUSINGUZI JULIUS	Meeting		Kyabaliruwa	
16.	ATEGEKA Gerard	meeting		Kyabaliruwa	
17.	[illegible]	EDWARD		KYABARITWA	
18.	[illegible]	M		Kyabaritwa	
19.	NAMPEWO FLOSSY	MEETING	0779	VIP KISITA 'A'	
20.	[illegible]	MEETING		Kisita	
21.	[illegible]	MEETING	0783	KISITA 'A'	
22.	RWendera Hebd	meeting	0786	KISIT A	
23.	[illegible]	meeting	0777	KISITA A	
24	TURYAMUREEBA EDISON RUHWEZIRA	MALE	0785 0756	KISITA A LC1	
25	MIRIMO OBED	MALE	0772	KISITA A - 1	

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

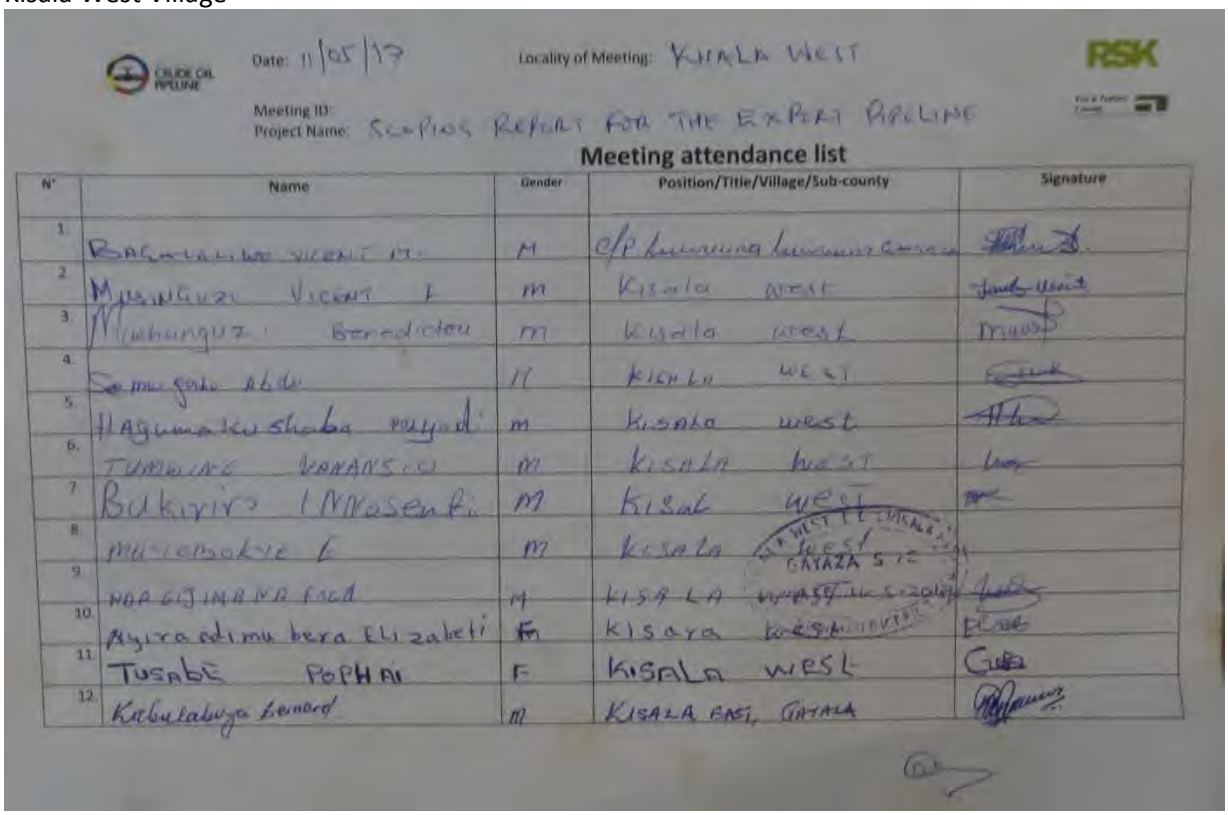
Meeting ID:
Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Mawejje Lezeni	meeting	C. mane Kisita A.	
2.	TUMWEBAZE JACK	meeting	Omutuze wa KISITA A LC1	
3.	Nalwanga Rwenabo's		Nwayiriza wa Kisita A LC1	
4.	KATUSIIME JUNIOR		omutuze wa KISITA A LC1	
5.	ARINDA GILBERT	Meeting	Omutuzi wa KISITA A' LC1	
6.	MURANGIRA Godfrey	Meeting	omutuze wa KISITA A LC1	
7.	Kiwanga Alex	- -	c/l youth Kyabaritwa LC1	
8.	Bwomusoka Bekkendaire	- -	Kyabaritwa LC1	
9.	Bwanaye PONSIANO	- -	Kyabaritwa LC1	
10.	Mushabwa Nealmeck	-	Kisiita A	
11.	TUGUMIRE AGGREY	=	Kisiita A LC1	
12.	MUTOZI ROBERT	=	KISITA A LC1	

5/5/2017

Kisala West Village



CRUDE OIL PIPELINE

Date: 11/05/17 Locality of Meeting: KISALA WEST

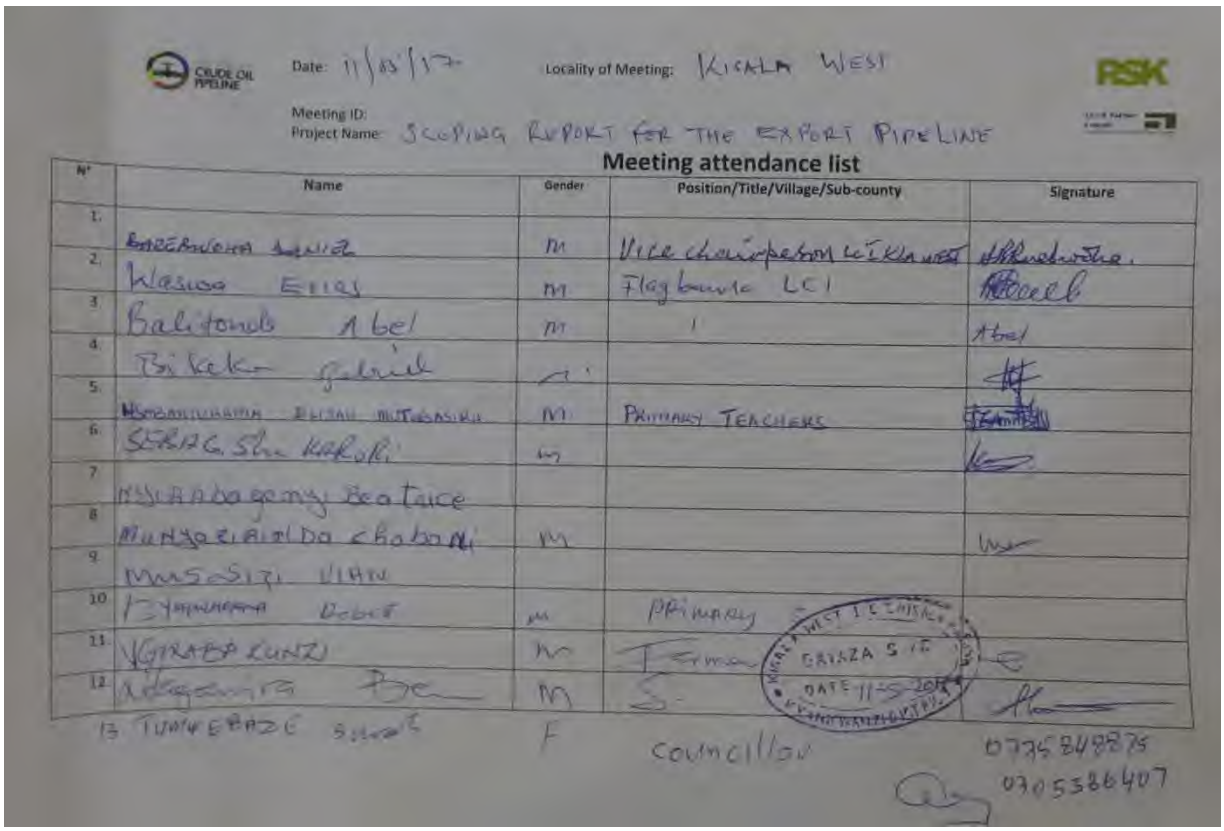
RSK

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	BAGUMAKUSHABA VICENT M.	M	C/P Kisala West	
2.	MUSINGUZI VICENT T	M	Kisala West	
3.	Mwebungwa Benedicto	M	Kisala West	
4.	Samugaba Abdu	M	KISALA WEST	
5.	HAGUMAKUSHABA Ronyadi	M	Kisala West	
6.	TUMWINE KANANSIO	M	KISALA WEST	
7.	Bukirwa Nkosenti	M	Kisal West	
8.	MUTEMBAKYE E	M	Kisala West	
9.	NDAGIJIMANA Fred	M	KISALA WEST	
10.	Akiraderimu bera Elizabeti	F	Kisara	
11.	TUSABE POPHAI	F	KISALA WEST	
12.	Kabulabuya Leonard	M	KISALA EAST, GAYAZA	

KISALA WEST I COUNCIL GAYAZA S/C



CRUDE OIL PIPELINE

Date: 11/05/17 Locality of Meeting: KISALA WEST

RSK

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	BAGUMAKUSHABA VICENT	M	Vice chairperson Kisala West	
2.	Wasswa Ellas	M	Flagbearer LC1	
3.	Balitondo Abel	M	1	Abel
4.	Bikeka Gabriel			
5.	NDAGIJIMANA BELTAU MUTEMBAKYE	M	PRIMARY TEACHERS	
6.	SSEBAG. She KAROLI	M		
7.	NYIRABAGAMU Beatrice			
8.	MUNYARIRIDA Chabo Ali	M		
9.	MWESIZI VIAN			
10.	KYAMWAMA Robert	M	PRIMARY	
11.	NGIRABA KUNZI	M	Teacher	
12.	Nkegamiza Bo	M	S.	
13.	TUMWEBAZE Sarah	F	councillor	0775848875 0705386407

KISALA WEST I COUNCIL GAYAZA S/C DATE 11-5-2017

CRUDE OIL PIPELINE

Date: 11/05/17 Locality of Meeting: KISALA WEST

RSK

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Segwala Gerald	M	GAyaza	
2.	Twaddinda Leonard	m	GMyaza	
3.	Kaweesi	m	Gayaza	
4.	BALIGYE INOCENT	M	GAYAZA	
5.	Mbabazi Jack	M	GAYAZA	
6.	Buyenjorezi C	M	GAYAZA	
7.	Banjunaki B	M	Gayaza	
8.	NBAISABE ERIC	M	GAYAZA	
9.	Dusabe Robert	M	Kisala West	
10.	Kuberanziza Joseph	m	Kisala west c/p	
11.	RUKORAMOSHA	M	KISALA WEST	
12.	KASIGAZI, AGNOZIO	M	KISALA EAST	

GAYAZA S.C DATE: 11-5-2017

CRUDE OIL PIPELINE

Date: 11/05/17 Locality of Meeting: KISALA WEST

RSK

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Nakamya Stella	F	Kisala village	
2.	Mukantagazwa Jane	F	Kisala village	
3.	Ssemujaka James	m	Kisala	
4.	Thiaswani emanuel	M	Kisala east	
5.	uwimana mariyabi		KISALA	
6.	Iwimana Christmas	M	KISALA WEST	
7.	HASumimana Richard	M	KISALA WEST	
8.	Ndagire Francis	M	Kisala	
9.	Kizza Posiano	F	Kisala	
10.		F	Kisala West	
11.	Twesigye V	M	Kisala East	
12.	Bogere Paul	M	Kisala west	

GAYAZA S.C DATE: 11-5-2017

CRUDE OIL PIPELINE

Date: 11th MAY 2017 Locality of Meeting: KISALA WEST

RSK

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	MUTABAZI VIAN	Male	Kisala parish councillor	
2.	BYOMUHANGI GEORGE	M	Kisala west, Gayaza	
3.	Mutebazi ALLAN	Male	Kisala east Gayaza	
4.	KIPSOU BADRU	male	Kisala East gayaza	
5.	Akimaheebwe Ibrahim			
6.	Bamuhumba charous		Kisala westbi	
7.	NYONYIH FAUSTINE	MALE	KISALA EAST 0704529690	
8.	ISSAAC NTAGANDA	MALE	KISALA WST	
9.	Rukundwa Moses	Male	Kisala WST	
10.	TUKASINGURA CHARLES	M	KISALA WEST	
11.	[illegible]	M	Kisala West	
12.	Biramugisha Robert	Male	Kisala West (Community mobilizer)	

GAYAZA S/C
DATE 11-5-2017

CRUDE OIL PIPELINE

Date: 11/05/2017 Locality of Meeting: KISALA WEST

RSK

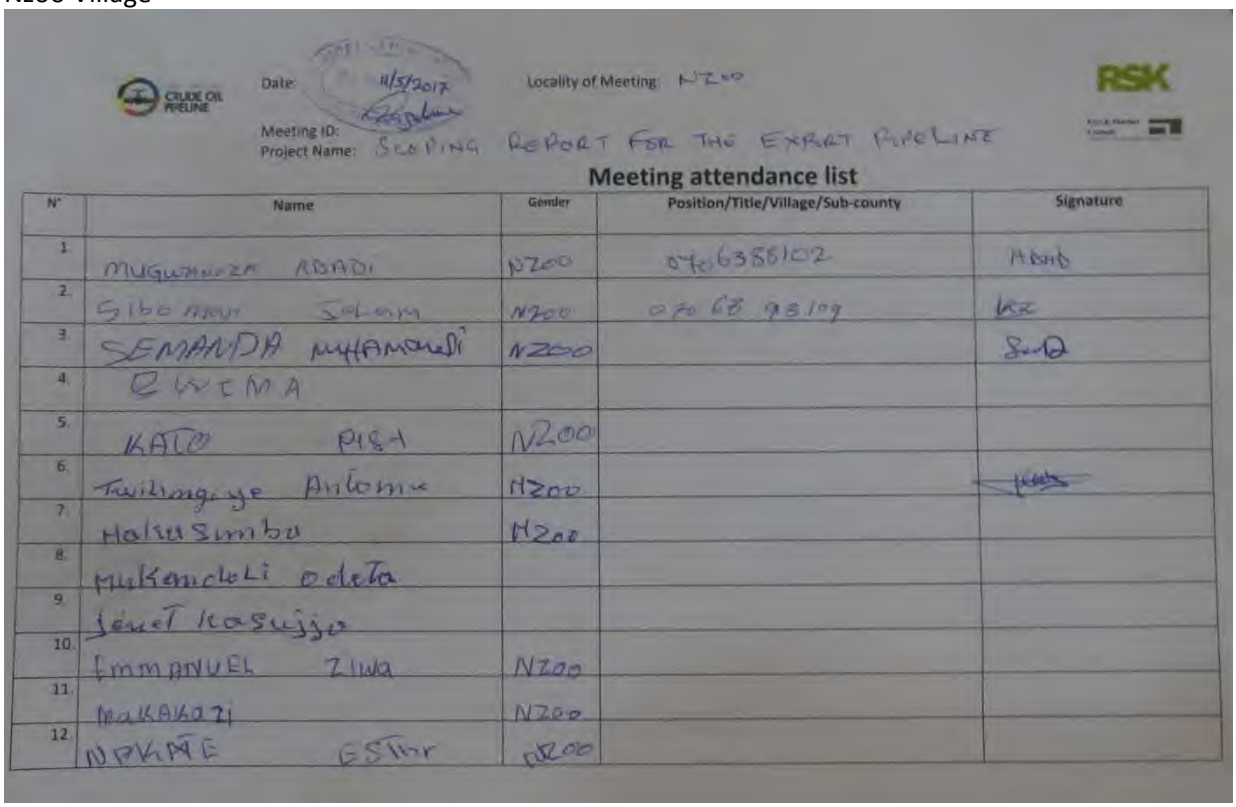
Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	MANIRIHEBO	M	KISARA	
2.	Kamutasi Juvenal	M	KISARA WST	
3.	NIZEYIMANA Clever	M	KISARA west	
4.	MALIKO	M	KISAR WEST	
5.	Kabore valens	M	Kisala west	
6.	Byamukama Faustine	M	KISALA EST	Byamukama
7.	Tungamaka Regina	M	Kasaka	
8.	Ikwizera JOHN	M	KITLERA	
9.	ERIYA DAVID	M	Kisala	
10.	MUFESHWA [illegible]	M	Kisala west	Mufesh
11.	MWESIGWA [illegible]	M	KISALA WEST	mwe
12.	NTAMUKURIRA Theogene	M	KISARA WEST	

GAYAZA S/C
DATE 11-5-2017

Nzoo Village



CRUDE OIL PIPELINE

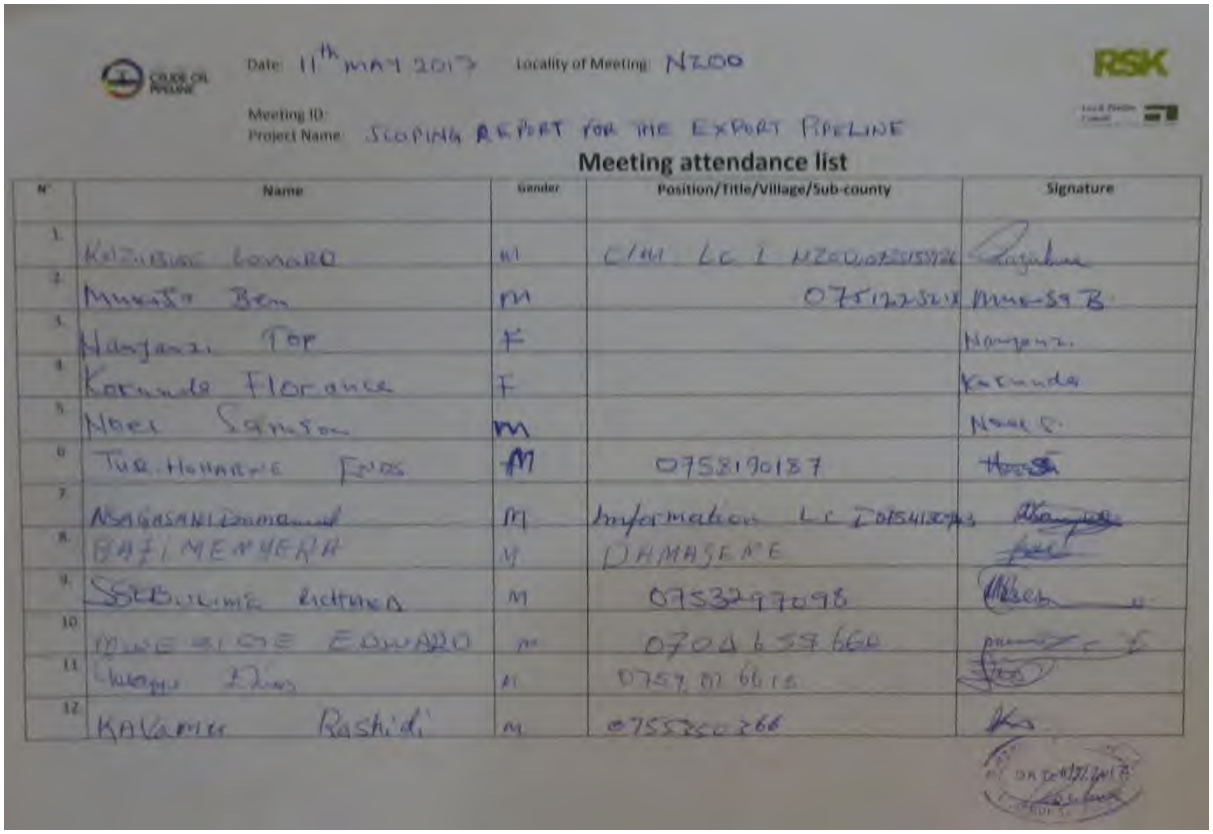
Date: 11/5/2017 Locality of Meeting: NZOO

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPRT PIPELINE

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	MUGUMANZA ABADI	NZOO	0756358102	ABAD
2.	Sibo Moh Islam	NZOO	0756 68 9809	
3.	SEMANDA MUHAMADI	NZOO		
4.	EWEMA			
5.	KATO PIS+	NZOO		
6.	Twilongeye Antonia	NZOO		
7.	Halimsimbo	NZOO		
8.	Mukanchali odeta			
9.	Janet Kasujja			
10.	Emmanuel Ziwa	NZOO		
11.	MAKANDZI	NZOO		
12.	NAKATE ESTHER	NZOO		



CRUDE OIL PIPELINE

Date: 11th MAY 2017 Locality of Meeting: NZOO

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	KAZIBWE LEONARD	M	C/M LC I NZOO	
2.	Musisi Ben	M	0751225218	
3.	Nanjanzi Pop	F		
4.	Kawuda Florence	F		
5.	Noel Samson	M		
6.	TUR. HAMARE EROS	M	0758190187	
7.	NSAGASANI Damaund	M	Information LC I 0754132743	
8.	BAJI MENYERH	M	DHMASEME	
9.	SSEBULIME RICHARD	M	0753297098	
10.	MWESIGWE EDWARD	M	0704659660	
11.	Lwanga Ziwa	M	0759 01 6616	
12.	KAKANDE Rashidi	M	0755260266	

Date: 11/05/2017 Locality of Meeting: NZOO

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

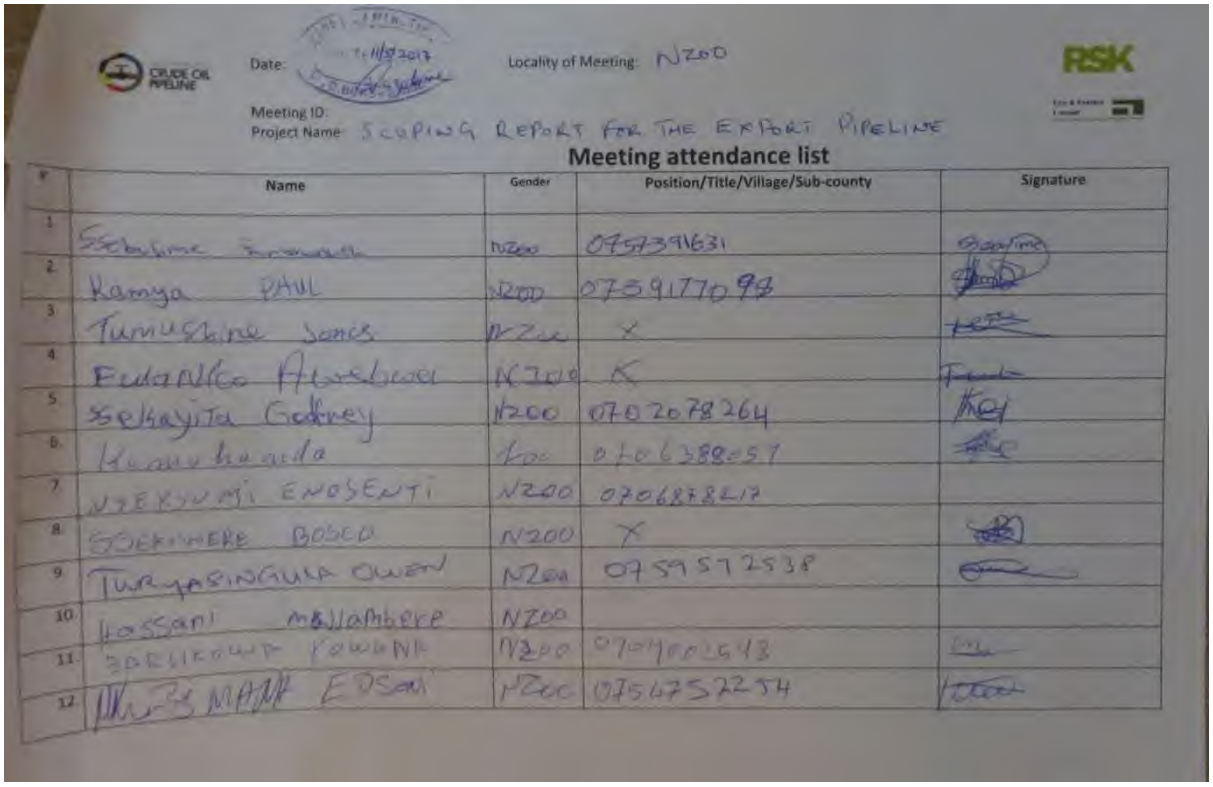
N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Segirinya Stephen	MALE	0704529620	
2.	SSEMBUSI JADED	NZOO	0704196803	
3.	[illegible] Hamid	NZOO	0703200224	
4.	Nsubuga SAM	NZOO	0704529499	
5.	EMANUEL Nzabandala	NZOO	- - -	
6.	Ndahinda Charles	NZOO	0750570137	
7.	Nyakana Johnson	- -	0754013765	
8.	Ntegeza Firista	NZOO	0701517689	
9.	Mukakalangwa mackereri	NZOO	- - -	
10.	Kyalikunda Elizabeth	NZOO	0705536385	
11.	DDEMBE ELI JO	NZOO	0750303653	
12.	MUSEMBI Filipo.	NZOO	0757033046	

Date: 11/05/2017 Locality of Meeting: NZOO

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Rubaramira Dismas	Male	NZOO/ Kitabona S/C	
2.	Tugume Eunice	male	NZOO Kitabona	Tugume
3.	Tukamuhebwa Christine	male	NZOO Kitabona	Tukamuhebwa
4.	Nimwiima Beniffice	male	NZOO Kitabona	
5.	NYAKALIKUNDA AMOS		NZOO	
6.	Sinuzibi CHARLES		NZOO	
7.	Tumuhinda Alfabet		NZOO	
8.	NSubuga Hamza Rami	NZOO	0752338039	NSubuga H
9.	DAPHNES. G.		NZOO	
10.	BiRAGo FulaSiko		NZOO Kitabona	
11.	Ntalagaga G	KAMBAZI		
12.	KiZA Jeremiah	NZOO	NZOO Kitabona	

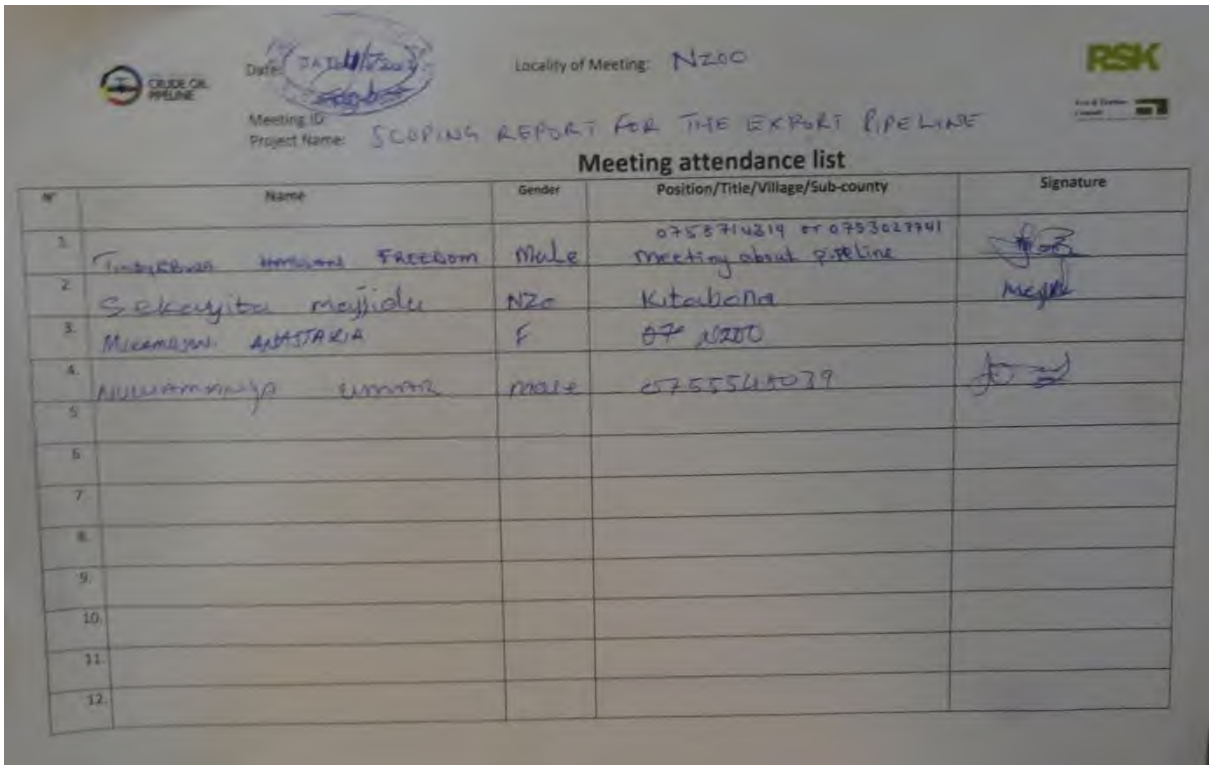


Date: 7/11/2017 Locality of Meeting: NZOO

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Ssebulime Fredrick	NZOO	0757391631	
2.	Kamya PAUL	NZOO	0759177093	
3.	Tumushime James	NZOO	X	
4.	Eudavico Ayebazibwe	NZOO	X	
5.	Sekayita Godfrey	NZOO	0702078264	
6.	Kawuhanda	NZOO	0706388057	
7.	NZEKYUMI ENOSENTI	NZOO	0706878217	
8.	SSEKIMBERE BOSCO	NZOO	X	
9.	TURYASINGURA OWEN	NZOO	0759572538	
10.	Hassani Mawambere	NZOO		
11.	BARLIKOWA POWONA	NZOO	0704005643	
12.	MAMA EDSON	NZOO	0754752254	



Date: 7/11/2017 Locality of Meeting: NZOO

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Tumwebaze Freedom	Male	0758714814 or 0753027941 Meeting about pipeline	
2.	Sekenyitu Mejjidu	NZO	Kitabiana	
3.	Nakamya ANASTAKIA	F	07 NZOO	
4.	Nuwamanya Emma	male	0755545039	
5.				
6.				
7.				
8.				
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11.				
12.				

Nalyankajja Village

CRUDE OIL PIPELINE

Date: 11/05/17

Locality of Meeting: Nalyambaya

Meeting ID:
Project Name:

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Nabakiro Rosemary Zakariya	M	Mulimi	
2.	Nasima	F	Mulimi	Nasima
3.	Jane Bailye	F	mulimi	
4.	Birungi Vicky	F	Mulimi	
5.	Nanyanzala Sadres	F	Mulimi	Nanyanzala
6.	Nabasirwa Nicombe	F	Mulimi	
7.	Namatovu Teddy	F	Mulimi	
8.	SSANYU	F	MULIMI	SSANYU
9.	NABABUTE F	F	Mulimi	
10.	Kusima	F	mulimi	Kusima
11.	PSI	F	mulimi	PSI
12.	Namatovu Teddy	F	Mulimi	

NALYANKANZA L.C.I
DATE: 11/05/2017
0758672929

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

Meeting ID:
Project Name:

Meeting attendance list

13.	Nabasirwa	Jennifer	F	Mulimi	Nabasirwa
14.	Kyamuhendo	Mukeferza	F	Mulimi	Kyamuhendo
15.	Naikomo	PELUSI	F	MULIMI	Naikomo
16.	Nasasira Beatrice		M	C/PERSON LCI KYENDA	
17.	Ssonga Kigongo	EDWARD SIRAJI	M	C/Person LCII Kaponya Parish	
18.	Nabatanzi	Mary	F	V.H.T Mukyenda	N.M
19.	KALISA JOLLY F	Priscilla	F	Teacher	
20.	KIMBOKWA	NELSON	M	Teacher	
21.	Kasirye	BASHIR	M		
22.	MUNIGA	CHRISTOPHER	M	BUSINESS MAN	
23.	SSEKIKEERA	GILAZIO	M	MULIMI	
24.	Kyesime	Edrone	F	mulimi	Kyesime
25.	Nanosinic	Annabuck	M	BUSINESS MAN	

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

Meeting ID:
Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	[illegible]	M	[illegible]	
2.	Mugisa Robert	M	Omuliri	
3.	Mukwaya Denis	M	Teacher	
4.	[illegible] Joseph	M	Bethens [illegible]	
5.	Kasigwa Walter	M	[illegible]	
6.	[illegible] Adrayate	M	—	
7.	[illegible] Denbe	M	Denbe	
8.	[illegible] EMMANUEL JOEL	M	[illegible]	
9.	[illegible] DANIEL	M	Self employed	
10.	[illegible] CHARLESTON	M	Self employed	
11.	Mwesigwa Paul	M	farmer	
12.	[illegible] BROWN	M	[illegible]	

DATE 11/05/2017

0754672999.

CRUDE OIL PIPELINE

Date:

Locality of Meeting:

RSK

Meeting ID:
Project Name:

Meeting attendance list

13.	[illegible]		M	[illegible] farmer	
14.	[illegible]	Julius	M	Farmer	
15.	Nalwabiya Esdras		M	Farmer	
16.	Sseguya	Everest	M	DIGG	
17.	Besigye	[illegible]	M	Farmer	
18.	MUGAB		M	FARMER	
19.	[illegible]	[illegible]	M	Farmer	
20.	Tumwebaze	Kamoga	M	Farmer	
21.	Atwiine	Musisa	M	Farmer	
22.	Kutesa	Mukasa	M	Farmer	
23.	[illegible]	Kabukyeti	M	Farmer	
24.	[illegible]		M	Muliisi	
25.	Musoga Vincent		M	Muliisi	

CRUDE OIL PIPELINE

Date: 11 05 2017 Locality of Meeting: NALWANSAMBA VILLAGE

RSK

Meeting ID:
Project Name: SCOPING JETL CONSULTATION FOR EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	[illegible] Hamidah	F	Sec H WUES - Kyenga S/C	
2.	[illegible]	M	Vice chairperson LC III - KITENTA	
3.	[illegible]	M	Defence L C Nalyankanda	
4.	[illegible]	M	Mukunga	
5.	[illegible]	M	Mukunga	
6.	[illegible]	M	Nabalema	
7.	[illegible]	M	Mukunga	
8.	[illegible]	M	Nalyankanda	
9.	[illegible] Francis	M	Nakaseeta LC1 Chairman	
10.	[illegible]	M	business man	
11.	[illegible]	M.	Red land	
12.	[illegible]	M.	Mukunga	

Date 11.05.2017

0754672927

CRUDE OIL PIPELINE

Date: Locality of Meeting:

RSK

Meeting ID:
Project Name:

Meeting attendance list

13.	NALULU	DAUDI	M	farmer	
14.	[illegible]	JOSEPH	M	TEACHER	
15.	[illegible]	WILLIAM	M	BISHAN MAN	
16.	[illegible]	Beogodfrous	M	PEASANT	
17.	[illegible]	WILBERFORCE	M	WELDER	
18.	[illegible]	Hajji	M	Farmer	
19.	BAKUSA [illegible]	RASHID	M	BANKER	
20	WAMUKAMA	REBINAH	F	HEADTEACHER	
21.	[illegible]	WINNIE	F	Farmer	Nansamba
22.	[illegible]	Wamukisa	F.	Treasurer	Kungalokwa
23.	Nakimanzi	Proscovia	F	Farmer	Nakimanzi
24.	[illegible]	Robinah	F	farmer	N.R.
25	[illegible]		F	NURSE	

Date:

Locality of Meeting:

Meeting ID:

Project Name:

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
1.				
2.				
3.				
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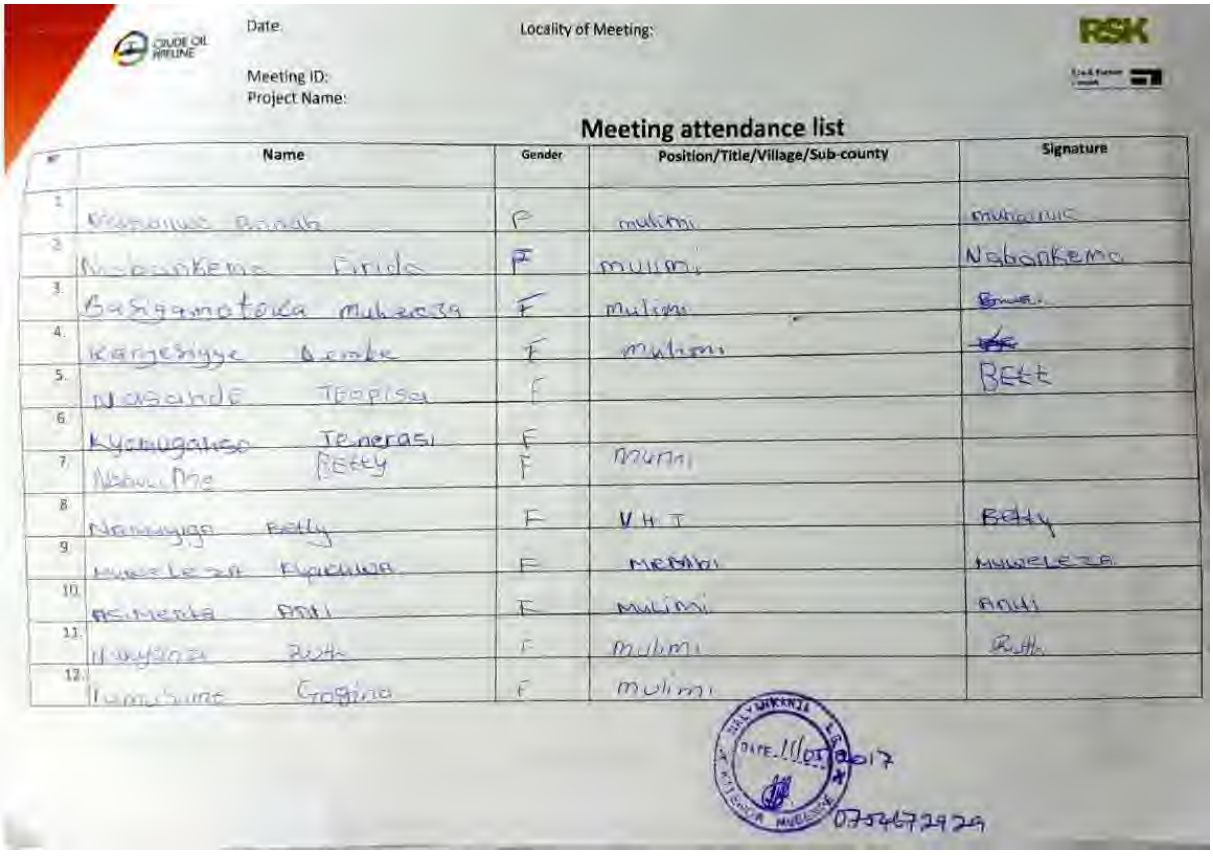
12.				



Date:

Locality of Meeting:

Meeting ID:

Project Name:

Meeting attendance list

#	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Nabankema Frida	F	mulimi	Nabankema
2.	Nabankema Frida	F	mulimi	Nabankema
3.	Basigamoteka Muhamed	F	mulimi	
4.	Kargeshye Beeke	F	mulimi	
5.	Nagande Teopista	F		BETT
6.	Kyamugaiso Jeneresi	F		
7.	Nabwire Betty	F	mumi	
8.	Namuyiga Betty	F	VHT	Betty
9.	Mwebeza Kyakuwa	F	MEMBER	MWEBEZA
10.	Asimeka Anti	F	Mulimi	Anti
11.	Nayenga Ruth	F	mulimi	Ruth
12.	Namusime Grafina	F	mulimi	

Meeting attendance list

Kisagazi Village

Date:

Locality of Meeting:

Meeting ID:

Project Name:

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	IGUMBO GODFREY	M	KISAGAZI	
2.	Ingabire J	M	Kisagazi	
3.	Nakimuya	F	Kisagazi	
4.	NALUNGUUMA JANE	F	KISAGAZI	
5.	Byamboleki Simon	M	Kisagazi	
6.	Tayebwa	M	Kisagazi	
7.	Bulenga christopher/Bamuchi	M	Kisagazi - Buseruga s/c	
8.	Yesita & K. NVU R1	M	Kinyamaseke CCT	
9.				
10.				
11.				
12.				

Date:

Locality of Meeting:

Meeting ID:
Project Name:

Meeting attendance list

Nº	Name	Gender	Position/Title/Village/Sub-county	Signature
1	SSEBAGALI [illegible]	M	Kisamazi	
2	SAAZI YASINI	M	KISAGAZI	
3	[illegible]	M	K. Sagazi	
4	Nassuuna Luzabula	F	Kisaguzi	
5	[illegible]	F	Kisagazi	
6	Nakachwa [illegible]	F	K. sagazi	
7	[illegible]	M	K. sagazi	
8	Kasingye Hanifa	F	Kisagazi	
9	Kwizera Davis	M	Bugamy:	
10	Nabirye Godfrey	M	Kisagazi	
11	Musisime Fulgensio	M	Kakuka	
12	Kayanga James	M	kakuka	

12/5/22

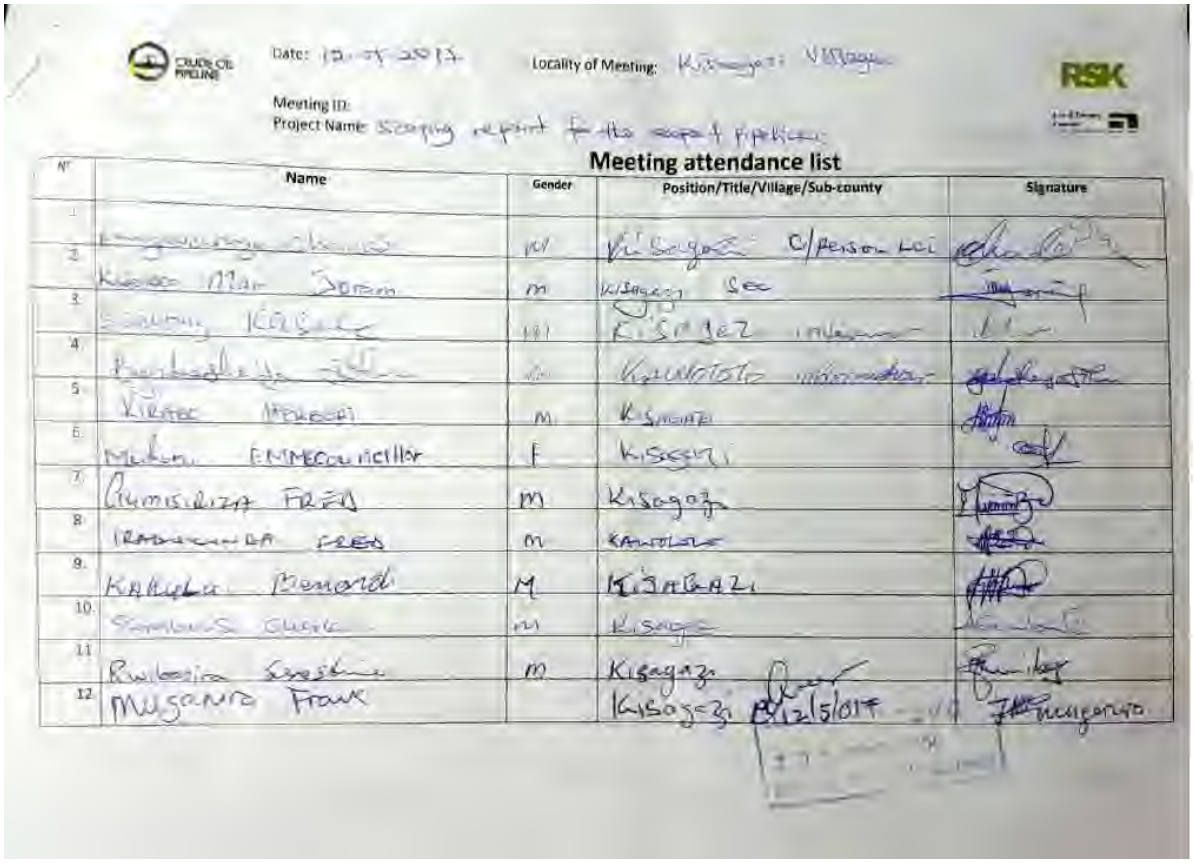
Date:

Locality of Meeting:

Meeting ID:
Project Name:

Meeting attendance list

Nº	Name		Gender	Position/Title/Village/Sub-county	Signature
13	[illegible]		M	KISAGAZI	
14	[illegible]		M	KITULE	
15	[illegible]		M	KAKUKA	
16	[illegible]		M		
17	[illegible]		M	CISAGULA	
18	[illegible]		M	[illegible]	
19	[illegible]		F	[illegible]	
20	[illegible]		M	[illegible]	
21	[illegible]		M	[illegible]	
22	[illegible]		M	[illegible]	
23	[illegible]		F	[illegible]	
24	[illegible]		M	[illegible]	
25	[illegible]	STEVEN	M	[illegible]	

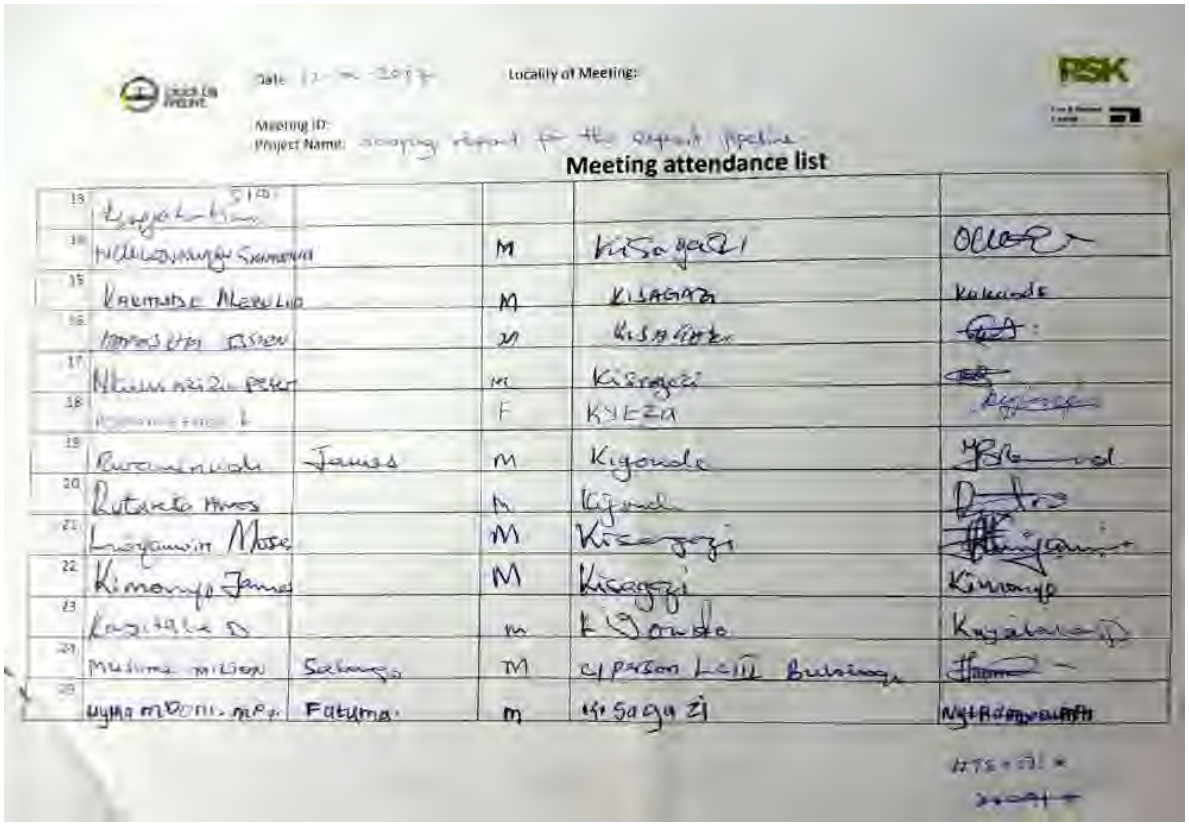


Date: 12-05-2017 Locality of Meeting: Kisagazi Village

Meeting ID:
Project Name: Scoping report for the ... pipeline

Meeting attendance list

Nº	Name	Gender	Position/Title/Village/Sub-county	Signature
1	[illegible]	M	Kisagazi C/person LCI	
2	Kisaka Mar Joseph	m	Kisagazi Sec	
3	[illegible]	M	Kisagazi [illegible]	
4	[illegible]	M	Kisagazi [illegible]	
5	Kirabo [illegible]	M	Kisagazi	
6	Madam [illegible] Councillor	F	Kisagazi	
7	Ayamisibizi Fred	M	Kisagazi	
8	Ramadhan Fred	M	Kamolole	
9	Kakuba Bernard	M	Kisagazi	
10	[illegible]	M	Kisagazi	
11	Rwabona [illegible]	M	Kisagazi	
12	Muganga Frank		Kisagazi 12/5/2017	



Date: [illegible] Locality of Meeting:

Meeting ID:
Project Name: Scoping report for the ... pipeline

Meeting attendance list

13	[illegible]				
14	[illegible]		M	Kisagazi	
15	Kakwaba Nelson		M	Kisagazi	
16	[illegible]		M	Kisagazi	
17	[illegible]		M	Kisagazi	
18	[illegible]		F	Kyeza	
19	[illegible]	James	M	Kigonde	
20	Kutaka Moses		M	Kigonde	
21	[illegible] Mose		M	Kisagazi	
22	Kimanya James		M	Kisagazi	
23	[illegible]		M	Kigonde	
24	Musima [illegible]	Sabanja	M	C/person LC II Bukinga	
25	[illegible]	Fatuma	M	Kisagazi	

Kyetume Village

CRUDE OIL PIPELINE

Date: 15 AUG 2017 Locality of Meeting: Kyehuma Village

Meeting ID:

Project Name: Scoping report for the export Pipeline

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1	Godfrey Etaru	M	PEPDPD - Observer	EG
2	KUBIRANGO JOSEPH	M	SAS MWOOTON	
3	Edward Mugabi		Kyehuma cim.	MGabi
4	Bagumba Stephen	m	Village Person	
5	FIBI MWOYO	F		F b
6	Fibi Isherukagi	F		F b.
7	Tecla Kakibaga	F		T K
8	KAKIRAAGYE VICENT	m		K V
9	NSHEMBO John	m		NJ
10	Rusanyakiro Steven	m		RS
11	Mukangusi Yesam	m		
12	[illegible]			

CRUDE OIL PIPELINE

Date: [illegible] Locality of Meeting: [illegible]

Meeting ID:

Project Name: [illegible]

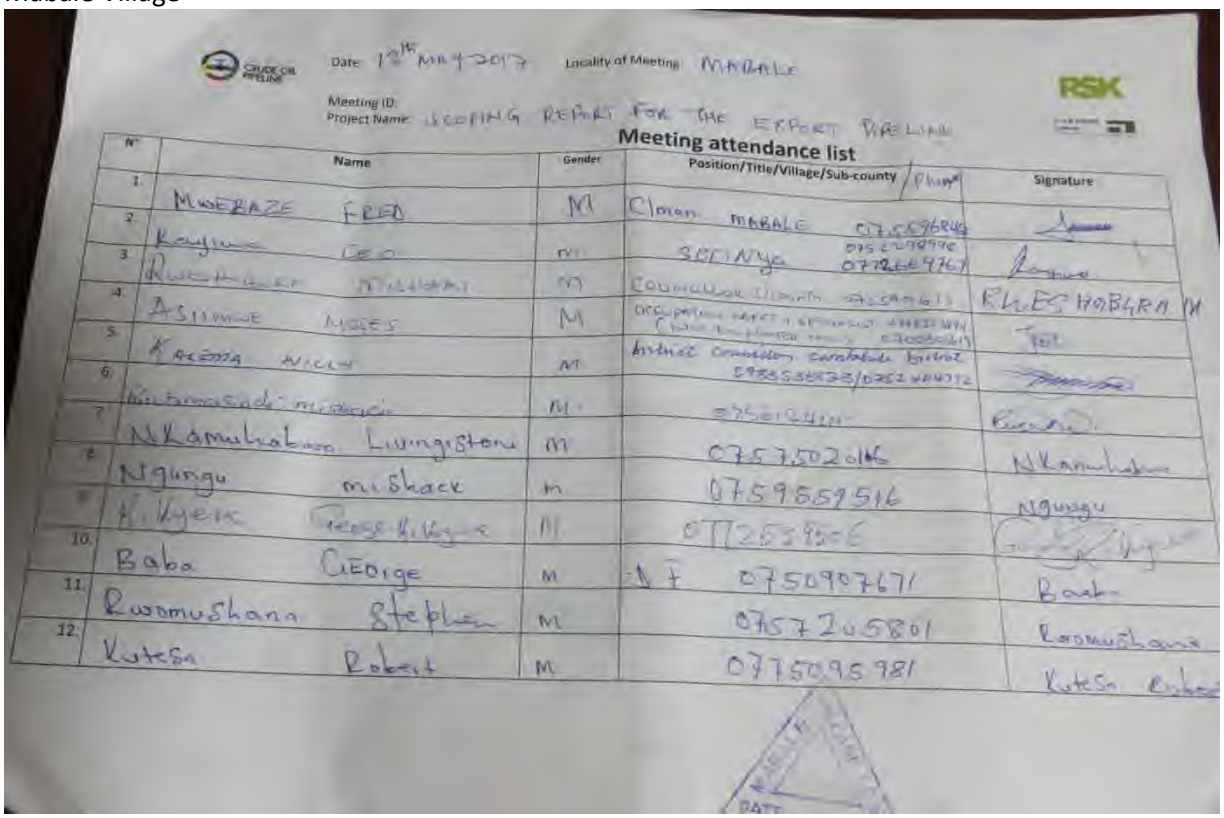
RSK

Meeting attendance list

1	[illegible]	Emmanuel	m		MS
18	[illegible]	[illegible]			
19	[illegible]	[illegible]	m		
20	[illegible]	[illegible]	m		
17	[illegible]	[illegible]	m		
16	[illegible]	Emmanuel	m	Village person	
9					
10					
21					
22					
23					
24					
25					

Meeting attendance list

Mabale Village



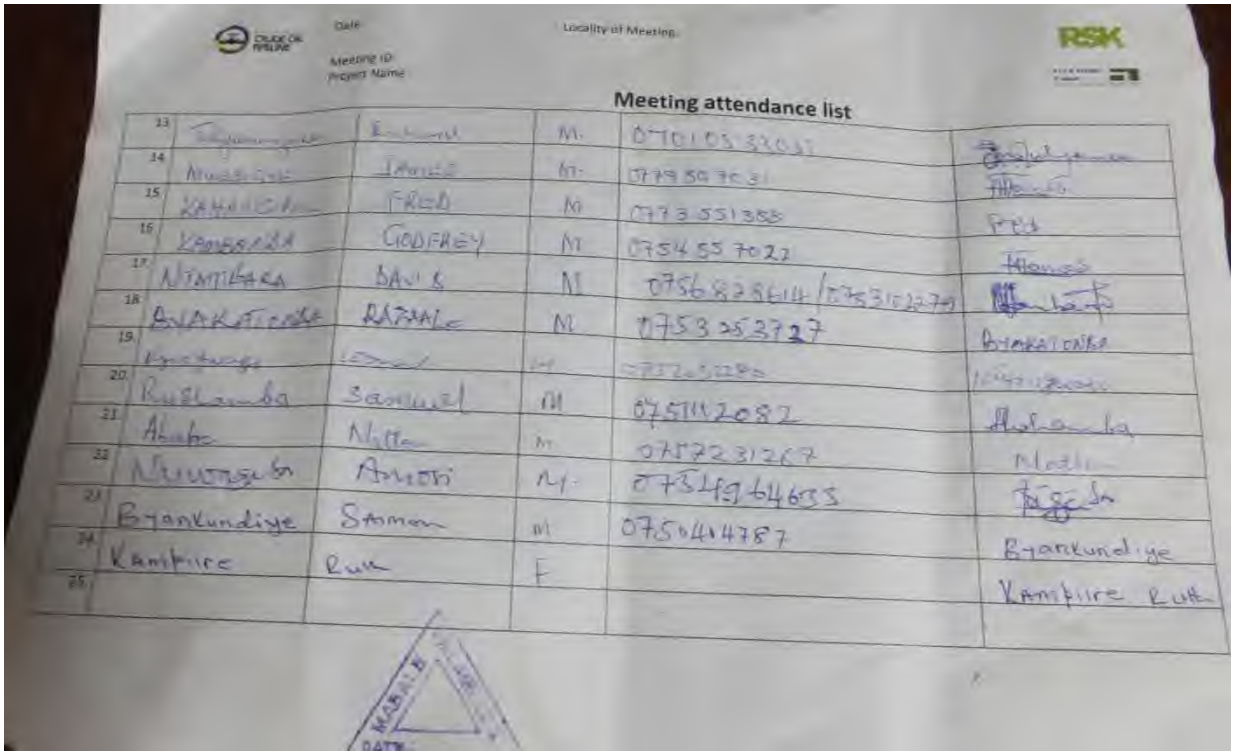
Date: 12th May 2017 Locality of Meeting: MABALE

Meeting ID:
Project Name: SCOPING REPORT FOR THE EFFORT PIPELINE

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county/Phone	Signature
1.	MWEBAZE FRED	M	C/man MABALE 0755596	
2.	Kayiwa CEO	M	SCIENCE 0772	
3.	[illegible]	M	[illegible]	RUBES HABYARA
4.	ASIIMWE MOSES	M	[illegible]	
5.	KAGONYA ALEX	M	[illegible]	
6.	[illegible]	M	[illegible]	
7.	[illegible]	M	[illegible]	
8.	NKamuhabwa Livingstone	M	0757502086	NKamuhabwa
9.	Ngungu mishack	M	0759659516	Ngungu
10.	K. Kyere George Kikyere	M	0772539506	
11.	Baba CEDrige	M	0750907671	Baba
12.	Rwomushana Stephen	M	0757205801	Rwomushana
	Kutesa Robert	M	0775095981	Kutesa Robert



Date:

Locality of Meeting:

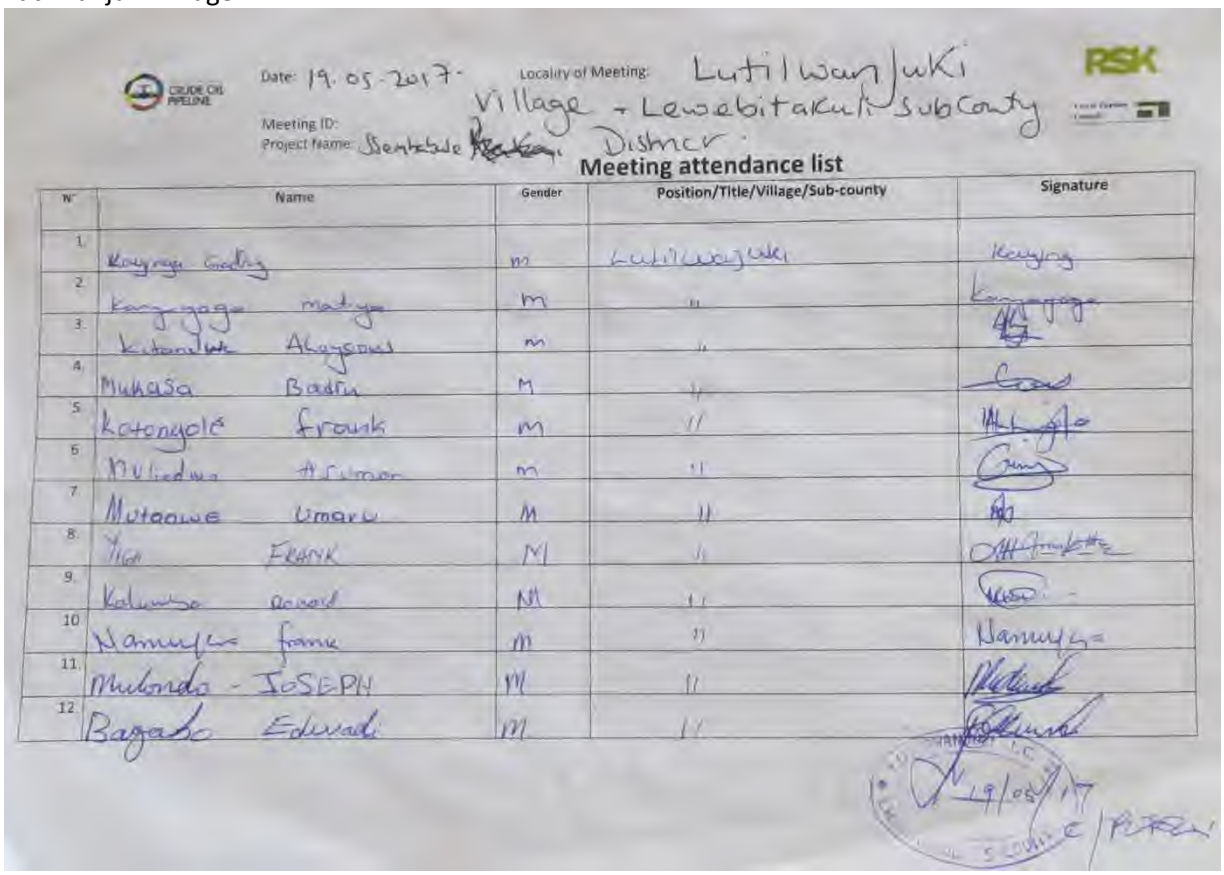
Meeting ID:
Project Name:

RSK

Meeting attendance list

13	[illegible]	[illegible]	M.	0701 05 332	[illegible]
14	[illegible]	[illegible]	M.	0779 50 70 31	[illegible]
15	[illegible]	FRED	M	0773 551 388	[illegible]
16	[illegible]	GODFREY	M	0754 55 7021	[illegible]
17	NTAMUHAKA	DAVID	M	0756 829 614 / 0753 102 279	[illegible]
18	BYAKATONDA	RAZALE	M	0753 253 727	BYAKATONDA
19	[illegible]	[illegible]	M	[illegible]	[illegible]
20	Ruslamba	Samuel	M	0751112082	Ruslamba
21	Abubo	Nuha	M	0772231267	Mutti
22	Nuwagaba	Amoti	M	0754976 4635	[illegible]
23	Byankundiye	Simon	M	0750414787	Byankundiye
24	Kamfire	Ruth	F		Kamfire Ruth
25					

Lutilwanjuki Village



Date: 19.05.2017. Locality of Meeting: Lutilwanjuki Village - Lwebitakuli Sub County Disnict.

Meeting ID:
Project Name: Semliki

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Kayaga Godfrey	m	Lutilwanjuki	Kayaga
2.	Kanyagaga Madiya	m	"	Kanyagaga
3.	Kitandwa Abayomi	m	"	
4.	Muhasa Badru	M	"	
5.	Katongole Frank	m	"	
6.	Mulindwa Asuman	m	"	
7.	Mutaawe Umaru	M	"	
8.	[illegible] FRANK	M	"	
9.	Kalumba Ronald	M	"	
10	Nanungu fame	m	"	Nanungu
11.	Mukonda - JOSEPH	M	"	
12.	Bagaba Edward	M	"	

19/05/17

CRUDE OIL PIPELINE

Date: 19.05.2017 Locality of Meeting: Lutilwanjuki Village, Lwebitakuli Sub County, Hoima District, Ssembabule.

Meeting ID:
Project Name:

RSK

Meeting attendance list

13	Kasoga Magidu Tudo		M	Lutilwanjuki	
14	Adecuntz	Matia	M	Lutilwanjuki	
15	[illegible]	[illegible]	M	Lutilwanjuki	
16	Nantonga	Halima	F	Lutilwanjuki	
17	Namudidu	Mangadalena	F	Lutilwanjuki	Namudidu
18	Nabbaija	Sarah	F	Lutilwanjuki	Nabbaija
19	Nambi	Joyce	F	Lutilwanjuki	Nambi
20	Nabawanda	Noweena	F	Lutilwanjuki	Noweena
21	N Samba	God	M	Lutilwanjuki	God
22	Nabukeera	Florence	F	Lutilwanjuki	
23	Kizanye	Markanja	F	Lutilwanjuki	Kizanye
24	Kalemangira	Joseph	M	Lutilwanjuki	Kalemangira
25	Kattinje	Annet	F	"	

CRUDE OIL PIPELINE

Date: Locality of Meeting: LUTILWANJUKI

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

RSK

Meeting attendance list

13.	Nakyanzi	baty	F	Lutilwanjuki	Nakyanzi
14.	WASWA PAUL		M	Lutilwanjuki	
15.	BUKENYA FULGENCIO		M	Lutilwanjuki	
16.	Nalwada Joice		F	Lutilwanjuki	Nalwada
17.	Nalubila Janet		F	Lutilwanjuki	Nalubila
18.	SSENTONGO S.		M	Lutilwanjuki	
19.	Ntamio Henry		M	Lutilwanjuki	
20.	Nabwire Josephine		M	Lutilwanjuki	
21.	Nnaluku Josephine		M	Lutilwanjuki	
22.	MULINDWA JAMES		M	Lutilwanjuki	
23.	MUWANGA PAUL		M	Lutilwanjuki	
24.	D. Dasi		M	SENKO	D S
25.	SSEBUMA HASSAN		M	Lutilwanjuki	

CRUDE OIL PIPELINE

Date: 19th MAY 2017 Locality of Meeting: LUTI LWANJUKI VILLAGE

RSK

Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	[illegible]	M	Local Leader Lutiwanjuki	
2.	Ssentongo Paul	M	Lutirwanjuki	
3.	Akena [illegible]	M	NOTE TAKER	
4.	SSEBIDDO Moses	M	Lutirwanjuki	
5.	Nabwogi fortunate	F	Lutirwanjuki	
6.	Namuddu Pauline	F	Lutirwanjuki	pauline
7.	Namboga Mangadalena	F	Lutirwanjuki	Mangadalena
8.	Nakato Regina	F	Lutirwanjuki	Regina
9.	Nabwire Rose	F	Lutirwanjuki	Rose
10.	Nabukenya Matidah	F	Lutirwanjuki	Matidah
11.	SSEKUMITI [illegible]	M	LUTIRWANJUKI	
12.	Nakiko Jane	F	Luti Iwanjuk	Nakiko

CRUDE OIL PIPELINE

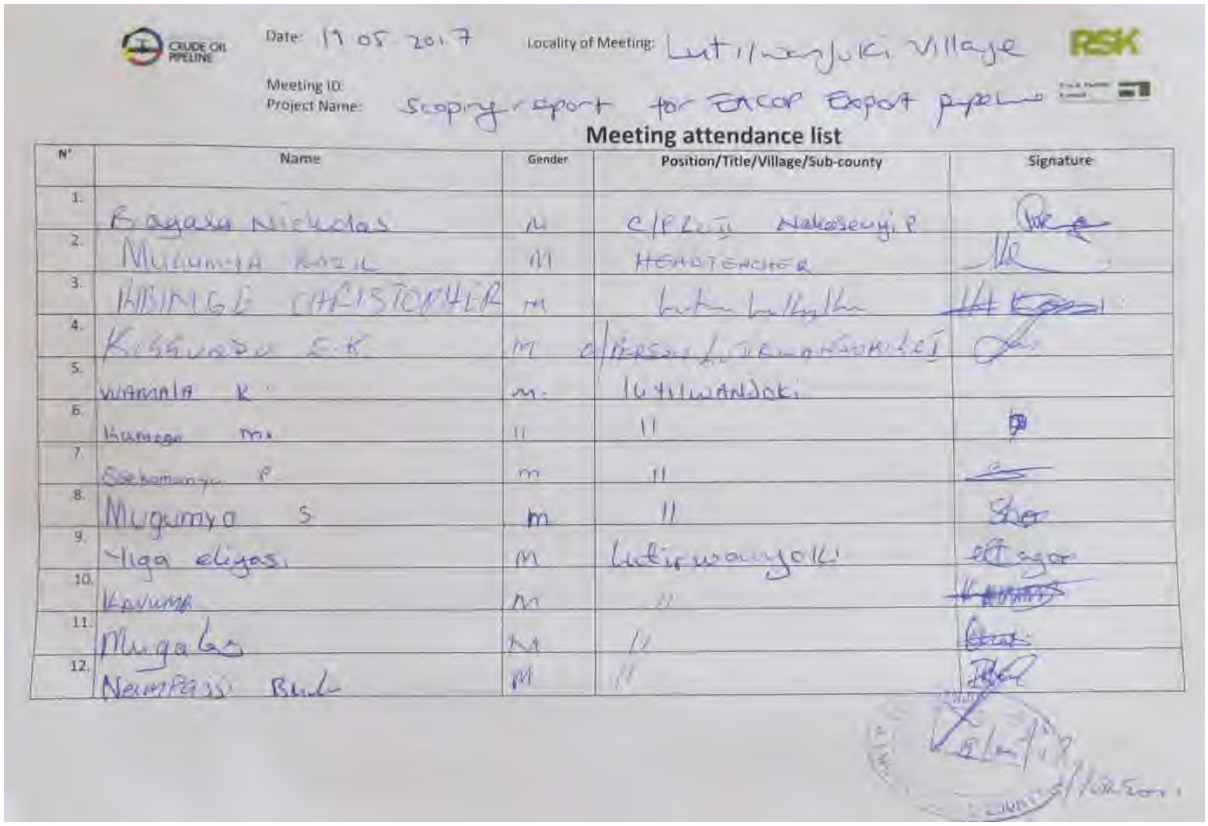
Date: 19 5 2017 Locality of Meeting: Lutiwanjuki Village Ssambabula Society

RSK

Meeting ID:
Project Name: Scoping report for Export Pipeline EACOP

Meeting attendance list

13.	GATSINZI	Wilson	M	Lutirwanjuki	Wilson
14.	[illegible]	[illegible]	M	Nabwogo	
15.	Nakanjako	Resty	F	Lutirwanjuki	
16.	Nakacwa	Afisha	F	Lutirwanjuki	Afisha
17.	Nalubowa	Alice	F	Lutirwanjuki	Alice
18.	Nakayinga	Agnath	F	Lutirwanjuki	Agnath
19.	Nabukeera	Ruth	F	Lutirwanjuki	Ruth
20.	Namutebi	Justina	F	Lutiwanjuki	Justina
21.	Nakimuka	Dadasi	M	//	Dadasi
22.	Kyolerekera	Zulayika	F	Lutirwanjuki	kyolerekera
23.	Kabusinje	Satina	F	Lutiwanjuk	kabusinje
24.	Byagaba F	Francis	M	Sambabula DLG	
25.	Kamukanga	Peter	M	Lutirwanjuki	



CRUDE OIL PIPELINE

Date: 19 05 2017 Locality of Meeting: Lutiri wanjoki Village

RSK

Meeting ID:
Project Name: Scoping report for EACOP Export pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Bagaya Nicholas	M	C/P Lutiri Nakasenyi S	
2.	MUGUMYA RAZIK	M	HEADTEACHER	
3.	IHBINGE CHRISTOPHER	M	Lutiri Village	
4.	Kagwaba E.K	M	Chairman Lutiri Nakasenyi	
5.	Wamala K	M.	Lutiri Wanjoki	
6.	Kamega M.	"	"	
7.	Ssebamanya P	M	"	
8.	Mugumya S	M	"	
9.	Yiga eliyasi	M	Lutiri wanjoki	
10.	Kavuma	M	"	
11.	Mugaba	M	"	
12.	Nampassi Bulu	M	"	

Kinvunikidde Village

CRUDE OIL PIPELINE

Date: 13 ct 2017 Locality of Meeting: Kinvunikidde village

RSK

Meeting ID:
Project Name: Scoping Level Consultation for the Export Pipe

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Mbuvuzi Bbaale	M	Kinvunikidde	
2.	Kyembe Tonny	M	"	
3.	Nsaba Hule Robert	M	"	
4.	MBAZIRA GEORGE	M	"	
5.	Kimanya Amosi	M	"	
6.	Kibuuka Kusoni	M	"	
7.	Tumwesigye Benon	M	"	
8.	Namayanja	F	"	
9.	Twinamuyuba Edisa	F	"	
10.	Nawuda Maria	F	"	
11.	Tibasima Angella	F	"	
12.	[illegible]	[illegible]	[illegible]	

CRUDE OIL PIPELINE

Date: 13 05 2017 Locality of Meeting: Kyenvunikidde village

RSK

Meeting ID:

Project Name: Stakeholder Consultation for the Eacop Pipeline

Meeting attendance list

13.	Zakaliya		M	Kyenvunikidde	Z
14.	Kalema S.	Abdu	M	"	Kalema
15.	Zahaya	Saidi	M	"	Zahaya
16.	Nabaye Sekawo		F	"	N. S.
17.	Nakigaye		F	"	Na
18.	Nakawunji	Justine	F	"	NJ
19.	Nassima	Phiona	F	"	NF
20.	[illegible]		M	"	
21.	Tulyatunga	Justus	M	"	Tj
22.	Nakanda	Rose	F	"	
23.	Muwanga	[illegible]	M	"	
24.	Ssenkubo	Paul	M	"	SSenkubo
25.	Twakirire	Shearing	F	"	T S

CRUDE OIL PIPELINE

Date: 13 05 2017 Locality of Meeting: Kyenvunikidde village

RSK

Meeting ID:

Project Name: Stakeholder Consultation for the Eacop Pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	[illegible] Julius Buwembo	M	Youth chairperson Kyenvunikidde	[illegible]
2.	Ssenkubo Paul	M	Kyenvunikidde	[illegible]
3.	Twakirire Charles	M	"	TC
4.	[illegible]	M	"	[illegible]
5.	Ssegujja Edward	M	"	0751472003
6.	Nakirya	F	"	N
7.	Nakkazi Jamada	F	"	NJ
8.	Nassima Jamila	M	"	0772-493405
9.	Katongole Johnson	M	"	[illegible]
10.	Bbosa Hayes	M	"	[illegible]
11.	Muwanga Jeneco	M	"	[illegible]
12.	Samuel Mila	M	"	Sm

[illegible]

CRUDE OIL PIPELINE

Date: 13 05 2017 Locality of Meeting: Kinyunikidde village

RSK

Meeting ID

Project Name: Scoping level consultations for the Export Pipeline

Meeting attendance list

13.	Nampijja		F	Kinyunikidde	N
14.	Ssemboga	Moses	M	Kinyunikidde	
15.	Kyalimuzaki	Sowedi	F	Kinyunikidde	
16	Nakate	Rosemary	F	Kinyunikidde	
17.	Nakayanzi Annet				N A
18	Kukwatibaze		M	Kinyunikidde	Kakwa
19.	Nanyonga Ch	Charles	M	"	Nyon
20.	Ki Ye Kiriba		M	"	"
21.	Kabuso	Suza	M	"	
22.	Bamwanga	Charles	M		
23.	Kiwa B	Robert	M	"	
24.	Ssebunnya Okiut	Christopher	M	"	
25.	Kiggen	Nicholas	M	"	

CRUDE OIL PIPELINE

Date: 13 05 2017 Locality of Meeting: Kinyunikidde village

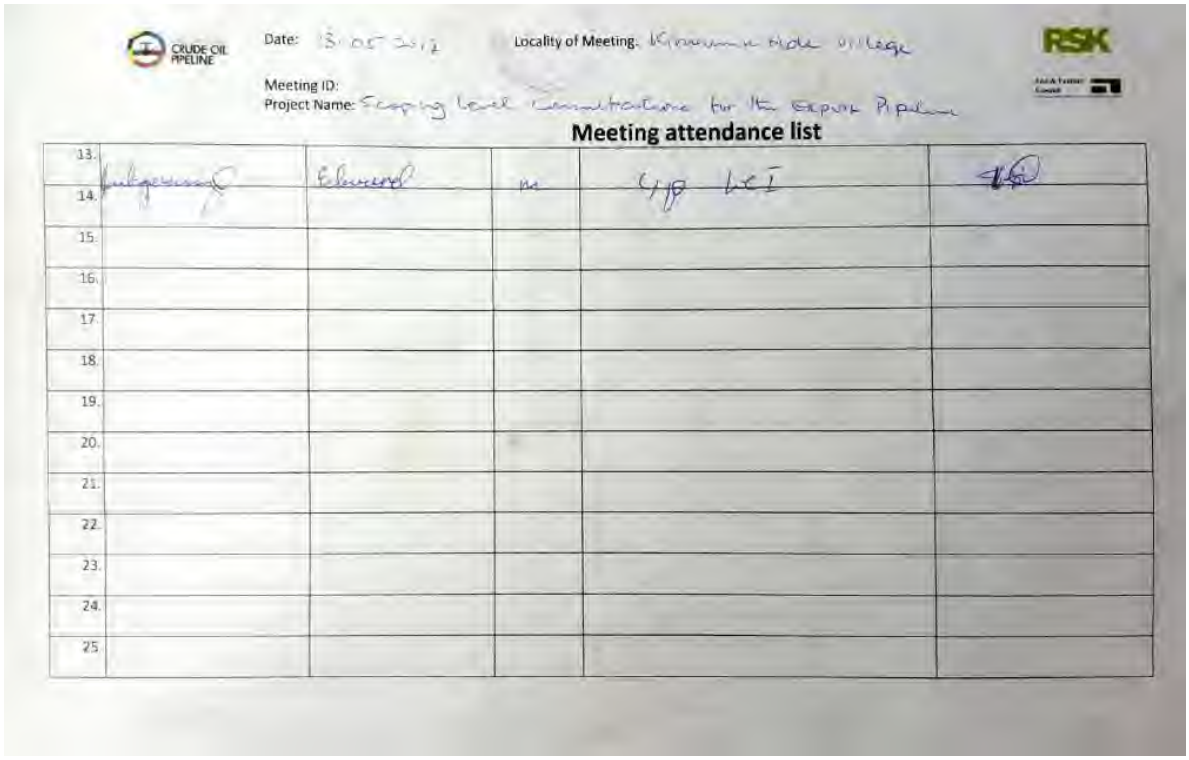
RSK

Meeting ID:

Project Name: Scoping level consultations for the Export Pipeline

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	Kayesu Annet	F	Kinyunikidde	KA
2.	Nakayizi Rose	F	"	NR
3.	Ekwationgi Vincent	M	Kinyunikidde	
4.	Mbeeri Frank	M		
5.	Mbabazi Janet	F	"	
6.	Mugisha Emmanuel	M	"	
7.	Mbeeri Ibra	M	"	
8.	Kakwatwa Ronald	M	"	KR
9.	Kakooza peter	M	"	
10.	Mutagubya Dea	M	"	
11.	Mayigaga John	M	"	
12.				



CRUDE OIL PIPELINE

Date: 13 OCT 2017 Locality of Meeting: Kinawataka village

RSK

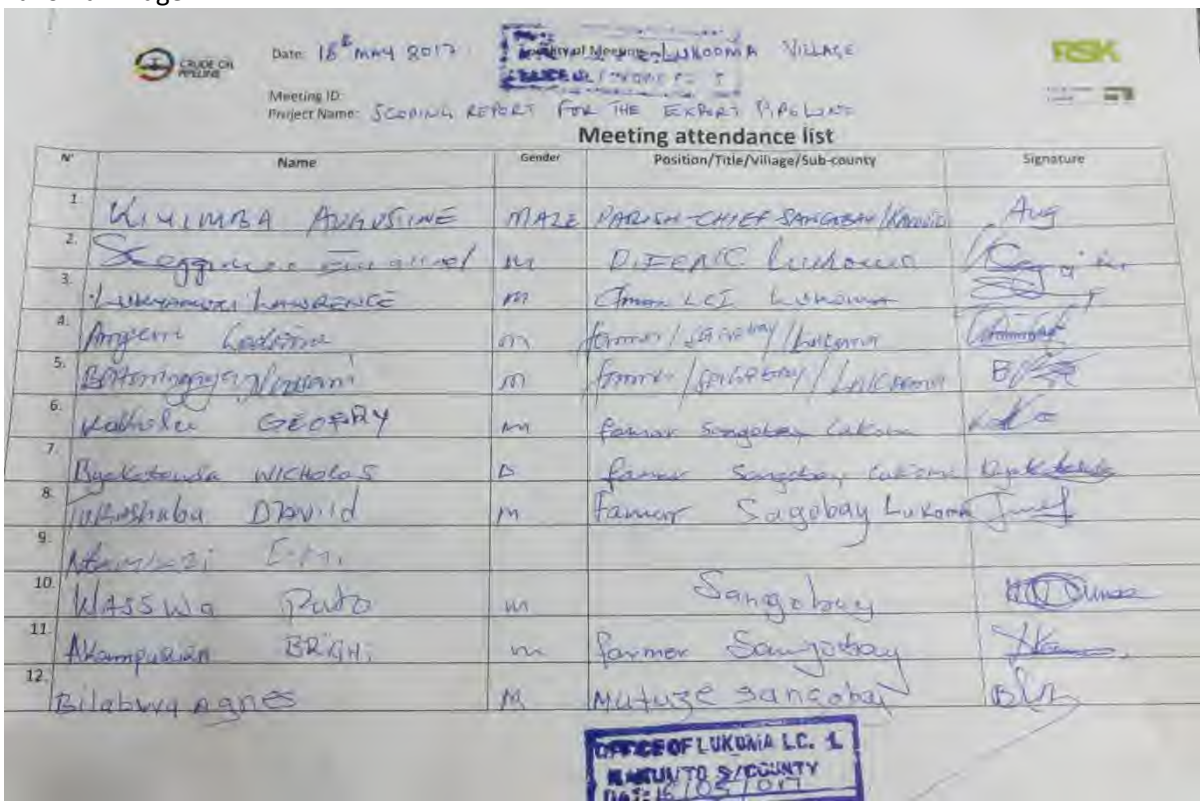
Meeting ID:

Project Name: Scoping level Consultations for the Export Pipeline

Meeting attendance list

13.	[illegible]	Edward	M	Yp LCI	
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					

Lukoma Village



CRUDE OIL PIPELINE

Date: 18th MAY 2017 Meeting at LUKOMA VILLAGE

RSK

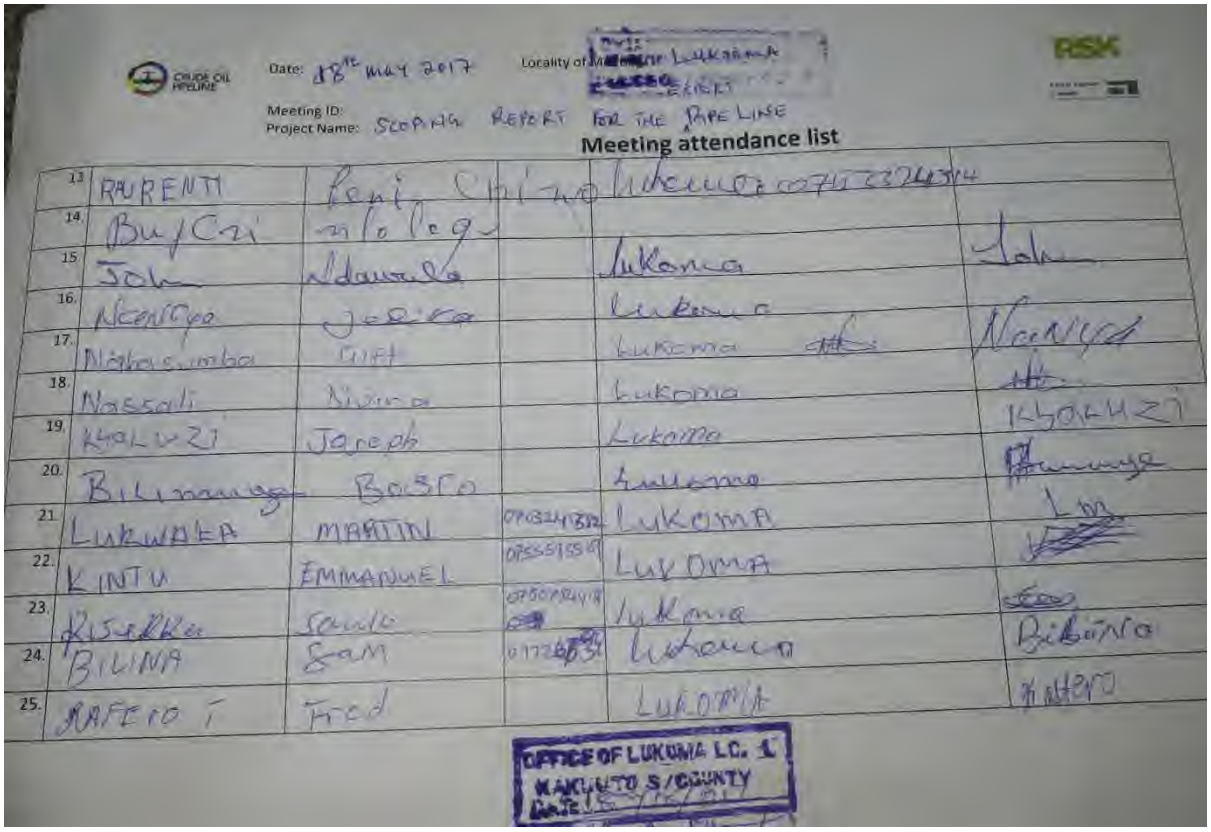
Meeting ID:

Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county	Signature
1.	KIYIMBA AUGUSTINE	MALE	PARISH CHIEF SANGOBAY/KAMWOKYA	Aug
2.	[illegible]	M	DEFENCE LUKOMA	
3.	[illegible] LAWRENCE	M	Chmn LCI Lukoma	
4.	[illegible]	M	farmer/Sangobay/Lukoma	
5.	[illegible]	M	farmer/Sangobay/Lukoma	
6.	[illegible] GEOFFRY	M	farmer Sangobay Lukoma	
7.	Byakatonda NICHOLAS	M	farmer Sangobay Lukoma	
8.	[illegible] DAVID	M	farmer Sangobay Lukoma	
9.	[illegible]			
10.	KASSWA Ruth	M	Sangobay	
11.	Nkamubiira BRIGHT	M	farmer Sangobay	
12.	Bilabwa Agnes	M	Mutuze Sangobay	

OFFICE OF LUKOMA L.C. 1 KAMWOKYA S/COUNTY



CRUDE OIL PIPELINE

Date: 18th May 2017 Locality of Meeting: LUKOMA

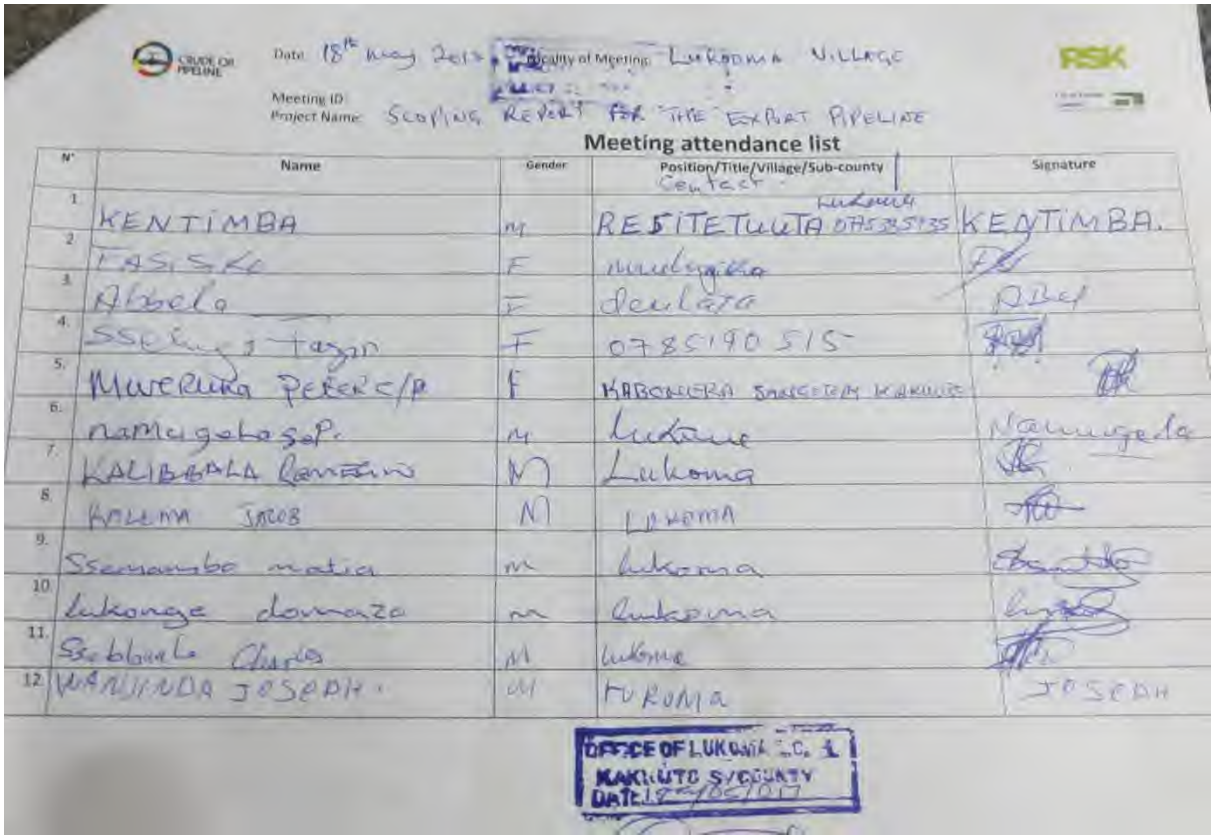
Meeting ID:
Project Name: SCOPING REPORT FOR THE PIPELINE

RSK

Meeting attendance list

13	RAURENTI	Remi Chi'no	Lukoma 0771232474	
14	Bu/Czi	mologo		
15	John	Idawala	Lukoma	
16.	Ncenopo	Jessica	Lukoma	
17.	Nabasumba	Gift	Lukoma	
18.	Nassali	Nivina	Lukoma	
19.	KALUZI	Joseph	Lukoma	
20.	Bilimunga	Bosco	Lukoma	
21.	LUKWAKA	MARTIN	0783413312 LUKOMA	
22.	KINTU	EMMANUEL	0755515569 LUKOMA	
23.	Kisekka	Saudo	0750784418 Lukoma	
24.	BILIMA	Sam	0772603 Lukoma	
25.	MAFEIO T	Fred	Lukoma	

OFFICE OF LUKOMA L.C. 1
KAKINDO S/COUNTY
DATE: 18/5/2017



CRUDE OIL PIPELINE

Date: 18th May 2017 Locality of Meeting: LUKOMA VILLAGE

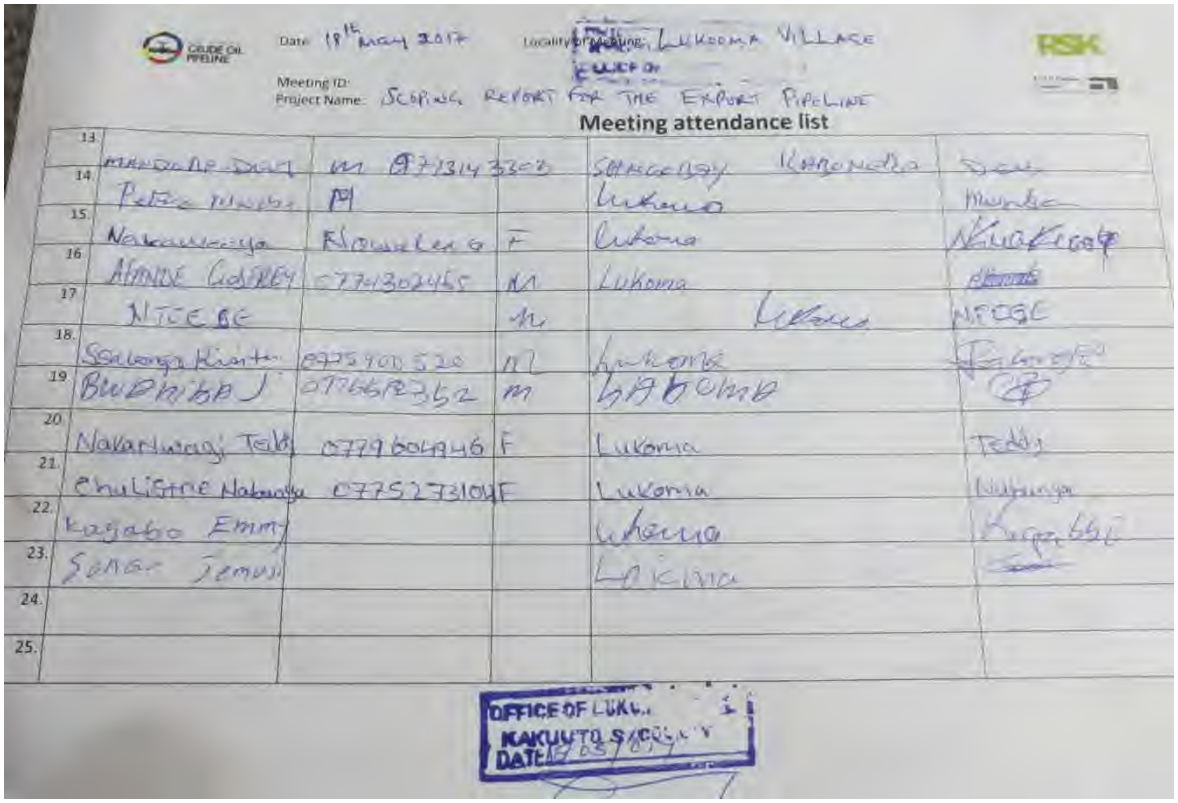
Meeting ID:
Project Name: SCOPING REPORT FOR THE EXPRAT PIPELINE

RSK

Meeting attendance list

N°	Name	Gender	Position/Title/Village/Sub-county Contact	Signature
1.	KENTIMBA	M	RESITETUUTA LUKOMA 0785385135	KENTIMBA.
2.	FASIKA	F	Nwalyaka	
3.	Abbola	F	Idwala	
4.	Ssebuggwa Tayan	F	0785190515	
5.	MWERUKA PETER C/P	F	KABONERA SNAGEGOM KAKINDO	
6.	namugabo SP.	M	Lukoma	Namugabo
7.	KALIBBALA Ramathan	M	Lukoma	
8.	KALEMA JACOB	M	LUKOMA	
9.	Ssemambo matia	M	lukoma	
10.	Lukonge domaza	M	Lukoma	
11.	Ssebbale Charles	M	Lukoma	
12.	KANYINDA JOSEPH.	M	LUKOMA	JOSEPH

OFFICE OF LUKOMA L.C. 1
KAKINDO S/COUNTY
DATE: 18/5/2017



CRUDE OIL PIPELINE

Date: 18th May 2017 Locality of Meeting: LUKOOMA VILLAGE

Meeting ID:

Project Name: SCOPING REPORT FOR THE EXPORT PIPELINE

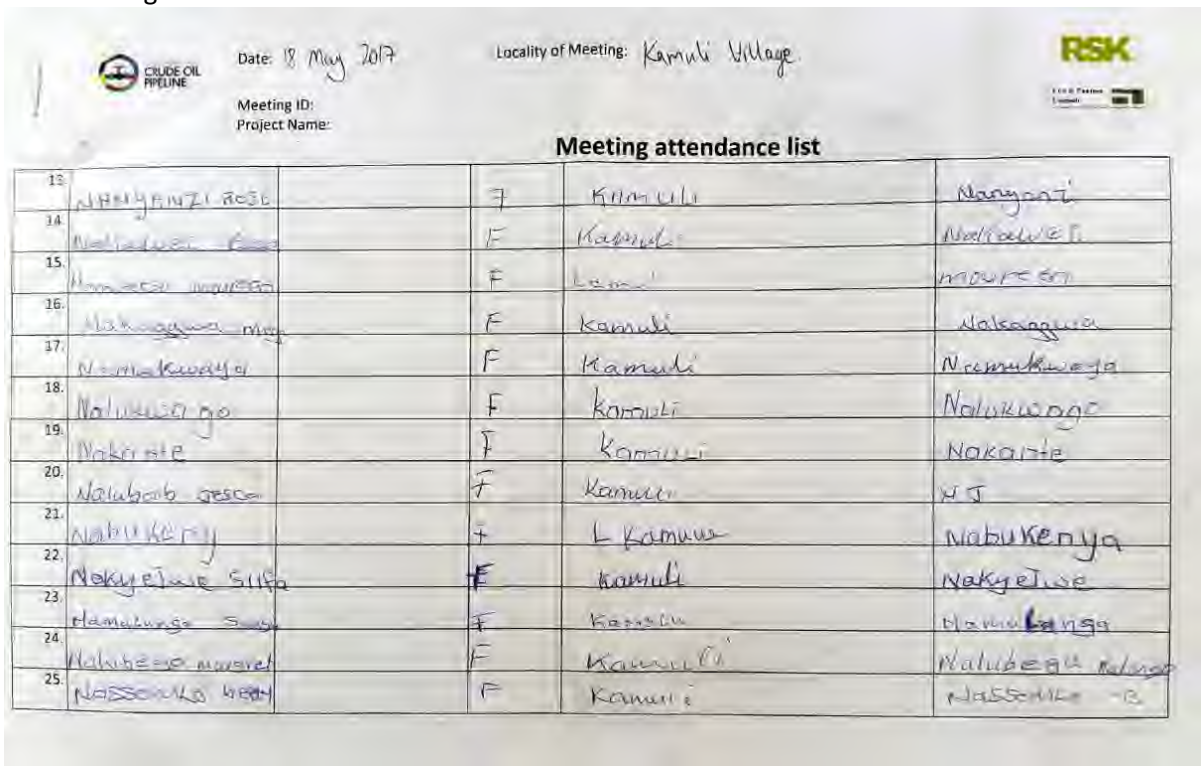
RSK

Meeting attendance list

13.					
14.	MANDALE DAVID	M 0771473303		SEMUGENYI	KAMONDYA
15.	Peter Mwebe	M		Lukoma	Mwebe
16.	Nakawuuya	Rhoda Eva	F	Lukoma	Nkwakeeba
17.	AMANDE Godfrey	0774302465	M	Lukoma	
18.	NTCBC		M	Lukoma	NTCBC
19.	Ssalonga Kinto	0775900520	M	Lukoma	
20.	BUDHIBA J	0776823652	M	LUKOMA	
21.	Nakatwagi Teddy	0779604946	F	Lukoma	Teddy
22.	Chulistine Nabunya	0775273104	F	Lukoma	Nabunya
23.	Kagaba Emmy			Lukoma	Kagaba
24.	Sonar Jamuli			Lukoma	
25.					

OFFICE OF LUKU..
KAKUUTO S/COUNTY
DATE 18/5/2017

Kamuli Village



CRUDE OIL PIPELINE

Date: 18 May 2017 Locality of Meeting: Kamuli Village

Meeting ID:

Project Name:

RSK

Meeting attendance list

13.	NANYANZI ROSE		F	KAMULI	Nanyanzi
14.	Nalubwa Rose		F	Kamuli	Nalubwa R.
15.	Namara Maria		F	Kamuli	Maria
16.	Nakaggwa Mary		F	Kamuli	Nakaggwa
17.	Namukwaya		F	Kamuli	Namukwaya
18.	Nalukwago		F	Kamuli	Nalukwago
19.	Nakaale		F	Kamuli	Nakaale
20.	Nalubaale Rosa		F	Kamuli	N J
21.	Nabukenya		F	Kamuli	Nabukenya
22.	Nakyejwe Silfa		F	Kamuli	Nakyejwe
23.	Namulanga Sarah		F	Kamuli	Namulanga
24.	Nalubega Margret		F	Kamuli	Nalubega
25.	NASSOLO HEDA		F	Kamuli	NASSOLO H.

Meeting ID:
Project Name:

Meeting attendance list

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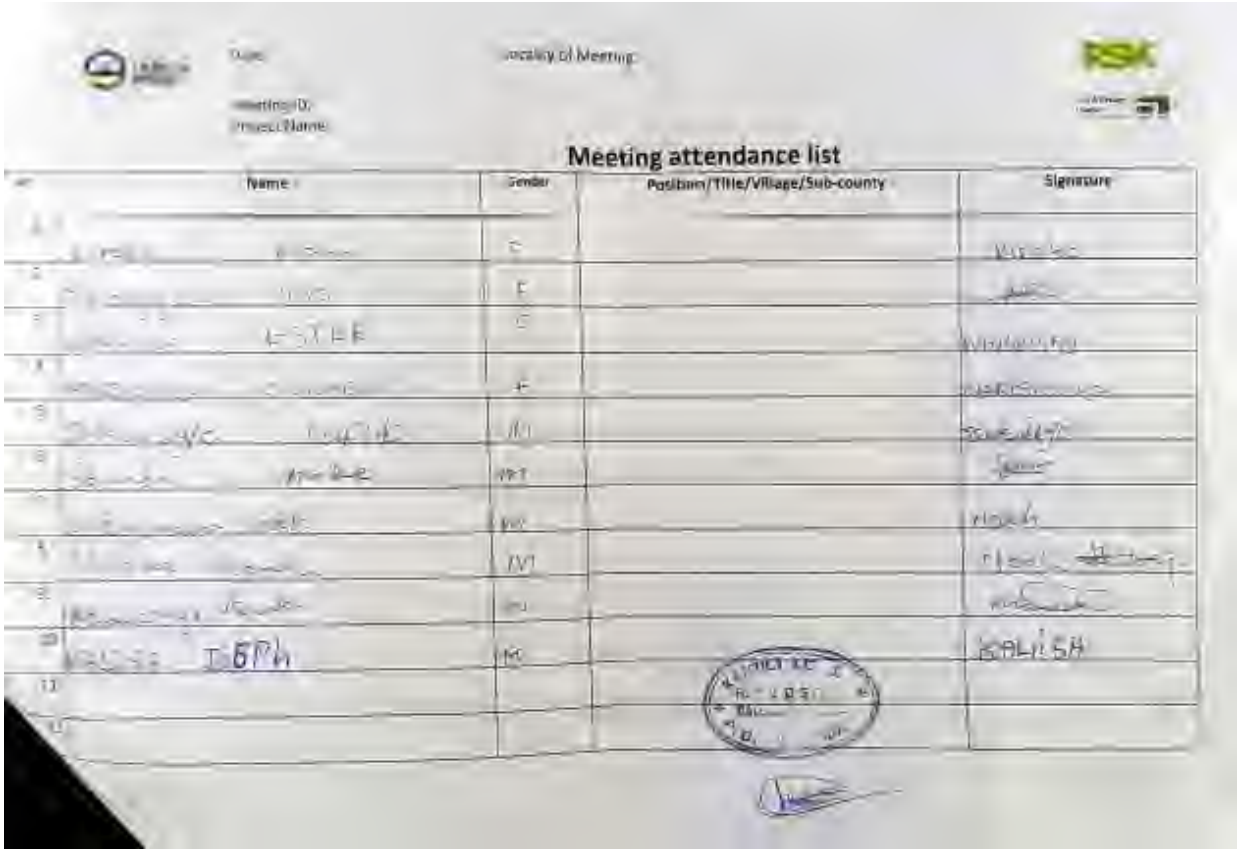

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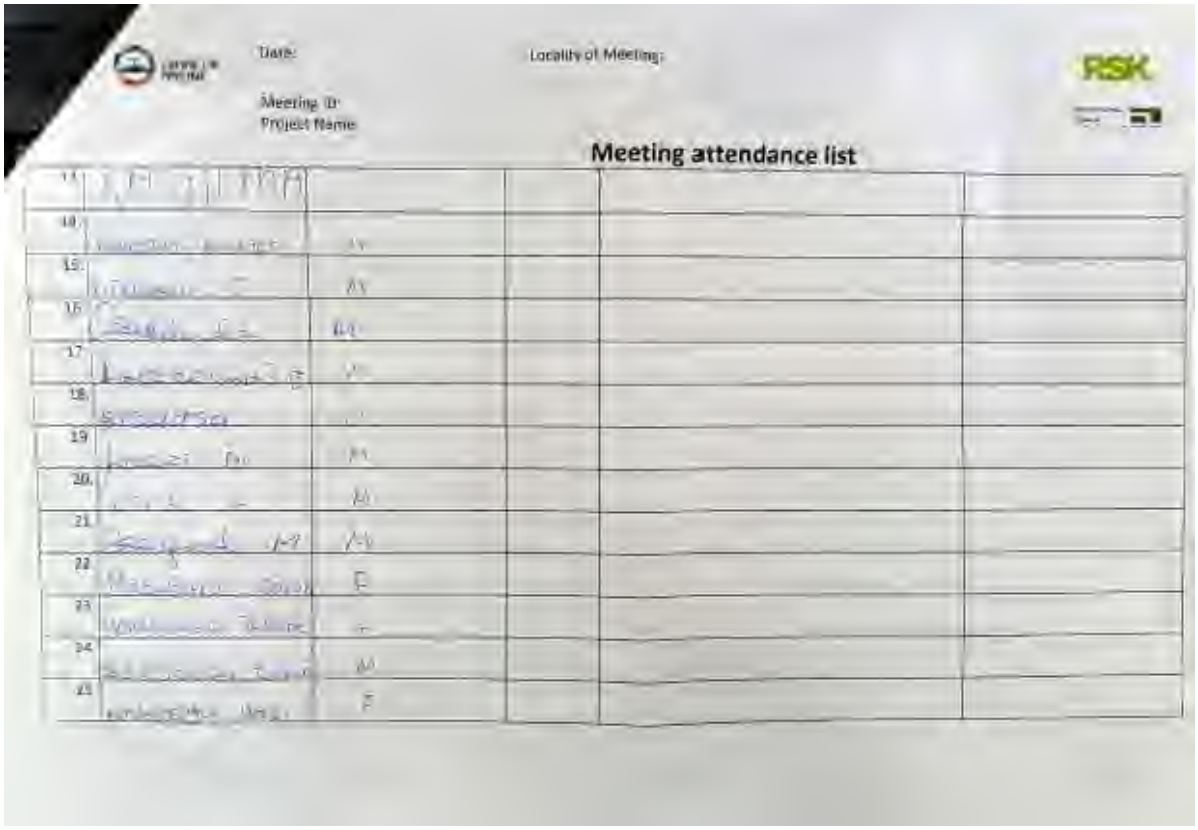

Date:

Locality of Meeting:

Meeting ID:
Project Name:

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Meeting attendance list

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Meeting attendance list

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Meeting Date	Stakeholder Group	Gender	Position	Meeting	Questions/ Concerns	Response provided
30/10/2017	LC1 - Village Local Council and Community Members	Male	Councillor	Mutukula Village	When is the Project starting?	This will depend on the completion of the pre-construction surveys and studies. A definite answer will be provided by EACOP team.
01/11/2017	LC1 - Village Local Council and	Female	Resident	Lwemisege Village	Will the compensation to the project affected persons be immediate following the completion of the evaluation exercise?	Compensation will be conducted before commencement of the project. However, the compensation will not be affected immediately following the completion of the evaluation exercise as there are certain procedures such as verification of the claimed amount that have to be undertaken.
		Male	Chairperson		If I have no land title, will I be compensated if my land is taken up by the project?	The project will compensate tenants – bibanja owners (who may not have their land interest in land registered but can verified by the local leaders) and are affected by the project
		Female	Resident		Will persons who own farm land used for grazing of cattle be compensated, in case they are affected?	Yes, these will be compensated for land that will be taken up by the project.
02/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	Will local people be recruited for work?	EACOP will sensitize local communities on the recruitment procedures. However, for non-technical jobs, the local people are normally prioritised.
		Male	Resident		How will watering points and cattle crossing points for cattle be handled?	Studies will map out all such places and mitigation measures suggested before commencement of the project?
02/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Lukulavu Village	There is a concern over payment of project affected persons. Experience from other projects indicates that affected persons are never paid and are left behind	Compensation of project affected persons will be in accordance with the existing legal framework and in a timely manner.

					suffering following the completion of the project.	
		Male	Resident		Can the project provide Lawyers to the affected persons? The local people are vulnerable and cannot stand against oil and gas companies in case of disputes.	This will be relayed to EACOP for an accurate response in Wednesday, the 8th November community meeting.
		Male	Chairperson		Can the pipeline be routed through a hilly or steep area?	At certain sections along the proposed route, the pipeline will be routed through relatively steep areas. But at most sections, the priority is to have the pipeline routed through low areas.
		Male	Chairperson		If the community water source, such as a borehole, is located downstream of the proposed pipeline, can there be no effect on the water quality?	There are no anticipated effects on water quality due to the location of the pipeline upstream as the pipeline's integrity will be tested before the project's commencement. Additionally, water quality will be monitored regularly to detect any changes.
		Male	Resident		How will the compensation rates be determined? Will the rates be dictated by the developer or negotiated with the Project Affected Persons?	The existing District Compensation rates will be used for crops that will be damaged/ destroyed. Compensation for any losses that will have occurred will be in accordance with the existing guidelines that are approved by the office of the Chief Government Valuer.
		Male	Resident		Some of the projects monitored by the World Bank such as the road construction works have generated a number of social issues. How will this project be different?	Management Plans are being developed to minimise impacts due to project activities.
		Male	Resident		Will affected persons be resettled before the commencement of the project or after?	The resettled persons will be handled before commencement of project activities.
		Male	Resident		In case residents decide that the project does not go through this	Community will be engaged before construction works commence and all negative measures mitigated. EACOP

					village, will the pipeline be re-routed?	will provide further information on the pipeline's routing.
		Male	Resident		Will the local people be prioritized when recruiting workers?	EACOP will sensitize local communities on the recruitment procedures. However, for non-technical jobs, the local people are normally prioritised.
		Male	Resident		There are concerns over possibility of commencement of child sacrifice practices in our area du e to the Project.	There will be child sacrifice due to the proposed project.
02/11/2017	LC3 - Lower Local Government	Male	Speaker	Maddu Sub County	Why are you collecting this information written in your inventory?	To familiarise with the various features in your community.
03/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Kibonzi Village	When will the project affected persons be compensated for any losses that they may have? Experience from related projects has indicated delayed payments of compensation dues.	Compensation of project affected persons will be in accordance with the existing legal framework and in a timely manner and i twill occur before project starts.
		Male	Resident		What are our chances of accessing employment opportunities during the pipeline project?	The project will prioritize the residents of the area through which the pipeline will be routed, mainly for non-technical jobs.
		Female	Resident		There are concerns that the pipeline may affect food crops that are grown above it.	The pipeline will be two metres below and it will be well insulated, so as to minimise impacts on human activities.
		Male	Chairperson		How will the pipeline be secured from vandalism?	The pipeline will be fitted with fibre optics that will send signals to the control rooms in case of any attempts to vandalise the pipeline.
03/11/2017	LC1 - Village Local Council and Community Members	Male	Secretary, LC1	Kyakudusi Village	Will project affected persons be paid in time?	Compensation of project affected persons will be in accordance with the existing legal framework and in a timely manner and will occur before project starts.

		Male	Secretary, LC1		How will the project be secured from terror attacks?	The pipeline route will be strategically monitored to minimise illegal activities, including terrorism, along the route.
		Male	Resident		What are our chances of accessing employment opportunities during the pipeline project?	The project will prioritize the residents of the area through which the pipeline will be routed, mainly for non-technical jobs.
		Female	Women's representative		What is the anticipated duration of the project's lifecycle?	Approximately 25-30 years.
03/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Bukulula Village	There is a concern that there will be an increase in the number of conflicts related to land, yet residents have been living in harmony.	Land acquisition process will be conducted in a transparent way involving local leaders to verify land ownership. This will minimise conflicts over land.
		Male	Resident		There is a fear that the government will use security forces to forcefully acquire land without compensating for land take. We have watched such incidents happening in Uganda over television networks.	There will be no forceful acquisition of land. Project affected persons will be approached and informed of the procedures that will be used for land acquisition.
		Female	Chairperson		How will cases involving a husband and wife that separated be handled?	Such incidents will be handled on a case by case basis, so as to clearly evaluate the situation. Some may involve consultation with the local leaders.
03/11/2017	LC1 - Village Local Council and Community Members	Male	Chairperson	Kiswaga Village	If we don't want the pipeline to be routed through our village, how will that be handled?	There will be no forceful acquisition of land. Project affected persons will be approached and informed of the procedures that will be used for land acquisition. The local community will be sensitised about the proposed project by the pipeline team.
		Male	Chairperson		There is a fear that local people will not be fairly compensated for	The project affected persons will be engaged and sensitised about the

					their land but instead be oppressed?	proposed project and will be fairly compensated in accordance with the national guidelines.
03/11/2017	LC1 - Village Local Council and Community Members	Male	Councillor	Nanywa Village	Will there be access roads to the pipeline constructed?	Some sections of the existing roads will be upgraded and a few access roads constructed.
		Male	Chairperson		Where will grievances be reported to?	EACOP has developed a grievance mechanism, and communities will be sensitised on how grievances can be resolved.
		Male	Chairperson		Will bibanja owners with no land titles and have not been levies to the land lords be compensated?	Land lords and bibanja owners, whose land will be acquired due to the proposed project activities, will be compensated for land take.
04/11/2017	LC1 - Village Local Council and Community Members	Male	Secretary, LC1	Butiti Village	Which entity will affect the compensation for loss of crops/property and when?	The Compensation process will be spearheaded by the EACOP team, but the rates are approved by the Government of Uganda. Compensation for loss of crops will be conducted following approval being obtained from the Chief Government Valuers office.
		Male	Resident		Will both the tenant (kibanja holder) and the landlord be compensated?	Both the tenant and landlord will be compensated for land take by the project.
		Male	Resident		If the pipeline goes through bare land, will the land owner be compensated?	The land owner will be compensated for loss of land.
		Male	Resident		There are concerns that sections of the pipeline may be damaged and oil spillages occur with devastating effects on the environment.	The pipeline will be fitted with fibre optic cables to detect points at which the pipeline is damaged instantly so that emergency response teams can move in fast.
04/11/2017	LC1 - Village Local Council and Community Members	Male	Chairperson	Kabonera Village	What is the impact of a heated pipeline on community safety, especially the health of children?	The pipeline will be insulated and will be designed in such a way that there is no heat emitted to the environment.
		Male	Chairperson		Will local people be considered for employment?	Local people will be considered for employment, especially for non-technical jobs. Technical jobs will be

						advertised nationally and internationally.
		Male	Chairperson		How will the local persons benefit from the proposed project?	There will be both direct (like job opportunities) and indirect benefits (like upgrade of roads to access the pipeline work sites).
		Female	Resident		If the pipeline is damaged, how will it affect the local people?	The pipeline will be fitted with optic fibre cables that will help detect points at which the pipeline is damaged for emergency response. Additionally, the crude oil is waxy, so in case of damage, and it is exposed to the surface, it will solidify and will not flow to impact large areas.
		Male	Resident		If the pipeline corridor includes an area with graves, will the graves be relocated?	Graves will be relocated with the consent of the affected persons.
		Male	Resident		Will both the tenant (kibanja holder) and the landlord be compensated even if the land had no crops?	Both the tenant and landlord will be compensated for land take by the project.
		Male	Resident		When will the project activities commence in Kabonera village?	The commencement date will be communicated in due course as this is dependent on a number of approvals that have to be obtained from the Government of Uganda.
		Male	Resident		Why should the project use the district compensation rates instead of negotiating with the affected person?	District compensation rates are referred to as they are legally binding and provide a guideline that is approved by the Government of Uganda.
		Male	Resident		Will there be a livelihood restoration programme for the resettled persons or they will just be given houses?	A livelihood restoration programme will be in place for the resettled persons.
06/11/2017	LC1 - Village Local Council and	Male	Chairperson	Kinvunikidde Village	Non-technical jobs should be considered for the persons so that they can benefit	Local people will be considered for employment, especially for non-technical jobs. Technical jobs will be

	Community Members					advertised nationally and internationally.
		Male	Chairperson		There are concerns over land acquisition. There is a bill being tabled by government to acquire land and then compensate the affected persons later. This has led to anxiety within the community.	Affected persons will be duly and compensated in a timely manner.
		Male	Resident		Will the affected persons whose land has been acquired retain full rights over the 20m that will revert to him/her following completion of the project?	The land owner will have full rights over the 20m after they have reverted to him/her.
		Male	Resident		Compensation for land take should target both the tenants and land owners as separate entities.	Both tenants and land owners will be compensated for land that will be taken up by the project.
		Female	Resident		We request that local persons are considered for employment.	Local people will be compensated for employment especially in non-technical fields.
		Male	Resident		Many of the projects promise to offer employment to the locals but this is never affected. Even those employed are usually paid less.	Local people will be prioritised for employment in non-technical fields. Workers will be paid the same rates for the same type of work.
		Male	Resident		Will compensation for persons that will be resettled be before or after construction of the proposed pipeline?	Compensation of persons that will be resettled will be before commencement of construction works.
06/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Mbirizi Village	Why do you intend to split the community members into small groups during the FGDs?	FGDs are intended to get an in depth understanding of the issues affecting a particular section of the society.
		Male	Resident		How will the residents of Lwengo TC benefit from the proposed project?	There will be both direct and indirect benefits associated with the proposed project. These may include job opportunities, business opportunities for suppliers among others.
		Male	Resident		We formed a Civil Society Organisation (CSO) – Volunteer	Noted. This is beyond the mandate of the EACOP team.

					Uganda Extra Limited – that deals with human rights, corruption and legal protection of the vulnerable groups. However, political leaders within are trying to frustrate our efforts, yet we can provide legal aid due to persons that may be affected by the proposed pipeline activities.	
		Male	Chairperson		What is the fate of the youths in relation to the proposed project?	Some of the youths in the local communities will be offered employment opportunities especially the non-technical jobs.
		Male	Chairperson		Why has Lwengo Zone in particular been identified for these studies?	Lwengo zone within Lwengo Town Council, will be one of the areas either directly or indirectly affected by the proposed project. As such baseline studies are being conducted so as to establish the baseline.
07/11/2017	LC1 - Village Local Council and Community Members	Male	Chairperson	Bulakati Village	Was aerial mapping done so as to zero down to Bulakati as one of the proposed pipeline routes?	Preliminary studies were conducted and are still being conducted until a final pipeline route is selected. Bulakati village is within the study area for the proposed pipeline route.
		Male	Resident		How many pipelines will go through our area?	The proposed studies are for the EACOP.
		Male	Resident		Will both the tenant (kibanja holder) and the landlord be compensated?	Both the tenant and landlord will be compensated for land take by the project.
		Male	Resident		Will the local people be considered for employment?	The local people will be prioritised for non-technical jobs.
08/11/2017	LC1 - Village Local Council and Community Members	Female	Resident	Muyenje Village	If the proposed pipeline is routed through a resident's household, will that person be resettled?	If a person is displaced due to the routing of the pipeline, the affected person will be resettled.
		Male	Resident		Will a grave site be relocated in case it is affected?	Yes, directly affected grave sites will be relocated.
		Male	Chairperson		How will issues related to speculation be handled? Some	Studies are being conducted to determine the most appropriate route

					people may construct houses within the proposed pipeline route.	and as such, any speculation may lead to losses.
08/11/2017	LC1 - Village Local Council and Community Members	Male	Farmer	Buseruka Village	EACOP should also run radio programs to sensitise the communities given many people listen to radio stations, hence information would easily be relayed.	Noted.
		Male	Farmer		There was a lot of bribery and corruption within the people who are in charge of compensation especially for the refinery area in Kabale. We request government to avoid such people during the construction of the pipeline?	Noted
		Male	Veteran		What will EACOP do to protect the installations from theft?	The Pipeline Company will operate the pipeline and will have responsibility for the long term safe and uninterrupted operations of the pipeline.
		Male	Veteran		Will compensation be made before construction of the pipeline?	EACOP will compensate affected persons prior to construction of its facilities.
09/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Sembabule Village	Will the government buy off the 30m corridor and only revert the 20m to the affected land owners as a courtesy?	The 10m corridor will be permanently acquired by the Government of Uganda, and the 20m will be temporarily acquired.
		Male	Resident		When will the project activities commence?	The start date will depend on the permitting process, but the schedule indicates late 2018.
		Male	Resident		Where, within Market Zone, will the pipeline be routed?	The pipeline route will be optimised following the completion of studies.
		Male	Resident		Will the pipeline be designed to avoid (have bends) certain structures? Will it be routed upslope at certain sections?	The pipeline can have bends at certain points along the route, and move upslope at some sections.

		Male	Resident		What will be the impact of the pipeline on community health? Are there health impacts for people beyond the 3om, during the operation phase of the project?	Potential health impacts will be evaluated following completion of the studies.
		Male	Resident		What will be duration between valuation of properties to be affected and payment of the compensation fees? Inflation can affect the compensation dues.	Compensation of the affected persons will be effected following approval by the office Chief Government Valuer's (CGV). There should be no delays.
		Male	Resident		Will the few sampled households be representative of the state of Market Zone?	The household surveys will be complimented by literature review, FGDs and KIIs to have a full understanding of the state of the environment in Market Zone.
		Male	Resident		If the pipeline is routed through land that was leased, will both the lessee and lesser be compensated?	The land owner with a current leasehold will be considered to have rights and interests over that particular piece of land. If the land has a tenant, the interests of the tenant will be compensated too.
09/11/2017	LC1 - Village Local Council and Community Members	Male	Chairperson	Nsambya Village	There are many villages in Lugusulu Sub-county, why has Nsambya village been particularly selected for the upcoming studies? Does it imply that the pipeline will be routed through our village?	Nsambya village is one the villages along the study area for the proposed pipeline route. Following the completion of the studies, the pipeline route will be optimised but at the moment, studies are still being conducted.
		Male	Resident		Will the affected sections of land temporarily acquired for the proposed pipeline activities be restored before being reverted to the land owners?	For land that will be temporarily acquired, there will be restoration before land is reverted to the land owners.
		Male	Resident		Will land owners, to whom the 20m will be reverted, have full rights over that piece of land?	The land owner will have full rights over that piece of land.

		Male	Resident		Will the youths be considered for employment?	Youths from the local communities will be prioritised for employment.
10/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Mabale Village	If the pipeline is routed through my parcel of land, will I be compensated and resettled?	The land owner of that parcel of land will be compensated as per the assessment of the land valuer and the rates set by Ssembabule district. If a person is displaced due to the routing of the pipeline, the affected person will be resettled.
		Male	Resident		Will residents be allowed to graze cows over the pipeline route?	Discussions over the user rights within the 10m corridor are still ongoing and the government will communicate a final position.
		Male	Youth Representative		Will the locals in the village be considered for employment?	Local people will be considered for employment, especially for non-technical jobs. Technical jobs will be advertised nationally and internationally.
		Female	Resident		How will the local persons benefit from the proposed project?	There will be both direct (job opportunities and supply of food items to camps) and indirect benefits (like upgrade of roads to access the pipeline work sites).
10/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Miti Village	If the pipeline is routed through my land and it is subdivided into two, can the project resettle me?	If the largest piece of your land has been acquired for project activities, then the project affected person (PAP) can be resettled. However, if small sections of the land are affected, PAP will not be resettled.
		Male	Resident		Will graves be relocated in case they are within the 30m corridor?	Graves will be relocated following consent of the affected person.
		Male	Resident		Is there adequate oil resource for Ugandans before it is exported?	Some of the crude oil will be refined at Kabaale to supply Ugandans and the regional market. However, the government has decided to export some of the crude oil in order for the country to earn foreign exchange.

		Male	Chairperson		When did the mapping of the proposed pipeline route commence?	Mapping of the proposed pipeline route commenced years back using satellite imagery and aerial photography.
		Male	Resident		Will the field study team that will conduct stakeholder engagement in the area show us the proposed pipeline route?	The field survey team will be collecting baseline for environmental and social impact assessment, and the studies will help to optimise the pipeline route.
		Male	Resident		Will both the landlords and tenants be compensated?	Both tenants and landlords will be compensated for land that will be acquired for the project.
		Female	Resident		If a piece of land was given to me by my husband, but there are no documents to verify this, who will be compensated?	Rightful land owners/users will be compensated for land take following a verification process.
		Female	Resident		If I am a widow, but have no documents to verify land ownership, will I be compensated?	Affected persons will be compensated following a verification process.
10/11/2017	LC1 - Village Local Council and Community Members			Kamuli Village	What is the safe distance from the pipeline that residents can construct households?	House can be constructed beyond the 10m corridor of the pipeline.
10/11/2017	LC1 - Village Local Council and Community Members	Male	Vice Chairperson	Serinya Village	Will there be other persons visiting and educating the communities on issues related to the ESIA of the proposed pipeline activities, property rights and issues related to the environment?	There will be continued stakeholder engagement throughout the project cycle. The topics of discussion within the engagements will vary and will be communicated.
		Female	Resident		I have been hearing radio announcements and allegations of the government forceful evicting locals out of their land for developments such as road and railway developments. Is this the same message you are delivering to us?	Consent of the project affected persons will be sought and there should be forceful eviction.

		Male	Resident		If the pipeline corridor includes an area with graves, will the graves be relocated?	Graves will be relocated with the consent of the affected persons.
		Male	Resident		Why has Serinya village been particularly selected for the upcoming studies? Does it imply that the pipeline will be routed through our village?	Serinya village is one the villages along the study area for the proposed pipeline route. Following the completion of the studies, the pipeline route will be optimised, but at the moment, studies are being conducted.
11/11/2017	LC1 - Village Local Council and Community Members	Female	Chairperson	Njaza Village	Will the 10m corridor be leased or fully bought by the Government of Uganda?	The 10m corridor of the pipeline will be permanently acquired but the Government of Uganda.
		Male	Resident		Will households be avoided or the affected persons will be relocated?	Directly affected households (within the 30m construction corridor) will be relocated.
		Male	Resident		If an affected person's land is only within the 30m corridor, and he/she is relocated, what will happen to the 20m following the completion of the construction and restoration?	The land will have been acquired by the Government of Uganda following the relocation/resettlement of the affected person.
		Female	Resident		What is the safe distance from the 30m corridor during the pipeline construction? There are likely to be incidents when a household is barely 5m from the 30m construction corridor.	Any distance beyond the 30m is considered safe as engineers can adopt the construction routines within the 30m corridor depending on the proximity of the receptors.
		Male	Resident		What measures will be put in place to minimise the spread of communicable diseases and associated social evils/	There will be a Camp Management Plan that will minimise interaction between the construction workers and the communities.
		Male	Resident		Will local people be considered for employment?	Local people will be prioritised during the recruitment for non-technical jobs.
11/11/2017	LC1 - Village Local Council and	Female	Chairperson	Kakende Village	Will the affected people be first compensated before the construction starts?	Compensation will be done prior to the construction activities

	Community Members	Male	Resident		How will villages neighbouring the pipeline benefit from its construction?	There are several benefits such as employment, improvement of some infrastructure especially roads among other.
		Male	Resident		The compensation rates are likely to be influenced by government people so as to cheat the affected people, we call upon EACOP to engage the affected people during such decision makings	Noted
13/11/2017	LC1 - Village Local Council and Community Members	Female	Resident	Kagoma Village	What are the impacts of a heated pipeline on community health?	The pipeline will be coated and insulated to eliminate the impacts that would have emanated from a heated pipeline.
		Female	Resident		What will happen if a pipeline is routed through a community water source?	Community water sources will be mapped prior to the construction of the pipeline. If the water source cannot be avoided, then an alternative water source will have to be constructed prior to the commencement of construction activities.
		Male	Chairperson		Will both the tenants and land lords with titles be compensated for the same piece of land?	Land users and owners will be compensated for losses/land take due to the proposed pipeline activities.
		Male	Chairperson		Will communities be sensitised before taking the land and compensating for losses?	Communities and project affected persons will be sensitised on various aspects including their rights, compensation rates among others.
		Male	Chairperson		What will be the approximate land take for a fly camp?	The exact size of land that will be required will be communicated prior to the construction works.
		Male	Resident		There are persons with no documents to indicate land ownership. How will such cases be handled?	Such persons will be compensated for losses they may incur but the verification process may be longer.
		Male	Resident		How will issues related to leakages of crude oil, fire outbreaks be handled?	There will be an emergency response plan in place that will stipulate how

						emergencies of that nature will be handled.
		Male	Resident		What are the regulated activities that may be permitted within the 10m corridor?	Such activities may include grazing of animals, growing short rooted and seasonal crops among others. Government will come up with a firm position on what activities may be permitted.
14/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Kyengera Village	Will the land acquisition process be different for the land to be permanently acquired (the 10m corridor) and that to be acquired on a temporary basis (20m of the construction corridor)?	The 10m corridor will be permanently acquired by the Government of Uganda, and the 20m will be temporarily acquired (during the construction phase). However, the land acquisition process will be conducted at once.
		Male	Resident		If the pipeline subdivides my 30 acres of land, will the project acquire the entire 30 acres? Sub-dividing my land may render one of the pieces of the land inaccessible.	The project will only acquire the 30m corridor (during construction), 20 of which will revert to the land owner and then permanently acquire the 10m corridor. Following the completion of the construction, the land owner should be able to use the entire piece of land as the pipeline will be buried. However, land uses within the 10m corridor will be regulated.
		Male	Resident		What activities will be permitted within the 10m corridor?	Activities to be permitted are still under review by the Government of Uganda, but shallow rooted seasonal crops and grazing may be some of the permitted activities.
		Male	Resident		Will both the tenants (bibanja holders) and titled land owners be compensated for land take?	Both the tenants and land owners with titles will be compensated for land that will be taken up by the project.
		Male	Resident		The Government of Uganda, through the relevant ministry, should sensitize the local persons about the proposed project to minimise misinformation.	Noted.

		Female	Resident		There is a concern over the impact of migrant labour onto the girl child. How should we protect our children?	There will be Camp Management Plans and Journey Management Plans to minimise the interaction of the migrant workers with local population.
		Female	Resident		How will the local community be able to report misbehaviour or crimes committed by the project workers?	A Grievance Management Mechanism will be in place involving the use Community Liaison Officers and Local leaders to address issues related to misbehaviour or crimes committed by the project workers.
		Male	Resident		What is the recruitment mechanism for workers?	The EACOP team will sensitise the communities on how workers will be recruited.
14/11/2017	LC1 - Village Local Council and Community Members	Male	Imam	Kagango Village	When will the pipeline project commence?	The commence date for the construction of the pipeline can only be ascertained after preliminary studies and a Final Investment Decision has been made.
		Male	Imam		Shall local people benefit from the pipeline project?	Some of the benefits of the proposed project include upgrade of some roads, job opportunities and enhanced economic activities in the area.
		Male	Vice Chairperson		Will the 20m that was taken from the land owners be reverted to them for use and will they have rights over their land?	The land owner will have rights over that piece of land.
		Male	Vice Chairperson		If the pipeline is going through the trading centre, will the trading centre be relocated?	Areas such as trading centres will be avoided but in case the trading centre is within the proposed pipeline corridor, then the affected trading centre will have to be relocated.
		Female	Resident		If the pipeline is routed through a water source that is used by a community, such as a valley dam, will it be restored or relocated?	An alternative water source will have to be provided to the community.
16/11/2017	LC1 - Village Local Council and	Male	Publicity Secretary	Kyenda Village	During the mobilisation for the stakeholder engagement, it would be important that directly affected	The community meeting will be for all residents of Kyenda village as some of the residents will be indirectly affected.

	Community Members				persons are part of the meeting. As such, can the reconnaissance team show us the proposed pipeline route so we can mobilise the directly affected persons to attend the meeting?	
		Male	Publicity Secretary		Can a resettled person be given an option of identifying land and they are relocated to that area?	Issues related to resettlement and the procedures that will be followed will be handled following the completion of a Resettlement Action Plan.
17/11/2017	LC1 - Village Local Council and Community Members	Male	Chairperson	Lulongo Village	The pipeline route may be quite distant from the trading centre (Kabulasoke). As such, the venue for community meeting should be held in an area on the periphery of the trading centre.	Noted. As long as the proposed venue is accessible to all residents within the village.
		Male	Resident		Can the residents be provided with a map indicating the proposed pipeline route?	The actual pipeline route will only be optimised following the finalisation of the ESIA studies.
		Female	Resident		Will the affected persons be compensated before commencement of pipeline works?	Valuation of the properties that will be affected by the proposed project will be done before construction but payment may be delayed by the prerequisite approvals by the Government agencies.
		Female	Resident		Will local people get job opportunities?	Local people will be prioritised during recruitment of workers for non-technical jobs.
		Male	Resident		What criteria are followed to recruit workers?	Local persons will be sensitised by the EACOP team on the recruitment procedure.
		Male	Resident		How will project workers that commit crimes such as rape be handled?	Project workers that commit criminal acts will be handled in accordance with the laws of Uganda.
17/11/2017	LC1 - Village Local Council and	Male	LCI	Kidongo Village	What is the exact route?	
		Male	Resident		What is the minimum speed of the cars to be used during the construction phase	

	Community Members	Male	Resident		What is the minimum speed of the cars to be used during the construction phase How will those with no land title be compensated?	
17/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Kisala West Village	Won't EACOP forcefully take peoples land for their construction.	All affected people will first be compensated before any activities can be conducted within their property.
		Male	Resident		Will the local community get some employment opportunities?	There will be job opportunities and these will range from casual, unskilled, semi-skilled and skilled labour.
		Female	Resident		EACOP should identify and notify the PAP early enough so that the affected people can start planning on their next step.	PAP will be identified and notified as soon as all studies are completed and an investment decision has been taken.
17/11/2017	LC1 - Village Local Council and Community Members	Female	Women's representative	Nzoo Village	What will happen if the pipeline crosses the road, will the activities of the area come to a stand?	
18/11/2017	LC1 - Village Local Council and Community Members	Male	Chairperson	Kalembe Village	Will the pipeline construction works be confined to the 30m corridor?	Construction works will be within the 30m corridor.
		Male	Chairperson		Will project affected persons be compensated before commencement of construction works?	Compensation for land take or losses due to the proposed pipeline activities will be before commencement of works. However, delays may be due to the approval process by the office of the Chief Government
		Female	Resident		What will happen to persons whose entire plot is within the 30m corridor?	Such persons will be resettled, with their consent.
		Male	Resident		How will grave sites within the 30m corridor be handled?	Such grave sites will be mapped and if they cannot be avoided, they will be relocated with consent from the affected persons.

18/11/2017	LC1 - Village Local Council and Community Members	Male	Chairperson	Kamusene Village	When are the proposed project activities likely to commence?	The commencement will depend on the permitting process but the project activities are scheduled to commence in the last quarter of 2018.
		Male	Chairperson		Where will the pipeline be routed in this particular village?	The final pipeline route will be firmed up following the completion of the ESIA studies.
		Male	Resident		If the pipeline is routed through a trading centre, what will happen in such an instance?	Trading centres will be avoided when routing the pipeline. However, if the pipeline has to be routed through such a high density area, the affected persons will have to be resettled.
		Male	Resident		Will women be considered for employment?	Women will be considered for employment.
		Male	Resident		What is the minimum level of qualification for a person to be recruited for non-technical jobs?	The procedure for recruitment will soon be communicated by the EACOP team.
		Female	Resident		How will community water sources be handled in case they are within the 30m corridor?	Alternative community water sources will have to be established in case the existing water source is affected by the proposed project.
18/11/2017	LC1 - Village Local Council and Community Members	Male	Resident	Kalembe Village	How will complaints/concerns related to the proposed project be handled? Where will the offices of the Pipeline Team be located?	There will be Community Liaison Officers that will have toll free numbers strategically located at various points along the pipeline. Information about this will be communicated by the EACOP team.
		Male	Resident		Where exactly will the pipeline be routed?	The final pipeline route will be firmed up following the completion of the ESIA studies.
		Male	Resident		There should be timely information flow for all the project affected persons.	This is noted.
27/11/2017	National Government	Male	Commissioner, Crop Inspection and Certification	Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	The Grievance Redress Mechanism that has been put in place by the developer needs to be applauded as it will address some of the grievances that may	Acknowledged.

					crop up during the project implementation.	
		Male	Commissioner, Crop Inspection and Certification		How is the Area of Influence (AOI) defined for this study?	AOI is defined differently for the various environmental and social components, but basically includes the project footprint (and associated facilities) and the indirectly affected areas.
		Male	Commissioner, Crop Inspection and Certification		What engineering designs will be used to cross ecologically sensitive areas such as wetlands? Will there be use of concrete posts to hold the pipe or the wetland will be filled with murram (soils)?	In Uganda, the proposed method for crossing wetlands/river is use of the open cut method. However, construction in such areas will be conducted either first or last to avoid delays in reconnecting the wetland/river. However, Horizontal Directional Drilling (HDD) will be used for some of the rivers in Tanzania, such as R. Kagera.
		Male	Commissioner, Crop Inspection and Certification		What measures will be put in place to handle oil leakages in wetlands or areas prone to floods? Will you have an early warning system or an automated system of detecting oil leakages from the pipeline? This is important to minimise or eliminate impacts on aquatic life.	Following the completion of the of the ESIA studies, the consultant will develop Environmental and Social Management Plans (ESMPs), which among others will include Oil Contingency Plans, Emergency Response Plans etc. These will guide on how such issues will be handled and will be shared with government departments for input/review.
		Male	Commissioner, Crop Inspection and Certification		The proposed study design and methodology seems concrete and we shall look forward to the draft report for our input as a Ministry.	Noted.
		Male	Commissioner, Crop Inspection and Certification		Is there a separate ESIA being conducted for associated facilities such as the CPF? If it is available, this should be shared with the Ministry.	The upstream projects are subjected to a different ESIA and the this will be shared with the Ministry. The Department of Fisheries Resources was consulted during the ESIA for the upstream facilities.

		Male	Principal Fisheries Officer		There is a need for the study team to list wetlands, rivers, lakes within the proposed pipeline route or in close proximity to the pipeline. Certain fish species can only be located in Uganda and in specific water bodies. As such, when the water bodies are listed, the Ministry can offer better guidance.	Noted. This will be provided following the completion of the baseline studies.
		Male	Principal Fisheries Officer		Certain fish species are migratory in nature. Providing a list of water bodies and or critical habitats to be affected and proposed methods of constructions across these water bodies/critical habitats is important.	Noted. This will be provided following the completion of the baseline studies. Maps of critical habitats and rivers will be shared with the Ministry.
		Male	Principal Fisheries Officer		What measures will be put in place to handle vandalism of the pipeline infrastructure? We have seen oil leakages in parts of Nigeria that are due to vandalism.	The developer intends to recruit and train some of the local persons at the village level and these will provide the first line of security in addition to other security measures that will be implemented. Previous land owners/users from whom the land will have been acquired will be permitted to undertake restricted activities within the 10m corridor and as such will also provide some oversight over the
		Male	Principal Fisheries Officer		The 30m corridor, in a local context, is a sizeable piece of land and raises a number of impacts related to loss of crop land. Are there measures to mitigate issues related to land acquisition such as compensation for losses that may occur, providing alternative livelihood	The 30m corridor will be temporarily acquired during the construction phase. Only a 10m corridor will be permanently acquired by the Government of Uganda as the Right of Way. There are plans to allow the land owners/users from who the 10m corridor will be acquired to conduct restricted activities such as grazing of

					activities for those that may be significantly impacted, sensitisation of the local communities on the potential benefits visa vie the national benefits?	livestock and growing of shallow-rooted seasonal crops but this is yet to be firmed up by the Government.
		Male	Principal Fisheries Officer		Massive projects of this nature are associated with a number of social issues due to various contractors that are procured. We have had incidences of underage girls get impregnated due to interactions between project workers and local communities (notably for road works)	There are a number of Social Management Plans (such as Camp Management Plans) that will be put in place to minimise interactions between contractors and the local communities. Communities will also be regularly sensitised.
		Male	Inspector, Department of Crop Protection		Will there be periodic assessments for unforeseen impacts? If yes, will these be public documents? This is important for the sustainability of the project and for tracking of impacts across various communities.	Following the completion of the ESIA studies and approval of the project, the developer will be required, in accordance with the National Environment Act, conduct regular environmental audits.
		Male	Inspector, Department of Crop Protection		Will we have a monitoring team involving stakeholders at various levels (agencies, local governments)?	This will be further discussed with the Authorities.
		Male	Inspector, Department of Crop Protection		The Local Content Plan needs to be emphasised with a clear strategy for skills transfer and eventual takeover of work even at management levels, not just at the non-technical levels.	Local content has been emphasised by the Government of Uganda and there are National Content Regulations in place.
29/11/2017	National Government	Male	Senior Disaster Preparedness Officer	Office of the Prime Minister	Has the Scoping Report (SR) been approved? OPM will need a copy of the SR. This is because the OPM coordinates all government businesses and thus	SR was approved by NEMA and copies of the SR can be obtained from NEMA.

					it is important that we are kept in the know of all stages of the proposed pipeline development.	
		Male	Senior Disaster Preparedness Officer		Regarding the grievance mechanism, who conducts the audit to ensure grievances are effectively closed out?	This is noted. The proposed grievance mechanism will provide for regular audits.
		Male	Senior Disaster Preparedness Officer		National Emergency Coordination and Operations Centre (NECOC) coordinate emergencies in the country and have developed a National Oil Contingency Plan. The developer should liaise with NECOC over this matter.	Noted.
		Male	Senior Disaster Preparedness Officer		What measures are being taken to develop the capacity of local institutions/persons to manage oil spills and emergencies in the oil and gas industry?	An Emergency Response Plan will be developed identifying the institutions and personnel to be involved, including a need for capacity building.
		Male	Senior Disaster Preparedness Officer		There is a National Policy for Disaster Preparedness in Uganda that spells out the hazards at the national level including potential terrorist attacks, potential for armed conflict and areas likely to face internal conflicts.	Noted.
		Male	Senior Disaster Preparedness Officer		The Department of Disaster Preparedness and Management handles cases related to internally displaced persons, movements of persons looking for jobs/opportunities, family breakages, impacts of communicable diseases like HIV/AIDS. There is a need for the developer to liaise closely with the Department.	Noted.

		Male	Senior Disaster Preparedness Officer		Issues related to displacement and relocation of project affected persons (PAPs) need to be critically reviewed as we have lessons from projects that have been implemented in other parts of the country.	Noted.
		Male	Senior Disaster Preparedness Officer		There is a need to liaise with District Disaster Management Committees at the local government level. By policy, all districts should be having these committees.	Noted. The project team will liaise with the District Technical Planning Committees to identify these structures and engage with them.
		Male	Senior Disaster Preparedness Officer		The study team should evaluate offsite effects and propose measures on how they can be managed. These will mainly be related to logistics management and transportation.	The Pipeline Team proposes to commission a study that will focus on logistics management for the proposed project and the study will identify the impacts and associated risks.
		Male	Military Assistant to the Head, NECOC		There are concerns over the security of the pipeline related to vandalism. How will the pipeline be secured?	There will be various layers of security ranging from use of the local communities in close proximity to the pipeline to use of the lead agency in charge security in the country (Oil and Gas Police).
		Male	Military Assistant to the Head, NECOC		What are the avenues for sharing information with the developer in case new risks have been identified and mapped out along the pipeline corridor?	Stakeholder engagement will be a continuous process throughout the project cycle and as such there will be regular avenues for information sharing with various stakeholders.
		Male	Assistant Commissioner, Disaster Preparedness and Management		A risk and hazard profile for each of the districts through which the pipeline will be routed has been developed. Some of the risks and hazards that were profiled include flood-prone areas, slope failures and areas prone to lightening.	Noted. Study team will review the published profiles to identify potential risks and hazards.

		Male	Assistant Commissioner, Disaster Preparedness and Management		The engineering design for the pipeline should take into consideration the seismic activity in this area.	Noted. Geological and geotechnical surveys will be commissioned to provide additional subsurface data.
		Male	Assistant Commissioner, Disaster Preparedness and Management		The Department of Disaster Preparedness and Management is mandated to protect peoples' livelihood activities and infrastructure (roads, rails, bridges, telecom systems, electricity transmission lines etc). As such, the proposed pipeline route should avoid heavily settled areas to minimise risks of death if there is a catastrophe.	Gerald Menhya Noted. Study team will review the published profiles to identify potential risks and hazards. Noted. Geological and geotechnical surveys will be commissioned to provide additional subsurface data. Noted. Environmental and social sensitivities along the proposed pipeline route have been mapped out, starting from a 50km corridor and this will eventually be optimised to a 30m corridor during construction.
		Male	Assistant Commissioner, Disaster Preparedness and Management		Who will monitor and supervise the integrity of the pipeline?	The pipeline design will include fibre optic cables to relay real time data related to the integrity of the pipeline.
		Male	Assistant Commissioner, Disaster Preparedness and Management		Compensation of PAPS and handling of grievances should be effective. Some of the aggrieved persons may resort to acts of sabotage and this may impact the operations of the pipeline.	Noted.
		Male	Assistant Commissioner, Disaster Preparedness and Management		Given the critical role of the OPM in supervision of government departments, there is a need to clearly spell out the role of the OPM in the proposed project.	Noted.

		Male	Assistant Commissioner, Disaster Preparedness and Management		Information related to potential risks and hazards can be provided by the OPM. The proposed project should not increase vulnerability and exposure to risks within the project's area of influence.	Noted. The project team will liaise with OPM to obtain this data.
		Female	Principal Disaster Management Officer		The project design should aim at identifying and mitigating risks but not enhancing risks. As such wetlands of international and national importance, forest reserves, crop fields and social infrastructure that may be impacted in case of an oil spillage or fire outbreak should be mapped out and appropriate mitigation measures proposed.	The ESIS will include ESMPs that will indicate how the various impacts/risks that will have been identified will be mitigated.
		Female	Principal Disaster Management Officer		There is a need for the EACOP team to engage the Chief of Defence (CDF) to identify the security ramifications of the proposed project.	The CDF and the Ministry of Defence was engaged by the Pipeline Team.
01/12/2017	National Government	Male	Principal Wetlands Officer	Ministry of Water and Environment (MWE)	When will the studies be completed?	The tentative date is March 2018
		Male	Principal Wetlands Officer		Where will the refined products end?	Handling of refined products is out of scope for this particular study but the Ministry will be engaged by the right parties at an appropriate time.
		Male	Principal Wetlands Officer		There are many ecologically sensitive areas along the proposed pipeline corridor, especially in Masaka area. There are a number of Ramsar sites (Nabugabo, Sango bay and Nabajjuzi wetlands). Studies have been conducted by Nature	Noted.

					Uganda (related to hot biodiversity areas in Lake Victoria basin) and these can be shared.	
		Male	Principal Wetlands Officer		There is a need to share a detailed map with the Ministry indicating the administrative units (Districts and sub-counties) so that we can advise on the critical areas that the pipeline can be routed through. There are some ecosystems that are interconnected and migratory routes for some species.	Detailed information related to the pipeline corridor can only be optimised following completion of the ESIA studies and geological and geotechnical studies.
		Male	Principal Wetlands Officer		Will construction of the pipeline be parallel to existing linear infrastructure like roads to minimise opening up ecosystems?	The proposed pipeline is considering avoidance of a range of environmental and social sensitivities and at some sections, it may be constructed along the existing infrastructure corridors.
		Female	Principal Environment Officer		There is a need to share the Scoping Report with the Ministry.	The Scoping Report can be obtained from NEMA that is mandated to submit copies to various Ministries, Departments and Agencies. It is a public document.
		Female	Senior Environment Officer		The ecosystem services assessment should take into consideration the provisioning, supporting and regulating services so as to make it comprehensive.	Noted. These services will be considered during the assessment.
		Male	Environmental Officer		Locations of AGIs should be shared with the Ministry. The locations for camps should not be within ecologically sensitive areas such as wetlands or forests.	Noted. The locations are screened based on the sensitivity of receptors.
		Male	Environmental Officer		Sources of materials such as stones and murram need to be evaluated to minimise impacts	Sources of construction materials will be included in a comprehensive logistics study that will be commissioned by the Pipeline team.

					related to sourcing of construction materials.	
		Male	Environmental Officer		Has the proposed pipeline route been locked up or it is subject to change?	The proposed pipeline corridor is not yet locked up as it will be optimised following completion of ESIA studies and G&G surveys.
		Male	Regional Wetlands Officer		Sensitive ecosystems that will be traversed by the pipeline should be mapped out to minimise impacts	Environmental sensitivities are being mapped and the process began with a 50km corridor and this will eventually be optimised to a 30m corridor.
		Male	Regional Wetlands Officer		There is a need for a detailed method statement at each of the sensitive ecosystems indicating the engineering designs that will be used to cross that point.	
		Male	Regional Wetlands Officer		What mitigation measures will be put in place to eliminate pollution of underground water sources (due to oil leakages)?	The pipeline will be fitted with a fibre optic cable to relay information about the integrity of the pipeline. A detailed oil contingency plan will be submitted to the authorities for review and input. Additionally, the crude oil to be transported is waxy and will solidify if there are any leakages.
04/12/2017	National Government	Male	Wildlife Officer	Ministry of Tourism, Wildlife and Antiquities	Scoping Report (SR) should be shared with the Ministry of Tourism, Wildlife and Antiquities. The Ministry is the overseer of wildlife conservation in the country.	Copies of the SR were distributed by NEMA to the various Ministries, Departments and Agencies (MDAs) and the report is a public document.
		Male	Wildlife Officer		What mechanisms are in place to prevent oil leakages to the ground water sources? We are better of preventing than attempting remediation.	Impacts related to hydrogeology and proposed mitigation measures will be included in the ESIS.

		Male	Wildlife Officer		How is the pipeline going to be secured against vandalism as this may lead to environmental pollution?	There will be various layers of security ranging from the local communities that will be crossed by the pipeline corridor to the lead agency in charge of security (Oil and Gas Police).
		Male	Wildlife Officer		The Ministry would like to engage with the biodiversity team conducting ESIA surveys before finalisation of the studies.	Noted. An engagement will be arranged.
		Male	Assistant Commissioner, Wildlife Conservation		Accessing study reports is difficult and yet as a Ministry, we are mandated to monitor.	The Ministry will be engaged throughout the project cycle and during these engagements, information will be shared.
		Male	Assistant Commissioner, Wildlife Conservation		Where will the displaced persons be relocated? Persons should not be relocated along park boundaries.	A detailed Resettlement Action Plan will be developed indicating how project affected persons will be handled. The plan will be shared with the Ministry.
		Male	Assistant Commissioner, Wildlife Conservation		Legal framework should be reviewed and included in the ESIS.	There is a Chapter in the ESIS that is aimed at the review of the existing laws, regulations and standards.
		Male	Assistant Commissioner, Wildlife Conservation		During the biodiversity surveys, apart making reference to International Union for Conservation of Nature (IUCN) species, there is a need to make reference to Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) so as to include endangered and migratory species under Convention on the Conservation of Migratory Species of Wild Animals (CMS).	Noted. Reference will be made to the species identified under CITES and CMS.
06/12/2017	National Government	Male	Chairperson	Chamber of Mines and Petroleum	During the legal review, include the Illiterates Protection Act and the Spouses Act.	Noted. The Acts will be included and relevance to the proposed project evaluated.

		Male	Chairperson		The Chamber can play a positive role during engagement of the local communities and such we should be notified when the engagements commence.	A section of the stakeholders at the local level have been engaged for purposes of characterising stakeholder concerns during this study. However, the engagement process will be ongoing throughout the project cycle and as such, modalities on how the Chamber can be engaged will be discussed.
		Male	Chairperson		EACOP team will have to make a Final Investment Decision based on how the Lenders assess the risks of the project. Issues related to professional competence of the team conducting the studies should be taken into consideration.	Noted. The ToR submitted to NEMA included the study team. Professional competence of the study team has therefore been reviewed by the Government of Uganda.
		Male	Chairperson		Gender issues should be taken into consideration. Are there women on the study team?	A number of women have been and will be engaged in the ESIA studies.
		Male	Chairperson		There is a need to ensure that the local communities are adequately sensitised so that they make decisions from an informed point of view.	Noted. Community sensitisation will be an ongoing process throughout the project cycle.
18/12/2017	National Government	Male	Principal Environment Inspector	National Environment Management Authority (NEMA)	What are Marshalling yards? The developer should avoid introducing terminology that was not in the Scoping Report.	
		Male	Principal Environment Inspector		What will be the approximate land take for marshalling yards? Will there be vegetation clearance at these yards?	
		Male	Principal Environment Inspector		Will it be possible for each of the project components (eg Pump stations) to be followed up from project description, its impacts,	

					proposed mitigations, etc in the report?	
		Male	Principal Environment Inspector		Climate change is a long term and cumulative impact and as such, it may be difficult to determine its Area of Influence. The pragmatic option would be evaluating Greenhouse gases emissions from the proposed pipeline activities.	
		Male	Principal Environment Inspector		During analysis of water samples, presence of Polyclic Aromatic Hydrocarbons (PAHs) should be considered. This is important for future monitoring.	
		Male	Principal Environment Inspector		Contractors should be bound by the ESMPs that have been approved by the Authority and they should not come up with separate ESMPs. The ESMPs should be indicate the project phase, eg Construction, Operation etc.	
		Male	Principal Environment Inspector		There should be a schematic/figurative presentation of the ToC in the next engagement. This will improve on the clarity of the proposed ToC.	

RECORDS OF STAKEHOLDER ENGAGEMENT-ATTENDANCE LISTS

NATIONAL MEETINGS
Ministry of Agriculture, Animal Industry and Fisheries (MAIIF)
Office of the Prime Minister
Ministry of Water and Environment (MWE)
Ministry of Tourism, Wildlife and Antiquities (MWTA)
Chamber of Mines and Petroleum
National Environment Management Authority (NEMA)
UN Chief Security Advisor
World Vision
SUBCOUNTY MEETINGS
Maddu Subcounty (Gomba District)
VILLAGE MEETINGS
Buseruka Village (Buseruka Subcounty, Hoima District)
Katooke Village (Buseruka Subcounty, Hoima District)
Kakende Village (Kiziranfumbi Subcounty, Hoima District)
Kisala West Village (Gayaza Subcounty, Kyankwanzi District
Nzoo Village (Kitenga Subcounty, Kyankwanzi District)
Kagoma Village (Kitenga Subcounty, Mubende District)
Kyenda Village (Kitenga Subcounty, Mubende District)
Kalembe Village (Kitenga Subcounty, Mubende District)
Kamusenene Village (Kitenga Subcounty, Mubende District)
Lulongo Village (Kitenga Subcounty, Mubende District)
Kidongo Village (Butoloogo Subcounty, Mubende District)
Kyengera Village (Maddu Subcounty, Gomba District)
Bulakati Village (Lwebitakuli Subcounty, Sembabule District)
Muyenje Village (Mijwala Subcounty, Sembabule District)
Nsambya Village (Mijwala Subcounty, Sembabule District)
Sembabule (Sembabule TC, Sembabule District)
Mabale Village (Lugusulu Subcounty, Sembabule District)
Miti Village (Mijwala Subcounty, Sembabule District)
Serinya Village (Lugusulu Subcounty, Sembabule District)
Njaza Village (Lugusulu Subcounty, Sembabule District)
Kagango Village (Lugusulu Subcounty, Sembabule District)
Bukulula Village (Ndagwe Subcounty, Lwengo District)
Nanywa Village (Ndagwe Subcounty, Lwengo District)
Kiswaga Village (Ndagwe Subcounty, Lwengo District)
Kinvunikidde Village (Lwengo Subcounty, Lwengo District)
Mbirizi Village (Lwengo TC, Lwengo District)
Lwemisege Village (Kifamba Subcounty, Lwengo District)
Butiti Village (Lwanda Subcounty, Lwengo District)
Kibonzi Village (Nabigasa Subcounty, Lwengo District)
Kamuli Village (Kasasa Subcounty, Lwengo District)
Mutukula Village (Kakuuto Subcounty, Kyotera District)
Lukoma Village (Kakuuto Subcounty, Kyotera District)
Lukulavu Village (Kakuuto Subcounty, Kyotera District)
Kyakudusi Village (Kasaali Subcounty, Kyotera District)
Kabonera Village (Kakuuto Subcounty, Kyotera District)

NATIONAL MEETINGS

Ministry of Agriculture

CRUDE OIL PIPELINE

RSK

Date: 2.2 11 2015

Locality of meeting: MINISTRY OF AGRICULTURE KAMPALA

Eco & Partner Consult

Project name: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE TILENGA FEEDER PIPELINE AND ESIA.

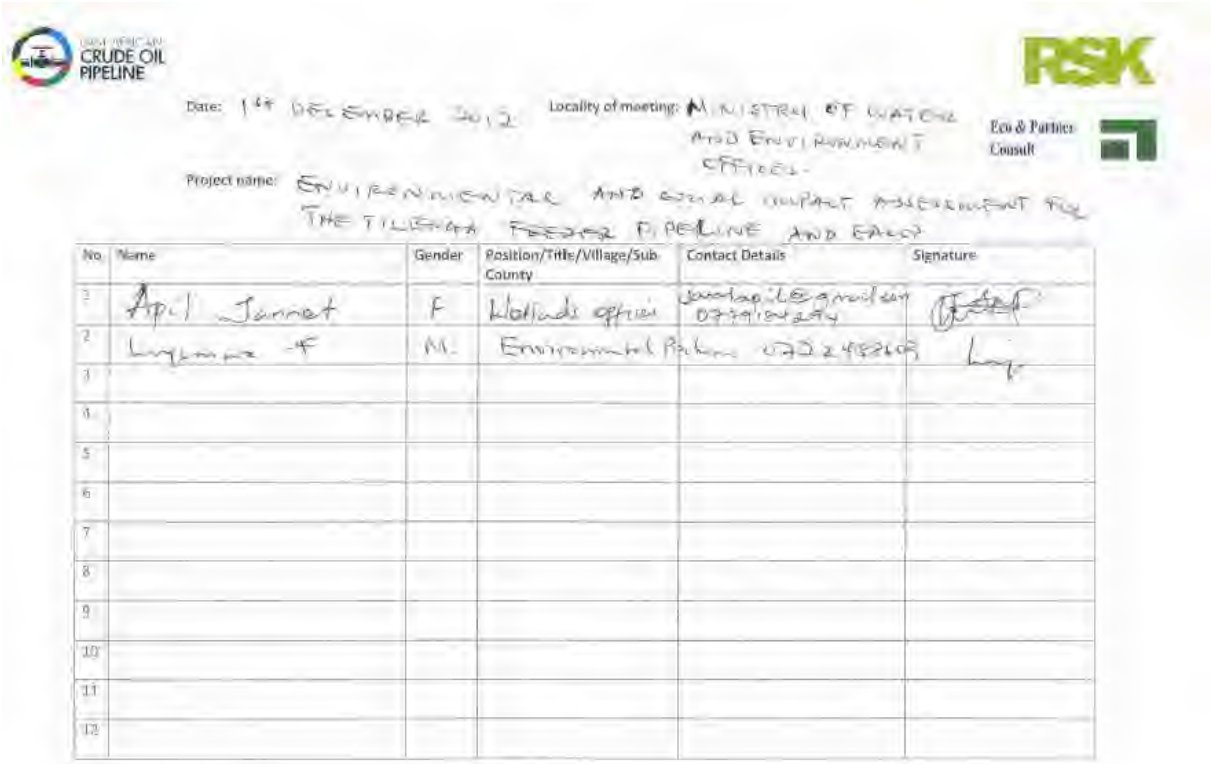
No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	Paul Mwambu	M	for DCP	pmwambu3@gmail.com	
2	Nuwamberaho James Mark	M	For DFR	jba.ahbk@gmail.com	
3	Ogwang James Mark Okidi	M	For CCP	ogwang.james@gmail.com	
4	Kungu Eddie	M	Ecos Consulting PM Ecos partner	eddie@ecosconsultants.co.ug	
5	[illegible]	F	Environmental Policy	0772478869	
6	CHARITY TUSHEMEREIRWE	F	ESIA ENG	0794888163	
7					
8					
9					
10					
11					
12					

Office of the Prime Minister

RSK

Mbabaja Ceasar Simon	M	Natural Resources Officer	0771 [illegible]	
Solomon Elungat	M	Programmes Officer	0782 [illegible]	
Sunday Ben Amin (Mr)	M	Senior [illegible]	0772 [illegible]	
[illegible]	M	[illegible]	0784 [illegible]	
[illegible]	M	[illegible]	0781 [illegible]	
[illegible]	M	CCE/DCC-EIA	0752 [illegible]	
[illegible]				
Ondoa Moses	M	NADIP	0772 384 209	
[illegible]	M	[illegible]	0772 [illegible]	
Nwokecaboo Catherine	F	Principal [illegible]	0772 562 101	

Ministry of Water and Environment



CRUDE OIL PIPELINE

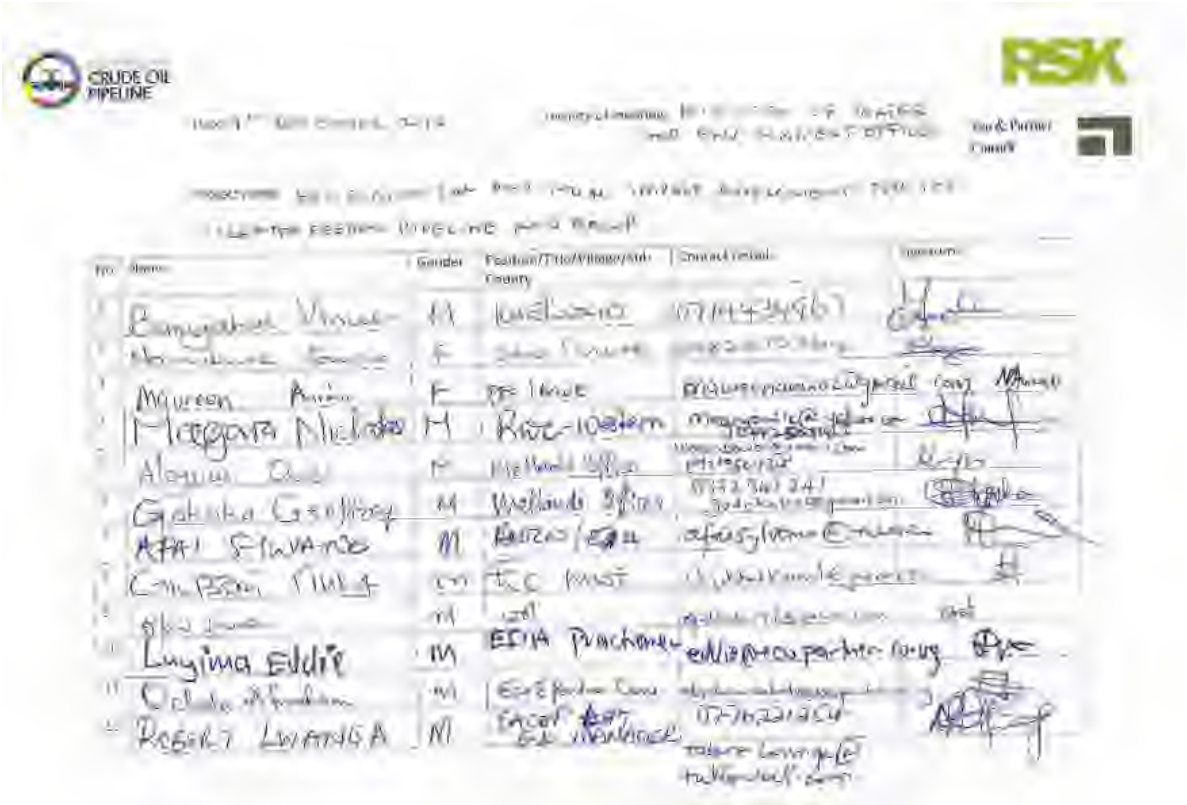
RSK

Eco & Parties Consult

Date: 1st DECEMBER 2012 Locality of meeting: MINISTRY OF WATER AND ENVIRONMENT OFFICES.

Project name: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE TILENGA FEEDER PIPELINE AND EACOP

No.	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	April Jannet	F	Wetlands officer	[illegible] 0772918[illegible]	
2	Lugimba F	M.	Environmental Partner	0772 [illegible]	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					



CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Gender | Position/Title/Village/Sub County

Lugimba Eddie M EIA Practioner

Robert Lwanga M

Ministry of Tourism, Wildlife and Antiquities

CRUDE OIL PIPELINE

RSK

Project name:

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
		M			
		M			
		F			
		M			
		F			
		M			
		F			
		M			
		M			

NEMA

CRUDE OIL PIPELINE

RSK

Date: 13 12 2017

Locality of meeting: NEMA OFFICES

Project name: ESIA ENVIRONTAL AND SOCIAL IMPACT ASSESSMENT FOR THE TILENGA FEEDER PIPELINE AND EACOP

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	ROBERT LWANGA	M	DEP ENV. MANAGER EACOP	0776221254 robert.lwanga@tullow.com	
2	Patience Nyakware	F	NEMA	0785264606	
3	Immaculate NAMUGEME	F	EMO / NEMA	0785 199 339	
4	Sarah Ajuka	F	SEI/NEMA	0776879796	
5	Christine Atwabyona	F	SEI/NEMA	0776507805	
6	Tungahurayo Enid	F	SEI/NEMA	0776698962	
7	Doreen Komukama	F	EAO/NEMA	0782827751	
8	Isaac. I.C. Ntegyo	M	PEI/NEMA	0772699825	
9	NSAKKO PATIENCE	F	PEI/NEMA	pnsekko@nemaug.org	
10	Lugima F	M	Environmental Practitioner	0772438107	
11	Lugima Eddie	M	Environmental Practitioner	0772669061	
12					
13					

VILLAGE MEETINGS

Katooke Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID:	**Date : 9th/11/17**
City/town/village *where the meeting is taking place*: **Katooke village**	
Sub-County *in which the city/town/village is located*: **Buseruka sub county**	
Region *in which the district is located*: **Western**	
Number of attendees: 12	
Notes/reasons for interacting: The meeting was a stakeholder notification regarding the Social Baseline Survey for the EACOP project	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Biingi	Patrick	M	N	Chairperson LC I	Katooke village
Oryem	William	M	N	Resident	Katooke village
Achai	Patrick	M	N	Resident	Katooke village
Okwai	Wilfred	M	N	Resident	Katooke village
Ayoo	Bony	M	N	Resident	Katooke village
Olwoch	Bosco	M	N	Resident	Katooke village
Amanyire	Joshua	M	N	Resident	Katooke village
Bagorora	Sirivano	M	N	Resident	Katooke village
Businge	Robert	M	N	Resident	Katooke village
Avutia	Simon	M	N	Resident	Katooke village
Rupiny	Albert	M	N	Resident	Katooke village

Kakende Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID:	**Date : 11/11/17**
City/town/village *where the meeting is taking place*: **Kakende Village**	
Sub-County *in which the city/town/village is located*: **Kiziranfumbi Sub County**	
Region *in which the district is located*: **Western**	
Number of attendees: 12	
Notes/reasons for interacting: The meeting was a stakeholder notification regarding the Social Baseline Survey for the EACOP project	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Kyokuhairwe	Juliet	F	N	Chairperson LC I	Kakende Village
Alisingura	Isaya	M	N	Resident	Kakende Village
Kamanyire	Zephania	M	N	Resident	Kakende Village
Kabonera	Edi	M	N	Resident	Kakende Village
Bigabwenkya	Astone	M	N	Resident	Kakende Village
Byamani	Moses	M	N	Resident	Kakende Village
Kaija		M	N	Resident	Kakende Village
Kyamanya	Philip	M	N	Resident	Kakende Village
Mugisa	Solomon	M	N	Resident	Kakende Village
Byamukama	Geofrey	M	N	Religious leader	Kakende Church of Uganda
Owaheirwe	Nobert	M	N	Resident	Kakende Village
Baguma	Aston	M	N	Resident	Kakende Village

Kisala West Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID:	**Date : 17/11/17**
City/town/village *where the meeting is taking place*: **Kisala West Village**	
Sub-County *in which the city/town/village is located*: **Gayaza Sub County**	
Region *in which the district is located*: **Western**	
Number of attendees: 11	
Notes/reasons for interacting: The meeting was a stakeholder notification regarding the Social Baseline Survey for the EACOP project	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Bikoramosha	T	M	N	Chairperson LCI	Kisala West
Nyiransekuye	Stella	F	N	Resident	Kisala West
Namakula	Viola	F	N	Resident	Kisala West
Byomuhangi	George	M	N	Resident	Kisala West
Majambere	Berenareta	F	N	Resident	Kisala West
Uzabaumasana	Rebereta	M	N	Resident	Kisala West
Muhawenimana	Beatrace	F	N	Resident	Kisala West
Nsowufuze	John	M	N	Resident	Kisala West
Ndivibushe			N	Resident	Kisala West
Niyonzima	Joseph	M	N	Resident	Kisala West
Senjirinya	Masiko	M	N	Resident	Kisala West

Nzoo Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID:	**Date : 17/11/17**
City/town/village *where the meeting is taking place*: **NZOO VILLAGE**	
Sub-County *in which the city/town/village is located*: **NTWETWE SUBCOUNTY**	
Region *in which the district is located*: **Western**	
Number of attendees: 5	
Notes/reasons for interacting: The meeting was a stakeholder notification regarding the Social Baseline Survey for the EACOP project	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
PAUL	TIBAYENDERA	M	N	L C III CHAIR PERSON	NZOO VILLAGE.
RONALD	KAZIBWE	M	N	L C I NZOO VILLAGE	NZOO VILLAGE
NYIRAMUKYO	RAHERI	F	N	WOMEN LEADER	NZOO VILLAGE
NASSAZI	FELISTER	F	N	WOMEN COUNCILOR	NZOO VILLAGE
DAN	MWANJE	M	N	PARISH CHIEF	NZOO VILLAGE

Kagoma Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 30-3	**Date : 3/11/17**
City/town/village*where the meeting is taking place*: **Kagoma Village**	
Sub-County*in which the city/town/village is located*: **Kitenga**	
Region *in which the district is located*: **South**	
Number of attendees:8	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Haruna	Katende	M	N	LC1 Chairperson	Kagoma village
Jude	Lubinga	M	N	Resident	Kagoma village
Grace	Mukaisire	F	N	Resident	Kagoma village
Gabriel	Muwonge	M	N	Resident	Kagoma village
Musisi	Ssewanyana	M	N	Resident	Kagoma village
Mary	Nalunga	F	N	Resident	Kagoma village
Nzabaniita		M	N	Resident	Kagoma village
Oliver	**Nakaayi**	F	N	Resident	Kagoma village

Kyenda Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 30-3	**Date : 16/11/17**
City/town/village*where the meeting is taking place*: **Kyenda Village**	
Sub-County*in which the city/town/village is located*: **Kitenga**	
Region *in which the district is located*: **South**	
Number of attendees:2	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Joseph	Mayanja	M	N	Publicity Secretary	Kyenda village
Joyce	Nansamba	F	N	Women's representative	Kyenda village

Kalembe Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 22-2	**Date : 18/11/17**
City/town/village*where the meeting is taking place*: **Kalembe Village**	
Sub-County*in which the city/town/village is located*: **Kitenga**	
Region *in which the district is located*: **South**	
Number of attendees:8	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Christopher	Kwefuga	M	N	LC1 Chairperson	Kalembe village
Vicent	Kyambadde	M	N	Resident	Kalembe village
Mary	Namulumba	F	N	Resident	Kalembe village
John	Kasozi	M	N	Resident	Kalembe village
John	Mary Nyanzi	M	N	Resident	Kalembe village
Martin	Kabanda	M	N	Resident	Kalembe village
Mary	Namulumba	F	N	Resident	Kalembe village

Kamusenene Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 20-2	**Date : 18/11/17**
City/town/village*where the meeting is taking place*: **Kamusene Village**	
Sub-County*in which the city/town/village is located*: **Kitenga**	
Region *in which the district is located*: **South**	
Number of attendees:7	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Tumwebaze	Ssekate	M	N	LC1 Chairperson	Kamusenene village
Kule	Tusabe	M	N	Resident	Kamusenene village
Serena	Nyirahabimana	F	N	Resident	Kamusenene village
Nyiramituzo		F	N	Resident	Kamusenene village
Yusuf	Kagema	M	N	Resident	Kamusenene village
Tulinawe	Rutayisire	M	N	Resident	Kamusenene village
Rutagyengwa		M	N	Resident	Kamusenene village
Aprilinelli	Kamugasha	M	N	Resident	Kamusenene village

Lulongo Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 20-1	**Date : 17/11/17**
City/town/village*where the meeting is taking place*:**Lulongo Village**	
Sub-County*in which the city/town/village is located*: **Kitenga**	
Region *in which the district is located*: **South**	
Number of attendees:11	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Tom	Ssempiira	M	N	LC1 Chairperson	Lulongo village
Geoffrey	Katuza	M	N	Resident	Lulongo village
Scovia	Nayiga	F	N	Resident	Lulongo village
Specioza	Tusabe	F	N	Resident	Lulongo village
Wilson	Katalinda	M	N	Resident	Lulongo village
Ezekiel	Tumwesigye	M	N	Resident	Lulongo village
Enock	Tusingwire	M	N	Resident	Lulongo village
Henry	Gachalo	M	N	Resident	Lulongo village
Justus	Tumukunde	M	N	Resident	Lulongo village
Sadat	Kyomuhangi	M	N	Resident	Lulongo village
Deogratius	Ssembiito	M	N	Parish Chief	

Kidongo Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID:	**Date : 17/11/17**
City/town/village *where the meeting is taking place*: **Kidongo village**	
Sub-County *in which the city/town/village is located*: **BUTOLOOGO SUBCOUNTY**	
Region *in which the district is located*: **Western**	
Number of attendees: 4	
Notes/reasons for interacting: The meeting was a stakeholder notification regarding the Social Baseline Survey for the EACOP project	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Kamya	Girando	M	N	L C II	Kidongo parish
Katuleka	Stephen	M	N	Community member	Kidongo parish
Kamanzi	Fred	M	N	L C I	Kigoba village- Kidongo parish
ssemwogere	John bosco	M	N	Community member – media	Kidongo parish

Kyengera Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 24-1	**Date : 14/11/17**
City/town/village *where the meeting is taking place*: **Kyengera Village**	
Sub-County *in which the city/town/village is located*: **Maddu Subcounty**	
Region *in which the district is located*: **South**	
Number of attendees:9	
Notes/reasons for interacting: Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Yosam	Nayebare	M	N	Chairperson LC1	Kyengera Village
George	Kanzira	M	N	Resident	Kyengera Village
Frank	Nuwagira	M	N	Resident	Kyengera Village
Ronald	Ssimbala	M	N	Resident	Kyengera Village
Robert	Nahurira	M	N	Resident	Kyengera Village
Amos	Mwijukye	M	N	Resident	Kyengera Village
Sharon	Komugisha	F	N	Resident	Kyengera Village
Ernest	Rulamini	M	N	Resident	Kyengera Village
Molly	Niwabyenki	M	N	Resident	Kyengera Village

Bulakati Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 29-3	**Date : 7/11/17**
City/town/village *where the meeting is taking place*: **Bbulakati Village**	
Sub-County *in which the city/town/village is located*: **Lwebitakuli**	
Region *in which the district is located*: **South**	
Number of attendees:6	
Notes/reasons for interacting: Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Paul	Mbaziira	M	N	Chairperson LC1	Bbulakati Village
Jamilu	Ssali	M	N	Resident	Bbulakati Village
Frank	Sempija	M	N	Resident	Bbulakati Village
Flugensio	Lugemwa	M	N	Resident	Bbulakati Village
Yunia	Nabakozza	F	N	Resident	Bbulakati Village
Noele	Namuli	F	N	Resident	Bbulakati Village

Muyenje Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 28-3	**Date : 8/11/17**
City/town/village *where the meeting is taking place*: **Muyenje Village (Nsoga Parish)**	
Sub-County *in which the city/town/village is located*: **Mijwala Sub county**	
Region *in which the district is located*: **South**	
Number of attendees: 8	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Joseph	Mutyaba	M	N	Chairperson LC1	Muyenje Village
Umar	Joseph	M	N	Resident	Muyenje Village
Annet	Nanyonjo	M	N	Resident	Muyenje Village
Ruth	Ayebare	F	N	Resident	Muyenje Village
Getrude	Ssebata	F	N	Resident	Muyenje Village
Elese	Bukenya	F	N	Resident	Muyenje Village
	Nikuzerozi	F	N	Resident	Muyenje Village
Annet	Nabankoza	F	N	Resident	Muyenje Village

Nsambya Village

9GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 28-2	**Date : 9/11/17**
City/town/village *where the meeting is taking place*: **Nsambya Village**	
Sub-County *in which the city/town/village is located*: **Lugusulu**	
Region *in which the district is located*: **South**	
Number of attendees:9	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Ssalongo	Ssemwanga Nsibambi	M	N	Chairperson LC1	Nsambya Village
Isma	Kateregga	M	N	Resident	Nsambya Village
Philly	Ssonko	M	N	Resident	Nsambya Village
Yahaya	Kabuubi	M	N	Resident	Nsambya Village
Jacqueline	Namukasa	F	N	Resident	Nsambya Village
Memburo		M	N	Resident	Nsambya Village
Damiano	Ddamulira	M	N	Resident	Nsambya Village
Yoweri	Kimbowa	M	N	Resident	Nsambya Village
Mary	Nagawa	M	N	Resident	Nsambya Village

Sembabule Market Zone

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 28-4	**Date : 9/11/17**
City/town/village *where the meeting is taking place*: **Ssembabule Market Zone Village**	
Sub-County *in which the city/town/village is located*: **Ssembabule Town Council**	
Region *in which the district is located*: **South**	
Number of attendees:5	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Getrude	Nakabugo	F	N	Chairperson LC1	Ssembabule Market Zone
Olivia	Murwana	F	N	Resident	Ssembabule Market Zone
Henry	Nsubuga	M	N	Resident	Ssembabule Market Zone
Damasein	Murwanashyaka John	M	N	Resident	Ssembabule Market Zone
Alex	Ssekikubo Kalule	M	N	Resident	Ssembabule Market Zone

Mabale Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 26-1	**Date : 10/11/17**
City/town/village *where the meeting is taking place*: **Mabale Village**	
Sub-County *in which the city/town/village is located*: **Lugusulu Sub-County**	
Region *in which the district is located*: **South**	
Number of attendees:4	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
George	Baaba	M	N	Resident	Mabale Village
David	Mutabazi	M	N	Resident	Mabale Village
Abaho	Amos	M	N	Youth representative	Mabale Village
Jessica	Baaba	F	N	Resident	Mabale Village

Miti Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 28-1	**Date : 10 /11/17**
City/town/village *where the meeting is taking place*: **Miti Village**	
Sub-County *in which the city/town/village is located*: **Mijwala**	
Region *in which the district is located*: **South**	
Number of attendees: 14	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Gerald	Mukasa	M	N	Chairman LC1	Miti Village
Amos	Tibamarwa	M	N	Secretary, LCI	Miti Village
Richard	Ssejje	M	N	Resident	Miti Village
Lecraff	Nakamya	F	N	Resident	Miti Village
Enosi	Mugerwa	M	N	Resident	Miti Village
Semu	Mugisha	M	N	Resident	Miti Village
Michael	Mukasa	**M**	**N**	Resident	Miti Village
Geoffrey	Kato	M	N	Resident	Miti Village
Night	Nabasinga	F	N	Resident	Miti Village
Margret	Nakyewa	F	N	Resident	Miti Village
Maria	Tushemerirwe	F	N	Resident	Miti Village
Joseph	Byekwaso	M	N	Resident	Miti Village
George	Ssentoogo	M	N	Resident	Miti Village
Margret	Nakyewa	F	N	Resident	Miti Village

Serinya Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 26-3	**Date : 10/11/17**
City/town/village *where the meeting is taking place*: **Serinya Village**	
Sub-County *in which the city/town/village is located*: **Lugusulu Sub-County**	
Region *in which the district is located*: **South**	
Number of attendees:6	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Lukyelibuga	Vincent	M	N	Vice Chairperson	Serinya Village
Fred	Kiyemba	M	N	Resident	Serinya Village
Annet	Namala	F	N	Vice Chairperson /Young Farmers group	Serinya Village
Noeline	Ndagire	F	N	Resident	Serinya Village
Vincent	Kaddu	M	N	Resident	Serinya Village
Gerald	Ssempijja	M	N	Resident	Sserinya Village

Njaza Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 26-2	**Date : 11/11/17**
City/town/village *where the meeting is taking place*: **Njaza Village**	
Sub-County *in which the city/town/village is located*: **Lugusulu**	
Region *in which the district is located*: **South**	
Number of attendees: 8	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Maureen	Namala	F	N	Chairperson LC1	Njaza Village
Harriet	Mukarusagara	F	N	Resident	Njaza Village
Frank	Abaho	M	N	Resident	Njaza Village
Allen	Kanaganwa	M	N	Resident	Njaza Village
Herbert	Ninsiima	M	N	Resident	Njaza Village
Hope	Kainembabazi	M	N	Resident	Njaza Village
Edward	Mugisha	M	N	Resident	Njaza Village
Fred	Kuteesa	M	N	Resident	Njaza Village

Kagango Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 26-4	**Date : 14/11/17**
City/town/village *where the meeting is taking place*: **Kagango Village**	
Sub-County *in which the city/town/village is located*: **Lugusulu Sub-County**	
Region *in which the district is located*: **South**	
Number of attendees:7	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews, and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Edson	Kayondo	M	N	Vice Chairperson	Kagango Village
Ramathan	Yiga	M	N	Imam	Kagango Village
Annet	Nantaye	F	N	Health Worker	Kagango Village
Resty	Nalubega	F	N	Resident	Kagango Village
Hajjara	Nabasumba	F	N	Resident	Kagango Village
Steven	Katumba	M	N	Resident	Kagango Village
Edson	Sabiiti	M	N	Resident	Kagango Village

Bukulula Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 30	**Date : 3 /11/17**
City/town/village *where the meeting is taking place*: **Bukulula Village**	
Sub-County *in which the city/town/village is located*: **Ndagwe**	
Region *in which the district is located*: **South**	
Number of attendees: 6	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Paskal	Ndaula	M	N	Chairman LC1	Nnanywa Village
Hamidu	Mulindwa	M	N	Resident	Bukulula Village
Gonzaga	Mugumya	M	N	Chairperson LC1	Kiswaga Village
Vicent	Lubowa	M	N	Area Councillor, Nnanywa Parish	Nnanywa Village
Margret	Naggirinya	F	N	Chairperson LC1	Bukulula Village
William	Ssekamanya	M	N	Chairperson LCII	Nnanywa Parish

Kinvunikidde Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 29-1	**Date : 6/11/17**
City/town/village *where the meeting is taking place*: **Kinvunikidde Village**	
Sub-County *in which the city/town/village is located*: **Lwengo Subcounty**	
Region *in which the district is located*: **South**	
Number of attendees:10	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Edward	Lukyamuzi	M	N	Chairperson LC1	Kinvunikidde Village
John	Senkungu	M	N	Resident	Kinvunikidde Village
Philip	Besigye	M	N	Resident	Kinvunikidde Village
Zangia	Nakalema	F	N	Resident	Kinvunikidde Village
Lulo	Nalwanga	F	N	Resident	Kinvunikidde Village
Veronica	Nyinakalalya	F	N	Resident	Kinvunikidde Village
Joseph	Ssali	M	N	Resident	Kinvunikidde Village
	Tamale	M	N	Resident	Kinvunikidde Village
Edward	Senyonga	M	N	Resident	Kinvunikidde Village
Martin	Kiwalabye	M	N	Resident	Kinvunikidde Village

Mbirizi Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 29-2	**Date : 6/11/17**
City/town/village *where the meeting is taking place*: **Mbirizi Village (Lwengo Zone)**	
Sub-County *in which the city/town/village is located*: **Lwengo Town Council**	
Region *in which the district is located*: **South**	
Number of attendees:7	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

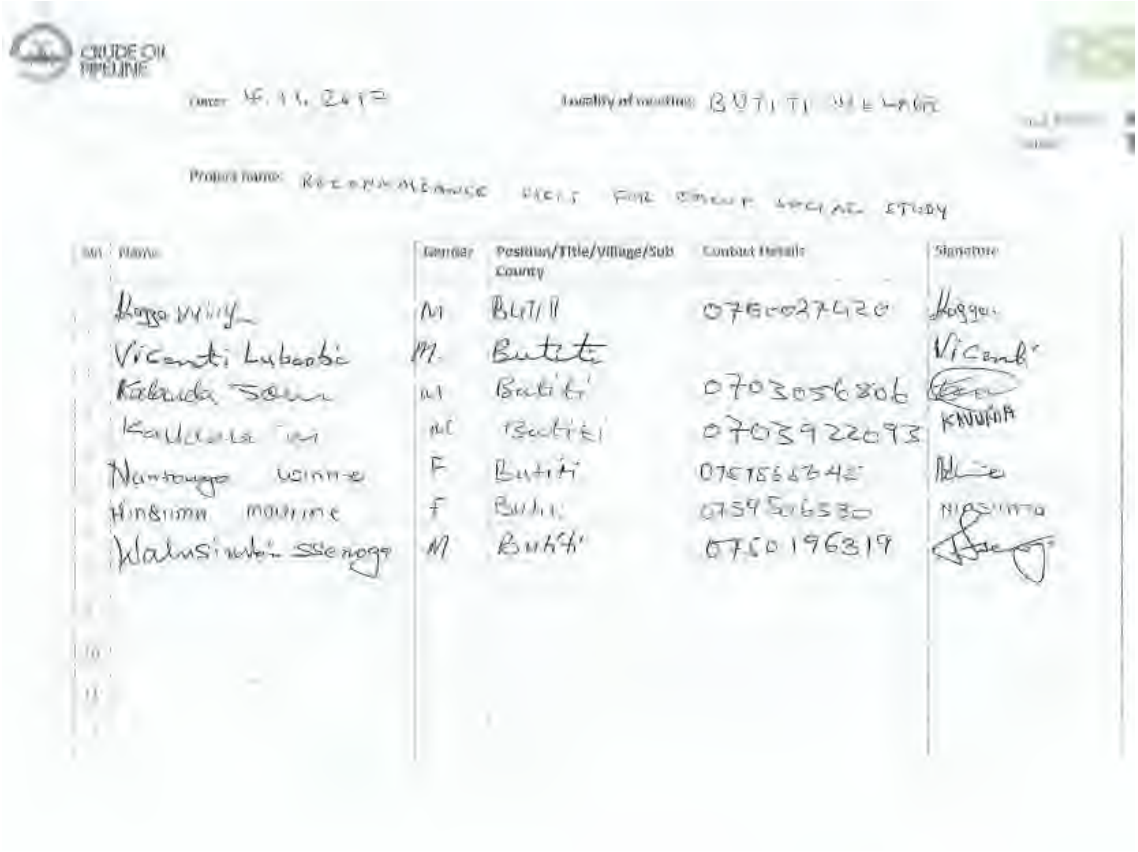
Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Twaha	Kyeyune	M	N	Chairperson LC1	Mbirizi Village
Dalausi	Mayanja	M	N	Resident	Mbirizi Village
Bruce	Tushabe	M	N	Resident/ Human rights activist	Mbirizi Village
Catherine	Najemba	F	N	Resident/ councillor	Mbirizi Village
Henry	Ssebata	M	N	Resident	Mbirizi Village
Yasin	Birimuye	M	N	Resident	Mbirizi Village
Ismael	Zziwa	M	N	Resident	Mbirizi Village
Hajji	Kyambande	M	N	Resident	Mbirizi Village

Lwemisege Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 35-2	**Date : 1/11/2017**
City/town/village *where the meeting is taking place*: **Lwemisege Village**	
Sub-County *in which the city/town/village is located*: **Kifamba**	
Region *in which the district is located*: **Southern**	
Number of attendees: 7	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Deo	**Ssenyonjo**	**M**	**N**	**LC1 Chairperson**	**Lwemisege**
Pauline	**Nanono**	**F**	**N**	**Women's representative LC1**	**Lwemisege**
Magdalena	**Namwanje**	**F**	**N**	**Resident**	**Lwemisege**
Betty	**Nansubuga**	**F**	**N**	**Resident**	**Lwemisege**
Christopher	**Dungu**	**M**	**N**	**Village Health Team representative (VHT)**	**Lwemisege**
John Bosco	**Semaganda**	**M**	**N**	**Farmer**	**Lwemisege**
Night	**Nanjala**	**F**	**N**	**Resident**	**Lwemisege**

Butiti Village



Kibonzi Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 30-4	**Date : 3/11/17**
City/town/village*where the meeting is taking place*:**Kibonzi Village**	
Sub-County*in which the city/town/village is located*: **Nabigasa**	
Region *in which the district is located*: **South**	
Number of attendees: 10	
Notes/reasons for interacting: Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Godfrey	Semwogerere	M	N	Resident	Kibonzi village
Ssalongo	Kiwewesi	M	N	Resident	Kibonzi village
Rose	Wanyama	F	N	Resident	Kibonzi village
Bata	Katongole	M	N	Resident	Kibonzi village
Kaloli	Wanyi	M	N	LC1 Chairperson	Kibonzi village
Aisha	Nakalyango	F	N	Resident	Kibonzi village
Moses	Kivumbi	M	N	Resident	Kibonzi village
Joseph	Kalibbala	M	N	Resident	Kibonzi village
Sulayimani	Kirumaganyi	M	N	Resident	Kibonzi village
Justine	Nabalema	F	N	Resident	Kibonzi village

Mutukula Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 36	**Date : 30 /10/17**
City/town/village *where the meeting is taking place*: **Mutukula Village**	
Sub-County *in which the city/town/village is located*: **Kakuuto**	
Region *in which the district is located*: **South**	
Number of attendees: 6	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Moses	**Mugume**	**M**	**N**	**Area Councillor**	**Mutukula Village**
Fatuma	**Asiimwe**	**F**	**N**	**Chairperson LC1**	**Mutukula Village**
Godfrey	**Twebaze**	**M**	**N**	**Member**	**Mutukula Village**
Stephen	**Gishatsha**	**M**	**N**	**Member**	**Mutukula Village**
Sharifu	**Byaruhanga**	**M**	**N**	**Member**	**Mutukula Village**
David	**Karuhanga**	**M**	**N**	**Member**	**Mutukula Village**

Lukoma Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 35-4	**Date : 2/11/17**
City/town/village *where the meeting is taking place*: **Lukoma Village**	
Sub-County *in which the city/town/village is located*: **Kakuuto**	
Region *in which the district is located*: **South**	
Number of attendees:9	
Notes/reasons for interacting:	

Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Lawrence	Lukyamuzi	M	N	Chairperson LC1	Lukoma Village
Moses	Mujuzi	M	N	Resident	Lukoma Village
Andrew	Kaggwa	M	N	Resident	Lukoma Village
Fred	Kafeero	M	N	Resident	Lukoma Village
Nalongo	Lukyamuzi	F	N	Resident	Lukoma Village
Mirembe	Kalongo	F	N	Resident	Lukoma Village
Nampijja	Kayiwa	F	N	Resident	Lukoma Village
Namugera	Sepiranza	F	N	Resident	Lukoma Village
Fagiri	Ssengo	M	N	Resident	Lukoma Village
Phillipino	Bwerere	M	N	Resident	Lukoma Village

Lukulavu Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 35-3	**Date : 2/11/17**
City/town/village *where the meeting is taking place*: **Lukulavu Village**	
Sub-County *in which the city/town/village is located*: **Kakuuto**	
Region *in which the district is located*: **South**	
Number of attendees:12	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

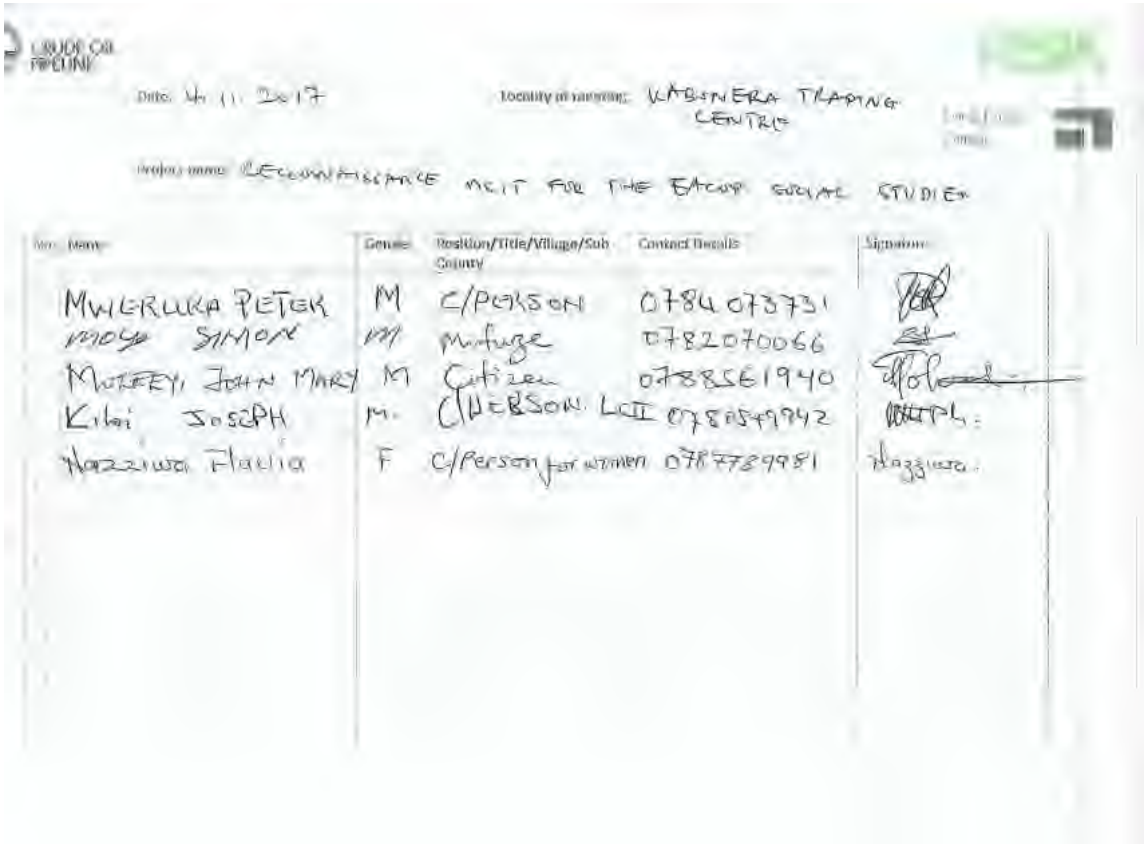
Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Hashim	**Mulindwa**	**M**	**N**	**Resident**	**Lukulavu Village**
Charles	**Matovu**	**M**	**N**	**Chairperson LC1**	**Lukulavu Village**
Bosco	**Lwegaba**	**M**	**N**	**Resident**	**Lukulavu Village**
Hamza	**Sempala**	**M**	**N**	**Resident**	**Lukulavu Village**
Vincent	**Kaweesi**	**M**	**N**	**Resident**	**Lukulavu Village**
Mustapha	**Ssenono**	**M**	**N**	**Resident**	**Lukulavu Village**
Monday	**Kaweesi**	**M**	**N**	**Resident**	**Lukulavu Village**
Mujib	**Mbazira**	**M**	**N**	**Resident**	**Lukulavu Village**
Esther	**Nakajwiga**	**M**	**N**	**Resident**	**Lukulavu Village**
Jane	**Nalule**	**F**	**N**	**Resident**	**Lukulavu Village**
Joyce	**Nantongo**	**F**	**N**	**Resident**	**Lukulavu Village**

Kyakudusi Village

GENERAL INFORMATION ABOUT THE MEETING	
Meeting ID: Site 30-3	**Date : 3/11/17**
City/town/village*where the meeting is taking place*: **Kyakudusi Village**	
Sub-County*in which the city/town/village is located*: **Kasaali**	
Region *in which the district is located*: **South**	
Number of attendees:6	
Notes/reasons for interacting:	
Reconnaissance visit to set up Small group interviews, Key Informant Interviews and Stakeholder engagement meetings to obtain preliminary community inventory.	

Provide the following information for "key" stakeholders (e.g. Chairperson) and those who have raised an intervention					
First name	**Last name**	**Gender (M/F)**	**Disability (Y/N)**	**Position within organisation**	**Name of organisation**
Tadeo	Lwasa	M	N	Resident	Kyakudusi village
Madinah	Nansubuga	F	N	Women's representative	Kyakudusi village
Imelda	Nantongo	F	N	Resident	Kyakudusi village
Tadeo	Ssazi	M	N	Resident	Kyakudusi village
Lawrence	Lubega	M	N	LC1 Secretary(represented LC1 Chairperson)	Kyakudusi village
Semambo		M	N	Resident	Kyakudusi village

Kabonera Village



Date: 4th 11 2017 Locality of training: KABONERA TRAINING CENTRE

Project name: RECONCILIATION MEET FOR THE EACOP SOCIAL STUDIES

No.	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
	MWERUKA PETER	M	C/PERSON	0784 073731	
	MOSES SIMON	M	Mufuze	0782070066	
	MUREEY, JOHN MARY	M	Citizen	0788561940	
	Kibai JOSEPH	M	C/PERSON LCII	0780549942	
	Nazziwa Flavia	F	C/Person for women	0787789981	

Meeting Date	Stakeholder Group	Gender	Position	Meeting	Questions/Concerns	Response Provided
06/06/2018	LC5 - Local Government	Male	Senior Entomologist/Acting Information Officer	Hoima District Technical Planning Committee/Political Leaders	There should be a mechanism to ensure that all communities along the proposed pipeline corridor are eventually engaged to minimise grievances that may crop up as a result of some directly affected communities not being engaged.	During the ESIA studies, communities along the pipeline were sampled to obtain a representative sample within the study scope. However, the EACOP project has a team of Community Liaison Officers (CLOs) that is engaging directly affected communities.
06/06/2018	LC5 - Local Government	Male	Senior Entomologist/Acting Information Officer	Hoima District Technical Planning Committee/Political Leaders	When is the production of crude oil likely to commence?	The production of oil is dependent on the establishment of support infrastructure (such as the CPF, pipelines/flow lines, refinery). These should be developed prior to commencement of the production of crude.
06/06/2018	LC5 - Local Government	Male	Senior Entomologist/Acting Information Officer	Hoima District Technical Planning Committee/Political Leaders	The grievance redress mechanism should also involve a procedure of capturing photos of the aggrieved persons.	A database for the grievances recorded will be developed and will include relevant details about the aggrieved person/entity.
06/06/2018	LC5 - Local Government	Male	District Statistician	Hoima District Technical Planning Committee/Political Leaders	During the construction phase, alternative routes will be established for livestock crossing. Will these routes be maintained following completion of the construction phase or animals will be allowed to move freely along the pipeline corridor?	During the operation phase, livestock will move freely across the pipeline corridor.
06/06/2018	LC5 - Local Government	Male	District Statistician	Hoima District Technical Planning Committee/Political Leaders	The resettlement process should take into consideration the entire homestead (even when some of the housing units are beyond the project footprint) and not the single housing unit that may affected. This is because some of the families settle as homesteads and not as housing units.	The Resettlement Action Plan, which will be developed, will provide the most financially feasible alternatives for handling such cases.
06/06/2018	LC5 - Local Government	Male	District Statistician	Hoima District Technical Planning Committee/Political Leaders	Pre-construction engagements should be conducted with affected communities to ensure that communities are empowered on what contractors are obliged to do. Reports normally contain mitigation measures that are not implemented during construction phase.	Noted. Pre-construction engagements will be conducted. Additionally, contractors will be monitored by government agencies to ensure compliance with set out conditions of approval in the ESIA Certificate.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Hoima District Technical Planning Committee/Political Leaders	How will local governments ensure that the proposed mitigation measures are enforced?	The District Environment Officers are mandated to conduct regular inspections and monitoring to ensure that mitigation measures are implemented.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Hoima District Technical Planning Committee/Political Leaders	How many households and persons are going to be resettled within Hoima District?	The RAP study will establish this data and it will be shared with the district authorities.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Hoima District Technical Planning Committee/Political Leaders	How will the children and women be affected by the proposed activities?	Social risks related to women and children have been evaluated in a section of the report.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Hoima District Technical Planning Committee/Political Leaders	How will intangible cultural resources be affected?	Impacts on cultural resources (including intangible) are included in a section of the report.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Hoima District Technical Planning Committee/Political Leaders	How many cultural sites have been identified as likely to be impacted and in which particular areas?	Impacts on cultural resources (including intangible) are included in a section of the report.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Hoima District Technical Planning Committee/Political Leaders	Local governments should be engaged not only through meetings but in issues related to grievance management and resettlement process.	Local governments will be part of the grievance redress mechanism (through a Grievance Management Committee that will be established at the district level) and during the resettlement process, technical officers at the district will part of the process.
06/06/2018	LC5 - Local Government	Male	District Education Officer	Hoima District Technical Planning Committee/Political Leaders	The district should be informed, well in advance, if any education institution is to be relocated.	Education institutions have been avoided. In case of any changes and an education institution is affected, the district authorities will be engaged.
06/06/2018	LC5 - Local Government	Female	Assistant Chief Administrative Officer	Hoima District Technical Planning Committee/Political Leaders	For the decentralised functions, the project team should work closely with the district officers to harmonise issues of policy and regulations.	Noted. The EACOP project team will work closely with local governments.
06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	There is speculation over the proposed pipeline route and activities that will be permitted within the pipeline corridor. Communities need to be sensitised.	Stakeholder engagement will be ongoing to minimise speculative information related to the project. The pipeline route will be firmed up following completion of the geological, geophysical and geotechnical surveys. Affected communities will be notified (about the final pipeline route) in due course.

06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	There is a concern that PAPs are given cut-off dates and then there is delayed payment of the compensation fees. This affects the affected persons' livelihoods.	The project team will liaise with the office of the CGV to explore options of how approval of compensation fees for the affected persons can be expedited to minimise delays.
06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	If government is to revert the 20m strip of the land acquired for construction of the pipeline to the previous land owners, what measures will be put in place to ensure that only permitted activities are undertaken within this corridor? The preferable option would be to acquire the entire 30m corridor, so that activities within the corridor are regulated.	The acquisition of the entire 30m corridor is being considered by the Government of Uganda. Recruitment of workers for non-technical jobs will prioritise local communities.
06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	How many rivers will be crossed by the pipeline route?	Nine rivers will be crossed by the export pipeline in Uganda. Some of the rivers include Kafu, Juma ngabo (that feeds into Wambabya).
06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	Results of the geophysical and geological surveys should be shared with the local governments.	This will be discussed with the Ministry of Energy and Mineral Development to identify the most appropriate method of transmitting the data to local governments.
06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	The study team should engage cultural institutions, notably Bunyoro Kitara Kingdom.	Noted, cultural institutions will be engaged.
06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	Local communities should be prioritised for employment, most especially for the non- technical jobs.	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. Recruitment of workers for non-technical jobs will prioritise local communities.
06/06/2018	LC5 - Local Government	Female	District Natural Resources Officer	Hoima District Technical Planning Committee/Political Leaders	The project team should closely liaise with the district authorities (especially Assistant CAOs) on issues related to resettlement.	The EACOP project team will liaise with existing local government structures.
06/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kamuli Village	The local people need to be sensitised about pipeline related activities.	Sensitisation programs are to be conducted throughout the project period to ensure that the local community are well informed about the project.
06/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kamuli Village	The oil is likely to be dangerous to the environment and the surrounding community once it spills; what measures have been put in place to ensure that such accidents are well managed?	Pipelines are safe and leakages are rare. However, an oil spill contingency plan will be part of the standard operating procedures.
06/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kamuli Village	The project drivers end up over speeding in community areas and causing accidents. How will the project ensure that speed limits are observed?	Project vehicles will be installed with In-vehicle Monitoring systems (IVMS) to monitor the speed and movements of all project vehicles.
06/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kamuli Village	Why should the district be responsible for setting compensation rates instead of the project affected persons?	The legal framework mandates the district authorities to establish compensation rates. These rates are validated by the CGV.
06/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kamuli Village	How will the communities benefit from the proposed project?	There are going to be a number of potential benefits from the project and these include employment opportunities, infrastructure development, local content and skill transfer, increase in foreign exchange.
06/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kamuli Village	What if the community resists the implementation of project activities until compensation of PAPs is undertaken?	Compensation will be done in accordance with the legal framework and, as such, there should be no uprising from the community.
06/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kamuli Village	Will houses damaged as a result of being within the proposed pipeline corridor be compensated for?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.
06/06/2018	LC1 - Village Local Council	Male	Resident	Kamuli Village	What qualification will be required for the available employment opportunities?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity,

	and Community Members					will be communicated in such a way as to make these employment opportunities available to as many people as possible.
06/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Kamuli Village	How will the rights of the local labour force be protected to ensure a safe work environment and timely and fair payment?	All persons employed are provided with PPE prior to carrying out a task and there is enforcement on wearing the correct PPE during work. The project follows national regulations on employment hence workers are paid on time.
06/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Kamuli Village	Why does the project claim to reduce land take in some areas and not in others? The same amount of land should be used for the whole project.	In special areas like protected areas and wetlands, the land take can be reduced to try and protect these habitats.
06/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Kamuli Village	There will be an increase in diseases and prostitution in the area, especially from the influx of workers in the area. What is the plan to address this?	The project workers will be housed in camps away from the local people. Awareness programmes will be put in place to educate both project employees and communities of such diseases.
06/06/2018	LC3 - Lower Local Government	Female	Community Development Officer	Kifamba Subcounty	What is going to be done to minimise delays to compensate PAPs?	The Grievance Redress Committee has a procedure to ensure that all compensation is made.
06/06/2018	LC3 – Lowe Local Government	Female	Community Development Officer	Kifamba Subcounty	What will be the role of community development officers in this project?	The role of local government will be addressed in the ESIA.
06/06/2018	LC3 – Lower Local Government	Female	Community Development Officer	Kifamba Subcounty	What is the criteria for resettlement?	The issue of resettlement will be handled during the RAP process and at this stage such matters will be addressed.
06/06/2018	LC3 – Lower Local Government	Female	Community Development Officer	Kifamba Subcounty	PAPs need to be informed in time to prepare themselves to be resettled.	Noted.
06/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Kigorobya Subcounty	Since a refinery is to be constructed at Kabaale, why then should crude oil be exported?	Once produced, the crude oil will be partly refined in Uganda to supply the local market and partly exported to the international market.
06/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Kigorobya Subcounty	What security measures have been put in place to guard against vandalisation of pipeline infrastructure?	An extensive pipeline monitoring and control system will be implemented to detect abnormal situations. Use of state of the art instrumentation and fibre optic technology along the pipeline route allows detection of movements around the pipeline. Additionally, the PPT will liaise closely with security agencies in the country.
06/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Kigorobya Subcounty	During the land acquisition, what size of the pipeline corridor will be acquired and as such considered for compensation?	A 30m corridor will be acquired and affected land owners and/or users will be compensated for loss of property and land take.
06/06/2018	LC3 - Lower Local Government	Female	Chairperson	Kigorobya Subcounty	Are there any CSR programmes for the affected communities?	There is currently no budget for CSR projects along the EACOP until a Final Investment Decision (FID) has been reached. The proposed surveys and ESIA studies will guide the FID.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kigorobya Town Council	There is a need to have such engagements held regularly at the sub county levels such that the councillors (political leaders) are equipped with appropriate information on the latest developments.	The EACOP project team will liaise with leaders at sub counties (LCIII) regularly.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kigorobya Town Council	Stakeholder engagements with local communities should be conducted in local languages (including reading material).	Engagements within local communities are held in local languages. Reading materials are translated to local languages.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kiziranfumbi Subcounty	Will local governments be compensated for land take within lakeshores and wetlands?	The Government of Uganda will provide guidance on how public land acquisition will be handled.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Lwanda Subcounty	It has come to our notice that PAPs in Buliisa District (where oil will be produced) are yet to be compensated. We are likely to have delayed compensation for PAPs within Rakai district.	Negotiations are ongoing for some of the PAPs (where the CPF will be constructed) who were not in agreement with the valuation report. However, the majority of the PAPs have been compensated.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Lwanda Subcounty	Does the pipeline affect the soil productivity given that it will be heated?	The pipeline will be insulated and coated to contain the heat.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Lwanda Subcounty	What if the pipeline is routed through a graveyard and the owner refuses to have the graves relocated, what will be done in such a case?	The project team will negotiate with the PAP to identify the most appropriate way to relocate the graves.

06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Lwanda Subcounty	Apart from employment, which other benefits will the project bring to the people?	Other benefits will include skills transfer, infrastructure improvement (such as road upgrades) among others.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Lwanda Subcounty	If land is acquired but there is no development on it, how will the affected person be compensated?	Compensation will be for loss of land.
06/06/2018	LC3 - Lower Local Government	Female	Community Development Officer	Lwanda Subcounty	How is the project going to engage the local leaders like the Community Development Officers?	Local leaders will be fully engaged in the handling of grievances and compensation process.
06/06/2018	LC3 - Lower Local Government	Male	Chairperson	Lwanda Subcounty	There are some people who have started setting up non-existent gravesites within the proposed pipeline corridor with an aim of defrauding the project. This is not a good practice and all those involved should stop since affected graves will have to be verified before compensation.	Valuation reports include detail of affected resources and assets. There should be no attempt to set up graveyards where there no persons buried at such locations.
06/06/2018	LC3 – Lowe Local Government	Male	Chairperson	Lwanda Subcounty	What will be the role of community development officers in this project?	The role of local government will be addressed in the ESIA.
06/06/2018	LC5 - Local Government	Male	Deputy Chief Administrative Officer	Rakai District Technical Planning Committee/Political Leaders	The communities need to be well sensitized regarding the project. Government should play a key role in convincing and ensuring the communities accept the project.	Awareness programs are currently being conducted by the EACOP project team. Further sensitization will be undertaken during the project cycle.
06/06/2018	LC5 - Local Government	Male	Deputy Chief Administrative Officer	Rakai District Technical Planning Committee/Political Leaders	The potential benefits from the pipeline project should always be well stated to the communities.	The project will have both positive and negative impacts and these have been disclosed to communities.
06/06/2018	LC5 - Local Government	Male	Deputy Chief Administrative Officer	Rakai District Technical Planning Committee/Political Leaders	The project should ensure that the local people are considered for employment as part of the local content aspect.	The issue of local content is to be emphasized during recruitment with priority being given to the PACs for non-technical jobs.
06/06/2018	LC5 - Local Government	Male	Deputy Chief Administrative Officer	Rakai District Technical Planning Committee/Political Leaders	Lead agencies and the EACOP project team should participate in sensitising PACs.	EACOP project team has embarked on community sensitisation.
06/06/2018	LC5 - Local Government	Male	Chairperson	Rakai District Technical Planning Committee/Political Leaders	Some of the communities likely to be affected by the pipeline construction are not contented with the use of district compensation rates. They believe the rates are very low.	The compensation rates are determined by the Chief Government Valuer's office
06/06/2018	LC5 - Local Government	Male	Chairperson	Rakai District Technical Planning Committee/Political Leaders	The project implementation may require expansion or establishment of new roads. This has left some people scared of not being compensated for land taken to develop the roads.	Land take will be done in consultation with land owners/users. Compensation for loss of property will be made in accordance with the existing legal framework.
06/06/2018	LC5 - Local Government	Male	Chairperson	Rakai District Technical Planning Committee/Political Leaders	The community is curious to know the actual pipeline route so that they can prepare themselves in case of displacement.	Studies (G&G) are underway to establish the final route. Once the final route has been identified, it will be communicated to the district leaders and PACs.
06/06/2018	LC5 - Local Government	Male	Chairperson	Rakai District Technical Planning Committee/Political Leaders	Compensation must be done on time before any project activity is carried out.	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of the physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with the national legislations and International Finance Corporation (IFC) performance standards.
06/06/2018	LC5 - Local Government	Male	Chairperson	Rakai District Technical Planning Committee/Political Leaders	The local leaders have a role to play in assisting the central government implement the project. The leaders should always attend meetings related to the EACOP project and thereafter deliver information to PACs.	This is acknowledged.
06/06/2018	LC5 – Local Government	Male	Chairperson	Rakai District Technical Planning Committee/ Political Leaders	What will be the role of community development officers in this project?	The role of local government will be addressed in the ESIA.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Rakai District Technical Planning Committee/Political Leaders	How will the vulnerable groups including widows, orphans and the elderly be catered for if they are displaced?	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of the physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with the national legislations and International Finance Corporation (IFC) performance standards.

06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Rakai District Technical Planning Committee/Political Leaders	Resettlement is usually associated with complaints related to the appropriateness of houses constructed for the PAPs. In some instances, a water tank is installed and then it runs short of water during the dry season.	A resettlement action plan will guide the compensation process. Cultural appropriateness will be included in the houses that will be constructed.
06/06/2018	LC5 - Local Government	Male	Senior Community Development Officer	Rakai District Technical Planning Committee/Political Leaders	How has the developer planned to mitigate community health impacts such as dust and noise nuisance? Are there plans to construct health facilities to cater for the workers?	Impacts related to community health, including noise and air quality have been evaluated in a section of the report. Water irrigation to suppress dust will be regularly undertaken. There are no plans to constructing new health facilities but project workers will have an onsite clinic at the camp.
06/06/2018	LC5 - Local Government	Male	Acting Labor Officer	Rakai District Technical Planning Committee/Political Leaders	There are high chances of women and children being abandoned if compensation proceeds are given to a man.	Spousal consent will be a key feature during the compensation.
06/06/2018	LC5 - Local Government	Male	Vice Chairman	Rakai District Technical Planning Committee/Political Leaders	Most of the local people do not have land titles. Will you compensate tenants (bibanja owners) too?	Bonafide landowners and users will be compensated for loss of land.
06/06/2018	LC5 – Local Government	Male		Rakai District Technical Planning Committee/ Political Leaders	The project needs to put in place a mechanism to handle land conflicts that arise from their activities especially between husbands and wives.	There is a grievance mechanism to deal with conflicts caused by the project activities. The project will not be in a position to mediate personal issues.
06/06/2018	LC5 – Local Government	Male		Rakai District Technical Planning Committee/ Political Leaders	If the owner of graves refuses to be compensated or to relocate his graves, what happens?	A discussion will be held with the owner of graves of cultural heritage artefacts to allow them to be relocated with advice from the local leaders in the area and the person will be compensated and aided to remove their graves. If this fails, there is a possibility of bending the pipe to avoid these graves.
07/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kisala West Village	There is a concern that the project will acquire and start using land before compensating PAPs in full. Where will the affected persons be residing in such cases?	Persons that will be relocated by the project will be duly compensated and resettled before commencement of the construction activities.
07/06/2018	LC1 - Village Local Council and Community Members		Resident	Kisala West Village	Will displaced persons have an opportunity to negotiate with the EACOP project team over their preferred destination following displacement?	The PAPs will be engaged to identify the most appropriate and financially feasible alternative.
07/06/2018	LC1 - Village Local Council and Community Members		Resident	Kisala West Village	The vulnerable persons may not have their grievances addressed due to the high levels of corruption within the judicial system.	There are various levels of handling grievances within the grievance redress mechanism. The courts of law are the last option.
07/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kisala West Village	How will mature fruit trees be compensated? Such trees are a source of livelihood from which families harvest fruits on an annual basis? Valuation based on the District Compensation rates may not be fair.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.
07/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kisala West Village	How will grave sites be handled?	Affected burial sites will be relocated, with consent from the affected persons.
07/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kisala West Village	Following the decommissioning of the camps, can boreholes (that provided water to camps) be handed over to communities?	This will be discussed with the local leaders. Permits for water abstraction have certain conditions of approval that have to be fulfilled, before handing over the boreholes.
07/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kisala West Village	What level of education will be considered when recruiting workers for the project?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
07/06/2018	LC5 - Local Government			Kyankwanzi District Health Authorities	The project may lead to influx with impacts on health facilities and services. Are there plans to have health facilities within the affected communities upgraded to cope with potential increase in population?	An influx management strategy is being developed to minimise impacts associated with influx. The strategy will include, among others, use of mass media to provide information (such as available opportunities and how they can be accesses) on

						the project. The project team will liaise closely with local authorities on issues related to influx management. Upgrade of health facilities is an obligation of the Government of Uganda.
07/06/2018	LC5 - Local Government	Female	District Environment Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	How can the project/ESIA study help the district authorities to ensure that the district compensation rates are approved by the central government expeditiously? This will minimise issues related to the compensation process that may crop up.	This concern will be forwarded to the Ministry of Lands, Housing and Urban Development.
07/06/2018	LC5 - Local Government	Female	District Environment Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	During the recruitment process (for jobs) or procurement of service providers local people should not be subjected to international requirements.	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. For service/goods providers, there is a requirement by the Authorities to have them listed on the National Supplier Database (NSD).
07/06/2018	LC5 - Local Government	Female	District Environment Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	We recommended 12 people to be trained as welders following a request by the EACOP project team. However, we have been informed that the recruitment agency (Q- Sourcing) subjected the applicants to a rigorous technical interview and majority were dropped.	This will be followed up with the recruitment agency to establish the reasons why some of the applicants were dropped.
07/06/2018	LC5 - Local Government	Female	District Environment Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	Roles of the local governments should be clearly spelt out in the Environmental and Social Management Plans.	Roles of government departments will be included in the report.
07/06/2018	LC5 - Local Government	Female	District Environment Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	Cut-off dates are set for PAPs but then, there is delayed payment of the compensation fees. This affects livelihoods of the PAPs.	The project will liaise with the CGV's office in Ministry of Lands, Housing and Urban Development to minimise delays related to the approval process.
07/06/2018	LC5 - Local Government	Male	District Education Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	Experience from infrastructural developments is that they are associated with kidnaps and human sacrifices. There is a fear within communities that such acts may crop up due to the proposed project.	There will be no kidnapping of children and human sacrifices due to the proposed project. Communities will be sensitised to ensure this fear is addressed.
07/06/2018	LC5 - Local Government	Male	District Education Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	Local governments should take the lead during sensitization of local people on the proposed project.	Local government officials will participate in the sensitisation of communities. The project team will communicate planned community engagements to the leaders.
07/06/2018	LC5 - Local Government	Male	District Education Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	How can local companies that would like to supply goods and services in the oil and gas sector be registered to the National Suppliers' Database? Where are offices of Petroleum Authority of Uganda (PAU) located?	Offices of the Authority are located in Entebbe. Information on how an application can be conducted is obtained online by accessing the PAU website.
07/06/2018	LC5 - Local Government	Female	District Labour Officer	Kyankwanzi District Technical Planning Committee/Political Leaders	Social risks (such as increased prevalence of HIV/AIDS, use of child labour, transactional sex) that are likely to emanate from the project activities can be managed by the district officers such as the Labour Officer, CDO and Information Officer. How shall we work with the EACOP project Community Liaison Officer to ensure such risks are minimised?	Social risks have been evaluated and mitigation measures proposed in a section of the report. Additionally, the project team and contractors will liaise with the existing local government structures to address issues related to social risks.
07/06/2018	LC5 - Local Government	Male		Kyankwanzi District Technical Planning Committee/Political Leaders	As district leaders, we need to mobilise our people so that they obtain land titles. This will minimise issues related to compensation for loss of land.	Documents to verify land ownership/use will expedite the compensation process.
07/06/2018	LC5 - Local Government	Female		Kyotera District Technical Planning Committee/Political Leaders	Ensure that health and safety impacts likely to affect the communities are addressed.	Health, safety, security and environment have been evaluated and mitigation measures included in a section of the report.
07/06/2018	LC5 - Local Government	Female		Kyotera District Technical Planning Committee/Political Leaders	The developers should be able to avoid and minimize the impacts as much as possible. Project negative impacts should be minimized in order to maximize benefits.	The ESIA is being conducted to identify some of the likely negative impacts so they can be mitigated.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	People of Kyotera District should benefit from the project. The technical teams of the district need to be involved in the project. Involve the Office of Natural Resources in the project.	All the relevant departments at the district will be involved at varying stages during the project cycle.

07/06/2018	LC5 – Local Government	Male		Kyotera District Technical Planning Committee/ Political Leaders	Kyotera district is currently in the process of developing their district compensation rates, however due to lack of funding this process has been slow. Therefore this project should communicate this to central government in an effort to expedite the process of compensation rates to prevent delays in the process.	Noted.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	Kasaali is no longer a sub county as presented in the previous report; it attained a Town Council status the moment Kyotera became a District Local Government.	This is noted and will be corrected in the final report.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	Alternative routes should be identified for affected wildlife, cattle and PACs in places like Sango Bay where people use footpaths to collect water.	During construction, alternative routes will be identified to minimise impacts on PACs and livestock.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	How will impacts on forest reserves be handled? Who will the project compensate in such cases?	The EACOP will liaise with the relevant authorities managing such resources such as National Forestry Authority.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	How will tenants (bibanja owners) and land owners be compensated?	Compensation for land will be made based on the findings by the resettlement action plan. However, in principle, both land owners and users will be compensated for losses that will be incurred due to the project activities.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	Physical planning of the local governments should be considered.	DDPs and physical plans have been reviewed. In addition, leaders at the DLG and sub counties are regularly engaged to minimise such impacts.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	Emergency responsiveness needs to be strengthened during project implementation.	An Emergency Response Plan will be developed to manage natural disasters such as earthquakes, floods, oil spillages among others.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	Are there plans to improve infrastructure and services in the PACs given that there may be influx due to the proposed project?	Measures to manage influx have been included in the ESIA report and they include liaison with local governments to minimise influx.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	There is need to conduct separate ESIAs for the support infrastructure.	NEMA will provide guidance on whether separate ESIAs are required.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	The project should provide toilets at the work areas for the project workers.	Sanitary facilities will be identified for workers in addition to mobile toilets that will be provided at work areas.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	During implementation, the project should consider helping communities by providing improved water sources.	Community water sources will be avoided as part of the mitigation hierarchy. There is currently no budget for CSR projects along the EACOP until a Final Investment Decision (FID) has been reached. The proposed surveys and ESIA studies will guide the FID.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	The waste management practices applied should ensure that the environment is not polluted	Waste generated at site will be collected and segregated at source. NEMA-licenced waste collector(s) will be procured to transport waste from the project facilities.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	Sensitisation and awareness programs should be conducted within project affected communities.	Sensitization of PACs will be ongoing throughout the project cycle.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	The project should carry out revegetation programs including provision of tree seedlings to replace the cleared vegetation as a result of the project.	The EACOP project will aim at biodiversity no net loss. As such, measures related to revegetation will be considered.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	The EACOP project team should continue working with the district technical teams throughout the project phases.	The EACOP project team will liaise with local authorities throughout the project cycle.
07/06/2018	LC5 - Local Government	Male		Kyotera District Technical Planning Committee/Political Leaders	There should be a program to replant trees (preferably indigenous species) to replace those that will be lost due to the project.	The project will aim at no net loss for biodiversity and, as such, such projects will be considered.
07/06/2018	LC5 – Local Government	Male		Kyotera District Technical Planning Committee/ Political leaders	How will mailo land versus public land owners be handled in the compensation process?	These details will be shared during the RAP process.
07/06/2018	LC5 – Local Government	Male		Kyotera District Technical Planning Committee/ Political Leaders	Will the people be allowed to use the land after the restoration of the land following construction?	This is still under discussion with the government if farming of seasonal crops and grazing will be permitted however no planting of trees or building of houses will be allowed within the RoW.

07/06/2018	LC5 – Local Government	Male		Kyotera District Technical Planning Committee/ Political Leaders	The ESIA needs to include unprotected water sources. Some communities still use unprotected water sources so the ESIA should not overlook this.	Noted.
07/06/2018	LC5 – Local Government	Male		Kyotera District Technical Planning Committee/ Political Leaders	Communities are worried that oil pipeline activities destroy soil fertility hence no crops will grow after the pipe has been placed.	The impacts of construction activities on soil fertility were studied and mitigation measures will be put in place to prevent this, for instance, the contractor shall ensure proper storage of top soil to prevent the loss of fertility.
07/06/2018	LC3 - Lower Local Government	Male		Ntwetwe Subcounty	Who will be compensated for loss of land? Tenants (bibanja holders) or land owners?	Affected land users and owners will be compensated for property and/or land that will lost due to project activities.
08/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kasasa Subcounty	Will there be employment opportunities for the local community during the implementation of the project?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
08/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kasasa Subcounty	Some PAPs in Hoima and Buliisa have not yet been compensated for the losses they incurred due to oil and gas activities. This has led to a fear that the same may happen in this area.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards. The delay to compensate some of the PAPs in Buliisa and Hoima is due to some negotiations between the PAPs and the developers.
08/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kasasa Subcounty	Who is responsible for the project?	The EACOP project is a private sector project and will be owned by the shareholders of the project, namely: the Government of the Republic of Uganda (Uganda National Oil Company), the Government of the United Republic of Tanzania (Tanzania Petroleum Development Corporation) and three upstream international oil companies (CNOOC, Total and Tullow PLC), who collectively seek to ship and export crude oil.
08/06/2018	LC3 – Lowe Local Government	Male	Chairperson	Kasasa Subcounty	There are many NGO's in the area teaching communities about oil and gas activities. This is causing anxiety among communities as it is difficult to identify which NGO's are giving the correct information.	Prior to approaching communities, project members first identify themselves to the districts and subcounties and carry letters which show that they have informed the local leaders of their presence. Additionally, toll free numbers are given to communities so that they can call and inform on the project in case people have contradicting information.
08/06/2018	LC3 - Lower Local Government	Female	Resident	Kasasa Subcounty	In case someone does not want the pipeline to be routed through his land, what is done?	The EACOP project is undertaken for the collective good of the nation. As such, there will be negotiations with the PAPs to ensure that they are compensated for losses incurred in a fair and timely manner.
08/06/2018	LC3 - Lower Local Government	Female	Resident	Kasasa Subcounty	What nature of jobs will be offered by the project to the community?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
08/06/2018	LC3 - Lower Local Government	Male	Resident	Kasasa Subcounty	Is developed land compensated at the same rate as undeveloped land?	The valuation report will include all assets that are on the acquired land. As such, the proceeds for developed land will be higher than the compensation fee for undeveloped land.
08/06/2018	LC3 - Lower Local Government	Male	Resident	Kasasa Subcounty	What happens in cases where the PAP does not feel the valuation report is fair?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards. As such, there are other

						stakeholders that are involved in the valuation process.
08/06/2018	LC3 – Lower Local Government	Male	Resident	Kasasa Subcounty	Is there a danger of the pipe bursting, causing harm to the people and damaging crops?	The pipeline has been designed taking in the best engineering techniques and materials to be used hence this probability is rare. There will be sensors along the pipeline to detect leaks and pinpoint the exact location of the damage. Also an oil spill plan will be put in place in case of any leaks. The nature of the crude oil in nature can't be used for anything without further refining so it solidifies once on top
08/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyajawe B Village	Why is crude being exported? We do not seem to have enough energy sources as a country.	Once produced, the crude oil will be partly refined in Uganda to supply the local market and partly exported to the international market.
08/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyajawe B Village	Will the top soil be stockpiled within the 30m corridor or additional land will be acquired?	The top soil will be stock piled within the 30m corridor (working area). For any additional land take, the affected land owner will be engaged and duly compensated.
08/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyajawe B Village	How will the local people be recruited for work?	Local persons will be prioritised for non-technical jobs. Project team will liaise with local leaders and identify the most suitable recruitment procedures.
08/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kyajawe B Village	There is a fear that grievance management committees may be ineffective due to corruption.	There are various levels of redress for aggrieved persons and, as such, the affected person should be able to appeal.
08/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyajawe B Village	If the displaced person has wives settled in households beyond the 30m corridor, will these households be relocated too to ensure that family union is not disrupted?	The most financially feasible and appropriate resettlement package will be negotiated with the affected persons.
08/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyajawe B Village	Are there plans to upgrade health centres within the affected areas?	The EACOP project has no plans to upgrade health facilities within affected areas. The project team will liaise closely with local authorities to manage issues related to influx so as to minimise impacts on health facilities.
08/06/2018	LC3 - Lower Local Government	Male	Sub-county Chief	Mpasaana Subcounty	During the recently concluded engagement between local leaders and Global Rights Alert (CSO), a concern was raised that local leaders are not given adequate information about the actual location of the proposed pipeline corridor.	The proposed pipeline route will only be firmed up following completion of the ESIA studies and geotechnical surveys. Local leaders will be given this information in due course.
08/06/2018	LC3 - Lower Local Government	Male	Sub-county Chief	Mpasaana Subcounty	Leaders at sub counties should always be informed about the meetings that are held within local communities. This will help to bridge the gap between the EACOP project team and local communities.	Sub county leaders will be informed about proposed meetings with local communities.
08/06/2018	LC3 - Lower Local Government	Male	Sub-county Chief	Mpasaana Subcounty	There is a need to have technical persons at the sub counties trained so that they can disseminate information about the project.	Sensitization of local leaders about the proposed project will be on- going so as to have local leaders empowered.
08/06/2018	LC3 - Lower Local Government	Male	Sub-county Chief	Mpasaana Subcounty	Social risks such as spread of HIV/AIDS, commercial sex workers, impacts on women and children should be identified and mitigated. These risks have been prevalent for most of the infrastructure development projects in Uganda.	Social risks have been evaluated and mitigation measures included in a section of the report.
08/06/2018	LC3 - Lower Local Government	Male	Chairperson	Mpasaana Subcounty	There is a concern that the roads that are being upgraded are far off from communities that are likely to be impacted by the pipeline activities.	The Government of Uganda is currently undertaking upgrades of some of the major roads within the proposed pipeline corridor. The upgraded roads will ease communication for all the communities in the region.
08/06/2018	LC3 - Lower Local Government	Male	Chairperson	Mpasaana Subcounty	If the economic activities are disrupted, local revenues are also impacted. Are there plans to compensate the local governments for this loss of revenue?	Affected persons will be compensated for loss of property and as such there should be minimal impacts on revenue collection.
08/06/2018	LC3 - Lower Local Government	Male	Chairperson	Mpasaana Subcounty	When affected persons are being compensated for losses incurred, they should be paid a lump sum amount and not installments.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in

						compliance with national regulations and IFC performance standards.
08/06/2018	LC3 - Lower Local Government	Male	Chairperson	Mpasaana Subcounty	There is a concern that speculation over land may derail the land acquisition process.	The EACOP project team will provide accurate information to the affected communities so as to manage speculation over land.
08/06/2018	LC3 - Lower Local Government	Female	Vice Chairperson	Mpasaana Subcounty	There is a fear that some members of the EACOP project team may connive with land speculators to buy off sections where the pipeline will be routed for their personal benefit.	Such cases should be identified and reported to the authorities. Such persons will be dealt with in accordance with the law.
08/06/2018	LC3 - Lower Local Government	Male	Councillor	Nabigasa Subcounty	There are people in this community that do not have land titles; will they be compensated?	All bonafide land owners will be compensated for losses they may incur due to the project activities.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Chairperson	Kakende Village	Due to the proposed project activities, speculation related to land has increased in the area. Some local persons have been transacting land without involving local leaders. This heightens the risk of fraudulent land deals.	Local people should not be coerced into land transactions by speculators. The EACOP project team will spearhead the land acquisition process for the 30m corridor and affected persons will be duly compensated for losses that they may incur.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kakende Village	Will both the tenants (bibanja holders) and landlords be compensated for loss of land?	Both tenants and landlords will be compensated for loss of land in varying percentages.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kakende Village	Will the land for the proposed activities be acquired on a permanent basis?	The proposal is that the Government of Uganda (through the Uganda land Commission) take over ownership of the land that will be acquired for the EACOP project.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kakende Village	What measures are in place to ensure that PAPs that receive compensation in form of cash have the ability to handle cash for productive activities?	Financial literacy programmes will be initiated for the affected persons.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kakende Village	How will the compensation rates for affected property be determined?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kakende Village	There is a concern that the amount of money that will be paid as compensation to the displaced persons may not be able to purchase comparable parcels of land at the existing market rates.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kakende Village	There is a speculation over the pipeline route. Can you confirm the route to us?	The pipeline route will be confirmed following completion of studies (geological, geophysical and geotechnical studies and ESIA studies) as these will identify potential hazards along the proposed pipeline route.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kakende Village	People in local communities do not have the skills that may be required by the proposed project and there seems to be no initiative by the Government of Uganda to skill local people. How, then, shall we be considered for employment?	There are initiatives by the EACOP project, in liaison with local leaders, to identify local artisans. A few have been forwarded to Q- Sourcing so that they can be trained. Local persons will be prioritised for non-technical jobs.
09/06/2018	LC1 - Village Local Council and Community Members	Male	General Secretary	Kijugunya Village	How will the local people be recruited for employment?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
09/06/2018	LC1 - Village Local Council and Community Members	Male	General Secretary	Kijugunya Village	How will the EACOP project team safeguard the community against con artists that may lure unsuspecting and vulnerable persons into being cheated? For such projects, fraudsters tend to promise locals that they will be considered for employment if they paid a nominal fee.	The EACOP project team channel of communication is through Community Liaison Officers (CLOs). The CLOs will provide telephone contacts to local communities. During recruitment of workers from local areas, leaders will be involved to minimise incidents of fraud.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kijugunya Village	There has been a precedent set by the rural electrification and road construction programmes where affected persons were not adequately compensated for	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in

					loss of property. How can we be sure the affected communities will be adequately compensated?	compliance with national regulations and IFC performance standards.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kijugunya Village	There is a concern that the grievance management mechanism may not address grievances of the vulnerable groups.	There are various steps within the grievance redress mechanism to ensure grievances are recorded, investigated and closed out.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kijugunya Village	There is a fear within the affected communities related to the possibility of secondary resettlement. Road upgrade works (by UNRA) led to resettlements and these same persons may be resettled by the proposed project activities.	Cumulative impacts have been evaluated and the most appropriate mitigation measures will be implemented.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kijugunya Village	How will compensation rates be determined?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kijugunya Village	Will persons whose houses are on the edge of the 30m corridor be compensated?	A 30m corridor of land will be acquired for the proposed pipeline construction and additional land for AGIs at specific locations. Property and land lost due to the project activities will be compensated for.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kijugunya Village	When will the construction works for the pipeline commence?	Commencement will depend on the permitting process and Final Investment Decision by the project sponsors. Early works are scheduled to commence end of 2018 or early 2019.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kijugunya Village	In case a community water source (such as a borehole) is affected by the construction activities, what measures will be in place to ensure the community has access to water?	The prioritised mitigation for community water sources is avoidance. If a source cannot be avoided, then an alternative water source will be provided before commencement of construction activities.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kijugunya Village	For persons that will be relocated, who will be responsible for identifying the replacement land? Will the PAPs be involved in the process of identifying replacement land?	The PAPs will be engaged throughout the resettlement process.
09/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kijugunya Village	How long will the construction phase take?	Two to three years (for the entire export pipeline).
09/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kisiita Town Council	Stakeholder engagement at an early stage is commendable as the concerned parties can air out their views early on.	Stakeholder engagement will be a continuous process throughout the project cycle.
09/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kisiita Town Council	Can the EACOP project team support Kakumiro District Authorities to establish District Compensation rates?	The project team will engage with the district authorities to identify how best this issue can be handled.
09/06/2018	LC3 - Lower Local Government	Male	Councillor and Secretary for Health and Education	Kisiita Town Council	Will PAPs be compensated in cash or in kind?	An engagement will be conducted with the affected person to identify the most appropriate form of compensation.
						The preferred mode of compensation for persons that will be relocated is in kind.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	When is the actual construction of the pipeline starting?	Commencement of construction works is dependent on acquisition of the relevant permits and a Final Investment Decision by the project sponsors.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	At what exact locations will pipeline be routed?	The exact locations will be communicated following completion of the G&G studies.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	What rates will be used to compensate project affected persons?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.

09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	The project should ensure that project affected persons, as well as other community members, are sensitized about how compensation will be done.	The RAP team will sensitise the PACs and the PAPs before compensation is done.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	What will happen in case the pipeline bursts as a result of natural causes?	EACOP will have an oil spill contingency plan in place to address such unlikely events.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	There is a fear that valuers may be corrupt and, as such, will ask for a fee from the PAPs.	Such grievances should be reported through the established GRM and they will be investigated and closed out.
09/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Lukoma Village	In case of conflicts over land ownership within an affected family, how will the project address such cases?	The project will acquire and value the land and the compensation fee will be kept aside to pay off the rightful land owner following the resolution of the conflict.
09/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Lukoma Village	Compensation has focused on land and crops. Will houses also be compensated?	Houses and any other assets on the land will be compensated for.
09/06/2018	LC3 - Lower Local Government	Male	Councillor	Nabigasa Subcounty	There is need to inform the Project Affected Persons early enough.	The land acquisition process will commence following the development of the RAP. All PAPs will be engaged well in advance.
10/06/2018	LC3 - Lower Local Government	Male	Councillor	Nabigasa Subcounty	How will the community be able to differentiate con men from actual project personnel?	The EACOP project will have CLOs, who will have a toll-free line. The CLO should be able to identify the contractor/EACOP project personnel. The local leaders will also be kept in full knowledge of the teams undertaking work in a particular area.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kabonera Village	Can housing units within community areas be connected to the electric power that will be used for heating the crude within the pipeline?	The source of energy for heating crude will be the CPF in Buliisa. As such, this energy source will not be available to communities.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kabonera Village	Will there be upgrading of roads within the PACS?	Upgrading of roads is mainly undertaken by the Government of Uganda. Some roads within the project corridor are being upgraded.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kabonera Village	What will be done in circumstances where people are inadequately compensated?	Such grievances will be addressed through the GRM. The aggrieved PAP will register a complaint that will be investigated and closed out. Courts of law are an option in the GRM.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	There are people within the community who studied but do not have certificates; will they be considered for the proposed jobs?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	After compensating someone, is the person given some grace period to leave the area?	There will be negotiations with PAPs on how best they can be physically or economically displaced.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	Will people get compensation for bare land?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.
11/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kabonera Village	Will people be given time to look for other options once they have been compensated?	There will be negotiations with PAPs on how best they can be physically or economically displaced.
11/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kabonera Village	What is the impact of the proposed construction activities on the grazing and movement of livestock?	Impacts related to livestock health have been evaluated and mitigated in a section of the ESIA report. There will be alternative routes established for livestock to move and graze during the construction phase.

11/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kabonera Village	Will the project establish an office that is accessible for people to go to in case of grievances?	There will be some project offices in addition to CLOs.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	How will orphaned land be handled?	The land acquisition team will evaluate issues related to such land and if it is orphaned, then it will be compensated and acquired by the project.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	Can the company replace land for land in terms of compensation?	This is an option that is included in the compensation process.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	If the valuation report does not meet the expectations of the PAP, how will such cases be handled?	There will be a grievance procedure to express dissatisfaction, in addition to CLOs.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	If the pipeline bursts, what will be impact on communities?	In an unlikely event that the pipeline bursts, the EACOP project will have an ERP to address such risks.
11/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kabonera Village	Where exactly will the pipeline be routed in this village?	The actual locations will be communicated following completion of the G&G studies.
11/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kakuuto Subcounty	Local communities will require that local authorities work with the project team to identify and recommend workers to be recruited for non-technical jobs.	The project will liaise with local leaders during recruitment of workers.
11/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kakuuto Subcounty	Will there be any programs to improve or even construct roads to support movement of project-related equipment?	The Government of Uganda has embarked on the upgrade of some roads to address this constraint.
11/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kakuuto Subcounty	Will the project construct some water sources for the communities?	If a community water source is affected by the project, an alternative water source will be provided. There is currently no budget for CSR until a FID has been made.
11/06/2018	LC3 - Lower Local Government	Male		Kakuuto Subcounty	At what exact locations will the pipeline be routed through the sub county?	The exact locations will be communicated following completion of the G&G studies.
11/06/2018	LC3 - Lower Local Government	Male		Kakuuto Subcounty	What criteria will be used to recruit project workers?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
11/06/2018	LC3 - Lower Local Government	Male		Kakuuto Subcounty	What will happen to the pipe once the oil is depleted?	Once the oil is depleted (in about 30 years), it is possible that other discoveries of oil may have been made in Uganda or neighbouring countries. The pipeline can be used to export crude oil from those discoveries as the physical life of the pipeline is much longer than the 30 years.
11/06/2018	LC3 – Lower Local Government	Male		Kakuuto Subcounty	Will PAPS be sensitised prior to the compensation process?	Yes the PAPs will be sensitised and the RAP process explained to them
11/06/2018	LC3 – Lower Local Government	Male		Kakuuto Subcounty	The main Masaka-Mutukula road is already in a sorry state. Does the project have any plans to upgrade this road for the pipeline use?	This is a UNRA road hence the project can't do any activities without the approval of the authority on that road.
11/06/2018	LC3 – Lower Local Government	Male		Kakuuto Subcounty	Will waste storage sites be located within the 30 m RoW or will different land outside the corridor be identified for this purpose.	Different land will be identified for the waste storage.
11/06/2018	LC3 - Lower Local Government	Female	Agricultural Officer	Kisiita Subcounty	At the moment, there are no approved district compensation rates for Kakumiro District. The district authorities are using the compensation rates for Kibaale District, which are old rates. This may lead to grievances.	The project team will engage with the district authorities to identify options of how this issue can be handled.
11/06/2018	LC3 - Lower Local Government	Male	Councillor	Nabigasa Subcounty	What will be done when the PAPs assets are undervalued?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by

						the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards. As such, there are other stakeholders that are involved in the valuation process. The PAP can deploy an independent valuer to ensure transparency.
11/06/2018	LC3 - Lower Local Government	Female	Chairperson	Nkooko Subcounty	We have been engaged by a number of study teams, which is commendable. However, as leaders, we are not certain of the particular areas (in the sub county) where the pipeline will be routed.	There are some ongoing studies (G&G and ESIA) that will confirm the pipeline route. During the pre-construction survey, leaders will be provided with the final pipeline route.
11/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Nkooko Subcounty	Leaders should be given information related to the precise pipeline route and affected villages. This is important for community mobilisation and minimises speculation over land.	There are some ongoing studies (G&G and ESIA) that will confirm the pipeline route. The villages have been provided through which the pipeline will be routed include... in Nkooko sub county.
11/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Nkooko Subcounty	How will local persons sell commodities to project workers if there will be restricted movement to and from the camp?	Local persons can be mobilised to engage in agricultural produce that will be procured through a preferred supplier. The supplier can then deliver the produce to the camp.
11/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Nkooko Subcounty	Risks related to family breakages due to the possibility of project workers eloping with wives of the local people should be mitigated.	A number of measures will be put in place to mitigate such risks. These will include development of Journey Management Plans for project vehicles that specify the destination and purpose of each trip. This will minimise interactions between the project workers and the local communities.
11/06/2018	LC3 - Lower Local Government	Female	Parish Chief	Nkooko Subcounty	During recruitment of workers from the local communities, will caretakers (such as parents/husbands) be consulted?	Recruitment of workers from local communities will be conducted with liaison of the local leaders to ensure such encumbrances are identified and addressed.
11/06/2018	LC3 - Lower Local Government	Male	Resident	Nkooko Subcounty	We need information on job opportunities and how local persons will be recruited.	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. Persons from local communities will be prioritised for recruitment for the non-technical jobs. EACOP project CLOs will provide further information during the pre-construction survey.
11/06/2018	LC3 - Lower Local Government	Male	Health Assistant	Nkooko Subcounty	How will the EACOP project team ensure that grievances are handled in a timely manner?	Grievances will be recorded and tracked to ensure they are closed out.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bukalasa Village	What level of education is required for the jobs going to be offered?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bukalasa Village	What happens in case the pipeline is routed through an area with someone's house?	The PAP will be relocated following valuation of the affected assets.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bukalasa Village	Where does one report in case they are not compensated for property damaged?	Such grievances can be registered with the CLO, investigated and closed out.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bukalasa Village	Has the actual pipeline route been identified?	The 30m corridor has been identified but will be firmed up following completion of the G&G studies.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bukalasa Village	What happens when the pipeline goes through graveyards?	The graves will be relocated in accordance with the cultural norms and consultations with the affected persons.

12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bukalasa Village	How will the elderly persons be handled in case they are to be relocated?	Livelihood restoration programmes will consider vulnerable groups such as the elderly so as to minimise impacts related to relocation.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bukalasa Village	Will project workers be accommodated within communities or will camps be established?	Project workers will be accommodated within the camps.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bukalasa Village	Will access roads that will be constructed due to the project be parallel to the pipeline corridor or existing roads will be upgraded?	A number of factors are considered when establishing an access road. Existing roads will be used to access to pipeline corridor except in a few cases when a new route will be established. Most of the trucks hauling construction equipment for use at construction sites will move within the ROW to ease pressure on community roads.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bukalasa Village	What grace period is given to an individual to relocate once they receive their compensation?	There will be negotiations with PAPs on how best they can be physically or economically displaced.
12/06/2018	LC5 - Local Government	Female	District Environment Officer	Kakumiro District Technical Planning Committee/Political Leaders	What measures are in place to handle plastic waste?	Generated waste will be segregated at site and a NEMA-licensed waste handling company will be procured to collect and dispose of the waste.
12/06/2018	LC5 - Local Government	Female	Vice Chairperson	Kakumiro District Technical Planning Committee/Political Leaders	Measures should be put in place to ensure that social risks (such as unplanned pregnancies and children born without identifiable fathers) due to interactions between the project workers and women in the local communities are minimised.	A number of measures have been included in the report to minimise these social risks. They include establishment of a camp with a clear camp management plan to minimise interactions between project workers and local communities, use of Journey Management Plans (JMPs) and regular sensitisation of local communities among others.
12/06/2018	LC5 - Local Government	Male	Assistant Chief Administrative Officer	Kakumiro District Technical Planning Committee/Political Leaders	Stakeholder engagements related to the export pipeline have been regular and this keeps leaders updated.	Noted.
12/06/2018	LC5 - Local Government	Male	Assistant Chief Administrative Officer	Kakumiro District Technical Planning Committee/Political Leaders	Communities should be engaged regularly to minimise the information gap within the communities.	Affected communities along the pipeline corridor are being engaged by EACOP's CLOs.
12/06/2018	LC5 - Local Government	Male	Assistant Chief Administrative Officer	Kakumiro District Technical Planning Committee/Political Leaders	A number of people were recommended from the district to Q-Sourcing (recruitment agency) for training in welding. The EACOP project team should provide us with information related to the progress of the training.	
12/06/2018	LC5 - Local Government	Male	District Health Officer	Kakumiro District Technical Planning Committee/Political Leaders	Are there plans to upgrade the district health services considering the number of persons that will be residing in the camp? The camp will be located in Katikara sub county?	The camp will have an onsite clinic to minimise impacts on the district health facilities.
12/06/2018	LC5 - Local Government	Male	District Health Officer	Kakumiro District Technical Planning Committee/Political Leaders	The EACOP project team should work closely with the District Health Officer as such projects are associated with a number of public health issues.	The EACOP project team will liaise with the existing government structures throughout the project cycle.
12/06/2018	LC5 - Local Government	Male	Human Resource Office	Kakumiro District Technical Planning Committee/Political Leaders	Is there any form of loyalty for the affected districts?	
12/06/2018	LC5 - Local Government	Male	Human Resource Office	Kakumiro District Technical Planning Committee/Political Leaders	Following acquisition of land, will the government restrict activities within the 30m corridor?	Negotiations are still ongoing between the various government agencies on how the 30m corridor of land will be managed. Activities like grazing of animals will be permitted.
12/06/2018	LC5 - Local Government	Male	Human Resource Office	Kakumiro District Technical Planning Committee/Political Leaders	Is the routing of the pipeline taking into consideration planned developments within the district so as to minimise future disruptions?	The EACOP project team has liaised with various government agencies, including district authorities, to identify planned developments. This has informed the routing of the pipeline.
12/06/2018	LC5 - Local Government	Male	District Natural Resources Officer	Kakumiro District Technical Planning Committee/Political Leaders	What measures are in place to ensure loss of biomass (especially tree cover) due to project activities is addressed? The district has a tree planting project and if this can be funded by EACOP, it may help to address this issue.	Mitigation measures related to loss of biodiversity are outlined in a section of the ESIA report.
12/06/2018	LC5 - Local Government	Male	District Natural Resources Officer	Kakumiro District Technical Planning Committee/Political Leaders	How will the risk associated with potential contamination of water sources be handled? Will	Mitigation measures to address the risk of water contamination are included in a section of the ESIA report.

					communities be provided with alternative water sources?	
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	Fears within the local communities related to human sacrifices associated with such infrastructure developments need to be addressed.	There will be no human sacrifices due to the proposed project.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	There are concerns related to compensation for property that may be lost due to the project activities. Experience from past projects (especially road upgrade works by UNRA) has shown that the compensation rates are not fair to the affected persons.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	Will the project acquire additional land beyond the 30m corridor and land acquired for AGIs?	There are no plans to acquire additional land beyond what has been stated.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	Will people in project affected communities (PACs) be considered for employment?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. People in PACs will be prioritised for non-technical jobs.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	There should be sensitisation before resettlement and compensation processes commence.	PACs will be sensitised on the planned resettlement and related compensation processes.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	How will orphaned land be handled?	The land acquisition team will, depending on the size, determine the most appropriate way to handle such land. In some cases, the PAP will be compensated for orphaned land.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	A market survey should be conducted to ensure that compensation rates are competitive.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kasambya Village	The current compensation rates for property are low and this may disadvantage the affected persons. Procuring an alternative piece of land will be equally expensive as market prices for land in the area are likely to go up due to speculation that oil and gas activities are associated with a lot of money.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kasambya Village	Will relocated persons be engaged on where they would prefer to be resettled?	The resettled persons will be engaged and negotiated with throughout the resettlement process.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kasambya Village	Local leaders should provide a compensation matrix to the general population and sensitise communities to ensure PACs are empowered.	Noted.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	The existing district compensation rates are lower than the prevailing market prices. How will this be handled?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	Why is property in urban centres valued at higher rates compared to property in the countryside within the same district?	Certified valuers will engage the affected persons on how property is valued.
12/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kasambya Village	If the pipeline corridor subdivides a piece of land into two, how will the affected land owner be compensated?	The 30m corridor will be permanently acquired by the Government of Uganda and the affected person will be paid. Following completion of construction phase, the trench will be backfilled and the area restored and the land owner will be able to access the piece of land across the

						pipeline. In case it is an orphaned piece of land, the land acquisition team may consider acquiring it.
12/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kasambya Village	Are there any CSR programmes being considered for the PACs?	There is currently no budget for CSR projects along the EACOP until a Final Investment Decision (FID) has been reached. The proposed surveys and ESIA studies will guide the FID.
12/06/2018	LC3 - Lower Local Government	Female	Health Assistant/Chairperson Land Committee	Katikara Subcounty	What measures are in place to address issues related to potential loss of water sources for local communities?	Community water sources will be avoided by the pipeline route. In case avoidance is not possible, then an alternative water source will be provided before construction commences.
12/06/2018	LC3 - Lower Local Government	Male	Resident	Nabigasa Subcounty	In case the landowner happens to be the land user, how is the compensation undertaken?	The valuation report will include the affected assets and these will be compensated for.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kinvunikidde Village	What gender is considered during recruitment of workers?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	There is a fear that job opportunities meant for the local community might be passed onto persons that are not residents.	Priority will always be given to the local community during recruitment for non-technical jobs. Recruitment will be done in liaison with the local leaders.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	Where should the people report in case they notice that the local people within the project area have not been given employment but instead the recruitment has considered people from other areas?	Grievances related to recruitment of workers can be forwarded to the EACOP project CLO so that they are closed out.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	What will be done to see that community properties are safe?	The project is to work with the local authorities and also the security organs.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	How will workers be scrutinized and be informed on what to do?	Recruitment will be done with the help of the local authorities. Workers will then undergo additional training on what they are meant to do.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	How will the project workers be differentiated from other members of society?	The EACOP project will have CLOs, who will have a toll-free line. The CLO should be able to identify the contractor/EACOP project personnel. The local leaders will also be kept in full knowledge of the teams undertaking work in a particular area.
13/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	There will be an increase in crime due to project workers. How will this be dealt with?	The workers will reside in camps that will be erected especially for them. They will also have rules to follow to ensure that their presence in the communities does not disrupt the lives of residents. The project will also work with local leaders to ensure safety and security in these areas.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	There is a likelihood of increased accidents in the area due to increased traffic. What will be done to minimize accidents?	Project vehicles will be installed with IVMS to ensure compliance with set speed limits for community areas. Drivers will have daily toolbox talks to identify potential risks and mitigate them, road safety signs will be installed at work sites, flagmen, communities will be sensitised on road safety among other measures.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	Where will project workers be staying?	All the workers will be accommodated within the workers' camps.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kinvunikidde Village	Are people who will aim to benefit from petty trade activities (roadside vending of roasted foodstuffs) free to move along with pipeline as workers move from one district to another?	Supply of goods and services to the project workforce will be through registered and pre-qualified companies. As such, road side vendors will not be supplying goods and services to project workers.

13/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kinvunikidde Village	Will the salaries paid to the workers be commensurate to work done?	Workers will have contracts that indicate the terms of service and remuneration. The salaries will be within range of similar infrastructure projects.
13/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kinvunikidde Village	Are there receipts given to people when they get compensated?	The compensation process will involve signing of consent forms by the PAPs. PAPs retain copies of the consent forms.
13/06/2018	LC1 – Village Local Council and Community Members	Male	Chairperson	Kinvunikidde Village	Will those being relocated be assisted in finding land to settle or is compensation the only way?	Compensation can be done in kind, however all this will be explained once the RAP process starts.
13/06/2018	LC5 - Local Government	Male	Physical Planner	Lwengo District Technical Planning Committee/Political Leaders	What kind of infrastructure shall the people of Lwengo District get during project implementation?	The main infrastructure development will be the upgrade of some of the roads. This is being undertaken by the Government of Uganda.
13/06/2018	LC5 - Local Government	Male	Physical Planner	Lwengo District Technical Planning Committee/Political Leaders	Will the communities be given priority to supply goods to the project?	Supply of goods and services will be done by pre-qualified companies that are listed on the NSD for oil and gas activities. The local people will be able to supply goods and services to these companies.
13/06/2018	LC5 - Local Government	Female	District Entomologist	Lwengo District Technical Planning Committee/Political Leaders	What is going to be done for the noise and vibrations?	Impacts related to noise and vibrations have been evaluated and mitigation measures suggested in a section of the ESIA report. The measures include use of mufflers to minimise noise levels.
13/06/2018	LC5 - Local Government	Female	Planner	Lwengo District Technical Planning Committee/Political Leaders	Where exactly will the pipeline be routed in Lwengo district?	The exact locations will be communicated when the G&G studies have been finalised.
13/06/2018	LC5 - Local Government	Male	District Health Officer	Lwengo District Technical Planning Committee/Political Leaders	Will the project have sanitary facilities for workers at worksites?	There will be mobile toilets for project workers and sanitary facilities within camps.
13/06/2018	LC5 - Local Government	Male	District Health Officer	Lwengo District Technical Planning Committee/Political Leaders	Will project team conduct AIDS/ HIV awareness programs in PACs?	HIV/AIDS awareness programs will be conducted within PACs.
13/06/2018	LC5 - Local Government	Male	Senior Environment Officer	Lwengo District Technical Planning Committee/Political Leaders	The local people should be sensitised about the requirements for companies to be pre- qualified to supply of goods and services.	Requirements for supply of goods and services will be communicated to the district authorities and local communities. The EACOP project will procure goods and services from registered companies that will be listed on the NSD. Other requirements will be communicated in due course.
13/06/2018	LC5 - Local Government	Male	Senior Environment Officer	Lwengo District Technical Planning Committee/Political Leaders	Are the proposed camps to be permanent or will they be decommissioned following completion of the construction phase?	The proposed camps are temporary and, on completion of the construction phase, they will be decommissioned and land restored.
13/06/2018	LC5 - Local Government	Male	Senior Environment Officer	Lwengo District Technical Planning Committee/Political Leaders	Fruit trees should be planted along the pipeline corridor so as to demarcate its boundaries.	The proposal will be discussed by the EACOP project team.
13/06/2018	LC5 – Local Government	Male		Lwengo District Technical Planning Committee/ Political Leaders	The destruction of crops might discourage people to carry out agriculture especially those next to the pipeline corridor. How will these people be addressed?	There will be livelihood restoration plans in place to assist such communities
13/06/2018	LC5- Local Government	Male		Lwengo District Technical Planning Committee/ political Leaders	Kingdoms and districts where oil discoveries have been made are to get royalties. What about districts where the pipeline passes?	This has been noted and will be shared with the government.
13/06/2018	LC5 - Local Government	Male	District Planner	Mubende District Technical Planning Committee/Political Leaders	In ecologically sensitive areas, what will be the size of the construction corridor?	The footprint will be reduced to a 20m corridor to minimise impacts in such areas.
13/06/2018	LC5 - Local Government	Male	District Planner	Mubende District Technical Planning Committee/Political Leaders	In the proposed grievance redress mechanism, the aggrieved party should be provided with an acknowledgement to indicate that a grievance has been recorded.	The aggrieved party will be provided with an acknowledgement form to indicate that a grievance has been received and recorded.
13/06/2018	LC5 - Local Government	Male	District Planner	Mubende District Technical Planning Committee/Political Leaders	If a forest resource is impacted, compensation should not be limited to the forest owner as there many beneficiaries of such a resource. In event of such an incident, the EACOP project team should liaise with District Natural Resource Department to aggregate the trees destroyed so that they are replanted at another location.	No net loss for biodiversity is being prioritised by the project.

13/06/2018	LC5 - Local Government	Male	District Natural Resources Officer	Mubende District Technical Planning Committee/Political Leaders	This is a high-profile project but district leaders have not been provided with GPS coordinates of the proposed pipeline corridor. How can we guide the process if we are not provided with information?	District leaders will be provided with location details following completion of G&G and ESIA studies.
13/06/2018	LC5 - Local Government	Male	District Natural Resources Officer	Mubende District Technical Planning Committee/Political Leaders	The district authorities were not involved in the land acquisition for the proposed camp in Kitenga subcounty.	The relevant District authorities will be involved in the land acquisition process for the camp. The initial process involved contractors taking measurements and leaving small markers at the proposed site.
13/06/2018	LC5 - Local Government	Male	District Natural Resources Officer	Mubende District Technical Planning Committee/Political Leaders	How many wetlands and forests will be crossed by the proposed pipeline corridor in Mubende District? Will there be compensation for such resources?	
13/06/2018	LC5 - Local Government	Male	District Natural Resources Officer	Mubende District Technical Planning Committee/Political Leaders	We should also be informed of the number of villages that will be directly affected by the proposed project so that we can start sensitising communities.	
13/06/2018	LC5 - Local Government	Male	District Natural Resources Officer	Mubende District Technical Planning Committee/Political Leaders	We need the information to enable us to monitor the proposed activities and represent interests of our people.	Detailed information will be provided in the ESIA and in the pre- construction stakeholder engagements.
13/06/2018	LC5 - Local Government	Male	District Education Officer	Mubende District Technical Planning Committee/Political Leaders	The district authorities should be informed early if any schools will be affected, so that we can plan for relocation early on.	Education institutions in the district have been avoided.
13/06/2018	LC5 - Local Government	Male	Senior District Environment Officer	Mubende District Technical Planning Committee/Political Leaders	We have been regularly informed by the CLOs of the Resettlement Action Plan contractors' (New Plan and ICS) about the progress of the land acquisition process for the proposed camp.	Noted.
13/06/2018	LC5 - Local Government	Male	Senior District Environment Officer	Mubende District Technical Planning Committee/Political Leaders	The EACOP project team and contractors have always submitted to us that the reason coordinates for proposed pipeline route are yet to be communicated to the district authorities is due to some studies that are yet to be completed. These studies will provide information on the final pipeline route and location of AGIs.	Noted.
13/06/2018	LC5 - Local Government	Male	Senior District Environment Officer	Mubende District Technical Planning Committee/Political Leaders	The districts that are directly impacted by the pipeline are coming up with a document that will be shared with EACOP project team. The document will highlight how the proposed project can maximally benefit the proposed project.	Noted.
13/06/2018	LC5 - Local Government	Male	Senior District Environment Officer	Mubende District Technical Planning Committee/Political Leaders	For ecologically sensitive areas (such as wetlands), there is a need for the study team to conduct a biodiversity risk assessment so that we can be able to quantify the biodiversity loss and how the loss can be compensated.	This has been included in a section of the ESIA report.
13/06/2018	LC5 - Local Government	Male	Senior District Environment Officer	Mubende District Technical Planning Committee/Political Leaders	There is a delay in the approval of the district compensation rates by the CGV's office. How can the project assist affected districts to ensure this process is expedited?	The EACOP project team will engage the CGV's office over this matter.
13/06/2018	LC5 - Local Government	Male	Deputy Chief Administrative Officer	Mubende District Technical Planning Committee/Political Leaders	Measures related to how social risks such as commercial sex workers and domestic violence will be mitigated should be clearly spelt out.	The measures are presented in a section of the ESIA. Sensitization of affected communities and liaison with local authorities will be critical in management of the social risks.
13/06/2018	LC5 - Local Government	Male	Deputy Chief Administrative Officer	Mubende District Technical Planning Committee/Political Leaders	In the grievance redress mechanism, are local authorities relegated to appeal levels?	Grievance management committees will be set up at the various levels of local administration (LCI, LCIII and LCV). These committees will be regularly engaged in the management of grievances.
13/06/2018	LC3 - Lower Local Government	Female	Resident	Nabigasa Subcounty	In other areas where the oil and gas activities have already commenced, communities are complaining of not being compensated for loss of assets. Will this be the case?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.
13/06/2018	LC3 – Lower Local Government	Female	Resident	Nabigasa Subcounty	There have been cases of unfair compensation with some people being paid more than others.	Compensation is based on the district compensation rates to make for a fair process, however if someone has assets on the land these are usually paid for too.

14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Butoloogo Subcounty	We expect that the proposed project will contribute to development of the area, especially road upgrade works.	Noted.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Butoloogo Subcounty	Directly affected communities should be sensitised about the proposed project.	Sensitisation and engagement with directly affected communities will be ongoing throughout the project cycle.
14/06/2018	LC3 - Lower Local Government	Male	Councillor	Butoloogo Subcounty	Delayed compensation following declaration of the cut-off date is a concern as it affects livelihoods of the PAPs.	The project team will engage with the CGV's office (responsible for review and approval of valuation reports) to find out ways through which delays can be minimised.
14/06/2018	LC3 - Lower Local Government	Female	Councillor for Persons with Disabilities	Butoloogo Subcounty	Residents prefer that the entire 30m corridor is permanently acquired by the government.	Line government agencies are discussing the acquisition and management of the 30m corridor and the final position will be communicated.
14/06/2018	LC3 - Lower Local Government	Female	Councillor for Persons with Disabilities	Butoloogo Subcounty	Are there opportunities for employment for the local persons?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. Recruitment of workers for non-technical jobs will prioritise persons from the directly affected local communities.
14/06/2018	LC3 - Lower Local Government	Male	Political Mobiliser	Butoloogo Subcounty	Will affected persons be compensated before commencement of construction activities?	Loss of property due to project activities will be compensated for before construction activities.
14/06/2018	LC3 - Lower Local Government	Female	Councillor for Women	Butoloogo Subcounty	Most of the project workers are likely to be men and, as women, we are concerned about social risks (such as teenage pregnancies and break up of families due to interactions of project workers and housewives). What measures will be in place to minimise such risks?	Measures to manage social risks are included in a section of the report. Project workers will be residing in camps, movement of project vehicles will be monitored through Journey Management Plans and such measures will minimise interactions between locals and project workers.
14/06/2018	LC3 - Lower Local Government	Female	Councillor for Women	Butoloogo Subcounty	How will the local people who are neither employed nor compensated by the project benefit from the proposed project?	The project will be associated with direct and indirect benefits such as upgrade of some roads by the Government of Uganda, supply of goods and services, increased revenue to the government through selling of crude oil among others.
14/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Butoloogo Subcounty	Sensitisation of the affected local communities is being conducted.	Noted.
14/06/2018	LC3 - Lower Local Government	Male	Community Development Officer	Butoloogo Subcounty	There is a concern that what is communicated to stakeholders during the pre- construction phase may differ from what is implemented during the construction and operation phase. In some projects, military force has been used for land acquisition.	Project activities will be monitored by local and national leaders to ensure compliance with the stated plans. There will be no use of the military in the land acquisition process.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kisagazi Village	Will consent forms for land acquisition be signed before payment to the PAPs is effected?	The land acquisition process involves a series of negotiations and engagements with the PAPs. Consent forms are signed as part of the process that eventually culminates in compensation for affected properties.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kisagazi Village	If, during the construction of a trench, a mineral resource is discovered in a PAP's land, how will such a person be compensated?	Mineral exploration requires obtaining a permit from the Government of Uganda and is out of scope for the pipeline construction works. The affected person will be compensated for land take.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kisagazi Village	What are the requirements for recruitment of workers?	There are technical and non-technical jobs. The technical jobs include those for skilled persons (these will be advertised at international and national level) and semi-skilled (that will be advertised at the national and local levels). Persons from local communities will be prioritised for recruitment for the non-technical jobs. EACOP Community Liaison Officers will provide further guidance during the pre-construction survey.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kisagazi Village	During the compensation for loss of land, will the tenants (bibanja holders) be compensated?	Tenants and landlords will be compensated for loss of land due to project activities.

14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kisagazi Village	If the community water source is affected by the project, how will that be addressed?	Community water sources will be avoided in accordance with the mitigation hierarchy. In case the source cannot be avoided, an alternative water source will be provided following consultations with the affected community.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kisagazi Village	If the proposed activities affect grazing areas, how will the affected person be compensated?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards. Project activities will be restricted to a 30m corridor and there will be livestock crossing points provided to ensure minimal impacts on livestock health.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	We thank the EACOP team for the regular updates related to the proposed project.	Noted.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	There are a number of complaints from leaders at various levels as we feel we are not fully involved in the project. There seems to be concealment of information. A case in point is the land acquisition for the camp in Kitenga Sub County; local leaders were not involved in the land acquisition process.	The local authorities will be involved in the land acquisition process. The initial process involved contractors taking measurements and leaving small markers at the proposed site.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	There were expectations from the local women that they could supply some goods to the camp. However, the requirement of having a registered company listed on the NSD may fail potential suppliers.	The requirements for supplying goods and services to the EACOP project will, among others, include a supplier being a registered entity with the Government of Uganda and listed on the NSD for oil and gas activities. Potential suppliers will be sensitised over this so that they can have their transactions formalised.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	Local leaders that attend meetings within communities and/or at the sub county offices are not given any form of financial facilitation and this has discouraged some of the leaders that move long distances to attend such meetings.	The current practice is to refund transport costs incurred by leaders that have been requested by the project team/contractors to commute and attend particular meetings.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	The project will cross wetlands (such as Nabakazi and Katabalega) within Kitenga Sub County. Are there plans to compensate local governments for land and these resources?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	Will project workers (residing in a camp that will be set up in Kitenga Sub County) be subjected to a local service tax?	The EACOP project will comply with national and local legislative frameworks.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	Will the project establish new access roads to the pipeline corridor or the existing roads will be upgraded?	Transportation of the logistics to the construction sites will mainly be within the 30m corridor (RoW). A few access roads will be opened up to the pipeline corridor but mostly, the existing roads will be used.
14/06/2018	LC3 - Lower Local Government	Male	Chairperson	Kitenga Subcounty	In instances where public utilities such as water sources and schools are affected, will the project establish alternatives for the PACs?	Public utilities have been mapped and the prioritised mitigation measure is avoidance of such facilities. In case the facility cannot be avoided, an alternative will be provided in consultation with the PACs and leaders.
14/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kitenga Subcounty	What CSR programmes are in place for the affected communities?	The social investment plan is still at proposal level but will be discussed with leaders to ensure sustainability.
14/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kitenga Subcounty	What is the strategy for offering employment opportunities to the youths that are not skilled?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. Recruitment of workers for non-technical jobs will prioritise persons from the directly affected local communities.

14/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kitenga Subcounty	There are expectations that the proposed camp in Kitenga Sub County will empower our people economically. Some people may be able to supply food stuffs to the camp in addition to the increased taxes that will be generated from the residents of the camp and local suppliers.	Noted.
14/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kitenga Subcounty	The project team should sensitise local communities on how best they can benefit from the project.	Engagements with directly affected communities will be continuous throughout the project cycle.
14/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Kitenga Subcounty	There has been a bad precedent set in the area due to unfair compensation of the affected persons along the Mubende-Kakumiro-Kagadi road (which is being upgraded). This should not be the case with the proposed project.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and IFC performance standards.
14/06/2018	LC3 - Lower Local Government	Female	Secretary for Health	Kitenga Subcounty	Will land orphaned by the project be compensated?	The land acquisition team will evaluate orphaned land on a case by case basis, and will make a decision on whether it should be compensated for.
14/06/2018	LC3 - Lower Local Government	Female	Secretary for Health	Kitenga Subcounty	Are there plans to offer assistance to the sub county authorities as a form of CSR?	The social investment plan is still at proposal level but will be discussed with leaders to ensure sustainability.
14/06/2018	LC5 - Local Government	Male	Community Development Officer	Sembabule District Technical Planning Committee/Political Leaders	We request that compensation be done before displacement or destruction of people's property.	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.
14/06/2018	LC5 - Local Government	Male	Community Development Officer	Sembabule District Technical Planning Committee/Political Leaders	People should be sensitized so that they are in the know of what is happening.	Sensitization programs are to be conducted throughout the project phases.
14/06/2018	LC5 - Local Government	Male	Natural Resource Officer	Sembabule District Technical Planning Committee/Political Leaders	If a PAP rejects the valuation report, what will be done?	There will be negotiations with the PAP to ensure the compensation is fair.
14/06/2018	LC5 - Local Government	Male	Natural Resource Officer	Sembabule District Technical Planning Committee/Political Leaders	Has the study team engaged key stakeholders such as NEMA, UWA and PAU?	These stakeholders have been engaged and study findings disclosed to them.
14/06/2018	LC5 - Local Government	Female	Senior Labour Officer	Sembabule District Technical Planning Committee/Political Leaders	The Community Liaison Officers should work very closely with the different sectors whenever a grievance occurs.	Noted.
14/06/2018	LC5 - Local Government	Male		Sembabule District Technical Planning Committee/Political Leaders	When is the appropriate time for the communities to know the exact locations through which the pipeline will be routed?	Following completion of the G&G studies, the PACs will be informed of the exact locations.
14/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Sembabule Market Zone	There are many types of oils on the market. Which type of oil are we going to export?	The EACOP project will export crude oil.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Sembabule Market Zone	After all the construction activities are done, and the land is restored, will PACs be allowed to access and use the 30m corridor?	Negotiations between government agencies are still ongoing on the level of activities that will be permitted within the corridor that will be acquired for pipeline works.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Sembabule Market Zone	Will people whose land is affected by road construction/upgrade works be compensated?	If the road upgrade/construction is undertaken by the EACOP project, the PAP will be compensated in accordance with the existing legal framework.
14/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Sembabule Market Zone	What happens after the pipeline has passed through the land? Will people be allowed to use the land again?	This is still under discussion with the government if farming of seasonal crops and grazing will be permitted, however no planting of trees or building of houses will be allowed within the RoW.
14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Sembabule Market Zone	There are cultural resources in this area like the Chwezi trees. What will be done when these are to be crossed by the pipeline?	Cultural resources have been mapped out and the prioritised mitigation measure is avoidance. In case the resource cannot be avoided, then relocation will be considered with consent of the affected persons.

14/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Sembabule Market Zone	Where exactly is the pipeline going to be routed through our village?	The pipeline route will be firmed up following completion of the G&G studies. The PACs will be informed in due course.
14/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Sembabule Market Zone	What is the possibility of the pipeline bursting, harming people and destroying crops?	The pipeline has been designed taking in the best engineering techniques and materials to be used, hence this probability is rare. There will be sensors along the pipeline to detect leaks and pinpoint the exact location of the damage. Also, an oil spill plan will be put in place in case of any leaks.
14/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Sembabule Market Zone	Why do the studies target a wide margin of people and not just those affected by the project?	There are indirect impacts which spread further than those directly affected by the project, therefore the project will put in place measures to address impacts of persons who are indirectly affected by the project.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kyetume Village	In cases where there is dispute over land ownership (and ongoing court cases), will the pipeline construction stall?	The pipeline construction activities will proceed, but the land acquisition team will liaise with local leaders and the disputing parties to value the acquired land. The compensation fees will be handed over to the rightful owner following completion of the court case.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kyetume Village	If community water sources are affected, how will this be handled?	Community water sources will be avoided in accordance with the mitigation hierarchy. In case the source cannot be avoided, an alternative water source will be provided following consultations with the affected community.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyetume Village	Youths from the local communities should be considered for employment. Some of the youths are educated.	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. Persons from local communities will be prioritised for recruitment for the non-technical jobs.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyetume Village	The project information should cascade down to the local persons and should not be left to local leaders at the district and sub county level to make decisions.	The project team will engage regularly with local communities and local leaders.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyetume Village	Does the project consider uneducated people for employment?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyetume Village	There is a need to obtain five people to mobilise for community meetings in this particular village to ensure a higher attendance of potentially affected residents. This is due to the fact that households are scattered.	The five or more mobilisers will be deployed for the next community meeting.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyetume Village	Local persons should be considered for employment opportunities.	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. Persons from local communities will be prioritised for recruitment for the non-technical jobs.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyetume Village	Can a PAP hire an independent valuer?	The affected person can hire an independent valuer in case of a contestation of the valuation report.
15/06/2018	LC3 - Lower Local Government	Female	Resident	Lugusulu Subcounty	If the Grievance Redress Committee at the district fails to close out a grievance, can the aggrieved party proceed to courts of law?	Courts of law are an option for closing out a grievance.
15/06/2018	LC3 – Lower Local Government	Male	Resident	Lugusulu Subcounty	There will be increased crime in the communities. How will the project deal with this?	The workers will reside in camps that will be erected especially for them. They will also have straight rules to follow to ensure that their presence in the communities doesn't disrupt the

						lives of the people. The project will also work with local leaders to ensure safety and security in the areas they are working in.
15/06/2018	LC3 - Lower Local Government	Male	Resident	Lugusulu Subcounty	Will the females be given employment by the project?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible. Gender inclusiveness in provision of opportunities is prioritised by the EACOP project.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	Mobilisation for the community meeting was done but some of the local people need to be sensitized further about the importance of community meetings.	Noted.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	How will security of the pipeline be handled?	The EACOP project team will liaise with the lead agency in charge of security and local leaders to ensure security along the pipeline corridor. Additionally, a private security service provider will be contracted.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	Are there any CSR programmes to benefit the sub county?	There is currently no budget for CSR projects along the EACOP until a Final Investment Decision (FID) has been reached. The proposed surveys and ESIA studies will guide the FID.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	If a worker's health is affected by the project activities, how will such an incident be handled?	Impacts on workers' health are covered in a section of the ESIA. Workers will be insured and they will be provided with protective equipment to minimise such incidents.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	We expected that the compensation rates will be higher than the district compensation rates.	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of the physical and economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with the national legislations and International Finance Corporation (IFC) performance standards.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	For acquiring the 30m corridor, do you require the affected persons to have a land title or sales agreements? What kind of documents should one have to verify ownership? Who owns the land following completion of construction phase?	The land acquisition team will request for land titles and/or agreements, or help of area land committees to verify land ownership. The land will belong to the Uganda Land Commission.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	How will the local leaders (that will guide the survey teams during the land survey process) be remunerated?	The remuneration of guides will depend on the length of engagement.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	All casual workers should be recruited from our area. This is because there are many people who are expecting work and yet the contractors may be offering us a few vacancies.	Local persons in directly affected areas will be prioritised for employment for non-technical jobs. All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
15/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	When is the project commencing? Communities are getting exhausted of meetings in preparation for the project.	The commencement will depend on the environmental permitting process and the Final Investment Decision by the project sponsors.
15/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Serinya A and B Villages	There is a likelihood of increase in thefts and child kidnaps during project implementation?	Social risks have been evaluated and mitigation measures included in a section of the ESIA report.
15/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Serinya A and B Villages	What are the requirements for getting job opportunities?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.

15/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Serinya A and B Villages	Where does one report a complaint as a result of a wrong doing by the project team?	A GRM has been developed indicating the various levels through which a grievance can be investigated and eventually closed out.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	How will land be acquired in cases where land is owned by a family and yet the family has no land title? Such land is associated with conflicts over ownership.	The land acquisition process will involve identifying the rightful landowner(s) to be compensated for loss of land. In case of conflicts over land, the project will commence as the aggrieved parties settle out their differences. The compensation fees will eventually be paid to rightful owner(s).
15/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	How will compensation on those currently occupying Buganda land be dealt with?	When the RAP process starts this will be addressed.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	The payment option of using cheques (and/or through banks) is hectic for people who receive little money from compensation. Can the project consider cash payments?	The RAP team will sensitise the PAPs on the available payment methods and risks involved.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	When will the PACs be informed of the exact locations through which the pipeline will be routed?	The pipeline route will be communicated following completion of the G&G studies.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	What will be done to minimise or avoid accidents at workplace?	Toolbox talks are held every day to identify risks and mitigations. Additionally, workers will be provided with protective wear.
15/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	What is done to the graves when the pipeline is routed through a grave yard?	Graves will be relocated with consent of the affected person.
15/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	Why can't Uganda National Oil Compact (UNOC) build the pipeline itself rather than brining in foreign oil companies?	The oil companies come with experts in the field of pipeline construction. This is the first oil pipeline to be built in Uganda so the country needs experts who have done it before to build the local capacity.
15/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Serinya A and B Villages	How can communities report their grievances?	There is a grievance mechanism in place to handle grievances arising from project activities.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bulakati Village	Where does one report in case of an accident arising from the project vehicles?	A GRM has been developed to address such cases.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bulakati Village	Are people compensated before the construction or after the pipeline construction?	Compensation will be made before construction works commence. Compensation fees are paid following approval of the valuation report by the office of the CGV.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bulakati Village	If there is unfair valuation of property lost due to the project activities, are the affected people protected by law?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bulakati Village	Will compensation money be paid through commercial banks?	Compensation will be in cash or kind. The RAP team will sensitise the PAPs on how the affected persons will be paid.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bulakati Village	Will people without land titles be compensated?	The EACOP project will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with national regulations and International Finance Corporation (IFC) performance standards.

16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bulakati Village	Why doesn't the government consider the option of acquiring leases from PAPs?	Government has considered permanent land acquisition as the corridor can be used for other utility services in future.
16/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Bulakati Village	What if the pipeline goes through an elderly person's house, what will the project do?	The resettlement process will include livelihood restoration programs, particularly for the vulnerable persons.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Bulakati Village	Will the oil deplete after some time?	It's estimated that the oil resource will be depleted after 3 decades.
16/06/2018	LC1 – Village Local Council and Community Members	Male	Resident	Bulakati Village	Workers from the project will impregnate young girls in the communities and break up families and deny responsibility.	The workers will reside in camps that will be erected especially for them. They will also have rules to follow to ensure that their presence in the communities doesn't disrupt the lives of the people.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kijaguzo Village	If a project worker is recruited from the local community, must that person reside in the camp?	
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kijaguzo Village	What are the requirements for one to be recruited for work?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
16/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kijaguzo Village	Residents should be given information related to the actual areas where the pipeline will be routed.	Residents will be provided with that information following the completion of the G&G and ESIA studies.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kijaguzo Village	Kijjaguzo village was curved out of Kabulamuliro village. However, most of the correspondence related to the EACOP project is directed to Kabulamuliro village. This should be rectified.	Noted.
16/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kijaguzo Village	Will uneducated persons be allowed to supply goods such as foodstuffs to the EACOP project?	The EACOP project is committed to reinforcing the use of local workers and contractors through training programs and support to local companies by strengthening their skills and capacities.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kyenda Village	There are a number of youth and women organisations in our area that may not be registered as companies but would like to supply goods to the EACOP project.	The EACOP project is committed to reinforcing the use of local workers and contractors through training programs and support to local companies by strengthening their skills and capacities. Such organisations will be trained on how they can formalise their registration and have opportunities to supply.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kyenda Village	Will the affected persons be compensated before commencement of construction activities?	Compensation for losses will be before commencement of project activities.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Chairperson	Kyenda Village	Can the local people be permitted to vend food stuffs at the camp entrance?	Vending of foods at the camp will not be permitted. The project will deal registered and formal vendors that will have to obtain a tender to supply food stuffs.
16/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kyenda Village	During relocation, will the affected person be resettled within the same locality?	Through development of resettlement action plans (RAPs), a resettlement package will be offered after consultations with eligible households. The affected person may be resettled within the same locality or another locality depending on the outcome of the negotiations.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyenda Village	If the land title of the affected person is still being processed, how will such a case be handled?	Negotiations will be conducted with the affected person so as to identify the most appropriate way for compensating for loss of land.
16/06/2018	LC1 - Village Local Council	Male	Resident	Kyenda Village	Following completion of the construction phase, what activities will be permitted within the 30m corridor?	Government agencies are finalising deliberations on the management of the 30m corridor. Regulated activities such as grazing of animals will

	and Community Members					be permitted. The affected communities will be sensitised on what will permitted within the acquired corridor.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyenda Village	Will the project compensate tenants or land owners for loss of land?	Tenants (bibanja owners) and land owners will be compensated for loss of land and/or property due to project activities.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyenda Village	Since the proposed pipeline requires heating, are there plans to install electricity supply to areas without energy sources for heating the pipeline?	The source of energy for heating the pipeline will be the CPF in Buliisa District.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyenda Village	Most of the land in our area is being used by tenants. How will these tenants be handled?	Tenants (bibanja owners) and land owners will be compensated for loss of land due to project activities.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyenda Village	Political leaders (Member of Parliament, Chairmen Local Council IIIs) tend to influence the compensation process and as such the local people are treated unfairly. This happened during the compensation of affected persons along Mubende-Kakumiro- Kagadi road. How will this be handled?	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of the physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with the national legislations and International Finance Corporation (IFC) performance standards.
16/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kyenda Village	When compensating for houses that will be relocated, is there a requirement that such houses should have approved plans?	There is no requirement for an approved structural plan for houses that will be affected.
16/06/2018	LC1 - Village Local Council and Community Members	Female	Resident	Kyenda Village	Are there CSR programmes for the affected communities such as provision of drugs in health centres?	The social investment plan is still at proposal level but will be discussed with leaders to ensure sustainability.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyenda Village	When should the local people expect adverts for the technical jobs?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
16/06/2018	LC1 - Village Local Council and Community Members	Male	Resident	Kyenda Village	Will the compensation process take into consideration plans (that are not yet effected) by the affected person? For instance, a plan to plant eucalyptus trees with an approved land use plan.	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of the physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer (CGV) and in compliance with the national legislations and International Finance Corporation (IFC) performance standards.
18/06/2018	LC3 - Lower Local Government	Male	Chairperson	Madudu Subcounty	We need to be informed about the particular location of the pipeline in the area.	Local leaders will be provided with location details following completion of G&G and ESIA studies.
18/06/2018	LC3 - Lower Local Government	Male	Chairperson	Madudu Subcounty	There is a need to engage the local communities and have them sensitized about the land acquisition process as there is speculation over land in the area.	Local communities will be engaged throughout the project cycle.
18/06/2018	LC3 - Lower Local Government	Male	Chairperson	Madudu Subcounty	The affected communities should be engaged and sensitized on how compensation will be conducted.	Communities are being engaged and sensitised on the compensation process.
18/06/2018	LC3 - Lower Local Government	Female	Community Development Officer	Madudu Subcounty	Gender issues in communities should be evaluated. Women and children in society depend on the environment for water, firewood, herbs and materials for income generating activities. What plans are in place to minimise these impacts?	Community water sources have been mapped out and prioritised for avoidance. Impacts on ecosystem services and livelihood activities and targeted mitigation measures for women and children are included in a section of the ESIA.
18/06/2018	LC3 - Lower Local Government	Female	Community Development Officer	Madudu Subcounty	Social risks (such as communicable diseases, teenage pregnancies, children born without identifiable fathers) associated with contractors interacting with local communities should be identified and mitigated.	Social risks have been evaluated and mitigated in a section of the ESIA.
18/06/2018	LC3 - Lower Local Government	Female	Community Development Officer	Madudu Subcounty	Women and children are left in a vulnerable state during the compensation for lost property. This is because the compensation proceeds are given to the men. How will such vulnerabilities be handled?	Spousal consent will be included in the compensation process to minimise such vulnerabilities.

18/06/2018	LC3 - Lower Local Government	Female	Community Development Officer	Madudu Subcounty	Local leaders were recently engaged by CSOs in Mubende District and one of the key issues highlighted was the limited information provided on the EACOP project. For instance, land was acquired for the proposed camp in Kitenga sub county without the involvement of local leaders.	Local leaders will be provided with location details following completion of G&G and ESIA studies.
18/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Madudu Subcounty	There is a need for the EACOP project CLOs to have assistants based in the affected communities. These CLOs will have a clearer understanding of the community setting in the respective sub counties.	The EACOP project CLOs will liaise with local leaders to ensure there is a clearer understanding of issues at a local level.
18/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Madudu Subcounty	Employment opportunities for the local persons should not be limited to casual work but should be extended to technical jobs. There are some educated people in the affected sub counties.	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
18/06/2018	LC3 - Lower Local Government	Male	Senior Assistant Secretary	Madudu Subcounty	The EACOP project should consider facilitating local leaders to community engagements. Communities have trust in local leaders and they can get hostile.	The practice involves providing a transport refund to leaders that have been requested by the EACOP project team/contractors to attend particular meetings.
19/06/2018	LC5 - Local Government	Male	Chief Administrative Officer	Gomba District Technical Planning Committee/Political Leaders	What specifically is the district technical team supposed to contribute towards the project? District leaders should be able to sensitize the communities and prepare the locals for the proposed project.	District technical officers will be engaged at various levels in the projects. A Grievance Management Committee will be set up at the district; technical officers will be involved in the land acquisition and compensation process, sensitization of local communities among others.
19/06/2018	LC5 - Local Government	Male	Chief Administrative Officer	Gomba District Technical Planning Committee/Political Leaders	There is a need to skill people in the affected districts. There is a need to coordinate the districts to ensure equity in job allocations.	EACOP project (through Q-sourcing) has recruited 20 youths from the affected districts. These will be trained in welding.
19/06/2018	LC5 - Local Government	Male	HOF	Gomba District Technical Planning Committee/Political Leaders	What happens if a cultural site or place of worship is within the proposed pipeline corridor?	Avoidance is the prioritised mitigation measure for cultural sites and/or places of worship. Incase these sites cannot be avoided, then relocation of the cultural sites (in consultation with the affected stakeholders) will be considered.
19/06/2018	LC5 - Local Government	Female	District Natural Resource Officer	Gomba District Technical Planning Committee/Political Leaders	Studies from countries with oil pipelines indicate that pipeline corridors tend to have scant vegetation cover, with dried up patches. What measures will you have in place to address this? Can trees be planted along the 30m corridor?	
19/06/2018	LC5 - Local Government	Female	District Natural Resource Officer	Gomba District Technical Planning Committee/Political Leaders	Will the displaced persons be given an opportunity to find alternative locations or they will be relocated into one single location?	Displaced persons will be engaged throughout the process of developing the resettlement action plan and there will be negotiations on the preferred area for relocation.
19/06/2018	LC5 - Local Government	Female	District Natural Resource Officer	Gomba District Technical Planning Committee/Political Leaders	Sanitation at camps (as evidenced at the road construction workers' camps) tend to be poor.	One of the standard operating procedures for camps include treatment of waste water on site using packaged sewage plants. Any waste discharged will be subject to a discharge permit from DWRM. Another feature is segregation of solid waste on site in order to recover recyclable waste. A common practice is to manage biodegradable waste on site through composting. Hazardous waste will be separated and transported offsite by licensed contractors for disposal at a permitted facility.
19/06/2018	LC5 - Local Government	Male	Principal Assistant Secretary	Gomba District Technical Planning Committee/Political Leaders	Will the displaced persons be relocated within Gomba District?	Displaced persons will be engaged throughout the process of developing the resettlement action plan and there will be negotiations on the preferred area for relocation.
19/06/2018	LC5 - Local Government	Male	Principal Assistant Secretary	Gomba District Technical Planning Committee/Political Leaders	What training programmes are in place to enable local people gain skills and benefit from the project?	National Content Regulations emphasize the need to ensure that local persons are included in the EACOP project. Gomba District submitted 20 youths to Q-Sourcing (recruitment agency contracted by EACOP) to be trained in welding and obtain certification.
19/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	There was a meeting held recently by a representative of the EACOP project. He requested local people to tender in applications for jobs and a number of people	

					submitted applications for jobs (as welders, drivers, nursery tree planting). What is the feedback in relation to these applications?	
19/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	Local leaders should be engaged in the sensitisation of local communities. Local leaders can deal with land-related matters in an appropriate way.	Local leaders will be involved in sensitisation of local communities whenever it is possible.
19/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	How will the workers from local areas be recruited? Will there be a particular office to which locals can submit applications for jobs?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
19/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	Which leaders at the sub county will be part of the Grievance Management Committees (GMCs)?	Local leaders will be engaged during the formation of the GMCs and they will second leaders to this committee.
19/06/2018	LC3 - Lower Local Government	Male	Vice Chairperson	Maddu Subcounty	During the land acquisition process, are there particular documents a land user/owner should have?	The affected persons will be sensitised on the required documents that will range from land titles to sales agreements among others.
19/06/2018	LC3 - Lower Local Government	Male	Opinion Leader	Maddu Subcounty	How will local people be recruited in case of employment opportunities? Who are they supposed to contact?	All employment opportunities available during the construction period, including the requirements specific to that particular employment opportunity, will be communicated in such a way as to make these employment opportunities available to as many people as possible.
19/06/2018	LC3 - Lower Local Government	Female	Secretary for Works	Maddu Subcounty	Project drivers (as evidenced from the road works that are ongoing in the district) tend to drive at high speeds, heightening the risk of accidents.	Projects drivers will be sensitised on a regular basis (through toolbox talks) on the accepted speed limits within communities. In addition, project vehicles will be installed with speed governors to monitor speeds.
19/06/2018	LC3 - Lower Local Government	Female	Secretary for Works	Maddu Subcounty	Use of drugs (such as cocaine) by the project workers should not be permitted.	There will be zero tolerance to use of drugs and alcohol while conducting project activities.
19/06/2018	LC3 - Lower Local Government	Female	Secretary for Works	Maddu Subcounty	Communities are worried that such infrastructure projects are associated with human sacrifices. There is a need to sensitize the communities over this.	Communities will be sensitised over this and reassured that the project will not engage in human sacrifice.
19/06/2018	LC3 - Lower Local Government	Female	Secretary for Works	Maddu Subcounty	Mitigation measures, as stated, should be implemented. There have been instances (during the ongoing road works by UNRA), when communities had to rise up before dust suppression measures were implemented.	Mitigation measures will be implemented and monitored by the authorities.
19/06/2018	LC3 - Lower Local Government	Female	Secretary for Works	Maddu Subcounty	There is a likelihood of increased crime levels, especially siphoning of fuel by project drivers. How will this be managed?	The project team will liaise with local authorities to manage crime levels due to the project activities.
19/06/2018	LC3 - Lower Local Government	Male	Councillor	Maddu Subcounty	What activities are permitted within the 30m corridor?	Regulated activities such as animal grazing, shallow-rooted crops will be permitted within the 30m corridor.
19/06/2018	LC3 - Lower Local Government	Male	Councillor	Maddu Subcounty	What are the exact locations that will crossed by the pipeline in Maddu Sub County?	Local leaders will be provided with location details following completion of G&G and ESIA studies.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	Will the workers be recruited from our area? What level of education is required?	People will be employed especially during the construction phase. Some jobs will be direct and others indirect. For the directly employed, there will be three categories of workers required; skilled, semi-skilled and non-technical. For all these jobs, the directly affected areas will be prioritised during consideration for employment but if the locals don't have the required skills, then the project will recruit from other areas.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	During acquisition of land for access roads, who will compensate for land take? The Government of Uganda or the EACOP project team?	Compensation for land acquired for project facilities will be led by the EACOP team. If the land is permanently acquired, the land acquisition process will be EACOP but the land will belong to the Government of Uganda
24 August 2018	LC1 – Village Local Council and Community	Male	Resident	Kabugimbi Village	How will tenants (bibanja holders) and landlords be compensated for loss of land? Will they be paid equally?	Both tenants (land users) and landlords (land owners holding titles) will be compensated for loss of land. The land acquisition team will clarify on

	Members					this matter during the time of obtaining land.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	If I have land that is currently under fallow and keeping it for my children, how will I be compensated for such a piece of land?	The affected person will be compensated for loss of land. If there are assets on the land that are within the national guidelines for compensation, these too will be compensated.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	There are some skilled persons within our village. Will they be considered for employment?	Opportunities for skilled workers are advertised at the national level and the most competent person will be recruited. However, persons from the affected areas are prioritised.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	Following the completion of the valuation process, will the PAP be allowed to operate on the land till the construction phase commences?	The land acquisition team will provide PAPs with cut-off dates and timelines for vacating an acquired piece of land to allow for preparation for engineering works
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	How will the vulnerable and marginalised groups (VMGs) such as the elderly and widows benefit from the proposed project?	Project benefits will include increased revenues to the national and local governments. It is expected that with increased revenues, governments will be in a position to address issues related to VMGs.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	Will project benefits be confined to the construction phase? Will the community benefit during the operation phase?	Direct and indirect benefits are expected throughout the project phase. However, most of the jobs and business opportunities will be within the construction phase.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	Will fuel prices go down following completion of the EACOP project?	Fuel prices are set by the Government of Uganda through the Petroleum Supplies Department. Oil and gas companies are licensed for production but are not involved in setting prices.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	During the land acquisition, will the team take original or duplicate documents to verify ownership?	The land acquisition team will sensitise PAPs about this matter. Original documents are usually required for verification process, but are thereafter returned to PAPs.
24 August 2018	LC1 – Village Local Council and Community Members	Female	Resident	Kabugimbi Village	Are there measures to have graves within the 30m corridor relocated?	Cultural resources, including graves will be relocated in consultation with affected persons.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	Has a PAP got a right to say no to being resettled?	A PAP has a right to say no, but will be further engaged by the project to find out what the basis for saying no is. A PAP will be provided with a range of options including land for land options to ensure that project is successfully completed.
24 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Kabugimbi Village	How will the authentic EACOP land acquisition team be distinguished from fraudsters?	The EACOP project team will have identity cards and will work with local leaders and representatives from the Ministry of Lands, Housing and Urban Development.
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	At what locations will the pipeline be routed in this village?	The pipeline route will only be confirmed following completion of the studies and associated surveys. The communities will be informed when studies are completed.
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	There is a concern that insecurity will increase due to the proposed activities. What plans are in place?	EACOP project team will develop a security plan and the plan will involve local leaders and lead agency in charge of security. Additionally, the camp will have a contractor that will be providing security to the camp.
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	Will workers be recruited from the local area?	Local areas are prioritised when recruiting workers. However, if the required skills are not available in the local area, then the project will recruit workers from other areas
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	Are there plans to upgrade roads in the area? During the wet season, the roads are in a poor state. Additionally, will the project lead to distribution of electric in the area?	Some of the access roads will be upgraded. Distribution of electric power is a mandate of the Government of Uganda. Electric power to be used in the camp will be generated privately.
26 August 2018	LC1 – Village Local Council and Community	Female	Resident	Bigada Village	Will the locals be permitted to vend food items at the camp?	Due to health and security concerns, locals will not be permitted to vend food items in or around the camp. Food items can be supplied through a

	Members					contractor that will have won a tender
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	The area is water-stressed and most of the existing community water sources have poor quality water. Are there plans to share the water sources that will be constructed for the camp with the local's camp?	This will be reviewed by the project team to evaluate the possibility of sharing some water sources.
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	The construction works (near schools) will distract pupils and this may affect studies. How will this be addressed?	There are plans to set up a fence in areas next to sensitive receptors such as schools. Additionally, pupils will be sensitized about the pipeline construction works to limit curiosity.
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	What is the difference between crude and refined oil products?	Crude oil is a naturally occurring, unrefined petroleum product composed of hydrocarbon deposits and other organic materials. Refined oil products are generated following industrial process where crude oil is transformed and refined into more useful products such as petroleum, gasoline, diesel fuel, asphalt base, heating oil, kerosene, liquified petroleum gas, jet fuel and fuel oils.
26 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Bigada Village	How will Ugandans benefit from exporting crude oil?	The government will earn foreign exchange that will be used to stimulate economic growth.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	Will construction works commence before compensation of affected persons?	The affected persons will be compensated before commencement of construction works. The PAPs will be engaged and their consent thought before land access and acquisition
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	How will bibanja holders (tenants) be compensated?	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government valuer and in compliance with national regulations.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	If studies will recommend avoidance of physical and cultural resources (such as sacred trees), why then would houses not be avoided?	The prioritised mitigation measure of the proposed project activity is avoidance of sensitive environmental social receptors. However, in case a receptor cannot be avoided, then compensation will be considered. Therefore, houses will be avoided as much as possible.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	What type of jobs will be available for the locals?	The persons in the directly affected areas will be prioritised for recruitment for both skilled and non-technical jobs. However, if the required skills and experience is not within the area and/or country, then the project will consider other areas.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	Using the district compensation rates to compensate for losses that may occur due to project activities is unfair as the farmers' market is not restricted to the district. The district compensation rate for a bunch of banana may be UGX 10,000/= well as a farmer was targeting to sell this crop in Kampala at UGX 35,000/=	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer and in compliance with national regulations. This point will however be forwarded to the project management team and they will provide adequate feedback.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	Will farmers be alerted when the project is about to commence so that we can grow crops targeting to supply them to the camp? Most of the farmers in the area grow crops.	Supply of agricultural products will be through contractors. As such, it is important for the farmers to mobilise themselves and grow crops so that they can stand a chance of supplying to contractors who will be dealing with the EACOP project team.
27 August 2018	LC1 – Village Local Council and	Male	Resident	Nabigasa Village	Following decommissioning of the camp, can the facility be converted to a school or an institution that	A decommissioning plan will be developed and submitted to the Government of Uganda for

	Community Members				will be helpful to the community?	approval. If at the stage such proposals arise, government will have to decide on the best way forward.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	If I am a land user (hiring land for crop growing), will I be compensated, or will only the land owner be compensated?	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer and in compliance with national regulations.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	When will construction works commence? I may be having plans to construct a house and do not want to be disrupted	Construction activities will commence when the project obtains a requisite permit and a final investment decision has been made. The commencement date will be communicated.
27 August 2018	LC1 – Village Local Council and Community Members	Male	Resident	Nabigasa Village	If I supply commodities to the camp (e.g. eggs), will I be paid instantly?	Supplying goods and services to the project will have clearly spelt out guidelines that will be communicated to potential suppliers.
29 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Lugala Village	Will the 30m corridor be sufficient to accommodate construction activities, or the contractors may request for more land?	Construction activities will be within the 30m corridor.
29 August 2018	LC1 - Village Local Council and Community Members	Female	Resident	Lugala Village	How will Ugandans benefit from the proposed project? Uganda might end up losing a resource and the Ugandans stay impoverished.	Selling of crude oil on the international market will enable the Government of Uganda to obtain foreign exchange. The money can thereafter be invested in improving social services.
29 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Lugala Village	What will happen to the graves within the proposed 30m corridor?	The EACOP project, on behalf of the Government of Uganda, will ensure that the graves are relocated, with consent from the affected persons.
29 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Lugala Village	Will community water sources such as dams be compensated for?	The EACOP project, on behalf of the Government of Uganda, will provide compensation for losses as a result of physical and/or economic displacement, on the basis of rates validated by the Chief Government Valuer and in compliance with national regulations.
29 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Lugala Village	Will all the three oil and gas companies use a single pipeline to export crude oil?	The EACOP project involves the three oil and gas and they will use this single export pipeline.
29 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Lugala Village	Can the pipeline be bent at certain sections?	The pipeline can be bent at certain sections to avoid ecologically and/or socially sensitive receptors or due to other reasons.
29 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Lugala Village	How will contracts to supply food to the camp be awarded?	Competent and potential suppliers should register on the national data base that is managed by the Petroleum Authority of Uganda. Thereafter, a duly registered company that will win the tender, will supply food products to the EACOP project facilities, such as camps for workers.
29 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Lugala Village	If I have a registered company with a tax identification number (TIN), can I supply goods to the project?	Any company that will be pre-qualified to supply goods and services to the project should also be on the national database for oil and gas.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	There is a site within Mijunwa village where land was surveyed for purposes of establishing a camp. Affected persons were stopped from working on those particular pieces of land. If this site is abandoned, will the affected persons be compensated?	The land acquisition and resettlement team of the EACOP project will soon provide a response to the affected persons.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	If companies that win contracts to supply food products such as fruits to the camp are from other areas, the local persons may not benefit as such companies may procure the foods from other areas other than	The EACOP project aims at ensuring the local persons benefit from the project and as such, contractors will be asked to provide a plan on how they intend to incorporate local content.

					Mubende. How is EACOP going to address this issue to ensure locals benefit from the project?	
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	Are there plans to train local farmers so that they are equipped and able to supply food products that can be procured by the project? Farmers may be using pesticides and yet the project will require organic foods.	Communities will be sensitised on the requirements/standards that should be complied with to supply goods and services to the project. The EACOP project is committed to ensuring the local persons are trained so as to enable them to meet the required standards.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	What will happen to the graves within the proposed 30m corridor?	The EACOP project, on behalf of the Government of Uganda, will ensure that the graves are relocated, with consent from the affected persons.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	Contractors (ISIS and New Plan) that were handling land acquisition for the proposed camp site in Mijunwa village surveyed land and left PAPs with assessment forms. However, the forms have no address nor telephone contacts. It is over three months since PAPs were given a cut-off date and now we hear that the camp location may be changed. How can we get to these companies for a formal feedback?	The contractors had a CLO (Harriet Namutebi), and this person provided her telephone contact to the affected persons. Call her for any updates. EACOP will soon provide a feedback to the affected persons.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	I hear that large volumes of crude oil are being exported by Chinese everyday as samples. What exactly they analysing?	That is not correct. Crude oil is not being exported at the moment. If any sample is to be analysed, small volumes are required and not on a daily basis.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	Can a house or crops be planted within a Right of Way?	There will be no construction of houses or planting of trees permitted within the RoW. Discussions are still ongoing related to whether growing of shallow-rooted season crops can be permitted and a posion on this matter will be communicated.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	Uganda exports electric power to Tanzania and yet houses in Uganda are not connected to electric power. Why then export crude oil to Tanzania?	Crude oil will be exported to the international market through Tanzania but not to Tanzania. Uganda is a land-locked country and in order to access the Indian Ocean, a pipeline had to be constructed either through Kenya or Tanzania. Tanzania was the preferred option.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	If a PAP is not compensated for losses incurred, where can he/she report this matter?	A grievance redress mechanism has been set up by the project and the PAP will report and have this grievance reported, recorded, investigated and closed out.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	Contractors (ISIS and New Plan) that were handling land acquisition for the proposed camp site in Mijunwa village surveyed land and disrupted activities at a school (Jesus the King) that had to be relocated since it was within the proposed camp site. Will we be compensated for losses incurred?	The land acquisition and resettlement team of the EACOP project will soon provide a response to the affected persons.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	There is a fear that when the project commences, rights of the local person will be trampled upon. How will this be minimised?	The project will comply with national and international best practices in relation to human rights.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	I doubt that Ugandans will benefit from the proposed project given the experience of electric power (exported to Tanzania) from which Ugandans are not benefitting.	The project benefits include upgrade of some of the roads within the project footprint, job opportunities (direct and indirect jobs), business opportunities, increased foreign exchange among others.
30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	Will fuel prices go down when the project commences?	Fuel prices are set by the Government of Uganda through the Petroleum Supply Department. The government will provide a response at an appropriate time.

30 August 2018	LC1 - Village Local Council and Community Members	Male	Resident	Mijunwa Village	If there are conflicts over a particular piece of land, will the EACOP project stall until these disputes are resolved?	If a particular piece of land to be acquired for project activities, and there is a dispute over land ownership, the project will commence but the compensation will eventually be passed on to the rightful owner following resolution of land ownership.

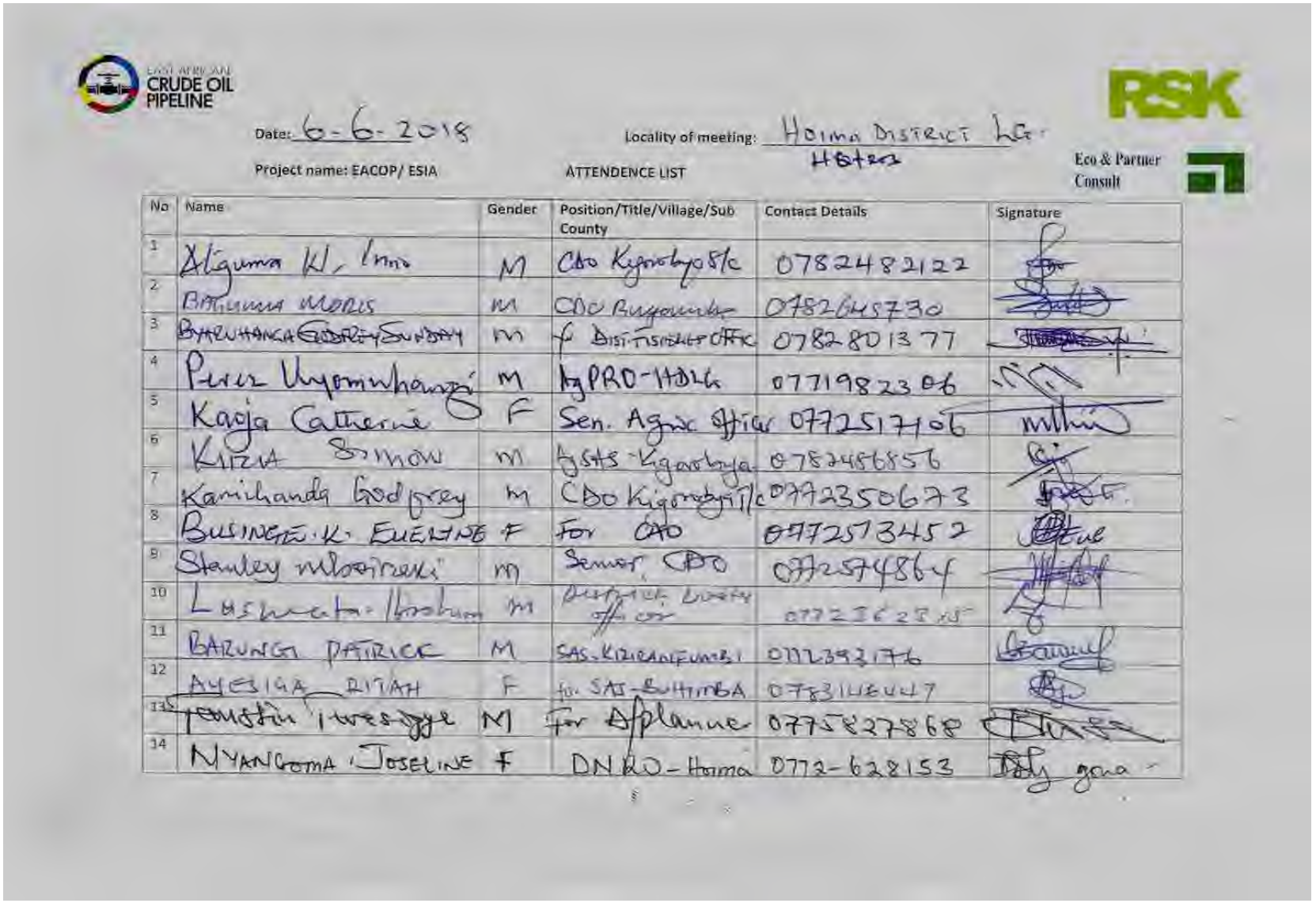
RECORDS OF STAKEHOLDER ENGAGEMENT- ATTENDANCE LISTS

DISTRICT MEETINGS
Hoima District Technical Planning Committee and Political Leaders
Kakumiro District Technical Planning Committee and Political Leaders
Kyankwanzi District Technical Planning Committee and Political Leaders
Mubende District Technical Planning Committee and Political Leaders
Gomba District Technical Planning Committee and Political Leaders
Sembabule District Technical Planning Committee and Political Leaders
Lwengo District Technical Planning Committee and Political Leaders
Rakai District Technical Planning Committee and Political Leaders
Kyotera District Technical Planning Committee and Political Leaders
SUBCOUNTY MEETINGS
Kiziranfumbi Subcounty (Hoima District)
Mpasaana Subcounty (Kakumiro District)
Kisiita Subcounty (Kakumiro District)
Nkooko Subcounty (Kakumiro District)
Katikara Subcounty (Kakumiro District)
Kisiita Town Council (Kakumiro District)
Ntwetwe Subcounty (Kyankwanzi District)
Butoloogo Subcounty (Mubende District)
Kitenga Subcounty (Mubende District)
Madudu Subcounty (Mubende District)
Maddu Subcounty (Gomba District)
Lugusulu Subcounty (Sembabule District)
Kifamba Subcounty (Rakai District)
Lwanda Subcounty (Rakai District)

Kasasa Subcounty (Rakai District)
Nabigasa Subcounty (Rakai District)
Kakuuto Subcounty (Rakai District)
VILLAGE MEETINGS
Kakende Village (Kiziranfumbi subcounty, Hoima District)
Kijugunya Village (Buhimba Subcounty, Hoima District)
Kyajawe B Village (Mpasaana Subcounty, Kakumiro District)
Kisala West Village (Gayaza Subcounty, Kyankwanzi District)
Kasambya Village (Bagezza Subcounty, Mubende District)
Kisagazi Village (Butoloogo Subcounty, Mubende District)
Kyenda Village (Kitenga Subcounty, Mubende District)
Kijaguzo Village (Kasambya Subcounty, Kibaale District)
Kyetume Village (Mpenja Subcounty, Gomba District)
Sembabule Market Zone (Sembabule TC, Sembabule District)
Serinya A and B Villages (Lugusulu Subcounty, Sembabule District)
Bulakati Village (Lwebitakuli Subcounty, Sembabule District)
Kinvunikidde Village (Lwengo Subcounty, Lwengo District)
Kamuli Village (Lwanda Subcounty, Rakai District)
Bukalasa Village (Kasaali Subcounty, Rakai District)
Lukoma Village (Kakuuto Subcounty, Kyotera District)
Kabonera Village (Kakuuto Subcounty, Kyotera District)

DISTRICT MEETINGS

Hoima District (Including Kiziranfumbi Subcounty Representatives)



EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 6-6-2018 Locality of meeting: HOIMA DISTRICT LG

Project name: EACOP/ ESIA ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	Aliguma W. Inno	M	CDO Kyarubyo S/c	0782482122	
2	Bitwiima Morris	M	CDO Buyanja	0782645730	
3	Byaruhanga Godfrey Sunday	M	Dist. Fisheries Offr	0782801377	
4	Peter Nyomuhangi	M	Ag PRO-HDLG	0771982306	
5	Kaaja Catherine	F	Sen. Agric Offic	0772517106	
6	Kiiza Simon	M	Ag SAS-Kyarubya	0782486856	
7	Kamihanda Godfrey	M	CDO Kigorobya T/C	0772350673	
8	Businge K. Eugene	F	For CAO	0772573452	
9	Stanley Mbabazi	M	Senior CDO	0772574864	
10	Lukwata Ibrahim	M	Principal Liaison Officer	0772362838	
11	Barungi Patrick	M	SAS-Kiziranfumbi	0772392176	
12	Ayesiga Riyah	F	for SAS-Buhimba	0783146447	
13	Tumusiime Twesigye	M	For Dplanner	0775827868	
14	Nyangoma Joseline	F	DNRO-Hoima	0772-628153	

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
15	[illegible]	F	[illegible]	[illegible]	[illegible]
16	Musgagi Lonabina Juma	M	C/P Nebbi Kagiranyanbi	0777964951	[illegible]
17 ✓	Kirebyaona Evelyne	F	CDO Buhimba	0773055556	[illegible]
18	Bwalugoma Grace	F	CDO Kagiranyanbi	0782841264	[illegible]
19	Godfrey Sserwanga	M	DEO-HOIMA	0772480154	[illegible]
20	Nkwatamumbe	M	C/P Buganda Rd	0782445183	[illegible]
21 ✓	NEBESA POTALUHATTALK-	M.	C/P IIT Bushenyi	0772-410653	[illegible]
22	JOSHUA BYANZIRE	M	C/P LIII K-T-C	0779726600	[illegible]
23	Bumwa Melta	M	T/Clerk KTC	0782586435	[illegible]
24	Semfuko T. Winfred	F	PS CAO	0772622689	[illegible]
25	Kaliba K. Issa	M	EACOP Environmental Engineer.	0794888212	[illegible]
26	Kaitare Lisa	F	EACOP Social	0794888107	[illegible]
27	Lygemba F.	M	Environmental Partner	0772483689	[illegible]
28	MURUNGI JULIET	f	Environmental [illegible]	0703256940	[illegible]
29	ATHEEBWA GERALD	M	Eco-Partner Consult	0772384416	[illegible]
30					

Kyankwanzi District (Including Ntwetwe Subcounty Representatives)

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 07 06 2018

Locality of meeting: KYANKWANZI DISTRICT OFFICES

Project name: EACOP/ ESIA

ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1					
2	Kabuuka Ibrahim	M	DEO KYDLG	0777896750/0253269557 Kabuukaibra@gmail.com	
3	Odong Philbert	M	DWO-KYDLG	0772515900 Odophil@yahoo.com	
4	Mukasa Moses	M	SEO - KYDLG	0782831183	
5	Kasumba Deogratius M.	M.	PACAO-KYDLG	0772394127	
6	Makumbi Jackson	M.	SCAO KYDLG	0772562457	
7	Ssebaggala William	M	District Planner	0772399095	
8	Bosco Tom	M	DIA	0775108650	
9	NALWANGE Polly Aidah	F	VICE CHAIRPERSON L.C. III GAYAZA SC	0785039312	
10	NASSEJJE TERESTA	F	COUNCILLOR KAWOLO	0775285208	
11	NABWAMI SHUMAYIAH	F	CAS GAYAZA	0715842335	
12	Muhanguzi A.K	M	ACDO	0782-655574	
13	Nakyazze Dorothy T.	F	DNRO	0772355607	
14	NAFYMA JULIET	F	LABOUR OFFICER	0751316024	

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
15	GADAFI GRETA	M	CDO	0774571189	
16	Mutebi Ronnie	M	JAS	0782389756	
17	SSEKAMATTE VINCENT	M	SPEAKER	0772836672	
18	TEETE ROGERS	M	CDO	0789570073	
19	Kinene Damulira L	M	D/C/person	0772886864	
20	Otheto paul	M	for DHO	0782455024	
21	Lugemwa F.	M	Environmental Officer	0772433805	
22	Gerald Ahebwa	M	Stakeholder Engagement Officer		
23	SSALI GODFREY	M	SOC/DAO	0782653648	
24	Kaliba K. Joshua	M	EACOP	0794 888 212	
25					
26					
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28					
29					
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Mubende District

EAST AFRICAN CRUDE OIL PIPELINE

PRE-SUBMISSION CONSULTATION WITH MUBENDE DISTRICT OFFICERS

RSK

Date: 13.06.2019

Locality of meeting: Mubende District Office

Project name: EACOP/ ESIA

ATTENDENCE LIST

Eco & Partner Consult

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	KAMYA GEOFFREY	M	FISHERIES OFFICER	0772545308 MUBENDE DLG	
2	Michael Wamuntu	M	Dist-Forestry officer	0700166139	
3	Kakinda Milton K	M	Ag DI Mamber	0701425178/0772 425178	
4	Nakibuuka Esther	F	Ag D.A.O	0782726483	
5	SENYONJO SIMON PETER	M	AGRIC OFFICER	0779521823	
6	NAKAGIRE MARIA N	F	DCDO	0772617274	
7	Lotel Ronald	m	S.E.O	0782083756	
8	Mugomba Geoffrey		Clerk To Council	0700995572	
9	Kimera Vincent	M	DNRO	0772/0701-627385	
10	Ouma Charles	m	DCAO	0703838333	
11	Kayiwa Benson	M	D.T.O	0702438312	
12	KABENYE JACKSON	m	Community Education Officer	0706877903	
13	MULUMBA MICHAEL	M	P.H.R.O	0774187236	
14	Kaloba K. Fosmin	m	EACOP	0794 888 212	

Gomba District

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 19/06/18 Location of meeting: GOMBA DISTRICT LG.

Project name: EACOP/ESIA ATTENDANCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	Kyohutungi Rubaraza W	F	DPLO	0772961669 planner.rubs@gmail.com Gomba District	
2	MUYONGA SAMUEL	M	I.A	0774252229	
3	DARISON YIGA MUKASA	M	CAO GOMBA	0772961821	
4	SSEBUKANDA FAUSTIN	M	RAS	0752144573	
5	Zimba William	M	SOW	0756583138	
6	Sanjuma Ibrahim	M	Agric Eng	0779217605	
7	Nambooza Sharon	F	Fisheries Officer	0775966802	
8	Keneddy Bamyenzaki	M	HOF	702984468	
9	Kizito Martin Justice	M	D/Planner	0752625745	
10	MUGERA FRED	M	DHI	0755369165	
11	NAKIBUUKA MARIAM	F	D/Planner	0784163206	
12	KAKANDE DENIS	M	Clerk to Council	0772-609422	
13	NAKUNGI JULIET	F	Eco & patner	0703256940	

Lwengo District

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 13th/08/18 Locality of meeting: _____

Project name: EACOP/ ESIA ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	Odonga David	M	Physical Planner	0772491180	
2	Ochola Abraham	M	Eco & Partner	0782976968	
3	Kamanya Happies	M	Diplamer	0752616373	
4	Owamani Olive	F	Entomologist	0772612047	
5	Sumayyah Mulumba	F	for DEO	0755033153	
6	Nalwanga Josephine	F	Ass Chf Lwengo TC	0757478166	
7	MUGABI DAVID	M	ADHO. EH	0700546221	
8	Dunstan Senchwale	M	EACOP Project Officer	0754398180	
9	Mutambe Godfrey	M	Senior Envt Offcr	0701-414805	
10	David Senuggo	M	Eco & Partner Consult	0755-929223	
11	WOBUSHOZI DENIS	M	Eco & Partner Consult	0705044472	
12	Ecclesia Peter	M	Labour office	0782321454	
13	CHARITY TUSHEMEREIRWE	F	ESIA EACOP	0794881163	
14					

Rakai District (Including Kifamba and Lwanda Subcounty Representatives)

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 6TH JUNE 2018 Locality of meeting: RAKAI DISTRICT OFFICES

Project name: EACOP/ ESIA ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	KAMMA EDWARD	M	DCAO	0775336422	
2	SSEMUTOMO Stephen	M	D.I.S	0773981434	
3	SSEMWENDWA ROSSY	M	SAS	0702-364775	
4	NALUBA CHARLES	M	C/P Kibi Lwanda	0782937849	
5	BUKENYA L WILSON	M	EA/M WORKS	0782-344957	
6	MUGWANYA MICHAEL	M	ADMINISTRATION	0700666701	
7	TAWE Samuel	M	Physical Planner	0702699129	
8	Nakayaga Ruthie	F	SCDO	0702322738	
9	Muwonge Francis	M	DSO	0701995757	
10	KAIGHABE STELLA	F	CDO - LWANDA	0789358166	
11	NASSOLO SYLVIA	F	CDO KIFAMBA	0782488506	
12	CHARITY TUSHEMEREIRWE	F	ESIA EACOP	0794 888163	
13	MOBUSEBOZI DENIS	M	ECO FIELD ASSISTANT	0705004972	
14	David Serugga	M	ECO2 PARTNER	0755-929223	

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 6/06/18

Locality of meeting: KAKAI DISTRICT OFFICES.

Project name: EACOP/ ESIA

ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	Benon Mugabi	M	LCV chairperson		
2	Matovu William Kumukunde	M	Vice chairperson LCV	kumukundewm@gmail.com	
3	Muebi David	M	D/Planner	dbmuebi@gmail.com	
4	Ssenkaji Joseph	M	Ag Labour Officer	0774597667 ssejosephaaron@gmail.com	
5	Nekesa Janet	F	For environment officer	nekesajanet@gmail.com	
6					
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Kyotera District

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 07/06/2018

Locality of meeting: Kyotera & Kalisizo T/C

Project name: EACOP/ ESIA

ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	[illegible]	M	A/CAO	0772921971	
2	PAMELA NATUHA	F	RDC KYOTERA	0773095690	
3	CAPT. LEMMY KAMUHANDA	M	DISO KYOTERA	0772597518	
4	KAHINDA [illegible]	M	DNRO (F/C CDL Program)	0772623619 0760421467	
5	LUBINGA GEOFFREY	M	DAO	0701427328	
6	[illegible]	M	DFO	0772662168	
7	[illegible]	M	[illegible]	0700923737	
8	[illegible]	F	H-T Kalisizo T/C	0782188762	
9	KIGOYE MATHIAS	M	LEO	0772669590	
10	MUSINGE AUGUSTINE	M	Vice chairperson Kasaka T/C	0773054416	
11	[illegible]	M	[illegible]	[illegible]	
12	MUHEMA STUATE	M	Population officer	0700303620	
13	NSUBUGA JOSEPH	M	Internee	0756762633	
14	NAMPIJJA MONICA	F	Internee	0706634646	

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 07th Feb 2018

Locality of meeting: Kyotera T/C

Project name: EACOP/ ESIA

ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	Namuli Charleah Mckenna	F	Intern	0759186045	
2	Kasussabazi Denis	M	Eco & Partner	0782004472	
3	David Sanyaga	M	Eco & Partner	0755-929223	
4	Mbuga Charles Nsimbe	M	Vice Chairman LCV	0782945418	
5	Kintu Kisekwa Patrick	M	LCV	0774111861	
6	Ssasiga Peter	M	District Speaker	0774255777	
7	Kiggozi Zakaria	M	L. Speaker	0779498154	
8	Charity Tushemereirwe	F	ESIA EACOP	0799 888163	
9	Odeda Abraham	M	Eco Partner	0782976988	
10					
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SUBCOUNTY MEETINGS

Mpasaana Subcounty

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 2.06.2019 Locality of meeting: Mpasaana S/c office

Project name: EACOP/ ESIA ATTENDENCE LIST Mpasaana S/c LC Kakumiro DLG

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	SEBUKEERA FRED	M	SUBCOUNTY CHIEF	0782872099	
2	ASIIMWE TADEO	M	CDO	0774039237	
3	HON. Bbaale Kamya Alex	M	Pwds Councillor	0774535300	
4	MUSIMENTA RECHEAL	F	COUNCILLOR	0772324802	
5	NKWITA SULAITI	M	GISO	0782491859	
6	TURYAGUMA[illegible]	M	C/P LC III	0772551071	
7	Kaliba :K. Joshua	M	EACOP	0794 888 212	
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Nkooko Subcounty

EAST AFRICAN CRUDE OIL PIPELINE

Date: 11/06/18

Locality of meeting: NKOOKO KTS SUB COUNTY KAKUMIRO DISTRICT.

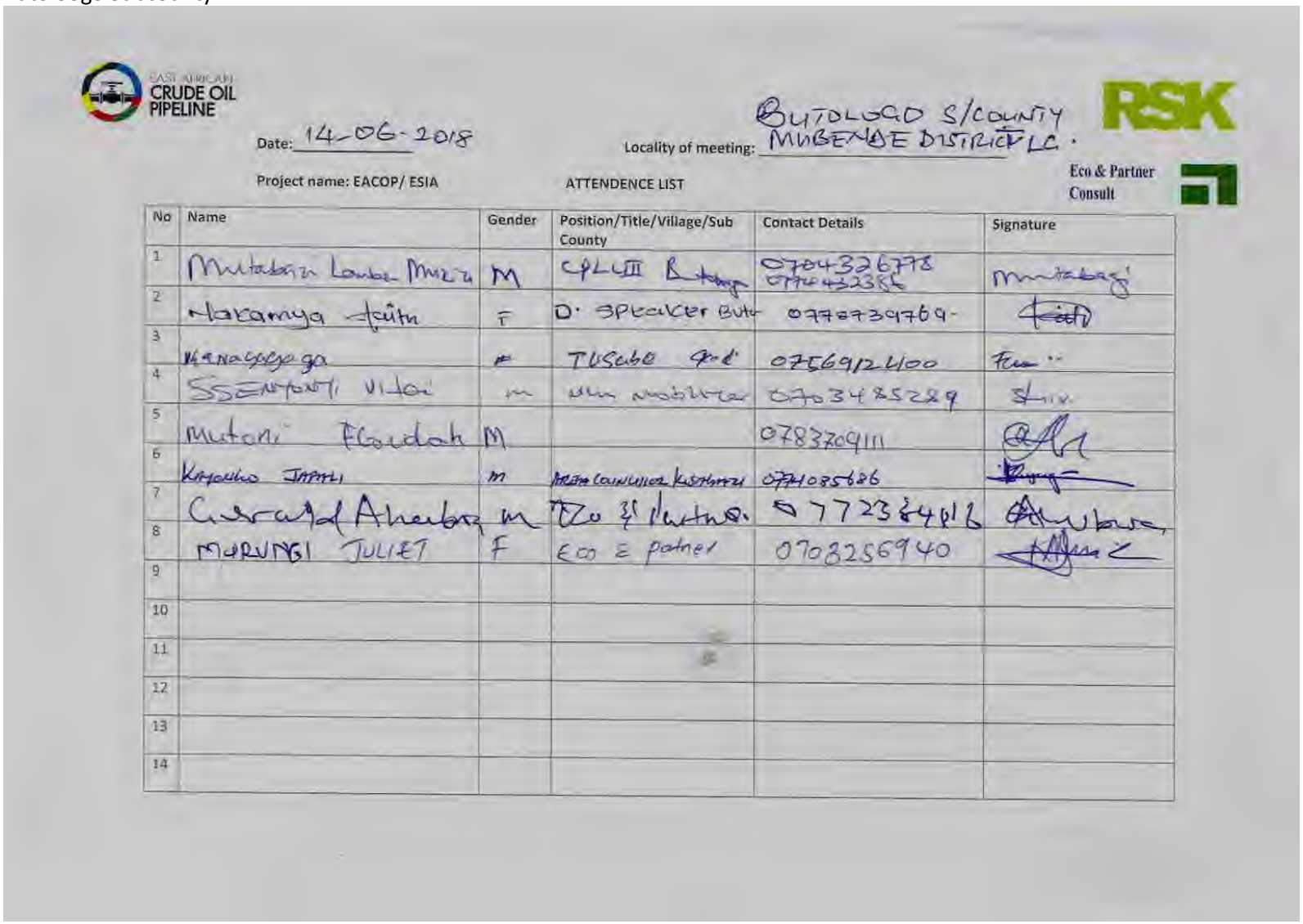
Project name: EACOP/ ESIA

ATTENDENCE LIST

RSK Eco & Partner Consult

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	KASAMBA TADEO	MALE	PARISH CHIEF KIMUGU	0775634191	
2	BITWEASE EPHRAIM	MALE	SPEAKER	0773328830	
3	SEMPEWO SAM	MALE	PARISH CHIEF KITEREDDE	0785721586	
4	INGUME GODFREY	MALE	CAO	0774117363	
5	NURYAHABWE RASHIDI	MALE	HEALTH ASSISTANT	0776497990	
6	SEKIMOGO JOHN	male	student	0757734656	
7	KYOLABA OLIVER	F	Councillor	0773841420	
8	MUSA HASSAN	M	LCIII/P	0788067976	
9	Kaliba K. Joshua	M	EACOP	0794 888212	
10	MURUNGI JULIET	F	ECO & partner	0793256940	
11	Gerald Ahebwa	M	ECO/Partner	0772384416	
12	Walugembe Apolo	M	Vet officer	0785764511	
13	Kaliba K. Joshua	M	EACOP	0794 888212	
14					

Butoloogo Subcounty



EAST AFRICAN CRUDE OIL PIPELINE

Date: 14-06-2018

Locality of meeting: BUTOLOGO S/COUNTY MUBENDE DISTRICT LC.

RSK

Eco & Partner Consult

Project name: EACOP/ ESIA

ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	Mutabazi Lawbe Muzza	M	CPL III Butologo	0704326778 0774323855	Mutabazi
2	Nakamya Faith	F	D. Speaker Butologo	0778739769	Faith
3	Nanasoga	F	TUSubo Pdt	0756912400	Fun
4	SSEMPANTI Vitali	M	Mbu mobilizer	0703485289	Stiv.
5	Mutami Fauzidah	M		0783209111	
6	Kayondo James	M	Mbu Councillor Kyamuzi	0774085686	
7	Gerald Ahebwa	M	Eco & partner	0772384816	
8	MARUNGI JULIET	F	Eco & patner	0703256940	
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Kitenga Subcounty

EAST AFRICAN CRUDE OIL PIPELINE

14/06/2018.

RSK

Date: 14/06/18.

Locality of meeting: KITENGA SUB COUNTY MUBENDE DISTRICT LG

Eco & Partner Consult

Project name: EACOP/ ESIA

ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	NAKALIBWE HANIFAH	F	SEC 4 HEALTH & COMM	0751770926	
2	MULINDWA JOHN	M	VICE CHAIRPERSON LC3	0700174878	
3	SSEBAKIJJE JOEL AKAKU	M	CAO	0756641802	
4	YIKII ABRAA STANLEY	M	SAS - KITENGA	0772452521	
5	GUMBA EDWARD	M	CHAIRPERSON LC3	0772748311	
6	Twine Abel Kwebuluzi	M	Area Councillor Kigaya	0774477.3	
7	Musoomi William	M	Area Councillor LC1	0772548153	
8	MURUNGI JULIET	F	Eco Partner	0703256940	
9	Gerard Ainebyona	M	Eco & Partner	0772384416	
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Nabigasa Sub County

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Date: 26/06/18 Locality of meeting: NABIGASA SUB-COUNTY

Project name: EACOP/ ESIA ATTENDENCE LIST

Eco & Partner Consult

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	WOBUSOBOZI DENIS	M	ECO & PARTNER	0705004972	
2	Kayanda Vincent	M	LCV Councillor	0702-628863	
3	Walusimbi Lucius	m	accountant	0773906687	
4	David Serugga	M	Eco & Partner Consult	0755-929223	
5	MBATUSSE RETIEMA	F	SAS	0757384985	
6	Ochola Abraham	m	Eco Partner Consult	0782976968	
7	CHARITY TUSHEMEREIRWE	F	ESIA EACOP	0794888163	
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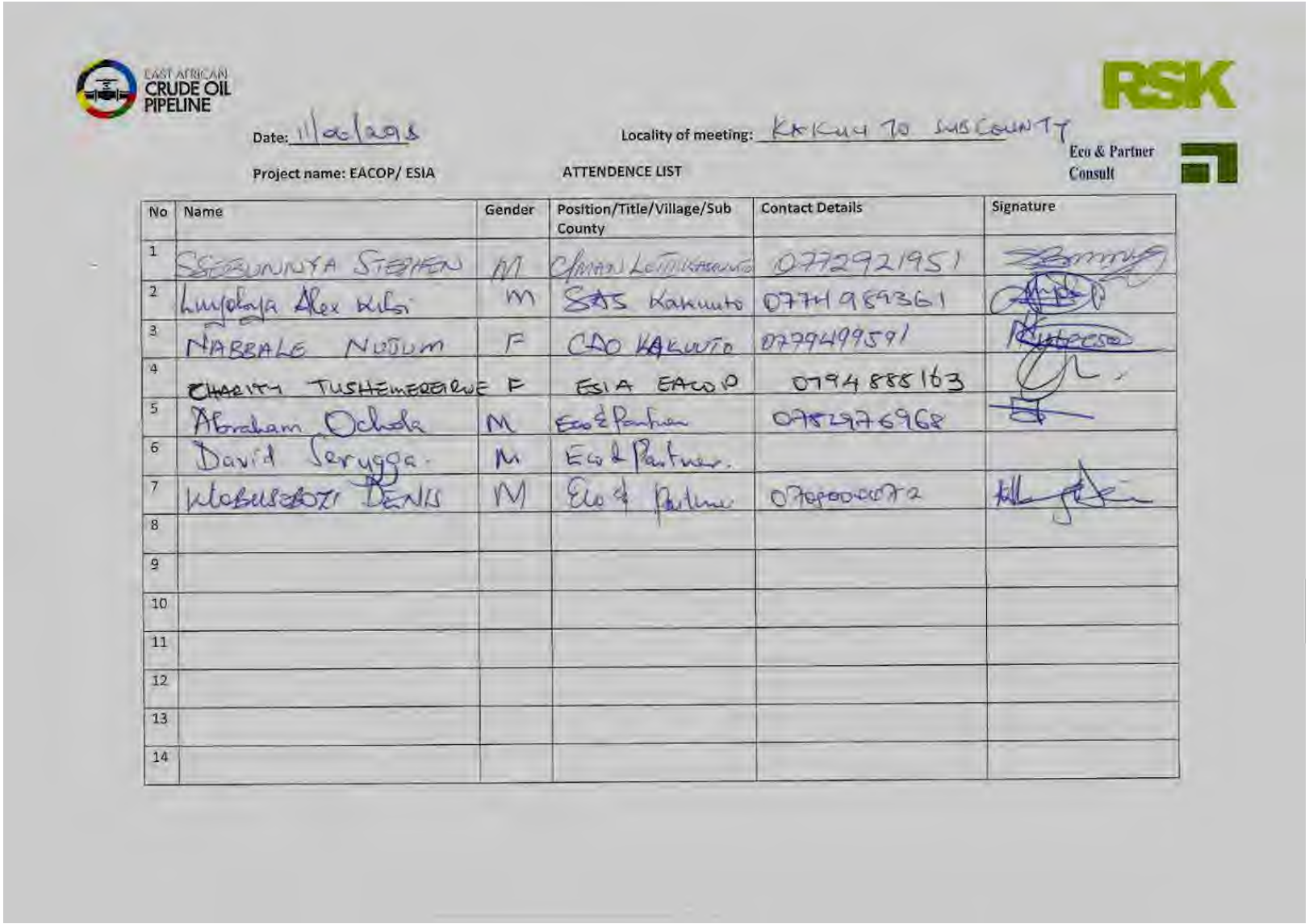
Kakuuto Sub County



EAST AFRICAN CRUDE OIL PIPELINE

RSK

Date: 11/06/2018 Locality of meeting: KAKUUTO SUB COUNTY

Project name: EACOP/ ESIA ATTENDENCE LIST

Eco & Partner Consult

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	SSEBUNNYA STEPHEN	M	CHAIRMAN LC III KAKUUTO	0772921951	
2	Lwanga Alex Kisi	M	SAS Kakuuto	0774959361	
3	NABBALE NUJUM	F	CAO KAKUUTO	0779499591	
4	CHARITY TUSHEMEREIRWE	F	ESIA EACOP	0794885163	
5	Abraham Ochola	M	Eco&Partner	0782976968	
6	David Seruyga.	M	Eco & Partner.		
7	MUGUSHOZI DENIS	M	Eco & Partner	0782000072	
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VILLAGE MEETINGS

Kakende Village

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Key & Partner Consult

Date: 09-06-2018 Locality of meeting: KAKENDE LCI

Project name: EACOP/ ESIA ATTENDENCE LIST BUTEMBA S/County KIZIRANFUMBI

No	Name	Gender	Position/Title/Village/Sub County	Contact Details Tel. NO	Signature
1	NGOBOKA CHARLES	m	Kakende LCI	0781824609	Ngboka
2	Bangamaki Nasiton	M	Kisonko LCI	0787055014	Bangamaki
3	Byamukama Gerald	M	Kakende	–	
4	Mujuni PLAYDER	m	Kakende	–	
5	BATALINGAYA ELIC	m	KISONKO	0783677737	
6	AMANYA Sam		KISONKO	0781763329	
7	mpaike y	M	Kakende LCI	0773222176	owachureza
8	Omuhereza Tarsisio	M	Kakende	0789343355	omuhere
9	Rusingye Mugisa	M	Kakende	– –	
10	Turyamureba .G.	M	Kakende	0789278601	Turyamureba
11	RICHARD SWALIKI	M	kakende	0786393 62	
12	Mugisa Samusi	M	KAKENDE	0770576 24	
13	MITETO TEREZA	F	KAKENDE	–	T.Temiketo
14	ASiimwekonsolata	F	Kakende	0779751642	K. ASiimwe

OFFICE OF CHAIRPERSON KA... DATE 9/6/2018

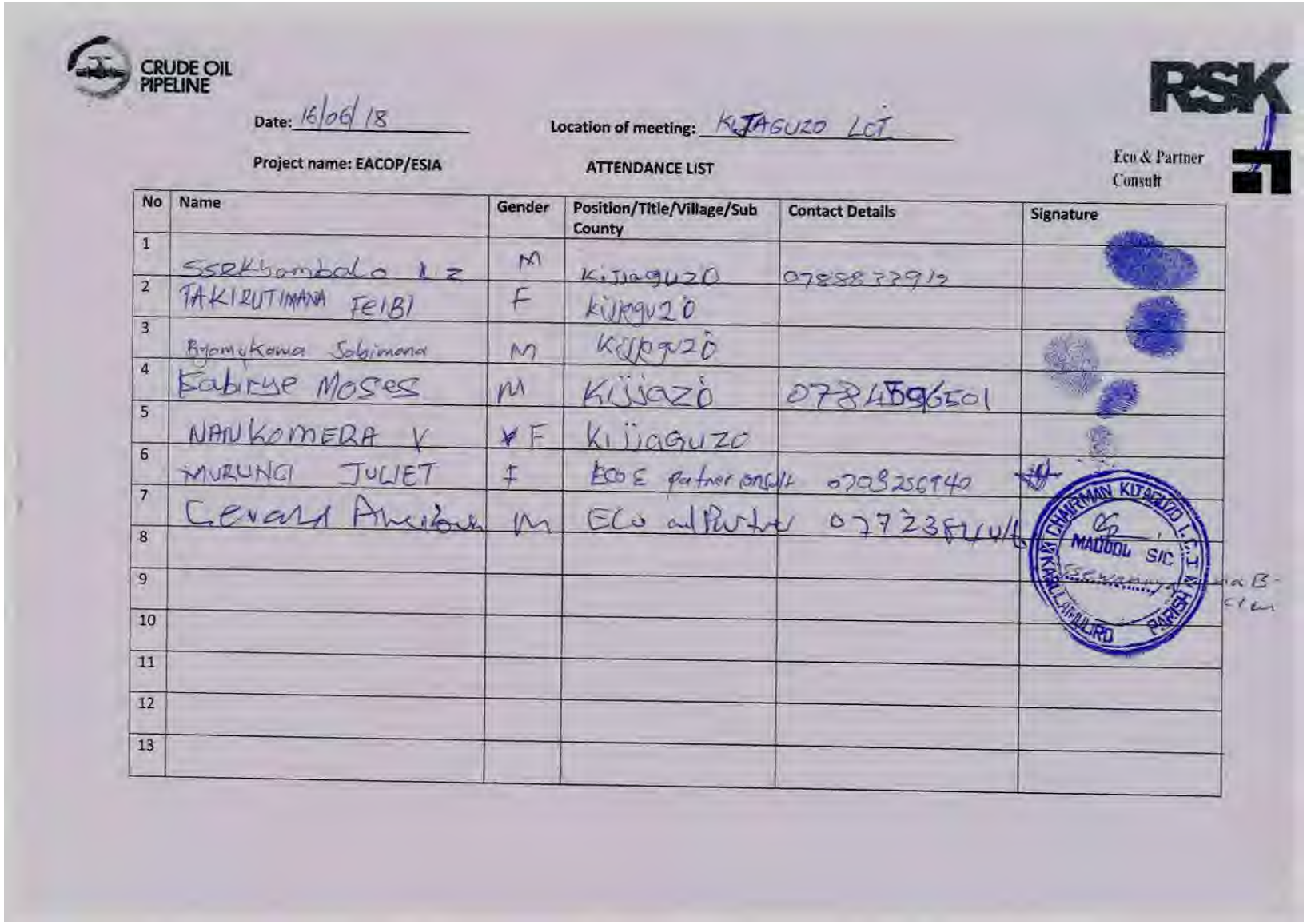
No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
15	JOICE KIRIKENJA	F	KAKENDE	- - -	
16	Ordinand Ketsinzire Frank	M	Visitor	0783211681	
17	L/R Birungi Victor	M	Kakende CDC Church Leader	0778336980	
18	HARRIET BIRUNGI	F	Kakende	0778147189	Birungi
19	K. Karubanga Kefa	M.	Kakende		
20	TUGUME	M	Kakende	0780341705	TUGUME
21	KIIZA WILLIAM	m	Kakende	0775499622	williams
22	MAGEZI	M	Kisoko	0777365589	magezi
23	Kyamanywa PH.D.	M	Kakende.	0783730076	
24	ASHOIN DERRICK	M	KAKENDE	0781145240	
25	Karubanga Kefa	m	KAKENDE	0779177504	
26	Twinomugumi costante	M	Kicakamya LCI	0785839715	
27	Fudenziya Rwanga	M.	Kakende	0774513816	F. R.
28	Ndahura James	F	Kakende	0789833426	
29	Tinkamanyire Elizabeth	F	Kakende	0782585507	Tinkamanyire
30	Turyatunga Juma	F	Kakende	0782443855	Juma

OFFICE OF C/MAN R.C.
DATE 7/2/20
KAKENDE - GULU

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
31	Alwa Hassan	m	Kakende LCI	0781411899	
32	Tumwesigye Yesero	M	Kisonko LCI		
33	JUMUGE JUMVUGJE	M	Kisonko LCI		J.T.
34	Nabwera Lillian	F	Kakonde LCI	0785509801	
35	Wanja Muribaela	M	Kakende LCI	0783653923	
36	Bafamba Sibamule	M	Kisonko	-	Baf
37	Mwiruki Fwirimoni	M	Kakende	0789881318	mwiruki
38	Kabunyamba Isaiah	M	Kakende	0775[illegible]49	
39	Kiiza Isa	M	Kakende		Kiiza
40	Twebaseme Robert	M	Kakende		Twebaseme
41	Mpitabi-K/Salumunga	M.	Kakende LCI	0776594508	
42	MBABAZI RASHID	M	Kakembe LCI		
43	Ambumuza miriya	F	Kyangakayonga	- - -	Miriya
44	ASIIMWE	M	Kakeeke		
45	Baagira Hassan	M	Kakende	0785354803	

OFFICE OF C/MAN R...
DATE 9/6/2019
KAKENDE - BULIRYO

Kijaguzo Village



CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 16/06/18 Location of meeting: KIJAGUZO LCI

Project name: EACOP/ESIA ATTENDANCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	SSEKyambalo I.Z	M	Kijaguzo	0785837291	
2	TAKIRUTIMANA FELIBI	F	kijaguzo		
3	Byamukama Sabimana	M	Kijaguzo		
4	Kabirye Moses	M	Kijjazo	0784596501	
5	NANKOMERA V	F	Kijjaguzo		
6	MURUNGI JULIET	F	Eco E partner consult	0709250940	
7	Cevans Amwiine	M	ECO and Partner	0772385444	
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CHAIRMAN KIJAGUZO L.C.I KABUJASHALIRO PARISH MADDU SIC

Kabonera Village

EAST AFRICAN CRUDE OIL PIPELINE

RSK

Eco & Partner Consult

Date: 11/06/2018 Locality of meeting: KABONERA VILLAGE

Project name: EACOP/ ESIA ATTENDENCE LIST

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
1	MUWERUKA PETER	M	KABONERA	0784073731	
2	Kibi JOSEPH	M	Kabonera.	0780549942	
3	Muhwezi Gerald	M	Kabonera.	0752660507	
4	SSENYONDO REMEGIO	M	NABIGASA	0785073 88.	
5	BWOGO JURI	M	KABONERA	0775512	
6	Bwesigye Paul	M.	Kamudika	0785257040	
7	Nusi Samuel	M	Kabonera	0752728040	
8	ALI JSEJJUMWA	M	Kabonera	0783077910	
9	Kabira Sande	M	Nabigasa	0785	
10	MUSISI MUMBASA	M	NABIGASA	0777530396	
11	Makovu Stephen	M	Kabonera		
12	Kalemba Dick	M	Kabemere	0701131/90	
13	Mujuzi Issa	M	Kabonera	0785757300	
14	Kagoba Godfrey	M	Kakoma	0783179560	

...11/06/18 Mwekuka Peter

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
15	Angelo Ssemuli	M	Kabonela	0775216260	M.S.
16	Lusiba Kabuli	M	Kabonela	x	Lusiba K
17	Kyebambe Kilisitofe	m	Nabikasa	0	
18	Nakachwa mJoyce	F	Kabonera	0759679552	N.K
19	Babirye Saturnes	F	Kabonera	0755818251	B.F
20	MULINDWA Rashid	M	Kabonera	0779478838	Mulindwa
21	Nabaguma Pred	F	Nabigaga	0775605550	Nab
22	Ramadhan	M	Kabonela	x	
23	Mukasa Kase	M	Kabonera	0782998991	Mkase
24	Kawuki Sam	M	Kabonera	0779516203	
25	Mugimbaho Karori	M	Kabonera	0779455344	
26	Bwanganda Jaa	M	nabigasa		
27	Mugisha Abdul	M	Kabonera	0782941519	Abdul
28	Nabayinda sarah	F	kabonela	0777509272	
29	Nalyigga Jane	F	Kabonera	0777798194	Nalyigga
30	Nalugoge Olivia	F	Kabonera		Olivia.

Mwekuka Peter

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
31	Nambejja Justine	F	Kabonera	0774 75 95 65	JUSTINE
31	Ruebuga Sirini	m	Kabonera	078990 8232	Ruebuga
33	Nakibeuka Sovia	F	kabonera	0775428H#33	Nak. beuka
34	KAGGWA BRIAN	M	Kabonera	0785857254	
35	Mawonge Moses	M	kabonera	0775848828	Mawonge
36	NYAMUKUOMI		Kabonera	0756567159	
37	Musuuliga Alcireo	m	Kabonera	0786195452	Musuuliga
38	SSERUNKUUGE DAMIANO	M	Kabonera	0788921688	
39	Namatovu Rose	F	Kabonera	0784073188	Namatovu
40	Dduguu Joseph	m	Kabonera	0782647654	Dduguu Joseph
41	Mawanga Sarah	M	Kabonera	0753934994	Sarah
42	Namatovu Sarah	f	Kabonera	0788928156	
43	Namuddu Resty	F	Kabonera	0705181252	Resty
44	Nauluddu Cissy	F	Kabonela	0779384449	Nauluddu
45	NAKAYUMA NOELENE	F	Kabonela		NAKAYUMA

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
15	Kwagiru Ssegujja	m	Kabonera		Ssegujja
16	KATALIMA NABAKOOZA	F	KABONERA		KATALIMA
17	RAMONJO CHRISTINE	F	KABONERA	0775759165	
18	NAMANJA MARGRET	F	KABONERA	0756925588	
19	Mukagenda Gelemina	F	Nabikasa	0775947428	
20	FAASI Twina Omugisa	M	KABONERA	0787737695	
21	Nakasita Hajirapina	F	Kabonera		Nakasita
22	Nimanywa Joseph	M	Kabonera	0775722272	
23	James Musasa	M	Kabonera	0782287130	
24	Kyarongo Sam	M	Kabonera	0706544458	
25	Musaka Maimona	M	Kabonera	-	
26	BAHATI THOMAS	M	KABONERA		
27	MURARA GEMSI	M	KABONERA	-	
28	KISEKULO JOSEPH	M	KABONERA	0786285858	
29	KIASKIA SSEMWENDWA	M	KABONERA	0788457168	-
30	KASUJJ VICENT	M	KABONERA	0771903957	

Mwebaza Patek

No	Name	Gender	Position/Title/Village/Sub County	Contact Details	Signature
31	LUBEGA EMMANUEL	M	TEACHER	0754-788407	
31	KABUSIGE				
33	Kabisitime		PISI	0757766891	
34	Nabunya Kristin				
35	Nakato Anamariya	F	Bangobe		
36	MBUGUKIZE	M	SIRIVELI		
37	Nalubaabi Dorothy	F	Bangobe	078711 7762	Dorothy
38	Kasiima Abuna	M	Kakomo	0774356021	
39	NAL-IWAGA MARY	F	NABIGASA	0779497350	
40	MUGWIGA EMM	M	NABIGASA	0779050548	
41	Kyegwa bosco		Nabigasa	0775 94 9875	
42	Kakoma paul	m	Kabomba	0752644 12	
43	Semanda Dani	m	Nabingasa	0758522947	
44	Nabukobozi DEWIS	M	Vice Patron	0785004972	
45					

Appendix D: Magnitude and Sensitivity Tables

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APPENDIX D MAGNITUDE AND SENSITIVITY TABLES

Table D1 VEC Magnitude and Sensitivity Topics

Magnitude	Sensitivity
Legally Protected, Internationally or Nationally Recognised Areas (for biodiversity purposes)	Legally Protected, Internationally or Nationally Recognised Areas (for biodiversity purposes)
Flora and Fauna Species of Conservation Importance (Terrestrial and non-marine Aquatic)	Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic)
Habitats of Conservation Importance (Terrestrial and Aquatic)	Habitats of Conservation Importance (Terrestrial and Aquatic)
Surface Watercourses and Water Bodies (Ephemeral and Permanent)	Surface Watercourses and Water Bodies (Ephemeral and Permanent)
Groundwater	Groundwater
Soils	Soils
Landscape	Landscape
Air Quality	Air Quality
Acoustic Environment	Acoustic Environment
Economy	Economy
Local Economy	Local Economy
Land-based Livelihoods	Land-based Livelihoods
River, Lake and Marine -Based Livelihoods	River, Lake and Marine -Based Livelihoods
Land and Property	Land and Property
Local Workforce Health, Safety and Welfare	Local Workforce, Health, Safety and Welfare
Social Infrastructure and Services	Social Infrastructure and Services
Community Health	Community Health
Community Safety, Security and Welfare	Community Safety, Security and Welfare
Cultural Heritage	Cultural Heritage

Table D2 Ranking of Magnitude of Predicted Impacts on VEC Legally Protected, Internationally or Nationally Recognised Areas (for Biodiversity Purposes)

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Site Value and Integrity
Beneficial		n/a
Negligible	2	Direct or indirect impacts on integrity of area largely not discernible by standard methods
Small	4	Direct or indirect impacts will be discernible but underlying character/composition/ attributes of baseline condition will be similar to pre-development circumstances/patterns.
Medium	6	Direct or indirect impacts to one or more key elements/features of the site and/or its qualifying features, such that post-development character/composition/ attributes of baseline will be partially changed but the overall integrity of the site is not threatened (ecological integrity includes issues such as loss of habitat, fragmentation of habitat, disruption and loss of wildlife corridors, and ecological carrying capacity).
		Project cannot be excluded from causing introduction/transmission of alien invasive species (AIS). Localised extension of range of AIS already known to be present in Tz and or Ug (incl. their waters). AIS introduced into areas of relatively low biodiversity value (e.g., modified landscapes, agricultural land). AIS introduced into areas with no significant (no/negligible/minor) socio-economic implications.
Large	8	Major direct or indirect impacts to key elements/features of the baseline conditions such that post-development character/composition/attributes will be fundamentally changed and the overall integrity of the site is threatened.
		Project likely to be involved in the introduction/transmission of AIS. Significant regional extension of range of AIS already known within region/biogeographical province. AIS introduced into areas of high biodiversity/nature conservation value (e.g., sites supporting globally threatened species, nationally protected areas). AIS introduced to areas with significant socio-economic implications.
Very large	10	Total loss or very major alteration to key elements/ features of the baseline conditions such that post-development character/composition/ attributes will be fundamentally changed and may be lost altogether.
		Project unambiguously /widely agreed to have resulted in introduction of AIS. Major extension of range of AIS into new region/biogeographical province. AIS introduced into areas of exceptionally high biodiversity/nature conservation value (e.g., sites supporting single-site endemic or severely range-restricted species, internationally protected areas). AIS introduced into areas with major socio-economic implications (e.g., pests of key crop/forestry species).

Table D3 Ranking of VEC Sensitivity – Legally Protected, Internationally or Nationally Recognised Areas (for Biodiversity Purposes)

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Site Value and Integrity
Very low	1	Nationally designated sites that are not specifically designated for biodiversity purposes, e.g., Forest Reserves designated solely for non-native timber plantations that are highly degraded.
Low	2	Broad landscape-scale internationally recognised areas such as High Biodiversity Wilderness Areas, Biodiversity Hotspots.
Moderate	3	Nationally designated sites that are not specifically designated for biodiversity purposes but have biodiversity value, e.g., as ecological stepping stones between more significant sites.
High	4	Nationally designated sites that are specifically designated for biodiversity purposes, including National Parks, Wildlife Reserves, Wildlife Management Areas and certain Open Areas, Game Controlled Areas and Forest Reserves. Internationally recognised areas such as Key Biodiversity Areas, Important Bird Areas, Endemic Bird Areas.
Very high	5	Legally protected sites listed under an intergovernmental treaty such as the 1971 Ramsar Convention and the 1972 World Heritage Convention. Sites internationally recognised as Areas for Zero Extinction (AZE).

Table D4 Ranking of Magnitude of Predicted Impacts on VEC Flora and Fauna Species of Conservation Importance (Terrestrial and non-marine aquatic)

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Population Health and Viability
Beneficial		n/a
Negligible	2	Direct or indirect impacts on species largely not discernible by standard methods
Small	4	Direct or indirect impacts will be discernible but underlying character/composition/ attributes of baseline condition will be similar to pre-development circumstances/patterns. Minor disruption of behaviour or species interactions not impacting overall health/integrity of the population of the species (Disruption owing to physical changes, noise, visual intrusion and air emissions behaviour on, for example, breeding, nesting, mating/spawning, diurnal and seasonal migration, hibernation, territorial activities, predator-prey relationships and, ultimately, mortality). Affects a specific group of localised individuals within a population over one generation or less, but does not affect other trophic levels or the population itself.

Table D4 Ranking of Magnitude of Predicted Impacts on VEC Flora and Fauna Species of Conservation Importance (Terrestrial and non-marine aquatic)

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Population Health and Viability
Medium	6	Direct or indirect impacts to a species such that post-development character/composition/ attributes of baseline will be partially changed; affects a portion of a population and may bring about a change in abundance and/or distribution over more than one generation, but does not threaten the integrity of that population or any population dependent on it.
		Project cannot be excluded from causing introduction/transmission of alien invasive species (AIS). Localised extension of range of AIS already known to be present in Tz and or Ug (incl. their waters). AIS introduced into areas of relatively low biodiversity value (e.g., modified landscapes, agricultural land). AIS introduced into areas with no significant (no/negligible/minor) socio-economic implications.
Large	8	Major direct or indirect impacts to key elements/features of the baseline conditions such that post-development character/composition/attributes will be fundamentally changed; affects an entire population or species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations.
		Project likely to have been involved in the introduction/transmission of AIS. Significant regional extension of range of AIS already known within region/biogeographical province. AIS introduced into areas of high biodiversity/nature conservation value (e.g., sites supporting globally threatened species, nationally protected areas). AIS introduced to areas with significant socio-economic implications. Introduction of new alien/invasive species.
Very large	10	Total loss or very major alteration to a species population such that post-development character/composition/ attributes will be fundamentally changed and may be lost altogether; affects an entire population or species in sufficient magnitude to cause a permanent decline in abundance and/or change in distribution.
		Project unambiguously /widely agreed to have resulted in introduction of AIS. Major extension of range of AIS into new region/biogeographical province. AIS introduced into areas of exceptionally high biodiversity/nature conservation value (e.g., sites supporting single-site endemic or severely range-restricted species, internationally protected areas). AIS introduced into areas with major socio-economic implications (e.g., pests of key crop/forestry species).

Table D5 Ranking of VEC Sensitivity – Flora and Fauna Species of Conservation Importance (Terrestrial and Nonmarine Aquatic)

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Conservation Status
Very low	1	n/a
Low	2	Species listed as Near Threatened or Least Concern on the IUCN red list.
Moderate	3	Species listed as Vulnerable on the relevant national red list. Landscape species.
High	4	Species listed as Vulnerable on the IUCN red list, or listed as Critically Endangered or Endangered on the relevant national red list. Endemic and/or range-restricted species whereby > 1% but < 95% of the global population is supported in the habitat and: • Endemic refers to species that have > 95% of their global range within the country or region of analysis • Range-restricted species is defined for 1) terrestrial vertebrates as those species which have an extent of occurrence of 50,000km^2 or less; 2) freshwater fish, crabs and molluscs as those species which have an extent of occurrence of 20,000km^2 or less; and 3) freshwater life stages of dragonfly and damselfly which have an extent of occurrence of 50,000km^2 or less . Migratory/congregatory species whereby > 1% but < 95% of the global population is supported in the habitat Keystone species. Species with long life histories, reflecting the inability of localised populations to recover from significant impacts
Very high	5	Species listed as Critically Endangered or Endangered on the IUCN red list. Highly endemic and/or range-restricted species whereby > 95% of the global population is supported in the habitat (e.g., single-site endemics) Migratory/congregatory species whereby > 95% of the global population is supported in the habitat

Table D6 Ranking of Magnitude of Predicted Impact on VEC Habitats of Conservation Importance (Terrestrial and Aquatic)

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Habitat Deterioration or Disturbance	**Habitat Loss**
Beneficial		Improvement of habitat of conservation importance.	n/a
Negligible	2	Direct or indirect impacts on habitat largely not discernible.	< 1% mapped habitat type within the project study area will be lost.

Table D6 Ranking of Magnitude of Predicted Impact on VEC Habitats of Conservation Importance (Terrestrial and Aquatic)

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Habitat Deterioration or Disturbance	**Habitat Loss**
Small	4	Direct or indirect impacts will be discernible but underlying character/composition/ attributes of baseline condition will be similar to pre-development circumstances/patterns.	Approximately 1–5% of habitat type within the project study area will be lost.
Medium	6	Direct or indirect impacts to one or more key elements/features of the habitat such that post-development character/composition/ attributes of baseline will be partially changed but the overall integrity of the habitat is not threatened (ecological integrity includes issues such as loss of habitat, fragmentation of habitat, disruption and loss of wildlife corridors, and ecological carrying capacity).	Approximately 5–30% of a habitat type of habitat type within the project study area will be lost.
		Project cannot be excluded from causing introduction/transmission of alien invasive species (AIS). Localised extension of range of AIS already known to be present in Tz and or Ug (incl. their waters). AIS introduced into areas of relatively low biodiversity value (e.g., modified landscapes, agricultural land). AIS introduced into areas with no significant (no/negligible/minor) socio-economic implications.	Project cannot be excluded from causing introduction/transmission of alien invasive species (AIS). Localised extension of range of AIS already known to be present in Tz and or Ug (incl. their waters). AIS introduced into areas of relatively low biodiversity value (e.g., modified landscapes, agricultural land). AIS introduced into areas with no significant (no/negligible/minor) socio-economic implications.

Table D6 Ranking of Magnitude of Predicted Impact on VEC Habitats of Conservation Importance (Terrestrial and Aquatic)

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Habitat Deterioration or Disturbance	**Habitat Loss**
Large	8	Major direct or indirect impacts to key elements/features of the baseline habitat such that post-development character/composition/attributes will be fundamentally changed and the overall integrity of the habitat is threatened.	Approximately 30–80% of a habitat of habitat type within the project study area will be lost.
		Project likely to have been involved in the introduction/transmission of AIS. Significant regional extension of range of AIS already known within region/biogeographical province. AIS introduced into areas of high biodiversity/nature conservation value (e.g., sites supporting globally threatened species, nationally protected areas). AIS introduced to areas with significant socio-economic implications.	Project likely to have been involved in the introduction/transmission of AIS. Significant regional extension of range of AIS already known within region/biogeographical province. AIS introduced into areas of high biodiversity/nature conservation value (e.g., sites supporting globally threatened species, nationally protected areas). AIS introduced to areas with significant socio-economic implications.
Very large	10	Total loss or very major alteration to key elements/ features of the baseline habitat such that post-development character/composition/ attributes will be fundamentally changed and may be lost altogether.	>80% of a habitat type within the project study area will be lost.
		Project unambiguously /widely agreed to have resulted in introduction of AIS. Major extension of range of AIS into new region/biogeographical province. AIS introduced into areas of exceptionally high biodiversity/nature conservation value (e.g., sites supporting single-site endemic or severely range-restricted species, internationally protected areas). AIS introduced into areas with major socio-economic implications (e.g., pests of key crop/forestry species).	Project unambiguously /widely agreed to have resulted in introduction of AIS. Major extension of range of AIS into new region/biogeographical province. AIS introduced into areas of exceptionally high biodiversity/nature conservation value (e.g., sites supporting single-site endemic or severely range-restricted species, internationally protected areas). AIS introduced into areas with major socio-economic implications (e.g., pests of key crop/forestry species).

Table D7 Ranking of VEC Sensitivity – Habitats of Conservation Importance (Terrestrial and Aquatic)

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Biodiversity Value – General	**Biodiversity Value – Wetlands And Watercourses**
Very low	1	Modified habitat with no, or limited, biodiversity value	
Low	2	Modified habitat (as defined by IFC PS6 and the accompanying Guidance Note) that nonetheless has biodiversity value.	Ephemeral watercourses when not in flow
Moderate	3	Semi-natural or modified habitat exhibiting one or more of the following characteristics: • largely non-native species • primary ecological function modified • species composition modified • disturbed by human activity.	Wetlands, permanent watercourses and ephemeral watercourses when in flow (but not linking the Albertine Rift lakes)
High	4	Natural habitat (as defined by IFC PS6 and the accompanying Guidance Note). Habitats providing important feeding or breeding grounds	Habitats providing connectivity, such as (but not limited to) riparian corridors and wetlands providing ecological linkages between the Albertine Rift Lakes.
Very high	5	Highly threatened and/or unique ecosystems and areas demonstrating key evolutionary processes, as defined under IFC PS 6.	Wetlands identified by Wetlands International's Critical Site Network Tool.

Table D8 Ranking of Magnitude of Predicted Impacts on VEC Surface Watercourses and Waterbodies (Ephemeral and Permanent)

Magnitude	Ranking	Feature of VEC Potentially Impacted		
		Flow Rate	**Water Quality**	**Morphology of Watercourse, Wetland or Waterbody (as Defined by Width, Depth, Longitudinal Slope or Lateral Stability of the Watercourse)**
Beneficial		n/a	n/a	n/a
Negligible	2	Decrease in surface water flow downstream of project asset not discernible by local users at any time of the year. Increase in magnitude and frequency of flooding downstream of project asset not discernible by local community.	Reduction in water quality (suspended sediment, turbidity, colour, odour and taste) downstream of project asset not discernible by local users at any time of year.	Physical alteration or erosion of watercourse, wetland or waterbody not discernible by local users.
Small	4	Decrease in surface water flow downstream of project asset is likely to be discernible by local users, but is unlikely to cause users to use less water than they normally use at any time of year. Increase in magnitude and frequency of flooding downstream of project asset is likely to be discernible by local community, but is unlikely to cause disruption to activities or livelihoods.	Reduction in water quality (suspended sediment, turbidity, colour, odour and taste) downstream of project asset is likely to be discernible by local users, but is unlikely to cause users to use less water than they normally use or to seek supplementary sources of water at any time of year.	Physical alteration of watercourse, wetland or waterbody resulting in erosion of channel bed or banks and/or sedimentation within the immediate working area. Changes will be discernible by local users but use and value of the water resource and adjacent land not impacted.

Table D8 Ranking of Magnitude of Predicted Impacts on VEC Surface Watercourses and Waterbodies (Ephemeral and Permanent)

Magnitude	Ranking	Feature of VEC Potentially Impacted		
		Flow Rate	**Water Quality**	**Morphology of Watercourse, Wetland or Waterbody (as Defined by Width, Depth, Longitudinal Slope or Lateral Stability of the Watercourse)**
Medium	6	Decrease in surface water flow downstream of project asset is sufficient to cause complaints from local users, but is unlikely to cause users to use less water than they would normally use or to seek a supplementary source of water at any time of year. Increase in magnitude and frequency of flooding downstream of project asset is sufficient to cause complaints from local community owing to damaged property or disrupted activities.	Reduction in water quality (suspended sediment, turbidity, colour, odour and taste) downstream of project asset is sufficient to cause complaints from local users, but is unlikely to cause users to use less water than they would normally use or to seek supplementary sources of water at any time of year.	Physical alteration of watercourse, wetland or waterbody resulting in erosion of channel bed or banks and/or sedimentation within 1 km downstream of the immediate working area. Changes to the waterbody may require physical works to control erosion.

Table D8 Ranking of Magnitude of Predicted Impacts on VEC Surface Watercourses and Waterbodies (Ephemeral and Permanent)

Magnitude	Ranking	Feature of VEC Potentially Impacted		
		Flow Rate	**Water Quality**	**Morphology of Watercourse, Wetland or Waterbody (as Defined by Width, Depth, Longitudinal Slope or Lateral Stability of the Watercourse)**
Large	8	Decrease in surface water flow downstream of project asset is likely to cause users to use less water than they normally use and to seek one or more supplementary sources of water to make up the deficit during the dry season. Increase in magnitude and frequency of flooding downstream of project asset is sufficient to cause damage to public infrastructure in rural areas.	Reduction in water quality (suspended sediment, turbidity, colour, odour and taste) downstream of project asset is likely to cause users to use less water than they normally use and to seek supplementary sources of water to make up the deficit during the dry season.	Physical alteration of watercourse, wetland or waterbody resulting in erosion of channel bed or banks and/or sedimentation within 5 km downstream of the immediate working area. Changes to the waterbody may require physical works to control erosion.
Very large	10	Decrease in surface water flow downstream of project asset is likely to cause users to use less water than they normally use and to seek one or more supplementary sources of water to make up the deficit at all times of the year. Increase in magnitude and frequency of flooding downstream of project asset is sufficient to cause damage to public infrastructure in rural and urban areas.	Reduction in water quality (suspended sediment, turbidity, colour, odour and taste) downstream of project asset is likely to cause users to use less water than they normally use and to seek supplementary sources of water to make up the deficit at all times of the year.	Physical alteration of watercourse, wetland or waterbody resulting in erosion of channel bed or banks and/or sedimentation >5 km downstream of the immediate working area. Changes to the waterbody may require physical works to control erosion.

Table D9 Ranking of VEC Sensitivity – Surface Watercourses and Waterbodies (Ephemeral and Permanent)

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability		
		Flow Rate	**Water Quality**	**Morphology of Watercourse, Wetland or Waterbody**
Very low	1	Waterbody which is not presently directly providing a source of public water supply or livestock or being used for hydropower generation and is unlikely to be developed in the future. There is no risk of disruption to normal livelihood activities in the event of serious flooding of the watercourse.	Very densely settled urban/peri-urban catchment. Very poor water quality	Watercourse has immovable boundaries (concrete bed and banks).
Low	2	Waterbody which is presently directly providing a source of water supply for rural communities including livestock whose water demand will rise in the future. There is a risk of disruption to normal livelihood activities, but damage to agricultural land is unlikely in the event of serious flooding of the watercourse.	Densely settled peri-urban catchment. Poor water quality	Natural channel, floodplain or hill slope formed in cohesive materials (silt/clay or loam soil) with thick continuous riparian vegetation along the banks of the channel, floodplain or on hill slope
Moderate	3	Waterbody which is earmarked for or is presently directly providing a source of water supply for rural communities and/or irrigated agriculture and/or urban communities and/or hydropower generation whose water demand will rise in the future. There is a risk of damage to agricultural land in the event of serious flooding of the watercourse, requiring reconstruction by farmers of in-field infrastructure (bunds and waterways).	Densely settled rural catchment predominantly with subsistence and some commercial agriculture. Reasonably good water quality	Natural channel, floodplain or hill slope formed in cohesive materials (silt/clay or loam soil) with a narrow zone of continuous riparian vegetation along the banks of the channel, floodplain or on hill slope.

Table D9 Ranking of VEC Sensitivity – Surface Watercourses and Waterbodies (Ephemeral and Permanent)

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability		
		Flow Rate	**Water Quality**	**Morphology of Watercourse, Wetland or Waterbody**
High	4	Waterbody which is earmarked for or is presently directly providing a source of water supply for rural and urban communities and/or irrigated agriculture and/or hydropower generation, whose water demand will rise in the future. There is a risk of damage to agricultural land and rural roads and bridges in the event of serious flooding of the watercourse, requiring expenditure of local government funds on maintenance activities as well as reconstruction by farmers of damaged in-field infrastructure (bunds and waterways).	Sparsely settled rural catchment, predominantly with subsistence agriculture and livestock rearing. Very good water quality	Natural channel, floodplain or hill slope formed in noncohesive materials (gravels, sands, silts) with thin incontinuous riparian vegetation along the banks of the channel, floodplain or hill slope.
Very high	5	Waterbody which is earmarked for or presently directly provides a source of water supply for rural and urban communities and irrigated agriculture and hydropower generation downstream, whose water demand will rise in the future. There is a risk of damage to agricultural land, rural infrastructure and urban infrastructure situated in the floodplain in the event of serious flooding of the watercourse.	Natural catchment. Natural water quality	Natural channel, floodplain or hillslope formed in noncohesive materials (gravels, sands, silts) with no riparian vegetation along the banks of the channel, floodplain or hill slope.

Table D10 Ranking of Predicted Magnitude on VEC Groundwater

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Groundwater Quality	**Groundwater Resource and Availability**
Beneficial			Access to groundwater is provided by a well that is provided by the project.
Negligible	2	Localised impact only, that can be restored to baseline quality in a period of days or up to a month, i.e., full restoration is achieved as a result of immediate clean-up operations.	There are no hand-dug wells or boreholes within the likely area of influence of a proposed abstraction borehole.
Small	4	Localised impact that may take up to 6 months to restore to baseline quality	An operating hand-dug well or borehole is within the area of influence of the proposed abstraction borehole; the location is in an area of low water stress and the well/borehole is not the only source of water for the local community.
Medium	6	Localised impact that may take six months to one year to restore to baseline quality. Widespread impact that may take up to six months to restore to baseline quality.	An operating hand-dug well or borehole is within the area of influence of the proposed abstraction borehole; the location is in an area of medium water stress and the well/borehole is not the only source of water for the local community.
Large	8	Localised impact that cannot be restored to baseline quality within one year. Widespread damage that may take 6-12 months to restore to baseline quality.	One or more operating hand-dug wells or boreholes are within the area of influence of the planned abstraction borehole; the wells/boreholes are the only source of water for the local community.
Very large	10	Widespread impact that cannot be restored to baseline quality within 12 months.	One or more operating hand-dug wells or boreholes are located within the area of influence of the planned abstraction borehole; the location is in an area of high water stress and the existing wells/boreholes are the only source of water for the local community.

Table D11 Ranking of VEC Sensitivity – Groundwater

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Groundwater Quality	**Groundwater Resource and Availability**
Very low	1	Very low quality groundwater/ groundwater not used by the community Evidence to suggest there is no ongoing change, either improvement or decline, in groundwater quality Aquifer identified as being generally tolerant of the proposed change without perceptible detriment to its present character	Ground conditions are characterised by cohesive soils (e.g., clay and silt) overlying impermeable cohesive deposits and/or confined aquifer conditions. Deep boreholes >50 m deep and a water table >50 m below ground level
Low	2	Groundwater with some pre-existing pollution that limits its use or value for wildlife or communities Evidence to suggest there is no ongoing change, either improvement or decline, in groundwater quality Aquifer identified as being generally tolerant of the proposed change with only minor detriment to its present character	Ground conditions are characterised by cohesive soils (e.g., clay and silt) overlying cohesive deposits of low permeability. Boreholes at a depth of 30 m and a water table >30 m below ground level
Moderate	3	Groundwater used for industrial purposes or agriculture Groundwater that provides baseflow to surface watercourses used for fishing or bathing Groundwater that supplies springs and wells but not used for domestic purposes (washing, cooking, bathing) Evidence to suggest minimal ongoing change, either improvement or decline, in groundwater condition is occurring Aquifer identified as having moderate capacity to tolerate the proposed change without much change to its present character	Ground conditions are characterised by moderately permeable soils (e.g., clay, silt, sand) overlying deposits of moderate permeability. Boreholes with a depth of approximately 30 m and a water table 15–30 m below ground level

Table D11 Ranking of VEC Sensitivity – Groundwater

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Groundwater Quality	**Groundwater Resource and Availability**
High	4	Groundwater of high quality Groundwater resource that is an important constituent of, or supports, a wetland designated for its ecological importance at national level Groundwater that provides essential baseflow to a watercourse Aquifer that crosses an international boundary within the project area of influence Aquifer used for drinking or domestic use (e.g., washing, cooking, bathing) by a small number of users Evidence to suggest considerable ongoing change, either improvement or decline, in groundwater condition is occurring Aquifer identified as having low capacity to accommodate the proposed change without substantially altering its present character	Ground conditions are characterised by permeable granular soils (e.g., sand and gravel) overlying highly permeable granular deposits or fractured rock. Shallow boreholes at >15 m depth and a water table below 15 m below ground level
Very high	5	Watercourse or groundwater resource that is an important constituent of, or supports, a wetland designated for its ecological importance at international level Aquifer used for drinking or domestic use (e.g., washing, cooking, bathing) by a large number of users Evidence to suggest considerable ongoing change, either improvement or decline, in groundwater condition is occurring Aquifer identified as having low capacity to accommodate the proposed change without fundamentally altering its present character	Ground conditions are characterised by permeable granular soils (e.g., sand and gravel) overlying highly permeable granular deposits or fractured rock. Shallow hand-dug wells or augured wells are common in the local area and a water table <15 m below ground level

Table D12 Ranking of Magnitude for Predicted Impacts of VEC Soils

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Soil Quality including Soil Productivity Potential (being a function of soil type, structure and fertility), Soil Compaction and Soil Contamination	**Soil Erosion**
Beneficial		Improved productivity and/or reduced pre-existing compaction and/or reduced level of pre-existing contamination	Reduced erosion beyond the construction period
Negligible	2	Immediate area damage only that can be restored to an equivalent productivity in a period of days or up to a month, i.e., full restoration is achieved as a result of immediate mitigation.	Loss of nutrient containing soils of immeasurably small volume where fertility can be restored with fertilizers during reinstatement
Small	4	Minor losses of productivity expected to last up to six months after reinstatement and/or localised compaction of agricultural land or natural/semi-natural habitat that can be alleviated e.g., by deep cultivation and/or localised contamination that may take up to 6 months to restore to pre-existing capability/function.	Minor loss of topsoil that can be replaced by imported materials of a similar nature and/or soil creep i.e., the localised lateral slippage of reinstated surface soils, without resulting in soil loss or damage, but creating slight uneven surface.
Medium	6	Minor losses of productivity expected to last between 6 and 12 months after reinstatement and/or widespread compaction of agricultural land or natural/semi-natural habitat that can be alleviated e.g., by deep cultivation and/or localised contamination (within single fields) that may take six months to one year to restore to pre-existing capability/function and/or widespread damage that may take up to six months to restore to pre-existing capability/function.	Significant soil loss by deep gulley erosion across an entire field (or 100 m or more along the route) such that large volumes of replacement soils are required to be imported for restoration.

Table D12 Ranking of Magnitude for Predicted Impacts of VEC Soils

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Soil Quality including Soil Productivity Potential (being a function of soil type, structure and fertility), Soil Compaction and Soil Contamination	**Soil Erosion**
Large	8	Moderate loss of productivity predicted to last >1 year after reinstatement and/or localised compaction of agricultural land or natural/semi-natural habitat that cannot be alleviated e.g., by deep cultivation and/or localised contamination that cannot be restored to pre-existing capability/function within one year and/or widespread damage that may take 6–12 months to restore to pre-existing capability/ function.	Significant soil loss by deep gulley erosion across several adjacent fields (or >200 m along the route) such that large volumes of replacement soils are required to be imported for restoration.
Very large	10	Major losses of productivity predicted to last >1 year after reinstatement and/or widespread compaction of agricultural land or natural/semi-natural habitat that cannot be alleviated e.g., by deep cultivation and/or localised contamination that cannot economically be restored and/or widespread damage that cannot be restored to pre-existing capability/function within 12 months.	Significant soil loss by deep gulley erosion across several adjacent fields (or >200 m along the route) at numerous locations along the pipeline route.

Table D13 Ranking of VEC Sensitivity – Soils

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability			
		Soil Productivity	**Soil Compaction**	**Soil Erosion**	**Soil Contamination**
Very low	1	Soils identified as being tolerant of the proposed change without perceptible detriment to its character.			Existing degraded or contaminated soils.
Low	2	Soils with no ecological, agricultural or economic value Soil identified as being generally tolerant of the proposed change with only minor detriment to its present character	Soils with no geological, ecological, agricultural or economic value Soils that respond well to restoration techniques	Soils with no geological, ecological, agricultural or economic value Soils less vulnerable to erosion	Soils with no geological, ecological, agricultural or economic value
Moderate	3	Soils with moderate ecological, agricultural or economic value Soils with the ability to recover within 3 years Soil identified as having moderate capacity to tolerate the proposed change without much change to its present character.	Soils that respond moderately well to restoration techniques Soils with moderate geological, ecological, agricultural or economic value	Soils with moderate erosion risk. Soils with moderate geological, ecological, agricultural or economic value	Soils that are not degraded or contaminated Soils with moderate geological, ecological, agricultural or economic value
High	4	Soils with high ecological, agricultural or economic value Soils with the ability to recover over 3–6 years Soil identified as having low capacity to accommodate the proposed change without substantially altering its present character	Soils with moderate geological, ecological, agricultural or economic value Sites valued or designated for protection on the grounds of geology at national level	Soils with moderate geological, ecological, agricultural or economic value Soils with high erosion risk	Soils with moderate geological, ecological, agricultural or economic value

Table D13 Ranking of VEC Sensitivity – Soils

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability			
		Soil Productivity	**Soil Compaction**	**Soil Erosion**	**Soil Contamination**
Very high	5	Soils with very high agricultural or economic value Land supporting critically endangered species whose presence is dependent on soil quality, structure or properties Soil recovery will take more than 6 years. Soil identified as having low capacity to accommodate the proposed change without fundamentally altering its present character	Land supporting critically endangered species whose presence is dependent on soil quality, structure or properties Sites of international importance/designated for protection at international level on geological grounds	Land supporting critically endangered species whose presence is dependent on soil quality, structure or properties Sites of international importance/designated for protection at international level on geological grounds.	Land supporting critically endangered species whose presence is dependent on soil quality, structure or properties Sites of international importance/designated for protection at international level on geological grounds.

Table D14 Ranking of Magnitude of Predicted Impact on VEC Landscape[1]

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Landscape Character	**Visual Amenity**
Beneficial		An improvement in condition of the landscape as the result of the removal of degraded elements and/or addition of new characteristics or complimentary elements	An improvement in views as the result of removal of degraded elements and/or addition of new characteristic or complimentary elements
Negligible	2	Small or imperceptible change in components/character of the landscape at a site scale and/or Introduction of a new element that is characteristic of the surroundings; difficult to perceive changes to landscape.	Development would be barely perceived in views of the wider landscape and could easily go unnoticed. It would be difficult to perceive and would not change the quality of view. A very small-scale change in view where the degree of contrast of the development is low
Small	4	Minor permanent change in components/character of the landscape at a local scale and/or Introduction of a new element that is only slightly out of character or does not degrade the wider landscape. The existing landscape character is maintained, albeit there may be some minor local change.	Development would result in minor changes in views that would not alter the overall balance of features or overall quality of views. A small scale change in view where the degree of contrast of the development is low and/or does not degrade the quality of view.
Medium	6	Permanent changes in components/ character of the landscape at a local/district scale. The landscape predicted in a localised area; introduction of a new element that may be prominent and or uncharacteristic, but not dominating the landscape. Partial change to the existing landscape character at a local/district scale	The development would result in a noticeable change in the existing view and or would cause a noticeable change in the quality and/or character of the view. A moderate scale change where the degree of contrast is apparent and results in some degradation of view.
Large	8	Permanent changes in components/ character of the landscape at a district/sub-regional scale. The new development will be prominent and will result in a high level of change to the existing landscape character as a result of the loss of key components and/or introduction of dominant and uncharacteristic elements.	The development would result in a prominent change in the existing view and/or would cause a prominent change in the quality and/or character of the view. A large-scale change where the degree of contrast clearly results in degradation of view.

[1] Landscape is defined to include seascape where appropriate

Table D14 Ranking of Magnitude of Predicted Impact on VEC Landscape[1]

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Landscape Character	**Visual Amenity**
Very large	10	Permanent change to the landscape at a regional scale. The new development will be very prominent and will fundamentally change the landscape character as a result of the loss of key components and introduction of dominant and substantially uncharacteristic elements.	Development will dominate the view or result in a dramatic change to the quality and/or character of the view. A very large-scale change where the degree of contrast completely degrades the view.

Table D15 Ranking of VEC Sensitivity – Landscape

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Landscape Character	**Visual Amenity**
Very low	1	Landscape that is dominated by derelict, disused or degraded man-made made structures and/ or which is not valued by local communities or others. Landscape is tolerant of substantial change, where modifications will not alter its character or quality classification.	People working within existing industrial facilities where focus will be on work and any incidental views will be not be uncharacteristic.
Low	2	A landscape with few intact or distinctive natural or historic features but which is valued at settlement or district level (e.g., of local interest). Landscape with large, dominant, numerous and/or noisy modern man-made features. A landscape dominated or highly modified by cultural land uses such as farming or grazing arable or pastoral agriculture. Landscape is likely to be tolerant of substantial change, where modifications are unlikely to alter its character or quality classification.	Settlement/residential receptors where views do not include elements of aesthetic, cultural or religious importance, or where such views would not be valued People travelling to, or at their place of work, e.g., office/school or outdoor recreation e.g., sporting activity where focus of views will be on activity and /or setting is not important to the activity.

Table D15 Ranking of VEC Sensitivity – Landscape

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Landscape Character	**Visual Amenity**
Moderate	3	Landscape with a number of distinctive natural landforms or historic/traditional features that add character and where modern man-made features may be present but do not significantly degrade the landscape character Anthropogenic landscape which has a more traditional, less intensive character and which has a higher sensitivity to change due to the presence of features such as gardens, plantations and traditional farming or grazing A generally commonplace landscape, which may still be valued at district/regional level and may be of some regional visitor/tourist value Landscape is able to tolerate some changes or modifications without altering the classification of landscape character or quality.	Settlement/residential receptors where views are valued due to key elements of aesthetic, cultural or religious importance, valued at a local level value People travelling in cars, on trains or other transport routes on their daily commute or where higher speeds are involved and views sporadic and short-lived Visitors/tourists or people engaged in outdoor recreation where enjoyment of the landscape views is incidental rather than the main interest – having local amenity value
High	4	Landscape with a high degree of naturalness/wilderness or dominated by traditional/historic landscape features and an absence of modern man-made features. A landscape which contains elements that are rare, or are valued at a regional/national level and may be of national visitor/tourist value. Changes or disruptions to the existing landscape would be noticeable and difficult to mitigate or restore, with a very low tolerance for change.	Settlement/residential receptors where views are valued due to key elements of aesthetic, cultural or religious importance Visitors/tourists or users of recreational facilities where enjoyment of views of the landscape are important or integral to that activity (e.g., visitors to parks/trails or hotels/lodges designed to enable the scenery to be enjoyed). Likely to be valued by visitors at a regional/national level

Table D15 Ranking of VEC Sensitivity – Landscape

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Landscape Character	**Visual Amenity**
Very high	5	Wilderness landscape or other landscape with a very high degree of 'naturalness', remoteness/isolation and without any intrusive man-made features. Landscape valued or designated for its landscape importance at a national/international level and may be of significant international visitor/tourist value Changes or disruptions to the existing landscape would be noticeable and difficult to mitigate or restore, with no tolerance for change.	Settlement/residential receptors where views are highly valued due to key elements of significant aesthetic, cultural or religious value. Visitors/tourists or users of recreational facilities where views of the landscape are integral to that activity (e.g., visitors to parks/trails or hotels/lodges designed to enable the scenery to be enjoyed). Likely to valued by visitors at a national/international level.

Table D16 Ranking of Magnitude of Predicted Impacts on VEC Air Quality

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Air Quality (Excluding Dust)	**Dust**
Compliance with project environmental standards		Compliant: not significant Non-compliant: significant	
Beneficial			
Negligible	2	Project/process contributions to annual average ground level concentrations are less than 1% of relevant project environmental standards at all points where long term exposure might occur. Maximum project/process contributions to short-term (averaging period 24 hours or less) ground level concentrations are less than 10% of relevant project environmental standards.	No perceptible increase in dust levels
Small	4	Maximum project/process contributions to annual average ground level concentrations, across all locations where long term exposure might occur, are 1-5% of relevant project environmental standards. Maximum short-term project/process contributions to ground level concentrations are 10-50% of relevant project environmental standards.	Visible increase in dust levels not predicted to cause a nuisance, reduce crop yields, affect animals, lead to complaints or cause adverse health impacts.

Table D16 Ranking of Magnitude of Predicted Impacts on VEC Air Quality

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Air Quality (Excluding Dust)	**Dust**
Medium	6	Maximum project/process contributions to annual average ground level concentrations, across all locations where long term exposure might occur, are 5-10% of relevant project environmental standards. Maximum project/process contributions to short-term ground level concentrations are 50-75% of relevant project environmental standards.	Dust is a nuisance to people and/or may cause perceived but not significant health effects, or minor property, crop or ecological damage.
Large	8	Maximum project/process contributions to annual average ground level concentrations, across all locations where long term exposure might occur, are 10-25% of relevant project environmental standards. Maximum project/process contributions to short-term ground level concentrations are 75-90% of relevant project environmental standards.	Dust is a significant nuisance to people and/or will cause measurable but not significant health effects, or moderate property, crop or ecological damage.
Very large	10	Maximum project/process contributions to annual average ground level concentrations, across all locations where long term exposure might occur, are >25% of relevant project environmental standards. Maximum project/process contributions to short-term ground level concentrations are 90-100% of relevant project environmental standards.	Dust is a very significant nuisance to people and/or will cause significant health effects or significant damage to property, crops and/or ecology

Table D17 Ranking of VEC Sensitivity – Air Quality

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Sensitivity to Organic and Inorganic Emissions	**Sensitivity to Dust**
Very low	1	Areas where baseline concentrations are less than 15% of the project environmental standard ambient air quality limit and where members of the public are not regularly present.	Areas where people would not normally be found – exposure is unlikely. Grazing or unused land.
Low	2	Areas where baseline concentrations are between 15% to 50% of the project environmental standard ambient air quality limit, and members of the public are regularly present.	Areas where people might be expected to pass through, but exposure for any extended period is unlikely (e.g., nomadic graziers, workers in agricultural fields). Crops and vegetation with high tolerance of dust emissions, e.g., cereal, animal feed crops.
Moderate	3	Areas where baseline concentrations are between 50% to 85% of the project environmental standard ambient air quality limit, and members of the public are regularly present.	Areas or buildings where occasional longer periods of exposure may occur. Crops and vegetation with moderate susceptibility to dust, e.g., crops with rough leaves. Fauna of moderate susceptibility/moderate tolerance of dust emissions, e.g., amphibians.
High	4	Areas where concentrations are 85% to 100% of the project environmental standard ambient air quality limit value and where members of the public are regularly present. Areas or buildings such as residential buildings, schools, offices, shops where exposure will be substantial but not constant.	Areas or buildings such as schools, offices, shops, markets where exposure will be substantial, but not constant. Crops, vegetation and fauna of high susceptibility/low tolerance of dust emissions, e.g., greenhouses, nurseries, horticulture and fruit crops as well as aquatic invertebrates and fish roe. Sites designated for aquatic value (e.g., Ramsar sites), waterways and wetlands
Very high	5	Areas where concentrations are 100% or more of the project environmental standard air quality limit value and members of the public are regularly present. Residential buildings (incl. hospitals) where near-constant	Residential buildings (including hospitals) where near-constant presence of people is possible and long-term exposure to dust is likely. Crops, vegetation and fauna of very high susceptibility/very low

Table D17 Ranking of VEC Sensitivity – Air Quality

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability	
		Sensitivity to Organic and Inorganic Emissions	**Sensitivity to Dust**
		presence of people is possible and long-term exposure to air pollution is likely	tolerance of dust emissions, e.g., aquatic invertebrates or fish roe. Sites designated for aquatic value (e.g., Ramsar sites), waterways and wetlands

Table D18 Ranking of Magnitude of Predicted Impact on VEC Acoustic Environment

Magnitude	Ranking	Feature of VEC Potentially Impacted			
		Noise	**Vibration (Nonblast Induced)**	**Vibration (Blast Induced)**	**Overpressure (Blast Induced)**
Compliance with Project Environmental Standards		Compliant: not significant Non-compliant: significant			
Beneficial		Reduction in ambient noise inside buildings occupied by local people (e.g., due to the installation of sound insulation).	n/a	n/a	n/a
Negligible	2	<5 dB(A) below applicable noise limits	Vibration velocity less than 0.11 mm/s	n/a	n/a
Small	4	0–5 dB(A) below applicable noise limits	Vibration velocity 0.11 mm/s - =< 1 mm/s.	Vibration velocity < 15 mm/s. For high sensitivity aboveground or buried heritage structures velocity <=3 mm/s	Air overpressure <150 dB (lin)
Medium	6	1–5 dB(A) above applicable noise limits.	Vibration velocity 1 mm/s - =< 10 mm/s.	n/a	n/a
Large	8	6–10 dB(A) above applicable noise limits	Vibration velocity >= 10 mm/s–15 mm/s	n/a	n/a
Very large	10	>10 dB(A) above applicable noise limits	Vibration velocity >= 15 mm/s	Vibration velocity >= 15 mm/s. For high sensitivity above ground or buried heritage structures velocity >=3 mm/s	Air overpressure >150 dB (lin)

Table D19 Ranking of VEC Sensitivity – Acoustic Environment

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability		
		Noise (Including Traffic Noise)	**Vibration (Including Blast-Induced Vibration)**	**Over Pressure (Blast Induced)**
Very low	1	Locations not regularly utilised. No human receptors other than project workforce and visitors to the project. Areas where baseline conditions are less than 15% of the project environmental standard ambient noise levels	Heavy weight structures with foundations	Heavy weight structures with foundations
Low	2	Locations used for recreation and industrial activities, such as industrial units, workshops, etc. Workers outside of the project site and/or not engaged in project work (i.e., not part of the project workforce). Areas where baseline conditions are 15–50% of the project environmental standard ambient noise levels and members of the public are regularly present.	Medium weight structures with foundations Heavy weight structures with no foundations	Medium weight structures with foundations Heavy weight structures with no foundations
Moderate	3	Locations used for work requiring concentration, such as offices. Areas where baseline conditions are 50–85% of the project environmental standard ambient noise levels and members of the public are regularly present.	Lightweight structures with foundations Medium weight structures with no foundations	Lightweight structures with foundations Medium weight structures with no foundations

Table D19 Ranking of VEC Sensitivity – Acoustic Environment

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability		
		Noise (Including Traffic Noise)	**Vibration (Including Blast-Induced Vibration)**	**Over Pressure (Blast Induced)**
High	4	Locations used for rest and sleep such as residential properties. Educational establishments and places of worship. Areas where baseline conditions are 85–100% of the project environmental standard ambient noise levels and where members of the public are regularly present. Areas or buildings such as residential buildings, schools, offices, shops where exposure will be substantial but not constant.	Lightweight structures in good conditions such as dwellings (mud brick construction) Lightweight structures with no foundations Buried services and utilities	Lightweight structures in good conditions such as dwellings (mud brick construction) Lightweight structures with no foundations Buried services and utilities
Very high	5	Locations used by vulnerable people such as hospitals Areas where concentrations are 100% or more of the project environmental standard ambient noise levels and members of the public are regularly present. Residential buildings (incl. hospitals) where near-constant presence of people is possible and long-term exposure to noise is likely.	Lightweight structures in poor conditions such as dwellings (mud brick construction) Lightweight structures with no foundations High sensitivity equipment incl. but not limited to medical or laboratory equipment Any above surface or known buried heritage structure	Lightweight structures in poor conditions such as dwellings (mud brick construction) Lightweight structures with no foundations High sensitivity equipment incl. but not limited to medical or laboratory equipment Any above surface heritage structure

Table D20 Ranking of Predicted Impacts on VEC Economy

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Direct and Indirect Employment, Contracting and Procurement, Workforce Capability and Skills, and Taxes
Beneficial		Increased ability of individuals and households to improve livelihoods through job opportunities, job security, skills and knowledge development and enhanced per capita income Improved business performance Economic conditions improved through local taxes and economic diversification
Negligible	2	At the national or regional level businesses unable to recoup the cost of investment to meet project needs No impact on business
Small	4	At the national or regional level businesses unable to recoup the cost of investment to meet project needs resulting in small loss of business profits or small number of businesses rendered unviable (in the order of < 25 businesses) or businesses rendered unviable represent a small proportion of the businesses or employment opportunities in given community. Unmet expectations of economic development for a few people
Medium	6	
Large	8	At the national or regional level businesses unable to recoup the cost of investment to meet project needs. Decrease in reported business profits, impacting business viability and potentially leading to loss of employment of some employees or 25–50 businesses rendered unviable. Unmet expectations of economic development for some people
Very large	10	At the national or regional level businesses unable to recoup the cost of investment to meet project needs. Potential total loss of viability for > 50 businesses Unmet expectations of economic development for a large number of people

No sensitivity ranking for the economy VEC is provided as this is not applicable. Economy is a national level issue and directly relevant to receptors. The ranking for these receptors is provided in the local economy VEC and the land and water based livelihood VECs.

Table D21 Ranking of Magnitude of Predicted Impacts on VEC Local Economy

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Formal and Informal (Non land Based) Economic Activities and Local Economic Conditions
Beneficial		
Negligible	2	Perception of missed opportunity to improve formal or informal business Perceived or actual decrease in ability of households to maintain standard of living (loss of purchasing power) due to local inflation
Small	4	Indirect impact Unmet expectations of economic development at the community and District level for a few people Business: Small loss of business profits or small number of businesses rendered unviable (in the order of < 20 businesses) or businesses rendered unviable represent a small proportion of the businesses or employment opportunities in given community Informal sole trader: Loss of profits has no/very small impact on overall household revenue or loss of < 20 informal businesses over whole of project.
Medium	6	Indirect impact Unmet expectations of economic development at the community and Ward level for some people. Business: Small loss of business profits or small number of businesses rendered unviable (up to 20–30) or businesses rendered unviable represent a small proportion of the businesses or employment opportunities in given community. Informal sole trader: Loss of profits has no/very small impact on overall household revenue or loss of < 20–30 informal businesses over whole of project.
Large	8	Indirect impact Unmet expectations of economic development at the community and district level for some people Businesses: Decrease in reported business profits, impacting business viability and potentially leading to loss of employment of some employees or 30–50 businesses rendered unviable or *all* business in given community rendered unviable. Informal sole trader: Substantial loss of profits with impact on overall revenue. 30–50 informal businesses rendered unviable
Very large	10	Indirect impact Unmet expectations of economic development at the community and District level for a large number of people Businesses: Potential total loss of viability for > 50 businesses Informal sole trader: Over 50 informal businesses rendered unviable or majority of businesses in given district

Table D22 Ranking of VEC Sensitivity – Local Economy

VEC Sensitivity	Ranking	VEC sensitivity/vulnerability
		Livelihoods – Single or Multiple Livelihood Strategies Impact on Vulnerability
Very low	1	Highly skilled (tertiary education and/or 10 years of relevant experience), employed PAC individuals Successful businesses with broad customer base that extends outside the PAC Business venture is part of a multiple livelihood strategy and forms a minimal proportion of the livelihood (1–10%)
Low	2	Skilled (artisanal training) PAC individuals Successful local businesses Multiple livelihood strategy and the business venture contributes a small to moderate proportion to livelihood (10–50%)
Moderate	3	Semi-skilled (no specific training but experience) PAC individuals Small local businesses Multiple livelihood strategy and the business venture contributes a high proportion to the livelihood (50–75%)
High	4	Unskilled individuals in the PACs Local businesses in difficulty or lacking expertise Single livelihood strategy and the business venture is the sole contributor to livelihood or forms the majority of the livelihood (75–100%)
Very high	5	Identified vulnerable groups in the PACs, which are currently disadvantaged in terms of job opportunities and business development and solely reliant on the business for livelihood.

Table D23 Ranking of Magnitude of Predicted Impacts on VEC Land-based Livelihoods

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Economic Displacement and Access to Land-Based Resources (e.g., Crops, Wild Animals, Wild Plants)
Beneficial		Increased access for livestock herders and crop growers, for example due to improved or new access tracks
Negligible	2	Inconvenience perceived by livestock herders and crop growers users without real changes to their access to land based ecosystem services. No material impact on land based productive capacity of household.
Small	4	Small inconvenience experienced by livestock herders and crop growers in terms of their access to land based ecosystem services (e.g.. longer distances to reach natural resources, more people using natural resources due to influx). Less than 10% of households' productively used land is affected and households are able to maintain livelihoods and food security with livelihood restoration support
Medium	6	Reduction in availability of land to livestock herders and crop growers (more users, loss of resources) leading to a moderate impact on the livelihoods of household relying on certain ecosystems (they can still manage to survive on their ecosystem services based livelihoods but standard of living may be decreased). Majority of identified affected households have over 25% of their productive land affected and effects being seen on their ability to maintain livelihoods and food security despite LR programmes.
Large	8	Reduction in availability of land for livestock herders and crop growers (more users, loss of resources) leading to a large impact on the livelihoods of household relying on certain ecosystems (they will need to adapt their livelihoods to maintain their standard of living). Impact on over 50% of productive land of land user or land owner affecting ability to maintain household food security for more than 50 households. Insufficient replacement land available to ensure adequate land based livelihood restoration.
Very large	10	Total loss of access for livestock herders and crop growers requiring ecosystem service users to develop alternative livelihoods. Confirmed increase in food insecurity among affected households after the transitional allowances stopped and failure to re-establish livelihoods. Elongated timescale for restoration of livelihoods.

Table D24 Ranking of VEC Sensitivity – Land-Based Livelihoods

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Economic Displacement and Access to Ecosystem Services (After Implementation of the RAP)
Very low	1	PAC households not relying in any significant manner on ecosystem services.
Low	2	PAC households relying on land (grazing and agriculture) with substantial contribution to livelihood from other sources
Moderate	3	PAC households dependent on land (agriculture and grazing) for their livelihood with contribution to livelihood from other sources.
High	4	PAC households highly dependent on land (agriculture and grazing) for their livelihood, with few alternatives available.
Very high	5	Vulnerable PAC households relying solely on land (agriculture or grazing) with no alternative available

Table D25 Ranking of Magnitude of Predicted Impacts on VEC River, Lake and Marine-based Livelihoods

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Economic or Physical Displacement and Access to Marine and Freshwater Resources
Beneficial		Increased access to river, lake and marine-based fisheries and related livelihoods
Negligible	2	Inconvenience perceived by river, lake and marine-based fisheries and related livelihoods without real changes to their access.
Small	4	Small inconvenience experienced by river, lake and marine-based fisheries and related livelihoods in terms of their access to carry out their activities (e.g., longer distances to reach natural resources)
Medium	6	Reduction in availability of river, lake and marine-based fisheries and related livelihoods (more users, loss of resources) leading to a moderate impact on the livelihoods of household relying on certain ecosystems (they can still manage to survive on their marine or freshwater based livelihoods but standard of living may be decreased). Prevention of access to small proportion of resources.
Large	8	Reduction in availability of river, lake and marine-based fisheries and related livelihoods (loss of resources) leading to a large impact on the livelihoods of household relying on certain marine or freshwater resources (they will need to adapt their livelihoods to maintain their standard of living). Prevention of access to some resources.
Very large	10	Total loss of access to river, lake and marine-based fisheries and related livelihoods requiring users to develop alternative livelihoods. Prevention of access to all resources.

Table D26 Ranking of VEC Sensitivity – River, Lake and Marine-based Livelihoods

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Economic or Physical Displacement and Access to Ecosystem Services
Very low	1	Households in PACs not relying in any significant manner on fishing or fishing-related activities.
Low	2	Households in PACS and commercial fisheries operating in a large area (in and beyond the project zone of influence).
Moderate	3	Households in PACs partially dependent on fisheries for their livelihood Small commercial fisheries predominantly operating in the project area
High	4	Households in PACs highly dependent on fishing and related activities in the project area
Very high	5	Vulnerable PAC individuals highly dependent on fishing and related activities in the project area

Table D27 Ranking of Magnitude of Predicted Impacts on VEC Land and Property

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Access to Land	**Physical Displacement – Assumes Best Efforts to Implement RAP Effectively but there are Potential Residual Impacts**
Beneficial			
Negligible	2	No material change to access to land	Fully effective RAP implementation for all physically displaced households and no negative effects and no remedial action required, including replacement housing with security of tenure available in a timely manner, positive or neutral attitude from land owners / users, investment of cash compensation in housing or land, sufficient land available to accommodate displaced households, existing land use conflicts not exacerbated, no new land conflicts,
Small	4	Small increase in land and property value not impacting on the buying or rental power of local residents who require the purchase of or rental of land or property	

Table D27 Ranking of Magnitude of Predicted Impacts on VEC Land and Property

Magnitude	Ranking	Feature of VEC Potentially Impacted	
		Access to Land	**Physical Displacement – Assumes Best Efforts to Implement RAP Effectively but there are Potential Residual Impacts**
Medium	6	Land users / tenants lose access to land or housing, rise in land speculation.	A small proportion of (the order of 5%) physically displaced households experience negative effects and in some cases remedial action is required.
Large	8	Temporary large increase in land and property value preventing local residents from buying or renting land or property or obtaining customary rights of occupancy, landowners abandon relationship with land users / tenants in favour of relationship project, corrupt practices arise to control access to land.	Support provided to physically displaced people makes them targets of criminality. Host communities not fully accepting of physically displaced households. Difference in housing standard for physically displaced people and host community leads to ostracisation. Cost of maintaining replacement housing adds burden to physically displaced households.
Very large	10	Permanent large increase in land and property value preventing local residents from buying land or property or obtaining customary rights of occupancy, land conflicts arise as a result of land competition, speculative / corrupt land access results in forced displacement of project unaffected people.	Replacement housing and land not available (delays to construction of replacement housing). No security of tenure at resettlement site. Full replacement value and in kind compensation not available to PAPs. Cash compensation leads to intrahousehold inequality, vulnerability and food insecurity. Compulsory acquisition and forced eviction leads to conflict, homelessness and increasing poverty. Option taken for cash compensation not invested in housing or land to protect the household. Insufficient land available to accommodate displaced households. Exacerbation of existing land conflicts and creation of new conflicts. Any of the above effects applying to a number of land owners / users (in the order of 10% of physically displaced households)

Table D28 Ranking of VEC Sensitivity – Land and Property

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Land or Property Value
Very low	1	Households in PACs not dependent on land in the project area to sustain their livelihood
Low	2	Households in PAC with the majority of their land and/or property in the project area and are dependent on that land for livelihood to a limited degree.
Moderate	3	Households in PACs with significant land and property, but only in the project area.
High	4	Poor households in PACs with a small piece of land / small property, or with no property in the project area.
Very high	5	Landless households i.e., people renting and using other people's land. Vulnerable households and individuals in PACs with a small plot land in the project area.

Table D29 Ranking of Magnitude of Predicted Impacts on VEC Local Workforce Health, Safety and Welfare

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Workers' Health, Safety And Welfare
Beneficial		Workers' health, safety and/or security status is improved.
Negligible	2	Workers perceive that their health safety and welfare is compromised, without verifiable quantification with regards to occupational exposures, occupational injury or occupational disease rate.
Small	4	Workers involved in low-risk activities associated with low levels of exposure (below regulatory limits) to occupational hazards that may result in minor/temporary health impacts only. Potential health impacts do not result in permanent incapacity and do not prohibit participation in future economic activities. Isolated concern or small numbers of sporadic concerns. No, or local, media or social media coverage.
Medium	6	Workers involved in moderate-risk activities associated with moderate levels of exposure (below/above regulatory limits) to occupational hazards that may result in temporary/permanent health impacts. Potential health impacts may result in permanent partial, or temporary total, incapacity that do not permanently prohibit participation in future economic activities. Serious level of concerns, repeated concerns from the same area (clustering), increasing rate of concerns. Greater local / national media or social media interest. Short term adverse national or international media or social media coverage. Serious but limited "interest-group" concern.

Table D29 Ranking of Magnitude of Predicted Impacts on VEC Local Workforce Health, Safety and Welfare

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Workers' Health, Safety And Welfare
Large	8	Workers involved in high-risk activities associated with high levels of exposure (above regulatory limits) to occupational hazards that may result in permanent health impacts. Potential health impacts result in partial, permanent incapacity that limits participation in future economic activity.
Very large	10	Workers involved in high-risk activities associated with high levels (above regulatory limits) of exposure to occupational hazards that result in permanent health impacts/fatalities. Potential health impacts result in total, permanent incapacity that prohibits participation in any future economic activity or potential fatalities. Prolonged adverse national or international media or stakeholder attention or concern

Table D30 Ranking of VEC Sensitivity – Local Workforce Health, Safety and Welfare

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Workers' Health, Safety and Welfare
Very low	1	Healthy workers from a safe community and household and with a supportive network Workers knowledgeable of pipeline construction health and safety risks and with relevant experience of pipeline or similar construction work. Workers from very low sensitivity PACs Workers received appropriate and verifiable HSSE training and PPE as part of project employment Relevant HSSE Contractor Management Plans in place
Low	2	Healthy workers from a safe community and household but without a supportive network Workers knowledgeable of pipeline construction health and safety risks, but no actual experience of pipeline or similar construction work. Workers from low sensitivity PACs Workers received appropriate and verifiable HSSE training and PPE as part of project employment Relevant HSSE Contractor Management Plans in place Workers knowledgeable of pipeline construction health and safety risks but with no relevant experience of pipeline or similar construction work

Table D30 Ranking of VEC Sensitivity – Local Workforce Health, Safety and Welfare

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Workers' Health, Safety and Welfare
Moderate	3	Workers exposed to health, safety or security risks in their community and lacking supportive networks Workers knowledgeable of pipeline construction health and safety risks, but no actual experience of pipeline or similar construction work. Workers from moderately sensitive PACs Workers received appropriate and verifiable HSSE training and PPE as part of project employment Relevant HSSE Contractor Management Plans in place Workers not knowledgeable about any level of construction health and safety risks
High	4	Workers exposed to health, safety and security risks in their community and lacking supportive networks. Workers not knowledgeable about pipeline construction health and safety risks Workers from highly sensitive PACs Workers received inappropriate HSSE training and PPE as part of project employment. Unsafe work practices are likely due to lack of knowledge No relevant HSSE Contractor Management Plans in place Workers not knowledgeable about any construction health and safety risks
Very high	5	Workers with identified health problems, experiencing threats to their health, welfare and safety outside the workplace Workers not knowledgeable about pipeline construction health and safety risks Workers from very highly sensitive PACs Workers received no HSSE training and PPE as part of project employment. Unsafe work practices are likely due to lack of knowledge. No relevant HSSE Contractor Management Plans in place Workers not knowledgeable about construction health and safety risks

Table D31 Ranking of Magnitude of Predicted Impact on VEC Social Infrastructure and Services

Magnitude	Ranking	Feature of VEC Potentially Impacted			
		Access to Infrastructure and Services	**Road Traffic**	**Road Condition**	**Road or Track Diversions and Closures**
Beneficial		A PACs access to social infrastructure and services is improved.		Some community use of new and rehabilitated roads	
Negligible	2	Access to social infrastructure or services is perceived as reduced (less availability of infrastructure or service, or quality of service reduced).	Less than 10% increase in daily two-way traffic flows (all vehicles or HGVs) during construction or operation, or less than 20 vehicles of any type per day.	No deterioration in road condition resulting from project traffic	
Small	4	Access to social infrastructure or a service is reduced (distance increases, less availability of infrastructures or services, or quality of services reduced) without a risk to changes in PACs health, safety, welfare and livelihood.	An increase of 10–30% in daily two-way traffic flow (all vehicles or HGVs) during construction or operation (minimal effect on severance).	Project traffic may lead to deterioration in road condition, though occurring on roads used by others and therefore not possible to differentiate impact.	Road or track closures or diversions impact individual houses rather than communities and /or involve minor roads or tracks with low traffic volumes and/or are for less than five days.
Medium	6	Access to social infrastructure or a service is reduced (less availability of infrastructure or services, or quality of services reduced, or services become overloaded) potentially leading to small negative changes in PACs health, safety, welfare and livelihood.	An increase of 30–60% in daily two-way traffic flow (all vehicles) or 30–100% increase in HGV during construction and operation (effects related to severance and pedestrian environment).	Project traffic may lead to deterioration in road condition requiring minor repairs (e.g., filling in pot holes).	Road or track closures or diversions impact a single community and/or involve roads or tracks with moderate traffic volumes and/or are for 5–10 days.

Table D31 Ranking of Magnitude of Predicted Impact on VEC Social Infrastructure and Services

Magnitude	Ranking	Feature of VEC Potentially Impacted			
		Access to Infrastructure and Services	**Road Traffic**	**Road Condition**	**Road or Track Diversions and Closures**
Large	8		An increase of 60–90% in daily two-way traffic flow (all vehicles) or 100–200% increase in HGV during construction and operation (effects related to severance and pedestrian environment).	Project traffic may lead to deterioration in road condition requiring substantial repairs (e.g., resurfacing).	Road or track closures or diversions impact more than one community and /or involve roads or tracks with high traffic volumes and/or are for more than 10 days.
Very large	10	Access to social infrastructure or a service is reduced (less availability of infrastructure or services, or quality of services reduced or services become overloaded) with definite large negative changes in PACs health, safety, welfare and livelihood.	An increase exceeding 90% in daily two-way traffic flow (all vehicles) or an increase exceeding 200% in HGV during construction and operation (effects related to severance and pedestrian environment).	Project traffic may lead to deterioration in road condition requiring road rebuilding.	Road or track closures or diversions impact a district or larger area.

Table D32 Ranking of VEC Sensitivity – Social Infrastructure and Services

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Access to Infrastructure and Services
Very low	1	Individuals, households or communities that use affected infrastructure or services but have access to nearby alternatives, the use of which does not cause adverse indirect impacts.
Low	2	Individuals, households or communities that use affected infrastructure or services and have access to nearby alternatives, the use of which may cause limited adverse indirect impacts.
Moderate	3	A few individuals/households depend on the affected infrastructure or service and there are no nearby alternatives.
High	4	A significant number of individuals/households depend on the affected infrastructure or service and there are no nearby alternatives. Accessibility more important than whether near or far, if no money or no transport then distance more important
Very high	5	A whole community depends on the affected infrastructure or service and there are no nearby alternatives.

Table D33 Ranking of Magnitude of Predicted Impacts on VEC Community Health

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Community Health
Beneficial		
Negligible	2	
Small	4	Minor deterioration (defined as nuisance or annoyance) in community members health. The receptors will adapt with ease to the influence of the determinant and maintain pre-impact levels of health. Minor or very localised (community level) stakeholder concern raised by receptors. e.g., dust produced by pipeline construction activities in proximity to PAC causes elevated levels of nuisance dust in the community. Due to the pace of construction. the duration and levels of exposure are relatively short and low and unlikely to cause significant and lasting health effects but does cause discomfort. The community leadership engages with the project CLO to raise concern about the issue.
Medium	6	Moderate/measurable/quantifiable deterioration in community members health. Typically impacts associated with acute conditions. The influence of the determinant will result in some difficulty in adapting the health effects, and maintaining pre-impact levels of health will require external support. Moderate stakeholder concern on district or higher level. Moderate exceedance of regulatory thresholds. e.g., indiscriminate use of ground/surface water by project leads to a decrease in the quantity and quality of potable water, leading to an outbreak of water and waste related conditions (e.g., typhoid, dysentery) and increased burden of disease associated with these conditions over the short term, stretching district level resources. This is recorded on the district health management and information system (HMIS). District level health authorities become aware of problem and engage with project to raise red light regarding impact.
Large	8	Significant deterioration in community members health. The influence of the determinant will result in the inability to adapt to the health impacts or to maintain a pre-impact level of health. Impacts typically associated with chronic or terminal conditions. There is substantial stakeholder concern on a regional or higher level. An identified regulatory threshold is often exceeded. e.g., project associated contractor personnel from areas with a higher HIV prevalence mix with local population and results in rise of HIV infection rates in specific hotspots (communities in proximity to camps, transport routes, etc.). Rise in HIV infections requires additional resources and level of effort from local health authorities to treat. Co-morbidity of HIV infections results in rise of other associated conditions (TB, Kaposi, etc.) further straining available resources and placing additional burden on districts. Chronic nature of HIV ensures that impact and additional strain on resources are long term impacts. Human rights advocacy groups become aware of situation and raise concern in regional and national media.
Very large	10	

Table D34 Ranking of VEC Sensitivity – Community Health

VEC Sensitivity	Ranking	VEC sensitivity/vulnerability
		Existing Burden of Disease (District Level or Verified Hotspot), Access to Health Services, Access to Basic Services, Consistent Health Knowledge, Trends in Existing Health Status/BOD
Very low	1	Healthy PAC individuals (low burden of disease) with good access to health services (within 5 km of HF) Trends for burden of disease improving (pertaining to key health conditions) Good access to basic services Changes to health posed by project-induced impacts well understood by all adults who have experience of living and working in vicinity of pipeline construction/operations
Low	2	Healthy PAC individuals (low burden of disease) with limited access to health services (more than 5 km away from HF) Trends for burden of disease improving (pertaining to key health conditions) Good access to basic services Changes to health posed by project-induced impacts well understood by all adults but no experience of living and working in vicinity of pipeline construction/operations.
Moderate	3	Moderately healthy PAC individuals (moderate burden of disease) with limited access to health services (more than 5 km away from HF) Trends for burden of disease stable (pertaining to key health conditions) Poor access to basic services. Changes to health posed by project-induced impacts well understood by some adults but no experience of living and working in vicinity of pipeline construction/operations
High	4	PACs with high burden of disease and good access to health services (within 5 km) and/or PACs with moderate burden of disease and limited access to health services (more than 5 km away from HF) Trends for burden of disease deteriorating (pertaining to key health conditions) Poor access to basic services Changes to health posed by project-induced impacts understood only by some adults
Very high	5	PACs with high burden of disease Poor access to health services Trends for burden of disease deteriorating (pertaining to key health conditions) Poor access to basic services Changes to health posed by project-induced impacts not well understood by most adults

Table D35 Ranking of Magnitude of Predicted Impacts on VEC Community Safety, Security and Welfare

Magnitude	Ranking	Feature of VEC potentially impacted		
		Risk of Accidents	**Traffic Congestion, Delays**	**Community Safety, Security and Welfare (Including Feeling of Well Being and Social Cohesion)**
Beneficial		Due to the project activities (which includes a traffic awareness campaign), less traffic accidents occur.		Community safety status is improved. Due to the project activities, including the presence of security staff the local community feels safer. Community welfare status is improved. Due to the project activities, some community development projects have been initiated
Negligible	2		Less than 10% increase in daily two-way traffic flows (all vehicles or HGVs) during construction or operation, or less than 20 vehicles of any type per day.	Due to the presence of the project activities, parents feel that the safety of their children may be endangered although all safety measures put in render make safety risks negligible
Small	4	Due to increased traffic, PAC members feel unsafe.	An increase of 10–30% in daily two-way traffic flow (all vehicles or HGVs) during construction or operation (temporary effects on accidents and delay).	Safety risks for PACs are improbable but some PAC members feel unsafe. Communities along the pipeline feel insecure due to project construction staff being in the area during working hours. The feeling of well being in a few PAC members has decreased. Due to the project activities the tranquillity of rural village life has been disrupted.

Table D35 Ranking of Magnitude of Predicted Impacts on VEC Community Safety, Security and Welfare

Magnitude	Ranking	Feature of VEC potentially impacted		
		Risk of Accidents	**Traffic Congestion, Delays**	**Community Safety, Security and Welfare (Including Feeling of Well Being and Social Cohesion)**
Medium	6		An increase of 30–60% in daily two-way traffic flow (all vehicles, effects related to accidents) or 30–100% increase in HGV during construction and operation (effects related to delay).	Serious level of concerns, repeated concerns from the same area (clustering), increasing rate of concerns. Greater local / national media or social media interest. Short term adverse national or international media or social media coverage. Serious but limited “interest-group” concern. Safety risks for PACs are possible. Some PAC members feel unsafe. Security risks for PACs are possible. Communities near the construction camps feel insecure due to project construction staff visiting the community after working hours. The feeling of well being in the majority of PAC members has decreased. Due to influx in the community the feeling of cohesion and wellbeing has been affected.

Table D35 Ranking of Magnitude of Predicted Impacts on VEC Community Safety, Security and Welfare

Magnitude	Ranking	Feature of VEC potentially impacted		
		Risk of Accidents	**Traffic Congestion, Delays**	**Community Safety, Security and Welfare (Including Feeling of Well Being and Social Cohesion)**
Large	8	Fatality caused by or involving project traffic.	An increase of 60–90% in daily two-way traffic flow (all vehicles, effects related to accidents) or 100–200% increase in HGV during construction and operation (effects related to delay).	Security risks for PACs are possible. Some PAC members feel insecure. Predatory behaviour caused by availability of disposable income, criminality caused by demand of illicit substances or competition for disposable income. The feeling of well being in the majority of PAC members has decreased The social cohesion in the PAC has been negatively affected with a possibility of conflict erupting. Due to project activities, employment of some local people and imbalance of those profiting from the project, the feeling of well being in the community has been lost and replaced with hostility.
Very large	10		An increase exceeding 90% in daily two-way traffic flow (all vehicles) or an increase exceeding 200% in HGV during construction and operation (effects related to delay and accidents).	Prolonged adverse national or international media or stakeholder attention or concern. Safety risks for PACs are probable. The entire PAC feels unsafe. Due to construction activities near a school, local communities feel unsafe. Communities near the construction camps feel insecure due to large influx of people as a result of the project. There is a probability of open conflict in the PAC. Community conflict, including violent conflict.

Table D36 Ranking of VEC Sensitivity – Community Safety, Security and Welfare

VEC Sensitivity	Ranking	VEC Sensitivity and Vulnerability
		Community Safety, Security and Well Being
Very low	1	PAC individuals from safe and secure communities with a good support network Threats to safety well understood by all adults who have experience of living and working in vicinity of pipeline construction/operations. Adults capable of advising/supervising children/young people with regards to their safety
Low	2	PAC individuals from relatively safe and secure communities with limited access to support networks Threats to safety posed by development-induced changes understood by all adults, but no experience of living and working in vicinity of pipeline construction/operations. Adults capable of advising/supervising children/young people in general terms only
Moderate	3	PAC individuals from relatively safe and secure communities without support networks. Threats to safety posed by development-induced changes understood by all adults, but no experience of living and working in vicinity of pipeline construction/operations. Adults capable of advising/supervising children/young people in general terms only
High	4	PAC individuals from communities exposed to safety and security threats with support networks Threats to safety posed by development-induced changes understood only by certain adults. These adults capable of advising/supervising children/young people in general terms only. Other children/young people unlikely to be advised/supervised adequately
Very high	5	PAC individuals from communities exposed to safety and security threats with support networks Threats to safety posed by development-induced changes not well understood by most adults. Unlikely that adults will advise/supervise children adequately

Table D37 Ranking of Magnitude of Potential Impacts for Cultural Heritage VEC, Category 1 – Tangible Cultural Heritage and Category 2 – Tangible Cultural Heritage with Strong Intangible Elements

Magnitude	Ranking	Feature of VEC Potentially Impacted
		Tangible Cultural Heritage Features, i.e., Physical Manifestations such as Religious Buildings, Structures and Cemeteries. Intangible Cultural Heritage may be associated with Physical Phenomenon such as a Specific Hill or Wood
Beneficial		Sites that were previously unknown or known, but not previously surveyed and where early baseline survey or research as a result of the project is predicted to lead to an increase in information/knowledge of benefit to researchers. No material change to the site. This applies to sites located in the study corridor outside of the direct footprint of the project.
Negligible	1 (scoring halved)	Very minor changes to archaeological materials or setting (the visible environment around the site or feature) (guide 1–10% of surviving deposits damaged or destroyed).
Small	2 (scoring halved)	Changes to key archaeological materials, such that the resource is slightly altered. Impact may consist of physical impact, dust, vibration or noise. (guide: 10–25% of surviving deposits damaged or destroyed). Slight changes to setting, most of a temporary nature, but do not affect the overall appreciation of the asset. Access to the asset may be curtailed for short periods.
6 Medium	3 (scoring halved)	Changes to many key archaeological materials, such that the resource is clearly modified (guide: 25–50% of surviving deposits damaged or destroyed). Impact may consist of physical impact, dust, vibration or noise. Considerable changes to setting that affect the character of the asset, but only affect the appreciation of the asset from some, not all directions. Access and enjoyment of the asset is permanently curtailed; social gatherings associated with the asset may be constrained by the presence of elements of the project and associated security.
8 Large	4 (scoring halved)	Changes to most of the key archaeological materials, such that the resource is significantly modified (guide: 50–75% of surviving deposits damaged or destroyed). Impact may consist of physical impact, dust, vibration or noise. Comprehensive changes to setting of a heritage asset, these are permanent in nature, but the nature and value of the asset can still be appreciated. Access to the assets is severely curtailed, large gatherings are prohibited until sanctioned by security staff.
10 Very large	5 (scoring halved)	Changes to majority, or all, of the key archaeological materials, such that the resource is totally modified (guide: 75–100% of surviving deposits damaged or destroyed). Impact may consist of physical impact, dust, vibration or noise. Widespread changes to setting, such that the feature is totally overwhelmed by permanent structures, or isolated from a setting which contributes to its significance, appreciation of the asset is impossible due to the presence of adjacent project structures. Access to the asset is made permanently impossible due to the project security zones.

Table D38 Ranking of VEC Sensitivity – Cultural Heritage Category 1 – Tangible Cultural Heritage and Category 2 – Tangible Cultural Heritage with Strong Intangible Elements

VEC Sensitivity	Ranking	VEC Sensitivity or Vulnerability
		Physical Impacts, Including Noise, Dust and Vibration. Setting of the Asset. Access Restrictions for the Use of the Asset
Very low	2 (scoring doubled)	Assets with very little or no surviving archaeological interest, e.g., sites that have been previously heavily damaged, or destroyed. Assets with no visible indicators related to departed social groups, where none of the current population can indicate a connection.
Low	4 (scoring doubled)	Designated and undesignated assets of local importance – the site is of value to the local populations. Mitigation may be appropriate to maintain good relations with that population, and indirectly with national and international actors. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives, e.g., sites that have been ploughed and are under threat of continued destruction by ploughing.
Moderate	6 (scoring doubled)	Designated or undesignated assets that are regionally important or contribute to regional research objectives. Assets used by current social groups that have associations with regional and national groups.
High	8 (scoring doubled)	Assets protected under national legislations; sites that are on the protected monuments list. Graves and cemeteries. Assets that can contribute significantly to acknowledged national research objectives. Assets designated by government to reflect recent geo-political events.
Very high	10 (scoring doubled)	UNESCO World Heritage Sites designated for their cultural, historic or archaeological value (including nominated sites). Assets that can contribute significantly to acknowledged international research objectives (in this project may imply hominid rich contexts).

Appendix E: Impact Assessment Tables

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E1 PROJECT ASPECTS

Table E1-1 Project Aspects

Abstraction of groundwater
Abstraction of water from river or channel
Accidental release of oil / chemicals
Altered drainage pattern
Community dynamics
Community health
Community safety
Contribution to economy
Damage to third party infrastructure
Disposal of surplus subsoil and aggregate
Disruption to surface water catchments
Disturbance or harm to wildlife
Disturbance or loss of cultural heritage
Disturbance, treatment and disposal of contamination
Dust
Employment
Impeded flow of river or channel
Impeded movement of animals and people
Introduction of competitive species or plant/animal diseases
Loss of habitat
Loss of habitat and disturbance or harm to wildlife
Loss of soil structure, fertility and seed bank
Loss/ severance of land and disruption to land-based livelihoods
Management of black and grey water
Management of solid and liquid waste
Management of surplus water from working areas
Noise
Open excavations
Project induced in migration
Provision of goods and services
Release of gases, exhausts and vapours to atmosphere
Resettlement

Table E1-1 Project Aspects

Restriction of access to fisheries
Soil compaction
Soil erosion
Temporary road closure
Treatment and disposal of known/unknown contamination
Use of rail network
Use of raw materials and natural resources
Use of road network
Vibration
Visual intrusion of project components into landscape

E2 GENERIC IMPACTS REGISTER

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Soil compaction	Habitats of conservation importance	Impaired re-establishment of vegetation after construction	C		–	UG 8.2	4	2	1	3	10	Soil Management Plan. Reinstatement Plan. Community Health, Safety and Security Plan.	2	2	1	3	8
Soil erosion	Habitats of conservation importance	Loss of topsoil through erosion by wind or water causing impaired reinstatement	C		–	UG 8.2	6	3	1	4	14	Soil Management Plan. Reinstatement Plan.	4	3	1	4	12
Soil erosion	Habitats of conservation importance	Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	C		–	UG 8.2	6	2	2	3	13	Soil Management Plan. Reinstatement Plan.	4	2	2	3	11
Loss of soil structure, fertility and seed bank	Habitats of conservation importance	Poor recolonisation due to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds	C		–	UG 8.2	6	2	1	3	12	Soil Management Plan.	4	2	1	3	10
Impeded flow of river or channel	Habitats of conservation importance	Loss of aquatic and water-margin habitats	C		–	UG 8.2	6	2	4	3	15	Natural Resource Management Plan.	4	2	4	3	13
Loss of habitat	Habitats of conservation importance	Permanent loss of habitat from AGIs and operational RoW	C		–	UG 8.2	6	5	2	3	16	Biodiversity Management Plan.	4	5	2	3	14
Loss of habitat	Habitats of conservation importance	Temporary loss of habitat from construction activities (RoW, other temporary worksites main camps and pipe yards MCPYs)	C		–	UG 8.2	8	3	2	4	17	Biodiversity Management Plan.	6	3	2	4	15
Loss of habitat	Habitats of conservation importance	Modified habitat structure following habitat reinstatement after construction	C		–	UG 8.2	6	3	2	4	15	Biodiversity Management Plan.	4	3	2	4	13
Loss of habitat	Habitats of conservation importance	Loss of wetland and riparian habitat through open cut crossing during construction of the RoW	C		–	UG 8.2	8	2	2	5	17	Biodiversity Management Plan.	6	2	2	5	15

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Introduction of competitive species or plants/animal diseases	Habitats of conservation importance	Poor re-colonisation by local flora through competition by non-natives following reinstatement	C	O	–	UG 8.2	6	5	2	5	18	Biodiversity Management Plan.	4	5	2	5	16
Disturbance or harm to wildlife	Habitats of conservation importance	Interaction between construction workers and habitats of conservation importance, especially relating to food and fuel	C		–	UG 8.2	6	2	2	3	13	Biodiversity Management Plan. Project-induced in-migration plan. Community health, safety and security plan Occupational health, safety and security plan	4	2	3	5	14
Disturbance or harm to wildlife	Habitats of conservation importance	PIIM to areas around camps causing increased pressure on natural resources (farming, deforestation for fuel)	C	O	–	UG 8.2	6	5	2	3	16	Project-induced in-migration plan.	4	5	2	3	14
Treatment and disposal of known/unknown contamination	Flora and fauna species of conservation importance (terrestrial and aquatic)	Injury or mortality of flora and fauna due to mobilisation of soil contaminants	C		–	UG 8.3	6	3	2	5	16	Pollution prevention plan.	4	3	2	5	14
Disposal of solid and liquid waste	Flora and fauna species of conservation importance (terrestrial and aquatic)	Mortality of flora and fauna through contamination of food and water supply	C		–	UG 8.3	6	2	1	5	14	Pollution prevention plan. Waste management plan.	2	2	1	5	10
Disposal of solid and liquid waste	Flora and fauna species of conservation importance (terrestrial and aquatic)	Increase in vermin around waste dumps and consequent increase in prey availability for carnivorous birds and mammals	C		–	UG 8.3	4	2	1	5	12	Occupational health, safety and security plan. Pollution prevention plan. Waste management plan.	2	2	1	5	10
Disposal of solid and liquid waste	Flora and fauna species of conservation importance (terrestrial and aquatic)	Stress or mortality to flora and fauna from spills of waste	C		–	UG 8.3	4	2	1	5	12	Pollution prevention plan. Waste management plan.	2	2	1	5	10

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Disposal of surplus water from working areas and hydrotest water	Flora and fauna species of conservation importance (terrestrial and aquatic)	Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	C		–	UG 8.3	6	2	3	5	16	Pollution prevention plan. Waste management plan.	4	2	3	5	14
Impeded flow of river or channel	Flora and fauna species of conservation importance (terrestrial and aquatic)	Restriction of fish (ranging from general fish species (nonmigratory) to potamodromous fish) movement and reduced reproductive success, impaired movement and reduced habitat suitability of other aquatic organisms	C		–	UG 8.3	6	2	4	3-5	15-17	Biodiversity management plan. Natural resource management plan.	4	2	4	3–5	13–15
Abstraction of water from river or channel	Flora and fauna species of conservation importance (terrestrial and aquatic)	Decreased water level due to water abstraction for project use leading to loss of aquatic and water-margin habitats causing reduced spawning activity	C		–	UG 8.3	6	2	4	3	15	Biodiversity management plan. Natural resource management plan.	4	2	4	3	13
Abstraction of water from river or channel	Flora and fauna species of conservation importance (terrestrial and aquatic)	Mortality to aquatic organisms from the river through direct abstraction	C		–	UG 8.3	4	2	2	4	12	Natural resource management plan.	2	2	2	4	10
Management of black and grey water	Flora and fauna species of conservation importance (terrestrial and aquatic)	Injury or mortality of flora and fauna due to surface water contamination	C	O	–	UG 8.3	6	4	3	4	17	Natural Resource Management Plan. Waste management plan.	2	2	2	4	10
Abstraction of groundwater	Flora and fauna species of conservation importance (terrestrial and aquatic)	Decreased water level due to water abstraction for project use leading to loss of habitat for stygofauna	C		–	UG 8.3	4	2	2	2	10	Natural Resource Management Plan	2	2	2	2	8

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Loss of habitat for species of conservation importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Permanent loss of breeding and foraging habitat for fauna through site clearance before construction	C		–	UG 8.3	6	5	2	2	15	Biodiversity management plan.	4	5	2	4	15
Loss of habitat for species of conservation importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Temporary loss of breeding and foraging habitat for fauna through site clearance before construction	C		–	UG 8.3	6	2	2	2	12	Biodiversity management plan.	4	2	2	4	12
Loss of habitat for species of conservation importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Temporary habitat fragmentation causing disrupted species movement during construction of RoW	C		–	UG 8.3	6	3	3	4	16	Biodiversity management plan.	6	2	4	4	16
Introduction of competitive species or plants/animal diseases	Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic)	Modified habitats due to non-native species establishment leading to increased competition and loss of habitat for breeding and foraging	C	O	–	UG 8.3	6	5	3	5	19	Biodiversity management plan.	4	5	3	5	16
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Increased predation from predator species due to removal of habitat used to shelter and forage	C		–	UG 8.3	6	3	2	5	16	Biodiversity management plan.	4	3	2	5	14
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Mortality of fauna species of conservation importance due to movement of vehicles and presence of construction plants and structures	C		–	UG 8.3	6	3	2	5	16	Biodiversity management plan.	4	3	2	5	14

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps, from improved access along new or upgraded project access roads and access provided by RoW during construction and reinstatement.	C		–	UG 8.3	8	5	3	5	21	Project Induced In-Migration Management Plan	6	5	2	4	17
Open excavations	Flora and fauna species of conservation importance (terrestrial and aquatic)	Injury or fatality of fauna from falling into excavations if they cannot escape or where they are at increased risk of predation	C		–	UG 8.3	6	2	2	5	15	Biodiversity management plan.	4	2	2	5	13
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and behaviour of animals	C		–	UG 8.3	6	2	2	5	15	Pollution prevention plan. Biodiversity management plan Community health, safety and security plan Occupational health, safety and security plan Project Induced In-Migration Management Plan Road traffic management plan	4	2	2	5	13
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Maintenance activities causing in directly mortality or loss of breeding and forage habitat to species		O	–	UG 8.3	4	1	1	5	11	Biodiversity management plan.	2	1	1	5	9
Use of raw materials and natural resources	Soil	Depletion of natural resources, for example, aggregate	C		–	UG 8.5	4	4	1	1–3	10–12	Waste management plan. Natural resource management plan.	2	2	1	1–3	6–8
Soil compaction	Soil	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development. Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity.	C		–	UG 8.5	8	2	1	1	12–14	Soil management plan. Community health, safety and security plan.	6	1	1	1–3	9–11

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Soil erosion	Soil	Loss of topsoil causing reduced fertility and impaired reinstatement	C		–	UG 8.5	8	2	1	1–3	12–14	Soil management plan. Community health, safety and security plan.	6	4	1	1–3	12–14
Soil erosion	Soil	Loss of topsoil causing reduced fertility and impaired reinstatement		O	–	UG 8.5	8	2	1	1–3	12–14	Reinstatement plan. Biodiversity management plan.	6	4	1	1–3	12–14
Loss of soil structure, fertility and seed bank	Soil	Development of anaerobic conditions in stored soil. Mixing of different soil or soil with foreign materials leading to loss of drainage and fertility.	C		Y	UG 8.5	4	2	1	1–4	8–11	Soil management plan.	2	2	1	1–4	6–9
Disturbance, treatment and disposal of known/unknown contamination	Soil	Mobilisation of soil contaminants	C		–	UG 8.5	4	2	1	3	10	Pollution prevention plan. Reinstatement plan.	2	1	1	3	7
Management of waste and accidental release of oil or chemicals	Soil	Soil contamination	C		–	UG 8.5	4	2	1	3	10	Pollution prevention plan. Waste management plan.	2	1	1	3	7
Management of waste and accidental release of oil or chemicals	Soil	Soil contamination		O	–	UG 8.5	2	4	1	3	10	Pollution prevention plan. Waste management plan.	2	2	1	3	8
Management of surplus subsoil and aggregate	Soil	Loss of soil structure, drainage, fertility and seed bank	C		–	UG 8.5	4	1	1	1–3	7–9	Waste management plan.	2	1	1	1–3	5–7
Erosion	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters	C	O	–	UG 8.6	4	2	2	3-4	11-13	Soil management plan. Reinstatement plan.	2	2	2	3–4	9–10
Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water	C		Y	UG 8.6	4	2	2	3-4	11-13	Soil management plan. Reinstatement plan. Waste management plan.	2	1–2	2	3–4	8–10
Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water		O	Y	UG 8.6	4	2	2	3–4	11–13	Pollution prevention plan. Waste management plan. Emergency preparedness and response plan.	2	2–4	1–2	3–4	9–10

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Impeded flow of river or channel	Surface water	Deterioration of water quality	C		Y	UG 8.6	4	1	1	3–4	9–10	Biodiversity management plan. Soil management plan. Pollution prevention plan.	2	1	1	3–4	7–8
Altered drainage pattern	Surface water	Trench can act as conduit for groundwater, draining higher areas and flooding lower areas	C	O	Y	UG 8.6	4	4	1	2	11	Reinstatement plan.	2	2	1	2	7
Management of waste and accidental release of oil or chemicals	Groundwater	Potential for groundwater contamination	C	O	–	UG 8.7	2	1–2	1–2	5	9–11	Waste management plan Pollution prevention plan. Natural resource management plan Emergency preparedness and response plan.	2	1	1–2	5	9–10
Visual intrusion of project components into landscape	Landscape	Change of landscape character and views caused by project components	C	O	–	UG 8.8	6	2	2	2	12	Biodiversity Management Plan. Reinstatement Plan. Soil Management Plan.	4	2	2	2	10
Disposal of surplus subsoil and aggregate	Landscape	Permanent change of views as a result of disposal of surplus subsoil and aggregate	C		–	UG 8.8	6	5	2	2	15	Soil Management Plan. Waste Management Plan. Reinstatement Plan. Biodiversity management plan.	4	5	2	2	13
Release of gases, exhausts and vapours to atmosphere	Air Quality	Reduced air quality from combustion of fuel in construction equipment and vehicles	C		–	UG 8.9	6	2	2	2–4	12–14	Pollution Prevention Plan	4	2	2	2–4	10–12
Release of gases, exhausts and vapours to atmosphere	Air Quality	Hydrocarbon vapour emissions from refuelling operations causing reduced air quality	C		–	UG 8.9	2	2	2	1	7	Pollution Prevention Plan	2	2	2	1	7
Release of gases, exhausts and vapours to atmosphere	Air Quality	Exhaust emissions from vehicles causing reduced air quality during operation		O	–	UG 8.9	4	4	2	2–5	12–15	Pollution Prevention Plan	2	4	2	2–5	10–13
Dust	Air Quality	Nuisance from dust emissions from construction site activities	C		–	UG 8.9	6	2	2	1–3	11–13	Pollution Prevention Plan Traffic and Road Safety Management Plan	4	2	2	1–3	9–11
Dust	Air Quality	Nuisance from mobilisation of dust by project vehicles		O	–	UG 8.9	4	4	2	1–3	11–13	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	4	2	1–3	9–11
Noise	Acoustic Environment	Disturbance or nuisance from noise from construction on the RoW	C			UG 8.10	10	1	2	4	17	Pollution Prevention Plan	4	1	2	4	11

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Noise	Acoustic environment	Disturbance or nuisance from noise during commissioning of the pipeline	C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan	4	1	2	4	11
Noise	Acoustic Environment	Disturbance or nuisance from noise from traffic movement	C	O		UG 8.10	10	1	2	5	18	Pollution Prevention Plan Transport and Road Safety Management Plan	8	1	2	5	16
Vibration	Acoustic Environment	Disturbance, nuisance or cosmetic / structural damage from vibration	C			UG 8.10	2-8	1	2	4	9-15	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
Employment	Economy	The generation of national employment opportunities leading to an increase in household income and an improvement in living standards.	C		Y	UG 8.11	B	–	–	–	–	Local Content Plan	B	–	–	–	–
Provision of goods and services	Economy	Project procurement providing opportunities for national businesses.	C	O	Y	UG 8.11	B	–	–	–	–	Local Content Plan	B	–	–	–	–
Contribution to economy	Economy	Contribution to national economy from investment.	C	O	Y	UG 8.11	B	–	–	–	–		B	–	–	–	–
Contribution to economy	Economy	Changes to the fiscal balance.	C	O	-	UG 8.11	B	–	–	–	–		B	–	–	–	–
Employment	Local economy (nonland-based livelihoods)	The generation of project local employment opportunities	C		Y	UG 8.12	B	–	–	–	–	Procurement and supply chain management plan. Labour management plan. Stakeholder engagement plan.	B	–	–	–	–
Employment	Local economy (nonland-based livelihoods)	The provision of training and skill development opportunities within employment	C		Y	UG 8.12	B	–	–	–	–	Procurement and supply chain management plan. Labour management plan.	B	–	–	–	–
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Project procurement providing opportunities for local businesses	C		Y	UG 8.12	B	–	–	–	–	Procurement and supply chain management plan. Labour management plan.	B	–	–	–	–
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Improvements in road conditions for business owners and public transport	C	O	Y	UG 8.12	B	–	–	–	–	Infrastructure and Utilities Management Plan	B	–	–	–	–
Employment	Local economy (nonland-based livelihoods)	Loss of employment after project construction phase	C		N	UG 8.12	8	2	1	5	16	Procurement and supply chain management plan. Labour management plan. Stakeholder engagement plan.	4	2	1	5	12

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Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Employment	Local economy (nonland-based livelihoods)	Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities	C		Y	UG 8.12	8	2	2	5	17	Project-induced in-migration management plan. Labour management plan. Stakeholder engagement plan.	4	2	3	5	14
Employment	Local economy (nonland-based livelihoods)	Competition over employment opportunities	C		Y	UG 8.12	8	2	2	5	17	Project-induced in-migration management plan. Labour management plan. Stakeholder engagement plan.	4	2	2	5	13
Employment	Local economy (nonland-based livelihoods)	Diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs	C		N	UG 8.12	8	2	2	4	16	Procurement and supply chain management plan. Labour management plan. Stakeholder engagement plan.	4	2	2	4	12
Employment	Local economy (nonland-based livelihoods)	School drops outs seeking employment in the project supply chain	C	O	Y	UG 8.12	8	4	1	4	17	Procurement and supply chain management plan. Monitoring and reporting plan. Labour management plan. Stakeholder engagement plan.	4	4	1	4	13
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Inflation and effects on supply owing to project procurement	C		-	UG 8.12	6	2	3	4	15	Procurement and supply chain management plan.	4	2	3	3	12
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Restriction of access to small businesses, street vendors and local markets during construction	C		-	UG 8.12	6	1	2	3	12	Resettlement action plan. Monitoring and reporting plan. Stakeholder engagement plan.	2	1	2	3	8
Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences	C		-	UG 8.12	6	1	2	5	14	Infrastructure and utilities management plan. Stakeholder engagement plan.	4	1	2	5	12
Use of Road Network	Land-based livelihoods	Improved ability to sell agricultural produce to nearby markets for farmers and traders	C		Y	UG 8.13	B	–	–	–	–	Infrastructure and Utilities Management Plan	B	–	–	–	–
Impeded Movement of Animals	Land-based livelihoods	Due to access restrictions, livestock cause damage to crops	C		-	UG 8.13	10	2	1	5	18	Community health, safety and security plan. Stakeholder engagement plan. Monitoring and reporting plan.	6	2	1	5	14
Accidents Due to Open Excavations	Land-based livelihoods	Livestock falling into excavations	C		Y	UG 8.13	6	3	1	5	15	Community health, safety and security plan. Stakeholder engagement plan. Monitoring and reporting plan.	2	3	1	5	11

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Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of land used for crop farming	C		Y	UG 8.13	8	5	1	5	19	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Temporary loss of grazing land	C		Y	UG 8.13	8	2	1	5	16	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Increased traffic leading to spread of animal diseases	C		-	UG 8.13	8	3	3	4	18	Transport and road safety management plan. Community health, safety and security plan. Biodiversity management plan.	4	3	3	4	14
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of access to artisanal mining sites	C		Y	UG 8.13	10	4	1	4	19	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	4	11
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of natural resources	C		Y	UG 8.13	4	3	2	2	11	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	2	2	2	2	8
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Reduction in honey production due to loss of habitat	C		Y	UG 8.13	4	3	1	3	11	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	2	2	1	3	8
Disruption to Surface Water Catchments	Land-based livelihoods	Temporary disruption to surface water	C		Y	UG 8.13	6	2	2	5	15	Infrastructure and utilities management plan. Resettlement action plan.	4	2	2	5	13
Restriction of Access to Fisheries	River and lake-based livelihoods	Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW	C		-	UG 8.14	6	2	1	4	13	Resettlement action plan. Stakeholder engagement plan.	2	2	1	4	9
Resettlement	River and lake-based livelihoods	Permanent loss of access to ponds used for aquaculture due to project land acquisition	C		Y	UG 8.14	6	5	1	5	17	Resettlement action plan. Stakeholder engagement plan. Monitoring and reporting plan.	4	2	1	5	12

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Resettlement	Land and property	Permanent loss of private land due to project land acquisition	C		Y	UG 8.15	6	2	1	4	13	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
Resettlement	Land and property	Land speculation by third parties	C		Y	UG 8.15	8	4	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	6	2	1	5	14
Resettlement	Land and property	Land and property speculation by landowners	C		Y	UG 8.15	6	2	1	4	13	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	4	11
Resettlement	Land and property	New disputes and exacerbation of pre-existing disputes and conflict around land and property	C		Y	UG 8.15	8	4	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	6	4	1	5	16
Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition	C		Y	UG 8.15	8	5	1	5	19	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
Resettlement	Land and property	Permanent loss of local enterprises due to project land acquisition	C		Y	UG 8.15	8	5	1	5	19	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
Resettlement	Land and property	Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition	C		Y	UG 8.15	4	4	2	4	14	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	2	2	2	4	10
Resettlement	Land and property	Loss of access to informal support networks and social services after physical displacement due to project land acquisition	C		Y	UG 8.15	4	3	1	4	12	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	2	3	1	4	10
Vibration	Land and property	The generation of vibrations during construction works	C		Y	UG 8.15	8	4	1	5	18	Infrastructure and utilities management plan.	4	3	1	5	13

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Employment	Workers' health, safety and welfare	An improvement in the health and safety of people employed from disease awareness and reduction programmes	C	O	-	UG 8.16	B	–	–	–	–	Occupational health, safety and security plan.	B	–	–	–	–
Employment	Workers' health, safety and welfare	Risk of wildlife interaction/animal bites and contracting zoonotic diseases	C		-	UG 8.16	8	3	1	5	17	Occupational health, safety and security plan.	4	2	1	5	12
Employment	Workers' health, safety and welfare	Other occupational health and safety incidents causing diseases, injuries and mortality	C	O	-	UG 8.16	8	5	1	5	19	Community health, safety and security plan. Occupational health, safety and security plan. Labour management plan. Transport and road safety management plan.	6	2	1	5	14
Use of Road Network	Social infrastructure and services	Road widening and improvement	C		Y	UG 8.17	B	–	–	–	–	N/A	B	–	–	–	–
Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)	Social infrastructure and services	Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction	C		-	UG 8.17	4	1	2	2	9	Infrastructure and utilities management plan.	2	1	2	2	7
Use of Road Network	Social infrastructure and services	Deterioration of road conditions	C		Y	UG 8.17	10	2	2	5	19	Infrastructure and utilities management plan.	6	2	2	5	15
Use of Road Network	Social infrastructure and services	Traffic congestion leading to delays	C		-	UG 8.17	8	2	2	5	17	Stakeholder engagement plan. Transport and road safety management plan.	4	2	2	3	11
Use of Road Network	Social infrastructure and services	Disruption of traffic flows	C		-	UG 8.17	4	1	2	5	12	Infrastructure and utilities management plan. Transport and road safety management plan.	4	1	2	2	9
Resettlement	Community health	Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases	C		Y	UG 8.18	6	4	1	5	16	Resettlement action plan.	4	2	1	5	12
Resettlement	Community health	Resettled households' decreased food security	C		Y	UG 8.18	8	3	1	4	16	Resettlement action plan.	4	2	1	4	11
Community health	Community health	Project activities leading to an increase in vector-related diseases	C		-	UG 8.18	8	3	3	4	18	Community health, safety and security plan. Occupational health, safety and security plan. Stakeholder engagement plan.	6	2	3	4	15

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Noise	Community health	Excessive noise exposure due to project activities	C		-	UG 8.18	4	2	2	4	12	Community health, safety and security plan. Pollution prevention plan. Stakeholder engagement plan.	2	2	2	4	10
Disposal of Solid and Liquid Waste	Community health	Increased pressure on regional waste management facilities due to project activities	C		-	UG 8.18	8	2	2	5	17	Waste managemnt plan.	4	2	2	5	13
Use of Road Network	Community health	An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases	C	O	Y	UG 8.18	8	4	3	5	20	Community health, safety and security plan. Occupational health, safety and security plan. Infrastructure and utilities management plan. Stakeholder engagement plan.	6	4	2	5	17
Community Safety	Community safety, security and welfare	Community health and safety incidents associated with construction activities other than traffic accidents	C		Y	UG 8.19	10	2	1	5	18	Community health, safety and security plan. Occupational health, safety and security plan. Stakeholder engagement plan.	4	2	1	5	12
Community Dynamics	Community safety, security and welfare	The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs	C		Y	UG 8.19	8	4	1	5	18	Community health, safety and security plan. Stakeholder engagement plan. Labour management plan. Resettlement action plan.	4	2	1	5	12
Community Dynamics	Community safety, security and welfare	Conflict between PACs and project security personnel	C		-	UG 8.19	8	4	2	5	19	Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	5	13
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Increased knowledge of tangible and intangible cultural heritage. Employment of people to survey and investigate cultural heritage affected by the project.	C		Y	UG 8.20	B	–	–	–	–	Cultural Heritage Management Plan	B	–	–	–	–
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage, disturbance or disruption of access of unknown Category 1 and 2 tangible cultural heritage features, such as evidence of previous settlement and graves.	C		TBC	UG 8.20	1–5	1–5	1–2	2–10	5–22	Cultural Heritage Management Plan	1–3	1–5	1–2	2–8	5–18

Table E2-1 Generic Impacts Register

Aspect	VEC	Potential Impact	Phase		High Stakeholder Concern	ESIA Section	Pre-mitigation Impact					Management Plan(s)	Residual Impact				
			C	O			M	D	E	S	SS		M	D	E	S	SS
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage, disturbance or disruption of access of unknown Category 3 intangible cultural heritage, such as meeting places, sacred natural sites, rivers or ceremonial ways, traditional dance, rituals, traditional healing and syncretism	C		TBC	UG 8.20	–	–	–	–	–	Cultural Heritage Management Plan	–	–	–	–	–
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage or disturbance of Category 1 and 2 tangible cultural heritage		O	Y	UG 8.20	1–5	1–5	1–2	2–8	5–20	Cultural Heritage Management Plan	1–3	1–5	1–2	2–8	5–18
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage or disturbance of Category 3 intangible cultural heritage		O	Y	UG 8.20	–	–	–	–	–	Cultural Heritage Management Plan	–	–	–	–	–

E3 LOCATION-SPECIFIC IMPACTS REGISTER

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
41	41	MCPY1	Kakumiro	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of gaseous substances causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	1–3	10–13	Pollution Prevention Plan	4	1-2	2	1–3	8–11
124.6	124.6	MCPY2	Mubende	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of gaseous substances causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	1–3	10–13	Pollution Prevention Plan	4	1-2	2	1–3	8–11
184.5	191.2	MCPY3	Sembabule	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of gaseous substances causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	1–3	10–13	Pollution Prevention Plan	4	1-2	2	1–3	8–11
288	288	MCPY4	Kyotera	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of gaseous substances causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	1–3	10–13	Pollution Prevention Plan	4	1-2	2	1–3	8–11
TBC	TBC	Hydrotest Sections	TBC	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of gaseous substances causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	1–3	10–13	Pollution Prevention Plan	4	1-2	2	1–3	8–11
41	41	MCPY1	Kakumiro	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of fine particulate matter causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	2–5	11–15	Pollution Prevention Plan	4	1-2	2	2–5	9–13
124.6	124.6	MCPY2	Mubende	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of fine particulate matter causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	2–5	11–15	Pollution Prevention Plan	4	1-2	2	2–5	9–13
184.5	191.2	MCPY3	Sembabule	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of fine particulate matter causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	2–5	11–15	Pollution Prevention Plan	4	1-2	2	2–5	9–13
288	288	MCPY4	Kyotera	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of fine particulate matter causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	2–5	11–15	Pollution Prevention Plan	4	1-2	2	2–5	9–13
TBC	TBC	Hydrotest Sections	TBC	Release of gases, exhausts and vapours to atmosphere	Air quality	Emissions of fine particulate matter causing reduced air quality from operation of generators		C		–	UG 8.9	6	1-2	2	2–5	11–15	Pollution Prevention Plan	4	1-2	2	2–5	9–13
41	41	MCPY1	Kakumiro	Dust	Air quality	Nuisance from mobilisation of dust by project vehicles		C		–	UG 8.9	4	2	2	1–5	9-13	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	2	2	1–5	7-11
124.6	124.6	MCPY2	Mubende	Dust	Air quality	Nuisance from mobilisation of dust by project vehicles		C		–	UG 8.9	4	2	2	1–5	9-13	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	2	2	1–5	7-11
184.5	191.2	MCPY3	Sembabule	Dust	Air quality	Nuisance from mobilisation of dust by project vehicles		C		–	UG 8.9	4	2	2	1–5	9-13	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	2	2	1–5	7-11

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
288	288	MCPY4	Kyotera	Dust	Air quality	Nuisance from mobilisation of dust by project vehicles		C		–	UG 8.9	4	2	2	1–5	9-13	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	2	2	1–5	7-11
TBC	TBC	Hydrotest Sections	TBC	Dust	Air quality	Nuisance from mobilisation of dust by project vehicles		C		–	UG 8.9	4	1	2	1–5	8-12	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	1	2	1–5	6-10
0	0	PS1	Hoima	Release of gases, exhausts and vapours to atmosphere	Air quality	Increased NO_2 concentrations at ground level from operation of bulk heaters (long and short term)			O		UG 8.9	4	4	2	1	11	Pollution Prevention Plan	4	4	2	1	11
184.5	184.5	PS2	Sembabule	Release of gases, exhausts and vapours to atmosphere	Air quality	Increased NO_2 concentrations at ground level from operation of bulk heaters (long and short term)			O		UG 8.9	4	4	2	1	11	Pollution Prevention Plan	4	4	2	1	11
0	0	PS1	Hoima	Release of gases, exhausts and vapours to atmosphere	Air quality	Increased $PM_{2.5}$ and PM_{10} concentrations at ground level from operation of bulk heaters (long and short term)			O		UG 8.9	4	4	2	3	13	Pollution Prevention Plan	4	4	2	3	13
184.5	184.5	PS2	Sembabule	Release of gases, exhausts and vapours to atmosphere	Air quality	Increased $PM_{2.5}$ and PM_{10} concentrations at ground level from operation of bulk heaters (long and short term)			O		UG 8.9	4	4	2	3	13	Pollution Prevention Plan	4	4	2	3	13
0	11	Guineo–Congolian semi-evergreen forest	Hoima	Loss of habitat	Habitats of conservation importance	Loss of, Guineo–Congolian semi-evergreen forest		C			UG 8.2	6	4	1	5	16	Biodiversity Management Plan. Reinstatement Plan	2	5	1	5	13
TBC	TBC	Wetland forests (riverine forest and swamp forests) located throughout the extent of the pipeline route	TBC	Loss of habitat	Habitats of conservation importance	Loss of wetland forest (swamp and riverine forest)		C			UG 8.2	4	5	1	5	15	Biodiversity Management Plan Reinstatement Plan	2	5	1	5	13
78	82	Taala FR	Kyankwanzi	Loss of habitat	Habitats of conservation importance	Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR		C			UG 8.2	4	5	1	4	14	Biodiversity Management Plan Reinstatement Plan	2	5	1	4	12
78	82	Taala FR	Kyankwanzi	Loss of habitat	Habitats of conservation importance	Temporary loss of habitat from Taala FR		C			UG 8.2	4	3	1	4	12	Biodiversity Management Plan. Reinstatement Plan	2	3	1	4	10
6	6	various	Hoima	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and disturbance to Bohor reedbuck		C			UG 8.2	6	2	2	4	14	Biodiversity Management Plan	4	2	2	4	12
165	165	various	Gomba	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and disturbance to Bohor reedbuck		C			UG 8.3	6	2	2	4	14	Biodiversity Management Plan	4	2	2	4	12
187	187	various	Sembabule	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and disturbance to Bohor reedbuck		C			UG 8.3	6	2	2	4	14	Biodiversity Management Plan	4	2	2	4	12

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
218	231	various	Lwengo	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and disturbance to Bohor reedbuck		C			UG 8.3	6	2	2	4	14	Biodiversity Management Plan	4	2	2	4	12
289	289	various	Rakai	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and disturbance to Bohor reedbuck		C			UG 8.3	6	2	2	4	14	Biodiversity Management Plan	4	2	2	4	12
0	20	Wambabya–Bugoma corridor	Hoima	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of chimpanzee habitat		C			UG 8.3	8	3	4	5	20	Biodiversity Management Plan. Reinstatement plan	6	3	4	5	18
0	20	Wambabya–Bugoma corridor	Hoima	Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Disturbance to chimpanzee		C			UG 8.3	6	3 - 4	4	5	18 - 19	Biodiversity Management Plan	4	3 - 4	4	5	16 - 17
4.5	8	Wambabya	Hoima	Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Noise and visual disturbance to species of conservation importance using the adjacent reserve		C			UG 8.3	4	1	2	4	11	Biodiversity Management Plan. Reinstatement plan	2	1	2	4	9
4.5	8	Wambabya	Hoima	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat, and noise and visual disturbance during construction for grey parrot.		C			UG 8.3	4	2	4	5	15	Biodiversity Management Plan. Reinstatement plan	2	2	4	5	13
36	37	Kafu Crossing	Kakumiro	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance		C			UG 8.3	4	2	2	4	12	Biodiversity Management Plan. Reinstatement plan	2	2	2	4	10
79	80	Wetland on northern edge of Taala FR	Kyankwanzi	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting species of conservation interest and noise and visual disturbance during construction		C			UG 8.3	6	2	3	4	15	Biodiversity Management Plan	4	2	3	4	13
99.5	99.5	Secondary Acacia sp. woodland, bushland and wooded grassland	Mubende	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
276.5	276.5	Secondary Acacia sp. woodland, bushland and wooded grassland	Rakai	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14
201.5	201.5	Secondary Acacia sp. woodland, bushland and wooded grassland	Sembabule	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14
217.5	217.5	Secondary Acacia sp. woodland, bushland and wooded grassland	Lwengo	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14
191.2	191.2	Secondary Acacia sp. woodland, bushland and wooded grassland	Sembabule	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14
178.8	178.8	Secondary Acacia sp. woodland, bushland and wooded grassland	Mubende	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14
93.1	93.1	Swampy grassland with occasional woody species	Mubende	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the endemic *Leucas calostachys*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14
100.1	100.1	Swampy grassland with occasional woody species	Mubende	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the endemic *Leucas calostachys*		C			UG 8.3	6	4	4	2	16	Biodiversity Management Plan	4	4	4	2	14
106	112.6	Swamp forest and Papyrus swamp	Mubende	Loss of Habitat to Species of Conservation Importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting the vascular plant, *Mondia whitei*		C			UG 8.3	6	4	4	3	17	Biodiversity Management Plan	4	4	4	3	15
147	148	River Crossing (Nabakazi River)	Mubende	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance		C			UG 8.3	4	2	2	4	12	Biodiversity Management Plan. Reinstatement plan	2	2	2	4	10

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
164	165	Katonga River	Gomba	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat supporting species of conservation interest, and noise and visual disturbance during construction		C			UG 8.3	8	2	3	3	16	Biodiversity Management Plan	6	2	3	3	14
187	187	Wetland	Sembabule	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of habitat and direct mortality for golden throated rocket frog		C			UG 8.3	6	2	2	4	14	Biodiversity Management Plan	4	2	2	4	12
203	270	Valleys in southern Uganda	Sembabule	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes		C			UG 8.3	6	2	4	5	17	Biodiversity Management Plan	4	2	4	5	15
283	283	MCPY-4	Kyotera	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit from MCPY4		C			UG 8.3	6	3	3	4	16	Biodiversity Management Plan	4	3	3	4	14
288	289	Disused airstrip and associated borrow pits	Rakai	Disturbance or Harm to Wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Noise and visual disturbance to bird and fauna species causing a restriction in species' distributions		C			UG 8.3	6	2	2	4	14	Biodiversity Management Plan	4	2	2	4	12
4.5	8	Wambabya FR	Hoima	Loss of Habitat and Disturbance or Harm to Wildlife	Biodiversity: Legally Protected, Internationally or Nationally Recognised Areas	Loss of ecological function and integrity of protected site through impacts on species and habitats		C	O		UG 8.4	4	5	3	3	15	Biodiversity Management Plan	2	5	3	3	13
78	82	Taala FR	Kyankwanzi	Loss of Habitat and Disturbance or Harm to Wildlife	Biodiversity: Legally Protected, Internationally or Nationally Recognised Areas	Loss of ecological function and integrity of protected site through impacts on species and habitats		C	O		UG 8.4	4	5	3	3	15	Biodiversity Management Plan	2	5	3	3	13
TBC	TBC	All locations sensitive to soil compaction	TBC	Soil compaction	Soil	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development. Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity.		C		–	UG 8.5	8	2	1	4–5	15–16	Biodiversity Management Plan Community Health, Safety and Security Plan Transport and Road Safety Management Plan	6	1	1	4–5	12–13
TBC	TBC	All locations sensitive to soil erosion	TBC	Soil erosion	Soil	Loss of topsoil causing reduced fertility and impaired reinstatement		C		–	UG 8.5	8	2	1	5	16	Soil management plan. Reinstatement plan.	6	4	1	5	16

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
0	0	PAR-PS1 road KP2.5	Hoima	Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water		C		Y	UG 8.6	4	2	1	3	10	Soil management plan. Reinstatement plan. Waste management plan.	2	1	2	3	8
40	40	MCPY1	Kakumiro	Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water		C		Y	UG 8.6	4	2	1	3	10	Soil management plan. Reinstatement plan. Waste management plan.	2	1	2	3	8
126	126	ERU-MCPY2 road KP1.0	Mubende	Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water		C		Y	UG 8.6	4	2	1	3	10	Soil management plan. Reinstatement plan. Waste management plan.	2	1	2	3	8
185	185	ERU-PS2 road KP0.5	Ssembabule	Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water		C		Y	UG 8.6	4	2	1	3	10	Soil management plan. Reinstatement plan. Waste management plan.	2	1	2	3	8
191	191	MCPY3	Ssembabule	Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water		C		Y	UG 8.6	4	2	1	3	10	Soil management plan. Reinstatement plan. Waste management plan.	2	1	2	3	8
283	283	MCPY4	Rakai	Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water		C		Y	UG 8.6	4	2	1	3	10	Soil management plan. Reinstatement plan. Waste management plan.	2	1	2	3	8
126	126	ERU-MCPY2 road KP1.0	Mubende	Erosion and increased suspended sediment in watercourses	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters		C		–	UG 8.6	4	2	1	3	10	Reinstatement plan. Soil management plan.	2	1	1	3	7
185	185	ERU-PS2 road KP0.5	Ssembabule	Erosion and increased suspended sediment in watercourses	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters		C		–	UG 8.6	4	2	1	3	10	Reinstatement plan. Soil management plan.	2	1	1	3	7
191	191	MCPY3	Ssembabule	Erosion and increased suspended sediment in watercourses	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters		C		–	UG 8.6	4	2	1	3	10	Reinstatement plan. Soil management plan.	2	1	1	3	7
283	283	MCPY4	Rakai	Erosion and increased suspended sediment in watercourses	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters		C		–	UG 8.6	4	2	1	3	10	Reinstatement plan. Soil management plan.	2	1	1	3	7
289.3	289.3	Pipeline crossing	Rakai	Erosion and increased suspended sediment in watercourses	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters		C		–	UG 8.6	4	2	1	3	10	Reinstatement plan. Soil management plan.	2	1	1	3	7
--	--	Location to be determined	--	Surface water use	Surface water	Decreased water level due to abstraction for project use		C									Water management plan					
0	0	PS1	Hoima	Management of waste and accidental release of oil or chemicals	Groundwater	Contamination of groundwater		C		Y	UG 8.7	4	1	1	4	10	Waste management plan	2	1	1	4	8

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
185	185	PS2	Ssembabule	Management of waste and accidental release of oil or chemicals	Groundwater	Contamination of groundwater		C		Y	UG 8.7	4	1	1	4	10	Waste management plan	2	1	1	4	8
40	40	MCPY1	Kakumiro	Management of waste and accidental release of oil or chemicals	Groundwater	Contamination of groundwater		C		Y	UG 8.7	4	1	1	4	10	Waste management plan	2	1	1	4	8
126	126	MCPY2	Mubende	Management of waste and accidental release of oil or chemicals	Groundwater	Contamination of groundwater		C		Y	UG 8.7	4	1	1	4	10	Waste management plan	2	1	1	4	8
191	191	MCPY3	Ssembabule	Management of waste and accidental release of oil or chemicals	Groundwater	Contamination of groundwater		C		Y	UG 8.7	4	1	1	4	10	Waste management plan	2	1	1	4	8
283	283	MCPY4	Rakai	Management of waste and accidental release of oil or chemicals	Groundwater	Contamination of groundwater		C		Y	UG 8.7	4	1	1	4	10	Waste management plan	2	1	1	4	8
0	0	PS1	Hoima	Management of black and grey water	Groundwater	Contamination of groundwater		C		Y	UG 8.7	6	1	2	4	13	Pollution prevention plan. Waste management plan.	4	1	2	4	11
185	185	PS2	Ssembabule	Management of black and grey water	Groundwater	Contamination of groundwater		C		Y	UG 8.7	6	1	2	4	13	Pollution prevention plan. Waste management plan.	4	1	2	4	11
40	40	MCPY1	Kakumiro	Management of black and grey water	Groundwater	Contamination of groundwater		C		Y	UG 8.7	6	1	2	4	13	Pollution prevention plan. Waste management plan.	4	1	2	4	11
126	126	MCPY2	Mubende	Management of black and grey water	Groundwater	Contamination of groundwater		C		Y	UG 8.7	6	1	2	4	13	Pollution prevention plan. Waste management plan.	4	1	2	4	11
191	191	MCPY3	Ssembabule	Management of black and grey water	Groundwater	Contamination of groundwater		C		Y	UG 8.7	6	1	2	4	13	Pollution prevention plan. Waste management plan.	4	1	2	4	11
283	283	MCPY4	Rakai	Management of black and grey water	Groundwater	Contamination of groundwater		C		Y	UG 8.7	6	1	2	4	13	Pollution prevention plan. Waste management plan.	4	1	2	4	11
0	0	PS1	Hoima	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use		C		Y	UG 8.7	4	1	2	8	15	Natural resource management plan	2	1	1	4	8
185	185	PS2	Ssembabule	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use		C		Y	UG 8.7	4	1	2	8	15	Natural resource management plan	2	1	1	4	8
40	40	MCPY1	Kakumiro	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use		C		Y	UG 8.7	4	1	2	8	15	Natural resource management plan	2	1	1	4	8
126	126	MCPY2	Mubende	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use		C		Y	UG 8.7	4	1	2	8	15	Natural resource management plan	2	1	1	4	8
191	191	MCPY3	Ssembabule	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use		C		Y	UG 8.7	4	1	2	8	15	Natural resource management plan	2	1	1	4	8

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KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
283	283	MCPY4	Rakai	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use		C		Y	UG 8.7	4	1	2	8	15	Natural resource management plan	2	1	1	4	8
0	0	PS1	Hoima	Visual intrusion of project components into landscape	Landscape	Change of landscape character	Construction and commissioning of the AGIs	C			UG 8.8	6	2	2	2	12	Reinstatement plan	6	2	2	2	12
184.5	184.5	PS2	Sembabule	Visual intrusion of project components into landscape	Landscape	Change of landscape character	Construction and commissioning of the AGIs	C			UG 8.8	6	2	2	2	12	Reinstatement plan	6	2	2	2	12
0	0	PS1	Hoima	Visual intrusion of project components into landscape	Landscape	Change of landscape character	Operation of the AGIs		O		UG 8.8	6	4	2	2	14	Reinstatement plan Pollution prevention plan	6	4	2	2	14
184.5	184.5	PS2	Sembabule	Visual intrusion of project components into landscape	Landscape	Change of landscape character	Operation of the AGIs		O		UG 8.8	6	4	2	2	14	Reinstatement plan Pollution prevention plan	6	4	2	2	14
0	0	PS1	Hoima	Visual intrusion of project components into landscape	Landscape	Change of views	Construction and commissioning of the AGIs	C			UG 8.8	4	2	2	2	10	Reinstatement plan	4	2	2	2	10
184.5	184.5	PS2	Sembabule	Visual intrusion of project components into landscape	Landscape	Change of views	Construction and commissioning of the AGIs	C			UG 8.8	4	2	2	2	10	Reinstatement plan	4	2	2	2	10
0	0	PS1	Hoima	Visual intrusion of project components into landscape	Landscape	Change of views	Operation of the AGIs		O		UG 8.8	4	4	2	2	12	Reinstatement plan Pollution prevention plan	4	4	2	2	12
184.5	184.5	PS2	Sembabule	Visual intrusion of project components into landscape	Landscape	Change of views	Operation of the AGIs		O		UG 8.8	4	4	2	2	12	Reinstatement plan Pollution prevention plan	4	4	2	2	12
TBC	TBC	Side Slope Areas with Permanent Benching	Various	Visual intrusion of project components into landscape	Landscape	Change of landscape character	Permanent benching of RoW in side slope areas	C			UG 8.8	6	5	5	2	15	Reinstatement plan Soil management plan	4	5	2	2	13
TBC	TBC	Side Slope Areas with Permanent Benching	Various	Visual intrusion of project components into landscape	Landscape	Change of views	In areas of permanent benching of RoW in side slope areas affecting views from small settlements, farms and unsealed roads	C			UG 8.8	6	5	5	2	15	Reinstatement plan Soil management plan	4	5	2	2	13
41	41	MCPY1	Kakumiro	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during development of construction facilities		C		–	UG 8.10	10	1	2	4	17	Pollution Prevention Plan	4	1	2	4	11
124.6	124.6	MCPY2	Mubende	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during development of construction facilities		C		–	UG 8.10	10	1	2	4	17	Pollution Prevention Plan	4	1	2	4	11
184.5	191.2	MCPY3	Sembabule	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during		C		–	UG 8.10	10	1	2	4	17	Pollution Prevention Plan	4	1	2	4	11

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KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
						development of construction facilities																
288	288	MCPY4	Kyotera	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during development of construction facilities		C		–	UG 8.10	2	1	2	4	9	Pollution Prevention Plan	2	1	2	4	9
41	41	MCPY1	Kakumiro	Vibration	Acoustic Environment	Disturbance or damage due to noise or vibration generation during development of construction facilities		C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
124.6	124.6	MCPY2	Mubende	Vibration	Acoustic Environment	Disturbance or damage due to noise or vibration generation during development of construction facilities		C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
184.5	191.2	MCPY3	Sembabule	Vibration	Acoustic Environment	Disturbance or damage due to noise or vibration generation during development of construction facilities		C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
288	288	MCPY4	Kyotera	Vibration	Acoustic Environment	Disturbance or damage due to noise or vibration generation during development of construction facilities		C		–	UG 8.10	2	1	2	4	9	Pollution Prevention Plan Stakeholder Engagement Plan	2	1	2	4	9
41	41	MCPY1	Kakumiro	Noise	Acoustic Environment	Disturbance or nuisance from operation of the MCPYs		C		–	UG 8.10	10	2	2	4	18	Pollution Prevention Plan	4	2	2	4	12
124.6	124.6	MCPY2	Mubende	Noise	Acoustic Environment	Disturbance or nuisance from operation of the MCPYs		C		–	UG 8.10	10	2	2	4	18	Pollution Prevention Plan	4	2	2	4	12
184.5	191.2	MCPY3	Sembabule	Noise	Acoustic Environment	Disturbance or nuisance from operation of the MCPYs		C		–	UG 8.10	10	2	2	4	18	Pollution Prevention Plan	4	2	2	4	12
288	288	MCPY4	Kyotera	Noise	Acoustic Environment	Disturbance or nuisance from operation of the MCPYs		C		–	UG 8.10	2	2	2	4	10	Pollution Prevention Plan	2	2	2	4	10
41	41	MCPY1	Kakumiro	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities		C		–	UG 8.10	10	1	2	4	17	Pollution Prevention Plan	4	1	2	4	11
124.6	124.6	MCPY2	Mubende	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities		C		–	UG 8.10	10	1	2	4	17	Pollution Prevention Plan	4	1	2	4	11
184.5	191.2	MCPY3	Sembabule	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities		C		–	UG 8.10	10	1	2	4	17	Pollution Prevention Plan	4	1	2	4	11
288	288	MCPY4	Kyotera	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities		C		–	UG 8.10	2	1	2	4	9	Pollution Prevention Plan	2	1	2	4	9
41	41	MCPY1	Kakumiro	Vibration	Acoustic Environment	Disturbance or damage from vibration generation during decommissioning of construction facilities		C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
124.6	124.6	MCPY2	Mubende	Vibration	Acoustic Environment	Disturbance or damage from vibration generation during decommissioning of construction facilities		C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
184.5	191.2	MCPY3	Sembabule	Vibration	Acoustic Environment	Disturbance or damage from vibration generation during decommissioning of construction facilities		C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
288	288	MCPY4	Kyotera	Vibration	Acoustic Environment	Disturbance or damage from vibration generation during decommissioning of construction facilities		C		–	UG 8.10	4	1	2	4	11	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
0	0	PS1	Hoima	Noise	Acoustic Environment	Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations.			O		UG 8.10	8	4	2	4	18	Pollution Prevention Plan	4	4	2	4	14
184.5	184.5	PS2	Sembabule	Noise	Acoustic Environment	Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations.			O		UG 8.10	8	4	2	4	18	Pollution Prevention Plan	4	4	2	4	14
0	0	Kayere	Hoima	Provision of Goods and Services	Local economy (nonland-based livelihoods)	Improvements in road conditions for business owners and public transport		C		Y	UG 8.12	B	–	–	–	–	–	B	–	–	–	–
1.5	1.5	Katooke	Hoima	Provision of Goods and Services	Local economy (nonland-based livelihoods)	Improvements in road conditions for business owners and public transport		C		Y	UG 8.12	B	–	–	–	–	–	B	–	–	–	–
41	41	Katikara Trading Centre	Kakumiro	Employment	Local economy (nonland-based livelihoods)	Competition over employment opportunities		C		Y	UG 8.12	10	2	2	5	19	Project-induced in-migration management plan. Stakeholder engagement plan.	6	2	2	5	15
125.5	125.5	Kyenda	Mubende	Employment	Local economy (nonland-based livelihoods)	Competition over employment opportunities		C		Y	UG 8.12	10	2	2	5	19	Project-induced in-migration management plan. Stakeholder engagement plan.	6	2	2	5	15
190	190	Sembabule Market Zone	Sembabule	Employment	Local economy (nonland-based livelihoods)	Competition over employment opportunities		C		Y	UG 8.12	10	2	2	5	19	Project-induced in-migration management plan. Stakeholder engagement plan.	6	2	2	5	15
61	61	Buswabwera	Kakumiro	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15
111	111	Kabulasoke	Mubende	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15
124.5	124.5	Kagoma	Mubende	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15
125.5	125.5	Kyenda	Mubende	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15
160.5	160.5	Kyengera	Gomba	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15

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KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
189	189	Nsambya	Sembabule	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15
240	240	Bukulula	Lwengo	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15
287.5	287.5	Lukoma	Kyotera	Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences		C		-	UG 8.12	8	2	2	5	17	Infrastructure and utilities management plan. Stakeholder engagement plan.	6	2	2	5	15
295.5	295.5	Mutukula Town	Kyotera	Employment	Local economy (nonland-based livelihoods)	Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities		C		Y	UG 8.12	10	2	2	5	19	Stakeholder engagement plan. Project-induced in-migration management plan.	6	2	2	5	15
295.5	295.5	Mutukula Town	Kyotera	Employment	Local economy (nonland-based livelihoods)	Competition over employment opportunities		C		Y	UG 8.12	10	2	2	5	19	Stakeholder engagement plan. Project-induced in-migration management plan.	6	2	2	5	15
40	40	PACs near MCPY1	Kakumiro	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of grazing land		C		Y	UG 8.13	10	5	1	5	21	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
125	125	PACs near MCPY2	Mubende	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of grazing land		C		Y	UG 8.13	10	5	1	5	21	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
195.5	195.5	PACs near MCPY3	Sembabule	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of grazing land		C		Y	UG 8.13	10	5	1	5	21	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
283	283	PACs near MCPY4	Kyotera	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of grazing land		C		Y	UG 8.13	10	5	1	5	21	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
40	40	PACs near MCPY1	Kakumiro	Employment	Land-based livelihoods	Household members seeking employment with the project will no longer be available for land-based livelihood activities		C		-	UG 8.13	8	3	1	4	16	Stakeholder engagement plan. Labour management plan.	4	3	1	4	12
125	125	PACs near MCPY2	Mubende	Employment	Land-based livelihoods	Household members seeking employment with the project will no longer be available for land-based livelihood activities		C		-	UG 8.13	8	3	1	4	16	Stakeholder engagement plan. Labour management plan.	4	3	1	4	12
195.5	195.5	PACs near MCPY3	Sembabule	Employment	Land-based livelihoods	Household members seeking employment with the project will no longer be available for land-based livelihood activities		C		-	UG 8.13	8	3	1	4	16	Stakeholder engagement plan. Labour management plan.	4	3	1	4	12
283	283	PACs near MCPY4	Kyotera	Employment	Land-based livelihoods	Household members seeking employment with the project will no longer be available for land-based livelihood activities		C		-	UG 8.13	8	3	1	4	16	Stakeholder engagement plan. Labour management plan.	4	3	1	4	12
0	240	PACs located in areas of high value crop production	Hoima, Kakumiro and Lwengo	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of land cultivated with high value cash crops		C		Y	UG 8.13	10	5	1	4	20	Resettlement action plan. Stakeholder engagement plan.	4	2	1	4	11

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								C	O			M	D	E	S	SS		M	D	E	S	SS
69	112	PACs where there is a concertration of gold ASM activities	Kakumiro, Kyankwanzi and Mubende	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of access to artisanal gold mining sites		C		Y	UG 8.13	10	4	1	5	20	Resettlement action plan. Stakeholder engagement plan.	4	2	1	4	11
53	289	PACs close to livestock watering points identified within the RoW	Kakumiro, Gomba, Sembabule, Lwengo, Kyotera	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Temporary loss of access to livestock watering points		C		Y	UG 8.13	8	2	1	4	15	Resettlement action plan. Stakeholder engagement plan.	4	2	1	4	11
0	0	PACs near PS1	Hoima	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of grazing land		C		Y	UG 8.13	10	5	1	5	21	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
184.5	184.5	PACs near PS2	Sembabule	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of grazing land		C		Y	UG 8.13	10	5	1	5	21	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	4	2	1	5	12
0	0	PACs near PS1	Hoima	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Accidental damage to crops during maintenance activities			O	-	UG 8.13	6	1	1	5	13	Stakeholder engagement plan. Resettlement action plan.	4	1	1	5	11
184.5	184.5	PACs near PS2	Sembabule	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Accidental damage to crops during maintenance activities			O	-	UG 8.13	6	1	1	5	13	Stakeholder engagement plan. Resettlement action plan.	4	1	1	5	11
40	40	PACs near MCPY1	Kakumiro	PIIM	River and lake-based livelihoods	Reduction in local fish stocks due to PIIM		C		Y	UG 8.14	6	2	1	3	12	Project-induced in-migration management plan.	4	2	1	3	10
125	125	PACs near MCPY2	Mubende	PIIM	River and lake-based livelihoods	Reduction in local fish stocks due to PIIM		C		Y	UG 8.14	6	2	1	3	12	Project-induced in-migration management plan.	4	2	1	3	10
195.5	195.5	PACs near MCPY3	Sembabule	PIIM	River and lake-based livelihoods	Reduction in local fish stocks due to PIIM		C		Y	UG 8.14	6	2	1	3	12	Project-induced in-migration management plan.	4	2	1	3	10
283	283	PACs near MCPY4	Kyotera	PIIM	River and lake-based livelihoods	Reduction in local fish stocks due to PIIM		C		Y	UG 8.14	6	2	1	3	12	Project-induced in-migration management plan.	4	2	1	3	10
36.5	274	PACs close to pipeline river crossings	Hoima, Kakumiro, Mubende, Gomba, Sembabule, Kyotera	Impeded flow of river or channel	River and lake-based livelihoods	Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction.		C		-	UG 8.14	8	2	1	5	16	Pollution prevention plan. Reinstatement plan.	4	2	1	2	9
40	40	PACs near MCPY1	Kakumiro	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	2	5	22	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
125	125	PACs near MCPY2	Mubende	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	2	5	22	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
195.5	195.5	PACs near MCPY3	Sembabule	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	2	5	22	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
283	283	PACs near MCPY4	Kyotera	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	2	5	22	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
40	40	PACs near MCPY1	Kakumiro	Resettlement	Land and property	Land specilation by third parties		C		Y	UG 8.15	10	2	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
125	125	PACs near MCPY2	Mubende	Resettlement	Land and property	Land specilation by third parties		C		Y	UG 8.15	10	2	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
195.5	195.5	PACs near MCPY3	Sembabule	Resettlement	Land and property	Land specilation by third parties		C		Y	UG 8.15	10	2	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
283	283	PACs near MCPY4	Kyotera	Resettlement	Land and property	Land specilation by third parties		C		Y	UG 8.15	10	2	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
40	40	PACs near MCPY1	Kakumiro	Resettlement	Land and property	Land and property speculation by land owners		C		Y	UG 8.15	8	2	1	4	15	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	4	11
125	125	PACs near MCPY2	Mubende	Resettlement	Land and property	Land and property speculation by land owners		C		Y	UG 8.15	8	2	1	4	15	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	4	11
195.5	195.5	PACs near MCPY3	Sembabule	Resettlement	Land and property	Land and property speculation by land owners		C		Y	UG 8.15	8	2	1	4	15	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	4	11
283	283	PACs near MCPY4	Kyotera	Resettlement	Land and property	Land and property speculation by land owners		C		Y	UG 8.15	8	2	1	4	15	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	4	11
40	40	PACs near MCPY1	Kakumiro	Resettlement	Land and property	New disputes and exacerbation of pre-existing disputes and conflict around land and property		C		Y	UG 8.15	10	4	1	5	20	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	6	4	1	5	16
125	125	PACs near MCPY2	Mubende	Resettlement	Land and property	New disputes and exacerbation of pre-existing disputes and conflict around land and property		C		Y	UG 8.15	10	4	1	5	20	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	6	4	1	5	16
195.5	195.5	PACs near MCPY3	Sembabule	Resettlement	Land and property	New disputes and exacerbation of pre-existing		C		Y	UG 8.15	10	4	1	5	20	Resettlement action plan. Stakeholder engagement plan. Community health,	6	4	1	5	16

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
						disputes and conflict around land and property											safety and security plan. Monitoring and reporting plan.					
283	283	PACs near MCPY4	Kyotera	Resettlement	Land and property	New disputes and exacerbation of pre-existing disputes and conflict around land and property		C		Y	UG 8.15	10	4	1	5	20	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	6	4	1	5	16
40	40	PACs near MCPY1	Kakumiro	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
125	125	PACs near MCPY2	Mubende	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
195.5	195.5	PACs near MCPY3	Sembabule	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
283	283	PACs near MCPY4	Kyotera	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
40	40	PACs near MCPY1	Kakumiro	Resettlement	Land and property	Permanent loss of local enterprises due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
125	125	PACs near MCPY2	Mubende	Resettlement	Land and property	Permanent loss of local enterprises due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
195.5	195.5	PACs near MCPY3	Sembabule	Resettlement	Land and property	Permanent loss of local enterprises due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
283	283	PACs near MCPY4	Kyotera	Resettlement	Land and property	Permanent loss of local enterprises due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
15	22.5	PACs located between KP15 to KP22.5	Hoima	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
75	82.5	PACs located between KP75 to KP82.5	Kyankwanzi	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12

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KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
90	97.5	PACs located between KP90 to KP97.5	Mubende	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
127.5	135	PACs located between KP127.5 to KP135	Mubende	Resettlement	Land and property	Permanent loss of private land due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
15	22.5	PACs located between KP15 to KP22.5	Hoima	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
75	82.5	PACs located between KP75 to KP82.5	Kyankwanzi	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
90	97.5	PACs located between KP90 to KP97.5	Mubende	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
127.5	135	PACs located between KP127.5 to KP135	Mubende	Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition		C		Y	UG 8.15	10	5	1	5	21	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
0.5	15	PACs located between KP0.5 and KP15	Hoima	Resettlement	Land and property	Land speculation by third parties		C		Y	UG 8.15	10	2	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
190	190	Sembabule Market Zone	Sembabule	Resettlement	Land and property	Land speculation by third parties		C		Y	UG 8.15	10	2	1	5	18	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	4	2	1	5	12
0.5	15	PACs located between KP0.5 and KP15	Hoima	Resettlement	Land and property	New disputes and exacerbation of pre-existing disputes and conflict around land and property		C		Y	UG 8.15	10	4	1	5	20	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	6	4	1	5	16
190	190	Sembabule Market Zone	Sembabule	Resettlement	Land and property	New disputes and exacerbation of pre-existing disputes and conflict around land and property		C		Y	UG 8.15	10	4	1	5	20	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	6	4	1	5	16
40	40	PACs near MCPY1	Kakumiro	Employment	Workers' health, safety and welfare	Increased risk of vector-related diseases amongst the local workforce		C		-	UG 8.16	8	4	1	5	18	Occupational health, safety and security plan	4	2	1	5	12
125	125	PACs near MCPY2	Mubende	Employment	Workers' health, safety and welfare	Increased risk of vector-related diseases amongst the local workforce		C		-	UG 8.16	8	4	1	5	18	Occupational health, safety and security plan	4	2	1	5	12

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KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
195.5	195.5	PACs near MCPY3	Sembabule	Employment	Workers' health, safety and welfare	Increased risk of vector-related diseases amongst the local workforce		C		-	UG 8.16	8	4	1	5	18	Occupational health, safety and security plan	4	2	1	5	12
283	283	PACs near MCPY4	Kyotera	Employment	Workers' health, safety and welfare	Increased risk of vector-related diseases amongst the local workforce		C		-	UG 8.16	8	4	1	5	18	Occupational health, safety and security plan	4	2	1	5	12
41	41	Katikara Trading Centre	Kakumiro	Use of Road Network	Social infrastructure and services	Traffic congestion leading to delays		C		-	UG 8.17	10	2	2	5	19	Stakeholder engagement plan. Transport and road safety management plan.	6	2	2	3	13
125.5	125.5	Kyenda	Mubende	Use of Road Network	Social infrastructure and services	Traffic congestion leading to delays		C		-	UG 8.17	10	2	2	5	19	Stakeholder engagement plan. Transport and road safety management plan.	6	2	2	3	13
190	190	Sembabule Market Zone	Sembabule	Use of Road Network	Social infrastructure and services	Traffic congestion leading to delays		C		-	UG 8.17	10	2	2	5	19	Stakeholder engagement plan. Transport and road safety management plan.	6	2	2	3	13
295.5	295.5	Mutukula Town	Kyotera	Use of Road Network	Social infrastructure and services	Traffic congestion leading to delays		C		-	UG 8.17	10	2	2	5	19	Stakeholder engagement plan. Transport and road safety management plan.	6	2	2	3	13
40	40	PACs near MCPY1	Kakumiro	Abstraction of Groundwater	Community health	Reduced availability of groundwater		C		Y	UG 8.18	6	2	2	4	14	Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	1	2	4	11
125	125	PACs near MCPY2	Mubende	Abstraction of Groundwater	Community health	Reduced availability of groundwater		C		Y	UG 8.18	6	2	2	4	14	Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	1	2	4	11
195.5	195.5	PACs near MCPY3	Sembabule	Abstraction of Groundwater	Community health	Reduced availability of groundwater		C		Y	UG 8.18	6	2	2	4	14	Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	1	2	4	11
283	283	PACs near MCPY4	Kyotera	Abstraction of Groundwater	Community health	Reduced availability of groundwater		C		Y	UG 8.18	6	2	2	4	14	Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	1	2	4	11
40	40	PACs near MCPY1	Kakumiro	Employment	Community health	The transmission of communicable diseases between the project's externally contracted workforce and PACs		C		Y	UG 8.18	10	4	2	5	21	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	2	2	5	15
125	125	PACs near MCPY2	Mubende	Employment	Community health	The transmission of communicable diseases between the project's externally contracted workforce and PACs		C		Y	UG 8.18	10	4	2	5	21	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan.	6	2	2	5	15

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KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
																	Stakeholder engagement plan.					
195.5	195.5	PACs near MCPY3	Sembabule	Employment	Community health	The transmission of communicable diseases between the project's externally contracted workforce and PACs		C		Y	UG 8.18	10	4	2	5	21	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	2	2	5	15
283	283	PACs near MCPY4	Kyotera	Employment	Community health	The transmission of communicable diseases between the project's externally contracted workforce and PACs		C		Y	UG 8.18	10	4	2	5	21	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	2	2	5	15
40	40	PACs near MCPY1	Kakumiro	Employment	Community health	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities		C		-	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	1	5	12
125	125	PACs near MCPY2	Mubende	Employment	Community health	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities		C		-	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	1	5	12
195.5	195.5	PACs near MCPY3	Sembabule	Employment	Community health	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities		C		-	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	1	5	12
283	283	PACs near MCPY4	Kyotera	Employment	Community health	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities		C		-	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	1	5	12
40	40	PACs near MCPY1	Kakumiro	Employment	Community health	Outbreaks of infectious conditions within MCPYs affecting the health of PACs		C		Y	UG 8.18	10	4	1	5	20	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution	6	4	1	4	15

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KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
																	prevention plan. Waste management plan. Stakeholder engagement plan.					
125	125	PACs near MCPY2	Mubende	Employment	Community health	Outbreaks of infectious conditions within MCPYs affecting the health of PACs		C		Y	UG 8.18	10	4	1	5	20	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	4	1	4	15
195.5	195.5	PACs near MCPY3	Sembabule	Employment	Community health	Outbreaks of infectious conditions within MCPYs affecting the health of PACs		C		Y	UG 8.18	10	4	1	5	20	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	4	1	4	15
283	283	PACs near MCPY4	Kyotera	Employment	Community health	Outbreaks of infectious conditions within MCPYs affecting the health of PACs		C		Y	UG 8.18	10	4	1	5	20	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	4	1	4	15
40	40	PACs near MCPY1	Kakumiro	PIIM	Community health	PIIM of jobseekers affecting PACs by:	carrying communicable diseases	C		Y	UG 8.18	8	5	3	5	21	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	6	4	3	5	18
125	125	PACs near MCPY2	Mubende	PIIM	Community health	PIIM of jobseekers affecting PACs by:	carrying communicable diseases	C		Y	UG 8.18	8	5	3	5	21	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	6	4	3	5	18
195.5	195.5	PACs near MCPY3	Sembabule	PIIM	Community health	PIIM of jobseekers affecting PACs by:	carrying communicable diseases	C		Y	UG 8.18	8	5	3	5	21	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	6	4	3	5	18
283	283	PACs near MCPY4	Kyotera	PIIM	Community health	PIIM of jobseekers affecting PACs by:	carrying communicable diseases	C		Y	UG 8.18	8	5	3	5	21	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	6	4	3	5	18
40	40	PACs near MCPY1	Kakumiro	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing environmental changes in PACs that promote vector breeding	C		Y	UG 8.18	8	3	2	4	17	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste	6	3	2	4	15

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
																	management plan. Stakeholder engagement plan.					
125	125	PACs near MCPY2	Mubende	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing environmental changes in PACs that promote vector breeding	C		Y	UG 8.18	8	3	2	4	17	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	3	2	4	15
195.5	195.5	PACs near MCPY3	Sembabule	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing environmental changes in PACs that promote vector breeding	C		Y	UG 8.18	8	3	2	4	17	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	3	2	4	15
283	283	PACs near MCPY4	Kyotera	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing environmental changes in PACs that promote vector breeding	C		Y	UG 8.18	8	3	2	4	17	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	6	3	2	4	15
40	40	PACs near MCPY1	Kakumiro	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing increased pressure on existing health services at the PAC level	C		Y	UG 8.18	6	3	2	5	16	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
125	125	PACs near MCPY2	Mubende	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing increased pressure on existing health services at the PAC level	C		Y	UG 8.18	6	3	2	5	16	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan.	4	2	2	5	13

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
																	Stakeholder engagement plan.					
195.5	195.5	PACs near MCPY3	Sembabule	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing increased pressure on existing health services at the PAC level	C		Y	UG 8.18	6	3	2	5	16	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
283	283	PACs near MCPY4	Kyotera	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing increased pressure on existing health services at the PAC level	C		Y	UG 8.18	6	3	2	5	16	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
40	40	PACs near MCPY1	Kakumiro	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing uncontrolled disposal of waste in PACs	C		-	UG 8.18	6	2	2	5	15	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
125	125	PACs near MCPY2	Mubende	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing uncontrolled disposal of waste in PACs	C		-	UG 8.18	6	2	2	5	15	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
195.5	195.5	PACs near MCPY3	Sembabule	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing uncontrolled disposal of waste in PACs	C		-	UG 8.18	6	2	2	5	15	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
283	283	PACs near MCPY4	Kyotera	PIIM	Community health	PIIM of jobseekers affecting PACs by:	causing uncontrolled disposal of waste in PACs	C		-	UG 8.18	6	2	2	5	15	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
40	40	PACs near MCPY1	Kakumiro	PIIM	Community health	Reduction in the availability of potable water in PACs due to PIIM		C		Y	UG 8.18	8	4	2	5	19	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
125	125	PACs near MCPY2	Mubende	PIIM	Community health	Reduction in the availability of potable water in PACs due to PIIM		C		Y	UG 8.18	8	4	2	5	19	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
195.5	195.5	PACs near MCPY3	Sembabule	PIIM	Community health	Reduction in the availability of potable water in PACs due to PIIM		C		Y	UG 8.18	8	4	2	5	19	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
283	283	PACs near MCPY4	Kyotera	PIIM	Community health	Reduction in the availability of potable water in PACs due to PIIM		C		Y	UG 8.18	8	4	2	5	19	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
40	40	PACs near MCPY1	Kakumiro	Provision of Goods and Services	Community health	Nutrition of PACs compromised by reduced food security		C		Y	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
125	125	PACs near MCPY2	Mubende	Provision of Goods and Services	Community health	Nutrition of PACs compromised by reduced food security		C		Y	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
195.5	195.5	PACs near MCPY3	Sembabule	Provision of Goods and Services	Community health	Nutrition of PACs compromised by reduced food security		C		Y	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
283	283	PACs near MCPY4	Kyotera	Provision of Goods and Services	Community health	Nutrition of PACs compromised by reduced food security		C		Y	UG 8.18	8	2	2	5	17	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	4	2	2	5	13
0	0	PACs near PS1	Hoima	Disposal of Solid and Liquid Waste	Community health	Increased pressure on regional waste management facilities due to project activities			O	-	UG 8.18	6	4	2	5	17	Waste management plan.	4	4	2	5	15
184.5	184.5	PACs near PS2	Sembabule	Disposal of Solid and Liquid Waste	Community health	Increased pressure on regional waste management facilities due to project activities			O	-	UG 8.18	6	4	2	5	17	Waste management plan.	4	4	2	5	15
40	40	PACs near MCPY1	Kakumiro	Community Dynamics	Community safety, security and welfare	Change in local community dynamics due to employment opportunities		C		Y	UG 8.19	6	3	2	4	15	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
125	125	PACs near MCPY2	Mubende	Community Dynamics	Community safety, security and welfare	Change in local community dynamics due to employment opportunities		C		Y	UG 8.19	6	3	2	4	15	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
195.5	195.5	PACs near MCPY3	Sembabule	Community Dynamics	Community safety, security and welfare	Change in local community dynamics due to employment opportunities		C		Y	UG 8.19	6	3	2	4	15	Project-induced in-migration management plan. Community health, safety and	4	2	2	4	12

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
																	security plan. Stakeholder engagement plan.					
283	283	PACs near MCPY4	Kyotera	Community Dynamics	Community safety, security and welfare	Change in local community dynamics due to employment opportunities		C		Y	UG 8.19	6	3	2	4	15	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
40	40	PACs near MCPY1	Kakumiro	Community Dynamics	Community safety, security and welfare	PIIM causing an increase in social ills		C		Y	UG 8.19	6	2	2	4	14	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
125	125	PACs near MCPY2	Mubende	Community Dynamics	Community safety, security and welfare	PIIM causing an increase in social ills		C		Y	UG 8.19	6	2	2	4	14	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
195.5	195.5	PACs near MCPY3	Sembabule	Community Dynamics	Community safety, security and welfare	PIIM causing an increase in social ills		C		Y	UG 8.19	6	2	2	4	14	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
283	283	PACs near MCPY4	Kyotera	Community Dynamics	Community safety, security and welfare	PIIM causing an increase in social ills		C		Y	UG 8.19	6	2	2	4	14	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
40	40	PACs near MCPY1	Kakumiro	Community Dynamics	Community safety, security and welfare	Tensions between non-local construction workforce and PACs		C		Y	UG 8.19	8	2	2	5	17	Community health, safety and security plan. Stakeholder engagement plan. Resettlement action plan.	4	2	2	5	13
125	125	PACs near MCPY2	Mubende	Community Dynamics	Community safety, security and welfare	Tensions between non-local construction workforce and PACs		C		Y	UG 8.19	8	2	2	5	17	Community health, safety and security plan. Stakeholder engagement plan. Resettlement action plan.	4	2	2	5	13
195.5	195.5	PACs near MCPY3	Sembabule	Community Dynamics	Community safety, security and welfare	Tensions between non-local construction workforce and PACs		C		Y	UG 8.19	8	2	2	5	17	Community health, safety and security plan. Stakeholder engagement plan. Resettlement action plan.	4	2	2	5	13
283	283	PACs near MCPY4	Kyotera	Community Dynamics	Community safety, security and welfare	Tensions between non-local construction workforce and PACs		C		Y	UG 8.19	8	2	2	5	17	Community health, safety and security plan. Stakeholder engagement plan. Resettlement action plan.	4	2	2	5	13
295.5	295.5	Mutukula Town	Kyotera	Community Dynamics	Community safety, security and welfare	PIIM causing an increase in social ills		C		Y	UG 8.19	6	2	2	4	14	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	4	2	2	4	12
40	40	PACs near MCPY1	Kakumiro	Community Welfare	Community safety, security and welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs		C		Y	UG 8.19	B	–	–	–	–	–	B	–	–	–	–
125	125	PACs near MCPY2	Mubende	Community Welfare	Community safety, security and welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs		C		Y	UG 8.19	B	–	–	–	–	–	B	–	–	–	–

Table E3-1 Location-Specific Impacts Register

KP Start	KP End	Location	District	Aspect	VEC	Potential Impact	Impact Detail	Phase		High Stakeholder Concern	ESIA Section	Pre-Mitigation Impact					Management Plan(s)	Residual Impacts				
								C	O			M	D	E	S	SS		M	D	E	S	SS
195.5	195.5	PACs near MCPY3	Sembabule	Community Welfare	Community safety, security and welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs		C		Y	UG 8.19	B	–	–	–	–	–	B	–	–	–	–
283	283	PACs near MCPY4	Kyotera	Community Welfare	Community safety, security and welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs		C		Y	UG 8.19	B	–	–	–	–	–	B	–	–	–	–
11	11	CHU129: Pentecostal Church. Category 2 tangible cultural heritage with strong intangible element	Hoima	Disturbance or loss of cultural heritage	Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature		C		Y	UG 8.20	1	1	1	6	9	Cultural Heritage Management Plan	1	1	1	6	9
26.4	26.4	CHU159: Fellowship Church. Category 2 tangible cultural heritage with strong intangible element	Hoima	Disturbance or loss of cultural heritage	Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature		C		Y	UG 8.20	1	1	1	6	9	Cultural Heritage Management Plan	1	1	1	6	9
43.15	43.15	CUH441: Pentecostal Church. Category 2 tangible cultural heritage with strong intangible element	Kakumiro	Disturbance or loss of cultural heritage	Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature		C		Y	UG 8.20	1	1	1	6	9	Cultural Heritage Management Plan	1	1	1	6	9
50.16	50.16	CUH445: Pentecostal Church. Category 2 tangible cultural heritage with strong intangible element	Kakumiro	Disturbance or loss of cultural heritage	Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature		C		Y	UG 8.20	1	1	1	6	9	Cultural Heritage Management Plan	1	1	1	6	9
184.8	184.8	CHU413: Kraal. Category 1 tangible cultural heritage	Sembabule	Disturbance or loss of cultural heritage	Category 1 tangible cultural heritage	Damage or disturbance of feature		C		TBC	UG 8.20	1	5	1	6	13	Cultural Heritage Management Plan	1	5	1	6	13
226.5	226.5	CHU398: Kyawagonya Cemetery. Category 2 tangible cultural heritage with strong intangible element	Lwengo	Disturbance or loss of cultural heritage	Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature		C		Y	UG 8.20	2-3	5	1	8	16-17	Cultural Heritage Management Plan	2-3	1	1	8	12-13
244.6	244.6	CHU399: Kanga / Rusheshe cemetery. Category 2 tangible cultural heritage with strong intangible element	Kyotera	Disturbance or loss of cultural heritage	Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature		C		Y	UG 8.20	2	5	1	8	16	Cultural Heritage Management Plan	2	1	1	8	12
277.5	277.5	CHU401: Kasoga Cemetery. Category 2 tangible cultural heritage with strong intangible element	Kyotera	Disturbance or loss of cultural heritage	Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature.		C		Y	UG 8.20	1	1	1	8	11	Cultural Heritage Management Plan	1	1	1	8	11

E4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

A4.1 Introduction

This ESIA appendix lists the mitigation measures developed throughout the impact assessment in order to avoid or reduce the potential impacts on VECs. These mitigation commitments form the minimum content of the project's environmental and social management plans and will be implemented throughout project lifetime.

The mitigation measures can either be generic, i.e., apply throughout the project to the identified project components, or location specific. Each mitigation measure is given a unique code, e.g., SOL for soil and a number, see Table E4.1-1 for a list of the codes and the primary section where they are described.

Table E4.1-1 Mitigation Measure Codes and Associated Primary Section

Code	Topic	Primary Impact Assessment Subsection
ACO	Acoustics	8.10 Acoustic Environment
AIR	Air quality	8.9 Air Quality
BIO	Biodiversity	8.2 Biodiversity: Habitats of Conservation Importance 8.3 Biodiversity: Flora and Fauna Species of Conservation Importance 8.4 Biodiversity: Legally Protected, Internationally or Nationally Recognised Areas
CHSW	Community health, safety, security and welfare	8.18 Community Health 8.19 Community Safety, Security and Welfare
CUH	Cultural heritage	8.20 Tangible and Intangible Cultural Heritage
ECO	Economy	8.11 Economy 8.12 Local Economy
GNL	General	Cross-cutting mitigations and cumulative impacts mitigations – various subsections
HR	Human rights	Cross-cutting mitigations – various subsections
INF	Infrastructure and services	8.17 Social Infrastructure and Services
LIV	Livelihoods	8.13 Land-Based Livelihoods 8.14 River and Lake-Based Livelihoods

Table E4.1-1 Mitigation Measure Codes and Associated Primary Section

Code	Topic	Primary Impact Assessment Subsection
LNP	Land and property	8.15 Land and Property
LSC	Landscape	8.8 Landscape
RES	Resource management	8.21 Ecosystem Services
SOL	Soil	8.5 Soil
WHSW	Workers health, safety and welfare	8.16 Workers' Health, Safety and Welfare
WTR	Water	8.6 Surface water 8.7 Groundwater

Additional mitigation measures may be developed after the ESIA report issue where the need for further impact control is identified.

A4.2 Construction Phase

A4.2.1 Biodiversity Management Plan

The biodiversity management plan (BMP) will define the approach to reduce impacts on biodiversity and will include the mitigation measures listed below.

Table E4.2-1 Biodiversity Management Plan – Construction Phase

ID	Mitigation Commitment
BIO01	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction.
BIO02	Supplementary preconstruction biodiversity baseline surveys will be undertaken in locations identified in the baseline appendices of the environmental and social impact assessment in order to produce a Biodiversity Action Plan to identify further enhancement and conservation measures.

Table E4.2-1 Biodiversity Management Plan – Construction Phase

ID	Mitigation Commitment
BIO03	As part of the biodiversity management plan, a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing.
BIO05	Hunting, fishing, unauthorised gathering of products (including plants and firewood) and deliberate disturbance or harassment of fauna will be prohibited for project personnel. The Project will restrict the purchase of wildlife related products and crafts by project workers.
BIO06	Appropriate measures will be implemented to prevent fauna or people from entering welded pipe sections or open excavations; there will be fauna ladders placed at suitable intervals in all open excavations. Animals will be removed safely and released into suitable habitat away from the working area.
BIO07	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed.
BIO08	A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preclearance checks on the right-of-way.
BIO09	Before construction starts, a plan will be prepared for translocating fauna and flora in areas identified in the environmental and social impact assessment and preconstruction surveys. The pre-entry surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction.
BIO10	A written and photographic record will be kept of translocated species for verification and potential post-construction monitoring. The success of translocation will be monitored during and post-construction for species of conservation importance.
BIO11	Information on seasonal constraints recorded within the baseline appendices environmental and social impact assessment will be used to identify activities that need to be undertaken at a specific time of year or periods when activities cannot be completed without project approval of a deviation (e.g., during sensitive periods such as breeding and migration of species).
BIO12	Where a section of the right-of-way is through habitats with high biodiversity value (as identified in the baseline appendices of the environmental and social impact assessment), the area will be reviewed to determine if the working width can be reduced to limit impacts as much as possible.
BIO13	Open-cut river crossings will be undertaken during the dry season where possible; where not possible site-specific method statements will be developed addressing ecological sensitivities.

Table E4.2-1 Biodiversity Management Plan – Construction Phase

ID	Mitigation Commitment
BIO14	As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made, and the area reinstated as quickly as possible.
BIO15	The maximum length of open trench at any one time (per spread) will be defined based on: • the habitats present and potential ecological sensitivities (e.g., terrestrial commuting routes for large mammals) • community safety. Gaps will also be left in soil stacks and pipe strings at strategic locations to allow passage of animals where it is considered safe to do so.
BIO16	If dams and pumps are used to maintain water flow during the construction of watercourse crossings or abstraction of water from watercourses is required, fish screens will be used on the end of the pump inlet hose. Any fish caught within dammed areas either side of the crossing will be transferred up or downstream as appropriate by suitably experienced personnel.
BIO17	Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity.
BIO18	All incidences of accidental injury or death of fauna will be recorded, including details of the circumstances, time, species, size and habitat. The report will be reviewed to determine if any action should to be taken to prevent further incidents.
BIO19	Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive species on the RoW, work sites and camp facilities. The biosecurity measures will also outline specifics to protect the aquatic environment from alien invasive species.
BIO20	The Project will support an education program for local communities in relation to grey crowned cranes. Construction within 250m of habitat that supports breeding grey crowned cranes will be avoided if nest sites are confirmed.
BIO21	Species' populations will be monitored pre and post construction. The project will employ adaptive management in response to findings.
BIO23	The use of pesticides, rodenticides and other chemicals is prohibited in proximity to raptor habitat.
BIO24	The total duration of construction disturbance (i.e. the time between initial site clearing and final reinstatement/biorestoration) will be minimised.
BIO26	The Project will support the relevant management authority with capacity-building, for example by contributing to additional ranger support or other activities identified in the existing protected area management plan prepared by the relevant management authority.
BIO36	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success.

Table E4.2-1 Biodiversity Management Plan – Construction Phase

ID	Mitigation Commitment
	Construction planning surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction.
BIO37	The need to compensate for trees removed will be determined on a site-by-site basis and will take into account the species removed. Preference will be given to native species representative of adjacent undisturbed areas. No exotic species will be planted unless specifically required by the forestry agency. In areas of plantation forestry, the requirements of the forestry agency will be met (e.g., ratios for compensation planting).
BIO38	Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.
BIO39	The Project will prohibit all staff and contractors from the possession, purchase, trade or collection of wildlife or living natural resources that are nationally legally protected, CITES listed, or classed as threatened by the IUCN Red List.
CHSW20	Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).
SOL11	Seeds of species that have the potential to outcompete local plant species will not be used in revegetation seed mixes. Where biorestoration is required, local species will be used as far as available.
WTR04	Watercourse banks will be stabilised directly after backfilling and subsequently restored to near original conditions. Where this is not possible, site-specific solutions will be proposed with engineering justification and assessment of potential impacts (including habitat connectivity).
WTR06	Where water is abstracted from a surface waterbody, the flow, water level or water volume in the waterbody will be assessed before and during abstraction. Abstraction rates and the frequency of assessment of the water flow, level or volume will be monitored based on permit conditions. During abstraction from surface waters, inlet hoses will be fitted with suitably sized fish screens.
WTR09	Other than when required for crossings excavations, construction equipment and traffic will normally not enter watercourses. Vehicles and equipment will cross watercourses via appropriately sized temporary culverts and bridging arrangements.
WTR10	Bathing or washing clothes, vehicles and equipment by project employees will be prohibited in watercourses.
WTR15	If temporary damming of a watercourse is required, a preconstruction engineering, social and environmental evaluation will be undertaken to plan the work and so the duration of the flow interruption is limited and to determine the need for pump around to maintain flows.

A4.2.2 Pollution Prevention Plan

The pollution prevention plan (PPP) will define the approach to prevent pollution and will include the mitigation measures listed below.

Table E4.2-2 Pollution Prevention Plan – Construction Phase

ID	Mitigation Commitment
ACO01	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site.
ACO02	Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration.
ACO03	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken or appropriate compensation paid if damage is proven.
ACO04	Preference will be given to selecting low noise and vibration emitting equipment for all construction works.
ACO05	Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.
ACO06	Potential noise and vibration impacts will be assessed where piling is to be undertaken close to sensitive receptors. Where possible, alternative techniques or materials will be used to reduce potential impacts, e.g. restrictions on times and duration in any given day that piling activities are undertaken.
ACO07	Where possible new access roads will be constructed a minimum of 100 m away from sensitive receptors (hospitals, educational facilities or dwellings).
ACO08	Blasting will only be used where other excavation methods are considered technically impracticable or uneconomic. Where blasting is undertaken, a Blast Management Plan will be developed to consider the effects of noise, air overpressure and vibration on dwellings, structures and wildlife, and develop appropriate mitigation where required. The Blast Management Plan will be prepared by a competent person and peer reviewed.
AIR01	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site
AIR02	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.

Table E4.2-2 Pollution Prevention Plan – Construction Phase

ID	Mitigation Commitment
AIR03	Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.
AIR04	The project will monitor and report its greenhouse gas emissions annually.
CHSW25	A monitoring plan will be developed and implemented to ensure that environmental noise exposure levels are periodically monitored and documented. Procedures for corrective measures will be incorporated and implemented in the event of exceedances.
CLI01	Electrical equipment of a size that is appropriate for the functions to be performed will be selected with a view to maximising energy efficiency. Electrical equipment will be turned off when not in use.
EPR02	Spill response equipment, such as absorbents and spill kits, will be available at all work site locations and on fuel bowsers and tankers. The spill kits will be inspected regularly to ensure they remain adequate for the needs of the project. The spill kits will be logged, inventoried and maintained.
EPR04	In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills.
SOL12	Procedures will be developed, incorporating plans for erosion and sediment control and reinstatement. These will be produced before work begins at areas of fragile, sensitive or thin topsoil, side slopes or narrow ridges and at watercourse crossings. Sediment interception measures will be installed, inspected and maintained to prevent sediment runoff from the right-of-way or construction sites affecting watercourses, wetlands, waterbodies or environmentally sensitive areas. Procedures will include additional precautions to be taken and increased monitoring (minimum twice per week), with the aim of preserving the topsoil for subsequent replacement.
SOL14	Areas of surface contamination identified prior to construction within the project footprint will be remediated before or during project construction. Where cleanup of pre-existing contaminated land is required, a remediation proposal will be implemented including but not limited to: • remediation techniques • the cleanup standard to be achieved • monitoring and analysis of remediated land to be undertaken • all regulatory and project documentation requirements • appropriate environmental and occupational health and safety protection measures to be adopted. All cleanup and remediation activities will be adequately documented.
SOL15	Contaminated material storage areas will be provided with containment measures (e.g., bunds, ditches, impermeable base membranes and covers) to prevent runoff and airborne losses.
WTR01	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater.

Table E4.2-2 Pollution Prevention Plan – Construction Phase

ID	Mitigation Commitment
WTR02	A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures.
WTR03	Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses.
WTR05	Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment.
WTR07	As a requirement of the PPP, locations for discharging excavated pipeline trench water will be identified as part of a 'Permit to Pump Procedure' which will be implemented during the construction phase. Appropriate sediment control measures in line with recognised industry best practices will be implemented at each location.
WTR09	Other than when required for crossings excavations, construction equipment and traffic will normally not enter watercourses. Vehicles and equipment will cross watercourses via appropriately sized temporary culverts and bridging arrangements.
WTR10	Bathing or washing clothes, vehicles and equipment by project employees will be prohibited in watercourses.
WTR11	Surface water that could be affected by runoff from the pipeline route or worksites will be visually inspected on a regular basis and remedial measures implemented if sediment or contamination arising from project activities are visible.
WTR16	An environmental and social evaluation of potential treated wastewater discharge locations will be undertaken as the basis for the development of measures to mitigate impacts from discharges on surface water ecology, downstream water users or terrestrial ecology. The evaluations will take into account the compliance with project environmental standards and will support applications for discharge permits. All licences and consents will be obtained before planned liquid discharges.
WTR20	Surface water run-off from construction areas and AGIs will be discharged in accordance with project environmental standards.

Table E4.2-2 Pollution Prevention Plan – Construction Phase

ID	Mitigation Commitment
WTR22	All licences and consents for hydrostatic test water discharge will be obtained following preparation of a hydrostatic test effluent disposal risk assessment. This will undergo internal technical evaluation before submitting the permit application to the appropriate water resources regulatory authority.
WTR25	No oil-based muds will be used for drilling of groundwater exploration and water supply boreholes.
WTR27	The Monitoring and Reporting Plan will detail robust monitoring and inspection requirements to be completed at locations with sensitive groundwater resources; to verify correct implementation of the PPP.

A4.2.3 Waste Management Plan

The waste management plan (WMP) will define the approach to reduce potential waste related impacts and will include the mitigation measures listed below.

Table E4.2-3 Waste Management Plan – Construction Phase

ID	Mitigation Commitment
LSC03	Options will be considered for the use of surplus rock from blasting including: • crushing and onsite re-use • offsite re-use • offsite disposal • onsite placement. if this is in keeping with the local landscape character.
RES01	All excavated materials will be screened and reused where possible to reduce the need for newly quarried aggregates.
RES02	If timber is cleared (e.g., as part of right-of-way clearance), it will be reused for construction activities as far as possible. Release of any and all chemically treated waste timber will be made by on a case-by-case basis.
SOL02	Environmental and social evaluations will be undertaken to identify suitable offsite disposal sites for waste soil and rock, and appropriate management measures to be implemented. All temporary borrow pits and soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented.
WHSW01	Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.
WTR08	The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards.
WTR17	An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams.

Table E4.2-3 Waste Management Plan – Construction Phase

ID	Mitigation Commitment
WTR18	Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.
WTR19	A contingency plan for wastewater treatment plant maintenance periods or downtime will be developed. This will include, as a minimum, the provision of holding tanks that can be used to retain emergency overflows or discharges that do not meet project environmental standards.
WTR21	All potentially contaminated wastewater, excluding sanitary wastewater, will be routed to an appropriately sized treatment unit capable of achieving consent conditions and project environmental standards.

A4.2.4 Natural Resource Management Plan

The natural resource management plan (NRMP) will define the approach to manage natural resource use and will include the mitigation measures listed below.

Table E4.2-4 Natural Resource Management Plan – Construction Phase

ID	Mitigation Commitment
ECO02	Project use of third-party quarries and borrow pits will require verification of national regulatory and project standard compliance; where suppliers do not meet project standards an action plan will be implemented to build capacity, so the supplier can meet the project standard in a timely manner.
LNP02	Any new aggregate extraction sites and batching plants sites, including 3rd party sites, will undergo environmental and social evaluation prior to use; and, where possible, new sites will be located as close as possible to the existing road network to reduce the requirement for new access roads.
RES01	All excavated materials will be screened and reused where possible to reduce the need for newly quarried aggregates.
RES02	If timber is cleared (e.g., as part of right-of-way clearance), it will be reused for construction activities as far as possible. Release of any and all chemically treated waste timber will be made by on a case-by-case basis.
WTR06	Where water is abstracted from a surface waterbody, the flow, water level or water volume in the waterbody will be assessed before and during abstraction. Abstraction rates and the frequency of assessment of the water flow, level or volume will be monitored based on permit conditions. During abstraction from surface waters, inlet hoses will be fitted with suitably sized fish screens.
WTR08	The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards.

Table E4.2-4 Natural Resource Management Plan – Construction Phase

ID	Mitigation Commitment
WTR13	Water meters will be installed to measure the quantities of water supplied and wastewater discharged at the camps and detailed records will be kept of quantities of water reused and the purposes for which water is reused as part of the water management plan and the data used for monitoring water usage and project reporting requirements.
WTR14	Water conservation initiatives and opportunities to reuse water, e.g., for dust suppression or concrete mixing, will be identified, assessed for impacts on the environment and human health and those deemed suitable will be implemented.
WTR15	If temporary damming of a watercourse is required, a preconstruction engineering, social and environmental evaluation will be undertaken to plan the work and so the duration of the flow interruption is limited and to determine the need for pump around to maintain flows.
WTR23	The water quality and sustainability of water abstracted from either new or existing boreholes or surface water will be monitored at suitable frequencies to confirm that supply meets permit conditions and project environmental standards and does not impact adversely on other known users.
WTR24	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered, and these alternative locations will be subject to the same testing and impact assessment process.
WTR26	All groundwater exploration and supply boreholes will be designed by suitably experienced and qualified hydrogeologists to avoid contaminant migration pathways between different aquifers and geological formations.
WTR28	Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.

A4.2.5 Soil Management Plan

The soil management plan (SMP) will define the approach to soil management and temporary erosion control and will include the mitigation measures listed below.

Table E4.2-5 Soil Management Plan – Construction Phase

ID	Mitigation Commitment
BIO07	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed.

Table E4.2-5 Soil Management Plan – Construction Phase

ID	Mitigation Commitment
SOL01	Where required, imported soil will have similar physical characteristics to soil in the area where it will be deposited. Soil will be checked, and analysed if needed, for presence of invasive species and contamination.
SOL02	Environmental and social evaluations will be undertaken to identify suitable offsite disposal sites for waste soil and rock, and appropriate management measures to be implemented. All temporary borrow pits and soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented.
SOL03	Where benching is required then the areas will be re-contoured to original profiles. Side casting in areas of steep terrain will be prohibited. The effects of accidental spoil slippage on steep slopes will mitigated, e.g., by using fences or a geotextile membrane.
SOL04	Load-bearing/ ground protection materials, such as bog mats and geotextile membranes under temporary haul roads, will be used to support heavy loads in areas of soft ground, including wetland areas.
SOL06	Topsoil and subsoil stockpiles will be stored in accordance with the Soil Management Plan, be free draining and include gaps left in strategic locations to allow potential floodwater through.
SOL07	If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme • compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site.
SOL08	A preconstruction soil survey will be undertaken of the RoW and MCPY and other construction facilities, based on a representative sample, to: • measure the depth of the topsoil layer along the pipeline route to inform requisite stripping depth • identify areas of fragile, sensitive and thin topsoil • identify areas lacking topsoil.
WTR03	Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses.

A4.2.6 Cultural Heritage Management Plan

The cultural heritage management plan (CHMP) will define the approach to the identification, assessment and mitigation of potential impacts on tangible and intangible cultural heritage and will include the mitigation measures listed below.

Table E4.2-6 Cultural Heritage Management Plan – Construction Phase

ID	Mitigation Commitment
CUH01	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained.
CUH02	A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel.
CUH03	A written scheme of investigation (WSI) will be prepared where an intervention is needed and appended to the cultural heritage management plan (CHMP). Until investigation and recording in accordance with the WSI, or avoidance or management activity is signed off by government authorities, construction may not proceed in that area.
CUH04	The senior cultural heritage monitor (SCHM) will prepare the chance finds procedure (CFP); Chance finds will be excavated by suitably qualified and approved archaeologists, in accordance with the CFP and authorised by the relevant government authority.
CUH05	Information on intangible cultural heritage (ICH) collected during the preconstruction surveys will be evaluated and integrated into the cultural heritage management plan (CHMP). This will include information on vulnerable groups if present.
CUH07	Collection of cultural heritage artefacts by workers for their own use is prohibited. Any cultural heritage artefacts found by workers will be left in situ and reported to the worksite supervisor or the cultural heritage monitor as required by the chance finds procedure.
CUH08	Any decompaction/ripping or other ground disturbance activities required during reinstatement will be planned to avoid any cultural heritage feature that has been preserved in situ.

A4.2.7 Reinstatement Plan

The reinstatement plan (RP) will define the approach to manage reinstatement incorporating permanent erosion control and bio-restoration and will include the mitigation measures listed below.

Table E4.2-7 Reinstatement Plan – Construction Phase

ID	Mitigation Commitment
BIO17	Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity.
BIO36	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction.
BIO37	The need to compensate for trees removed will be determined on a site-by-site basis and will take into account the species removed. Preference will be given to native species representative of adjacent undisturbed areas. No exotic species will be planted unless specifically required by the forestry agency. In areas of plantation forestry, the requirements of the forestry agency will be met (e.g., ratios for compensation planting).
CUH08	Any decompaction/ripping or other ground disturbance activities required during reinstatement will be planned to avoid any cultural heritage feature that has been preserved in situ.
LNP01	A preconstruction entry survey, including photographs, will be undertaken to document the condition of the land including immovable assets, crops and improvements required to the land before construction.
SOL02	Environmental and social evaluations will be undertaken to identify suitable offsite disposal sites for waste soil and rock, and appropriate management measures to be implemented. All temporary borrow pits and soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented.
SOL09	Recontouring should be sympathetic and in keeping with preconstruction profiles, where this is not precluded by risk to integrity of the pipeline or erosion considerations.
SOL10	Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout

Table E4.2-7 Reinstatement Plan – Construction Phase

ID	Mitigation Commitment
	reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement.
SOL11	Seeds of species that have the potential to outcompete local plant species will not be used in revegetation seed mixes. Where biorestoration is required, local species will be used as far as available.
SOL13	A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.
SOL14	Areas of surface contamination identified prior to construction within the project footprint will be remediated before or during project construction. Where cleanup of pre-existing contaminated land is required, a remediation proposal will be implemented including but not limited to: • remediation techniques • the cleanup standard to be achieved • monitoring and analysis of remediated land to be undertaken • all regulatory and project documentation requirements • appropriate environmental and occupational health and safety protection measures to be adopted. All cleanup and remediation activities will be adequately documented.
SOL17	Trench breakers will be installed in the pipeline trench where downhill flow within the backfilled trench may lead to erosion.
SOL18	New access roads will follow existing tracks, where possible, and will be designed with adequate slope and cross fall drainage to channel runoff safely to off-road soakaways without causing erosion or siltation.
WTR03	Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses.
WTR04	Watercourse banks will be stabilised directly after backfilling and subsequently restored to near original conditions. Where this is not possible, site-specific solutions will be proposed with engineering justification and assessment of potential impacts (including habitat connectivity).

Table E4.2-7 Reinstatement Plan – Construction Phase

ID	Mitigation Commitment
WTR05	Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment.
WTR11	Surface water that could be affected by runoff from the pipeline route or worksites will be visually inspected on a regular basis and remedial measures implemented if sediment or contamination arising from project activities are visible.
WTR15	If temporary damming of a watercourse is required, a preconstruction engineering, social and environmental evaluation will be undertaken to plan the work and so the duration of the flow interruption is limited and to determine the need for pump around to maintain flows.

A4.2.8 Stakeholder Engagement Plan

The stakeholder engagement plan (SEP) will define the approach to maintain a social licence to operate[1] among project-affected communities (PACs) and will include the mitigation measures listed below.

Table E4.2-8 Stakeholder Engagement Plan – Construction Phase

ID	Mitigation Commitment
ACO03	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken or appropriate compensation paid if damage is proven.
ACO05	Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.
ACO08	Blasting will only be used where other excavation methods are considered technically impracticable or uneconomic. Where blasting is undertaken, a Blast Management Plan will be developed to consider the effects of noise, air overpressure and vibration on dwellings, structures and wildlife, and develop appropriate mitigation where required. The Blast Management Plan will be prepared by a competent person and peer reviewed.

[1] A social licence to operate exists when a project has ongoing approval or acceptance within the local community and other stakeholders.

Table E4.2-8 Stakeholder Engagement Plan – Construction Phase

ID	Mitigation Commitment
ACO09	The Project will conduct regular inspection of access roads to check for damage caused by project vehicles to repair damage in a timely and efficient manner. Strict load management will be enforced on all project vehicles.
BIO06	Appropriate measures will be implemented to prevent fauna or people from entering welded pipe sections or open excavations; there will be fauna ladders placed at suitable intervals in all open excavations. Animals will be removed safely and released into suitable habitat away from the working area.
BIO20	The Project will support an education program for local communities in relation to grey crowned cranes. Construction within 250m of habitat that supports breeding grey crowned cranes will be avoided if nest sites are confirmed.
BIO26	The Project will support the relevant management authority with capacity-building, for example by contributing to additional ranger support or other activities identified in the existing protected area management plan prepared by the relevant management authority.
BIO37	The need to compensate for trees removed will be determined on a site-by-site basis and will take into account the species removed. Preference will be given to native species representative of adjacent undisturbed areas. No exotic species will be planted unless specifically required by the forestry agency. In areas of plantation forestry, the requirements of the forestry agency will be met (e.g., ratios for compensation planting).
CHSW02	Local people will be consulted on the optimum location of crossing points and pastoralists informed of the access restrictions in advance, advising them to avoid cultivated areas. Crossing points will be provided across open trenches and welded pipes and gaps will be left in soil stacks and pipe strings at strategic locations. Incidents in conflicts between crop farmers and herders in the vicinity of the project footprint will be monitored and support will be provided to local authorities to obtain a resolution in cases of conflict wherever possible.
CHSW17	Community liaison officers will encourage PAC Leadership to provide advance warning of local events so that construction activities can be avoided at these times.
CHSW18	Regular meetings will be held with PAC representatives, during construction in their area, to update them on construction progress and to receive comments or queries. A community liaison log will be maintained detailing the content of all meetings.
CHSW19	Community awareness programmes will be developed and implemented in project-affected communities to explain: • road safety risks and how to increase the safety of pedestrians particularly children • how to ensure their safety during construction • the measures that have been, or will be, implemented to protect their health and safety (e.g., provision of safe access).
CHSW21	Public awareness programmes for stakeholders will include a specific section about the security presence around camps and security protocols which apply.
CHSW22	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.
CHSW27	Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.

Table E4.2-8 Stakeholder Engagement Plan – Construction Phase

ID	Mitigation Commitment
CHSW28	The project will work closely with local authorities to monitor any emerging tensions between crop farmers and pastoralists related to project impacts.
CHSW29	The Project will liaise with other third-party developments and relevant government bodies to share information about their worker and community health management strategies, as well as information about worker movements, to ensure that they are commensurate and enable an efficient and coordinated response to any potential disease outbreak.
CUH01	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained.
CUH02	A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel.
CUH03	A written scheme of investigation (WSI) will be prepared where an intervention is needed and appended to the cultural heritage management plan (CHMP). Until investigation and recording in accordance with the WSI, or avoidance or management activity is signed off by government authorities, construction may not proceed in that area.
CUH04	The senior cultural heritage monitor (SCHM) will prepare the chance finds procedure (CFP); Chance finds will be excavated by suitably qualified and approved archaeologists, in accordance with the CFP and authorised by the relevant government authority.

Table E4.2-8 Stakeholder Engagement Plan – Construction Phase

ID	Mitigation Commitment
ECO04	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment.
ECO05	A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary through targeted meetings scheduled at times and locations that may increase women's participation
ECO06	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.
ECO09	Before construction, a benchmarking exercise to gather data associated with average prices for goods will be undertaken in each region/district. This information will be used to identify appropriate prices so that large price disparities between project-procured goods and local goods are avoided.
ECO10	Senior project security personnel will liaise directly with the army and/or security forces to provide information on project construction activities and schedules.
ECO12	The Project will engage with tourism facilities and operators and relevant organisations to communicate information about the project and the management of environmental and social risks.
ECO14	The Project will conduct ongoing monitoring and liaise with authorities to review social changes in the towns of • Katikara Trading Centre, Kyenda and Sembabule Market Zone (Uganda) and • Mutukula (Uganda) Appropriate interventions will be developed as deemed necessary to enhance existing interventions (as set out in PIIM management plan).
ECO15	The project will undertake a benchmarking assessment on the inflation of goods within PACs if construction phases with other third parties with large workforces coincide. The results of benchmarking will be shared with the proponents of the third-party developments as required.

Table E4.2-8 Stakeholder Engagement Plan – Construction Phase

ID	Mitigation Commitment
GNL01	The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.
GNL02	The Project will advise appropriate regulators and lead agencies of the construction schedule
GNL03	The Project will, in collaboration with the government and other third-party developers in the Albertine Graben, participate in the Regional Cumulative Impacts Management (RCIM) initiative proposed by the upstream Tilenga Project.
GNL05	The Project will ensure that the proponents of the associated facilities are made aware of the construction schedule so that construction activities can be strategically planned to reduce disruption.
GNL06	The project will continue engagement with Tilenga PACs and Buliisa and Hoima district local authorities during the construction phases of the project, emphasising the temporary nature of construction employment.
GNL08	The project will consider the issue of double resettlement into its resettlement plan.
GNL09	The Project will engage proponents of the associated facilities and the third-party developments and relevant government agencies to consider options for management measures to address significant cumulative impacts. Options could cover: project design, scheduling, construction management or operations management.
GNL10	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures.
GNL11	The Project will ensure that the proponents of the associated facilities are made aware of the construction schedule so that construction activities can be strategically planned to reduce disruption.
GNL13	The Project will assist with capacity-building for government organisations to develop and budget for appropriate town planning, infrastructure and service provisions in the mid-Western Region (Hoima).
HR01	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment.
HR04	A formal structure will be established (e.g. Ethics Committee), which deals with infringement of Human Rights linked to the working environment; a company representative will participate in the Ethics Committee; infringements of the Project labour policy and national regulations will be monitored.
HR08	Stakeholders concerned about child labour will be encouraged to use the grievance mechanism to address project-related child labour concerns.

Table E4.2-8 Stakeholder Engagement Plan – Construction Phase

ID	Mitigation Commitment
HR09	The Government will be requested not to use any prison labour for tasks that are, or could be associated with, project activities.
HR13	The Human Resources function will organize periodic town hall-style sessions to provide information and receive labour and working conditions related feedback.
HR16	Community Liaison Officers will hold regular meetings with supply chain workers to address human and labour rights. This includes a focus on harassment including the possibility of demands for sexual favours, or a financial kick-back during the recruitment process.
HR17	The Project will work in partnership with local organizations to address gender bias; female CLOs will be employed to facilitate project employment and to improve the work environment for women. Female CLOs will hold periodic meetings with female employees and community groups to ensure concerns specific to women and children are identified and to solicit suggestions for improvement.
HR22	An awareness campaign targeting schools at sensitive locations within the project AOI will be developed, addressing: • Importance of staying in school. • Risks particularly to girls of relationships with transient workers, transactional and commercial sex. • Road safety awareness. • Awareness about their rights. • Project grievance mechanism and their right to use it.
HR24	The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities.
HR27	The Project will support Government efforts to clarify disputed land boundaries in the Project area, in particular where it concerns customary right of occupancy of land.
HR38	Project will work in partnership with local organisations to provide support to women seeking employment with the project so that they are better able to express and understand opportunities, benefits and their rights at work.
INF04	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors.
LIV05	Grievances arising from the community in relation to maintenance activities at AGIs will be handled in accordance with the project grievance procedure.
LNP04	The Project will continue monitoring of, and liaising with authorities on land speculation. Where required additional interventions will be developed to enhance existing interventions.
LNP06	PACs will be sensitised to recent land speculation and instances of associated violence and informed of actions that can be taken.

A4.2.9 Resettlement Action Plan

The resettlement action plan (RAP) will define the approach for addressing physical and/or economic displacement of Project Affected Persons (PAPs) and will include the mitigation measures listed below.

Table E4.2-9 Resettlement Action Plan – Construction Phase

ID	Mitigation Commitment
BIO37	The need to compensate for trees removed will be determined on a site-by-site basis and will take into account the species removed. Preference will be given to native species representative of adjacent undisturbed areas. No exotic species will be planted unless specifically required by the forestry agency. In areas of plantation forestry, the requirements of the forestry agency will be met (e.g., ratios for compensation planting).
CHSW02	Local people will be consulted on the optimum location of crossing points and pastoralists informed of the access restrictions in advance, advising them to avoid cultivated areas. Crossing points will be provided across open trenches and welded pipes and gaps will be left in soil stacks and pipe strings at strategic locations. Incidents in conflicts between crop farmers and herders in the vicinity of the project footprint will be monitored and support will be provided to local authorities to obtain a resolution in cases of conflict wherever possible.
CHSW27	Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.
GNL08	The project will consider the issue of double resettlement into its resettlement plan.
GNL10	The project will work closely with the government and other developers to understand past, current and planned resettlement processes for other developments with potential for cumulative double displacement impacts.
HR26	The Project will deal directly with those having customary rights of occupancy to land; with the compensation process witnessed by appropriate third party to minimize the risk of interference by intermediaries.
HR27	The Project will support Government efforts to clarify disputed land boundaries in the Project area, in particular where it concerns customary right of occupancy of land.
INF07	If project activities affect land-based livelihoods because of interruption to irrigation, drainage or agricultural production, appropriate compensation will be provided in accordance with the RAP.
LIV01	The community health, safety and security plan will include measures to reduce the spread of animal diseases due to increased movement of livestock.
LIV05	Grievances arising from the community in relation to maintenance activities at AGIs will be handled in accordance with the project grievance procedure.
LIV06	Post RAP monitoring of PAPs engaged in gold ASM or high value crop cultivation, particularly female headed households, youth and casual, landless artisanal miners, will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored to pre-project levels.
LNP03	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.

Table E4.2-9 Resettlement Action Plan – Construction Phase

ID	Mitigation Commitment
LNP04	The Project will continue monitoring of, and liaising with authorities on land speculation. Where required additional interventions will be developed to enhance existing interventions.

A4.2.10 Labour Management Plan

The labour management plan (LMP) will define the approach to ensure recruitment practices and working conditions comply with legal requirements and project standards. The LMP will include the mitigation measures listed below.

Table E4.2-10 Labour Management Plan – Construction Phase

ID	Mitigation Commitment
BIO05	Hunting, fishing, unauthorised gathering of products (including plants and firewood) and deliberate disturbance or harassment of fauna will be prohibited for project personnel. The Project will restrict the purchase of wildlife related products and crafts by project workers.
BIO39	The Project will prohibit all staff and contractors from the possession, purchase, trade or collection of wildlife or living natural resources that are nationally legally protected, CITES listed, or classed as threatened by the IUCN Red List.
CHSW09	Only trained, certified and physically fit drivers will drive vehicles. Night-time driving will be by exception only.
CHSW14	The Voluntary Principles on Security and Human Rights will be implemented; compliance will be monitored.
CHSW15	Pre-deployment screenings will be described in the LMP and communicated during the recruitment process
CHSW31	A HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to address: •awareness and understanding among drivers about the risks of HIV and STDs •the associated health implications •the preventative measures that can be taken •community awareness meetings •counselling and testing services •the distribution of information, leaflets and condoms.
CHSW32	A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors.
ECO03	Compliance with project human resources policies and procedures will be a construction contract requirement.
ECO04	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants.

Table E4.2-10 Labour Management Plan – Construction Phase

ID	Mitigation Commitment
	Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment.
ECO05	A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary through targeted meetings scheduled at times and locations that may increase women's participation
ECO07	A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.
ECO08	Before construction, a benchmarking exercise gathering data associated with average incomes in the private and public sector for each region/district will be undertaken. This information will be used to identify salary levels for the construction workforce so that disparities between project-related salaries and local businesses/public sector salaries are avoided.
HR01	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment.
HR03	The workers' grievance procedure will include the option to log grievances anonymously.
HR04	A formal structure will be established (e.g. Ethics Committee), which deals with infringement of Human Rights linked to the working environment; a company representative will participate in the Ethics Committee; infringements of the Project labour policy and national regulations will be monitored.
HR05	Hiring managers from (sub) contractors will receive training regarding the developer's non-discrimination policies.
HR06	Gender-based hiring criteria will be included in tendering documents, so that it becomes part of the selection criteria for (sub) contractors; contracts will include targets stipulating a minimum number of women as well as staff with disabilities or other vulnerable groups.
HR07	As a standard clause in all contracts, no employees shall be hired, directly or indirectly, under the age of 18 years of age. It will be the responsibility of the developer to ensure that no children under the age of 18 are involved in their supply chain. If periodic inspections and audits identify children under the age of 18 being hired by the developer, this will be considered a breach of contract and the child will be removed from the workplace. Their salary may continue to be paid to them for a set period pending the putting in place an alternative solution.

Table E4.2-10 Labour Management Plan – Construction Phase

ID	Mitigation Commitment
HR09	The Government will be requested not to use any prison labour for tasks that are, or could be associated with, project activities.
HR10	Contracts will not include provisions that may support forced labour; for example, requests of deposit guarantees from employees to have access to safety protection equipment or other materials.
HR11	As part of the work site induction, all staff will be informed on workers' rights.
HR12	The Project will require that all workers in similar jobs work under the same, or similar, working conditions (salary, vacation, insurance etc.)
HR13	The Human Resources function will organize periodic town hall-style sessions to provide information and receive labour and working conditions related feedback.
HR14	All workers will have contracts describing conditions of work and will have the contents explained to them. This includes their legal rights under national law. Contracts will be available in workers' native languages written in easily understandable language. Contracts will state terms of employment and duration and specifically address: • salary • working conditions • working hours and overtime • holidays and sick leave • social security and compensation • health insurance • access to remedy. • medical leave • other provisions related to medical care.
HR15	A due diligence evaluation of each (sub) contractor's human rights record related to labour and working conditions will be conducted.
HR17	The Project will work in partnership with local organizations to address gender bias; female CLOs will be employed to facilitate project employment and to improve the work environment for women. Female CLOs will hold periodic meetings with female employees and community groups to ensure concerns specific to women and children are identified and to solicit suggestions for improvement.
HR18	Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis.
HR19	The employee Code of Behaviour will include a clause that a sexual relation based on power inequality will lead to instant dismissal of the senior person.
HR25	The OHSSP, LMP and the CHSSP will include strategies for implementing the Voluntary Principles on Security and Human Rights.
HR38	Project will work in partnership with local organisations to provide support to women seeking employment with the project so that they are better able to express and understand opportunities, benefits and their rights at work.
HR39	Equal remuneration for jobs of equal value for men and women will be provided.
HR40	An independent labour rights related monitoring and evaluation system will be established, possibly in collaboration with the national regulatory agencies, to ensure that policies are adhered to and national legislation is followed.
WHSW07	Project approved vehicles will be provided to transport camp residents to worksites.

Table E4.2-10 Labour Management Plan – Construction Phase

ID	Mitigation Commitment
WHSW11	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of non-compliance, workers will be disciplined in accordance with project disciplinary procedures and structures.
WHSW13	Prior to construction, a project workers' grievance procedure will be implemented, which will detail the processes for recording, investigating and, where necessary, implementing corrective actions relating to complaints, including the responsibility of the contractor. The workers' grievance procedure will: • be available for use by all workers, including subcontractor workers and workers in the primary supply chain; • be displayed at visible places in all camps and work sites.
WHSW14	Hours worked by all project personnel will be according to their contracts and national regulatory requirements.
WHSW16	PPE appropriate for the task will be provided to all workers.
WHSW20	The labour management plan will include: • Compliance with international labour standards, national labour laws and regulations concerning transparency, accountability, anticorruption and human rights; • Recognising workers' right to organise collective bargaining and trade unions; • Providing suitable working conditions, including rest facilities and breaks; • Mechanism of compliance with the ILO Maternity Protection Convention (2000); and • Respecting workers' rights to privacy including data protection requirements.

A4.2.11 Project Induced In-Migration Management Plan

The project induced in-migration management plan (PIIMP) will define the approach to prevent project induced in-migration and manage negative impacts of potential project induced in-migration and will include the mitigation measures listed below.

Table E4.2-11 Project Induced In-Migration Management Plan – Construction Phase

ID	Mitigation Commitment
CHSW33	Construction camps will be designated as having "closed" status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures.
ECO06	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.

Table E4.2-11 Project Induced In-Migration Management Plan – Construction Phase

ID	Mitigation Commitment
ECO14	The Project will conduct ongoing monitoring and liaise with authorities to review social changes in the towns of • Katikara Trading Centre, Kyenda and Sembabule Market Zone (Uganda) and • Mutukula (Uganda) Appropriate interventions will be developed as deemed necessary to enhance existing interventions (as set out in PIIM management plan).
HR33	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM.

A4.2.12 Procurement and Supply Chain Management Plan

The procurement and supply chain management plan (PSCMP) will define the approach to supply chain management including environmental, social and quality considerations, maximise the purchase of local goods and services, and will include the mitigation measures listed below.

Table E4.2-12 Procurement and Supply Chain Management Plan – Construction Phase

ID	Mitigation Commitment
BIO39	The Project will prohibit all staff and contractors from the possession, purchase, trade or collection of wildlife or living natural resources that are nationally legally protected, CITES listed, or classed as threatened by the IUCN Red List.
ECO01	A Procurement and Supply Chain Management Plan (PSCMP) will be developed to maximise the purchase of goods and services from within Uganda/Tanzania. This will be contingent on whether local suppliers can offer sufficient quality and reliability and can meet project requirements. PSCMP will include, as appropriate, enterprise development, capacity development and ring-fencing contracts.
ECO02	Project use of third-party quarries and borrow pits will require verification of national regulatory and project standard compliance; where suppliers do not meet project standards an action plan will be implemented to build capacity, so the supplier can meet the project standard in a timely manner.
ECO03	Compliance with project human resources policies and procedures will be a construction contract requirement.
ECO09	Before construction, a benchmarking exercise to gather data associated with average prices for goods will be undertaken in each region/district. This information will be used to identify appropriate prices so that large price disparities between project-procured goods and local goods are avoided.
HR02	As part of the tendering process, (sub) contractors will be required to include training components in their proposal aimed at increasing local employment as well as improving skills of local staff.
HR05	Hiring managers from (sub) contractors will receive training regarding the developer's non-discrimination policies.

Table E4.2-12 Procurement and Supply Chain Management Plan – Construction Phase

ID	Mitigation Commitment
HR06	Gender-based hiring criteria will be included in tendering documents, so that it becomes part of the selection criteria for (sub) contractors; contracts will include targets stipulating a minimum number of women as well as staff with disabilities or other vulnerable groups.
HR07	As a standard clause in all contracts, no employees shall be hired, directly or indirectly, under the age of 18 years of age. It will be the responsibility of the developer to ensure that no children under the age of 18 are involved in their supply chain. If periodic inspections and audits identify children under the age of 18 being hired by the developer, this will be considered a breach of contract and the child will be removed from the workplace. Their salary may continue to be paid to them for a set period pending the putting in place an alternative solution.
HR12	The Project will require that all workers in similar jobs work under the same, or similar, working conditions (salary, vacation, insurance etc.)
HR15	A due diligence evaluation of each (sub) contractor's human rights record related to labour and working conditions will be conducted.
HR18	Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis.
HR19	The employee Code of Behaviour will include a clause that a sexual relation based on power inequality will lead to instant dismissal of the senior person.
LNP02	Any new aggregate extraction sites and batching plants sites, including 3rd party sites, will undergo environmental and social evaluation prior to use; and, where possible, new sites will be located as close as possible to the existing road network to reduce the requirement for new access roads.

A4.2.13 Infrastructure and Utilities Management Plan

The infrastructure and utilities management plan (IUMP) will define the approach to monitor use of and/ or accidental damage to infrastructure and utilities and define the process of corrective action and will include the mitigation measures listed below.

Table E4.2-13 Infrastructure and Utilities Management Plan – Construction Phase

ID	Mitigation Commitment
ACO09	The Project will conduct regular inspection of access roads to check for damage caused by project vehicles to repair damage in a timely and efficient manner. Strict load management will be enforced on all project vehicles.
INF01	For major road crossings, crossing techniques that minimize the obstruction of traffic flow will be selected.
INF02	A preconstruction entry survey area will be defined where there is potential for vibration effects on dwellings and buildings. The survey (including photographs) will record the external condition of dwellings and buildings before construction, provide baseline evidence in the event of a claim for damage, and will inform pre-entry agreements that will also include repair requirements.

Table E4.2-13 Infrastructure and Utilities Management Plan – Construction Phase

ID	Mitigation Commitment
INF03	Potentially affected landowners, land users, communities and other affected stakeholders (e.g. tourism operators) will be consulted if there is likely to be any disruption to the existing infrastructure and utility services. Feedback from communities will inform planning of the works, especially when determining the options for temporary alternatives.
INF04	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors.
INF05	A crossing schedule, including all known roads, telephone and electricity facilities and oil, gas and water pipes, will be maintained. Owners and service operators will be consulted and full agreement gained to cross the infrastructure or utility. Where a third-party utility service will be crossed by the project, a method statement that includes measures to protect the integrity of the utility service will be agreed with the service operator before work can start.
INF06	The Project will notify third-party utility services of any damage and the damage will be repaired promptly in consultation with the service operator or utility owner. A timetable for repair of any damaged infrastructure will be agreed with the service operator or utility owner and communicated to affected communities.
INF07	If project activities affect land-based livelihoods because of interruption to irrigation, drainage or agricultural production, appropriate compensation will be provided in accordance with the RAP.
INF08	Authorities will be notified when oversize heavy loads need to be transported and such loads will be escorted by the project. Payloads will be monitored.
INF09	The design of new road sections and upgrades will take account of local conditions to ensure maintenance of good road condition, for example inclusion of drainage ditches.
INF10	A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner.
INF11	Infrastructure and utility services will be identified and protected during construction.
INF12	Where disruption to infrastructure and utilities will occur for more than 12 hours, a risk analysis of impacts on affected settlements will be completed. Where there will be a risk to health or livelihood to settlements or where the disruption is not acceptable to the affected settlements, alternatives will be provided.
INF13	An initial survey, supported by photographs, will be completed of the condition of roads to be used by the project including but limited to bridges, drainage structures, signage, traffic management and other road infrastructure. The survey will be agreed and signed by the road authority, local authority and any affected landowner. The survey will be made available to the road authority and municipal authorities if requested. The chosen project access routes will be improved as required to provide safe access for the project duration.

Table E4.2-13 Infrastructure and Utilities Management Plan – Construction Phase

ID	Mitigation Commitment
INF16	Where there is potential for congestion on shared transport routes, the project will liaise with third party developers, the police and authorities to identify and implement additional traffic management measures that limit disruption.

A4.2.14 Community Health, Safety and Security Plan

The community health, safety and security plan (CHSSP) will define approach to manage community health, safety and security issues and will include the mitigation measures listed below.

Table E4.2-14 Community Health, Safety and Security Plan – Construction Phase

ID	Mitigation Commitment
ACO08	Blasting will only be used where other excavation methods are considered technically impracticable or uneconomic. Where blasting is undertaken, a Blast Management Plan will be developed to consider the effects of noise, air overpressure and vibration on dwellings, structures and wildlife, and develop appropriate mitigation where required. The Blast Management Plan will be prepared by a competent person and peer reviewed.
BIO06	Appropriate measures will be implemented to prevent fauna or people from entering welded pipe sections or open excavations; there will be fauna ladders placed at suitable intervals in all open excavations. Animals will be removed safely and released into suitable habitat away from the working area.
BIO15	The maximum length of open trench at any one time (per spread) will be defined based on: • the habitats present and potential ecological sensitivities (e.g., terrestrial commuting routes for large mammals) • community safety. Gaps will also be left in soil stacks and pipe strings at strategic locations to allow passage of animals where it is considered safe to do so.
CHSW01	A strict project maximum speed limit will be enforced for project vehicles.
CHSW02	Local people will be consulted on the optimum location of crossing points and pastoralists informed of the access restrictions in advance, advising them to avoid cultivated areas. Crossing points will be provided across open trenches and welded pipes and gaps will be left in soil stacks and pipe strings at strategic locations. Incidents in conflicts between crop farmers and herders in the vicinity of the project footprint will be monitored and support will be provided to local authorities to obtain a resolution in cases of conflict wherever possible.
CHSW03	Security personnel engaged by the project will receive training on Voluntary Principles (this will include where army and or security forces are engaged by the project); performance will be monitored.
CHSW05	Where a safety risk assessment has identified a potential for construction interfaces to cause traffic accidents, temporary traffic control measures (signage, flagmen, temporary traffic lights, barricades) will be implemented.

Table E4.2-14 Community Health, Safety and Security Plan – Construction Phase

ID	Mitigation Commitment
CHSW11	Construction barriers will have visible warning signs understandable by local communities. Signage will be in accordance with internationally accepted symbols and/or be well known to local communities.
CHSW12	A risk assessment will be conducted for excavations with consideration to community safety.
CHSW14	The Voluntary Principles on Security and Human Rights will be implemented; compliance will be monitored.
CHSW19	Community awareness programmes will be developed and implemented in project-affected communities to explain: • road safety risks and how to increase the safety of pedestrians particularly children • how to ensure their safety during construction • the measures that have been, or will be, implemented to protect their health and safety (e.g., provision of safe access).
CHSW20	Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).
CHSW21	Public awareness programmes for stakeholders will include a specific section about the security presence around camps and security protocols which apply.
CHSW23	As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme.
CHSW33	Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures.
CHSW36	As part of the CHSSP, the District Health Management Teams (DHMTs) will be engaged to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. Proactive planning and coordination with DHMTs, including the development and implementation of community programmes, will take place prior to the start of construction.
HR25	The OHSSP, LMP and the CHSSP will include strategies for implementing the Voluntary Principles on Security and Human Rights.
HR34	An Information Education and Communication (IEC) programme will be developed for workers addressing social conduct and including topics such as: gender-based violence and, drug and alcohol misuse. The IEC programme will explore opportunities to support community initiatives addressing vulnerable groups including gender balance.
HR35	As part of the CHSSP, implement community patrols during the evenings to monitor and minimise night-time activity in project construction areas.
LIV01	The community health, safety and security plan will include measures to reduce the spread of animal diseases due to increased movement of livestock.
LIV03	The CHSSP will describe requirements to be implemented for vehicles passing through areas where animal disease control measures are in place.

Table E4.2-14 Community Health, Safety and Security Plan – Construction Phase

ID	Mitigation Commitment
SOL05	Local communities will be discouraged from using the right-of-way as an access road during construction through signage, awareness raising and the use of communication materials.

A4.2.15Occupational Health, Safety and Security Plan

The occupational health, safety and security plan (OHSSP) will define the management of workforce occupational health, safety and security and will include the mitigation measures listed below.

Table E4.2-15 Occupational Health, Safety and Security Plan – Construction Phase

ID	Mitigation Commitment
CHSW04	As part of the OHSSP, a Substance Misuse Management Plan will be developed and implemented, focusing on zero tolerance of drugs and alcohol. Random drugs and alcohol testing of personnel will be conducted, recorded and audited regularly.
CHSW06	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps.
CHSW07	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs.
CHSW13	As part of the OHSSP, pipe skid supports will be constructed to a suitable standard to prevent risks to public and worker safety.
CHSW14	The Voluntary Principles on Security and Human Rights will be implemented; compliance will be monitored.
CHSW15	Pre-deployment screenings will be described in the LMP and communicated during the recruitment process
CHSW16	As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented.
CHSW24	As part of OHSSP, Health Design Specifications, adequate drainage and the avoidance of standing water will be considered in camp site selection, construction and operation.
CHSW31	A HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to address: •awareness and understanding among drivers about the risks of HIV and STDs •the associated health implications •the preventative measures that can be taken •community awareness meetings •counselling and testing services •the distribution of information, leaflets and condoms.

Table E4.2-15 Occupational Health, Safety and Security Plan – Construction Phase

ID	Mitigation Commitment
CHSW32	A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors.
CHSW33	Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures.
ECO10	Senior project security personnel will liaise directly with the army and/or security forces to provide information on project construction activities and schedules.
HR23	As part of Camp Management Standards, menus in project facility canteens will be developed in consultation with a dietician to ensure adequate nutrition, cultural acceptability, portion size and diversity that is acceptable to all workers.
HR25	The OHSSP, LMP and the CHSSP will include strategies for implementing the Voluntary Principles on Security and Human Rights.
HR28	As part of the project OHSSP, a job-specific risk assessment (RA) process will be developed to consider: • risks associated with project activities; • mitigation measures (PPE, etc.); and • knowledge and understanding of the local workforce. Based on the outcome of the RA process, appropriate management measures will be developed and implemented prior to any activities being undertaken.
HR29	Risks from and mitigation of Worker Fatigue will be specifically addressed in the Occupational Health, Safety and Security Plan and the Transport and Road Safety Management Plan; the latter will stipulate driving hours and night driving will be by exception only.
HR30	Specific classes of hazards will be identified in work areas, including physical, chemical, biological, and radiological hazards and communicated to the workforce.
HR31	As part of the OHSSP, special attention will be paid to the health and safety of pregnant women, disabled employees and other vulnerable workers.
HR32	PPE and safety gear will take into account gender differences and the special needs of pregnant women.
HR36	As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.
WHSW01	Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.

Table E4.2-15 Occupational Health, Safety and Security Plan – Construction Phase

ID	Mitigation Commitment
WHSW02	As part of the project OHSSP, construction camps will be designed and built to meet national requirements and regulations. Measures will be detailed to avoid and reduce impacts associated with the development and occupation of construction camps, including but not limited to: • suitable and sufficient welfare facilities will be provided appropriate for both genders • clean and sanitary toilet facilities and showers will be provided appropriate for both genders. • adequate segregation between different areas (e.g. accommodation and hazardous areas) • measures to reduce or remove community disturbance or nuisance from the camps, e.g. preventing litter, dust generation, odours and noise. • include a helicopter landing area and secure fencing around the boundary.
WHSW03	Provide workers with personal protection from prevalent diseases where feasible (e.g., condoms and ITN).
WHSW04	As part of camp management standards, procedures will be developed to maintain the condition of each camp and to ensure camp facilities are kept clean and hygienic.
WHSW05	As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.
WHSW06	As part of the OHSSP Risk Assessment process, the risk to worker health posed by wildlife at each camp and yard will be assessed and appropriate management measures will be developed and implemented.
WHSW08	As part of the OHSSP, a first aid needs assessment will be undertaken for each camp to determine first aider and first aid kit requirements (e.g., qualifications, content of kits, locations).
WHSW09	As part of the OHSSP, a pest control plan will be developed for implementation on construction camps.
WHSW10	As part of Camp Management Standards, pets will be prohibited in construction camps/MCPYs.
WHSW12	As part of the OHSSP, a risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors; the training programme (including daily toolbox meetings) will be updated in accordance with changes made in scope, incident statistics and/or regulatory requirements. Daily toolbox meetings will be held where health and safety issues will be discussed.
WHSW15	A medical emergency response plan will be developed and implemented to ensure that emergency cases can be dealt with without impacting on district health services.
WHSW18	MCPYs will have health facilities with sufficient capacity and capability to prevent additional pressure being placed on local and district health services.
WHSW19	As part of the OHSSP, basic workplace wellness programs that are culturally and religiously acceptable will be developed and implemented.

A4.2.16 Transport and Road Safety Management Plan

The transport and road safety management plan (TRSMP) will guide project logistics and support community and driver road safety during project related transportation activities and will include the mitigation measures listed below.

Table E4.2-16 Transport and Road Safety Management Plan – Construction Phase

ID	Mitigation Commitment
ACO09	The Project will conduct regular inspection of access roads to check for damage caused by project vehicles to repair damage in a timely and efficient manner. Strict load management will be enforced on all project vehicles.
CHSW01	A strict project maximum speed limit will be enforced for project vehicles.
CHSW05	Where a safety risk assessment has identified a potential for construction interfaces to cause traffic accidents, temporary traffic control measures (signage, flagmen, temporary traffic lights, barricades) will be implemented.
CHSW08	A transport and road safety management plan based on project policies, site-specific traffic risk assessments and safe driving procedures will be developed and implemented.
CHSW09	Only trained, certified and physically fit drivers will drive vehicles. Night-time driving will be by exception only.
CHSW10	Where appropriate, such as built up areas, a banksman will be used for reversing vehicles.
CHSW17	Community liaison officers will encourage PAC Leadership to provide advance warning of local events so that construction activities can be avoided at these times.
CHSW20	Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).
CHSW26	Rest areas will be identified to allow drivers to comply with rest stop requirements and maximum daytime driving hours
HR29	Risks from and mitigation of Worker Fatigue will be specifically addressed in the Occupational Health, Safety and Security Plan and the Transport and Road Safety Management Plan; the latter will stipulate driving hours and night driving will be by exception only.
INF08	Authorities will be notified when oversize heavy loads need to be transported and such loads will be escorted by the project. Payloads will be monitored.
INF14	Preference will be given to transport of pipe and other construction materials by rail to Isaka where feasible.

A4.2.17 Emergency Preparedness and Response Plan

The emergency preparedness and response plan (EPRP) will define the approach to emergency preparedness and response and will include the mitigation measures listed below.

Table E4.2-17 Emergency Preparedness and Response Plan – Construction Phase

ID	Mitigation Commitment
EPR01	A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system.
EPR03	A schedule of emergency response exercises will be implemented to verify the project's emergency preparedness. A report of each exercise will be written and any areas for improvement identified.
EPR04	In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills.
WHSW15	A medical emergency response plan will be developed and implemented to ensure that emergency cases can be dealt with without impacting on district health services.

A4.2.18 Monitoring and Reporting Plan

The monitoring and reporting plan will define the approach to ensure that monitoring, inspections and audits are undertaken in a systematic way in order to monitor the success of the environmental and social mitigation measures as well as gather data on environmental and social performance, investigation of incidents and non-conformance monitoring results. Monitoring approach for each identified potential impact is described in the ESMP matrix (Appendix K), complete with monitoring parameter, target criteria and monitoring frequency. The plan will include the mitigation measures listed below.

Table E4.2-18 Monitoring and Reporting Plan – Construction Phase

ID	Mitigation Commitment
GNL14	The Project will monitor and report on project environmental and social performance as required by national legislation and as required by the ESMP.
MBIO12	Monitoring of suspended sediment and sedimentation will be described in the Monitoring and Reporting Plan; results will inform remedial action.

A4.3 Operational Phase

A4.3.1 Biodiversity Management Plan

The biodiversity management plan (BMP) will define the approach to reduce impacts on biodiversity and will include the mitigation measures listed below.

Table E4.3-1 Biodiversity Management Plan – Operational Phase

ID	Mitigation Commitment
BIO34	Operation phase vegetation management activities will account for species of conservation importance and their habitat requirements for foraging, nesting and/or breeding.
BIO39	The Project will prohibit all staff and contractors from the possession, purchase, trade or collection of wildlife or living natural resources that are nationally legally protected, CITES listed, or classed as threatened by the IUCN Red List.

A4.3.2 Pollution Prevention Plan

The pollution prevention plan (PPP) will define the approach to prevent pollution and will include the mitigation measures listed below.

Table E4.3-2 Pollution Prevention Plan – Operational Phase

ID	Mitigation Commitment
AIR05	All combustion plant will be designed to meet national regulations and project standards with regards to air quality and emission limits.
EPR04	In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills.
WTR02	A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures.

A4.3.3 Waste Management Plan

The waste management plan (WMP) will define the approach to reduce potential waste related impacts. No mitigations identified at ESIA stage.

A4.3.4 Natural Resource Management Plan

The natural resource management plan (NRMP) will define the approach to manage natural resource use and will include the mitigation measures listed below.

Table E4.3-3 Natural Resource Management Plan – Operational Phase

ID	Mitigation Commitment
WTR12	An effective collection and disposal systems for stormwater from all paved/hardstanding areas and buildings will be provided at aboveground installations.

A4.3.5 Soil Management Plan

The soil management plan (SMP) will define the approach to soil management and temporary erosion control. No mitigations identified at ESIA stage.

A4.3.6 Cultural Heritage Management Plan

The cultural heritage management plan (CHMP) will define the approach to the identification, assessment and mitigation of potential impacts on tangible and intangible cultural heritage and will include the mitigation measures listed below.

Table E4.3-4 Cultural Heritage Management Plan – Operational Phase

ID	Mitigation Commitment
CUH06	A CHMP will include details of all cultural heritage features identified before and during construction. The CHMP will inform cultural heritage management measures that may be required during project operation.
CUH07	Collection of cultural heritage artefacts by workers for their own use is prohibited. Any cultural heritage artefacts found by workers will be left in situ and reported to the worksite supervisor or the cultural heritage monitor as required by the chance finds procedure.

A4.3.7 Reinstatement Plan

The reinstatement plan (RP) will define the approach to manage reinstatement incorporating permanent erosion control and bio-restoration and will include the mitigation measures listed below.

Table E4.3-5 Reinstatement Plan – Operational Phase

ID	Mitigation Commitment
SOL16	When the pipeline is operating, regular monthly monitoring and inspections will be undertaken to check that the security and integrity of the pipeline is not compromised by erosion, with weekly monitoring at locations susceptible to erosion.

A4.3.8 Stakeholder Engagement Plan

The stakeholder engagement plan (SEP) will define the approach to maintain a social licence to operate[2] among project-affected communities (PACs) and will include the mitigation measures listed below.

[2] A social licence to operate exists when a project has ongoing approval or acceptance within the local community and other stakeholders.

Table E4.3-6 Stakeholder Engagement Plan – Operational Phase

ID	Mitigation Commitment
ECO12	The Project will engage with tourism facilities and operators and relevant organisations to communicate information about the project and the management of environmental and social risks.

A4.3.9 Resettlement Action Plan

The resettlement action plan (RAP) will define the approach for addressing physical and/or economic displacement of Project Affected Persons (PAPs). No mitigations identified at ESIA stage.

A4.3.10 Labour Management Plan

The labour management plan (LMP) will define the approach to ensure recruitment practices and working conditions comply with legal requirements and project standards. The LMP will include the mitigation measures listed below.

Table E4.3-7 Labour Management Plan – Operational Phase

ID	Mitigation Commitment
BIO39	The Project will prohibit all staff and contractors from the possession, purchase, trade or collection of wildlife or living natural resources that are nationally legally protected, CITES listed, or classed as threatened by the IUCN Red List.
HR39	Equal remuneration for jobs of equal value for men and women will be provided.
HR41	The Project will review the project performance regarding the Voluntary Principles on Security and Human Rights and develop an action plan to address performance improvement where necessary; the operational phase Labour Management Plan, Occupational Health, Safety and Security Plan and, the Community Health, Safety and Security Plan will account for any new measures that are required.
WHSW20	The labour management plan will include: • Compliance with international labour standards, national labour laws and regulations concerning transparency, accountability, anticorruption and human rights; • Recognising workers' right to organise collective bargaining and trade unions; • Providing suitable working conditions, including rest facilities and breaks; • Mechanism of compliance with the ILO Maternity Protection Convention (2000); and • Respecting workers' rights to privacy including data protection requirements.

A4.3.11 Project Induced In-Migration Management Plan

The project induced in-migration management plan (PIIMP) will define the approach to prevent project induced in-migration and manage negative impacts of potential project induced in-migration. No mitigations identified at ESIA stage.

A4.3.12 Procurement and Supply Chain Management Plan

The procurement and supply chain management plan (PSCMP) will define the approach to supply chain management including environmental, social and quality

considerations, maximise the purchase of local goods and services. The PSCMP will include the mitigation measures listed below.

Table E4.3-8 Procurement and Supply Chain Management Plan – Operational Phase

ID	Mitigation Commitment
BIO39	The Project will prohibit all staff and contractors from the possession, purchase, trade or collection of wildlife or living natural resources that are nationally legally protected, CITES listed, or classed as threatened by the IUCN Red List.

A4.3.13 Infrastructure and Utilities Management Plan

The infrastructure and utilities management plan (IUMP) will define the approach to monitor use of and/ or accidental damage to infrastructure and utilities and define the process of corrective action. No mitigations identified at ESIA stage.

A4.3.14 Community Health, Safety and Security Plan

The community health, safety and security plan (CHSSP) will define approach to manage community health, safety and security issues and will include the mitigation measures listed below.

Table E4.3-9 Community Health, Safety and Security Plan – Operational Phase

ID	Mitigation Commitment
CHSW01	A strict project maximum speed limit will be enforced for project vehicles.
CHSW23	As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme.
HR41	The Project will review the project performance regarding the Voluntary Principles on Security and Human Rights and develop an action plan to address performance improvement where necessary; the operational phase Labour Management Plan, Occupational Health, Safety and Security Plan and, the Community Health, Safety and Security Plan will account for any new measures that are required.

A4.3.15 Occupational Health, Safety and Security Plan

The occupational health, safety and security plan (OHSSP) will define the management of workforce occupational health, safety and security and will include the mitigation measures listed below.

Table E4.3-10 Occupational Health, Safety and Security Plan – Operational Phase

ID	Mitigation Commitment
CHSW24	As part of OHSSP, Health Design Specifications, adequate drainage and the avoidance of standing water will be considered in camp site selection, construction and operation.
HR41	The Project will review the project performance regarding the Voluntary Principles on Security and Human Rights and develop an action plan to address performance improvement where necessary; the operational phase Labour Management Plan, Occupational Health, Safety and Security Plan and, the Community Health, Safety and Security Plan will account for any new measures that are required.

A4.3.16 Transport and Road Safety Management Plan

The transport and road safety management plan (TRSMP) will guide project logistics and support community and driver road safety during project related transportation activities and will include the mitigation measures listed below.

Table E4.3-11 Transport and Road Safety Management Plan – Operational Phase

ID	Mitigation Commitment
CHSW01	A strict project maximum speed limit will be enforced for project vehicles.

A4.3.17 Emergency Preparedness and Response Plan

The emergency preparedness and response plan (EPRP) will define the approach to emergency preparedness and response and will include the mitigation measures listed below.

Table E4.3-12 Emergency Preparedness and Response Plan – Operational Phase

ID	Mitigation Commitment
EPR01	A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system.
EPR03	A schedule of emergency response exercises will be implemented to verify the project's emergency preparedness. A report of each exercise will be written and any areas for improvement identified.

Table E4.3-12 Emergency Preparedness and Response Plan – Operational Phase

ID	Mitigation Commitment
EPR04	In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills.

A4.3.18 Monitoring and Reporting Plan

The monitoring and reporting plan will define the approach to ensure that monitoring, inspections and audits are undertaken in a systematic way in order to monitor the success of the environmental and social mitigation measures as well as gather data on environmental and social performance, investigation of incidents and non-conformance monitoring results. Monitoring approach for each identified potential impact is described in the ESMP matrix (Appendix K), complete with monitoring parameter, target criteria and monitoring frequency. The plan will include the mitigation measures listed below.

Table E4.3-13 Monitoring and Reporting Plan – Operational Phase

ID	Mitigation Commitment
GNL12	The Project will monitor and report on project environmental and social performance as required by national legislation and as required by the ESMP.

A4.4 Mitigation Commitments Register

Table E4.4-1 below summarises project mitigation measures in alphabetical order, together with the corresponding management plans.

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
ACO01	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site.	Y		PPP
ACO02	Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration.	Y		PPP
ACO03	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken or appropriate compensation paid if damage is proven.	Y		PPP, SEP
ACO04	Preference will be given to selecting low noise and vibration emitting equipment for all construction works.	Y		PPP
ACO05	Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Y		PPP, SEP
ACO06	Potential noise and vibration impacts will be assessed where piling is to be undertaken close to sensitive receptors. Where possible, alternative techniques or materials will be used to reduce potential impacts, e.g. restrictions on times and duration in any given day that piling activities are undertaken.	Y		PPP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
ACO07	Where possible new access roads will be constructed a minimum of 100 m away from sensitive receptors (hospitals, educational facilities or dwellings).	Y		PPP
ACO08	Blasting will only be used where other excavation methods are considered technically impracticable or uneconomic. Where blasting is undertaken, a Blast Management Plan will be developed to consider the effects of noise, air overpressure and vibration on dwellings, structures and wildlife, and develop appropriate mitigation where required. The Blast Management Plan will be prepared by a competent person and peer reviewed.	Y		PPP, SEP, CHSSP
ACO09	The Project will conduct regular inspection of access roads to check for damage caused by project vehicles to repair damage in a timely and efficient manner. Strict load management will be enforced on all project vehicles.	Y		SEP, IUMP, TRSMP
AIR01	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Y		PPP
AIR02	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions	Y		PPP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	• not be allowed to idle – engines will be switched off when not in use.			
AIR03	Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Y		PPP
AIR05	All combustion plant will be designed to meet national regulations and project standards with regards to air quality and emission limits.		Y	PPP
BIO01	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction.	Y		BMP
BIO02	Supplementary preconstruction biodiversity baseline surveys will be undertaken in locations identified in the baseline appendices of the environmental and social impact assessment in order to produce a Biodiversity Action Plan to identify further enhancement and conservation measures.	Y		BMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
BIO03	As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing.	Y		BMP
BIO05	Hunting, fishing, unauthorised gathering of products (including plants and firewood) and deliberate disturbance or harassment of fauna will be prohibited for project personnel. The Project will restrict the purchase of wildlife related products and crafts by project workers.	Y		BMP, LMP
BIO06	Appropriate measures will be implemented to prevent fauna or people from entering welded pipe sections or open excavations; there will be fauna ladders placed at suitable intervals in all open excavations. Animals will be removed safely and released into suitable habitat away from the working area.	Y		BMP, SEP, CHSSP
BIO07	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed.	Y		BMP, SMP
BIO08	A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river	Y		BMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preclearance checks on the right-of-way.			
BIO09	Before construction starts, a plan will be prepared for translocating fauna and flora in areas identified in the environmental and social impact assessment and preconstruction surveys. The pre-entry surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction.	Y		BMP
BIO10	A written and photographic record will be kept of translocated species for verification and potential post-construction monitoring. The success of translocation will be monitored during and post-construction for species of conservation importance.	Y		BMP
BIO11	Information on seasonal constraints recorded within the baseline appendices environmental and social impact assessment will be used to identify activities that need to be undertaken at a specific time of year or periods when activities cannot be completed without project approval of a deviation (e.g., during sensitive periods such as breeding and migration of species).	Y		BMP
BIO12	Where a section of the right-of-way is through habitats with high biodiversity value (as identified in the baseline appendices of the environmental and social impact assessment), the area will be reviewed to determine if the working width can be reduced to limit impacts as much as possible.	Y		BMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
BIO13	Open-cut river crossings will be undertaken during the dry season where possible; where not possible site-specific method statements will be developed addressing ecological sensitivities.	Y		BMP
BIO14	As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made and the area reinstated as quickly as possible.	y		BMP
BIO15	The maximum length of open trench at any one time (per spread) will be defined based on: • the habitats present and potential ecological sensitivities (e.g., terrestrial commuting routes for large mammals) • community safety. Gaps will also be left in soil stacks and pipe strings at strategic locations to allow passage of animals where it is considered safe to do so.	Y		BMP, CHSSP
BIO16	If dams and pumps are used to maintain water flow during the construction of watercourse crossings or abstraction of water from watercourses is required, fish screens will be used on the end of the pump inlet hose. Any fish caught within dammed areas either side of the crossing will be transferred up or downstream as appropriate by suitably experienced personnel.	Y		BMP
BIO17	Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity.	Y		BMP, RP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
BIO18	All incidences of accidental injury or death of fauna will be recorded, including details of the circumstances, time, species, size and habitat. The report will be reviewed to determine if any action should to be taken to prevent further incidents.	Y		BMP
BIO19	Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive species on the RoW, work sites and camp facilities. The biosecurity measures will also outline specifics to protect the aquatic environment from alien invasive species.	Y		BMP
BIO20	The Project will support an education program for local communities in relation to grey crowned cranes. Construction within 250m of habitat that supports breeding grey crowned cranes will be avoided if nest sites are confirmed.	Y		BMP, SEP
BIO21	Species' populations will be monitored pre and post construction. The project will employ adaptive management in response to findings.	Y		BMP
BIO23	The use of pesticides, rodenticides and other chemicals is prohibited in proximity to raptor habitat.	Y		BMP
BIO24	The total duration of construction disturbance (i.e. the time between initial site clearing and final reinstatement/biorestoration) will be minimised.	Y		BMP
BIO26	The Project will support the relevant management authority with capacity-building, for example by contributing to additional ranger support or other activities identified in the existing protected area management plan prepared by the relevant management authority.	Y		BMP, SEP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
BIO34	Operation phase vegetation management activities will account for species of conservation importance and their habitat requirements for foraging, nesting and/or breeding.		Y	BMP
BIO36	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Construction planning surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction.	Y		BMP, RP
BIO37	The need to compensate for trees removed will be determined on a site-by-site basis and will take into account the species removed. Preference will be given to native species representative of adjacent undisturbed areas. No exotic species will be planted unless specifically required by the forestry agency. In areas of plantation forestry, the requirements of the forestry agency will be met (e.g., ratios for compensation planting).	Y		BMP, RP, SEP, RAP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
BIO38	Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Y		BMP
BIO39	The Project will prohibit all staff and contractors from the possession, purchase, trade or collection of wildlife or living natural resources that are nationally legally protected, CITES listed, or classed as threatened by the IUCN Red List.	Y	Y	BMP, LMP, PSCMP
CHSW01	A strict project maximum speed limit will be enforced for project vehicles.	Y	Y	CHSSP, TRSMP
CHSW02	Local people will be consulted on the optimum location of crossing points and pastoralists informed of the access restrictions in advance, advising them to avoid cultivated areas. Crossing points will be provided across open trenches and welded pipes and gaps will be left in soil stacks and pipe strings at strategic locations. Incidents in conflicts between crop farmers and herders in the vicinity of the project footprint will be monitored and support will be provided to local authorities to obtain a resolution in cases of conflict wherever possible.	Y		SEP, RAP, CHSSP
CHSW03	Security personnel engaged by the project will receive training on Voluntary Principles (this will include where army and or security forces are engaged by the project); performance will be monitored.	Y		CHSSP, MRP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
CHSW04	As part of the OHSSP, a Substance Misuse Management Plan will be developed and implemented, focusing on zero tolerance of drugs and alcohol. Random drugs and alcohol testing of personnel will be conducted, recorded and audited regularly.	Y		OHSSP
CHSW05	Where a safety risk assessment has identified a potential for construction interfaces to cause traffic accidents, temporary traffic control measures (signage, flagmen, temporary traffic lights, barricades) will be implemented.	Y		CHSSP, TRSMP
CHSW06	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps.	Y		OHSSP
CHSW07	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs.	Y		OHSSP
CHSW08	A transport and road safety management plan based on project policies, site-specific traffic risk assessments and safe driving procedures will be developed and implemented.	Y		TRSMP
CHSW09	Only trained, certified and physically fit drivers will drive vehicles. Night-time driving will be by exception only.	Y		LMP, TRSMP
CHSW10	Where appropriate, such as built up areas, a banksman will be used for reversing vehicles.	Y		TRSMP
CHSW11	Construction barriers will have visible warning signs understandable by local communities. Signage will be in accordance with internationally accepted symbols and/or be well known to local communities.	Y		CHSSP
CHSW12	A risk assessment will be conducted for excavations with consideration to community safety.	Y		CHSSP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
CHSW13	As part of the OHSSP, pipe skid supports will be constructed to a suitable standard to prevent risks to public and worker safety.	Y		OHSSP
CHSW14	The Voluntary Principles on Security and Human Rights will be implemented; compliance will be monitored.	Y		LMP, CHSSP, OHSSP, MRP
CHSW15	Pre-deployment screenings will be described in the LMP and communicated during the recruitment process	Y		LMP, OHSSP
CHSW16	As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented.	Y		OHSSP
CHSW17	Community liaison officers will encourage PAC Leadership to provide advance warning of local events so that construction activities can be avoided at these times.	Y		SEP, TRSMP
CHSW18	Regular meetings will be held with PAC representatives, during construction in their area, to update them on construction progress and to receive comments or queries. A community liaison log will be maintained detailing the content of all meetings.	Y		SEP
CHSW19	Community awareness programmes will be developed and implemented in project-affected communities to explain: • road safety risks and how to increase the safety of pedestrians particularly children • how to ensure their safety during construction • the measures that have been, or will be, implemented to protect their health and safety (e.g., provision of safe access).	Y		SEP, CHSSP
CHSW20	Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).	Y		BMP, CHSSP, TRSMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
CHSW21	Public awareness programmes for stakeholders will include a specific section about the security presence around camps and security protocols which apply.	Y		SEP, CHSSP
CHSW22	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Y		SEP
CHSW23	As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme.	Y	Y	CHSSP
CHSW24	As part of OHSSP, Health Design Specifications, adequate drainage and the avoidance of standing water will be considered in camp site selection, construction and operation.	Y	Y	OHSSP
CHSW25	A monitoring plan will be developed and implemented to ensure that environmental noise exposure levels are periodically monitored and documented. Procedures for corrective measures will be incorporated and implemented in the event of exceedances.	Y		PPP, MRP
CHSW26	Rest areas will be identified to allow drivers to comply with rest stop requirements and maximum daytime driving hours	Y		TRSMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
CHSW27	Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Y		SEP, RAP
CHSW28	The project will work closely with local authorities to monitor any emerging tensions between crop farmers and pastoralists related to project impacts.	Y		SEP
CHSW29	The Project will liaise with other third-party developments and relevant government bodies to share information about their worker and community health management strategies, as well as information about worker movements, to ensure that they are commensurate and enable an efficient and coordinated response to any potential disease outbreak.	Y		SEP
CHSW31	A HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to address: •awareness and understanding among drivers about the risks of HIV and STDs •the associated health implications •the preventative measures that can be taken •community awareness meetings •counselling and testing services •the distribution of information, leaflets and condoms.	Y		LMP, OHSSP
CHSW32	A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors.	Y		LMP, OHSSP
CHSW33	Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will	Y		PIIMP, CHSSP, OHSSP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	be developed to manage transgressions within the project disciplinary procedures and structures.			
CHSW36	As part of the CHSSP, the District Health Management Teams (DHMTs) will be engaged to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. Proactive planning and coordination with DHMTs, including the development and implementation of community programmes, will take place prior to the start of construction.	Y		CHSSP
CLI01	Electrical equipment of a size that is appropriate for the functions to be performed will be selected with a view to maximising energy efficiency. Electrical equipment will be turned off when not in use.	Y		PPP
CUH01	A construction planning survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained.	Y		CHMP, SEP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
CUH02	A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel.	Y		CHMP, SEP
CUH03	A written scheme of investigation (WSI) will be prepared where an intervention is needed and appended to the cultural heritage management plan (CHMP). Until investigation and recording in accordance with the WSI, or avoidance or management activity is signed off by government authorities, construction may not proceed in that area.	Y		CHMP, SEP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
CUH04	The senior cultural heritage monitor (SCHM) will prepare the chance finds procedure (CFP); Chance finds will be excavated by suitably qualified and approved archaeologists, in accordance with the CFP and authorised by the relevant government authority.	Y		CHMP, SEP
CUH05	Information on intangible cultural heritage (ICH) collected during the construction planning survey will be evaluated and integrated into the cultural heritage management plan (CHMP). This will include information on vulnerable groups if present.	Y		CHMP
CUH06	A CHMP will include details of all cultural heritage features identified before and during construction. The CHMP will inform cultural heritage management measures that may be required during project operation.	Y	Y	CHMP
CUH07	Collection of cultural heritage artefacts by workers for their own use is prohibited. Any cultural heritage artefacts found by workers will be left in situ and reported to the worksite supervisor or the cultural heritage monitor as required by the chance finds procedure.	Y	Y	CHMP
CUH08	Any decompaction/ripping or other ground disturbance activities required during reinstatement will be planned to avoid any cultural heritage feature that has been preserved in situ.	Y		CHMP, RP
ECO01	A Procurement and Supply Chain Management Plan (PSCMP) will be developed to maximise the purchase of goods and services from within Uganda/Tanzania. This will be contingent on whether local suppliers can offer sufficient quality and reliability and can meet project requirements. PSCMP will include, as appropriate, enterprise development, capacity development and ring-fencing contracts.	Y		PSCMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
ECO02	Project use of third-party quarries and borrow pits will require verification of national regulatory and project standard compliance; where suppliers do not meet project standards an action plan will be implemented to build capacity, so the supplier can meet the project standard in a timely manner.	Y		NRMP, PSCMP
ECO03	Compliance with project human resources policies and procedures will be a construction contract requirement.	Y		LMP, PSCMP
ECO04	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment.	Y		SEP, LMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
ECO05	A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary through targeted meetings scheduled at times and locations that may increase women's participation	Y		SEP, LMP
ECO06	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Y		SEP, PIIMP, MRP
ECO07	A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.	Y		LMP
ECO08	Before construction, a benchmarking exercise gathering data associated with average incomes in the private and public sector for each region/district will be undertaken. This information will be used to identify salary levels for the construction workforce so that disparities between project-related salaries and local businesses/public sector salaries are avoided.	Y		LMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
ECO09	Before construction, a benchmarking exercise to gather data associated with average prices for goods will be undertaken in each region/district. This information will be used to identify appropriate prices so that large price disparities between project-procured goods and local goods are avoided.	Y		SEP, PSCMP
ECO10	Senior project security personnel will liaise directly with the army and/or security forces to provide information on project construction activities and schedules.	Y		SEP, OHSSP
ECO12	The Project will engage with tourism facilities and operators and relevant organisations to communicate information about the project and the management of environmental and social risks.	Y	Y	SEP
ECO14	The Project will conduct ongoing monitoring and liaise with authorities to review social changes in the towns of • Katikara Trading Centre, Kyenda and Sembabule Market Zone (Uganda) and • Mutukula (Uganda) Appropriate interventions will be developed as deemed necessary to enhance existing interventions (as set out in PIIM management plan).	Y		SEP, PIIMP
ECO15	The project will undertake a benchmarking assessment on the inflation of goods within PACs if construction phases with other third parties with large workforces coincide. The results of benchmarking will be shared with the proponents of the third-party developments as required.	Y		SEP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
EPR01	A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system.	Y	Y	EPRP
EPR02	Spill response equipment, such as absorbents and spill kits, will be available at all work site locations and on fuel bowsers and tankers. The spill kits will be inspected regularly to ensure they remain adequate for the needs of the project. The spill kits will be logged, inventoried and maintained.	Y		PPP
EPR03	A schedule of emergency response exercises will be implemented to verify the project's emergency preparedness. A report of each exercise will be written and any areas for improvement identified.	Y	Y	EPRP
EPR04	In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills.	Y	Y	PPP, EPRP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
GNL01	The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Y		SEP
GNL02	The Project will advise appropriate regulators and lead agencies of the construction schedule	Y		SEP
GNL03	The Project will, in collaboration with the government and other third-party developers in the Albertine Graben, participate in the Regional Cumulative Impacts Management (RCIM) initiative proposed by the upstream Tilenga Project.	Y		SEP
GNL05	The Project will ensure that the proponents of the associated facilities are made aware of the construction schedule so that construction activities can be strategically planned to reduce disruption.	Y		SEP
GNL06	The project will continue engagement with Tilenga PACs and Buliisa and Hoima district local authorities during the construction phases of the project, emphasising the temporary nature of construction employment.	Y		SEP
GNL08	The project will consider the issue of double resettlement into its resettlement plan.	Y		SEP, RAP
GNL09	The Project will engage proponents of the associated facilities and the third-party developments and relevant government agencies to consider options for management measures to address significant cumulative impacts. Options could cover: project design, scheduling, construction management or operations management.	Y		SEP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
GNL10	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures.	Y		SEP
GNL11	The Project will ensure that the proponents of the associated facilities are made aware of the construction schedule so that construction activities can be strategically planned to reduce disruption.	Y		SEP
GNL13	The Project will assist with capacity-building for government organisations to develop and budget for appropriate town planning, infrastructure and service provisions in the mid-Western Region (Hoima).			SEP
GNL14	The Project will monitor and report on project environmental and social performance as required by national legislation and as required by the ESMP.	Y	Y	MRP
HR01	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment.	Y		SEP, LMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
HR02	As part of the tendering process, (sub) contractors will be required to include training components in their proposal aimed at increasing local employment as well as improving skills of local staff.	Y		PSCMP
HR03	The workers' grievance procedure will include the option to log grievances anonymously.	Y		LMP
HR04	A formal structure will be established (e.g. Ethics Committee), which deals with infringement of Human Rights linked to the working environment; a company representative will participate in the Ethics Committee; infringements of the Project labour policy and national regulations will be monitored.	Y		SEP, LMP, MRP
HR05	Hiring managers from (sub) contractors will receive training regarding the developer's non-discrimination policies.	Y		LMP, PSCMP
HR06	Gender-based hiring criteria will be included in tendering documents, so that it becomes part of the selection criteria for (sub) contractors; contracts will include targets stipulating a minimum number of women as well as staff with disabilities or other vulnerable groups.	Y		LMP, PSCMP, MRP
HR07	As a standard clause in all contracts, no employees shall be hired, directly or indirectly, under the age of 18 years of age. It will be the responsibility of the developer to ensure that no children under the age of 18 are involved in their supply chain. If periodic inspections and audits identify children under the age of 18 being hired by the developer, this will be considered a breach of contract and the child will be removed from the workplace. Their salary may continue to be paid to them for a set period pending the putting in place an alternative solution.	Y		LMP, PSCMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
HR08	Stakeholders concerned about child labour will be encouraged to use the grievance mechanism to address project-related child labour concerns.	Y		SEP
HR09	The Government will be requested not to use any prison labour for tasks that are, or could be associated with, project activities.	Y		SEP, LMP
HR10	Contracts will not include provisions that may support forced labour; for example, requests of deposit guarantees from employees to have access to safety protection equipment or other materials.	Y		LMP
HR11	As part of the work site induction, all staff will be informed on workers' rights.	Y		LMP
HR12	The Project will require that all workers in similar jobs work under the same, or similar, working conditions (salary, vacation, insurance etc.)	Y		LMP, PSCMP
HR13	The Human Resources function will organize periodic town hall-style sessions to provide information and receive labour and working conditions related feedback.	Y		SEP, LMP
HR14	All workers will have contracts describing conditions of work and will have the contents explained to them. This includes their legal rights under national law. Contracts will be available in workers' native languages written in easily understandable language. Contracts will state terms of employment and duration and specifically address: • salary • working conditions • working hours and overtime • holidays and sick leave • social security and compensation • health insurance • access to remedy.	Y		LMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	• medical leave • other provisions related to medical care.			
HR15	A due diligence evaluation of each (sub) contractor's human rights record related to labour and working conditions will be conducted.	Y		LMP, PSCMP
HR16	Community Liaison Officers will hold regular meetings with supply chain workers to address human and labour rights. This includes a focus on harassment including the possibility of demands for sexual favours, or a financial kick-back during the recruitment process.	Y		SEP
HR17	The Project will work in partnership with local organizations to address gender bias; female CLOs will be employed to facilitate project employment and to improve the work environment for women. Female CLOs will hold periodic meetings with female employees and community groups to ensure concerns specific to women and children are identified and to solicit suggestions for improvement.	Y		SEP, LMP
HR18	Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis.	Y		LMP, PSCMP
HR19	The employee Code of Behaviour will include a clause that a sexual relation based on power inequality will lead to instant dismissal of the senior person.	Y		LMP, PSCMP
HR22	An awareness campaign targeting schools at sensitive locations within the project AOI will be developed, addressing: • Importance of staying in school. • Risks particularly to girls of relationships with transient workers, transactional and commercial sex. • Road safety awareness.	Y		SEP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	• Awareness about their rights. • Project grievance mechanism and their right to use it.			
HR23	As part of Camp Management Standards, menus in project facility canteens will be developed in consultation with a dietician to ensure adequate nutrition, cultural acceptability, portion size and diversity that is acceptable to all workers.	Y		OHSSP
HR24	The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities.	Y		SEP
HR25	The OHSSP, LMP and the CHSSP will include strategies for implementing the Voluntary Principles on Security and Human Rights.	Y		LMP, CHSSP, OHSSP
HR26	The Project will deal directly with those having customary rights of occupancy to land; with the compensation process witnessed by appropriate third party to minimize the risk of interference by intermediaries.	Y		RAP
HR27	The Project will support Government efforts to clarify disputed land boundaries in the Project area, in particular where it concerns customary right of occupancy of land.	Y		SEP, RAP
HR28	As part of the project OHSSP, a job-specific risk assessment (RA) process will be developed to consider: • risks associated with project activities; • mitigation measures (PPE, etc.); and • knowledge and understanding of the local workforce. Based on the outcome of the RA process, appropriate management measures will be developed and implemented prior to any activities being undertaken.	Y		OHSSP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
HR29	Risks from and mitigation of Worker Fatigue will be specifically addressed in the Occupational Health, Safety and Security Plan and the Transport and Road Safety Management Plan; the latter will stipulate driving hours and night driving will be by exception only.	Y		OHSSP, TRSMP
HR30	Specific classes of hazards will be identified in work areas, including physical, chemical, biological, and radiological hazards and communicated to the workforce.	Y		OHSSP
HR31	As part of the OHSSP, special attention will be paid to the health and safety of pregnant women, disabled employees and other vulnerable workers.	Y		OHSSP
HR32	PPE and safety gear will take into account gender differences and the special needs of pregnant women.	Y		OHSSP
HR33	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM.	Y		PIIMP
HR34	An Information Education and Communication (IEC) programme will be developed for workers addressing social conduct and including topics such as: gender-based violence and, drug and alcohol misuse. The IEC programme will explore opportunities to support community initiatives addressing vulnerable groups including gender balance.	Y		CHSSP
HR35	As part of the CHSSP, implement community patrols during the evenings to monitor and minimise night-time activity in project construction areas.	Y		CHSSP
HR36	As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Y		OHSSP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
HR38	Project will work in partnership with local organisations to provide support to women seeking employment with the project so that they are better able to express and understand opportunities, benefits and their rights at work.	Y		SEP, LMP
HR39	Equal remuneration for jobs of equal value for men and women will be provided.	Y	Y	LMP
HR40	An independent labour rights related monitoring and evaluation system will be established, possibly in collaboration with the national regulatory agencies, to ensure that policies are adhered to and national legislation is followed.	Y		LMP
HR41	The Project will review the project performance regarding the Voluntary Principles on Security and Human Rights and develop an action plan to address performance improvement where necessary; the operational phase Labour Management Plan, Occupational Health, Safety and Security Plan and, the Community Health, Safety and Security Plan will account for any new measures that are required.		Y	LMP, CHSSP, OHSSP
INF01	For major road crossings, crossing techniques that minimize the obstruction of traffic flow will be selected.	Y		IUMP
INF02	A preconstruction entry survey area will be defined where there is potential for vibration effects on dwellings and buildings. The survey (including photographs) will record the external condition of dwellings and buildings before construction, provide baseline evidence in the event of a claim for damage, and will inform pre-entry agreements that will also include repair requirements.	Y		IUMP
INF03	Potentially affected landowners, land users, communities and other affected stakeholders (e.g. tourism operators) will be consulted if there is likely to be any disruption to the existing infrastructure and utility services. Feedback from communities	Y		IUMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	will inform planning of the works, especially when determining the options for temporary alternatives.			
INF04	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors.	Y		SEP, IUMP
INF05	A crossing schedule, including all known roads, telephone and electricity facilities and oil, gas and water pipes, will be maintained. Owners and service operators will be consulted and full agreement gained to cross the infrastructure or utility. Where a third-party utility service will be crossed by the project, a method statement that includes measures to protect the integrity of the utility service will be agreed with the service operator before work can start.	Y		IUMP
INF06	The Project will notify third-party utility services of any damage and the damage will be repaired promptly in consultation with the service operator or utility owner. A timetable for repair of any damaged infrastructure will be agreed with the service operator or utility owner and communicated to affected communities.	Y		IUMP
INF07	If project activities affect land-based livelihoods because of interruption to irrigation, drainage or agricultural production, appropriate compensation will be provided in accordance with the RAP.	Y		RAP, IUMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
INF08	Authorities will be notified when oversize heavy loads need to be transported and such loads will be escorted by the project. Payloads will be monitored.	Y		IUMP, TRSMP
INF09	The design of new road sections and upgrades will take account of local conditions to ensure maintenance of good road condition, for example inclusion of drainage ditches.	Y		IUMP
INF10	A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner.	Y		IUMP
INF11	Infrastructure and utility services will be identified and protected during construction.	Y		IUMP
INF12	Where disruption to infrastructure and utilities will occur for more than 12 hours, a risk analysis of impacts on affected settlements will be completed. Where there will be a risk to health or livelihood to settlements or where the disruption is not acceptable to the affected settlements, alternatives will be provided.	Y		IUMP
INF13	An initial survey, supported by photographs, will be completed of the condition of roads to be used by the project including but limited to bridges, drainage structures, signage, traffic management and other road infrastructure. The survey will be agreed and signed by the road authority, local authority and any affected landowner. The survey will be made available to the road authority and municipal authorities if requested. The	Y		IUMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	chosen project access routes will be improved as required to provide safe access for the project duration.			
INF14	Preference will be given to transport of pipe and other construction materials by rail to Isaka where feasible.	Y		TRSMP
INF16	Where there is potential for congestion on shared transport routes, the project will liaise with third party developers, the police and authorities to identify and implement additional traffic management measures that limit disruption.	Y		IUMP
LIV01	The community health, safety and security plan will include measures to reduce the spread of animal diseases due to increased movement of livestock.	Y		RAP, CHSSP
LIV03	The CHSSP will describe requirements to be implemented for vehicles passing through areas where animal disease control measures are in place.	Y		CHSSP
LIV05	Grievances arising from the community in relation to maintenance activities at AGIs will be handled in accordance with the project grievance procedure.	Y		SEP, RAP
LIV06	Post RAP monitoring of PAPs engaged in gold ASM or high value crop cultivation, particularly female headed households, youth and casual, landless artisanal miners, will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored to pre-project levels.	Y		RAP
LNP01	A preconstruction entry survey, including photographs, will be undertaken to document the condition of the land including immovable assets, crops and improvements required to the land before construction.	Y		RP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
LNP02	Any new aggregate extraction sites and batching plants sites, including 3rd party sites, will undergo environmental and social evaluation prior to use; and, where possible, new sites will be located as close as possible to the existing road network to reduce the requirement for new access roads.	Y		NRMP, PSCMP
LNP03	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Y		RAP, MRP
LNP04	The Project will continue monitoring of, and liaising with authorities on land speculation. Where required additional interventions will be developed to enhance existing interventions.	Y		SEP, RAP, MRP
LNP06	PACs will be sensitised to recent land speculation and instances of associated violence and informed of actions that can be taken.	Y		SEP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
LSC03	Options will be considered for the use of surplus rock from blasting including: • crushing and onsite re-use • offsite re-use • offsite disposal • onsite placement. if this is in keeping with the local landscape character.	Y		WMP
RES01	All excavated materials will be screened and reused where possible to reduce the need for newly quarried aggregates.	Y		WMP, NRMP
RES02	If timber is cleared (e.g., as part of right-of-way clearance), it will be reused for construction activities as far as possible. Release of any and all chemically treated waste timber will be made by on a case-by-case basis.	Y		WMP, NRMP
SOL01	Where required, imported soil will have similar physical characteristics to soil in the area where it will be deposited. Soil will be checked, and analysed if needed, for presence of invasive species and contamination.	Y		SMP
SOL02	Environmental and social evaluations will be undertaken to identify suitable offsite disposal sites for waste soil and rock, and appropriate management measures to be implemented. All temporary borrow pits and soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented.	Y		WMP, SMP, RP
SOL03	Where benching is required then the areas will be re-contoured to original profiles. Side casting in areas of steep terrain will be prohibited. The effects of accidental spoil slippage on steep slopes will mitigated, e.g., by using fences or a geotextile membrane.	Y		SMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
SOL04	Load-bearing/ ground protection materials, such as bog mats and geotextile membranes under temporary haul roads, will be used to support heavy loads in areas of soft ground, including wetland areas.	Y		SMP
SOL05	Local communities will be discouraged from using the right-of-way as an access road during construction through signage, awareness raising and the use of communication materials.	Y		CHSSP
SOL06	Topsoil and subsoil stockpiles will be stored in accordance with the Soil Management Plan, be free draining and include gaps left in strategic locations to allow potential floodwater through.	Y		SMP
SOL07	If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme • compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site.	Y		SMP
SOL08	A preconstruction soil survey will be undertaken of the RoW and MCPY and other construction facilities, based on a representative sample, to: • measure the depth of the topsoil layer along the pipeline route to inform requisite stripping depth • identify areas of fragile, sensitive and thin topsoil • identify areas lacking topsoil.	Y		SMP
SOL09	Recontouring should be sympathetic and in keeping with preconstruction profiles, where this is not precluded by risk to integrity of the pipeline or erosion considerations.	Y		RP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
SOL10	Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement.	Y		RP
SOL11	Seeds of species that have the potential to outcompete local plant species will not be used in revegetation seed mixes. Where biorestoration is required, local species will be used as far as available.	Y		BMP, RP
SOL12	Procedures will be developed, incorporating plans for erosion and sediment control and reinstatement. These will be produced before work begins at areas of fragile, sensitive or thin topsoil, side slopes or narrow ridges and at watercourse crossings. Sediment interception measures will be installed, inspected and maintained to prevent sediment runoff from the right-of-way or construction sites affecting watercourses, wetlands, waterbodies or environmentally sensitive areas. Procedures will include additional precautions to be taken and increased monitoring (minimum twice per week), with the aim of preserving the topsoil for subsequent replacement.	Y		PPP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
SOL13	A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.	Y		RP
SOL14	Areas of surface contamination identified prior to construction within the project footprint will be remediated before or during project construction. Where cleanup of pre-existing contaminated land is required, a remediation proposal will be implemented including but not limited to: • remediation techniques • the cleanup standard to be achieved • monitoring and analysis of remediated land to be undertaken • all regulatory and project documentation requirements • appropriate environmental and occupational health and safety protection measures to be adopted. All cleanup and remediation activities will be adequately documented.	Y		PPP, RP
SOL15	Contaminated material storage areas will be provided with containment measures (e.g., bunds, ditches, impermeable base membranes and covers) to prevent runoff and airborne losses.	Y		PPP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
SOL16	When the pipeline is operating, regular monthly monitoring and inspections will be undertaken to check that the security and integrity of the pipeline is not compromised by erosion, with weekly monitoring at locations susceptible to erosion.		Y	RP, MRP
SOL17	Trench breakers will be installed in the pipeline trench where downhill flow within the backfilled trench may lead to erosion.	Y		RP
SOL18	New access roads will follow existing tracks, where possible, and will be designed with adequate slope and cross fall drainage to channel runoff safely to off-road soakaways without causing erosion or siltation.	Y		RP
WHSW01	Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.	Y		WMP, OHSSP
WHSW02	As part of the project OHSSP, construction camps will be designed and built to meet national requirements and regulations. Measures will be detailed to avoid and reduce impacts associated with the development and occupation of construction camps, including but not limited to: • suitable and sufficient welfare facilities will be provided appropriate for both genders • clean and sanitary toilet facilities and showers will be provided appropriate for both genders. • adequate segregation between different areas (e.g. accommodation and hazardous areas) • measures to reduce or remove community disturbance or nuisance from the camps, e.g. preventing litter, dust generation, odours and noise. • include a helicopter landing area and secure fencing around the boundary.	Y		OHSSP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WHSW03	Provide workers with personal protection from prevalent diseases where feasible (e.g., condoms and ITN).	Y		OHSSP
WHSW04	As part of camp management standards, procedures will be developed to maintain the condition of each camp and to ensure camp facilities are kept clean and hygienic.	Y		OHSSP
WHSW05	As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.	Y		OHSSP
WHSW06	As part of the OHSSP Risk Assessment process, the risk to worker health posed by wildlife at each camp and yard will be assessed and appropriate management measures will be developed and implemented.	Y		OHSSP
WHSW07	Project approved vehicles will be provided to transport camp residents to worksites.	Y		LMP
WHSW08	As part of the OHSSP, a first aid needs assessment will be undertaken for each camp to determine first aider and first aid kit requirements (e.g., qualifications, content of kits, locations).	Y		OHSSP
WHSW09	As part of the OHSSP, a pest control plan will be developed for implementation on construction camps.	Y		OHSSP
WHSW10	As part of Camp Management Standards, pets will be prohibited in construction camps/MCPYs.	Y		OHSSP
WHSW11	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of	Y		LMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
	non-compliance, workers will be disciplined in accordance with project disciplinary procedures and structures.			
WHSW12	As part of the OHSSP, a risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors; the training programme (including daily toolbox meetings) will be updated in accordance with changes made in scope, incident statistics and/or regulatory requirements. Daily toolbox meetings will be held where health and safety issues will be discussed.	Y		OHSSP
WHSW13	Prior to construction, a project workers' grievance procedure will be implemented, which will detail the processes for recording, investigating and, where necessary, implementing corrective actions relating to complaints, including the responsibility of the contractor. The workers' grievance procedure will: • be available for use by all workers, including subcontractor workers and workers in the primary supply chain; • be displayed at visible places in all camps and work sites.	Y		LMP
WHSW14	Hours worked by all project personnel will be according to their contracts and national regulatory requirements.	Y		LMP
WHSW15	A medical emergency response plan will be developed and implemented to ensure that emergency cases can be dealt with without impacting on district health services.	Y		OHSSP, EPRP
WHSW16	PPE appropriate for the task will be provided to all workers.	Y		LMP
WHSW17	Lost time incidences and, type and incidence of malady (sickness, disease, injury) will be monitored.	Y		MRP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WHSW18	MCPYs will have health facilities with sufficient capacity and capability to prevent additional pressure being placed on local and district health services.	Y		OHSSP
WHSW19	As part of the OHSSP, basic workplace wellness programs that are culturally and religiously acceptable will be developed and implemented.	Y		OHSSP
WHSW20	The labour management plan will include: • Compliance with international labour standards, national labour laws and regulations concerning transparency, accountability, anticorruption and human rights; • Recognising workers' right to organise collective bargaining and trade unions; • Providing suitable working conditions, including rest facilities and breaks; • Mechanism of compliance with the ILO Maternity Protection Convention (2000); and • Respecting workers' rights to privacy including data protection requirements.	Y	Y	LMP
WTR01	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater.	Y		PPP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WTR02	A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures.	Y	y	PPP
WTR03	Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses.	Y		PPP, SMP, RP
WTR04	Watercourse banks will be stabilised directly after backfilling and subsequently restored to near original conditions. Where this is not possible, site-specific solutions will be proposed with engineering justification and assessment of potential impacts (including habitat connectivity).	Y		BMP, RP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WTR05	Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment.	Y		PPP, RP
WTR06	Where water is abstracted from a surface waterbody, the flow, water level or water volume in the waterbody will be assessed before and during abstraction. Abstraction rates and the frequency of assessment of the water flow, level or volume will be monitored based on permit conditions. During abstraction from surface waters, inlet hoses will be fitted with suitably sized fish screens.	Y		BMP, NRMP
WTR07	As a requirement of the PPP, locations for discharging excavated pipeline trench water will be identified as part of a 'Permit to Pump Procedure' which will be implemented during the construction phase. Appropriate sediment control measures in line with recognised industry best practices will be implemented at each location.	Y		PPP
WTR08	The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards.	Y		WMP, NRMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WTR09	Other than when required for crossings excavations, construction equipment and traffic will normally not enter watercourses. Vehicles and equipment will cross watercourses via appropriately sized temporary culverts and bridging arrangements.	Y		BMP, PPP
WTR10	Bathing or washing clothes, vehicles and equipment by project employees will be prohibited in watercourses.	Y		BMP, PPP
WTR11	Surface water that could be affected by runoff from the pipeline route or worksites will be visually inspected on a regular basis and remedial measures implemented if sediment or contamination arising from project activities are visible.	Y		PPP, RP
WTR12	An effective collection and disposal systems for stormwater from all paved/hardstanding areas and buildings will be provided at aboveground installations.		Y	NRMP
WTR13	Water meters will be installed to measure the quantities of water supplied and wastewater discharged at the camps and detailed records will be kept of quantities of water reused and the purposes for which water is reused as part of the water management plan and the data used for monitoring water usage and project reporting requirements.	Y		NRMP
WTR14	Water conservation initiatives and opportunities to reuse water, e.g., for dust suppression or concrete mixing, will be identified, assessed for impacts on the environment and human health and those deemed suitable will be implemented.	Y		NRMP
WTR15	If temporary damming of a watercourse is required, a preconstruction engineering, social and environmental evaluation will be undertaken to plan the work and so the duration of the flow interruption is limited and to determine the need for pump around to maintain flows.	Y		BMP, NRMP, RP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WTR16	An environmental and social evaluation of potential treated wastewater discharge locations will be undertaken as the basis for the development of measures to mitigate impacts from discharges on surface water ecology, downstream water users or terrestrial ecology. The evaluations will take into account the compliance with project environmental standards and will support applications for discharge permits. All licences and consents will be obtained before planned liquid discharges.	Y		PPP
WTR17	An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams.	Y		WMP
WTR18	Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.	Y		WMP
WTR19	A contingency plan for wastewater treatment plant maintenance periods or downtime will be developed. This will include, as a minimum, the provision of holding tanks that can be used to retain emergency overflows or discharges that do not meet project environmental standards.	Y		WMP
WTR20	Surface water run-off from construction areas and AGIs will be discharged in accordance with project environmental standards.	Y		PPP
WTR21	All potentially contaminated wastewater, excluding sanitary wastewater, will be routed to an appropriately sized treatment unit capable of achieving consent conditions and project environmental standards.	Y		WMP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WTR22	All licences and consents for hydrostatic test water discharge will be obtained following preparation of a hydrostatic test effluent disposal risk assessment. This will undergo internal technical evaluation before submitting the permit application to the appropriate water resources regulatory authority.	Y		PPP
WTR23	The water quality and sustainability of water abstracted from either new or existing boreholes or surface water will be monitored at suitable frequencies to confirm that supply meets permit conditions and project environmental standards and does not impact adversely on other known users.	Y		NRMP
WTR24	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process.	Y		NRMP
WTR25	No oil-based muds will be used for drilling of groundwater exploration and water supply boreholes.	Y		PPP
WTR26	All groundwater exploration and supply boreholes will be designed by suitably experienced and qualified hydrogeologists to avoid contaminant migration pathways between different aquifers and geological formations.	Y		NRMP
WTR27	The Monitoring and Reporting Plan will detail robust monitoring and inspection requirements to be completed at locations with sensitive groundwater resources; to verify correct implementation of the PPP.	Y		PPP, MRP

Table E4.4-1 Project Mitigation Commitments Register and Relevant Management Plans

ID	Mitigation Commitment	Construction	Operation	Management Plan(s)
WTR28	Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	Y		NRMP, MRP
WTR30	The Monitoring and Reporting Plan will describe requirements for monitoring community water sources including surface water and groundwater; the monitoring plan will detail monitoring boreholes and monitoring equipment.	Y		MRP

E5 CONTENT TABLES OF MANAGEMENT PLANS

This section shows content tables for the following management plans:

- terrestrial management plans:
  - MP01: Biodiversity Management Plan
  - MP02: Pollution Prevention Plan
  - MP03: Waste Management Plan
  - MP04: Natural Resource Management Plan
  - MP05: Soil Management Plan
  - MP06: Cultural Heritage Management Plan
  - MP07: Reinstatement Plan
  - MP08: Stakeholder Engagement Plan
  - MP09: Resettlement Action Plan
  - MP10: Labour Management Plan
  - MP11: Project Induced In-Migration Management Plan
  - MP12: Procurement and Supply Chain Management Plan
  - MP13: Infrastructure and Utilities Management Plan
  - MP14: Community Health, Safety and Security Plan
  - MP15: Occupational Health, Safety and Security Plan
  - MP16: Transport and Road Safety Management Plan
  - MP18: Emergency Preparedness and Response Plan
  - MP19: Monitoring and Reporting Plan
  - MP20: Decommissioning Plan

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			System / Subsystem: **NN**		Equipment Type: **NN**

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Biodiversity Management Plan - Uganda

(Contractor Control Plan)

01	IFR	22/11/2019	Issued for Use	S McBride A Huckbody	P Eyraud	M Marchenko
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Pollution Prevention Plan (Uganda)

(Contractor Control Plan)

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(Contractor Control Plan)

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Appendix F: Project Environmental Standards

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
µ	micro – one millionth, or 10^{-6}
A	
AQ	air quality
B	
BOD	biological oxygen demand – the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a given water sample. Effectively a water pollutant parameter
C	
CO	carbon monoxide
COD	chemical oxygen demand – the amount of oxidisable pollutants found in surface water
D	
dB, dB(A)	decibel – in an environmental context, a unit of sound pressure. Suffixed by (A), it is A-weighted. A-weighting is applied to instrument-measured sound levels in an effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.
DDT	dichlorodiphenyltrichloroethane – a chemical used as an insecticide
dscm	dry standard cubic metre
E	
EAC	East African Community – regional intergovernmental organisation of six states including both Tanzania and Uganda. Publishes standards to be applied across its member states
EACOP	East African Crude Oil Pipeline
EC	electrical conductivity (of soil) – a parameter that correlates with soil properties that affect crop productivity, including soil texture, drainage conditions, organic matter level, salinity and subsoil characteristics. Can also be European Community, but only in references to directives
EHS	environment, health and safety
EMDC	Environmental Management Divisional Standards Committee – Tanzanian body responsible for environmental standards
EPA	See US EPA
ESP	exchangeable sodium percentage – a parameter used to classify saline and alkali soils or to determine if a sodium hazard exists
EU	European Union
F	
G	

H	
HC	hydrocarbon
I	
IED	Industrial Emissions Directive – a directive (ref 2010/75/EU) of the European Union concerning industrial pollution prevention and control
IFC	International Finance Corporation – part of World Bank Group, provider of finance to private sector projects and publisher of widely used international standards and guidelines on environmental, health, safety and social performance
J	
K	
K	kelvin – International System of Units (SI) unit of temperature
kPa	kilopascal – a unit of pressure
L	
L	limit level
L_{eq}, L_{max}	define averaging periods for noise measurements. L_{eq} is equivalent continuous noise level and is the usual preferred method to characterise noise levels that vary over time. L_{max} is the maximum instantaneous level. If a number is included, it refers to a percentile of the time. If 'A' is included, it means A-weighted – see dB(A).
M	
mg, mg/Nm^3 also µg, µg/Nm^3	milligram (or µg=microgram), per normal cubic metre – a unit of concentration of air pollutants. The reference temperature and pressure conditions that represent 'normal' do not have a universal standard definition and should be clearly defined.
mmhos/cm	milli mhos per centimetre - the basic (archaic) unit of measure of electrical conductivity in soil. A mho is equivalent to a siemens, which is the modern, SI-derived unit.
MPN	most probable number (of organisms in a water sample)
MW, MWth	megawatt (thermal) – one million watts. Thermal power distinguishes from electrical or mechanical power. In environmental regulatory context, it usually refers to the energy input capacity of a process, i.e., the energy content of the fuel use at maximum rate
N	
NEMA	National Environmental Management Authority – semi-autonomous institution coordinating, monitoring, regulating and supervising all matters on environment in Uganda
ng	nanogram – one billionth (10^{-9}) of a gram
NO, NO_2	See NOx
NOx	oxides of nitrogen – a generic term for the nitrogen oxides that are most relevant for air pollution, namely nitric oxide (NO) and nitrogen dioxide (NO_2)
NTU	nephelometric turbidity unit – a unit for turbidity from a calibrated nephelometer
O	

P	
PEC	predicted environmental concentration – usually used in relation to air pollutants
PM, PM_{10}, $PM_{2.5}$	particulate matter – also known as dust. Numerical suffixes refer to a size fraction and are in micrometers, e.g. PM_{10} is particulate matter with diameter of less than 10 µm. These small fractions present higher health risk as they penetrate further into the respiratory system.
ppm, ppmv	parts per million, parts per million by volume
Q	
R	
S	
SI	International System of Units. From the French *Système international*
SO_2	sulphur dioxide
T	
TBS	Tanzanian Bureau of Standards
TEQ	toxic equivalents. A weighted factor allowing mixtures of toxic compounds to be reported as a single number.
TSS	total suspended solids (mass in a water sample)
TZ	Tanzania
TZS	Tanzanian standard (prefix used for naming standards)
U	
UG	Uganda
US EPA	United States Environmental Protection Agency
V	
VOC	volatile organic compound.
W	
WHO	World Health Organization – a specialised agency of the United Nations that is concerned with international public health
WID	waste incineration directive – a directive (ref 2000/76/EC) of the European Community
X	
Y	
Z	

1 INTRODUCTION

1.1 General Project Information

Total E&P Uganda (TEPU), Tullow Uganda Operations Pty Ltd (TUOP) and CNOOC Uganda Limited (CUL) (Upstream Partners) hold interests in petroleum resource licences in the Lake Albert Development Area. The licences include the following Exploration Areas (EA): Buliisa-Nwoya (EA 1 and northern portion of EA 2), Kaiso Tonya (EA 2), located on the central part of the east shoreline of Lake Albert and Kingfisher (EA 3A), located on the southeast shoreline of Lake Albert. The Upstream Partners and the Government of Uganda have made a number of commercial crude oil discoveries in the Exploration Areas and propose upstream projects for the Buliisa-Nwoya EA called the Tilenga Project and for the Kingfisher EA called the Kingfisher Discovery Area, and to construct two crude oil feeder pipelines and an export pipeline to transport the crude oil produced to international markets, net of supply commitments to a planned refinery development in the Kabaale area that will produce refined products to service regional market needs.

The crude oil produced by the Tilenga Project will be transported from the Tilenga Central Processing Facility near Buliisa via the Tilenga feeder pipeline to a hub at Kabaale. From Kabaale crude oil will be delivered to a government planned refinery and to an export pipeline, the East African Crude Oil Pipeline (EACOP) Project, and delivered to the East African coast at Tanga in Tanzania for marine export.

The Republic of Uganda, the National Oil Company of Uganda (the Potential State Participants), as well as the international oil company parties partaking in the development of the Lake Albert Development area, and their affiliates (the "Potential International Participants") will participate in the implementation of the Tilenga Project, including the Tilenga feeder pipeline. The Republic of Uganda, the National Oil Company of Uganda, the United Republic of Tanzania and/or Tanzania Petroleum Development Corporation (the Potential State Participants), as well as the international oil company parties partaking in the development of the Lake Albert Development area, and their affiliates (the "Potential International Participants"), will participate in the implementation of the EACOP.

The Potential State Participants and the Potential International Participants, collectively "Potential Pipeline Participants" may create one or more special purpose companies (Pipe Co) to develop, construct, operate and maintain the EACOP project on behalf of the development partners. Prior to the establishment of Pipe Co, the ESIA for the projects will be managed by the Pipeline Project Team (PPT) responsible for undertaking all activities relating to the ESIA of the EACOP project. Currently the corporate proponent of the EACOP project is Total East Africa Midstream BV.

Subject to the regulatory requirements of Uganda and Tanzania and requirements of international lending institutions, environmental and social impact assessments are being planned and stakeholder engagement will be implemented for the two pipeline projects:

- 24” diameter feeder pipeline of approximately 95 km from Buliisa to the Kabaale hub
- 24” export pipeline of an estimated length of 1443 km, 296 km in Uganda and 1147 km in Tanzania, from the hub in Kabaale Uganda to north of Tanga, Tanzania. The crude oil flows in the pipeline where it commences at the hub, traverses southward along the western side of Lake Victoria, crosses the border into Tanzania, continues to the south end of Lake Victoria, turns east continuing across the Rift Valley at the Tanzanian Divergence, continuing east and terminates at Marine Storage Terminal (MST) located at north of the port of Tanga on the Chongoleani peninsula for storage and further export.

The marine storage terminal (MST) is connected by a jetty to a load-out facility (LOF) located approximately 1.5 km offshore.

1.2 Project Standards Introduction

This document details Ugandan, Tanzanian and international emission and ambient standards for air, water and environmental noise and identifies project-preferred standards. The proposed project preferred standards are generally the national standards except where more stringent international standards apply, national standards are not available or, in rare cases, where concerns are identified with the implementation of the national standard. There are also a small number of instances where the national standards have not been listed as the project standard to minimise duplication as other standards identified for adoption already provide adequate control. There is an associated parallel document that provides more information where needed.

The intent is to incorporate the content of this document into the project Environmental Optimum Requirements document.

2 AIR EMISSIONS AND AIR QUALITY

2.1 Stationary Source Emissions Standards

2.1.1 Ugandan Standards

There are two sources of standards for air quality in Uganda, neither of which is adopted into statute:

- the National Environmental Management Authority (NEMA) public notice, a public notice of standards for public consultation that has been in circulation since 2006 but has not been formally issued as a regulation
- the National Environment (Air Quality) Regulations, 2013, draft regulations detailing air emission standards for emissions from various point sources and standards for ambient air quality. These standards have been issued for public review before they are issued as regulations.

2.1.2 Tanzanian and East African Community Standards

Established under the Environmental Management Act (Cap. 191) (2004), the Environmental Management (Air Quality Standards) Regulations, 2007 contain provisions for the regulation of air quality. This includes establishing minimum air quality standards (source emissions and ambient air), emission permits, measures for compliance and enforcement, offences and penalties and reporting measures.

The Tanzanian standards TZS 845:2005 Air Quality – Specification and EMDC[1] 2 (1758): Air Quality – Vehicular Exhaust Emissions Limits are two of the nine compulsory environmental standards developed by the Tanzanian Bureau of Standards (TBS) and collated in the National Environmental Standards Compendium (part 1 of the compendium contains the compulsory standards and is the only part discussed in this document). In general, the air quality standards contain the same tables of limit or guideline values as the regulations, though there are some differences between the vehicle emissions limits in EMDC 2 (1758) and the regulations.

Applicable schedules are as follows:

- first schedule: permissible weight concentration of emission limits from the atmosphere to a receptor and respective test methods (these are ambient air quality standards, covered in Section 2.2)
- second schedule: highest permissible quantity (emission) and test methods
- (third schedule: for cement factories, i.e., kilns, which will not be under the project's control)
- fourth schedule: emission limits for motor vehicles (discussed in Section 2.3).

The East African Community air quality specification duplicates the Tanzanian standards.

[1] EMDC is the Environmental Management Divisional Standards Committee, but only the abbreviation is used in the name of the standard.

2.1.3 International Standards

Table 1.1.2 of the International Finance Corporation (IFC) EHS General Guidelines 2007 details emission limits for combustion plant with a total rated heat input of 3 to 50 MWth.

The emissions guidelines are applicable to small combustion process installations operating more than 500 hours per year, and those with an annual capacity use of more than 30%.

The emissions guidelines also specify some monitoring requirements and general management and optimisation principles.

The sector-specific guidelines, including the EHS Guidelines for Onshore Oil and Gas Development (IFC, 2007 and draft 2017 versions), principally refer to these general emissions guidelines. A notable exception is the waste management facilities guideline, which contains additional standards for waste incineration plant. These are covered in Section 2.1.5.

2.1.4 General Source Emissions Standards Comparison

Table 2.1-1 compares general source emissions standards. The project column includes the project-preferred standards.

Table 2.1-1 Source Emissions Standards

Stationary Emission Source Type	Fuel	Pollutant	Exhaust Gas Concentration (mg/Nm^3, dry gas, 15% O_2 for engines, 3% O_2 for boilers)			
			UG	TZ/EAC[9]	IFC	Project Preferred Standard
Boiler/heater	Liquid	NOx	300[2]	-	460	300
Engine	Liquid	NOx	300[2]	-	1460/1600/1850[1]	1460[2]
Boiler/heater	Liquid	CO	[4]	175[3]	-	175[3]
Engine	Liquid	CO	[4]	-	-	-
Boiler/heater	Liquid	PM	50[8]	250[7]	50[5]	50
Engine	Liquid	PM	50[8]	250[7]	50[6]	50
All	All	HC/VOC	20[7]	20[6]	-	20

NOTES:

[1] Bore size diameter less than 400 mm: 1460 or 1600 for smaller engines if justified to maintain high energy efficiency. Bore size diameter greater than 400 mm: 1850. Concept engineering documents indicate bore size likely to be less than 400 mm

[2] Reference conditions, equipment types not specified. Propose to adopt 3% O_2 for boiler standard, in accordance with EU Medium Combustion Plant Directive. The associated document explains why the project intends to adopt the less stringent IFC engine standard rather than the draft Ugandan standard

[3] Standard applies above 5 MW heat output

[4] Standards in point source emission column of schedule 2 of draft air quality regulations 2013 are incongruous There are no point source standards for CO in the 2006 draft standards

[5] Or up to 150 if justified by environmental assessment

[6] Or up to 100 if justified by project specific considerations, e.g., economic feasibility of using lower ash content fuel, or adding secondary treatment to meet 50, and available environmental capacity of the site

[7] 24-hour mean (for PM). As (unlike for other pollutants) there are no qualifiers regarding equipment, capacities or fuels, this standard is assumed to apply to all. In Tanzanian regulations, "as total organic carbon" is specified for the hydrocarbon standard

[8] 2006 draft standards only. Standards in point source emission column of schedule 2 of draft air quality regulations 2013 require clarification

[9] The Tanzanian standards are duplicated in the East African Community standards

The following standards are not included in the above comparison table:

- turbine standards. It is assumed that there will not be any turbines.
- standards that apply to installations greater than 50 MWth. Concept-phase engineering documents indicate that no project facility will approach this threshold, even when aggregation rules are taken into account. According to the IFC guidelines, the capacities of individual plant that might reasonably emit through a common stack should be aggregated.
- sulphur dioxide source emissions standards. Some standards are set in terms of the sulphur content of the fuels, others as exhaust gas concentration limits. Concept-phase engineering documents show that the sulphur content of the crude is low enough to meet all sulphur dioxide standards. Sulphur dioxide ambient air standards are, however, included (see Section 2.2).

2.1.5 Waste Incineration Standards

Section 2 of the IFC's EHS guideline for waste management facilities documents performance indicators and industry benchmarks, and includes applicable standards on air emissions for waste incineration. It compares standards from the EU Waste Incineration Directive (WID), 2000/76/EC and US EPA legislative standards. Since the guideline dates from 2007 it does not refer to the EU Industrial Emissions Directive (IED), which supersedes the WID. The IED is therefore considered the more up-to-date source of European waste incineration standards for use as a reference of the IFC guidelines and is the directive quoted in Table 2.1-2.

The US EPA standards are different for hazardous and non-hazardous waste incinerators.

There are no specific standards for incineration in either Uganda or Tanzania.

All the standards are presented in Table 2.1-2.

The values in the US standard have been converted to the same units as the EU standard for ease of comparison. The proposed project preferred standards are the EU standards because they are more recent, more stringent in most cases for nonhazardous wastes, which it is assumed will make up by far the greater proportion of waste for incineration and include a wider range of substances.

Table 2.1-2 Waste Incineration Emission Standards

Pollutant	EU Standard (mg/Nm^3, 11% O_2) (Proposed Project Standard)			US Standard (mg/dscm, Except Where Stated, 7% O_2)		US Standard, Converted (mg/Nm^3, 11% O_2) [5]	
	Daily Mean	Half-hour Mean A[1]	Half-hour Mean B[1]	Hazardous Waste	Non-haz Waste	Hazardous Waste	Non-haz Waste
Particulate matter, PM	10	30	10	1.5	70	1.2	54.6
VOC/HC as total organic carbon	10	20	10	10 ppmv	-	4.2	-
Hydrogen chloride, HCl	10	60	10	21 ppmv [3]	62 ppmv	26.7	78.7
Hydrogen fluoride, HF	1	4	2	-	-	-	-
Sulphur dioxide, SO_2	50	200	50	-	20 ppmv	-	44.5
Oxides of nitrogen, NOx (as NO_2)	200	400	200	-	388 ppmv	-	621
Carbon monoxide, CO	50	100	-	100 ppmv	157 ppmv		153
Dioxins and furans (as TEQ)	$1x10^{-7}$ [2]	-	-	$1.1x10^{-7}$ [4]	$4.1x10^{-7}$	$8.6x10^{-8}$	$3.2x10^{-7}$
Mercury, Hg	0.05 [2]		-	0.008	0.47	0.006	0.37
Thallium, Th	0.05 [2]		-	-	-	-	-
Cadmium, Cd				0.01	0.004	0.008	0.003
Lead, Pb	0.5 [2]		-		0.04		0.031
Arsenic, As				0.023	-	0.018	-
Beryllium, Be					-		-
Chromium, Cr					-		-
Cobalt, Co				-	-	-	-
Copper, Cu				-	-	-	-
Manganese, Mn				-	-	-	-
Nickel, Ni				-	-	-	-
Antimony, Sb				-	-	-	-
Vanadium, V				-	-	-	-

NOTES:
Where cells are merged across numerous pollutants, the standard for is the total of the concentrations of these substances

[1] The two columns of limit values (A and B) are different limits that have to be met by 100% of the half-hourly average values and 97% of the half hourly average values over a year respectively. Compliance with the EU directive is on an either/or basis for each pollutant, i.e. as long as one or the other is met, compliance is deemed

[2] EU dioxins and furans averaging period is 6 to 8 hours; for metals it is 30 minutes to 8 hours

[3] Total chlorine (HCl, Cl_2)

[4] With 'air pollution control device'. Without, the standard is 2.0×10^{-7} mg/dscm

[5] In these columns, the standard as published in the IFC guideline has been converted to the same units and reference conditions as the EU standards, for ease of comparison. This entails an oxygen correction of (21-11)/(21-7) to convert from 7% to 11% O_2, a temperature correction of 298/273 to convert from the US EPA 'standard' temperature of 25°C to the EU 'normal' temperature of 0°C and, where the standard is quoted in ppm, converted to mass units by multiplying by the species molecular weight and dividing by the molar volume at normal conditions, 22.414 l/mol. For total chlorine (HCl and Cl_2), a molecular weight of 36.5 was used.

2.2 Ambient Air Quality Standards

2.2.1 Ugandan Standards

The two sources referred to in Section 2.1.1 include both ambient air quality and source emission standards.

2.2.2 Tanzanian Standards

The first schedule of the Environmental Management (Air Quality Standards) Regulations 2007, duplicated in the Tanzanian standard TZS 845: 2005 Air Quality – Specification, sets ambient air quality standards.

The standard gives two types of standards, "guidelines" and "limit levels", and explains them as follows:

> "The limit levels are binding and are to be used for regulatory purposes. Limit levels are usually measurable in shorter averaging periods. The guidelines are based on studies that indicate safe levels averaged over relatively longer periods and mostly, they are derived from WHO[2] Guidelines."

The regulations reproduce both the guidelines and limits and do not repeat the explanation.

The standard specifies various test methods to be applied.

2.2.3 East African Community Standards

The East African Community (EAC) specification contains standards applicable at the property boundary as well as three columns of standards that are dependent on a classification of the area into "industrial", "residential, rural and other" and "controlled". These classifications are not defined further in the specification.

[2] World Health Organization

2.2.4 International Standards

The following sections contain the standards, limits and values applicable to ambient air quality contained within the IFC General EHS Guidelines and WHO standards.EU standards are similar to the WHO standards so are not described separately.

2.2.4.1 IFC EHS General Guidelines

Regarding ambient air quality, the IFC EHS General Guidelines require that

> "emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence the current WHO Air Quality Guidelines or other internationally recognised sources".

The guidelines also require that

> "emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed."

Therefore, the guidelines focus on both absolute pollutant concentrations (also known as PECs, predicted environmental concentrations, which include background levels) and process contributions (the change caused by the project components).

However, the IFC's guidance notes (specifically GN36) on performance standard 3 in addition requires that the background concentration of the pollutant is taken into account:

> "the project should not normally consume more than 25 percent of the assimilative capacity[3] between the pre-project case and the relevant ambient quality guideline standards."

This is proposed as the project preferred standard.

2.2.4.2 WHO Standards

The WHO air quality guidelines have been designed for worldwide use with the key objective of protecting human health. They originate from two publications: the Air Quality Guidelines for Europe (2nd Edition), 2000 and the Global Update (2005). The 2005 update did not review all pollutants and some guidelines from the earlier publication remain current.

2.2.5 Standards Comparison

Table 2.2-1 compares the ambient air quality standards. The project column contains the project-preferred standard.

[3] Defined in a footnote within the performance standard itself as "the capacity of the environment for absorbing an incremental load of pollutants while remaining below a threshold of unacceptable risk to human health and the environment"

Where standards are set only by the draft Ugandan regulations or the EAC specification (NOx, nonmethane hydrocarbons, total VOC, ozone 1-hour average, total suspended particulate matter), these are not preferred as project standards. This is because these are not criteria pollutants or averaging periods covered by, for example, the internationally widely accepted WHO guidelines, and risk mitigation is achieved through coverage of other pollutants or averaging periods.[4] Further information is also given in the associated parallel document.

Table 2.2-1 Ambient Air Quality Standards

Pollutant	Averaging Period	Air Quality Standard - Ambient Air Concentration, µg/m^3					
		UG	TZ Guideline[11]	TZ Limit [11]	EAC [12]	WHO[3]	Project Preferred Standard
Nitrogen dioxide, NO_2	Annual	40	100[1]	-	150/100/-	40	40
	1 month	-	-	-	-/160/-	-	-
	24 hr	-	-	150 [2]	100/200/-	-	150
	8 hr	-	-	120 [2]	-	-	120
	1 hr	200	-	-	-/400/-	200	200
	10 mins	-	-	-	-/1,000/-	-	-
Oxides of nitrogen, NOx (as NO_2)	Annual	-	-	-	80/60/15	-	-
	1 month	-	-	-		-	-
	24 hr	200	-	-	150/80/30	-	-
	1 hr	-	-	-		-	-
	10 mins	-	-	-		-	-
Sulphur dioxide, SO_2	Annual	-	40–60	-	80/60 or 50/15	50 [9]	50
	24 hr	400 [10]	100	100 [6]	125/80 or 125/30	20 [9]	20
	10 min	500	-	500	-/500/-	500	500
Carbon monoxide, CO	8 hr	10 or 11x10^3	-	10,000	5/2/1 x10^3	10,000	10,000
	1 hr	-	-	30,000	10/4/2 x 10^3	30,000	30,000
	30 min	-	-	60,000	-	60,000	60,000
	15 min	-	-	100,000	-	100,000	100,000
Suspended particulate matter	Annual	-	-	-	3.6/1.4 or 1/.7 x10^2	-	-
	24 hr	500 ('soot')	-	-	5/2 or 1.8/1 x10^2	-	-

[4] For example, particulate matter risks can be appropriately covered by consideration of the finer fractions (which are where the health risks lie), NOx is covered by the NO_2 standards.

Table 2.2-1 Ambient Air Quality Standards

Pollutant	Averaging Period	Air Quality Standard - Ambient Air Concentration, µg/m^3					
		UG	TZ Guideline[11]	TZ Limit [11]	EAC [12]	WHO[3]	Project Preferred Standard
Fine particulate matter, PM_{10}	Annual	60	-	-	70/50/50	20 [5]	20
	24 hr	100	60–90 [7]	100 [8]	150/100/75	50 [5]	50
	1 hr	-	-	200 [8]	-	-	200
Fine particulate matter, $PM_{2.5}$	Annual	40	-	-	35/-/-	10 [5]	10
	24 hour	60	-	-	75/-/-	25 [5]	25
Ozone, O_3	Annual	-	10–100	-	-	-	-
	8 hr [4]	120	-	120	120/[10]/-	100	100
	1 hr	-	-	-	200/ 260[10]/-	-	-
Nonmethane hydrocarbons	10 mins	-	-	-	700 ppb	-	-
Total volatile organic carbon (VOC)	24 hr	6,000	-	-	6,000	-	6,000

NOTES:

[1] The Tanzanian Environmental Management (Air Quality Standards) Regulations 2007 state 0.1 µg/m^3. This is assumed to be a typographical error and the intention is probably 0.1 mg/m^3

[2] It is contrary to expectations that the longer averaging period should have the higher limit value associated with it. This is perhaps a clerical error in the Environmental Management (Air Quality Standards) Regulations 2007

[3] WHO standards are listed as analogous to IFC standards. The IFC EHS General Guidelines require that "emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence the current WHO Air Quality Guidelines or other internationally recognised sources."

[4] Maximum daily 8-hour mean, permitted exceedances 25 days averaged over 3 years

[5] In addition to the guideline values included here, the 2005 update guidelines provide interim targets aimed at promoting a gradual shift from high to lower concentrations

[6] The Environmental Management (Air Quality Standards) Regulations 2007 states that daily average of hourly values will not exceed 0.1 mg/kg. Assumed typographical error and 0.1 mg/m^3 is intended. Differs from guideline value in that the guideline value states only 24-hour average

[7] Averaging period not stated

[8] Written as 0.10 and 0.20 µg/m^3 in the Environmental Management (Air Quality Standards) Regulations 2007. Assumed a typographical error and milligrams rather than micrograms is intended

[9] The apparent anomaly whereby the WHO guideline of 20 µg/m^3 24-hour mean contradicts its annual mean guideline of 50 µg/m^3 is because the former is from the 2005 global update, whereas the latter is from the 2000 guidelines for Europe and no updated value for this averaging period was included in the 2005 update. The 2005 update found that health effects were now known to be associated with much lower levels of SO_2 than previously believed and adopted the precautionary principle in setting a guideline value that it acknowledges will be very

tough for many areas to meet

[10] Converted from 0.15 ppm as written in the draft regulations, for consistency of units and ease of comparison. 20°C reference temperature is assumed in this conversion

[11] TZ GL = Tanzanian guideline, TZ L = Tanzanian limit. Ambient air quality standards are set by the first schedule of The Environmental Management (Air Quality Standards) Regulations 2007, duplicated in the Tanzanian standard TZS 845: 2005 Air Quality – Specification. The standard gives two types of standards, "guidelines" and "limit levels", and explains them as follows: "The limit levels are binding and are to be used for regulatory purposes. Limit levels are usually measurable in shorter averaging periods. The guidelines are based on studies that indicate safe levels averaged over relatively longer periods and mostly, they are derived from WHO Guidelines." The regulations reproduce both the guidelines and limits and do not repeat the explanation The standard specifies various test methods to be applied, as does the EAC standard

[12] EAC standards apply to "industrial", "residential, rural and other" and "controlled' areas"

The IFC performance standard guidance that projects should not normally contribute more than 25% of the difference between the background level of a pollutant, and the applicable ambient air quality standard should also be considered as an overarching ambient air quality standard.

2.3 Vehicle Emission Standards

The Tanzanian regulation 12 states that

> "a person owning, driving or controlling motor vehicles shall ensure that the vehicle comply [sic] with permissible limits of substances found in exhaust emissions . . . prescribed in the Fourth Schedule . . ."

The Ugandan draft regulation is worded differently, regulation 22 stating

> "Every motor vehicle (other than a motor cycle or scooter) to be imported or registered . . . shall conform to the standard of exhaust emission specified in the Fourth Schedule to these Regulations."

There is no specification of responsibility.

Normally the onus would be on manufacturers, importers and vendors to show emissions compliance of vehicles, according to a standard set of laboratory tests. For this reason, this document does not include the vehicle emissions standards.

3 WATER

3.1 Industrial Effluent and Sewage Discharge Standards

3.1.1 Ugandan Standards

Ugandan standards are part of the National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, SI No 5/1999 and there is also a 2014 draft update of these regulations. They apply to discharges to surface water, groundwater and land.

3.1.2 Tanzanian Standards

The Tanzanian standard TZS 860:2005, Municipal and Industrial Wastewaters – General Tolerance Limits for Municipal and Industrial Wastewaters, is one of the nine compulsory environmental standards developed by the TBS. It is applicable to effluents discharged from all establishments, setting out permissible municipal and industrial wastewater limits that have been incorporated into the Environmental Management (Water Quality Standards) Regulations, 2007. They apply to discharges into surface water and groundwater.

3.1.3 East African Community Standards

The East African Community Gazette of 8 January 2016 included legal notice EAC/4/2016, the East African Industrial and Municipal Effluents Standards. The notice states that “these standards are hereby set to be the standards applicable in the East African Community”. It makes no reference to the existing legislation in the member states.

The standards for discharges to public sewer are not included in this document as there will be no such discharges from the project.

3.1.4 International Standards

The IFC EHS Guidelines for Onshore Oil and Gas Development, 2007 include standards specific to hydrotest discharges to surface water or land. There are also standards in these guidelines applicable to cooling water (temperature only) and stormwater (oil and grease only), which are also included in the comparison. For sewage discharges, the onshore oil and gas guidelines refer to the relevant standards in the General EHS Guidelines. These are presented in the comparison, which makes clear where they differ from the effluent standards or are only applicable to certain types of discharge. The sewage discharge standards are not applicable to discharges to centralised, municipal, wastewater treatment systems.

The IFC EHS Guidelines for Onshore Oil and Gas Development 2007 also include several descriptive standards on hydrotest water sourcing, use, discharge and storage. The impending revision of the onshore oil and gas guidelines does not include any changes to the effluent standards, according to the second draft for consultation (April 2017, available on the IFC website).

3.1.5 Comparison of Standards

Table 3.1-1 compares industrial effluent and sewage discharge standards. The rightmost column includes the project-preferred standard.

The most notable of these are the draft Ugandan and EAC standards of 5 mg/l for oil and grease, which are lower than the equivalent limits in the other sources.

Table 3.1-1 Industrial Effluent and Sewage Discharge Standards

Parameter	Ugandan Standards Limit		TZ Limit	EAC Limit	IFC Guideline Value	Project Preferred Standard
	1999	Draft 2014				
	mg/l unless stated					
Physical Components						
BOD	50	30	30	30	25 (effluent), 30 (sewage)	25 (effluent), 30 (sewage)
COD	100	60	60	60	125	60
Colour	300 TCU	50 TCU	300 TCU	50 TCU	-	50 TCU
pH range	6–8	6–9	6.5-8.5	6–9	6–9	6–8
Temperature range	20–35°C	-	20–35°C	±3°C[7]	A limit for cooling water only is set (maximum increase of 3°C in mixing zone)	20–35°C
Total coliform organisms	10,000 count / 100 ml	400 count / 100 ml	10,000 count / 100 ml	400 count / 100 ml[8]	400 MPN[E] / 100 ml (sewage only)	400 MPN[E] / 100 ml (sewage only)
Total dissolved solids (TDS)	1200	1200	-	1200	-	1200
Total suspended solids (TSS)	100	100	100	100	35 (effluent), 50 (sewage)	35 (effluent), 50 (sewage)
Turbidity	300 NTU	30 NTU	300 NTU	30 NTU	-	30 NTU
Inorganic Components						
Aluminium (Al)	0.5	-	2.0	2.0	-	0.5
Ammonia nitrogen	10	5	-	5	-	5
Arsenic (As)	0.2	0.01	0.2	0.01	Part of total metals	0.01
Barium (Ba)	10	10	1.5		-	1.5
Boron (B)	5		-		-	5

Table 3.1-1 Industrial Effluent and Sewage Discharge Standards

Parameter	Ugandan Standards Limit		TZ Limit	EAC Limit	IFC Guideline Value	Project Preferred Standard
	1999	Draft 2014				
	mg/l unless stated					
Cadmium (Cd)	0.1	0.01	0.1	0.01	Part of total metals	0.01
Calcium	100		-		-	100
Chlorides (Cl-)	500	250	200		600 (average) 1200 (maximum)	200
Chlorine	1	0.2	-	0.2[6]	-	0.2
Chromium (total)	1.0	1.0	1.0	1.0	Part of total metals	1.0
Chromium VI	0.05	-	0.1	0.05	Part of total metals	0.05
Chlorides (Cl-)	500	250	200		600 (average) 1200 (maximum)	200
Cobalt (Co)	? [1]	-	1.0		-	1.0
Copper (Cu)	1.0	0.5	2.0	0.5	Part of total metals	0.5
Cyanide	0.1		-	0.05	-	0.05
Fluorides (F-)	-	-	8	2	-	2
Iron (Fe)	10	-	5.0		-	5
Lead (Pb)	0.1	0.01	0.1	0.01	Part of total metals	0.01
Magnesium	100		-		-	100
Manganese (Mn)	1.0	-	5.0		-	1.0
Mercury (Hg)	0.01	0.001	0.005	0.001	Part of total metals	0.001
Nickel (Ni)	1.0	1.0	0.5	0.5	Part of total metals	0.5
Nitrates (NO_3^-)	? [2]	5	20	5	-	5
Nitrites	2		-	1	-	1
Phosphate (soluble)	5		-		-	5
Phosphorus total (as P)[3]	10	5	6	5	2 (sewage only)	5 (effluent), 2 (sewage)
Selenium (Se)	1.0	-	1.0	0.02	-	0.02

Table 3.1-1 Industrial Effluent and Sewage Discharge Standards

Parameter	Ugandan Standards Limit		TZ Limit	EAC Limit	IFC Guideline Value	Project Preferred Standard
	1999	Draft 2014				
	mg/l unless stated					
Silver (Ag)	0.5	0.1	0.1	0.1	Part of total metals	0.1
Sulphate (SO_4^{-2})	500	-	500	50	-	50
Sulphides (S-)	1.0	1.0	1	1	1	1
Tin (Sn)	5	-	2.0		-	2
Total heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, V and Zn)	-	-	-		5	5
Total (Kjeldahl)[D] nitrogen (as N)	10	-	15	10	10 (sewage only)	10
Vanadium (V)	-	-	1.0		Part of total metals	1
Zinc (Zn)	5	5	5.0	5	Part of total metals	5
Organic Components						
1,1,2-trichloroethane	0.2	-	0.06		-	0.06
1,1,1-trichloroethane	3	-	3.0		-	3
1,2-dichloroethylene	0.2	-	0.2		-	0.2
1,2-dichloroethane	0.04	-	0.04		-	0.04
1,3-dichloropropene	0.2	-	0.2		-	0.2
Alkyl benzene sulfonate (ABS)	-	-	0.5		-	0.5
Aromatic nitrogen containing compounds (e.g. aromatic amines)	-	-	0.001		-	0.001
Benzene	0.2	Nil	-	0	-	Nil
Cis-1,2-dichloroethylene	? [1]	-	0.4		-	0.4
Detergents	10		-		-	10
Dichloromethane	0.2	-	0.2		-	0.2

Table 3.1-1 Industrial Effluent and Sewage Discharge Standards

Parameter	Ugandan Standards Limit		TZ Limit	EAC Limit	IFC Guideline Value	Project Preferred Standard
	1999	Draft 2014				
	mg/l unless stated					
Oil and grease (fatty matters and hydrocarbons)	10	5	10	5	10 (stormwater and sewage only)	5
Organochlorine pesticides (Cl)	-	-	0.0005	0	-	0
Other aromatic or aliphatic hydrocarbons not used as pesticides	-	-	0.05		-	0.05
Total hydrocarbon content	-	-	-		10 (effluent only)	10 (effluent only)
Pesticides other than organochlorines	-	-	0.01		-	0.01
Phenols	0.2	0.02	0.002	0.002	0.5	0.002
Polychlorinated biphenyls	-	-	-	0.003	-	0.003
Tetrachloroethylene	0.1	-	0.1		-	0.1
Tetrachloromethane	0.02	-	0.02		-	0.02
Trichloroethylene	0.3	-	0.3		-	0.3

NOTES:

[1] There are line entries (no.19 for cis-1,2-dichloroethylene, no.20 for cobalt) in the regulations, but no figures defining a limit.

[2] There are duplicate entries for “nitrite – N” in the Ugandan regulations: line 34, 20 mg/l; line 35, 2.0 mg/l. It is assumed that the former of these is intended to be nitrates.

[3] Ugandan regulations and IFC guidelines state “phosphates”, Tanzanian regulations “phosphorus as P”, EAC “total phosphorous”.

[4] “Kjeldahl” specified in Tanzanian regulations only and defined therein as meaning “the concentration of organic nitrogen and ammoniacal nitrogen in an effluent sample, determined after mineralisation. It does not include nitrate and nitrite nitrogen, and does not necessarily include all organically bound nitrogen”

[5] Most probable number

[6] Total residual chlorine

[7] Parameter expressed as ‘temperature change’ – it is unclear if this is a temperature difference of effluent to receiving body or a temperature change of the receiving body e.g. at the edge of a mixing zone, as per IFC.

[8] Faecal coliform

3.2 Receiving and Irrigation Water Standards for Tanzania

On 27 April 2017, the Tanzanian Bureau of Standards' Chemical Standards Section released two draft standards for public consultation. These are:

- CDC 6 (5017) P3 – Receiving Waters – Specification
- CDC 6 (5016) P3 – Water for Irrigation – Specification

Both operate in a similar way, classifying waterbodies according to levels of various parameters and defining their suitability in the receiving waters specification for broad usage groups and the irrigation waters specification for irrigation.

The receiving waters specification defines receiving waters as "water bodies into which any effluent or runoff are being or can be discharged". It states that the standard is being prepared "to guide authorities for processing various uses of receiving waters".

There are no similar standards in Uganda or in the IFC guidelines.

3.2.1 Receiving Waters Specification

Table 3.2-1 details the receiving water standards. The usage categories, "fields of application", are defined as follows:

- **Category 1:** Water that can be processed for drinking water supplies, swimming pools, food and beverage manufacturing industries, pharmaceuticals manufacturing industries or industries requiring a water source of similar quality.
- **Category 2:** Water that can be processed for use in feeding domestic animals; in fisheries, shellfish cultures, recreation and water contact sports.
- **Category 3:** Water that can be processed for irrigation and other industrial activities requiring water of standards lower than those of water in categories 1 and 2.

Table 3.2-1 Receiving Water Standards

Parameter	Permissible Level (mg/l Unless Specified Otherwise)		
	Category 1	Category 2	Category 3
pH	6.5–8.5	6.5–8.5	6.5–9.0
Total dissolved solids	2000	2000	-
Aluminium (Al)	0.3	0.3	0.3
Arsenic (As)	0.05	0.1	0.1
Barium (Ba)	1.0	1.0	1.5
Boron (B)	1.15	1.5	1.5
Cadmium (Cd)	0.03	0.1	0.2
Chromium III (Cr^{3+})	0.1	0.3	0.5
Chromium VI (Cr^{6+})	0.05	0.1	0.1
Cobalt (Co)	0.1	0.1	0.5

Table 3.2-1 Receiving Water Standards

Parameter	Permissible Level (mg/l Unless Specified Otherwise)		
	Category 1	Category 2	Category 3
Copper (Cu)	3.0	3.0	4.0
Iron (Fe)	1.0	1.2	1.5
Lead (Pb)	0.1	0.1	0.2
Manganese (Mn)	0.5	0.8	0.8
Mercury (Hg)	0.001	0.001	0.005
Nickel (Ni)	0.05	0.05	0.1
Selenium (Se)	0.05	0.05	0.5
Silver (Ag)	0.05	0.05	0.05
Tin (Sn)	0.5	0.5	0.1
Vanadium (V)	0.005	0.005	0.01
Zinc (Zn)	0.2	0.2	1.0
Ammonia + Ammonium ($NH_3 + NH_4^+$)	0.5	0.5	2.0
Chlorides (Cl^-)	200	200	400
Fluorides (F^-)	8.0	8.0	8.0
Cyanides (Cn)	0.05	0.05	0.1
Nitrates (NO_3^-)	50	50	100
Dissolved oxygen, min	6	5	3
Oxygen saturation, min	80%	60%	40%
Sulphates (SO_4^{2-})	600	600	600
Sulphides (S^{2-})	0.01	0.01	0.1
Organic and Microbiological Substances or Parameters			
Alkyl benzene sulphonates (ABS)	0.5	1.0	1.0
Aromatic and aliphatic hydrocarbons	0.05	0.05	1.0
Aromatic nitrogen containing compounds (e.g. aromatic amines)	0.01	0.01	0.1
Chloroform extract	0.5	0.5	1.0
Formaldehyde	0.2	0.2	0.5
Grease and oils (petroleum ether extract)	0.5	1.0	5.0
Non-volatile chlorinated compounds	0.005	0.005	0.10
Volatile chlorinated hydrocarbons (as Cl^-)	0.005	0.005	0.01
Organochlorine pesticides (as Cl^-)	0.0005	0.0005	0.001
Other pesticides	0.001	0.001	0.005
Phenols	0.002	0.002	0.1

Table 3.2-1 Receiving Water Standards

Parameter	Permissible Level (mg/l Unless Specified Otherwise)		
	Category 1	Category 2	Category 3
Resins or tar	0.1	0.1	0.5
BOD-5 days, 20°C	5	5	10
BOD-5 days, 25°C	6	6	12
BOD-5 days, 30°C	6	6	12
BOD-5 days, 35°C	7	7	13
Permanganate value	20	20	30
Total coliform organisms (count per 100 ml)	5000	25,000	100,000

Additional specifications are:

(1) The receiving water shall have a concentration of nitrates as low as required to prevent eutrophication or excessive weed growth if nitrogen is a limiting nutrient.

(2) The receiving water shall have a concentration of phosphates as low as required to prevent eutrophication or excessive weed growth if phosphorous is a limiting nutrient.

It is recommended that, as this is a very recent proposed draft, the project should monitor its progress towards adoption. The recommended approach to compliance would be to identify the potential use category of any waterbodies into which effluent may be discharged and to ensure that project discharges do not lead to a change in the use category.

3.2.2 Water for Irrigation Specification

The irrigation specification states:

> "This Draft Tanzania Standard is being prepared in order to control the quality of water used for irrigation purposes. Within the growing agriculture industry in Tanzania, it is accepted that good quality water is needed for maintaining viable production. This draft standard has been prepared in order to maintain the quality of required water for use by relevant stakeholders in the irrigation purposes."

The specification contains two tables. The first classifies water into "degrees of restriction" for irrigation according to levels of major parameters. The precise implications of the degrees of restriction are not detailed. The specification states, "For guidance on use of these tables refer to specialists in irrigation". The second table contains maximum levels of trace elements for long- and short-term irrigation use. These tables are reproduced as Table 3.2-2 and Table 3.2-3 respectively.

Table 3.2-2 Degree of Restriction of Irrigation Water According to Major Parameters

Parameter	Degree of Restriction		
	No Problem	Increasing Problem	Severe Problem
Salinity (affects crop water availability)			
Electrical conductivity (mmhos/cm)	<0.75	0.75–3.0	>3.0
Total dissolved solids (mg/l)	<450	450–2000	>2000
Permeability/filtration (affects infiltration rate into soil) electrical conductivity (mmhos/cm)	>0.5	0.2–0.5	<0.2
Specific Ion Toxicity (affects sensitive crops)			
Sodium adsorption rate [1]	<3	3–9	>9
Chloride (Cl) (mg/l)	<142	142–355	>355
Boron (B) (mg/l)	<0.75	0.75–2.0	>2.0
NO3-N or NH4-N (mg/l) [2]	<5	5–30	>30
HCO3 (mg/l) (overhead sprinkling)	<91.5	91.5–518.5	>518.5
pH	<6.5	6.5–8.4	>8.4

NOTES:

[1] Sodium adsorption ratio – ratio between soluble sodium and soluble divalent cations (calcium and magnesium) in water or soil extracts that can be used to predict the relative activity of sodium ions in exchange reactions with soil

[2] NO_3-N means nitrate nitrogen reported in terms of elemental nitrogen (NH_4-N and Organic-N should be included when wastewater is being tested)

Table 3.2-3 Maximum Concentrations of Trace Elements in Water for Irrigation

Substance	Maximum Concentration (mg/l)	
	Long-Term Use	Short-Term Use
Aluminium (Al)	5.0	20
Arsenic (As)	0.10	2.0
Beryllium (Be)	0.10	0.5
Cadmium (Cd)	0.01	0.05
Chromium (Cr)	0.1	1.0
Cobalt (Co)	0.05	5.0
Copper (Cu)	0.2	5.0
Fluoride (F–)	1.0	15.0
Iron (Fe)	5.0	20.0
Lead (Pb)	5.0	10.0

Table 3.2-3 Maximum Concentrations of Trace Elements in Water for Irrigation

Substance	Maximum Concentration (mg/l)	
	Long-Term Use	Short-Term Use
Lithium (Li)	2.5	2.5
Manganese (Mg)	0.2	10.0
Molybdenum (Mo)	0.01	0.05
Nickel (Ni)	0.2	2.0
Selenium (Se)	0.02	0.02
Vanadium (V)	0.1	1.0
Zinc (Zn)	2.0	10.0

NOTE:
The maximum concentration is based on a water application rate that is consistent with good irrigation practices (10,000 m_3 per hectare per year). If the water application rate greatly exceeds this, the maximum concentrations should be adjusted downward accordingly. No adjustment should be made for application rates less than 10,000 m_3 per hectare per year. The values given are for water used on a continuous basis at one site.

It is recommended that, as this is a very recent proposed draft, the project should monitor its progress towards adoption. The recommended approach to compliance would be to identify the potential classification, for irrigation purposes, of any water bodies into which effluent may be discharged and to aim to ensure that project discharges do not lead to a change in the classification or contain levels of trace elements that would restrict the use of water for irrigation.

3.3 Drinking Water Standards

3.3.1 Ugandan Standards

The Uganda Standard, US EAS 12: 2014, Potable water — Specification, is identical to and has been reproduced from an East African Standard, EAS 12: 2014. US EAS 12: 2014 cancels and replaces the previous Ugandan standard US 201:2008.

In addition, the Ugandan Design Guidelines for Water Supply Infrastructure state that water supplied for potable uses should meet the WHO water quality standards for parameters that are not included in the national drinking water quality standards.

3.3.2 Tanzanian Standards

The TBS Tanzanian Standard TZS 789:2003 Drinking (Potable) Water – Specification contains quality requirements applicable to drinking water other than packaged drinking water and natural mineral water. Requirements for quality are divided into three categories:

- microbiological quality requirements
- physical and chemical requirements

- standards of sanitary protection of water intake and surrounding land.

The limits established for the above components have been incorporated into the Environmental Management (Water Quality Standards) Regulations, 2007, which also include various descriptive requirements. In some cases, both lower and upper limits are stated; these are expressed as a range in the comparison table.

3.3.3 International Standards

The IFC General EHS Guidelines for Community Health and Safety state that drinking water sources, whether public or private, should at all times be protected so that they meet or exceed applicable national acceptability standards or, in their absence, the current edition of WHO's *Guidelines for Drinking-water Quality*.

WHO's *Guidelines for Drinking-water Quality* (fourth edition, WHO 2011) is recognised as the UN system's official position on drinking water quality. The guidelines are used as the scientific departure point for many regulatory regimes such as the EU's directives.

The International Association of Oil and Gas Producers (IOGP) and the International Petroleum Industry Environmental Conservation Association (IPIECA) both reference the WHO guidelines as a reference source for determining drinking water quality guidelines.

3.3.4 Comparison of Standards

Table 3.3-1 compares drinking water standards. The rightmost column includes the proposed project-preferred standard.

Table 3.3-1 Drinking Water Standards

Parameter	Ugandan Standard Limit Level		Tanzanian Standards Limit Levels	WHO Water Quality Guidelines Limit Levels	Project Preferred Standard
	Treated	Natural			
	(mg/l unless otherwise stated)				
Coliform	Absent	Absent	0 count per 100 ml at 37°C (excellent) 1–3 count per 100 ml at 37°C (satisfactory**)	Must not be detectable in any 100 ml sample (*E. Coli* or thermotolerant coliform bacteria)	Absent
E. Coli (faecal coliform)	Absent	Absent	0 count per 100 ml at 44°C	Must not be detectable in any 100 ml sample (*E. Coli* or thermotolerant coliform bacteria)	Absent
Enterococci	-	-	0 number/100 ml	-	0 number/100 ml
Acrylamide	-	-	-	0.5 µg/l	0.5 µg/l

Table 3.3-1 Drinking Water Standards

Parameter	Ugandan Standard Limit Level		Tanzanian Standards Limit Levels	WHO Water Quality Guidelines Limit Levels	Project Preferred Standard
	Treated	Natural			
	(mg/l unless otherwise stated)				
Antimony	-	-	-	20 µg/l	20 µg/l
Arsenic	0.01	0.01	0.05	10 µg/l	10 µg/l
Barium	0.7	0.7	1	-	0.7 mg/l
Benzene	0.01	0.01	-	10 µg/l	10 µg/l
Benzo(a)pyrene	0.7 µg/l [3]	0.7 µg/l [3]	-	0.7 µg/l	0.7 µg/l
Boron	2.4	2.4	-	2.4 mg/l	2.4 mg/l
Bromate	0.01	0.01	-	10 µg/l	10 µg/l
Cadmium	0.003	0.003	0.05	3 µg/l	3 µg/l
Chromium [D]	0.05	0.05	0.05	50 µg/l	50 µg/l
Copper	1	1	1–3	2 mg/l	1 mg/l
Cyanide	0.01	0.01	0.2	-	0.01 mg/l
Epichlorohydrin	-	-	-	0.4 µg/l	0.4 µg/l
Fluoride	1.5	1.5	1.5–4	1.5 mg/l	1.5 mg/l
Lead	0.01	0.01	0.1	10 µg/l	10 µg/l
Mercury	0.001	0.001	0.001	6 µg/l	0.001 mg/l
Nickel	0.02	0.02	-	70 µg/l	0.02 mg/l
Nitrate	45	45	10–75	50 mg/l[5]	45 mg/l
Nitrite	0.003	0.003	-	3 mg/l (short-term exposure)[5] 0.2 mg/l (long-term exposure)	3 mg/l (short-term exposure)[5] 0.2 mg/l (long-term exposure)
Total nitrogen (excluding NO_3)	-	-	1	-	1 mg/l
Zinc	5	5	5–15	-	5 mg/l
Aldrin + Dieldrin	0.03 µg/l	0.03 µg/l	-	0.03 µg/l	0.03 µg/l
Selenium	0.01	0.01	0.05	40 µg/l	0.01 mg/l
Trichloroethene	-	-	-	40 µg/l	40 µg/l

Table 3.3-1 Drinking Water Standards

Parameter	Ugandan Standard Limit Level		Tanzanian Standards Limit Levels	WHO Water Quality Guidelines Limit Levels	Project Preferred Standard
	Treated	Natural			
	(mg/l unless otherwise stated)				
Trihalomethanes total	30 µg/l chloroform	30 µg/l chloroform	-	The sum of the ratio of the concentration of each to its respective guideline value should not exceed 1 300 µg/l chloroform 100 µg/l bromoform 100 µg/l dibromochloromethane 60 µg/l bromodichloromethane	Comply with both the Ugandan outright chloroform standard and the WHO composite standard
Vinyl chloride	-	-	-	0.3 µg/l	0.3 µg/l
Colour	15 TCU	50 TCU	15–50 TCU	-	15 TCU
Iron	0.3	0.3	0.3–1.0	-	0.3 mg/l
Manganese	0.1	0.1	0.1–0.5	400 µg/l	0.1 mg/l
Odour	Odourless	Odourless	Not objectionable	-	Odourless
Taste	Not obj.	Not obj.	Not objectionable	-	Not objectionable
Turbidity	5	25	5–25 NTU	-	5 NTU
pH	6.5–8.5	5.5–9.5	6.5–9.2	-	6.5–8.5
Total filterable residue	-	-	200–2000	-	200–2000 mg/l
Total hardness	300 [1]	600 [1]	500–600	-	300 mg/l [1]
$CaCO_3$	-	-	75–300	-	300 mg/l
Calcium	150	150	50–100	-	100 mg/l
Magnesium	100	100	500–1000	-	100 mg/l
Magnesium and sodium	200 (Na)	200 (Na)	200–600	-	200 mg/l (Na)
Sulphate	400	400	200–800	-	400 mg/l
BOD (5 days at 30°C)	-	-	6	-	6 mg/l
PV (oxygen as $KMNO_4$)	-	-	10–20	-	10 mg/l
Ammonia or ammonium	0.5 (NH_3)	0.5 (NH_3)	2 (NH_3+NH_4^+)	-	2 mg/l (NH_3+NH_4^+), 0.5 mg/l (NH_3)

Table 3.3-1 Drinking Water Standards

Parameter	Ugandan Standard Limit Level		Tanzanian Standards Limit Levels	WHO Water Quality Guidelines Limit Levels	Project Preferred Standard
	Treated	Natural			
	(mg/l unless otherwise stated)				
Surfactants (alkyl benzyl sulphonates)	0.2 [2]	0.2 [2]	1 – 2	-	0.2 mg/l [2]
Organic matter (as carbon in chloroform extract)	-	-	0.5	-	0.5
Phenolic substances (as phenol)	0.002	0.002	0.002	-	0.002 mg/l
Radioactive materials: gross alpha activity	0.5	0.5	0.1 Bq/l	-	0.1 Bq/l
Gross beta activity	1	1	0.1 Bq/l	-	0.1 Bq/l

NOTES:

[1]As $CaCO_3$

[2]Reacting with methylene blue

[3]Unspecified polynuclear aromatic hydrocarbon

[4]Specified as “Chromium (6+)” for Tanzanian Standards limit level

[5]WHO standards are as ions.

The Ugandan standard sets limits for the following substances or parameters, for which there are no comparable limits in Tanzanian or WHO standards. Units are mg/l. Where there is an oblique, this separates different standards for treated and natural water sources. These are proposed as project standards.

Physical: Conductivity 1500/2500 µS/cm, suspended matter not detectable

Chemical: total dissolved solids 700/1500, aluminium as Al^{3+} 0.2, chloride as Cl^- 250

Inorganic: molybdenum 0.07, phosphates as PO_4^{3-} 2.2, residual free chlorine 0.2–0.5/absent

Organic: toluene 0.7, xylene 0.5, carbon tetrachloride 0.002, 1,2-dichloroethane 0.03, 1,1-dichloroethylene 0.0003, tetrachloroethene 0.04, 2,4,6-trichlorophenol 0.2, organic matter 0.003, mineral oil 0.00001

Pesticides: chlordane (total) 0.0003, 2,4-dichlorophenoxyacetic acid 0.03, DDT (total) 0.001, heptachlor and heptachlor epoxide 0.00003, hexachlorobenzene 0.001, lindane BHC 0.002, methoxychlor 0.02

Microbiological: total viable counts at 22 and 37°C respectively: 100 and 50; plus a number of specified micro-organisms such as shigella and salmonella that must be absent

4 NOISE

4.1 Environmental Noise

4.1.1 Ugandan and Tanzanian Standards

The noise control standards defined by Ugandan and Tanzanian legislation are the same. They are respectively from the National Environment (Noise Standards and Control) Regulations, 2003 and the Environmental Management (Standards for the Control of Noise and Vibration Pollution) Regulations, 2011.

In April 2017, the Tanzanian Bureau of Standards (TBS) published a new draft standard - EMDC 5(4145) P3, “Acoustic- General Tolerance Limits for Environmental and Occupational Noise” for stakeholder comment. This draft proposes less stringent standards applicable to the two most sensitive noise receptor classes, aligning them with the IFC standards. These are shown in parentheses in Table 4.1-1. The standards for the other receptor classes remain unchanged.

4.1.2 International Standards

The IFC General EHS Guidelines include some guidelines for noise levels.

4.1.3 Comparison of Standards

Table 4.1-1 compares national and international standards for noise. The project-preferred standards are the same as the in-force national standards.

Table 4.1-1 Operational or General Environmental Noise Standards

Surrounding Environment[1]	**Ugandan, Tanzanian and Project Preferred Standards(dB(A) L_{Aeq}) Draft Tanzanian Standards in (s)[2]**		**IFC Guidelines (dB(A) one-hour L_{Aeq})**	
	Day (0600 to 2200)	**Night (2200 to 0600)**	**Day (0700 to 2200)**	**Night (2200 to 0700)**
Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, and environmental or recreational sites	45 (52)	35 (42)	55	45
Residential buildings	50 (55)	35 (45)		

Table 4.1-1 Operational or General Environmental Noise Standards

Surrounding Environment[1]	Ugandan, Tanzanian and Project Preferred Standards(dB(A) L_{Aeq}) Draft Tanzanian Standards in (s)[2]		IFC Guidelines (dB(A) one-hour L_{Aeq})	
	Day (0600 to 2200)	**Night (2200 to 0600)**	**Day (0700 to 2200)**	**Night (2200 to 0700)**
Mixed residential, with some commercial and entertainment	55	45	70	70
Residential + industry or small-scale production + commerce	60	50		
Industrial	70	60		

NOTES:

[1]The receptor categories are from the national legislation. The categories in the IFC guidelines are "residential, institutional and educational" (for which the lower guideline levels apply) and "industrial and commercial" (higher levels)

[2] The draft revised limits are not project preferred limits at present

The IFC guidelines state that, in addition, to meeting the IFC standards:

> "noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. Noise impacts should not exceed the levels [presented in Table 4.1-1]] or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site."

4.2 Construction Noise

The Tanzanian and Ugandan regulations detailed in Section 4.1.1 both contain limits applicable to construction and they differ between the two countries; see Table 4.2-1. The TBS draft standard does not include standards specific to construction noise.

Table 4.2-1 Construction Site Noise Standards

Facility (TZ) or Noise Control Zone (UZ)	Ugandan Standards (dB(A) LAeq)		Tanzanian Standards (dB(A) LAeq)		Project Preferred Standard (dB(A) LAeq)	
	Day (0600 to 2200)	Night (2200 to 0600)	Day (0600 to 2200)	Night (2200 to 0600)	Day (0600 to 2200)	Night (2200 to 0600)
Residential	60	40	75[1]	65[1]	60	40
Commercial	75	50			75	50
Industrial	85	65			75	65
"Hospital, schools, institutions of higher learning, homes for the disabled"	-	-	60	50	60	50

NOTES: [1]These standards apply to any building other than those for which the more stringent standard is prescribed (such as hospitals).

The IFC does not provide any numerical limits specifically related to noise generated from construction. It does, however, outline several mitigation measures to control noise for consideration.

The relevant Ugandan and Tanzanian regulations and the draft Tanzanian standard set the same standards for impact or impulsive noise and intermittent or continuous noise from a factory or workshop. Although they do not specify limitations on the receptors that they intend to protect, they are clearly primarily occupational noise standards and are therefore not included in this document.

Both sets of national regulations also prescribe (the same) limits for vehicles (specified as 'accelerating' vehicles in the Ugandan regulations). Similar comments apply as in Section 2.3 regarding the responsibilities of vehicle owners and operators compared to manufacturers, importers or retailers and therefore the standards are not included in this document.

5 SOIL

5.1.1 Ugandan Standards

Section 3.1 includes standards for the discharge of effluent to groundwater or land.

The National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001 set Ugandan soil quality standards. These regulations:

- establish and prescribe minimum soil quality standards for maintaining, restoring and enhancing the inherent productivity of the soil in the long term
- establish minimum standards for managing the quality of soil for specified agricultural practices
- establish criteria and procedures for measuring and determining soil quality
- issue measures and guidelines for managing soil.

The classifications for soil quality for rain-fed and irrigated agriculture (with the minimum required quality indicated) are presented respectively in Table 4.2-1 and Table 4.2-2. There are no regulations or standards limiting the levels of contaminants in soils, as there are in Tanzania.

Table 4.2-1 Ugandan Soil Quality Classifications for Rain-fed Agriculture

Soil Quality Parameter	Class I Prime	Class II Good	Class III Medium (Minimum Standard)	Class IV Marginal	Class V Unsuitable
Bulk density – upper limit (g/cm^3)	1.25	1.3	1.5	1.65 or 1.25 (wetlands)	High
Porosity (volume %)	53	51	43	38 or 53 (wetlands)	Low
Water holding capacity (mm H_2O/m soil)	>150	130–150	100–130	<100	Low
Infiltration rate (mm/hr)	60–100	40–60	10–40	<10	Low
Permeability (mm/hr)	50–80	40–50	10–40	<10	Low
Slope (%)	0–3	3–8	8–13	13–20	>20
Stoniness (volume %)	<0.1 (>30 m apart)	0.1 (10–30 m apart)	<1 (10–30 m apart)	1–3 (10–30 m apart)	>15% of the surface covered
Soil depth (cm)	>100	75–100	20–75	<20	Very shallow
Flooding and duration (monthly or year)	NL	NL	Slight to moderate >1–2	Moderate to severe 2–4	Very severe >4
Depth to water table (cm)	>150	100–150	50–100	25–50	0–25

Table 4.2-2 Ugandan Soil Quality Classifications for Irrigated Agriculture

Soil Quality Parameter	Class I Suitable	Class II Moderately Suitable	Class III Marginally Suitable (Minimum Standard)	Class IV Potentially Suitable	Class V Unsuitable
Slope (%)	0–3	3–8	8–13	13–20	>20
Wetness Flooding Internal drainage Natural drainage	 NF Moderate Good	 Slight or less Moderate - rapid Good	 - Slow-very rapid Mod.	 - Slow-very rapid Imperfect	 - Very slow Very poor
Physical Topsoil texture, 0–25 cm Subsoil texture, 25–100 cm Surface stoniness (volume %) Subsurface coarse fragments (volume %)	 SL-CL SL-CL <0.01 0-5	 LS-C LS-C 0.01-0.1 5-15	 S-C LS-C 0.1-3.0 15-20	 S-C S-C 3-15 20-25	 CM-S CM-S >15 >25
Salinity and alkalinity (75–100 cm) EC (mmhos/cm) ESP, 0–100 cm	 <1 <4	 1-4 4-10	 4-8 10-20	 8-15 20-25	 >15 >25

NOTES:
C= clay, CM = massive clay, S= sand, SL = sandy loam, CL = clay loam, LS = loamy sand
NL = not limiting.
ESP = Exchangeable sodium percentage (meq/100g soil) x 100.
EC = electrical conductivity
mmhos/cm = milli mhos per centimetre - the basic (archaic) unit of measure of electrical conductivity in soil. A mho is equivalent to a siemens, which is the modern, SI-derived unit

Further tables within the first schedule of the regulations similarly define classifications for wetland rice systems. Table 4.2-3 presents the classification thresholds. The table includes the classifications for both naturally flooded and irrigated systems. The regulations give the following guidance on these definitions:

> "The natural flooding or waterlogged system represents the small-scale rice products in periodically flooded alluvial plains and valleys. These systems depend on flooding from rain events. The irrigated system represents the large-scale systems where irrigation waters

are ‘fairly’ well regulated. These rice production systems are adapted to specific hydrologic conditions and specific soil qualities.

The first category is very widespread in eastern Uganda and it is the main cultivation pattern in wetlands.”

Table 4.2-3 Ugandan Soil Quality Classifications for Wetland Rice Systems

Soil Quality Parameter	**Class I Suitable**	**Class II Moderately Suitable**	**Class III Marginally Suitable (Minimum Standard)**	**Class IV Potentially Suitable**	**Class V Unsuitable**
Slope (%)	NL / <1	<2 / <2	<4 / <3	<6 / <4	<8 / <5
Wetness Flooding Drainage	3–4 mon / NL Poor / mod to IP	3–4 mon / NL Poor to imperfect / Good to poor	<2 mon / 3–4 mon VP to mod / good to VP	<1 mon / 3–4 mon VP to mod / -	Too short / too short or too long VP / -
Physical Surface texture and structure Subsurface texture and structure	CM to SIC CM to LSF	CM to SCL CM to SC	CM to SF -	CM to SF -	CM to SC -
Salinity and alkalinity EC (mmhos/cm) ESP, %	<1 / <2 <4 / <5	<4 / <4 <10 / <10	<6 / <6 <20 / <20	<6 / <6 <25 / <35	<6 / <6 <25 / <35

NOTES:
Data before the oblique (/) are threshold limits for naturally flooded systems, those after the oblique are for irrigated systems. Data for the physical parameters are the same for both types
CM = massive clay, SF= fine sand, SC = coarse sand, SIC = silty clay blocky, SCL = sandy clay loam, LSF = loamy fine sand
NL = not limiting, mod = moderate, VP = very poor, IP = impermeable, mon = month(s)
ESP = Exchangeable sodium percentage (meq/100 g soil) x 100.
EC = electrical conductivity
mmhos/cm = milli mhos per centimetre - the basic (archaic) unit of measure of electrical conductivity in soil. A mho is equivalent to a siemens, which is the modern, SI-derived unit

Subsequent relevant schedules of the regulations include further guidance on the definitions and methods for determination of the soil quality parameters (third schedule) and measures and guidelines for soil conservation (fourth schedule).

The project-preferred procedure is that where the project affects agricultural land, the project will define and classify the soil quality before any major groundwork takes place. On reinstatement of the land, the process will be repeated and the soil quality should be at least returned to the same class as prior to groundwork.

5.1.2 Tanzanian Standards

Section 3.1 covers standards for the discharge of effluents to surface water and groundwater.

The Environmental Management (Soil Quality Standards) Regulations 2007 establish the role of the National Environmental Standards Committee for soil quality, and contain provisions establishing pollution prohibitions and minimum soil quality standards, arrangements for soil pollutant discharge permits, compliance and enforcement, and offences and penalties. One of the committee's responsibilities is to set minimum standards for soil quality. Empirical limits for a variety of polluting substances are set out in several schedules. These are summarised in the table below. All are adopted as project-preferred standards. There are no standards or regulations classifying requirements for agricultural land as there are in Uganda.

Table 4.2-4 Tanzanian Soil Contaminant Limits

Parameter	**Upper Limit (mg/kg)**	**Parameter**	**Upper Limit (mg/kg)**
Organic compounds		Metals	
Benzene	5	Arsenic	1
Carbon tetrachloride	5	Cadmium	1
1, 2-dichloroethane	5	Hexavalent chromium	100
1, 1-dichloroethylene	0.5	Lead	200
Cis-1,2-dichloroethylene	40	Manganese	1800
Trans-1,2-dichloroethylene	60	Mercury	2
Dichloromethane	90	Nickel	100
Ethylbenzene	200	Selenium	20
Styrene	1000	Copper	200
Tetrachloroethylene	50	Zinc	150
Toluene	500	Molybdenum	5
Trichloroethylene	30	Other chemicals	
1,1,1-trichloroethane	600	Benzo(a)pyrene	1.0
1,1,2-trichloroethane	10	Cyanide	10
Total xylenes	200	Polychlorinated biphenyls (PCBs)	1.0
		Vinyl chloride	1.0
		Polychlorinated dibenzo dioxins	100 ng toxic equivalents (TEQ)/kg

Table 4.2-4 Tanzanian Soil Contaminant Limits

Parameter	Upper Limit (mg/kg)	Parameter	Upper Limit (mg/kg)
Pesticides		Pesticides	
Atrazine	50	Paraquat	300
2,4-dichlorophenox acetic acid (2,4-D)	700	Diquat	150
2,4-dichlorophenox acetic acid amine (2,4-D amine)	700	Chlordane[1]	0.6
Lindane	2	DDT[1]	3
Pentachlorophenol	20	Dieldrin[1]	0.05
Sulphur	500	Heptachlor[1]	0.2
Endosulfan	60	Toxaphene[2]	0.6
Glyphosate	700	Aldrin[1]	0.05
Acetochlor	500	Hexachlorobenzene[1]	500
Carbofuran	200		

NOTES:

[1]Restricted by Stockholm Convention on persistent organic pollutants, to which Tanzania is a party

[2]Banned by Stockholm Convention on persistent organic pollutants

5.1.3 International Standards

International best practice has adopted a risk-based approach for contaminated land and associated groundwater management. With this approach, the required soil quality is defined by the use of the land, pathways to potential receptors, and types of receptors rather than the rigid standards as set by Ugandan and Tanzanian legislation. The approach is described in Section 1.8 of the IFC's General EHS Guidelines.

The project-preferred standard will use this risk-based approach to go beyond compliance with the national standards where necessary. In exceptional circumstances, the risk-based approach could be used to justify a noncompliance with a national standard.

The IFC EHS Guidelines for Onshore Oil and Gas Development include guideline values for hydrotest discharges to land; see Section 3.1.3.

5.1.4 Summary of Project Preferred Standards

Controls on soil and groundwater impact differ considerably between Ugandan law, Tanzanian law and international standards. The project should apply a composite of these regimes in managing its effects on soils and groundwater. The project preferred approach is to:

- for affected agricultural land, at least maintain and preferably improve the soil quality classification, as defined by the Ugandan regulations, that was in place before the project's activity when it is returned to agricultural use
- comply with the Tanzanian limits on contaminant levels
- apply the risk-based approach as outlined in the IFC EHS General Guidelines to determine when it will be necessary to go beyond compliance in managing land contamination.

Appendix G: Impacts Assessments

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G1 SOIL EROSION RISK ASSESSMENT

G1.1 Purpose and Scope of Report

The purpose of this report is to:

- identify areas on the proposed EACOP corridor that have very high risk for soil erosion
- screen each very high risk site against its proximity upslope of VECs sensitive to sediment runoff
- identify mitigation measures that may be needed in very high risk areas and the general scope of work of any further assessment and site survey that may need to be undertaken.

The precise choice and number of final mitigation measures to be applied is not within the scope of this report.

G1.2 Study Boundary

The study boundary will encompass all land within 2 km of the EACOP right of way (ROW).

G1.3 Methods

G1.3.1 Secondary Data

A study of available information on climate, soils and slopes along the pipeline corridor was undertaken.

GIS maps showing the soil types were created using data from Isabirye et al., (2004) and Kaizzi (2017) (see Appendix A5). The soil types were then categorised into textures based on the table in Attachment G1.2. The gradient along the pipeline was derived using 30 m Advanced Spaceborne Thermal Emission and Reflection Radiometer digital elevation model data (ASTER GDEM 2009).

G1.3.2 Field Survey

Soil surveys were undertaken on the EACOP corridor in November 2017 as part of the ESIA soil baseline study. Data from the soil survey was used to verify the soil classifications and confirm soil texture descriptions. The soil types were categorised into textures based on the table in Attachment G1.3.

The soil type classifications based on the EACOP baseline soil survey did not always correspond with the mapped soil type GIS maps. This was due to the reconnaissance scale of the survey, which was only able to identify the predominant soil type within each mapping unit rather than the specific soil type at any particular location.

G1.3.3 Categorisation and Mapping of Soil Erosion Risk

Soil descriptions were transposed into the following textural classes:

- sandy, light silty soils, peaty
- medium, calcareous
- heavy.

The textural classes were then cross-referenced with the landscape gradients of the area near the pipeline, using ASTER GDEM data (2009), under the following categories:

- very steep >11°
- steep 7–11°
- moderate 3–7°
- gentle 2–3°
- level ground <2°.

Terrain within 2 km of the pipeline corridor was categorised to identify areas at high and very high risk of soil erosion. The categorisation was based on the risk assessment in Table G1.3-1, which was developed using the Department for Environment, Food and Rural Affairs (DEFRA) manual on controlling soil erosion (DEFRA 2005).

Table G1.3-1 Erosion Risk Category Based on Soil Texture and Slope

Soil or Slope	Very Steep Slopes >11°	Steep Slopes 7–11°	Moderate Slopes 3–7°	Gentle Slopes 2–3°	Level Ground <2°
Sandy soils Light silty soils Peat soils	Very high	Very high	High	Moderate	Lower
Medium and calcareous soils	Very high	High	Moderate	Lower	Lower
Heavy soils	Very high	Lower	Lower	Lower	Lower

The results of the erosion risk assessment are shown on the erosion risk maps in Attachment G1.1. Each map is divided into four to show the slope, soil texture and erosion risk according to the categories in Table G1.3-1. The fourth map is a plain base-map.

Very high risk sites were screened against the proximity of upslope VECs sensitive to sediment runoff according to the ESIA sensitivity ranking (see Appendix D of the ESIA).

G1.3.4 Data Considerations

Table G1.3-1 is a guide to assessing the risk of erosion. In a more comprehensive assessment, professional judgement would also be used to assess each site in situ.

Land use and cropping calendars have not been incorporated into the risk assessment. This is because the soil will be exposed within the temporary working

areas during the works and the calendars therefore will not be relevant, as crops will not be present.

The scale on the GIS map enclosed in Attachment G1.1 is sufficient to identify risk of erosion for this preliminary risk assessment. However, an assessment of erosion risk derived from the table and maps alone should be dismissed if visible signs of erosion are already present or appear during the preliminary phases of pipeline construction.

Due to the variability of terrain and soil types across the corridor, further detailed assessment should be undertaken on site, and professional judgement should be exercised to confirm or revise a site's erosion risk. Such judgements should take into account additional factors such as

- microtopography and valley features, which may concentrate surface runoff
- long unbroken slopes
- uncommon landscape features
- organic matter and soil structure
- vegetation cover
- distance to sensitive VECs.

G1.4 Soil Erosion Conditions

Much of the land in East Africa is already badly degraded, with numerous soil erosion research projects undertaken in the area over many decades. The Montpellier Panel (2014) states that in Africa, the impacts of land degradation are substantial where 65% of arable land, 30% of grazing land and 20% of forests are already damaged.

G1.4.1 EACOP Uganda

The EACOP Uganda pipeline erosion risk map is in Attachment G1.1.

The landscape is dominated by grazing, commercial farms and plantations, and subsistence farming. Many rivers drain into Lake Victoria.

Table G1.4-1 Description of Erosion Risk

KP	Erosion Risk	Description	Sensitive VECs		
			KP	Description	Distance Downslope of Pipeline (km)
KP0–KP15	Low–very high	Very variable slope	0–15	Numerous tributaries of the Wambabya River, and associated wetlands	<1
			10–15	Local road	<1
KP15 – KP30	High–very high	Gentle slope to level ground	15–30	Numerous tributaries of the Wambabya River, and associated wetlands	<1
			30	Village of Kakende	<1
KP30–KP50	Low–very high	Predominantly medium to heavy soils, and low to moderate slopes. Predominantly low erosion risk, with some high to very high risk areas along the ridge near KP45–KP50.	35–40	Kafu River	<1
			35–40	Local road	<1
			45–50	Local road	<1
			45–50	Tributaries of the Mpongo River, and associated wetlands	<1
KP50–KP65	Low–very high	A high ridge on the east of KP65	55–60	Village of Mpasana	1–2
			60	Local road	<1
KP65–KP75	Low–very high	Gentle to moderate slope	65–75	Numerous rivers, and associated wetlands	<1
			70–75	Local road	<1
KP75–KP100	Very high	Many areas of very high risk, especially after KP85. The erosion risk in Buwekula County is very high.	80–90	Villages of Kisala, Nzoo and Kidongo	<1
			75–95	There are a number of rivers, and associated wetlands, crossing this section.	<1

Table G1.4-1 Description of Erosion Risk

KP	Erosion Risk	Description	Sensitive VECs		
			KP	Description	Distance Downslope of Pipeline (km)
KP100–KP130	Moderate–very high	Variable erosion risk, but more generally low to moderate risk with some high and very high risk hotspots.	105–110	Local road	<1
			110–115	Villages of Kabulasoke, Nateete and Kamusenene	<1
			115–120	The Nabakazi River and associated wetland	<1
			120–125	Main road	<1
			120–125	Villages of Kagoma and Kitenga and the town of Kiwumulo	<2
KP130–KP160	Low–very high	Largely low to moderate risk, but with some distinctive ridges in the landscape leading to high and very high risk areas crossing the corridor. Low risk in line with the river	125–140	Local road	<1
			145–150	Nabakazi River, and associated wetlands	<1
KP160–KP195	Low–very high	Two rivers cross the corridor in Gomba County. The variations in slope and soil texture at KP165 increases the risk of erosion from low to moderate to high tovery high.	160–165	Village of Bugula	<1
			160–165	Local road	<1
			165	Katonga River, and associated wetlands	<1
			160–190	Numerous rivers, and associated wetlands	<1
			180–195	Villages of Njaza, Selinya, Kagango, Nsambya, Kyemandwa, Miti and Mbinzi	<2
			185–190	Local road	<1

Table G1.4-1 Description of Erosion Risk

KP	Erosion Risk	Description	Sensitive VECs		
			KP	Description	Distance Downslope of Pipeline (km)
KP195–KP215	Moderate–very high	This is within an area of variable terrain and erosion risk. From KP195 onwards the terrain is mainly moderate to steeply sloping and erosion risk is predominantly moderate to very high.	205–210	Town of Kitembo	<1
			210	Local road	<1
			215–220	Numerous rivers, and associated wetlands	<1
KP215–KP230	Moderate–very high	To the south of KP215 there is a county boundary. This is marked by a valley bottom and has a lower risk of erosion. Erosion risk is moderate to very high surrounding KP215.	225	Village of Kinvunikidde	<1
KP230–KP235	Low–moderate	Soils are heavy and slopes are gentle to moderate.	230–235	District town of Lwengo	1-2
KP235–KP240	Moderate–very high	Soils are medium/calcareous but the slope is very variable. A high ridge begins to the west.	235–240	Local road	<1
			235–240	Village of Kiswaga	<1

Table G1.4-1 Description of Erosion Risk

KP	Erosion Risk	Description	Sensitive VECs		
			KP	Description	Distance Downslope of Pipeline (km)
KP245–KP255	Low–very high	The land is gently sloping with a range of soil types within the area of investigation. There is a low erosion risk in line with the pipeline and to the east. However, to the west of the pipeline is a very high erosion area, marked by the steep slopes along Bukoto and Kooki Counties.	245–250	Village of Bethlehem	1–2
			245–255	River	<1
			255–260	Village of Koki	<1
			255–260	Main road	<1
KP255–KP265	Low–very high	Soils and slopes are variable.	260–265	Villages Lusolo, Kigand and Kalunumu	<2
			260–265	River	<1
KP265–KP280	Low–very high	Soils are predominantly medium to heavy and erosion risk is mainly low, although erosion risk is moderate to very high due to a hill to the west of KP280.	265–270	River	<1
			265–270	Main road	<1
			270–275	Villages of Sanje, Nyanga and Lwemisege	<2
			265–280	Numerous rivers	<1
KP280–KP290	Low–very high	Erosion risk is low to moderate with a few high to very high risk areas adjacent to the main road.	280–285	Main road	<1
			285–290	Villages of Kabonera and Lukoma	<1
			285–290	Jemakunya River	<1

Table G1.4-1 Description of Erosion Risk

KP	Erosion Risk	Description	Sensitive VECs		
			KP	Description	Distance Downslope of Pipeline (km)
KP290–KP295	Low–very high	Dominated by low risk of erosion and moderate and calcareous soils.	290–295	Main road	<1

G1.5 Site Specific Review – Very High Erosion Risk

Using GIS mapping, areas where the pipeline traverses sections of very high erosion risk have been identified and described in more detail. From a review of the low-resolution aerial imagery of the corridor, areas where erosion appeared to be occurring already have also been noted.

G1.5.1 EACOP Uganda Export Pipeline

Table G1.5-1 Very High Erosion Risk

Starting KP	Ending KP	Soil Classification	Signs of Existing Erosion	Comment
68.5	68.5	Gleyic Arenosol	No	Side slope listed
76.5	77	Acric Ferralsol	No	N/A
84.5	85	Acric Ferralsol	No	N/A
89	89.5	Leptosol	No	N/A
90.25	90.75	Leptosol	No	Watercourse at KP90.75 (Kyetinda)
91	91	Leptosol	No	N/A
91.8	93.25	Acric Ferralsol	No	Watercourse at KP92.75 (Kanangalo)
94.25	94.75	Acric Ferralsol	No	Watercourse at KP95
95	95.3	Acric Ferralsol	No	Watercourse at KP95
97.5	97.7	Acric Ferralsol	No	N/A
104.5	104.5	Acric Ferralsol	No	Map does not put area as very high risk. Lidar levels must give steeper slope. Watercourse at KP105
111.8	111.8	Acric Ferralsol	No	N/A
138	138.5	Gleyic Arenosol	No	Wetland mapped north of KP138
145.5	145.5	Gleyic Arenosol	No	Upslope of wetland
202	202	Acric Ferralsol	Yes	N/A
202.4	202.4	Acric Ferralsol	Yes	Erosion immediately on western fringe of working strip
203	203	Gleyic Arenosol	Yes	N/A
205.1	205.7	Gleyic Arenosol	Yes	N/A
206	206	Gleyic Arenosol	Yes	N/A

Table G1.5-1 Very High Erosion Risk

Starting KP	Ending KP	Soil Classification	Signs of Existing Erosion	Comment
208	208	Acric Ferralsol	Yes	Was not high risk on GIS study but existing erosion widespread at this location. Side slope listed.
209.5	209.8	Acric Ferralsol	Yes	Was not high risk on GIS study but existing erosion widespread at this location. Side slope listed.
221.5	221.5	Gleyic Arenosol	Yes	GIS study showed very high risk on both slopes towards KP221.5 and erosion taken place along valley feature that crosses the ROW.

G1.6 Summary of Results

The risk of soil erosion within the study area is highly variable, reflecting the change in soil and slopes. There is a large number of high to very high risk areas along the corridor.

The EACOP Uganda corridor is adjacent to Lake Albert where the terrain is gentle to very low and soils slightly heavier. There are a few ridges, however, which increase the risk of erosion due to increased slope. The most notable area of very high erosion risk is an escarpment around KP55. Here the land has slopes greater than 15 degrees directly along the route.

The terrain and soils on the EACOP Uganda corridor are very variable, thereby creating variable erosion risk. There are both very high risk areas, with very steep slopes, and low risk areas, where the land is flatter and soils heavier. A number of the very high risk areas were concentrated within a hilly range between KP77 and KP97.

G1.7 Recommendations

G1.7.1 Mitigation Measures for High to Very High Risk Zones

Locations identified as high to very high erosion risk will be further assessed and mitigation measures implemented to reduce impacts.

The suite of mitigation measures that can applied to control erosion is described in Section 2 and Section 8.5 of the ESIA. The precise choice and number of mitigation measures to be applied in these high risk areas will be determined on the basis of the risk assessments.

G1.7.1.1 Erosion Control Methods

Soil erosion on susceptible soils can be reduced by lowering the erosive risk of rainfall, and ensuring soils remain permeable thereby reducing surface flow. This can be achieved by:

- protecting the soil from impact, usually with vegetation cover
- avoiding smooth flat soil surfaces, so that water cannot infiltrate
- avoiding compaction, tramlines, wheelings or any features that could concentrate water flow
- ensuring the soil remains stable.

G1.7.1.2 Timing of Works

- Any disturbance of the soil surface during the rainy season or high rainfall events should be avoided.
- Plan operations to minimise the total area of vulnerable soils worked at any one time or left exposed. Planning should include soil-stripping proposals and haul-route mitigation measures.
- Avoid working during heavy rainfall periods, and protect any disturbed site soils if heavy rain is predicted.

G1.7.2 Drainage

- Any runoff from buildings, concreted areas, roads and tracks should be effectively channelled into ditches and drains so no excess water flows over the soil surface.
- Construct shallow channels with catch pits to intercept any runoff and encourage settlement of soil particles.
- Install drains to intercept existing land drains or springs (where present) or to intercept surface water when an open channel would be unstable.
- Protect excavated areas by intercepting and diverting surface water on the upslope side of the site.
- Prevent any drainage water with a high suspended sediment loading from leaving the site.
- Onsite channels should be kept clean of blockages to allow the controlled flow of runoff.
- Install remedial drains to replace damaged original land drains and to aid soil recovery.

G1.7.3 Breaking the Slope

- Break up long slopes with benching or a ditch along the contour to reduce the chances of surface flow causing rills and gullies.

G1.7.4 Stockpiles

- Minimise soil damage by stripping topsoil and subsoils carefully, and keep different soil types separated in distinct stockpiles.
- Ensure stockpiles of the stripped soils are treated carefully. They should be designed to allow water to run off the sides, not become too wet, and not made too large.

- Sow stockpiles with native grass or wildflowers to protect them from any erosion. Steep banks, waterlogged areas, or compacted soils, where grass cover is unlikely to take, may need artificial covers. Consider hydroseeding.
- Ensure stockpiles are located away from drains and watercourses.
- Bund the stockpiles to keep runoff away from them.
- Keep soil storage periods as short as possible.

G1.7.5 Stabilising Soils

- Geotextiles or matting can be used in places where vegetation has been removed to provide temporary protection before new vegetation is established.

G1.7.6 Reinstating Soils

- Reinstate differing soils in the pipeline trench on a first-out-last-back basis to re-establish the original soil profile.
- Construct trench breakers where there is a risk of water migrating down the pipeline trench.
- Reinstate soils under dry conditions and control machinery movement so there is no unnecessary trafficking of the topsoil or subsoil.
- Try to restore the site at an appropriate time, to aid fast re-establishment of ground cover.
- Aim to place soils loosely to allow them to settle naturally.
- Remove compaction from the soils during reinstatement, eliminate ruts and wheelings and re-establish drainage where necessary.
- Ensure the subsoil surface is rough before the topsoil is placed. Do not compact any layers of the soil profile.

G1.7.7 Sediment Control

Erosion control is much more effective than treating sediment-laden runoff in preventing water pollution. However, it is likely that sediment control measures will be required in most areas but more intensively in areas of high to very high erosion risk.

Several methods are available to help slow down runoff and settle out sediment, including:

- check dams and sediment traps
- silt fences
- straw bales or similar natural material
- settlement tanks
- settlement pond.

More information on methods of controlling sediment can be found in CIRIA C648 (2006).

G1.8 References

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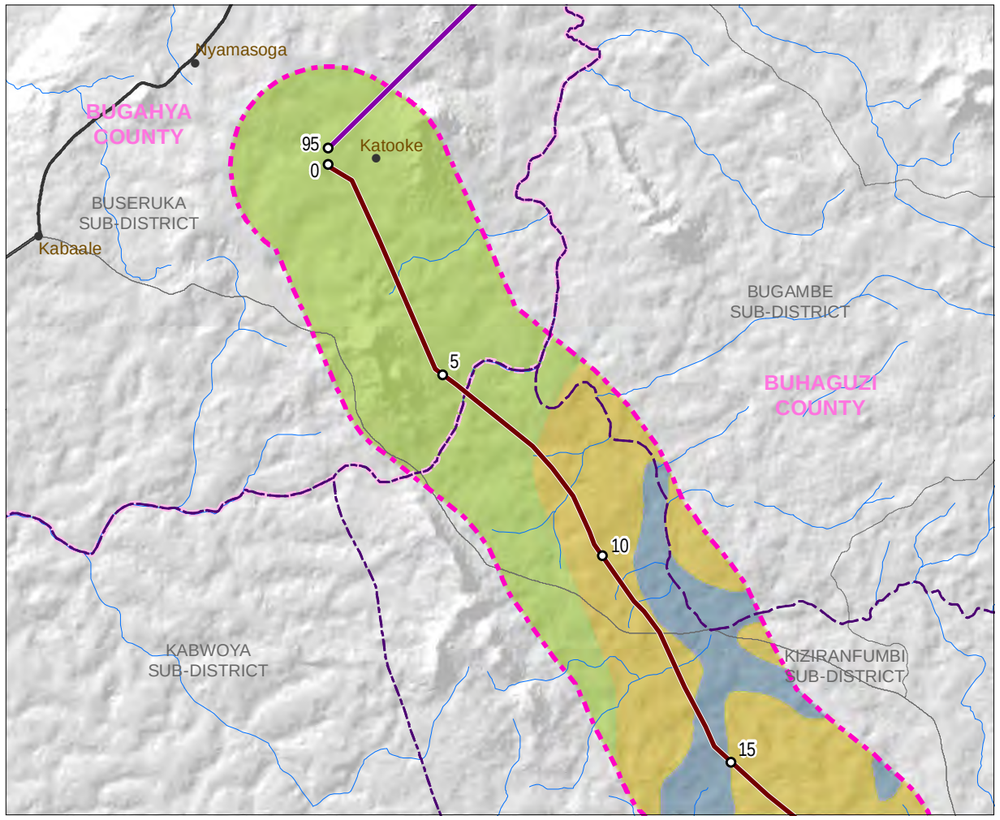
ATTACHMENT G1.1 EROSION RISK MAP

Soil Texture



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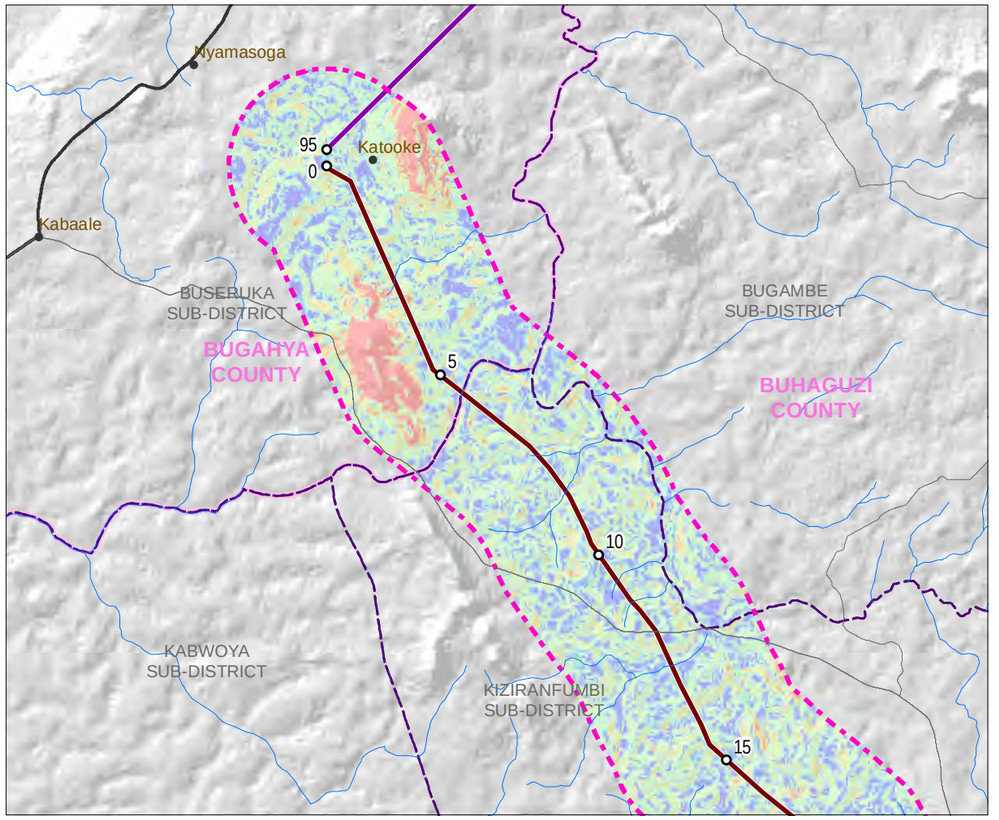
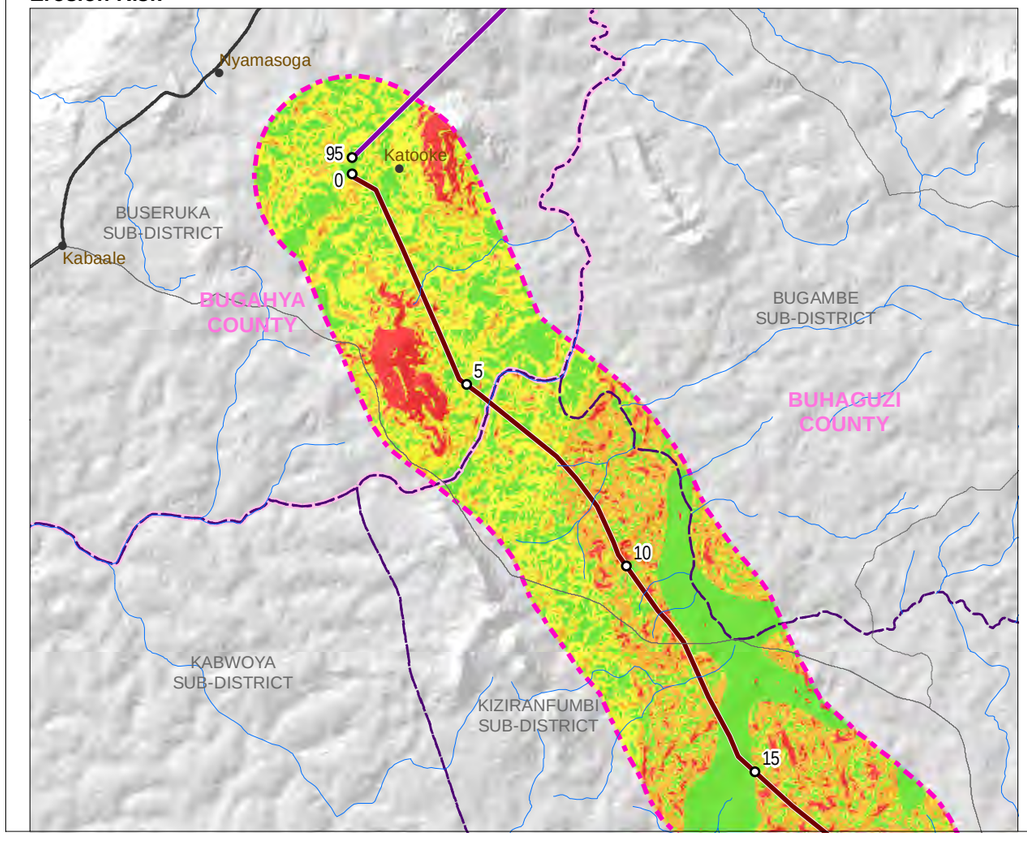
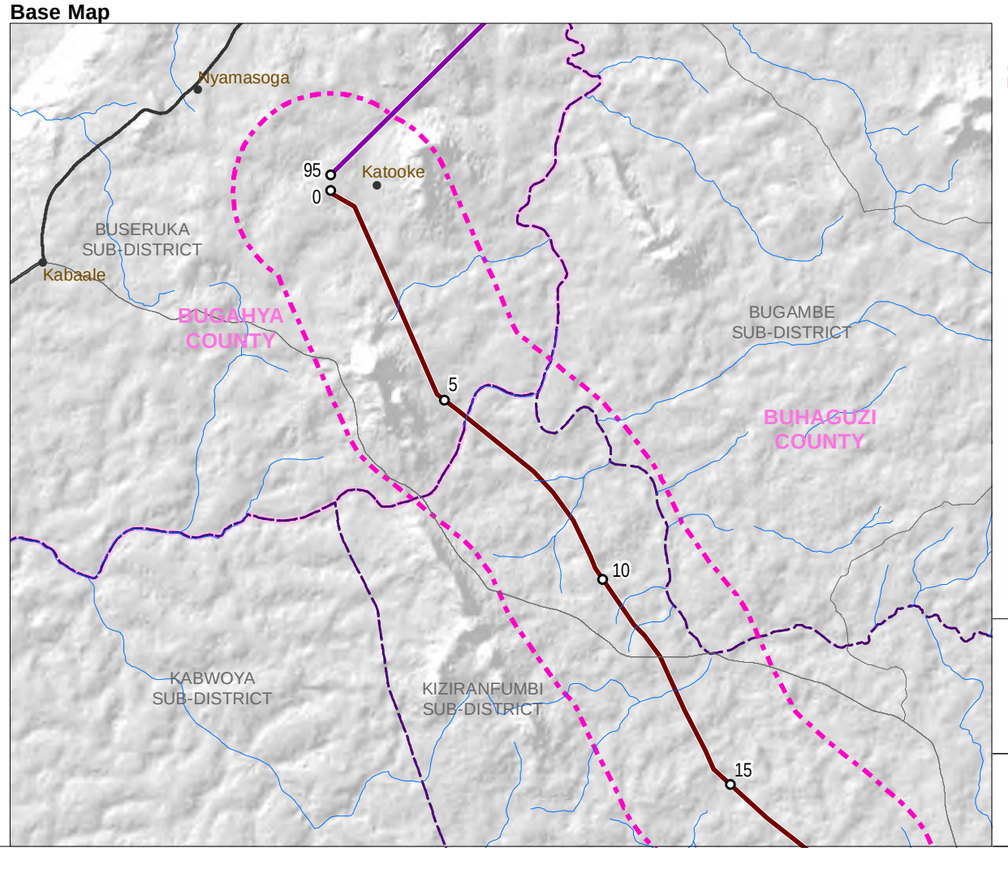


Erosion Risk



Base Map



Legend

- **East African Crude Oil Pipeline**
- **Tilenga Feeder Pipeline**
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

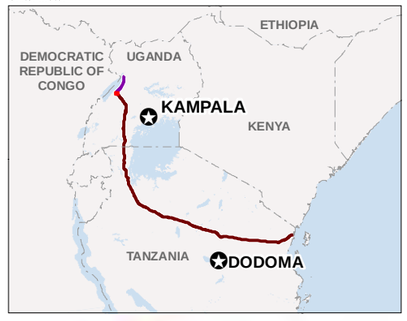
Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
- Gentle (2°-3°)
- Level Ground (<2°)
- National Capital
- District Headquarters
- Town/Settlement
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



EAST AFRICAN CRUDE OIL PIPELINE

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Kilometres
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N W E S

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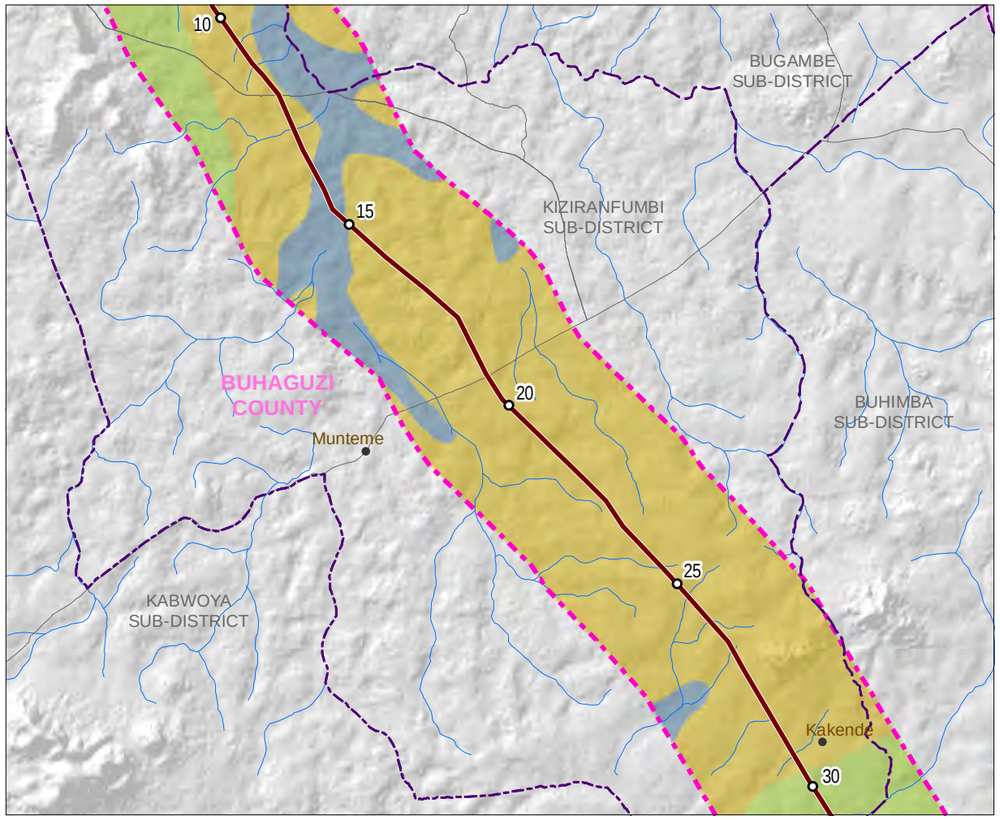
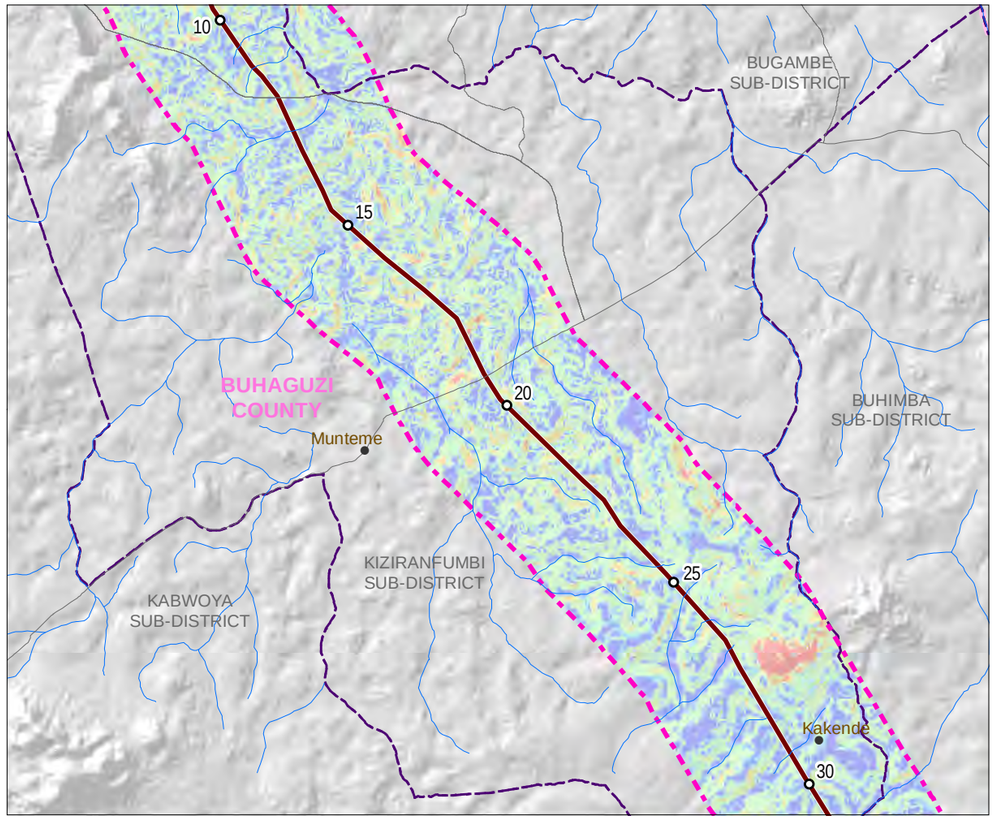
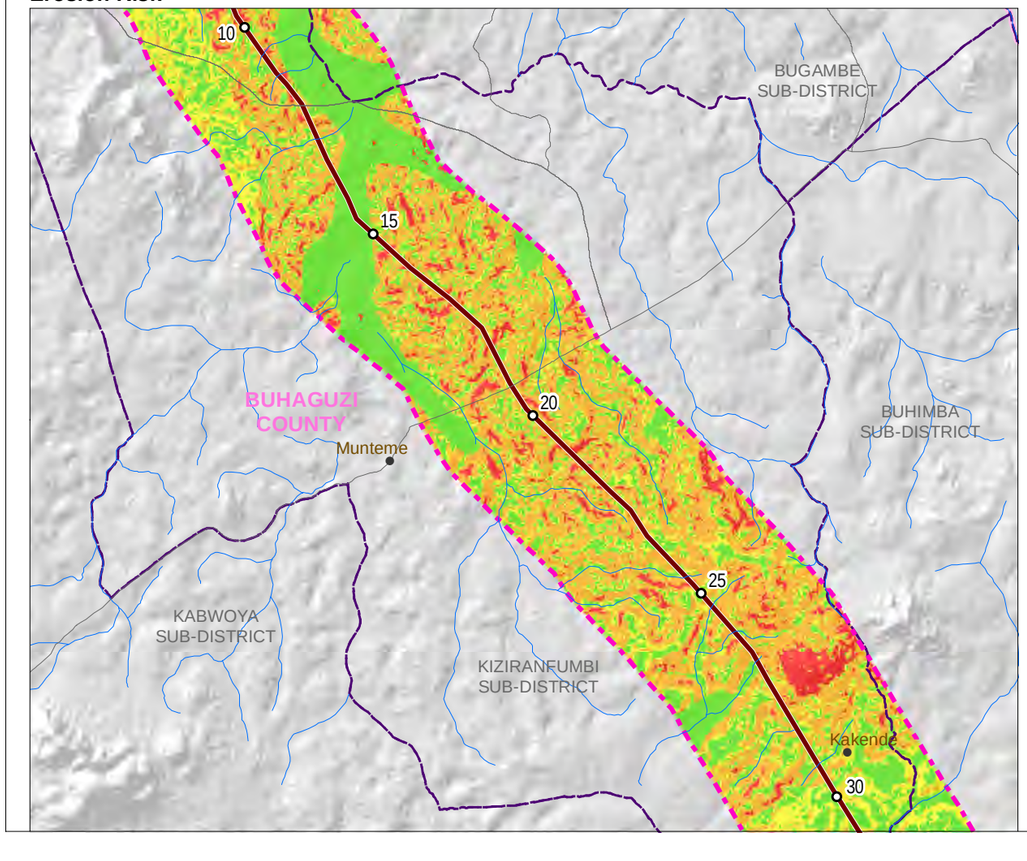
Soil Texture



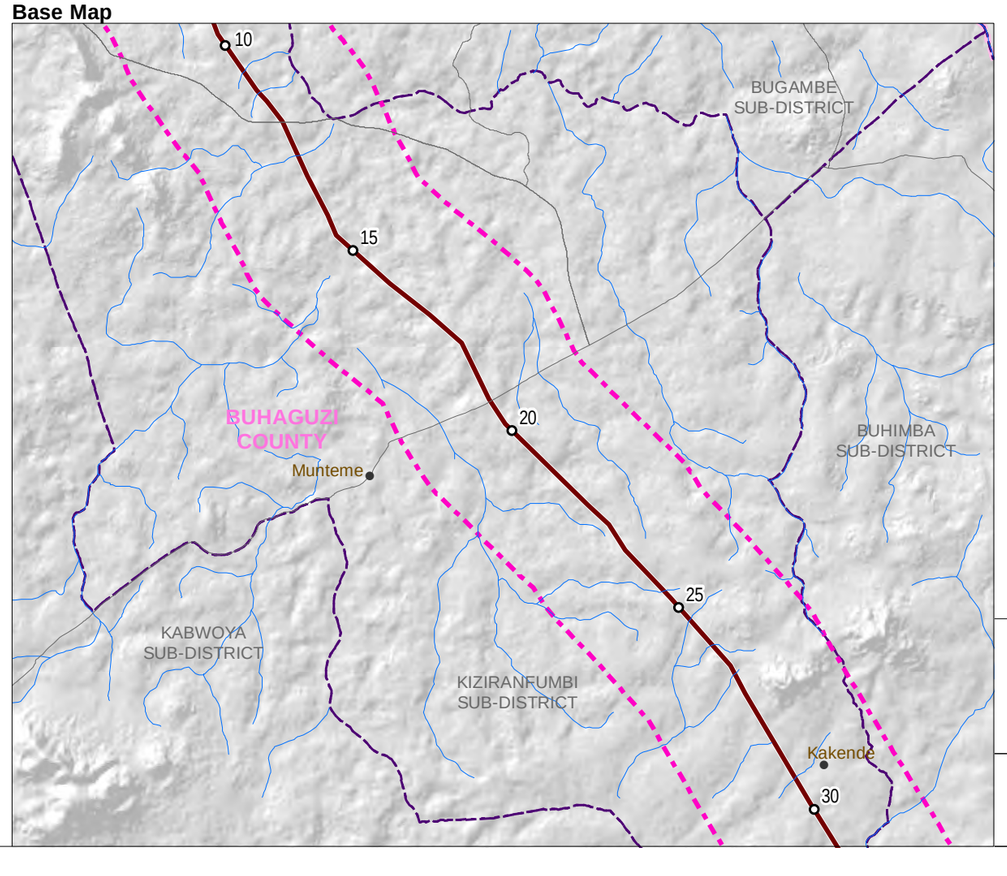
Slope



Erosion Risk



Base Map



Legend

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- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

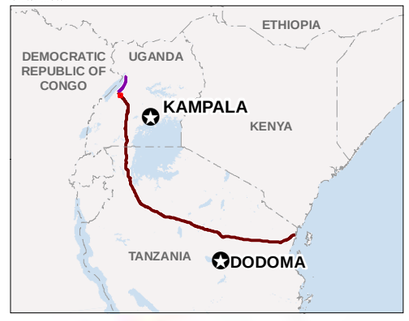
Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
- Gentle (2°-3°)
- Level Ground (<2°)
- National Capital
- District Headquarters
- Town/Settlement
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



EAST AFRICAN CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:125,000 @ A3

N W E S

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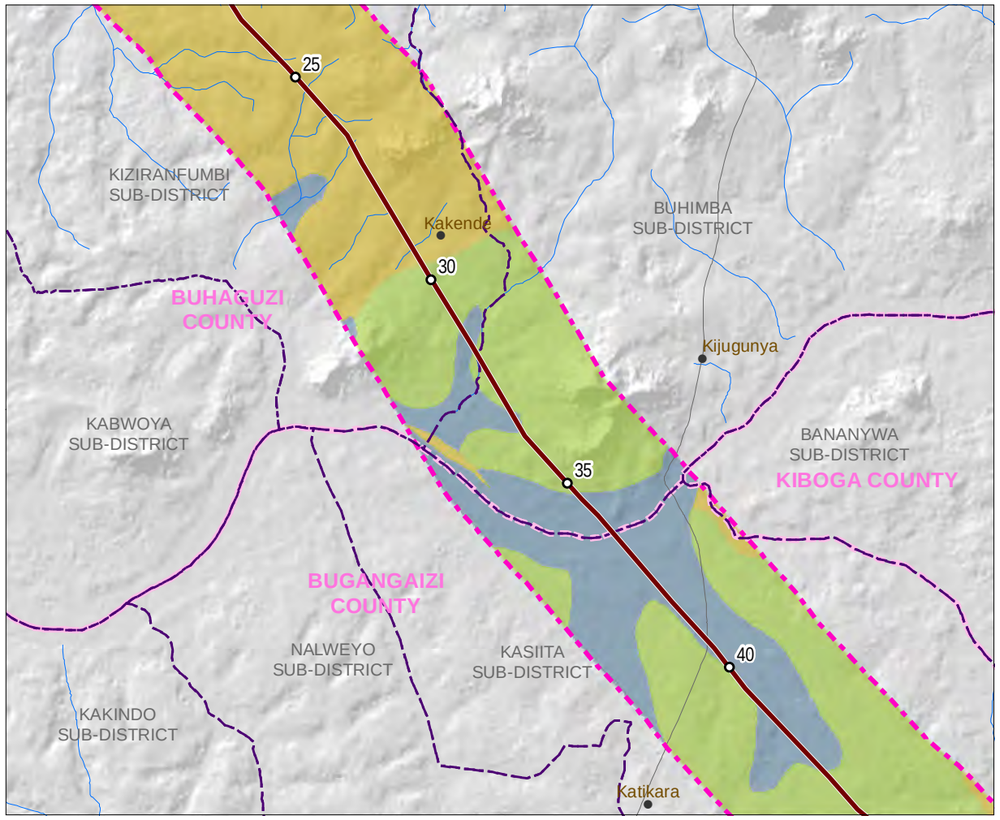
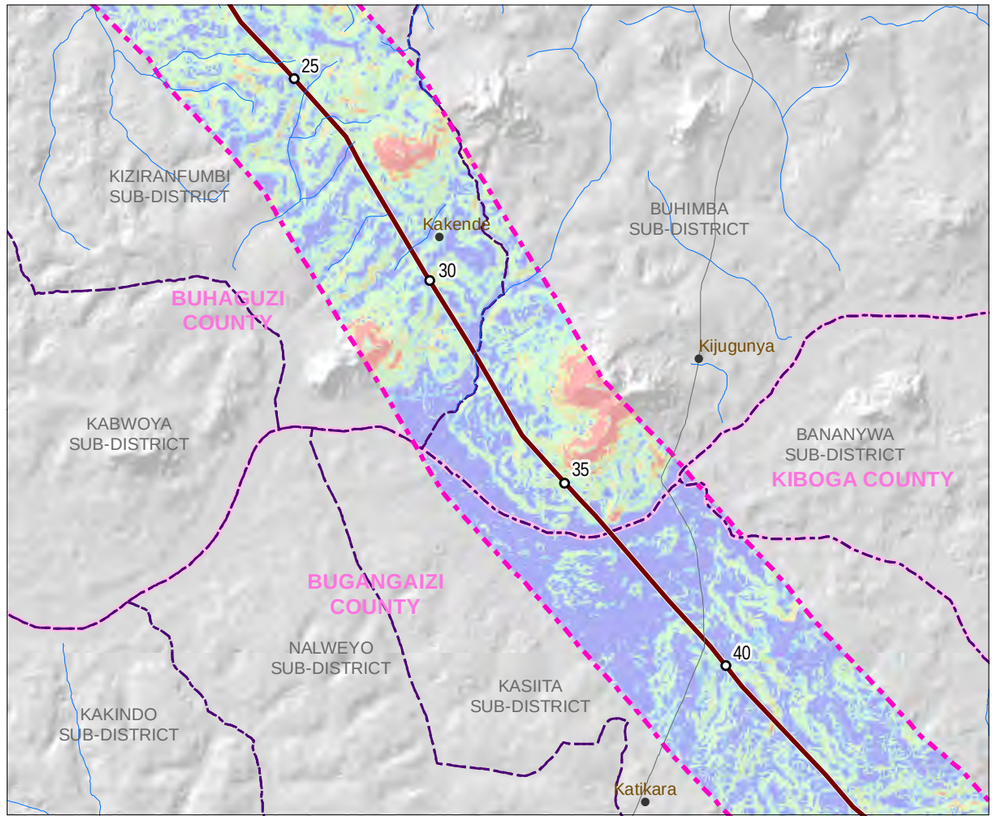
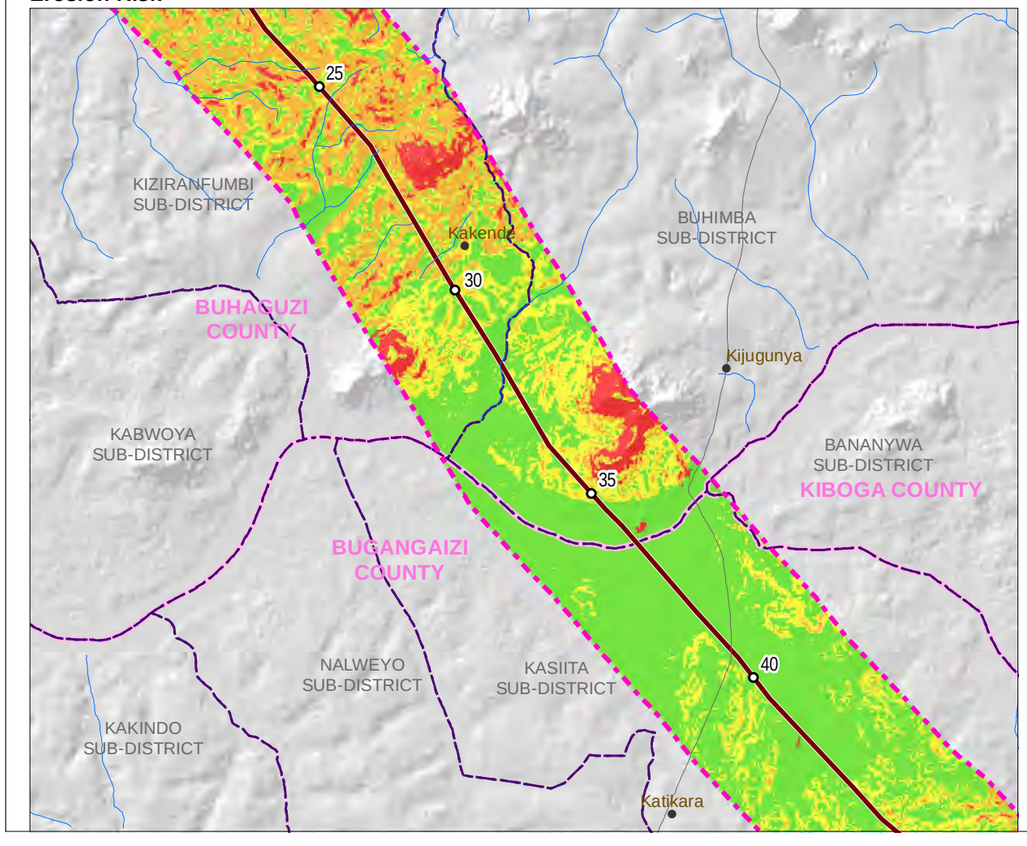
Soil Texture



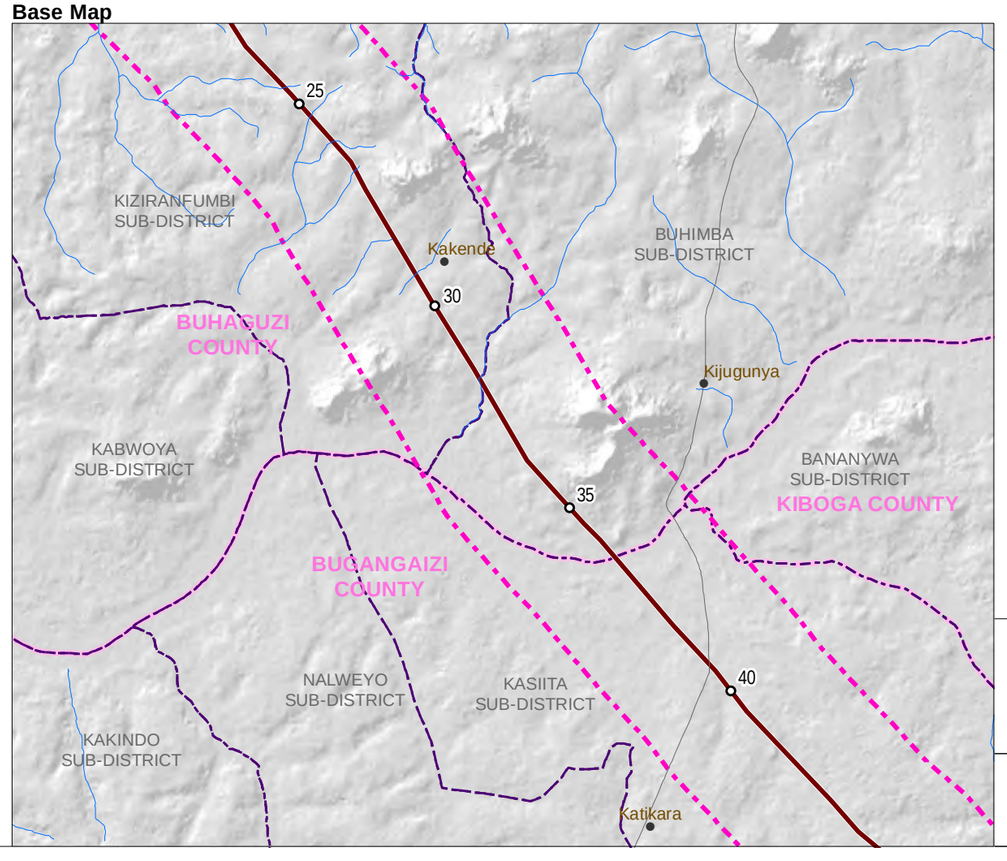
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

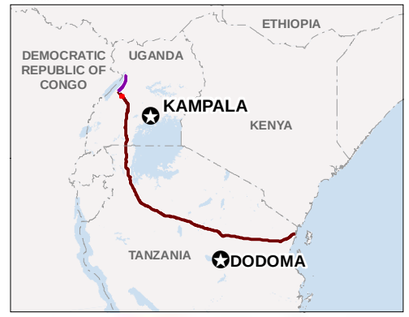
Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
- Gentle (2°-3°)
- Level Ground (<2°)
- National Capital
- District Headquarters
- Town/Settlement
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



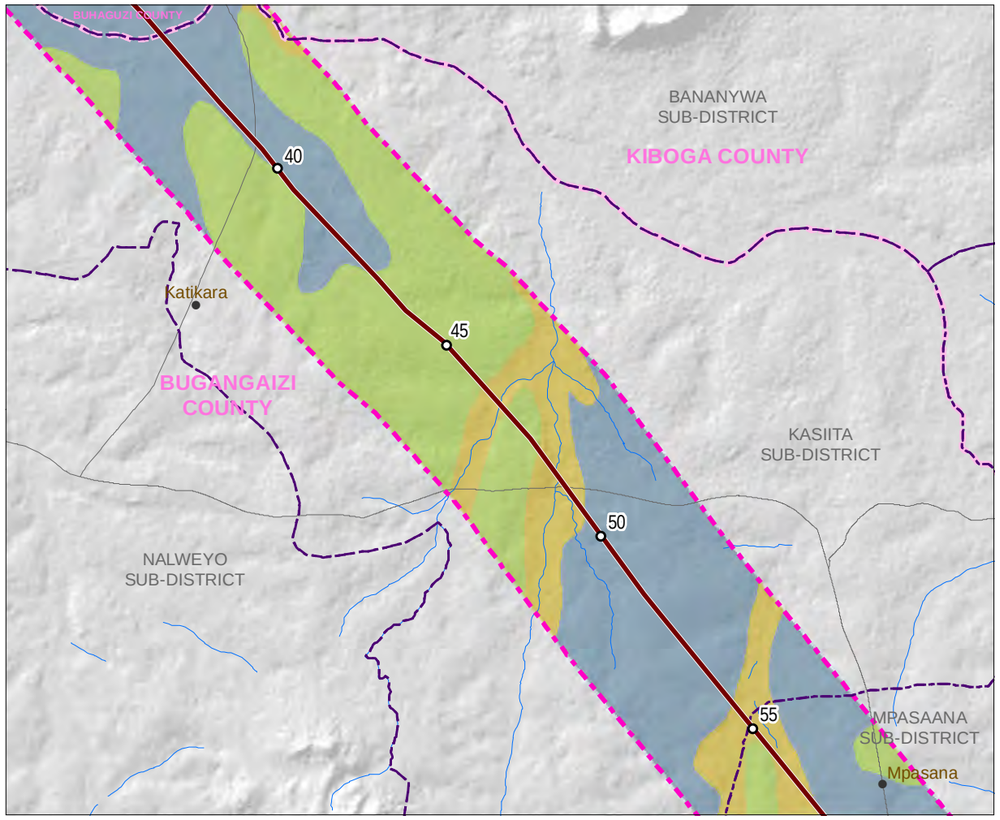
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

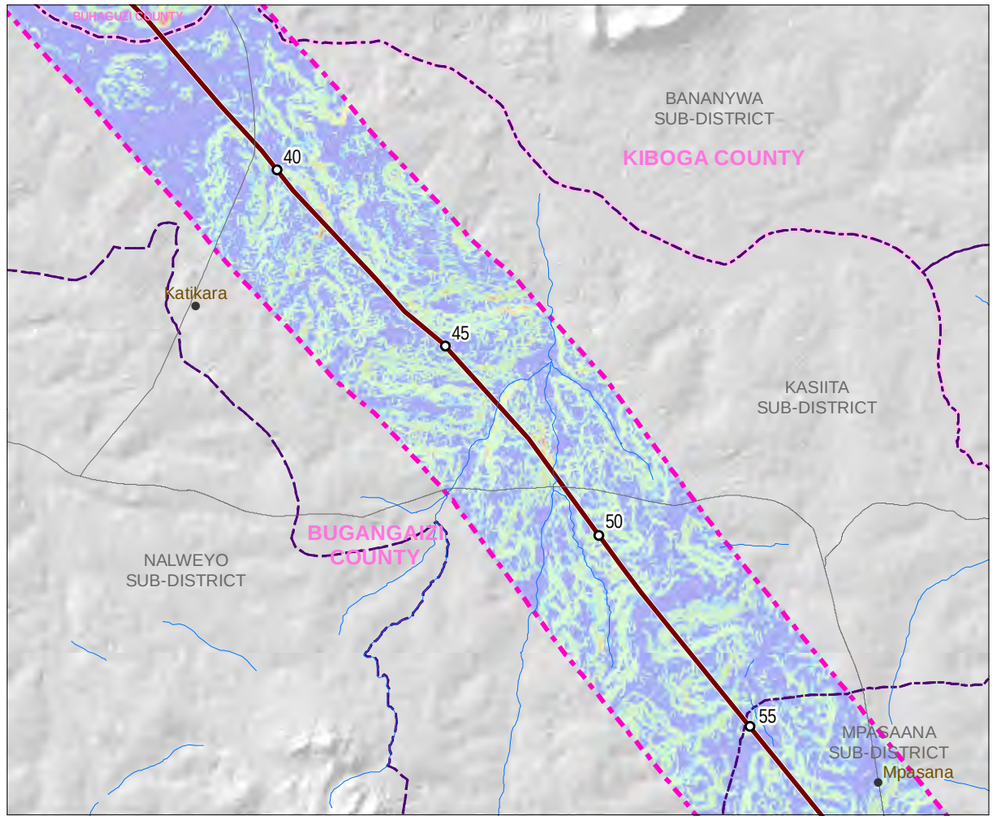
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

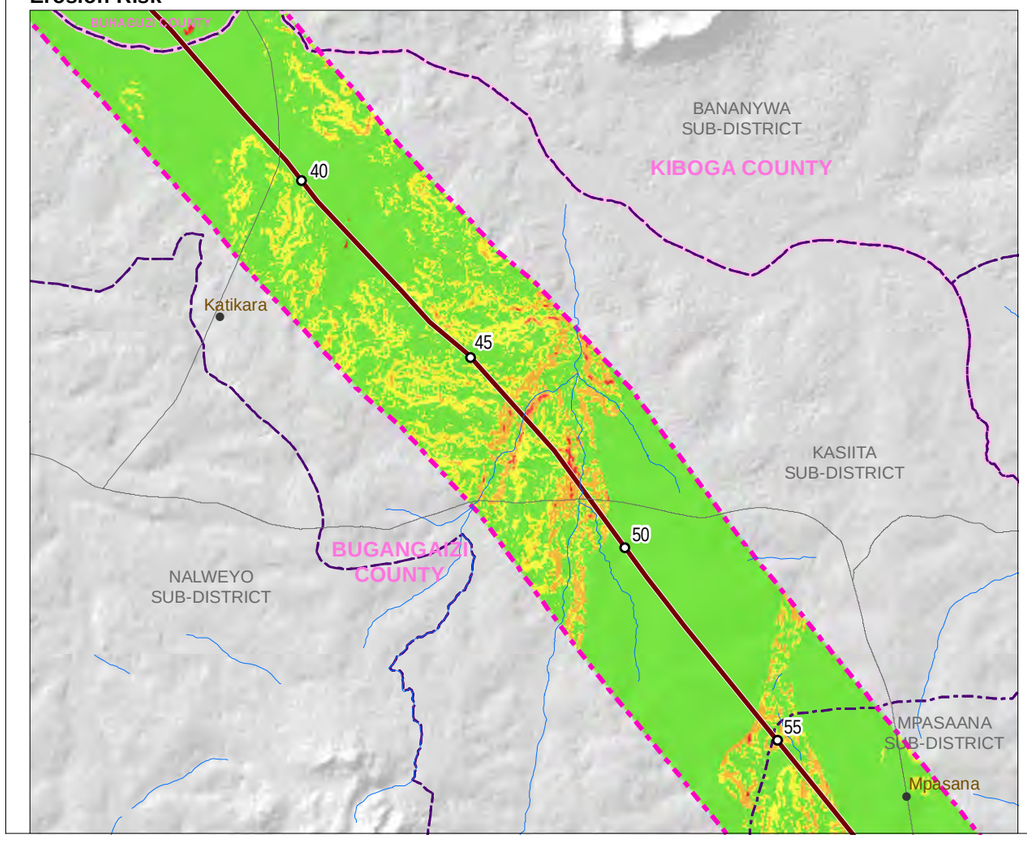
Soil Texture



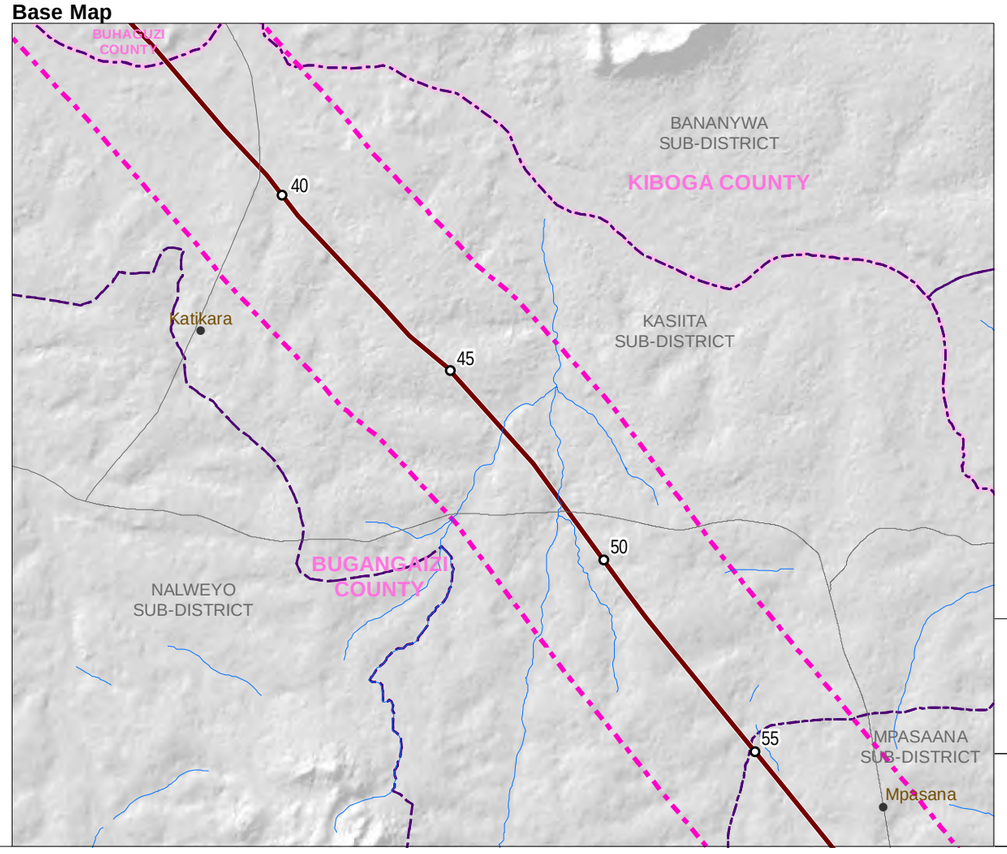
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

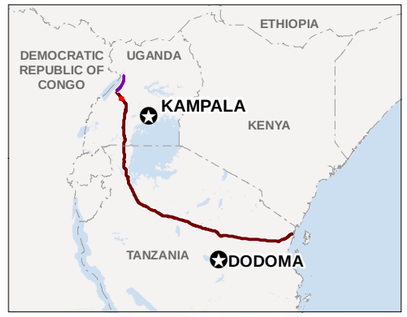
Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
- Gentle (2°-3°)
- Level Ground (<2°)
- National Capital
- District Headquarters
- Town/Settlement
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



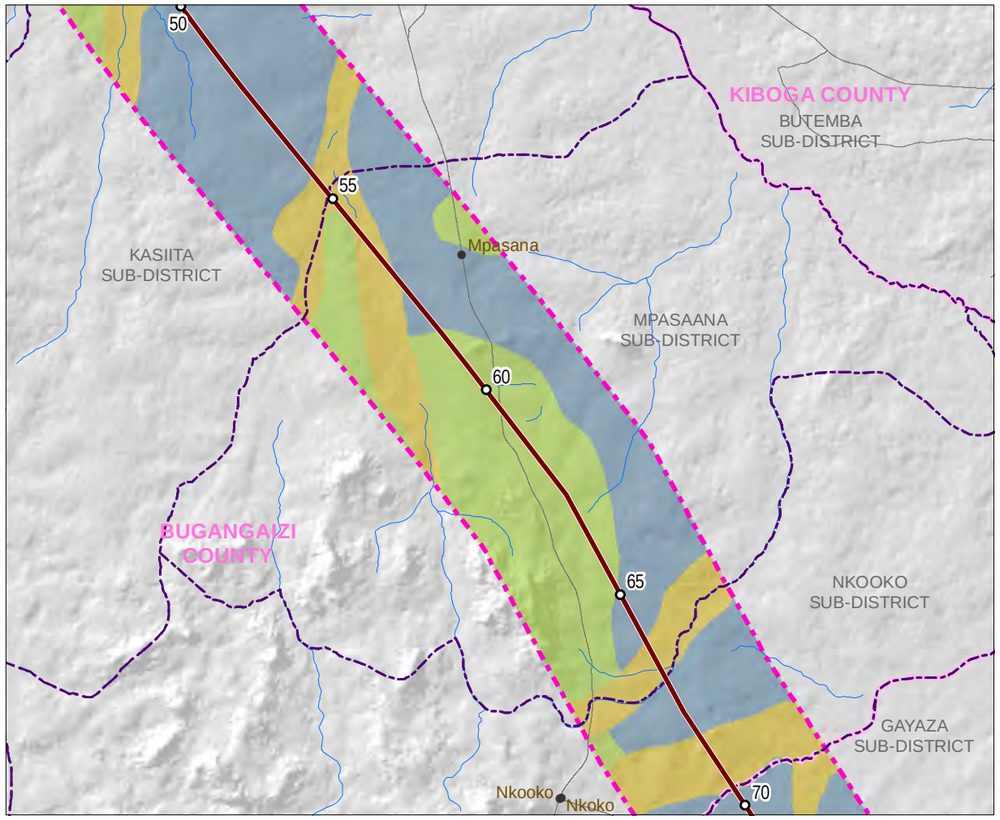
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

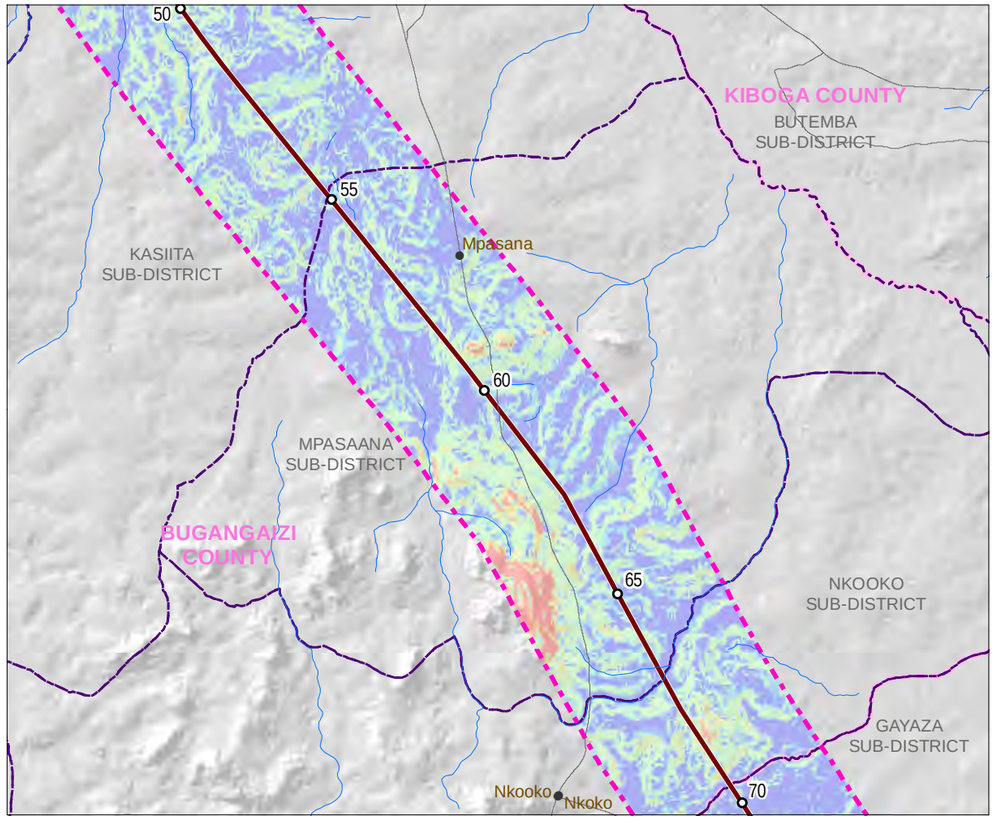
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

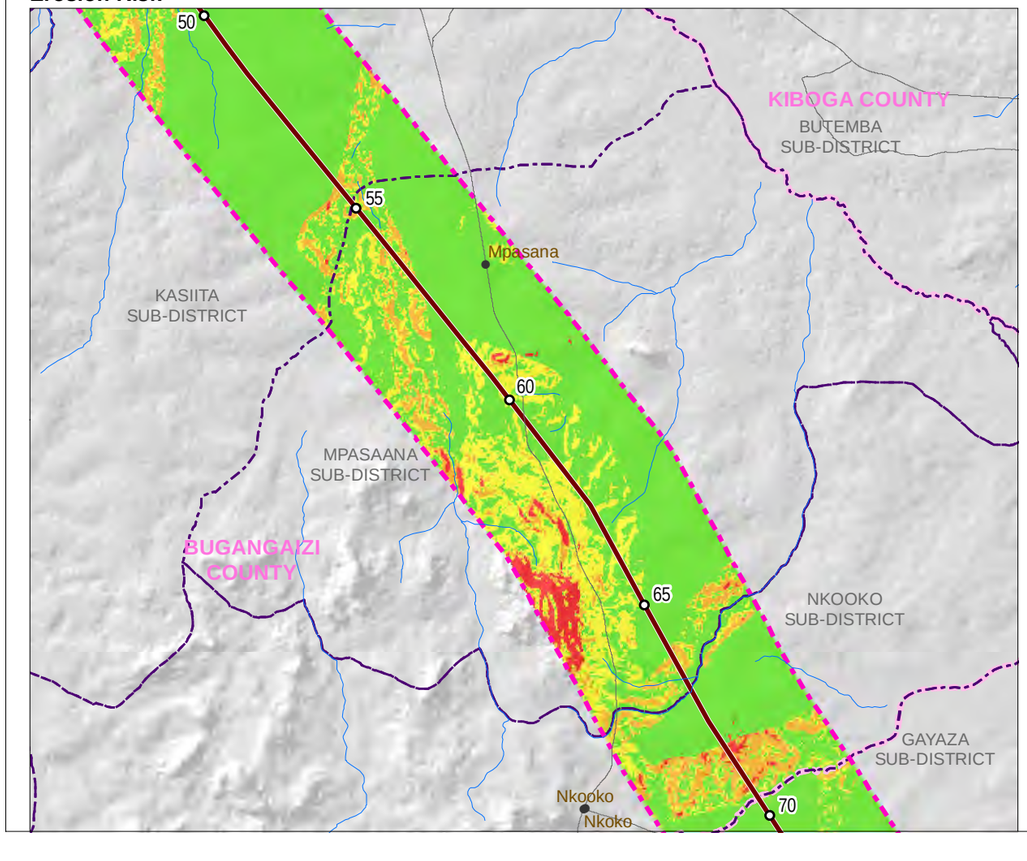
Soil Texture



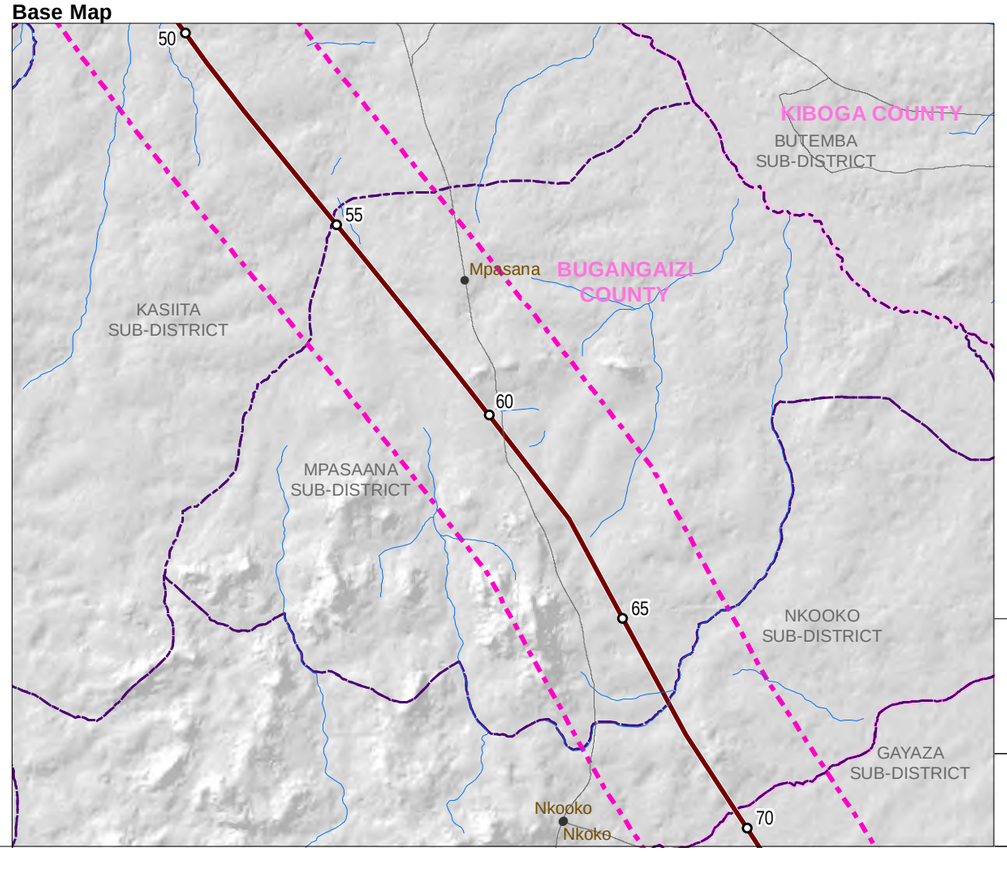
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

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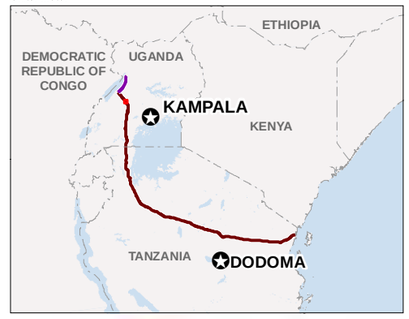
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



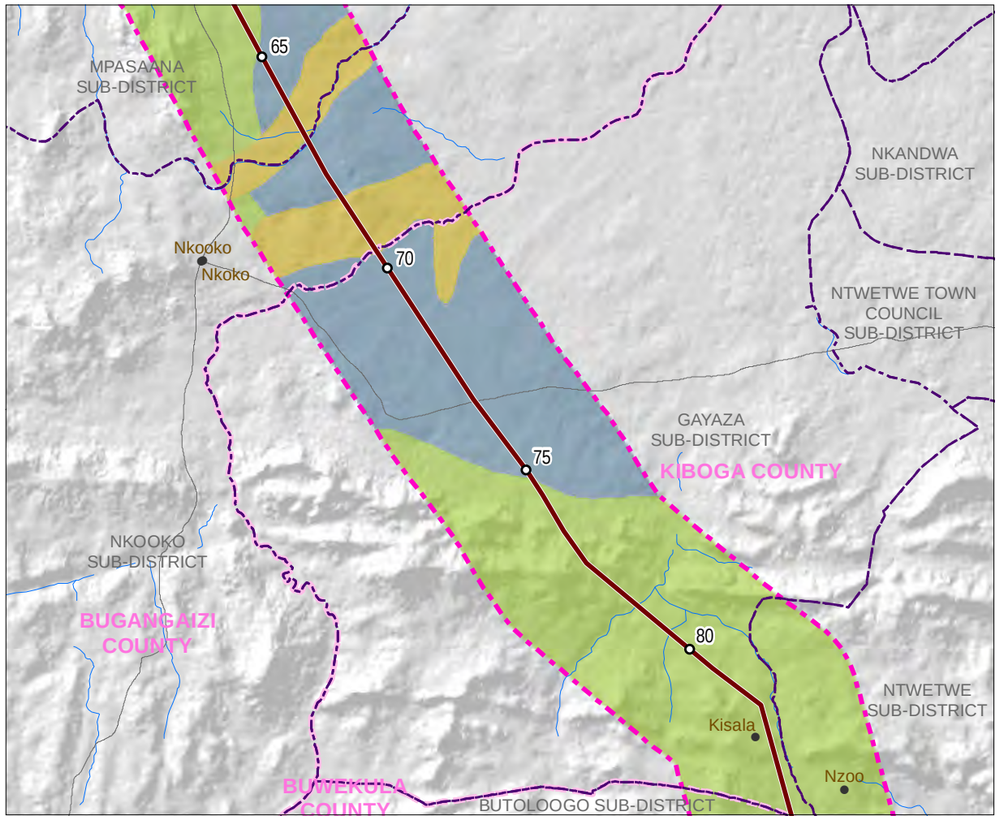
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

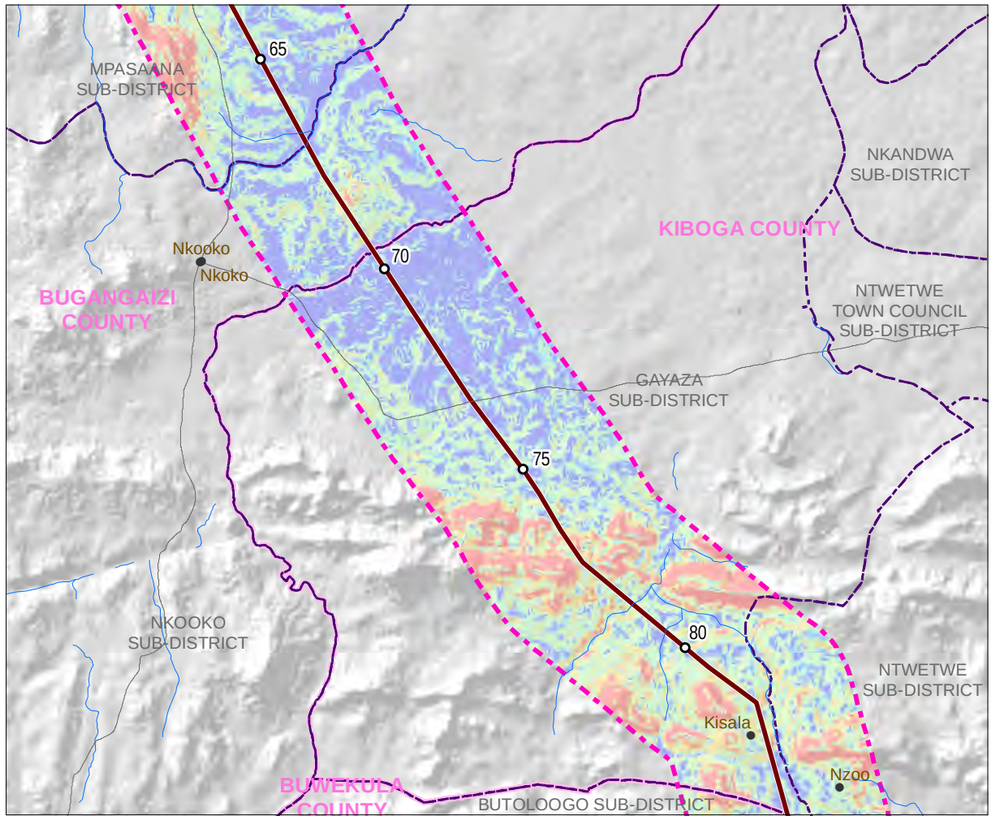
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

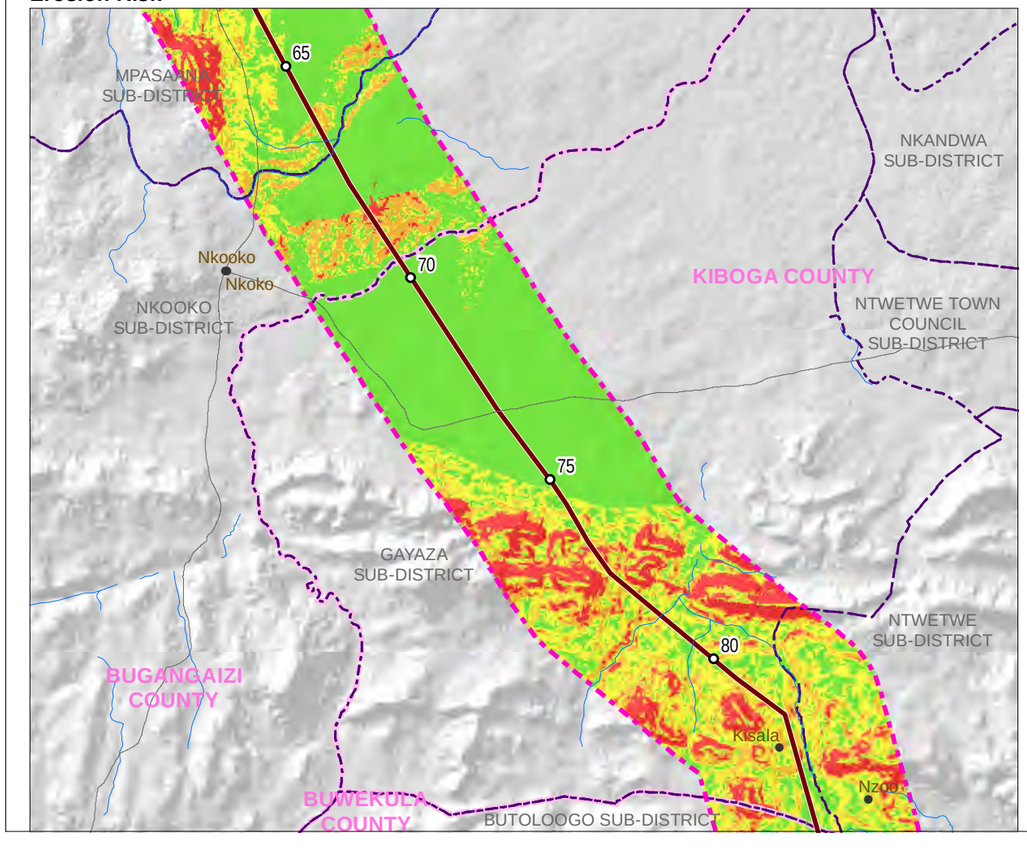
Soil Texture



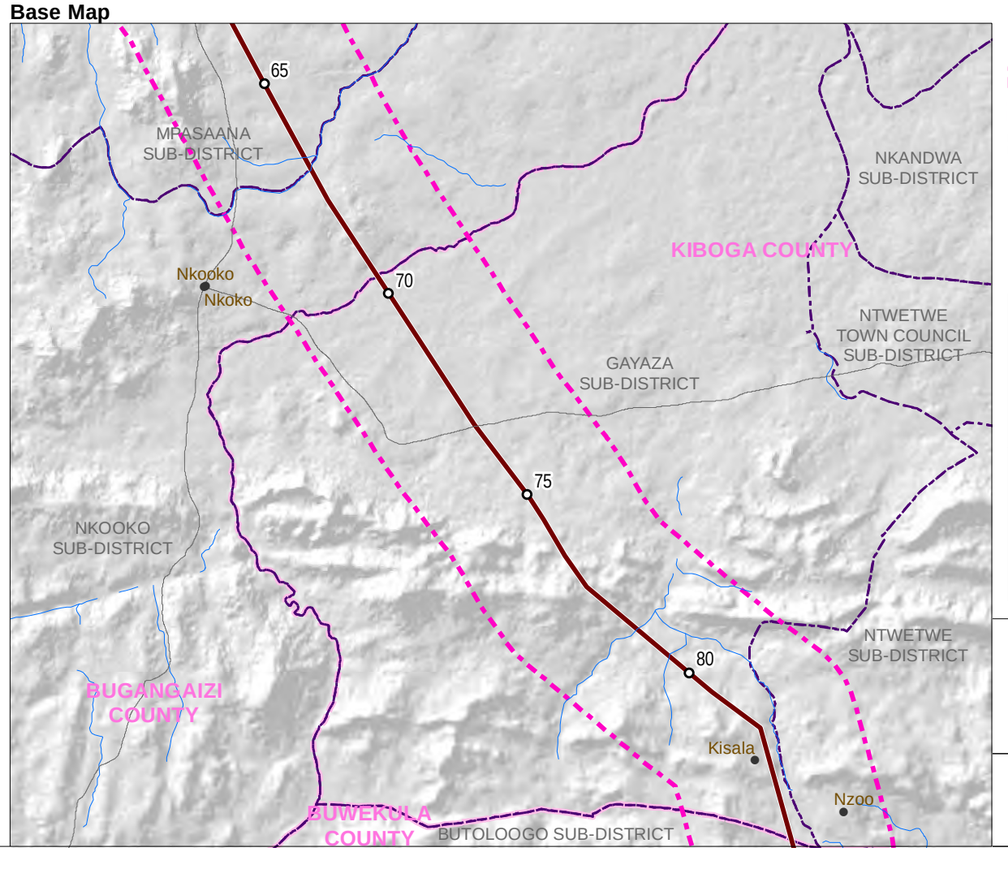
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
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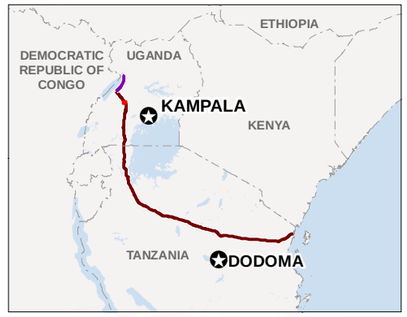
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



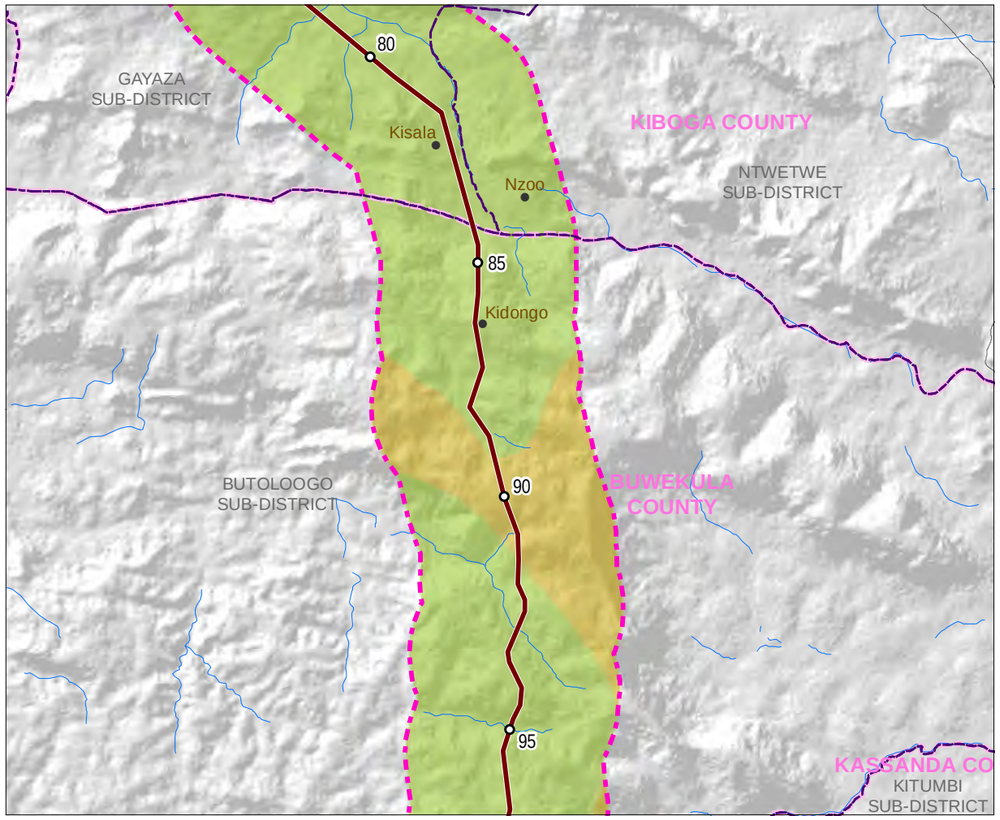
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

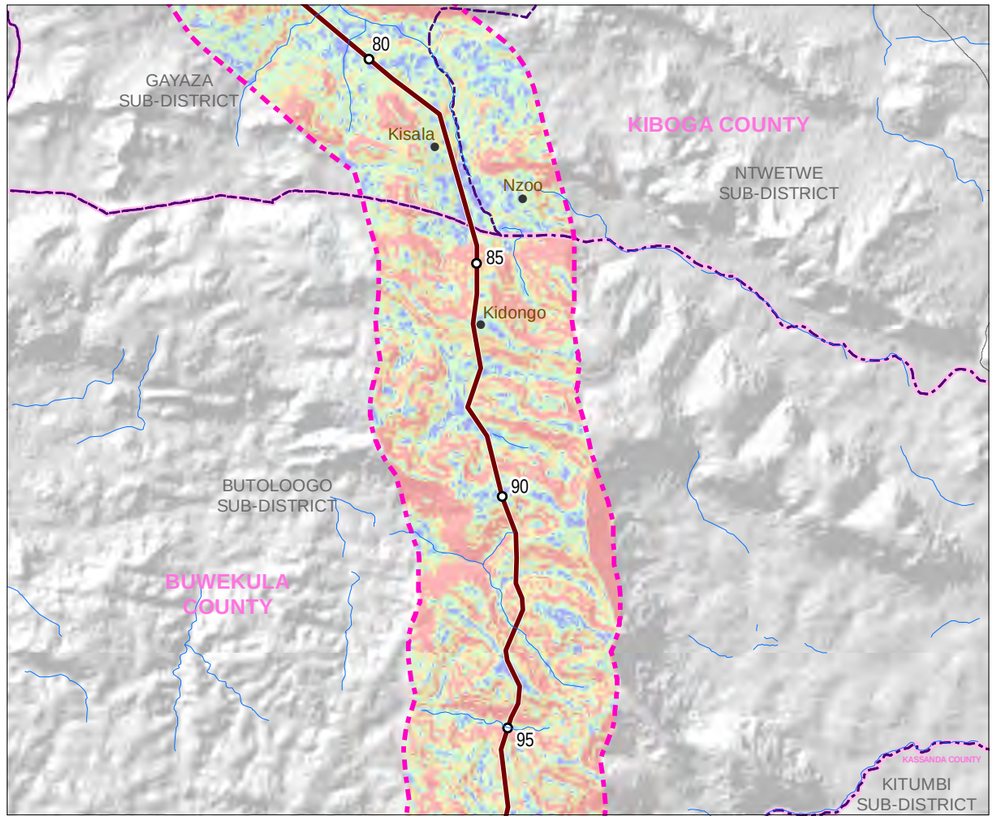
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

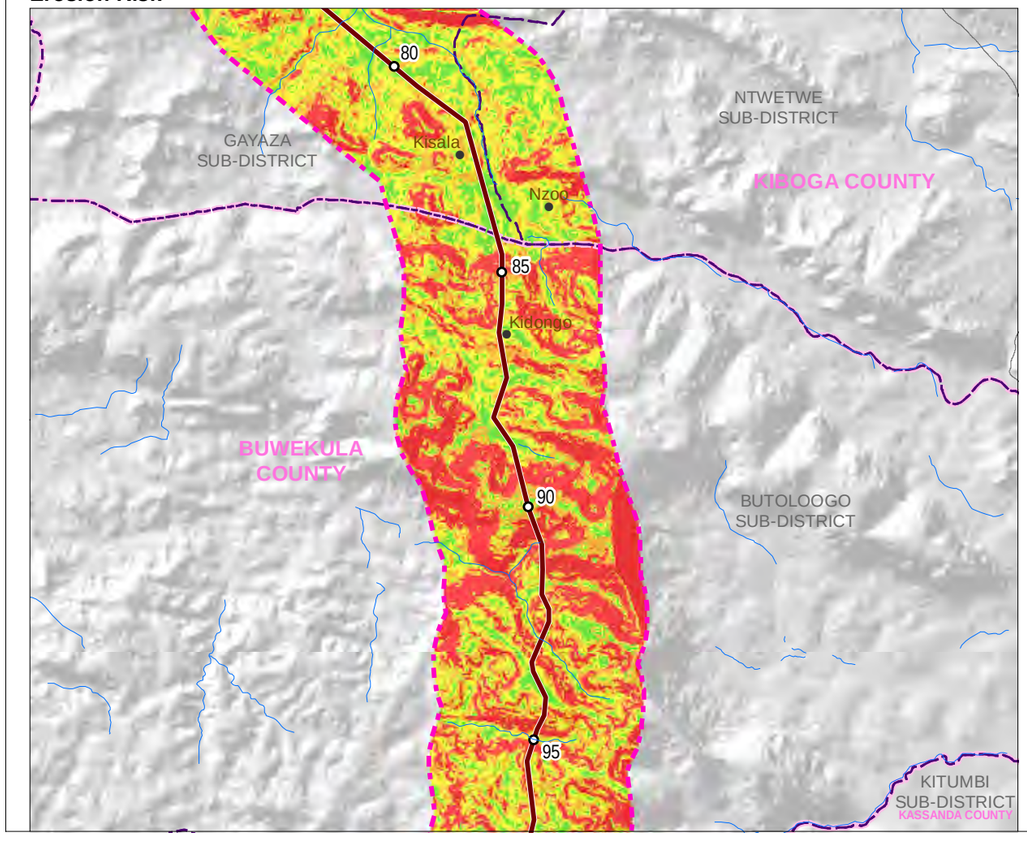
Soil Texture



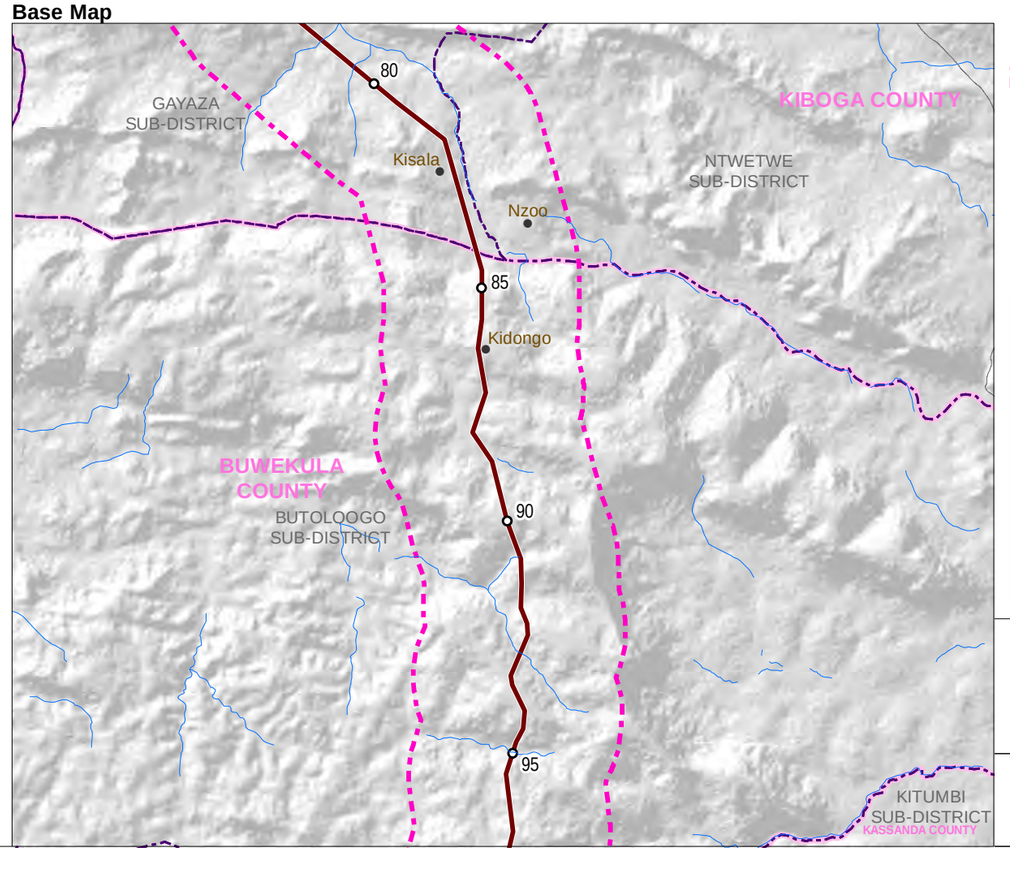
Slope



Erosion Risk



Base Map



Legend

- **East African Crude Oil Pipeline**
- **Tilenga Feeder Pipeline**
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

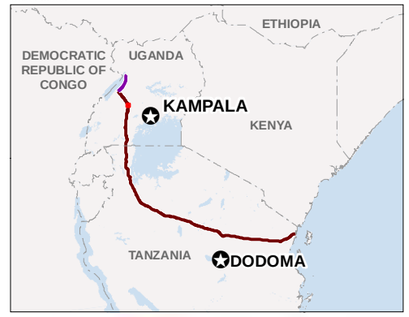
Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
- Gentle (2°-3°)
- Level Ground (<2°)
- National Capital
- District Headquarters
- Town/Settlement
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



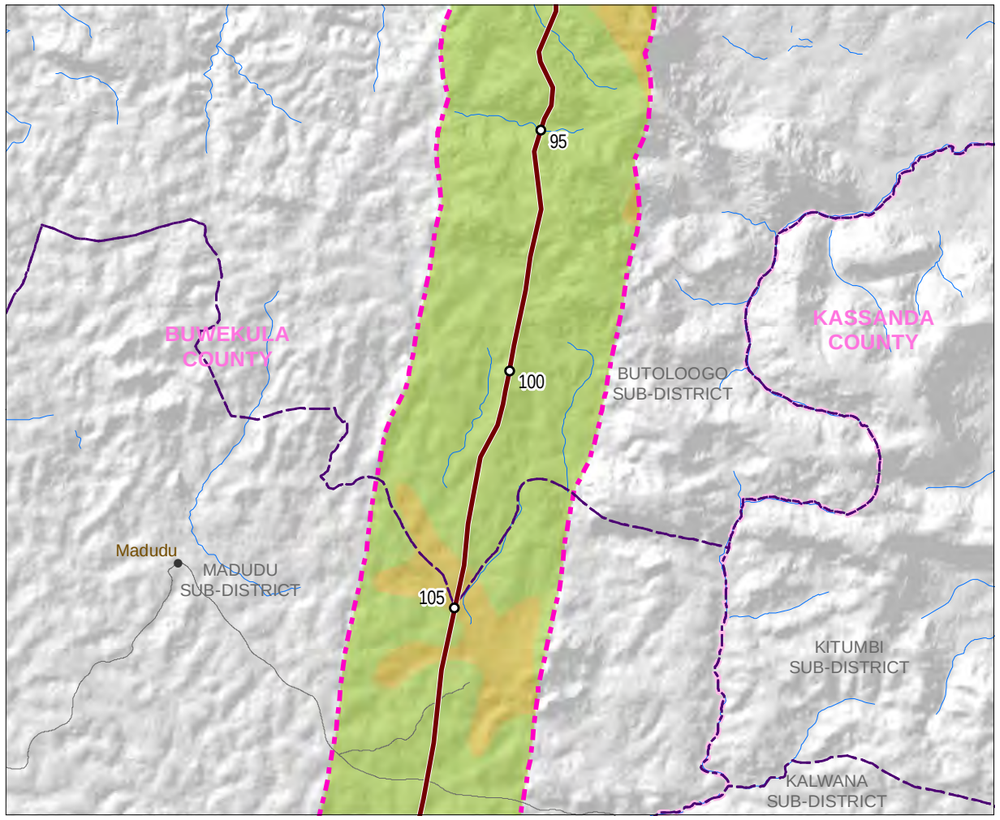
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

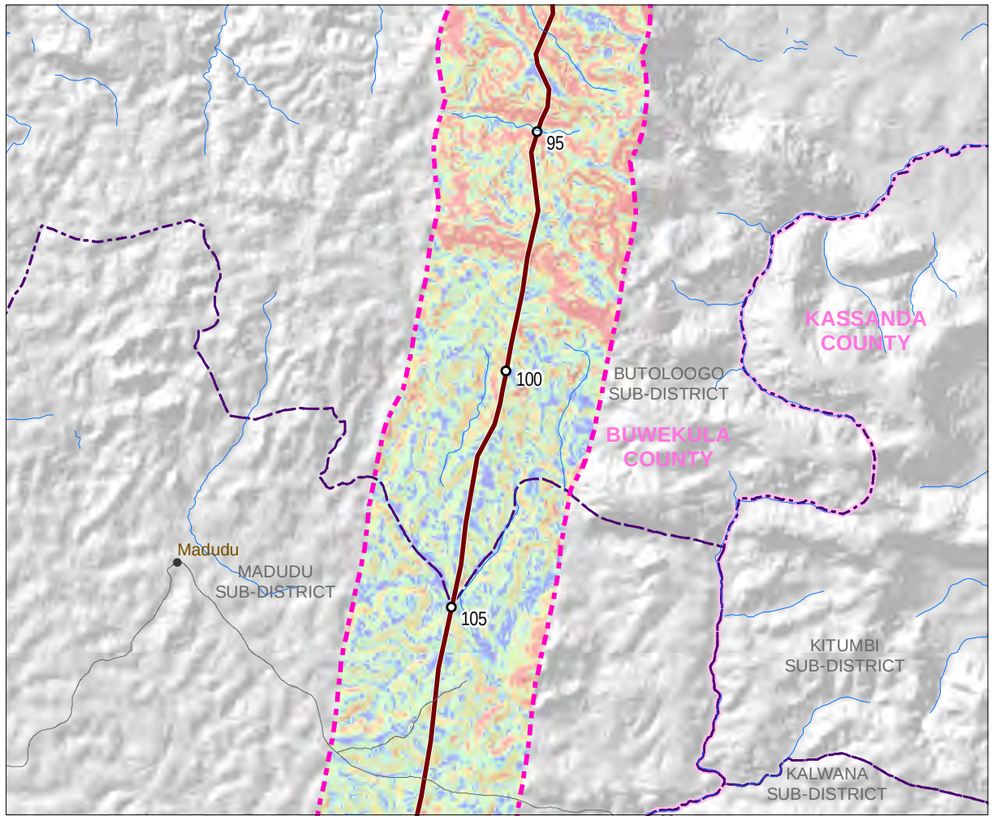
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

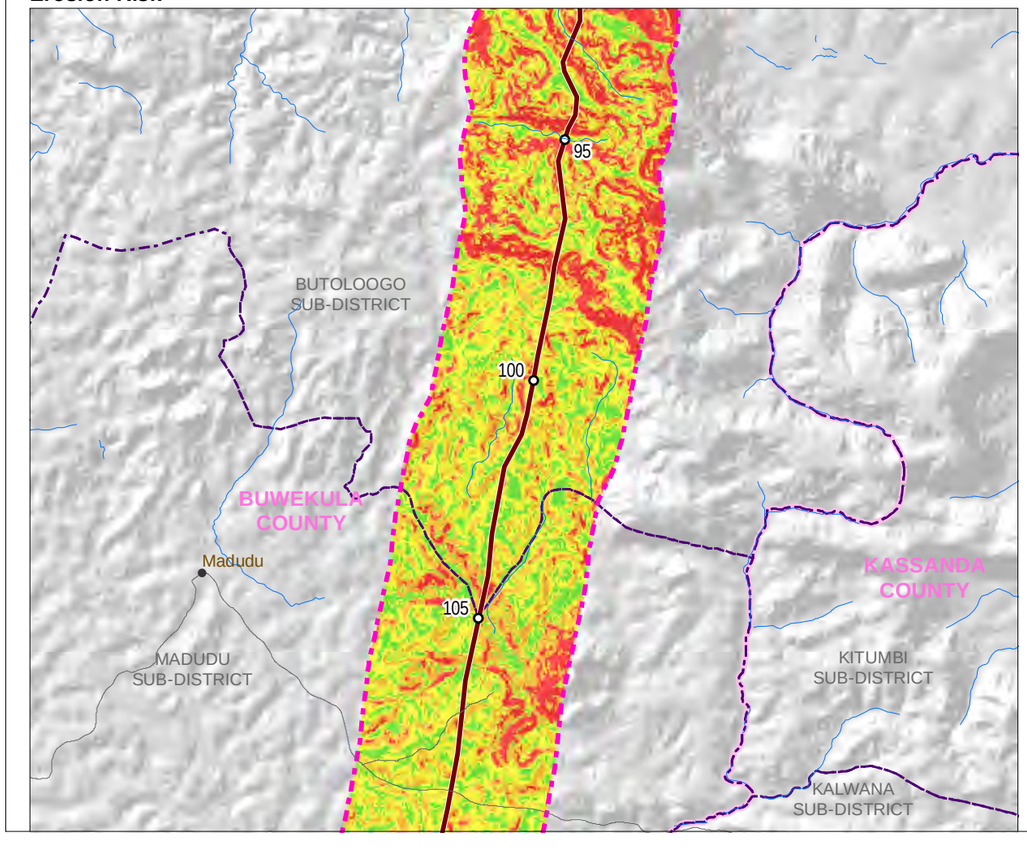
Soil Texture



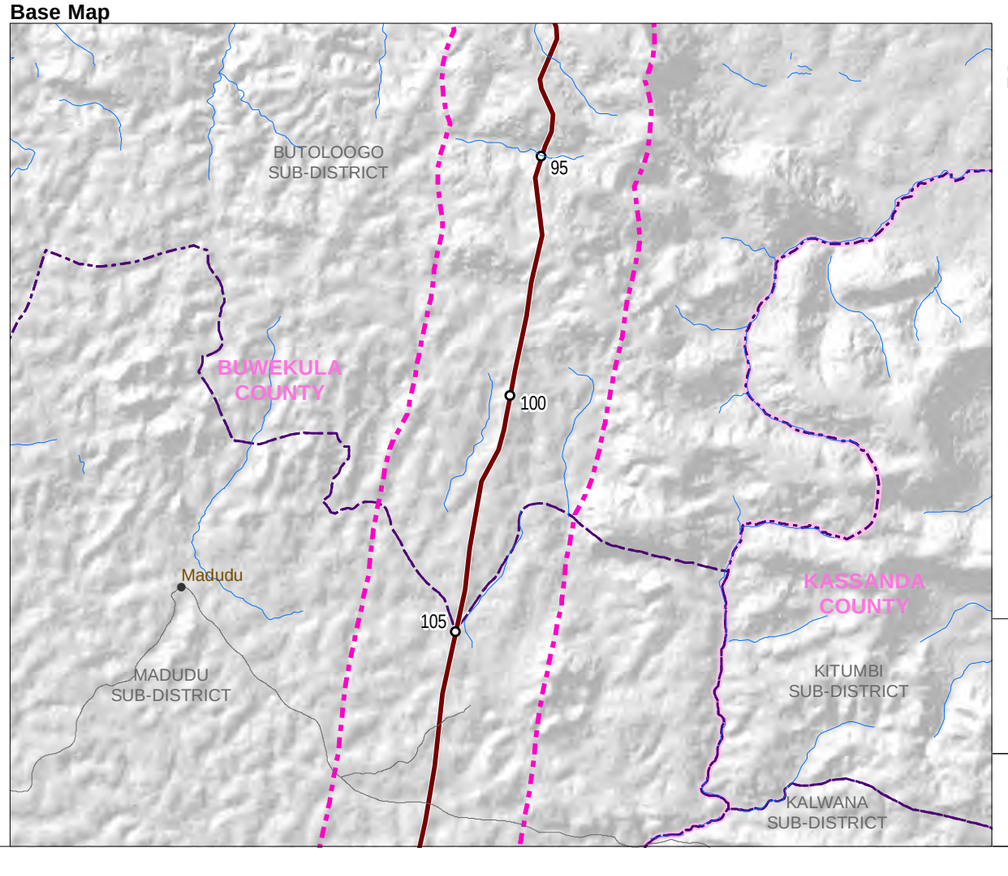
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
- Gentle (2°-3°)
- Level Ground (<2°)
- National Capital
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- Town/Settlement
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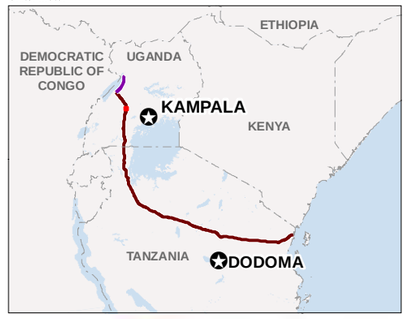
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



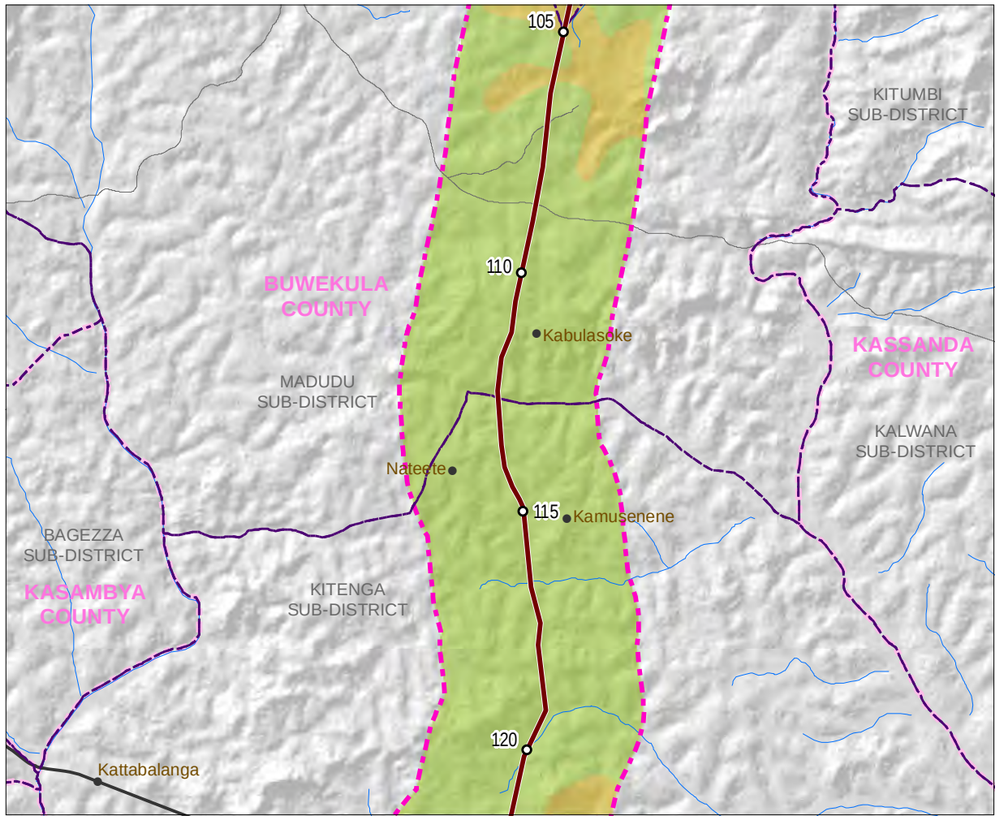
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

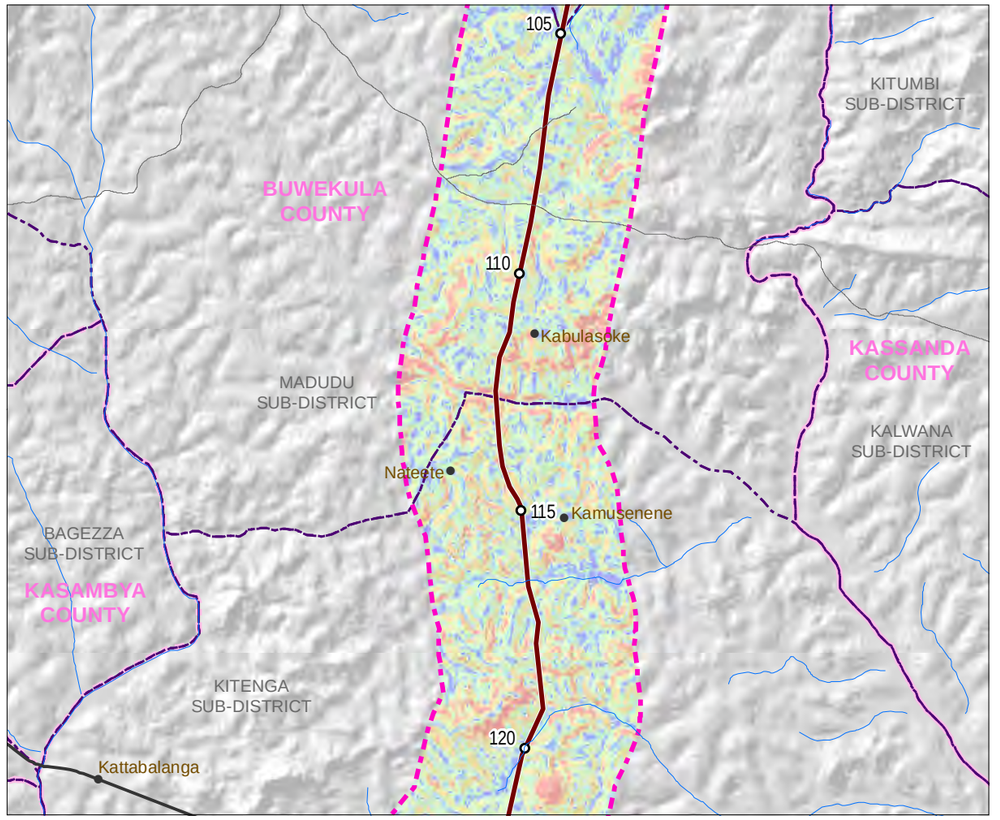
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

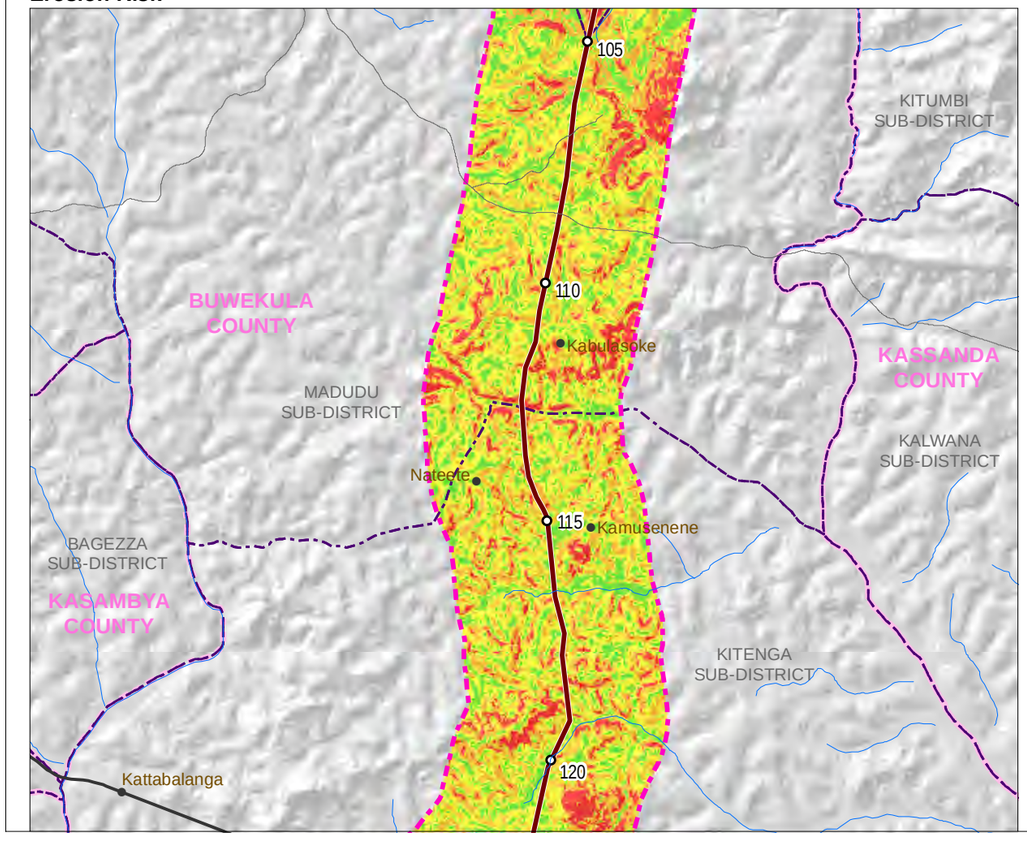
Soil Texture



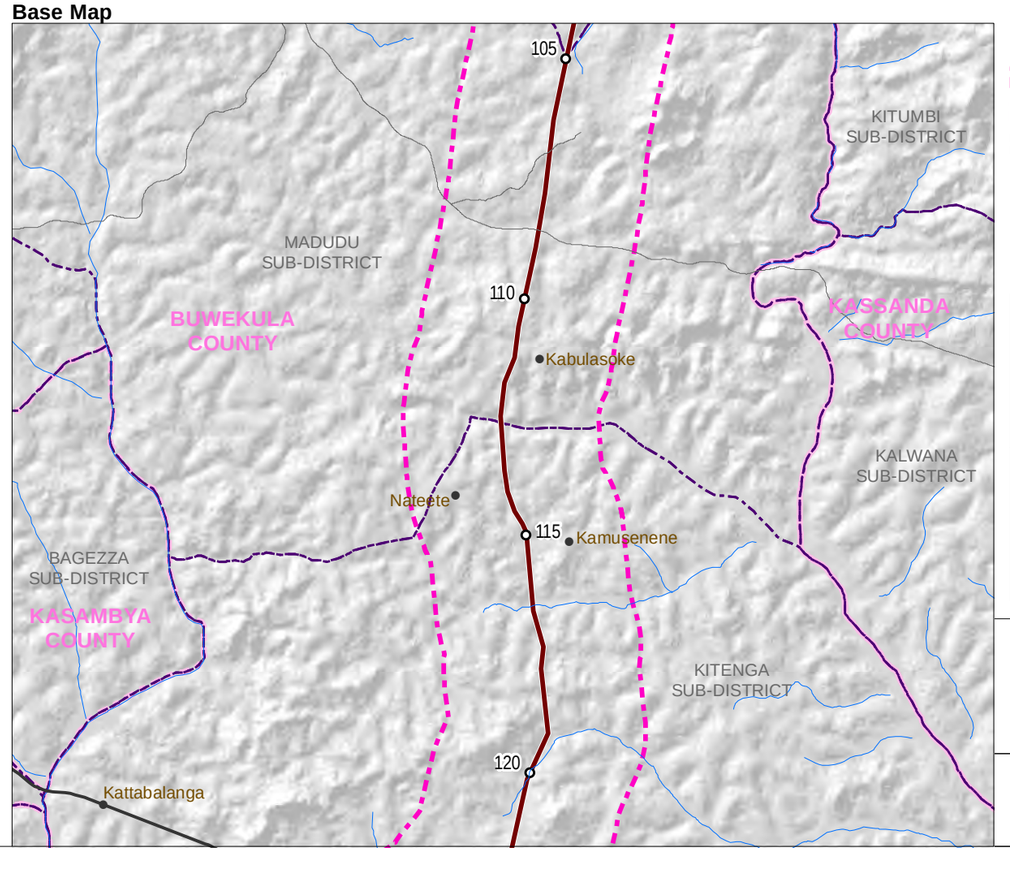
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
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Soil Texture

- Heavy Soils
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Slope

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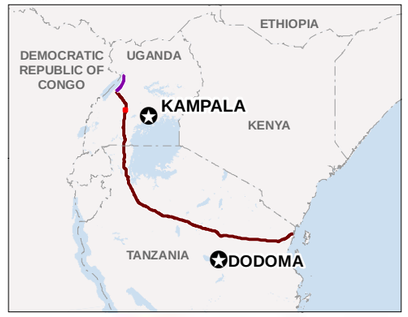
Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



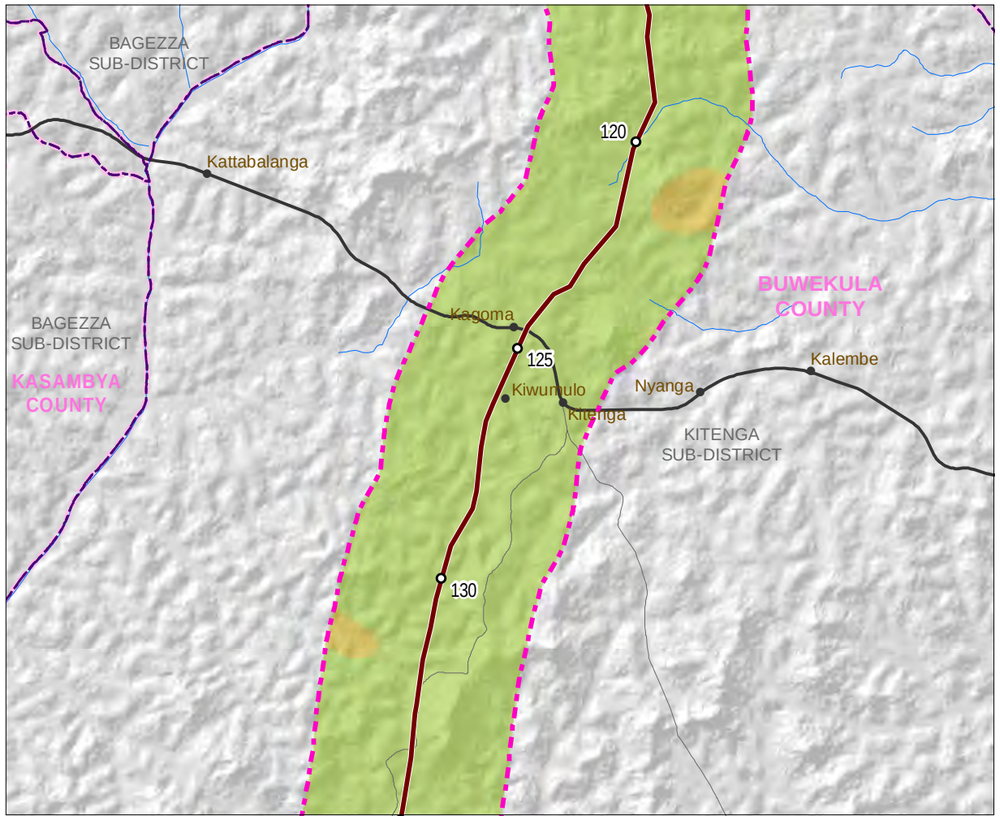
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

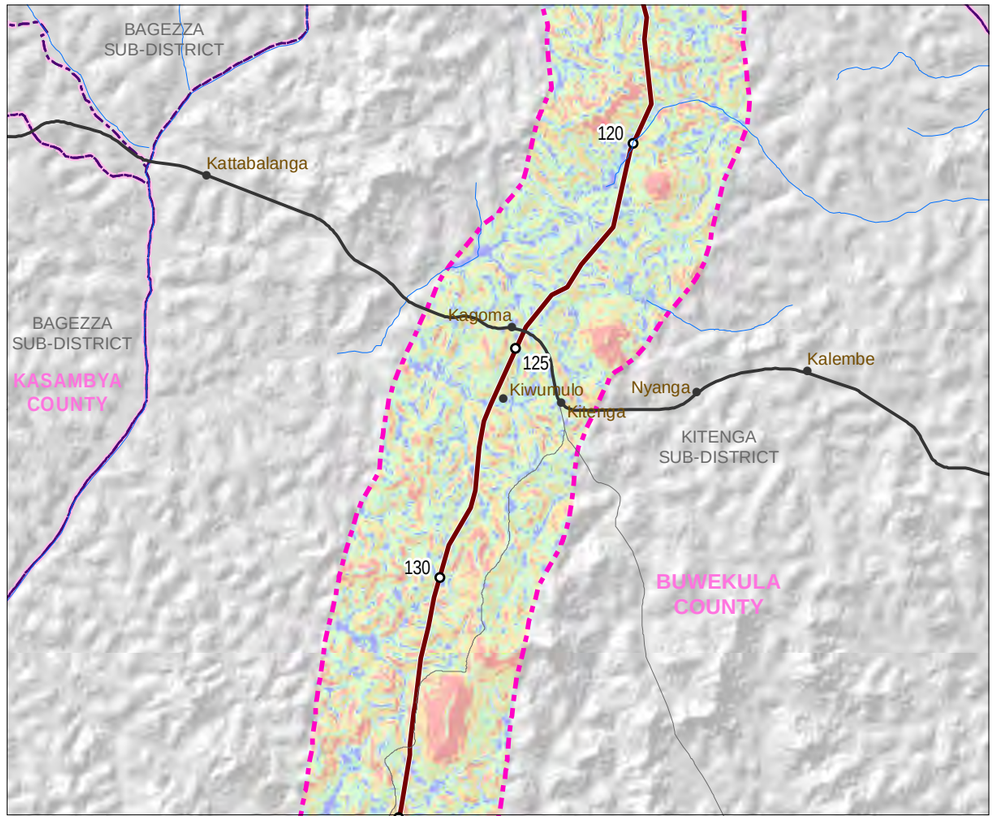
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

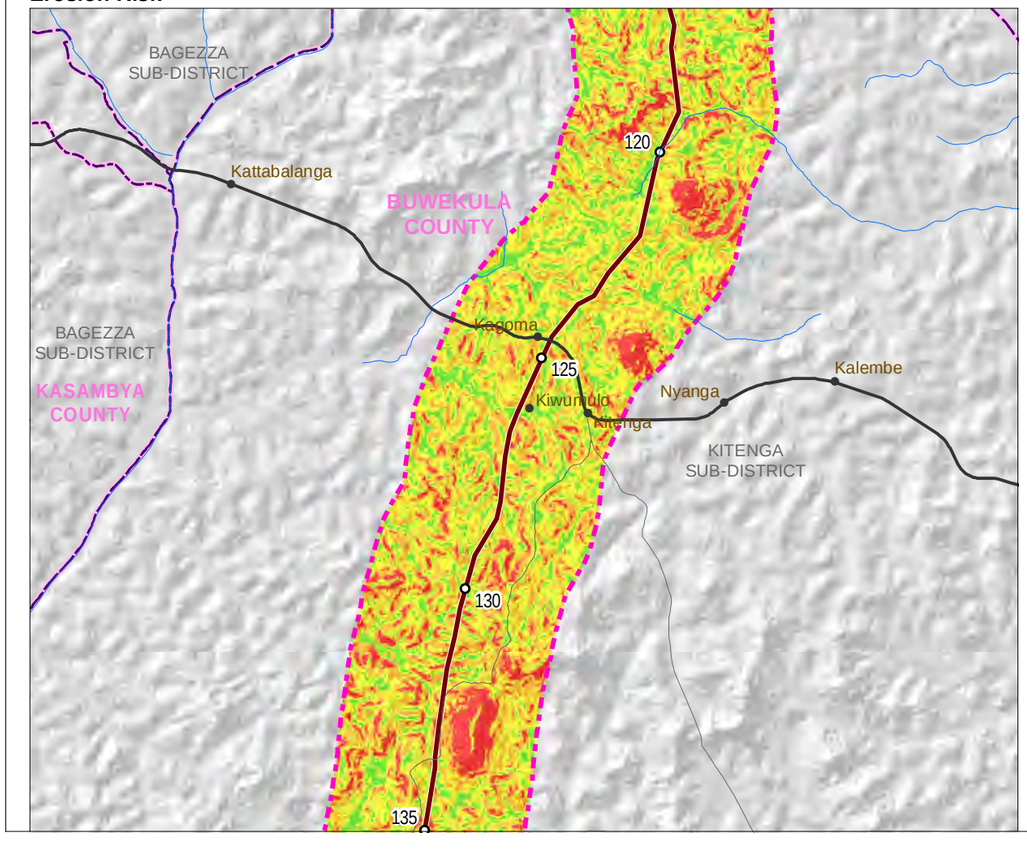
Soil Texture



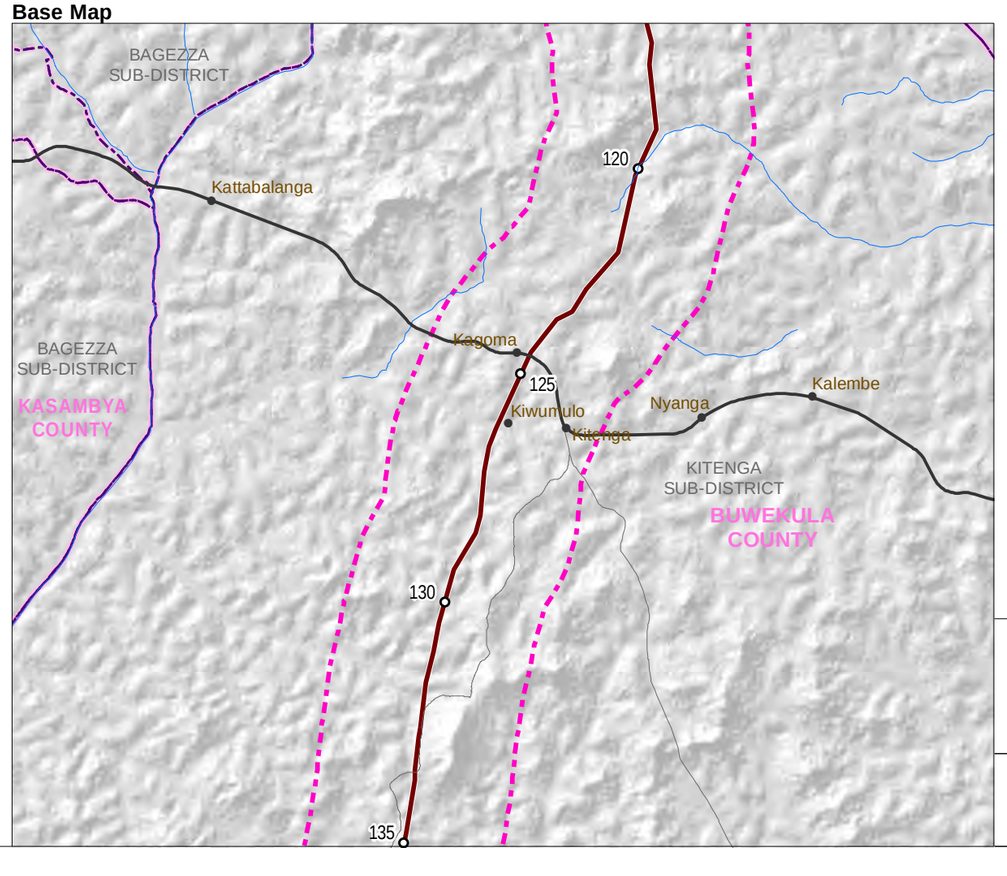
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

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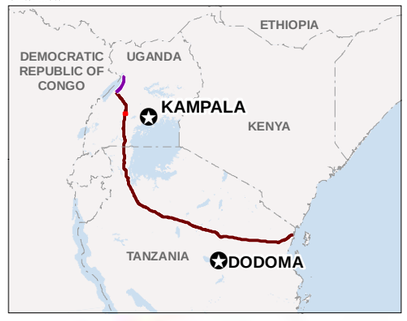
Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



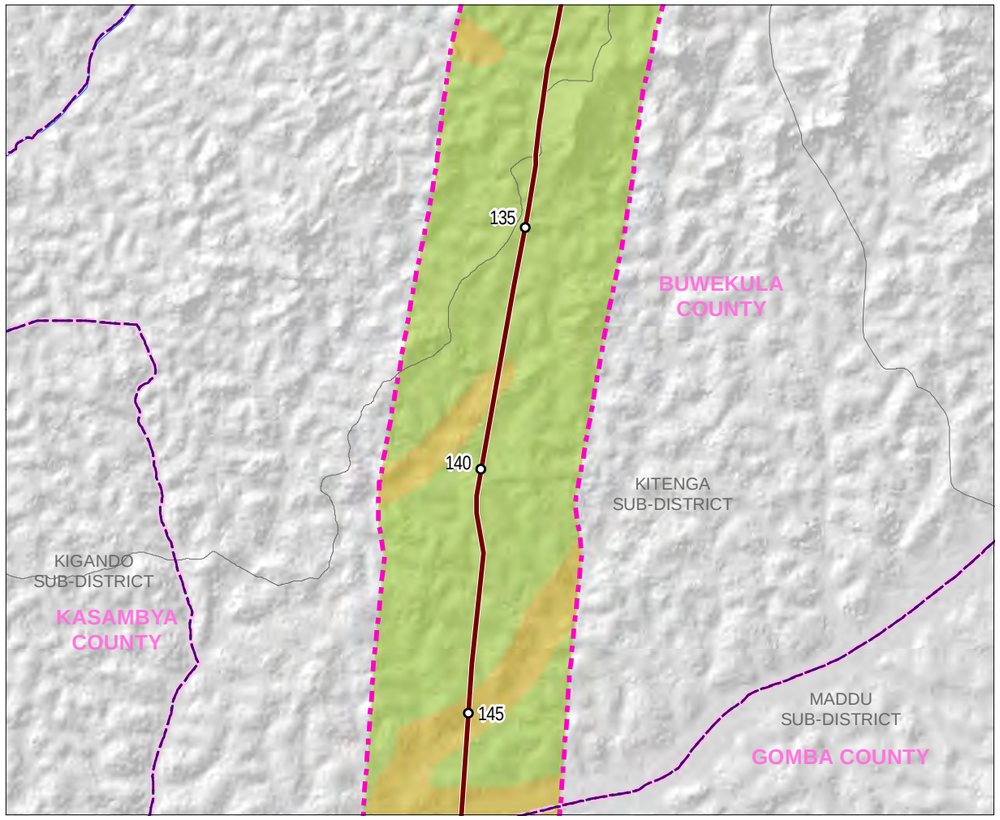
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

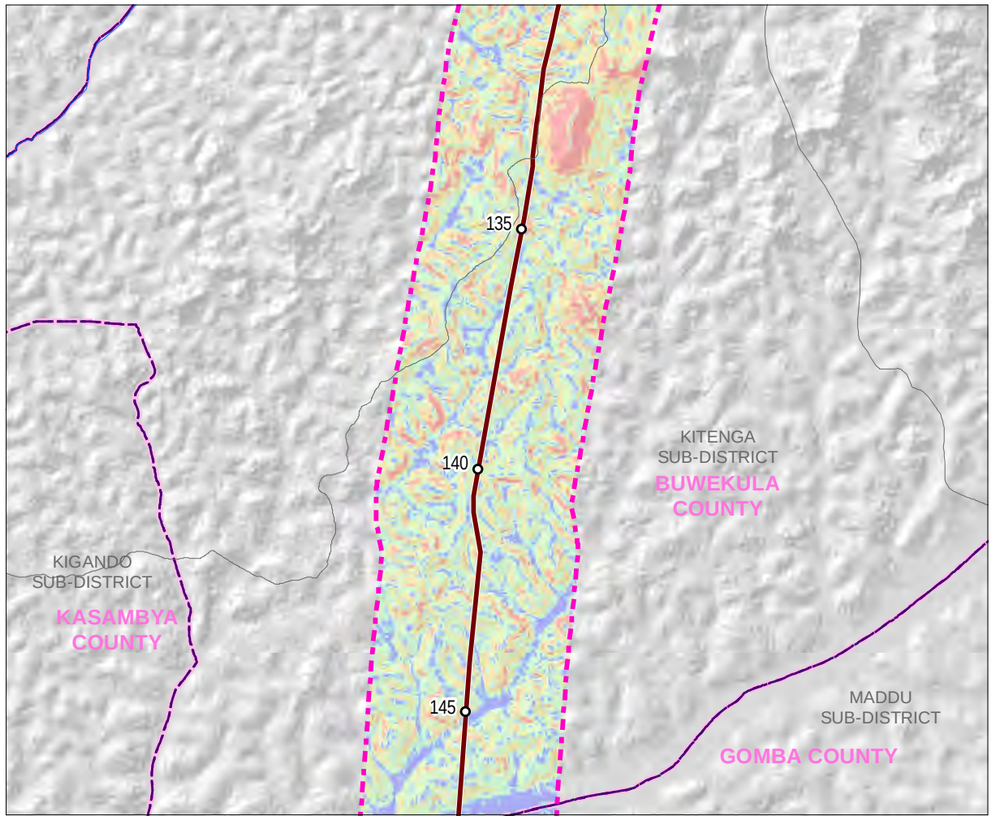
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

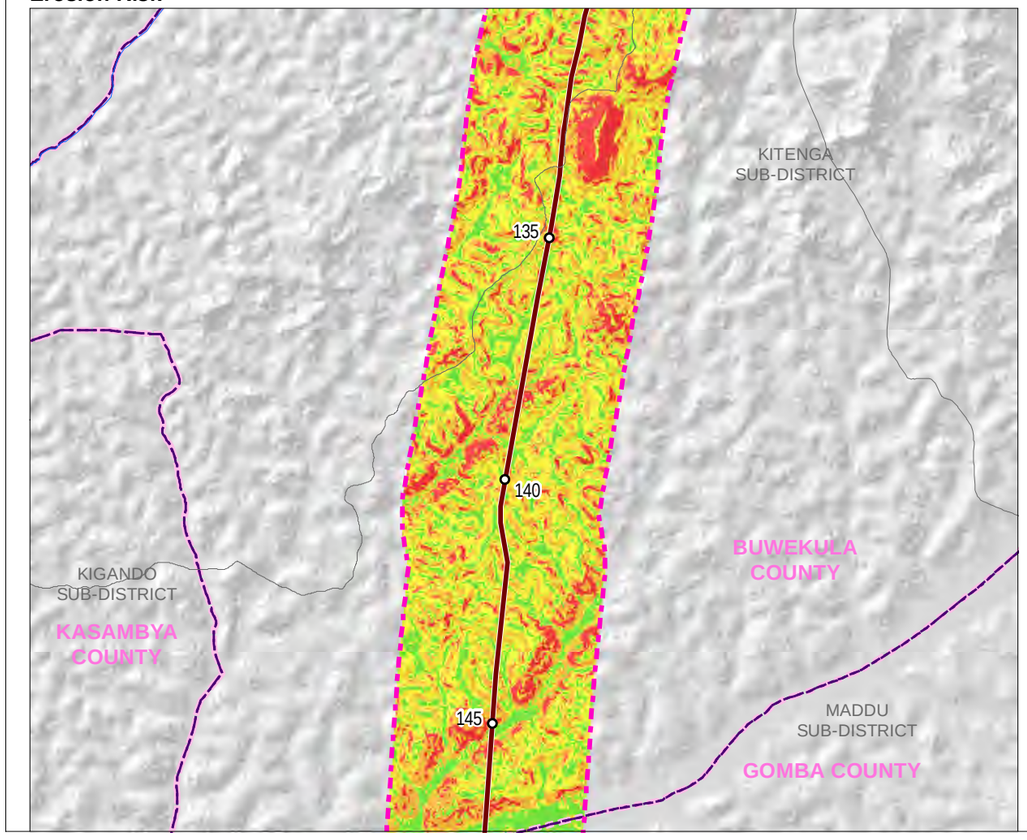
Soil Texture



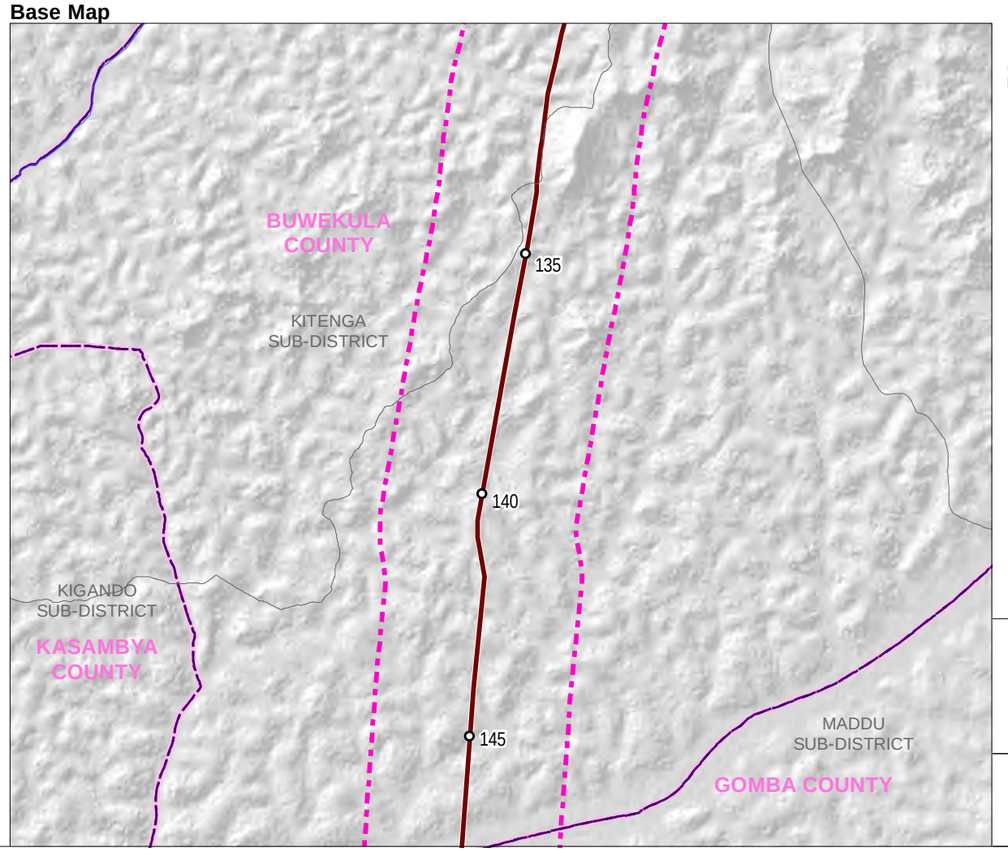
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

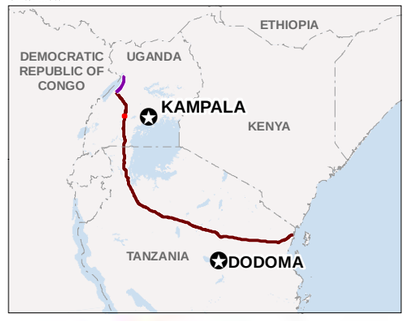
Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
- Gentle (2°-3°)
- Level Ground (<2°)
- National Capital
- District Headquarters
- Town/Settlement
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



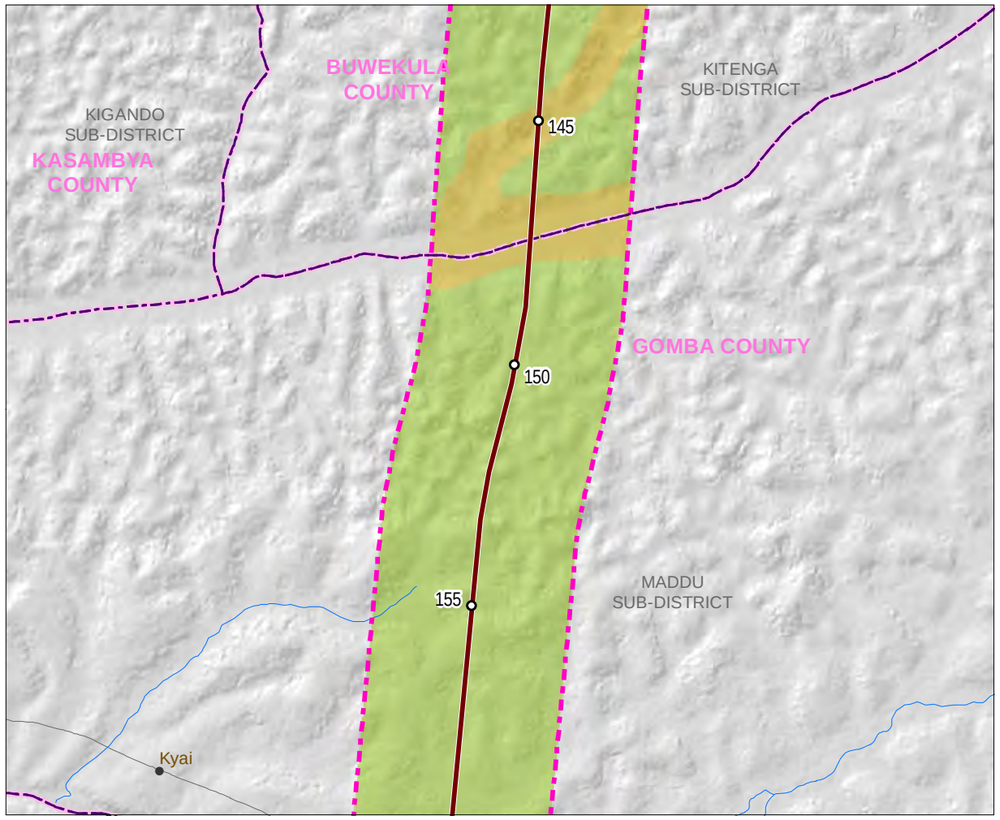
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

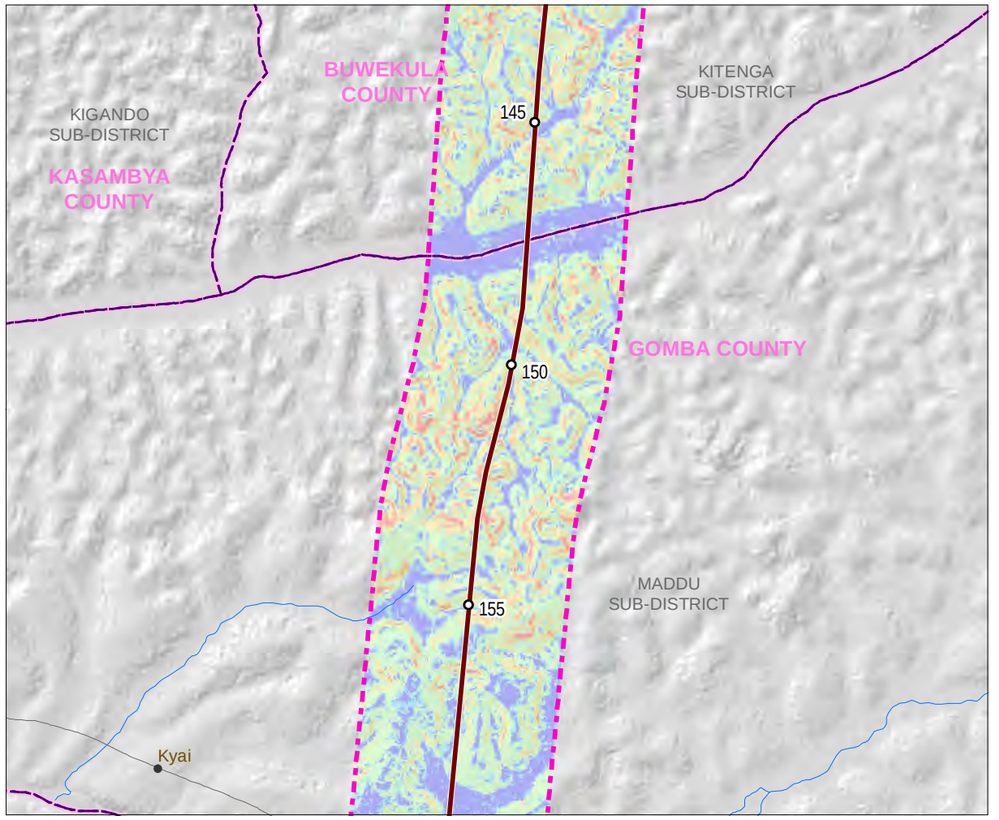
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

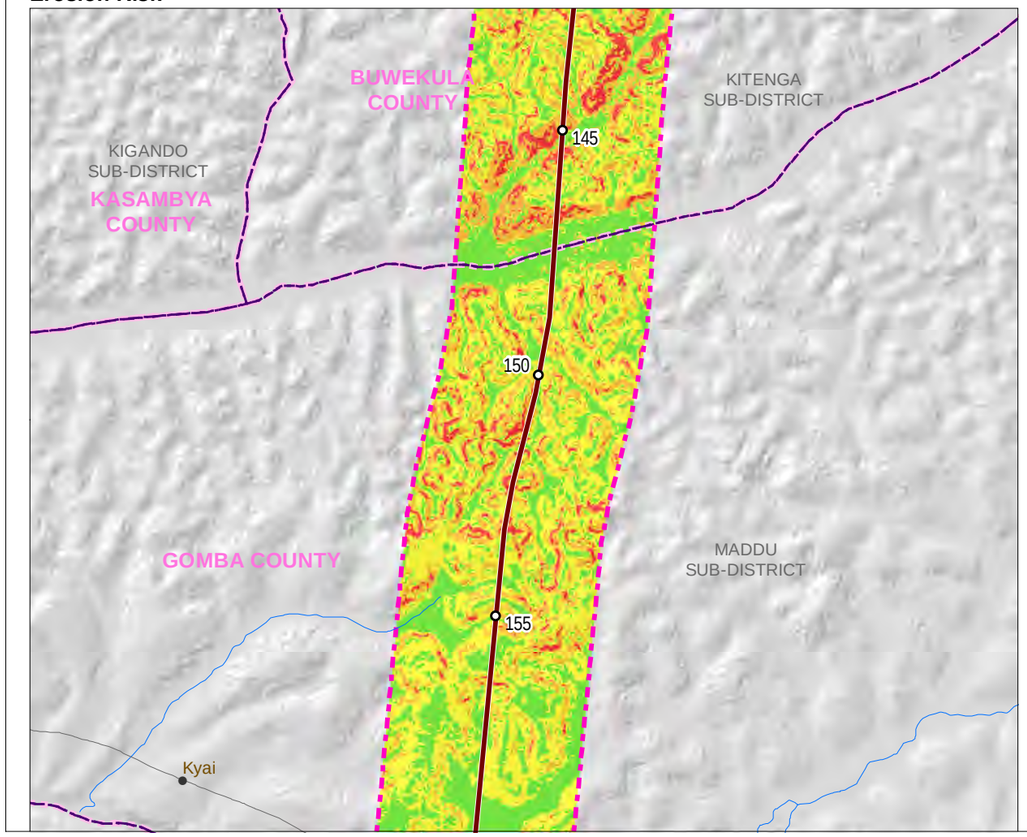
Soil Texture



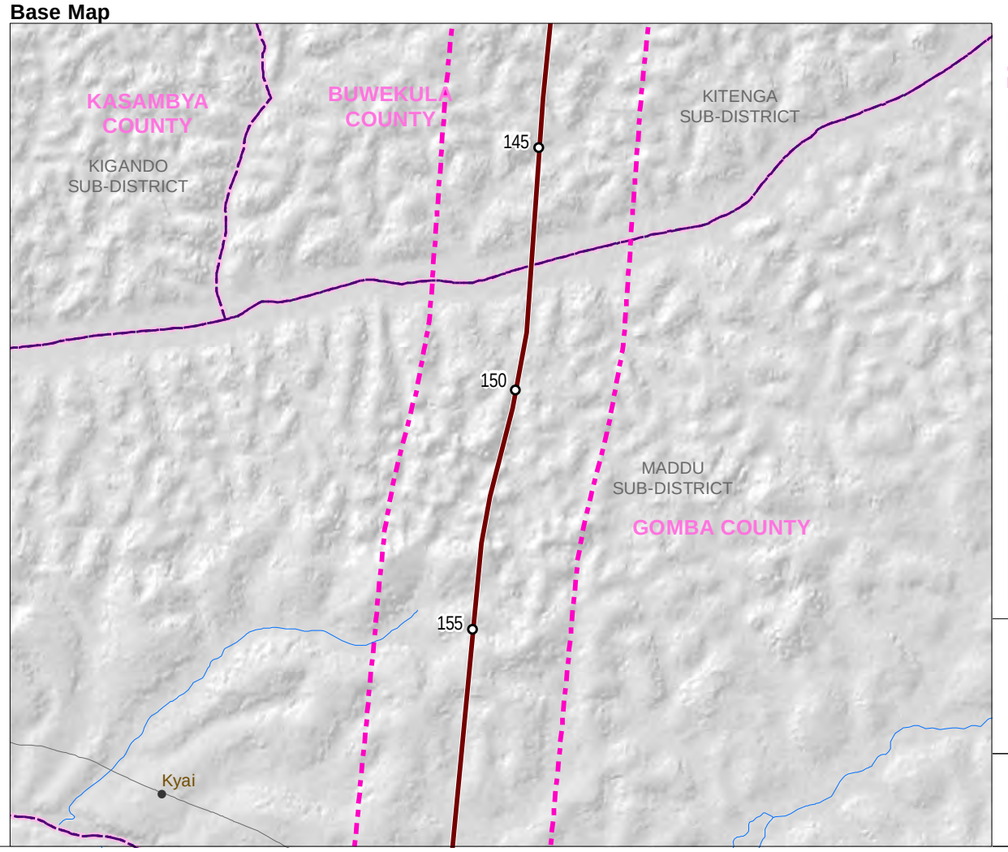
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
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Soil Texture

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- District Headquarters
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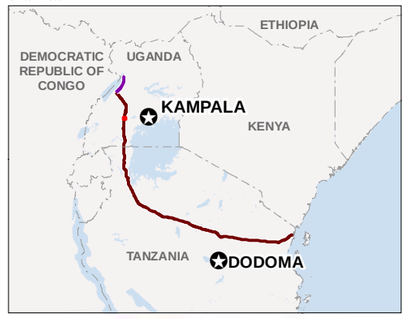
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



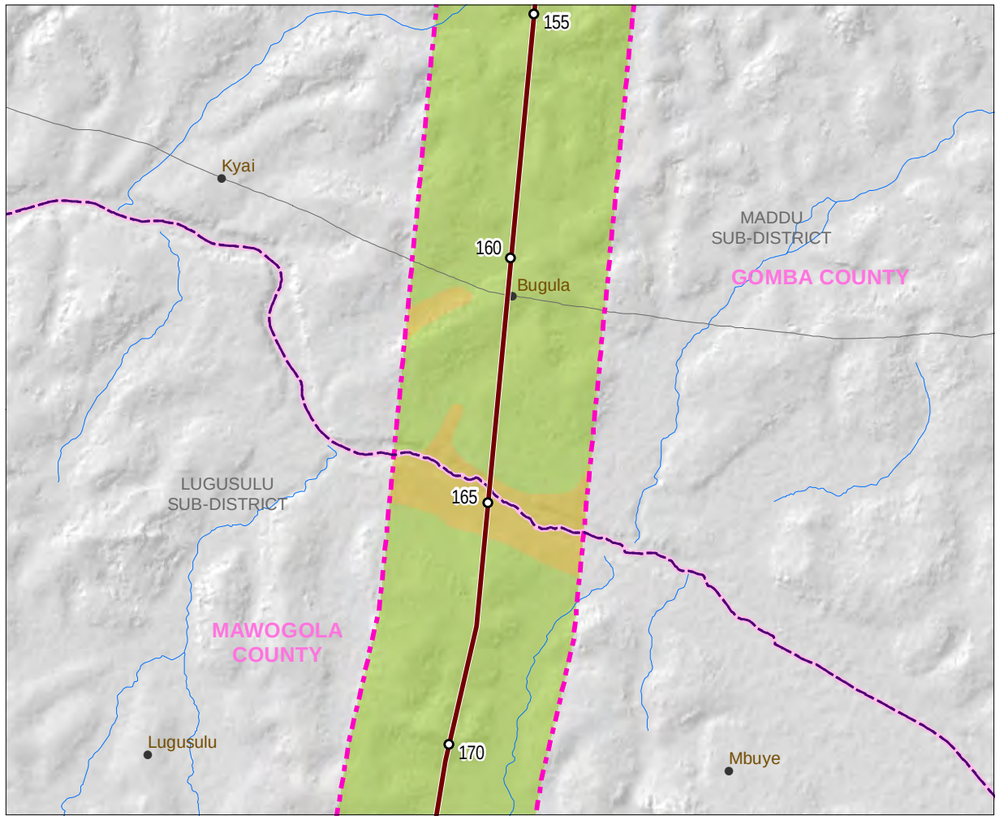
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

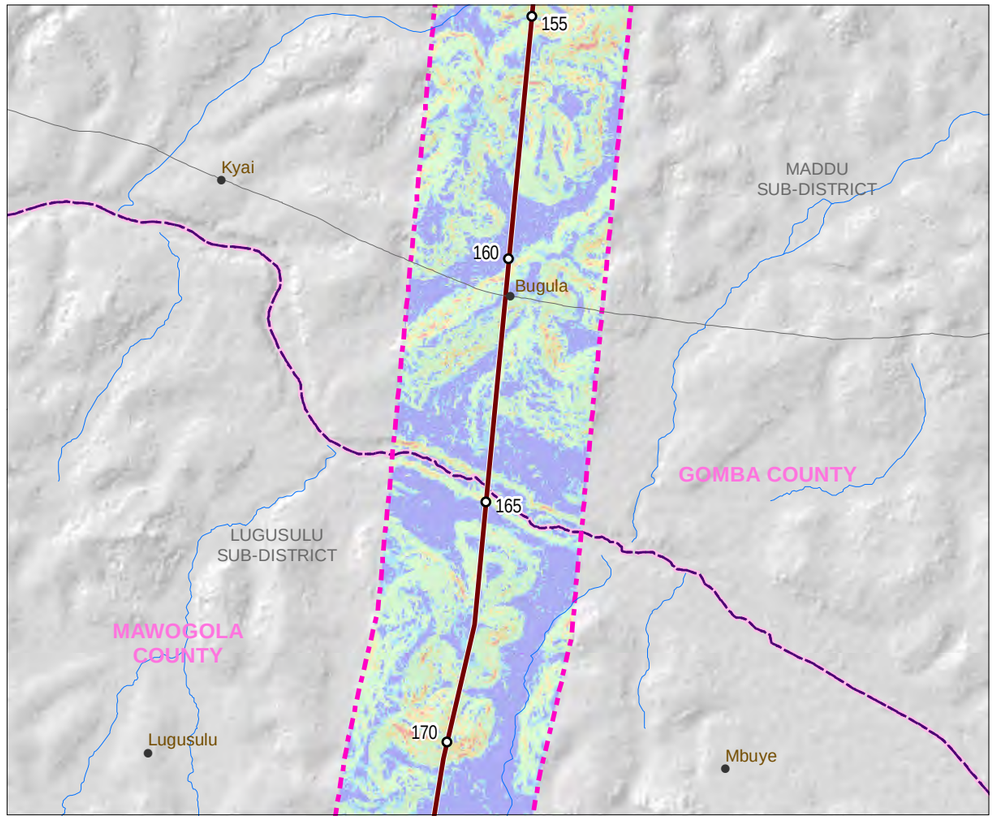
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

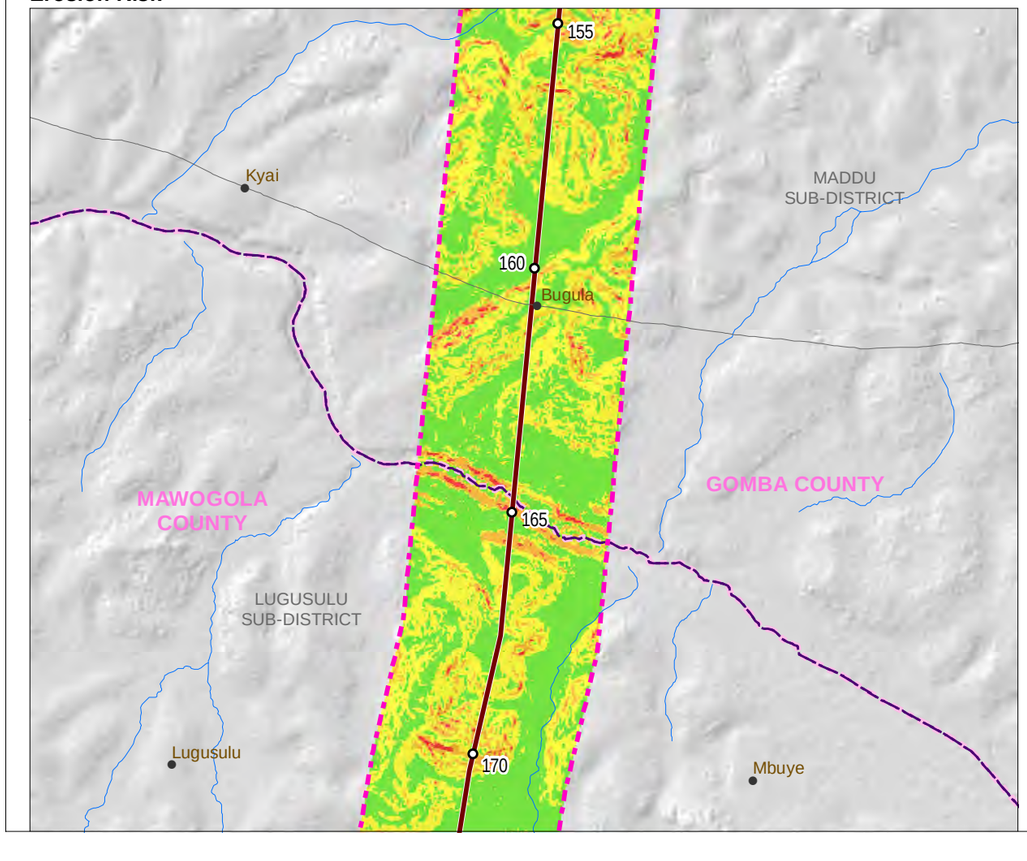
Soil Texture



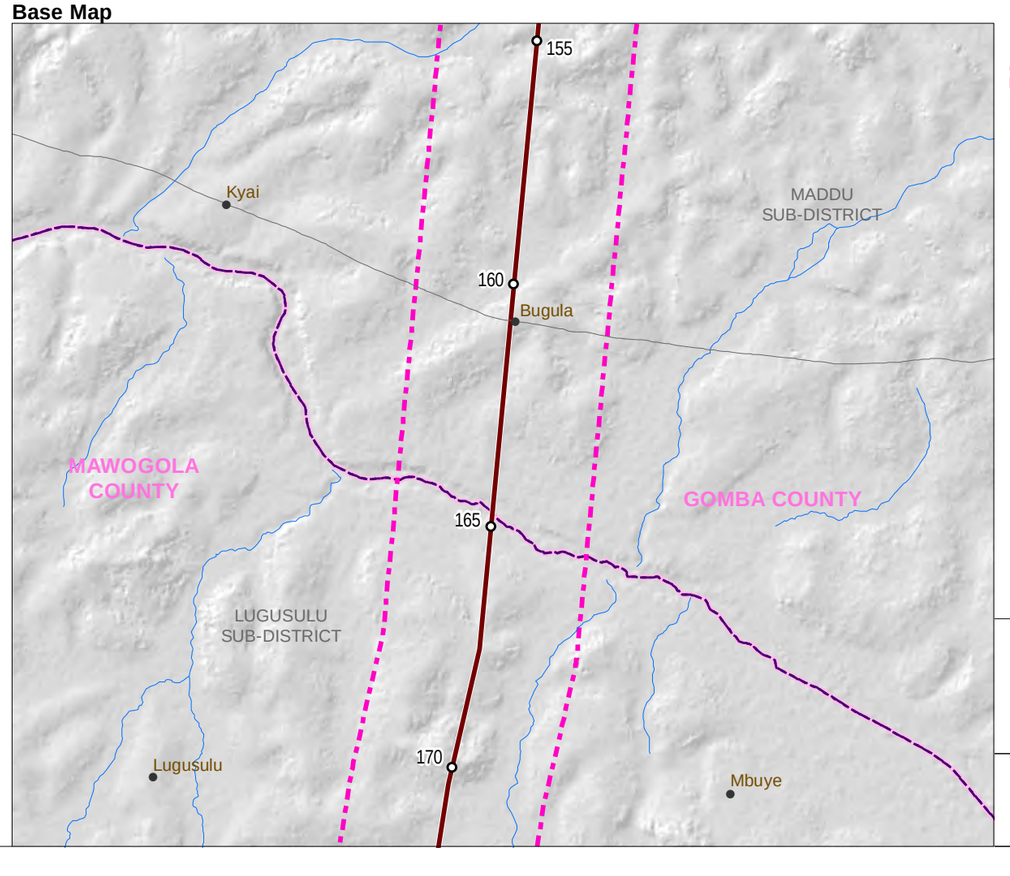
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

- Heavy Soils
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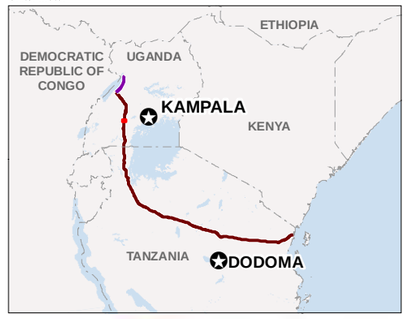
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



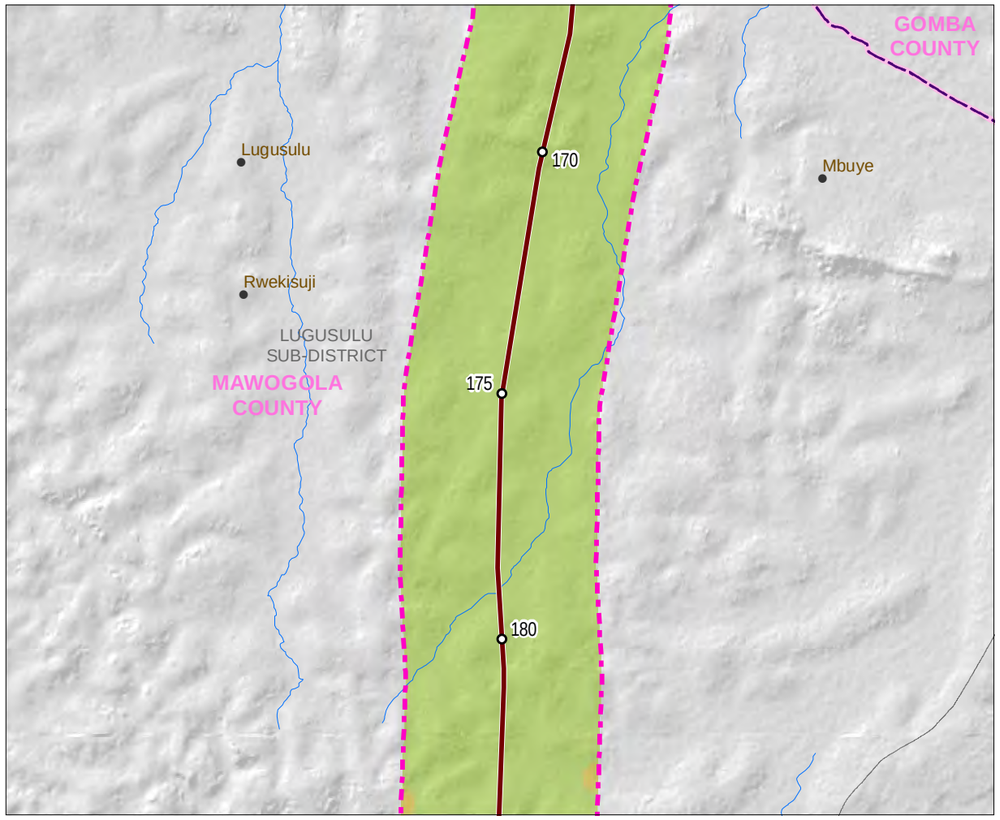
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

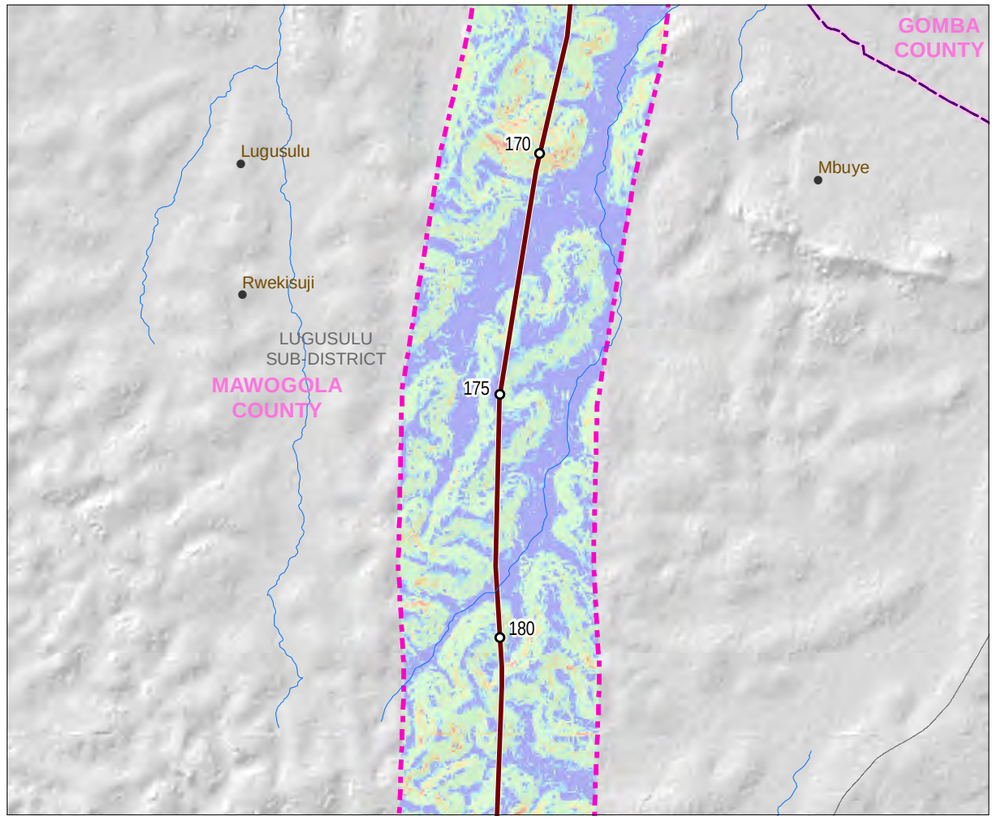
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

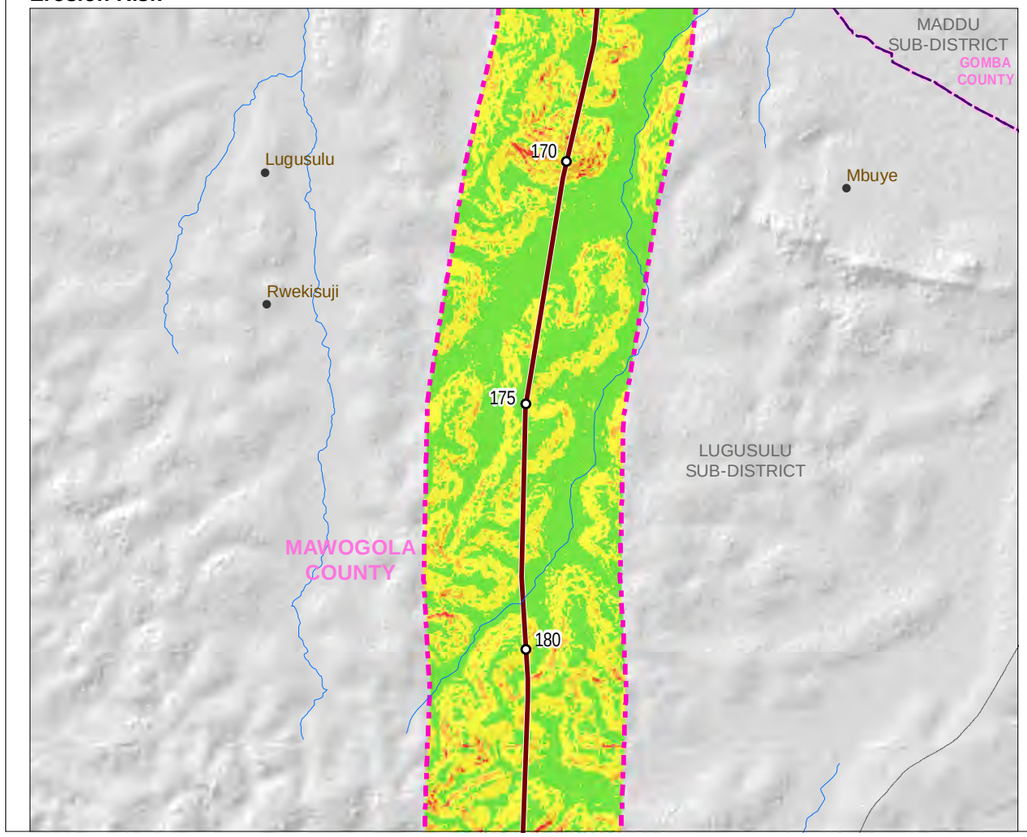
Soil Texture



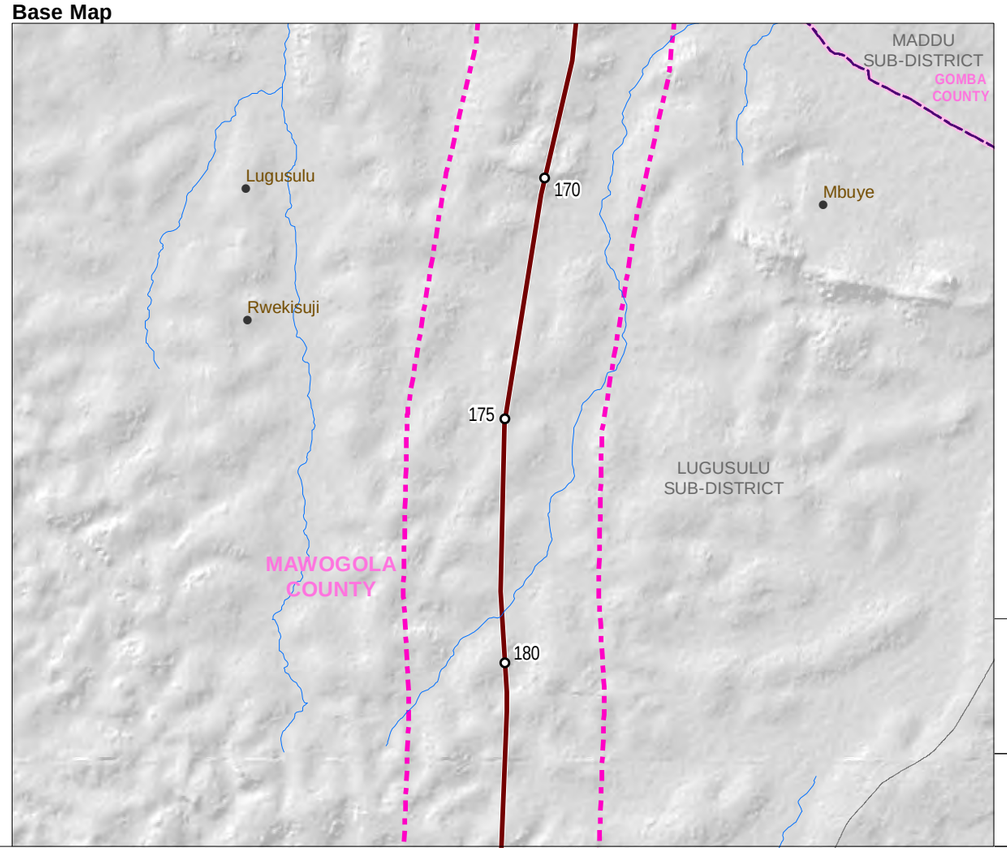
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
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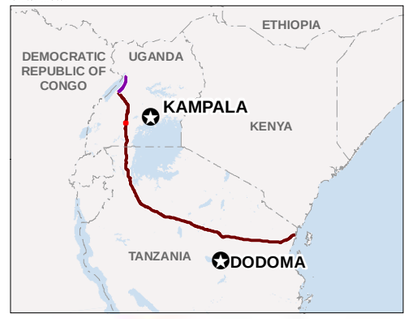
- Highway
- Main Road
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



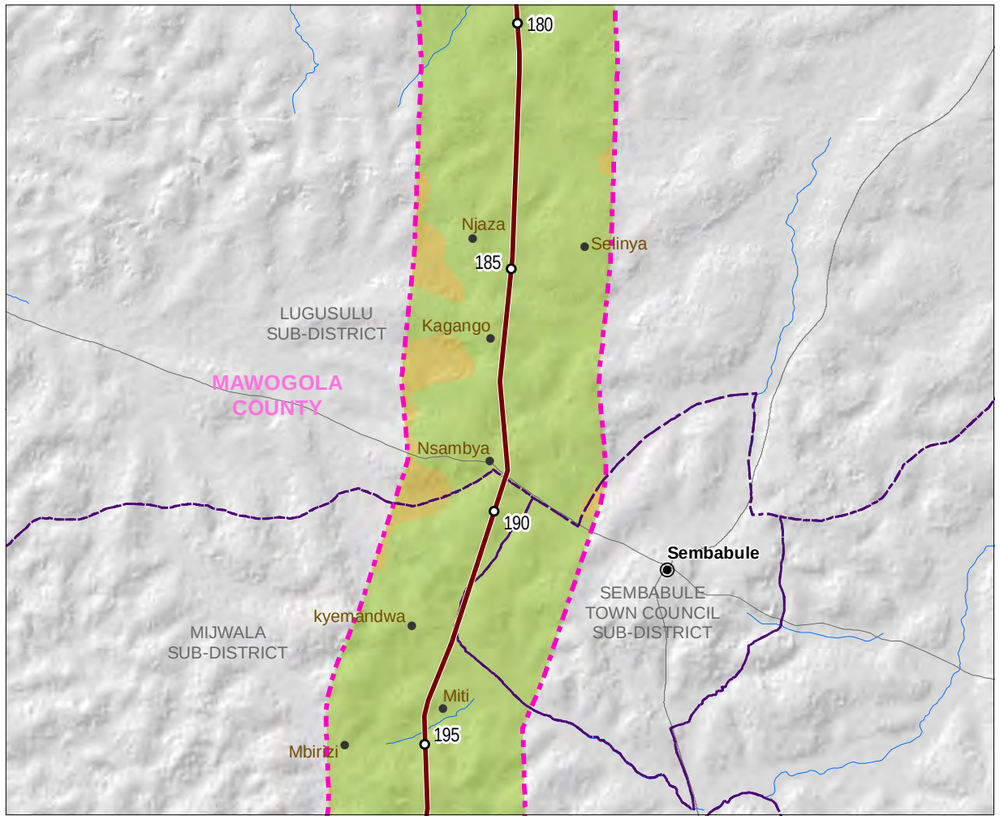
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

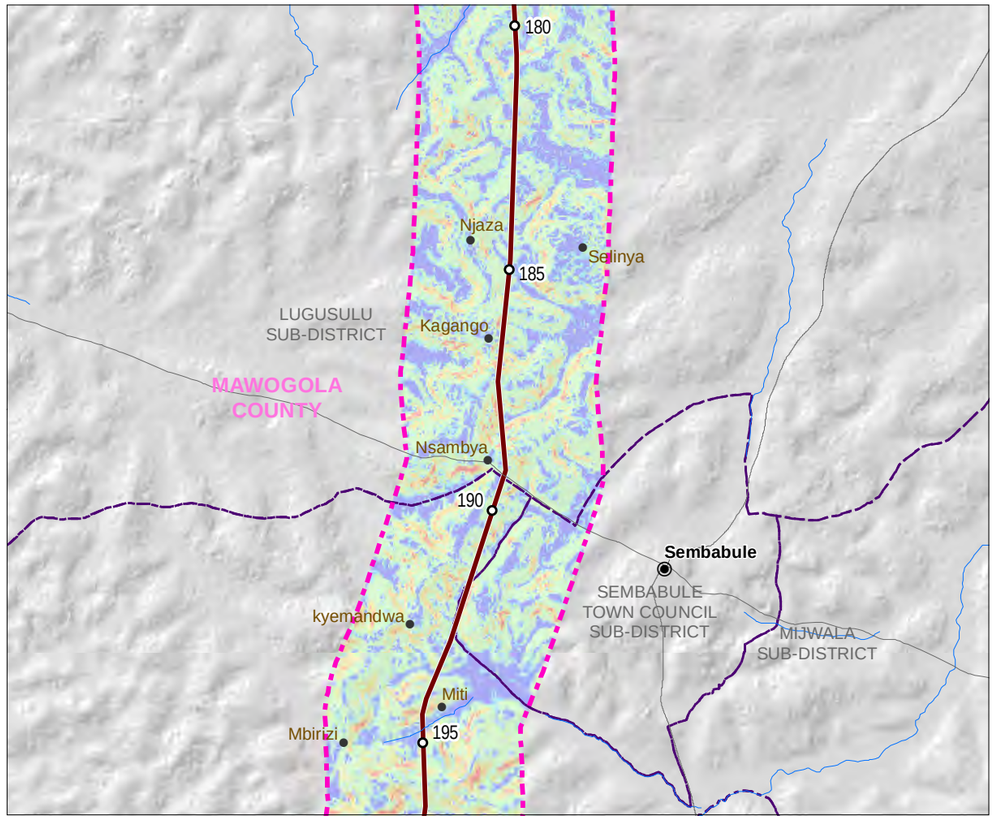
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

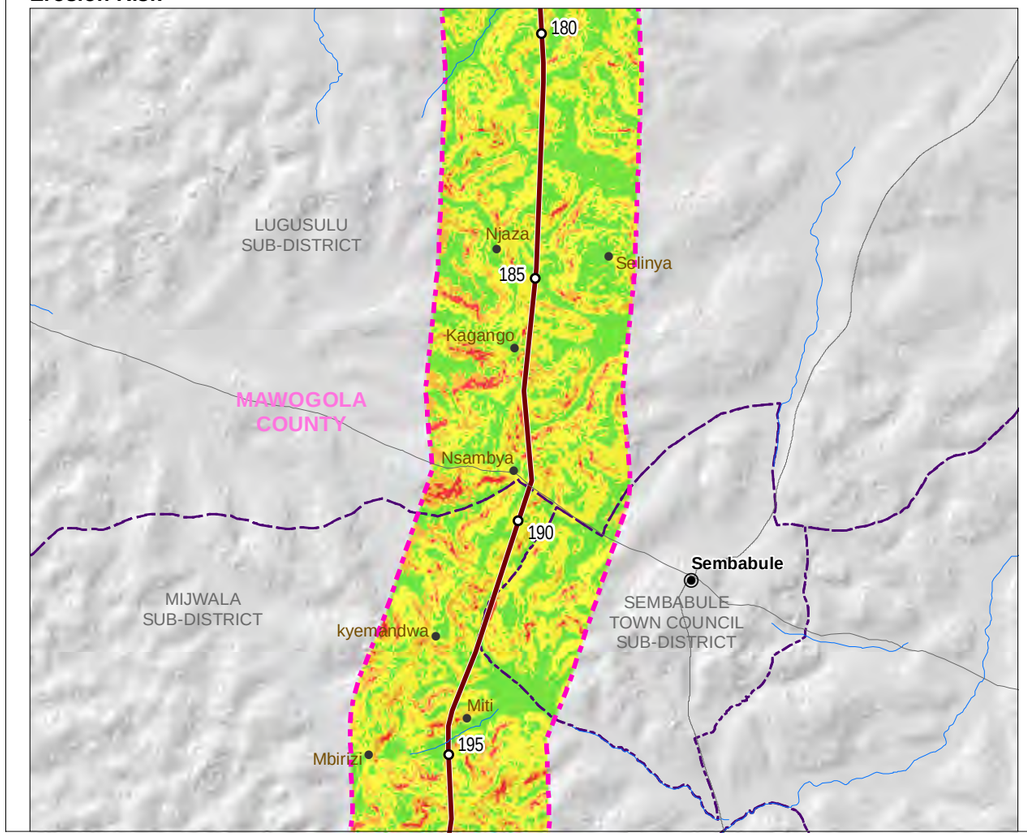
Soil Texture



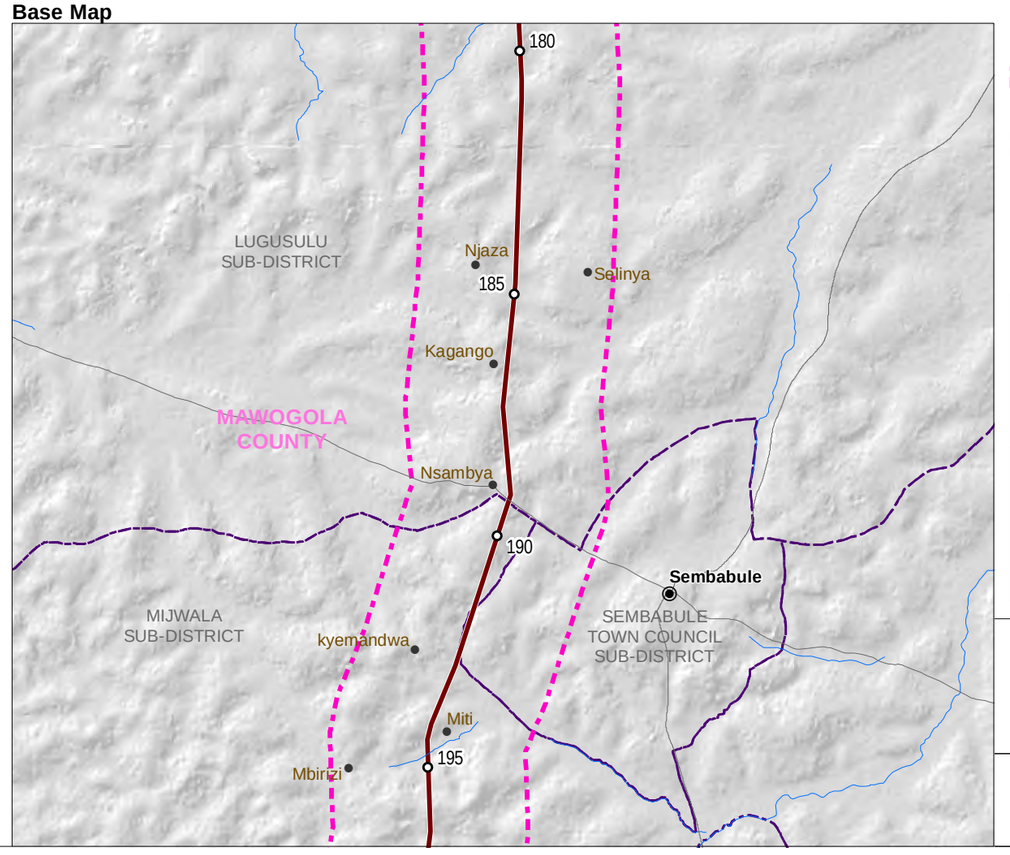
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
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- District Headquarters
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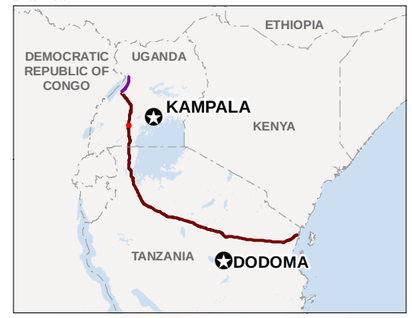
- Watercourse
- Lake
- County Boundary
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



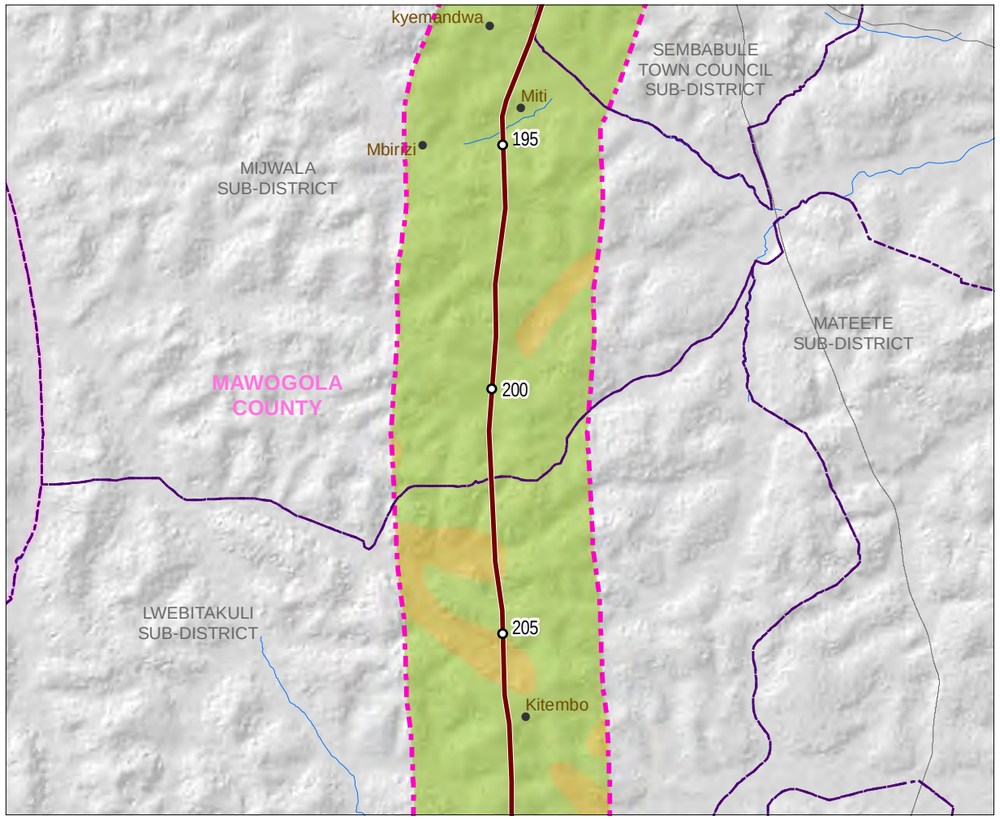
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

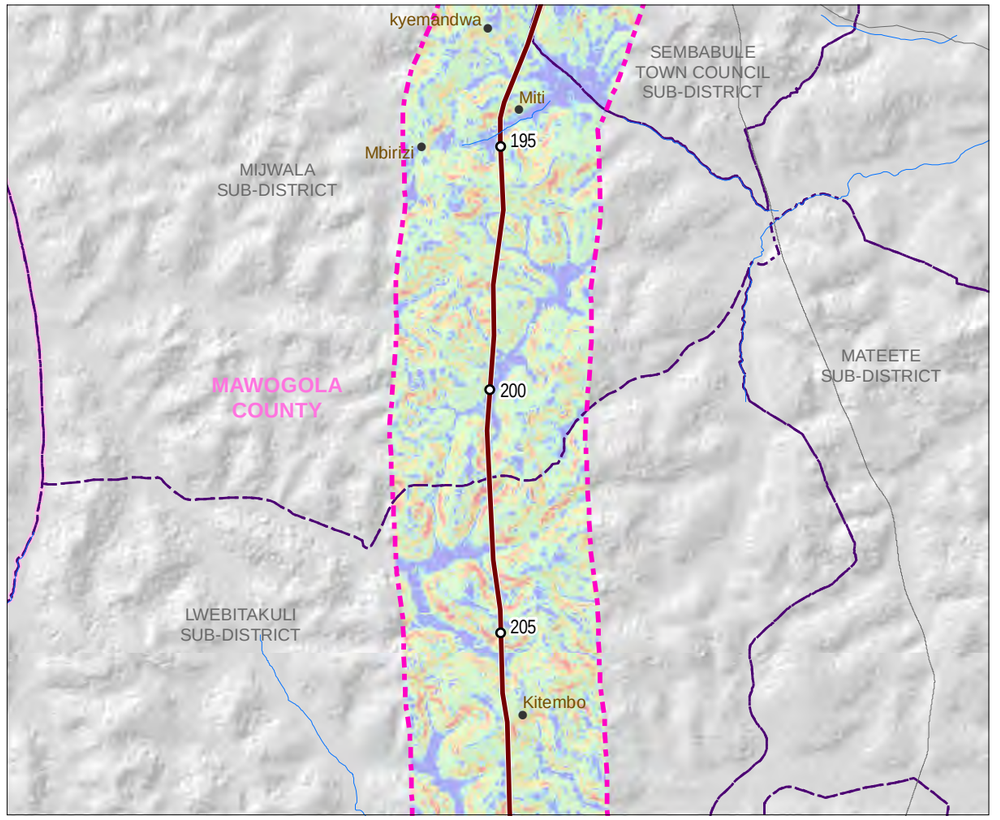
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

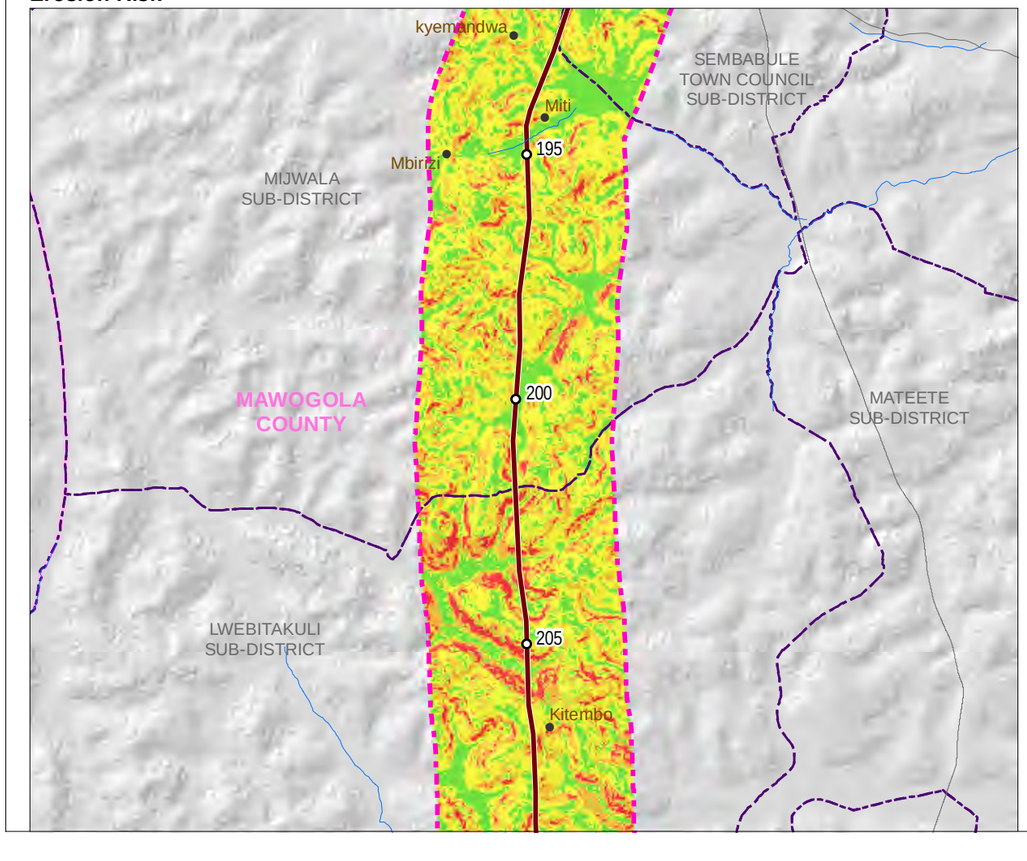
Soil Texture



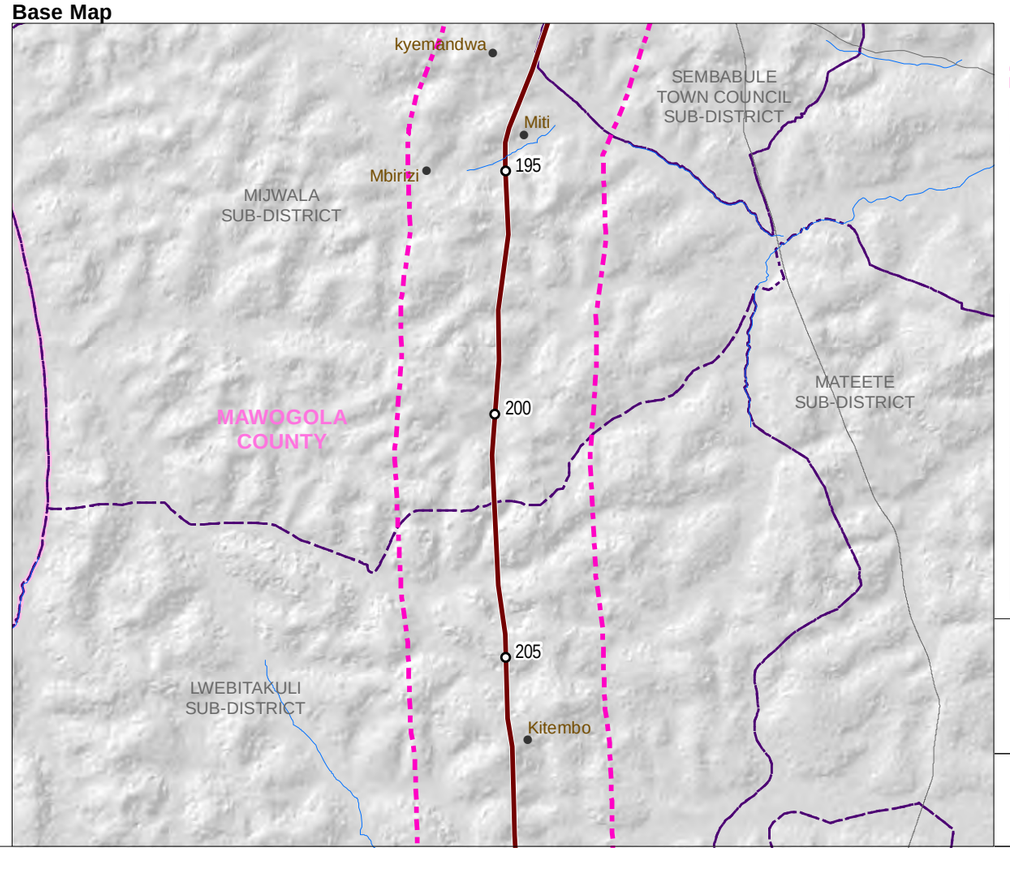
Slope



Erosion Risk



Base Map



Legend

- **East African Crude Oil Pipeline**
- **Tilenga Feeder Pipeline**
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
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Slope

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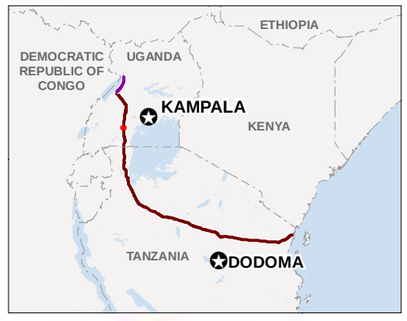
Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



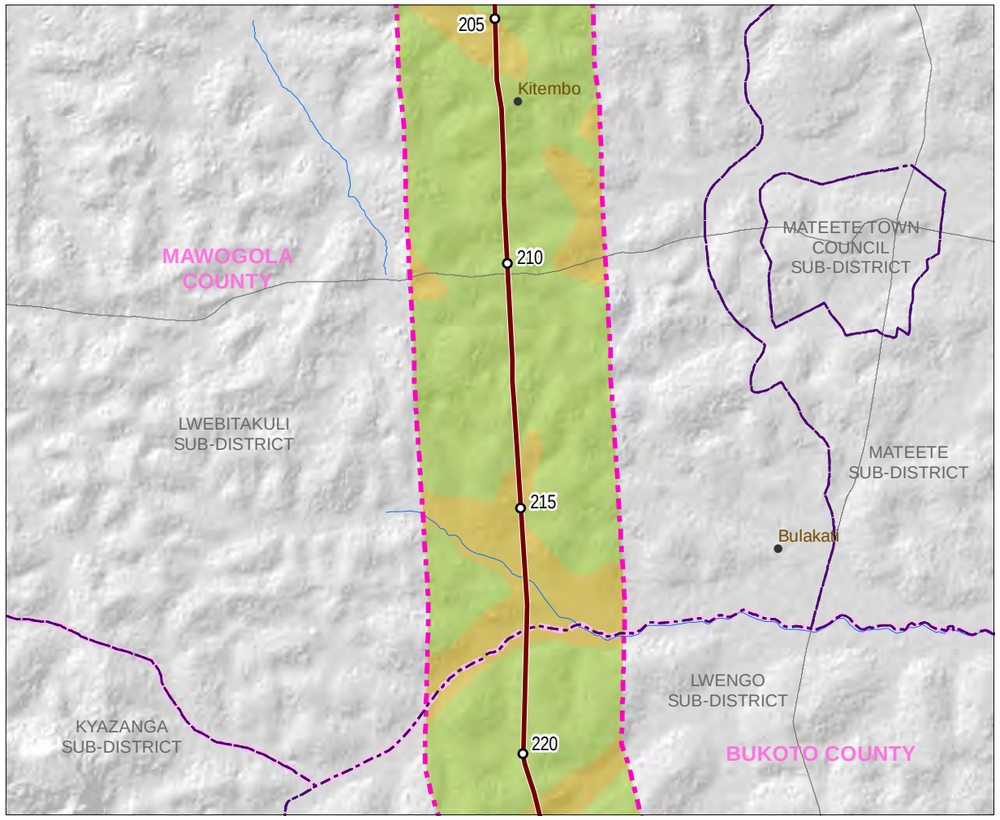
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

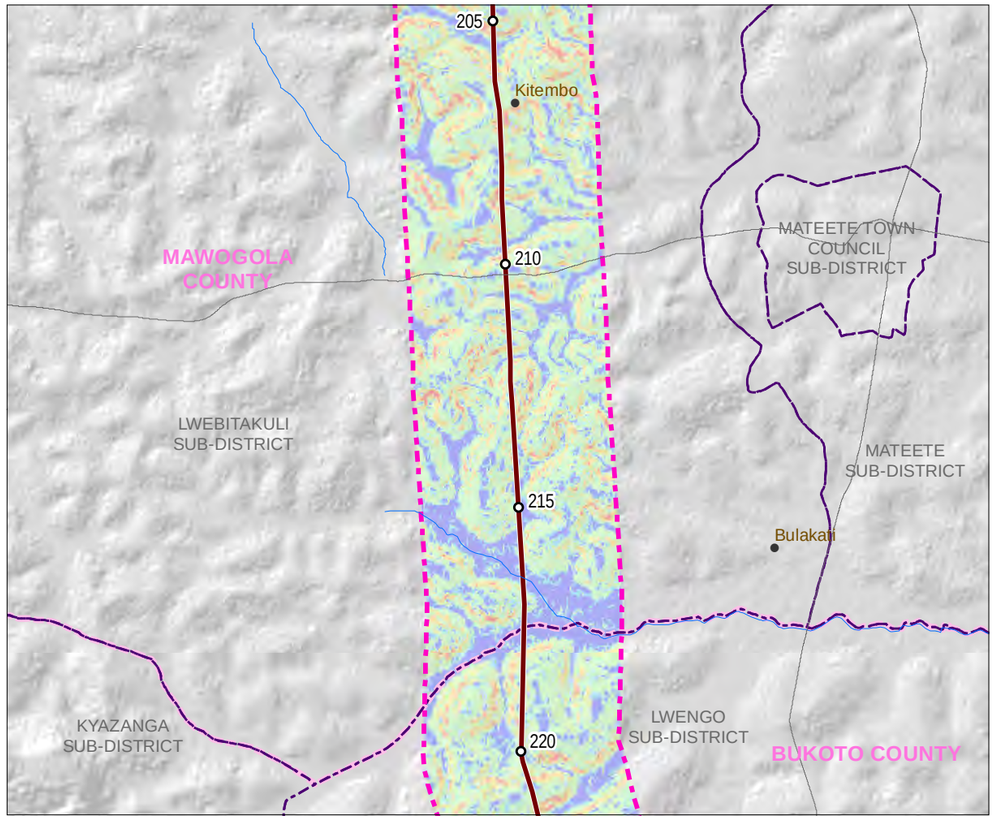
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

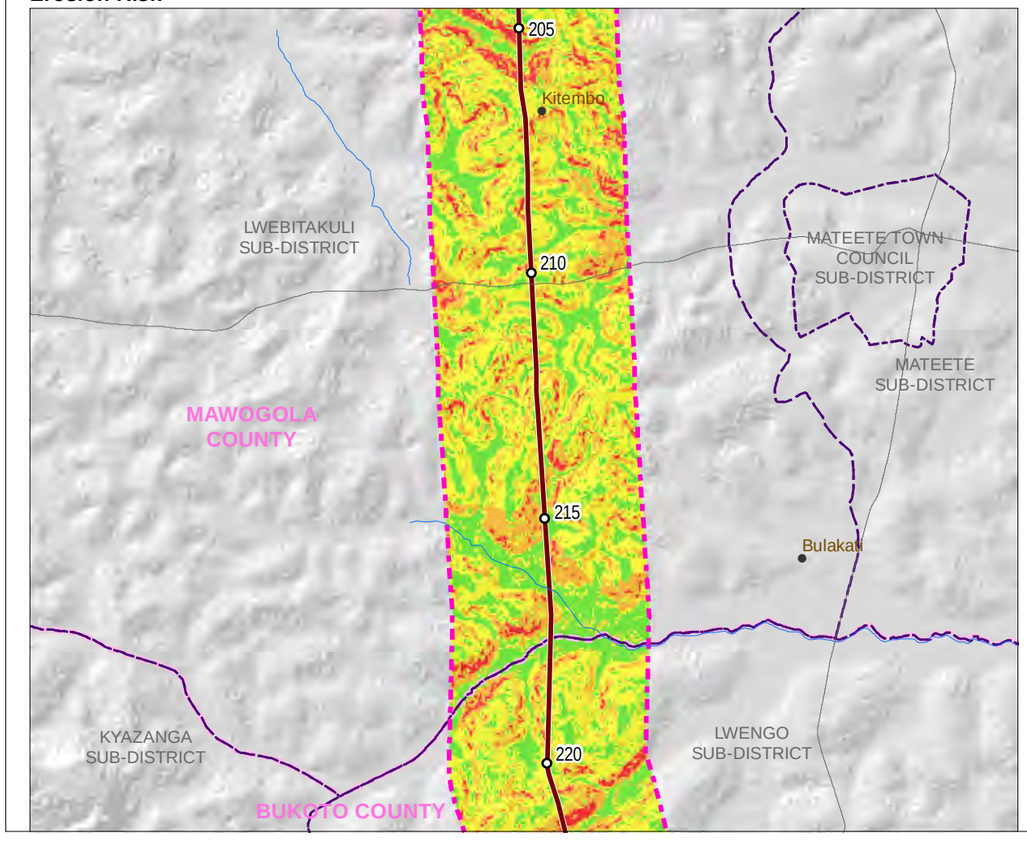
Soil Texture



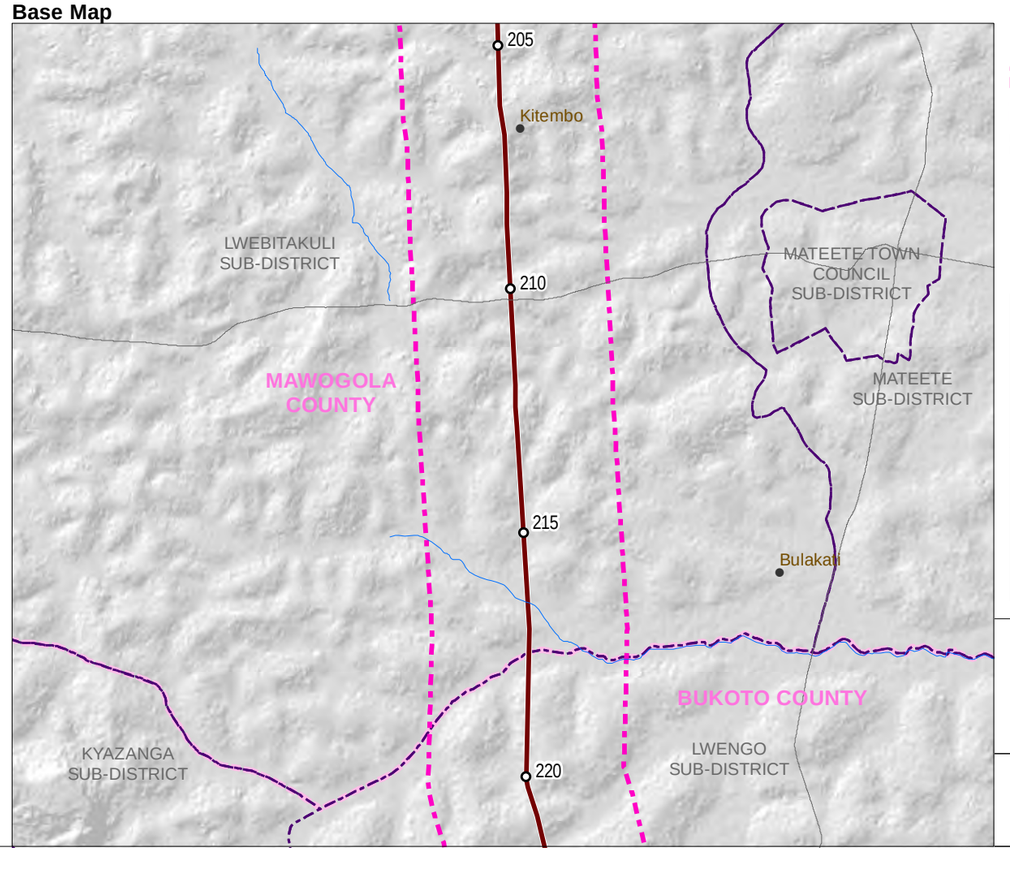
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

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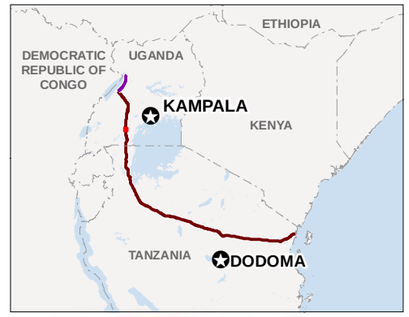
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



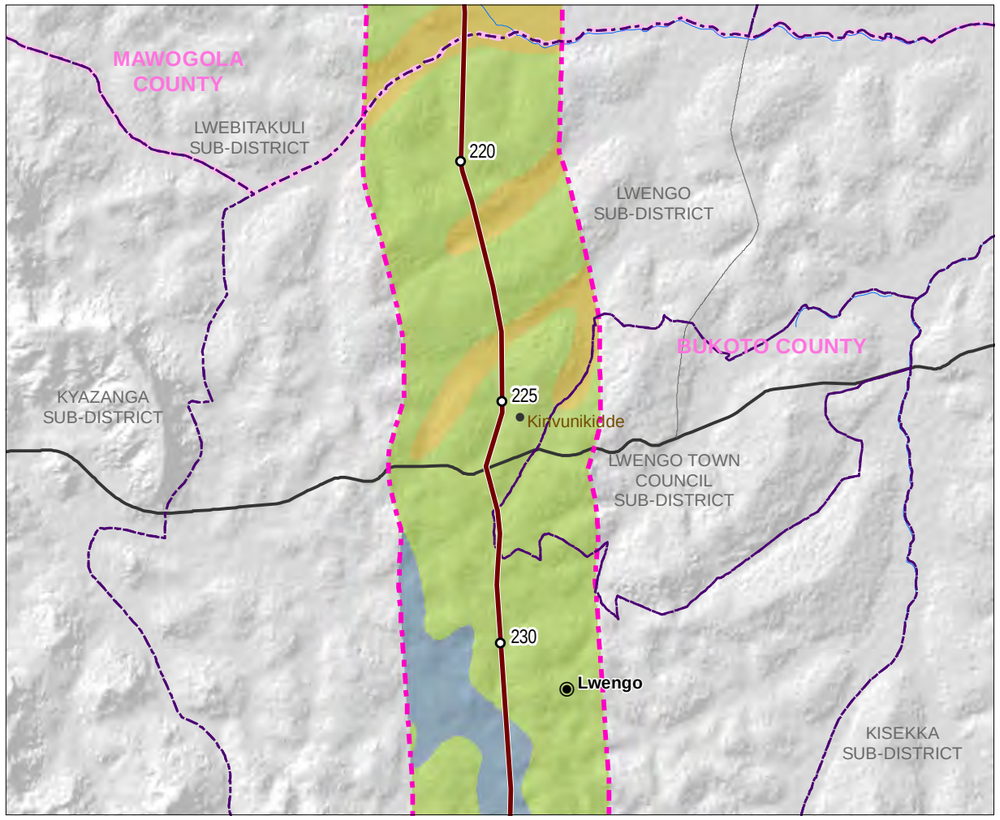
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

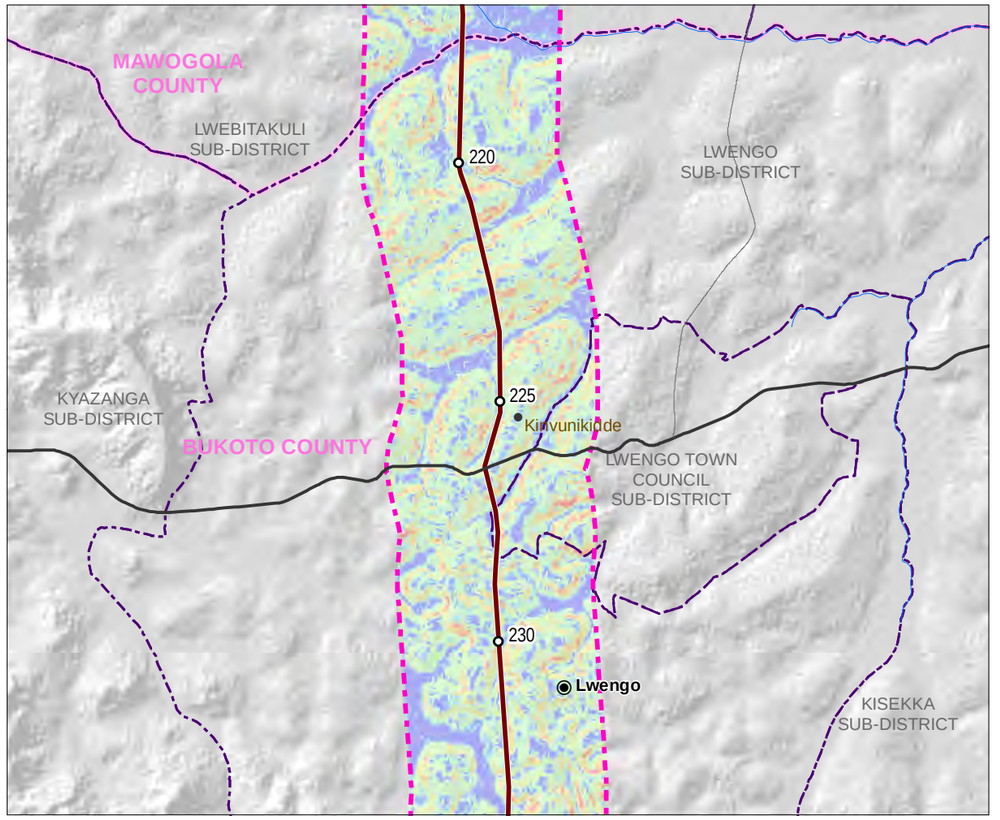
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

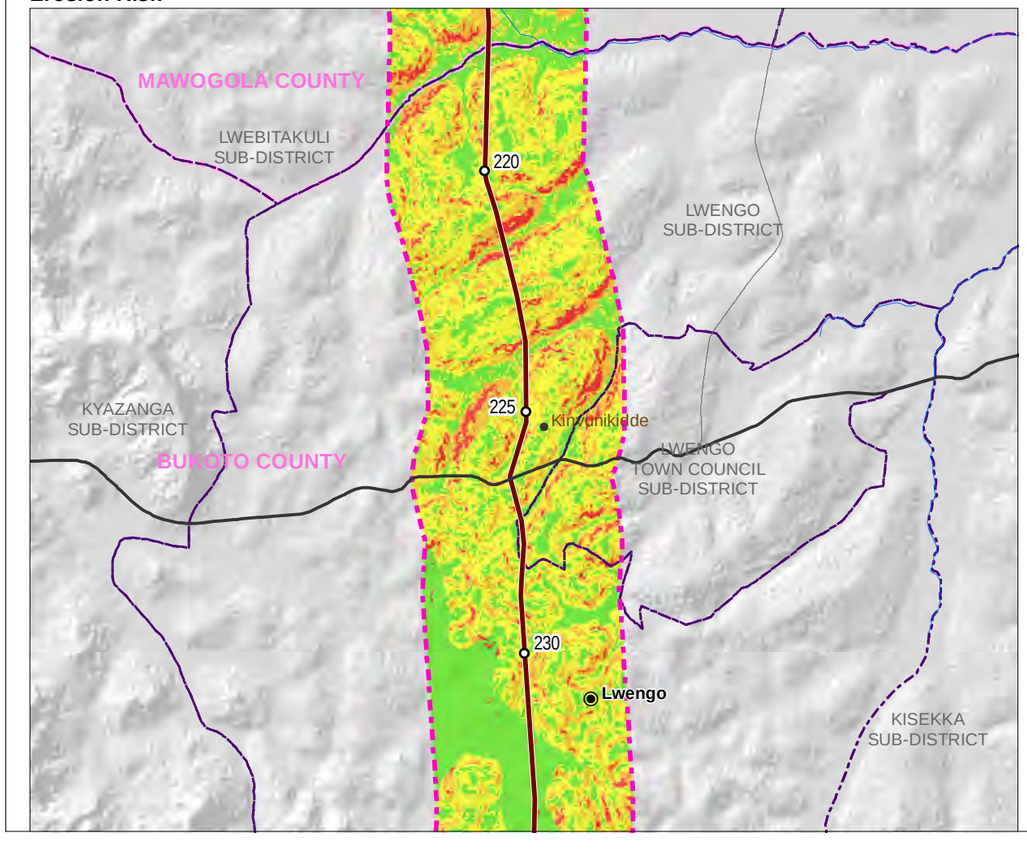
Soil Texture



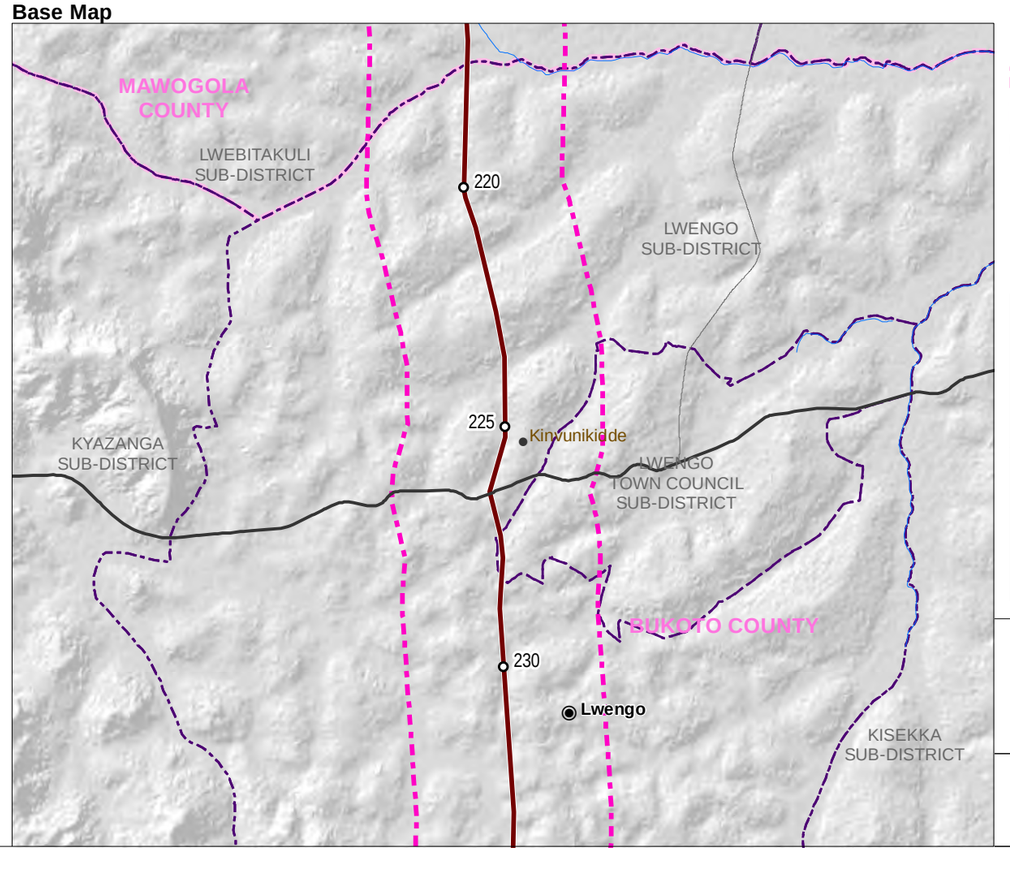
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

Erosion Risk

- Very High
- High
- Moderate
- Lower

Soil Texture

- Heavy Soils
- Medium/Calcareous Soils
- Sandy/Light Silty/Peat Soils

Slope

- Very Steep (>11°)
- Steep (7°-11°)
- Moderate (3°-7°)
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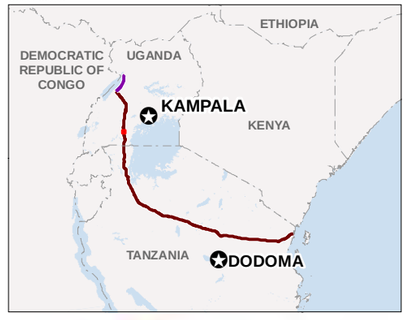
- Sub-County Boundary
- National Boundary

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



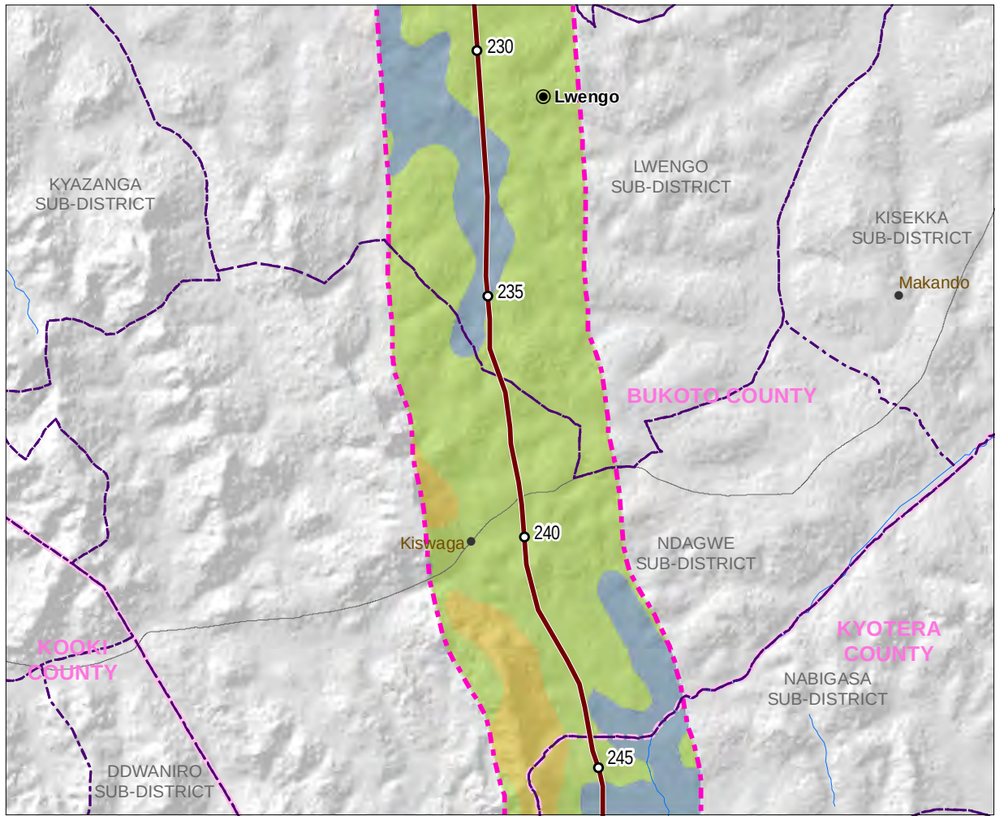
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

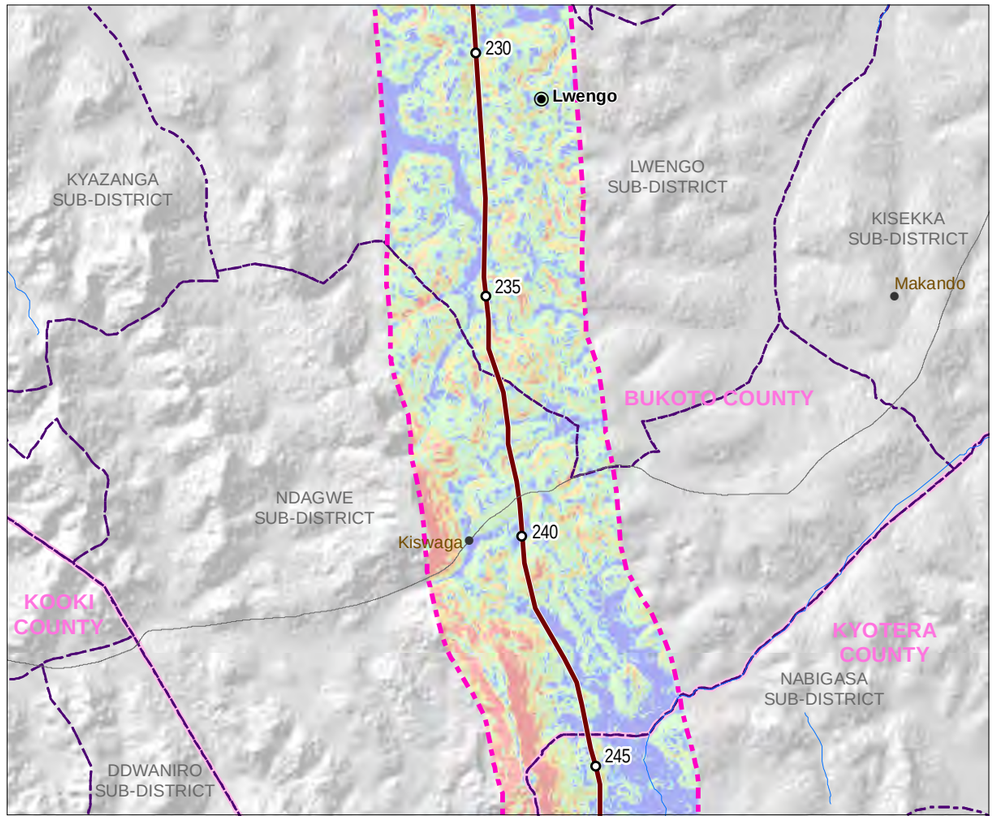
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

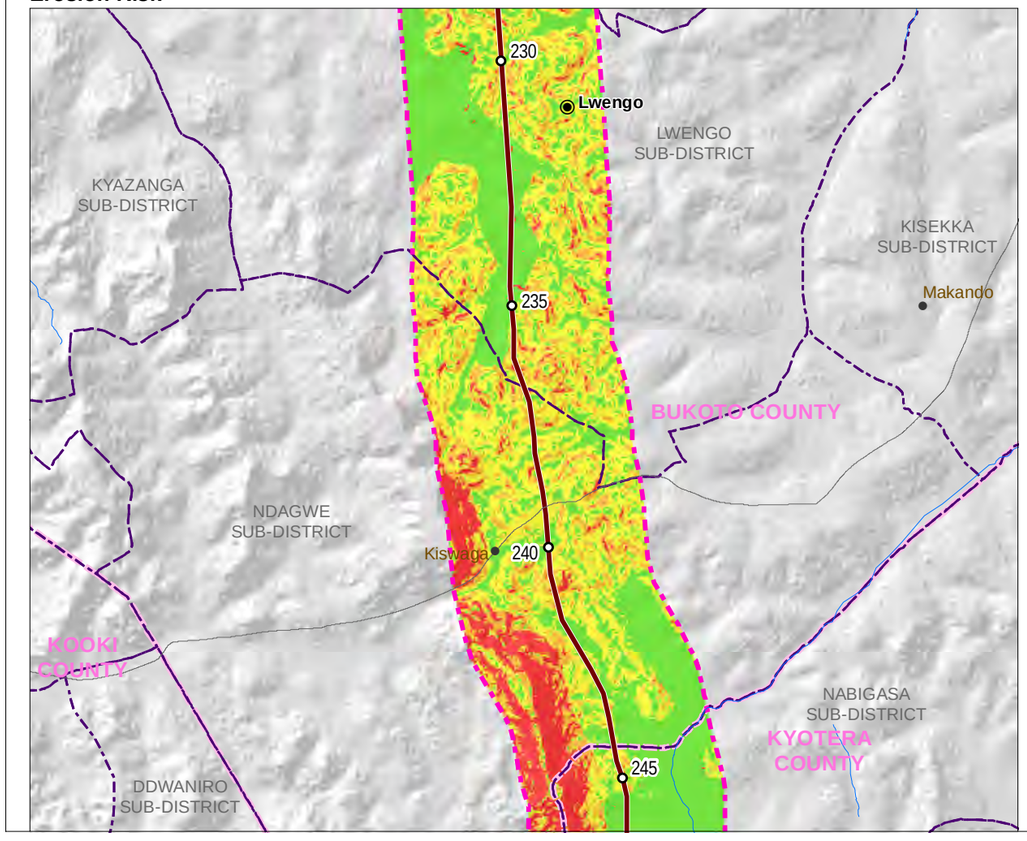
Soil Texture



Slope



Erosion Risk



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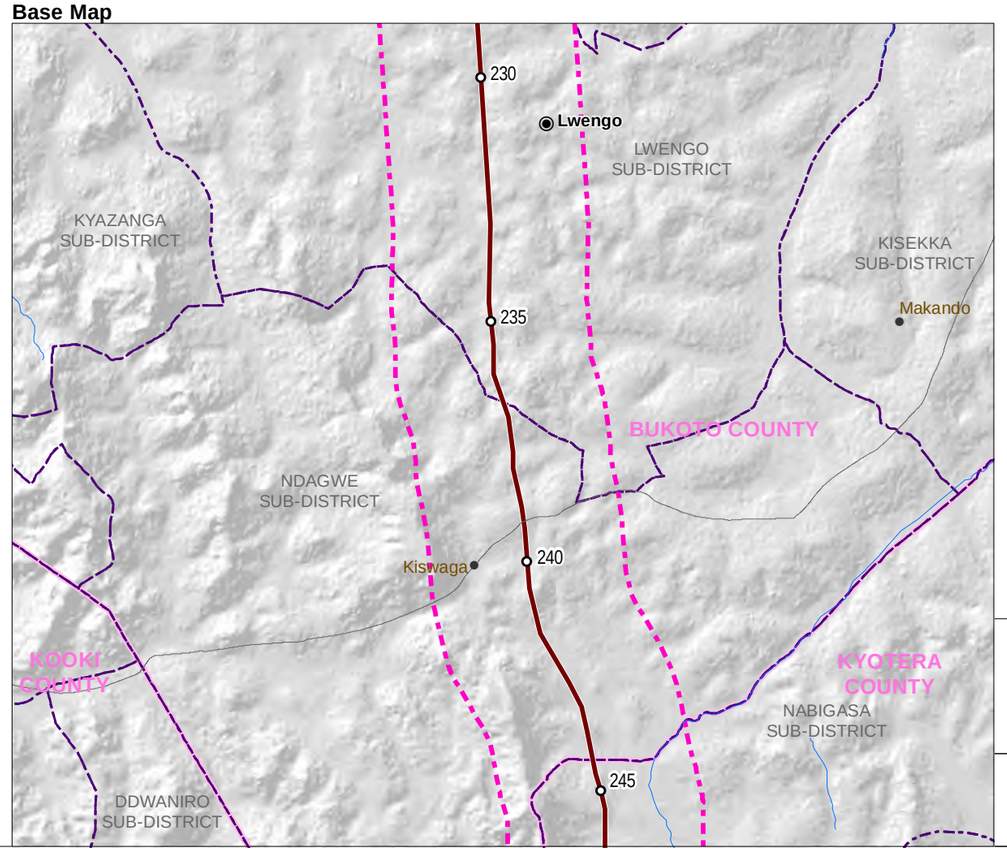

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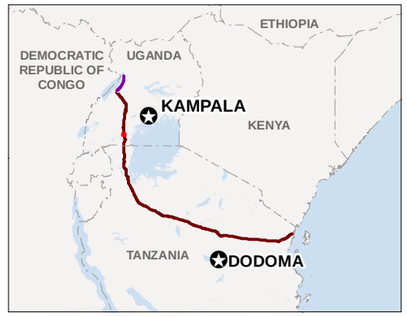
Datum: WGS 1984
Units: Meter



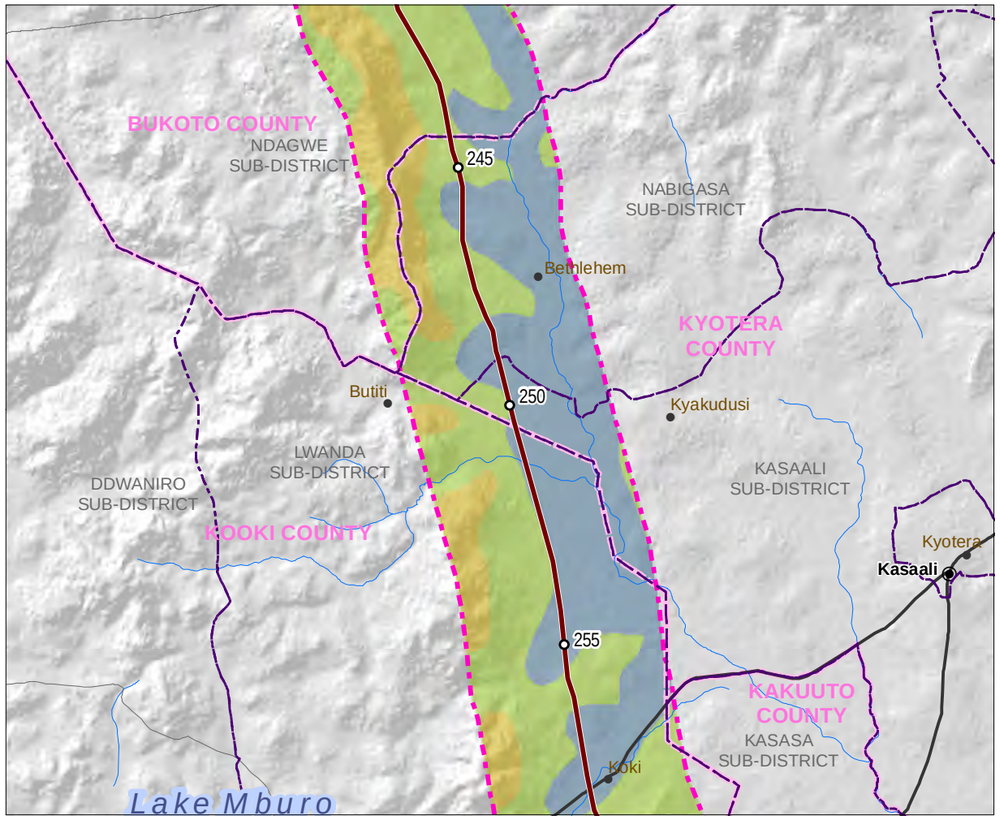
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

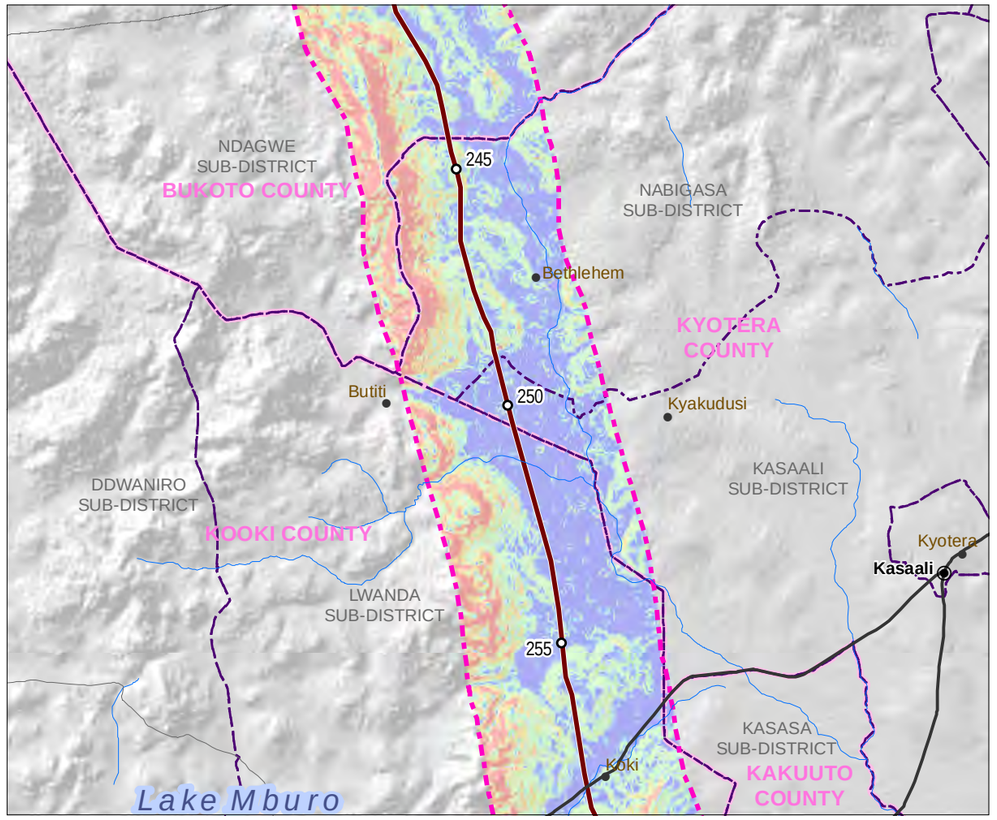
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

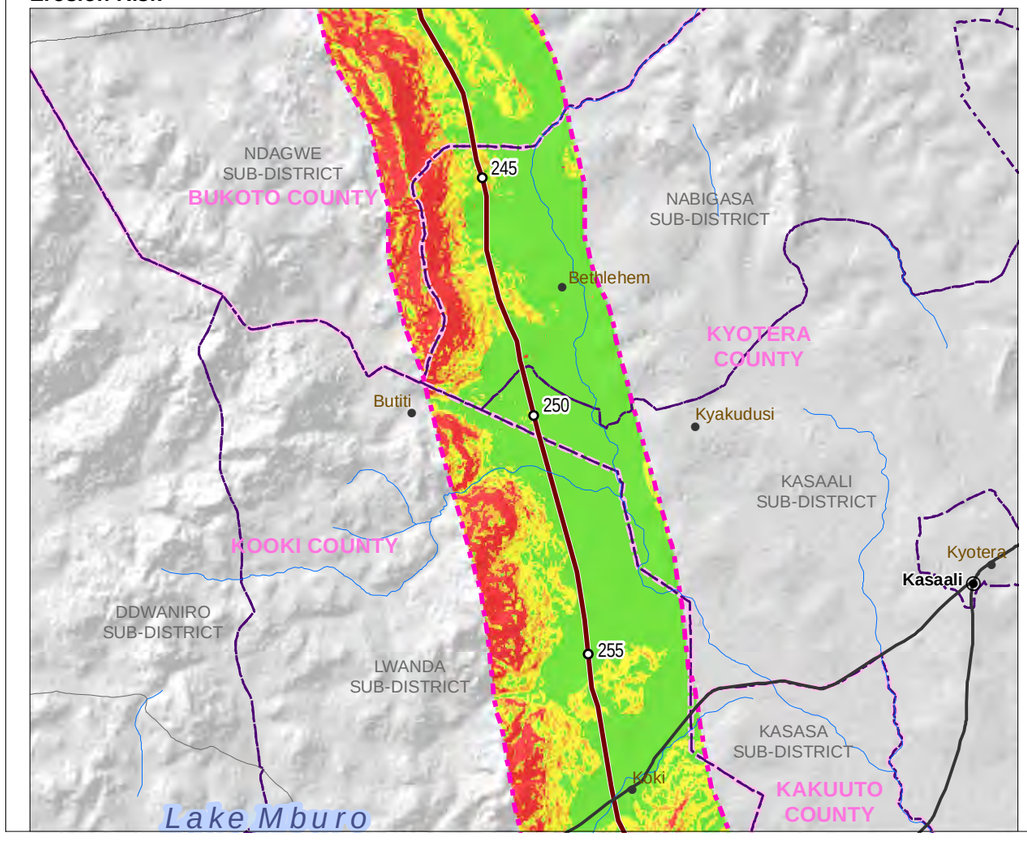
Soil Texture



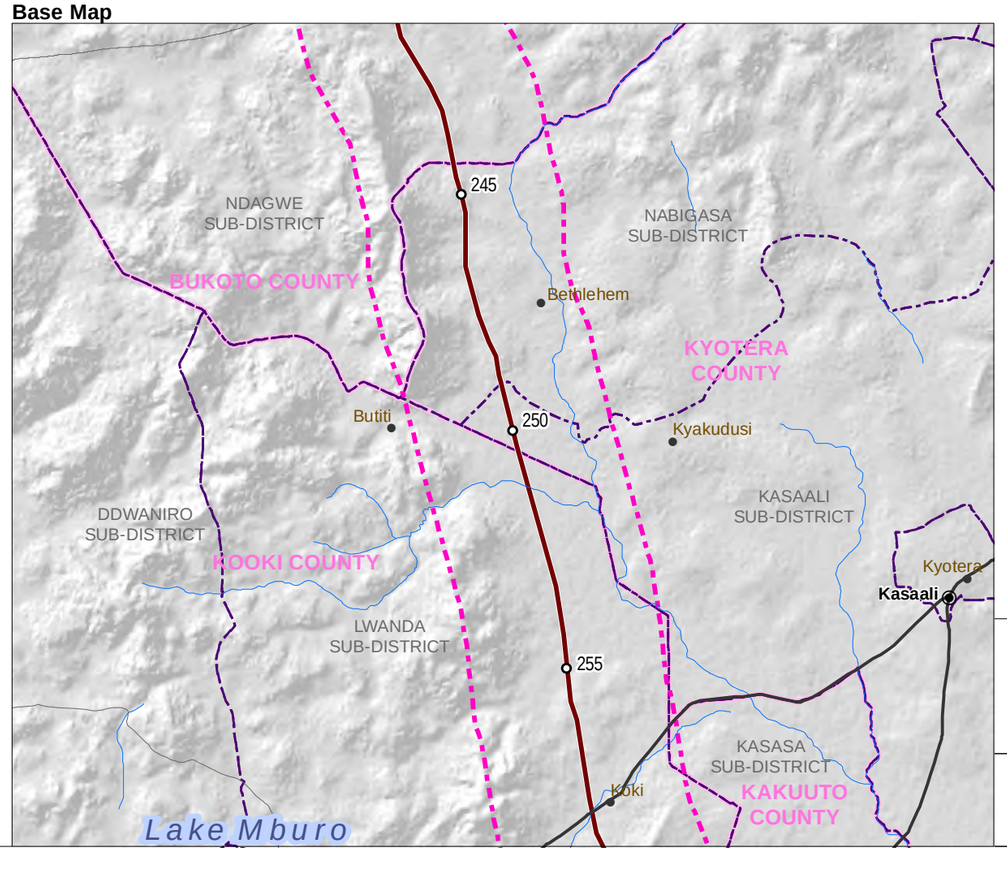
Slope



Erosion Risk



Base Map



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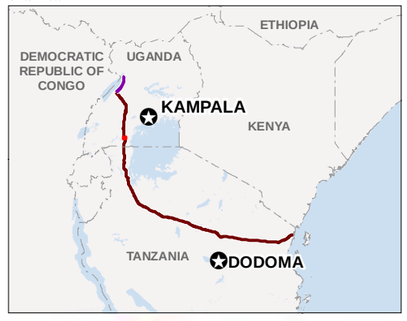


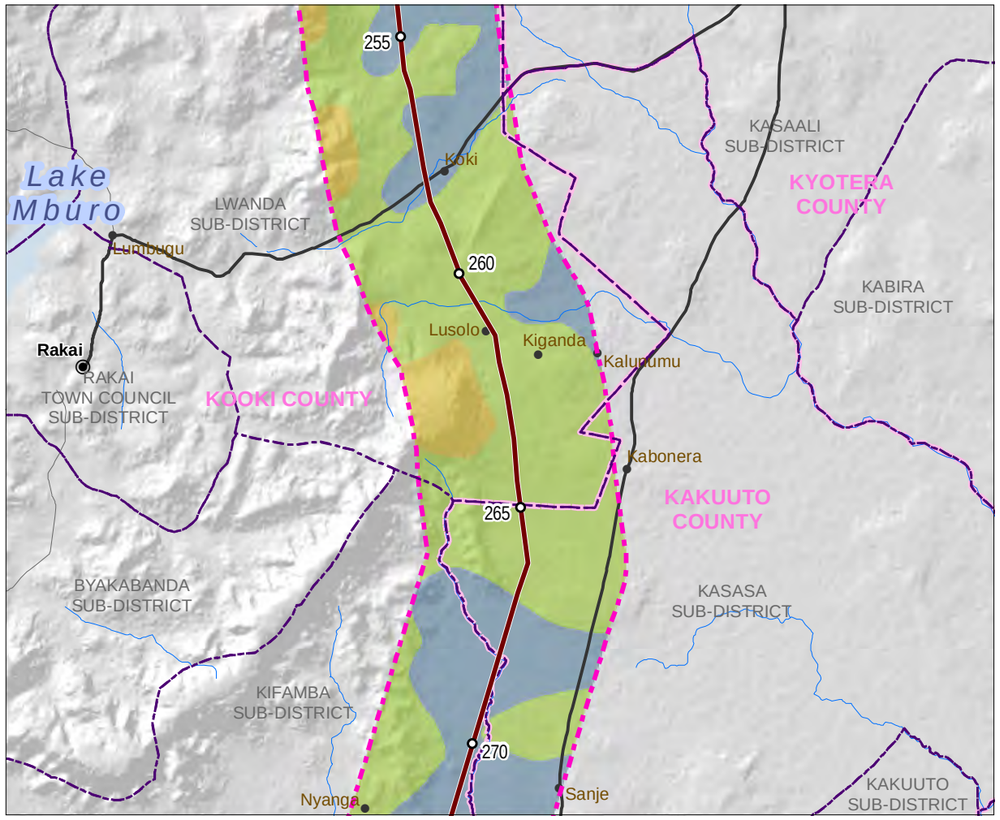
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

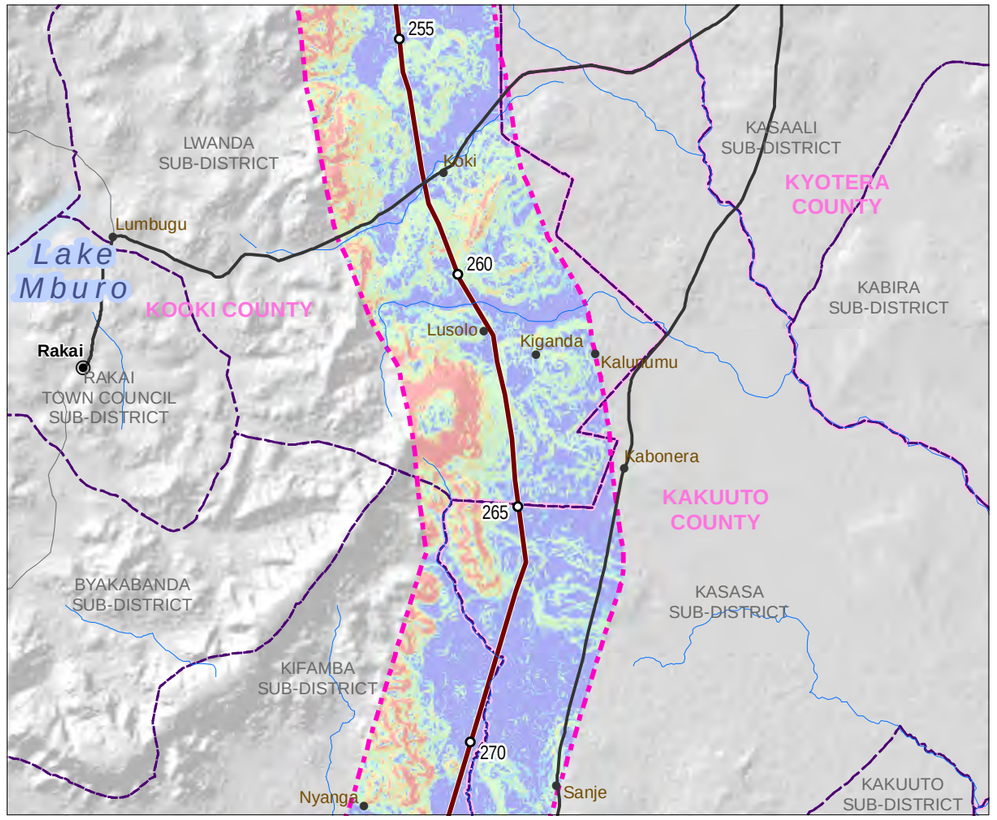
N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

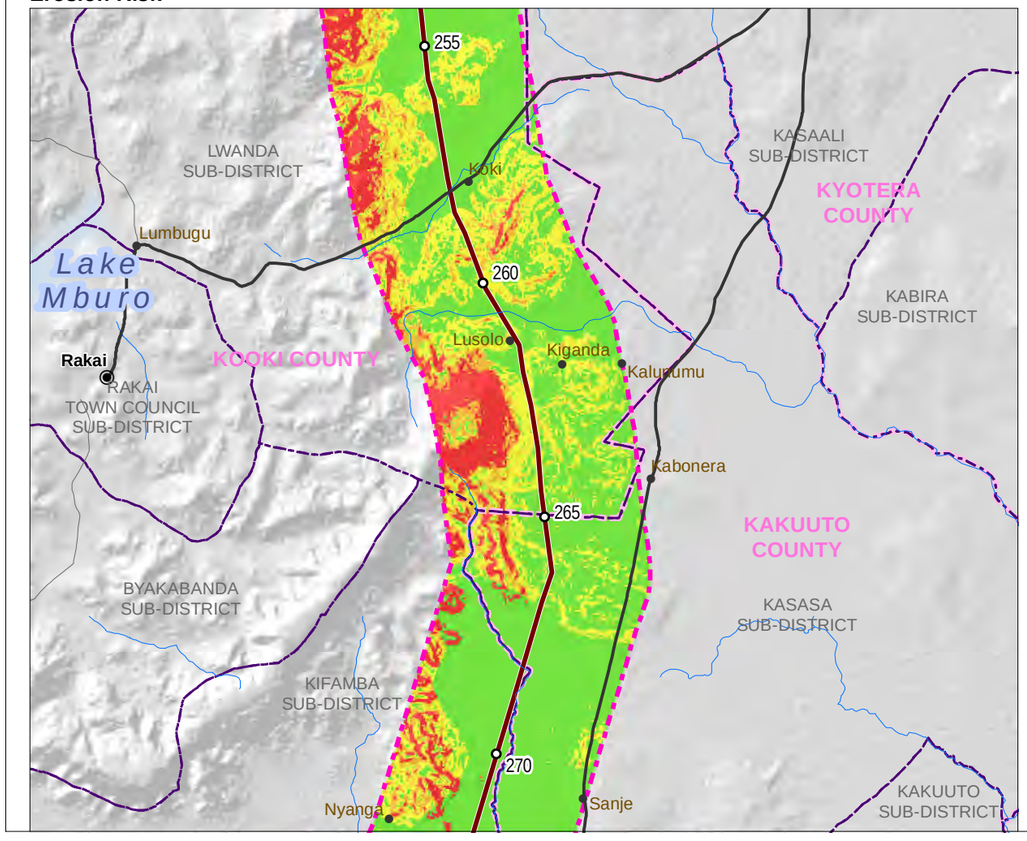
Soil Texture



Slope



Erosion Risk



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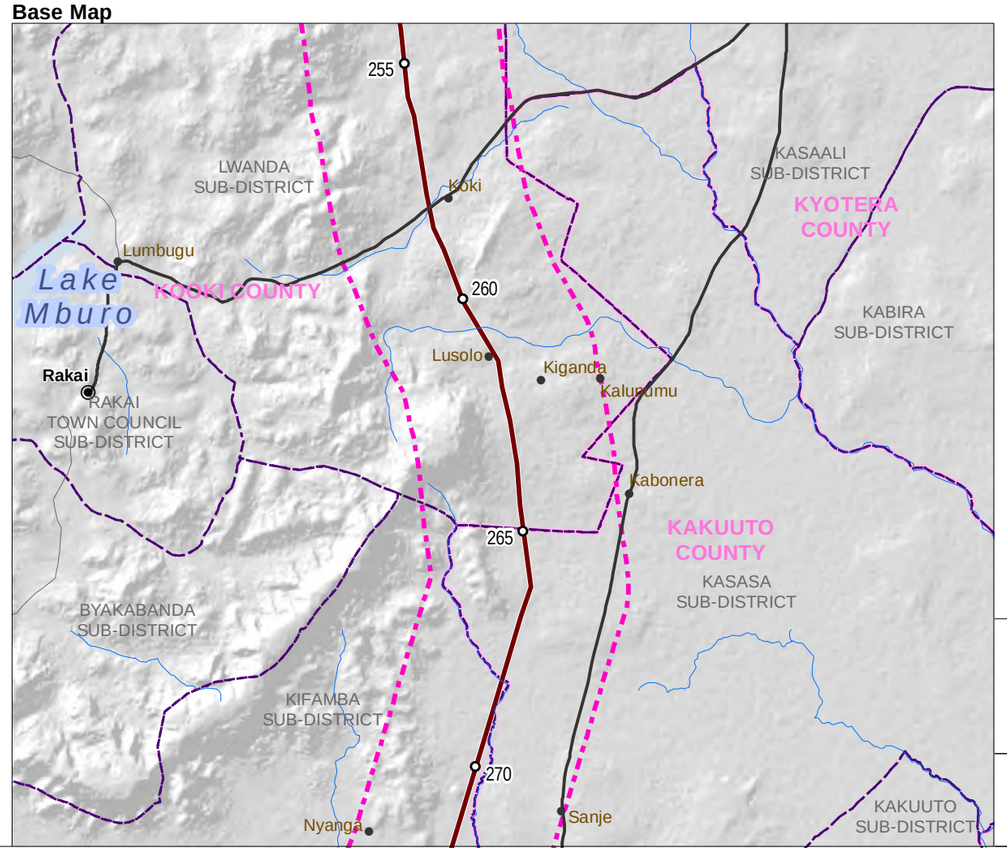

Legend

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- Tilenga Feeder Pipeline
- Kilometre Point
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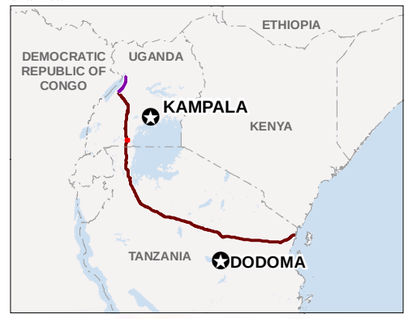
Datum: WGS 1984
Units: Meter



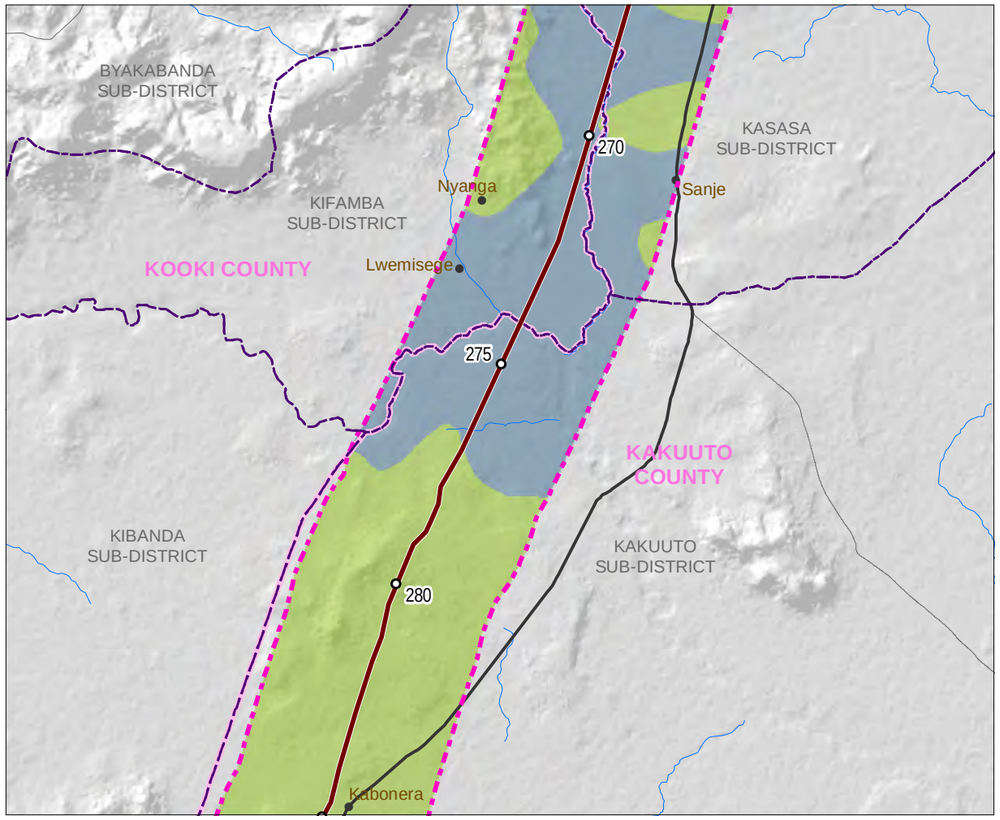
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

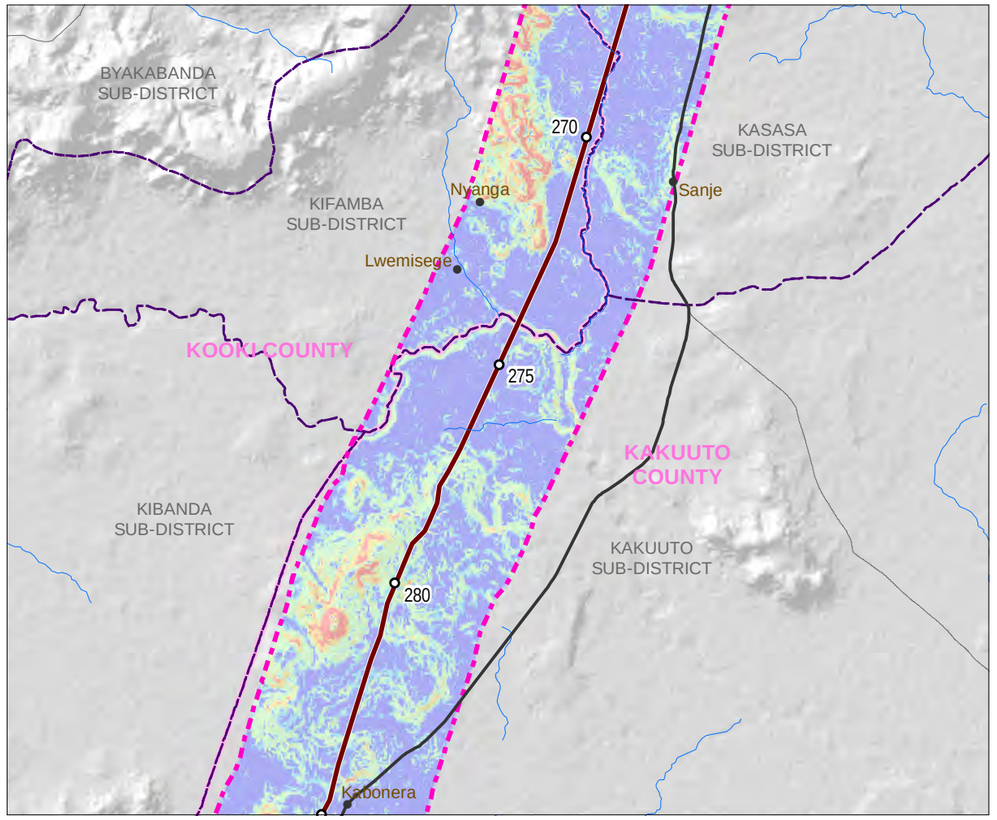
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

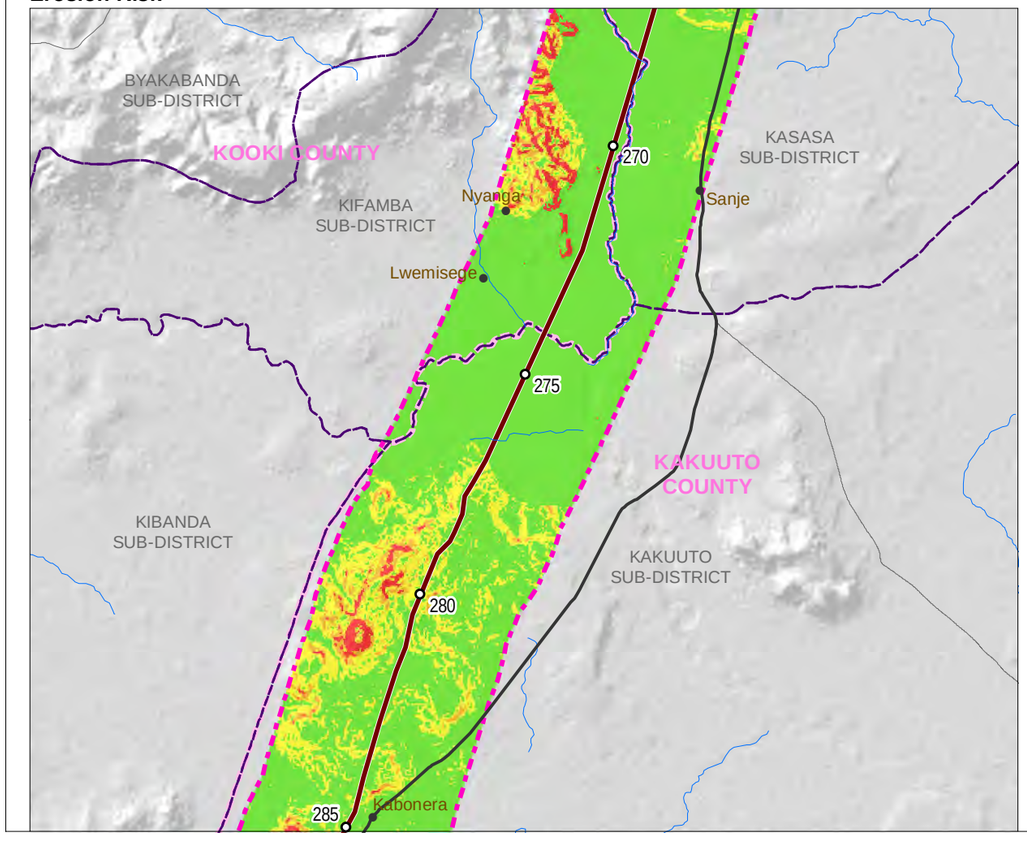
Soil Texture



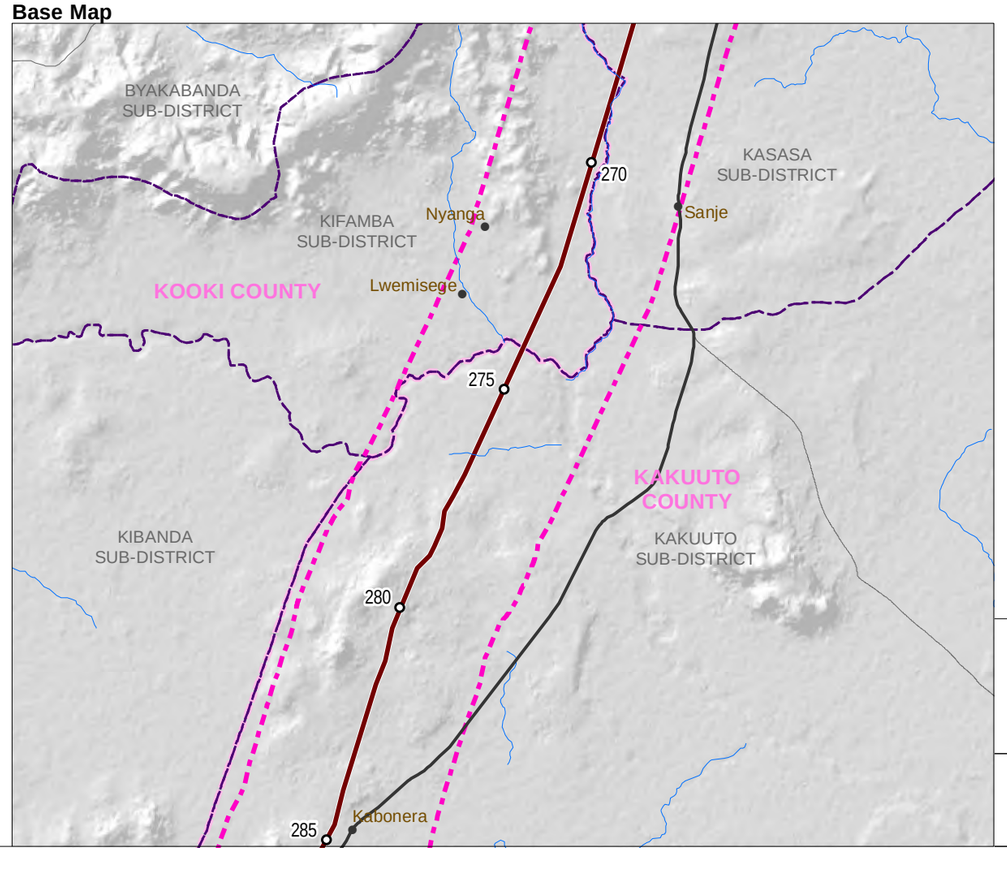
Slope



Erosion Risk



Base Map



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Influence

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Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
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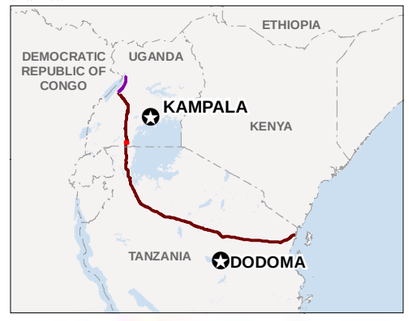


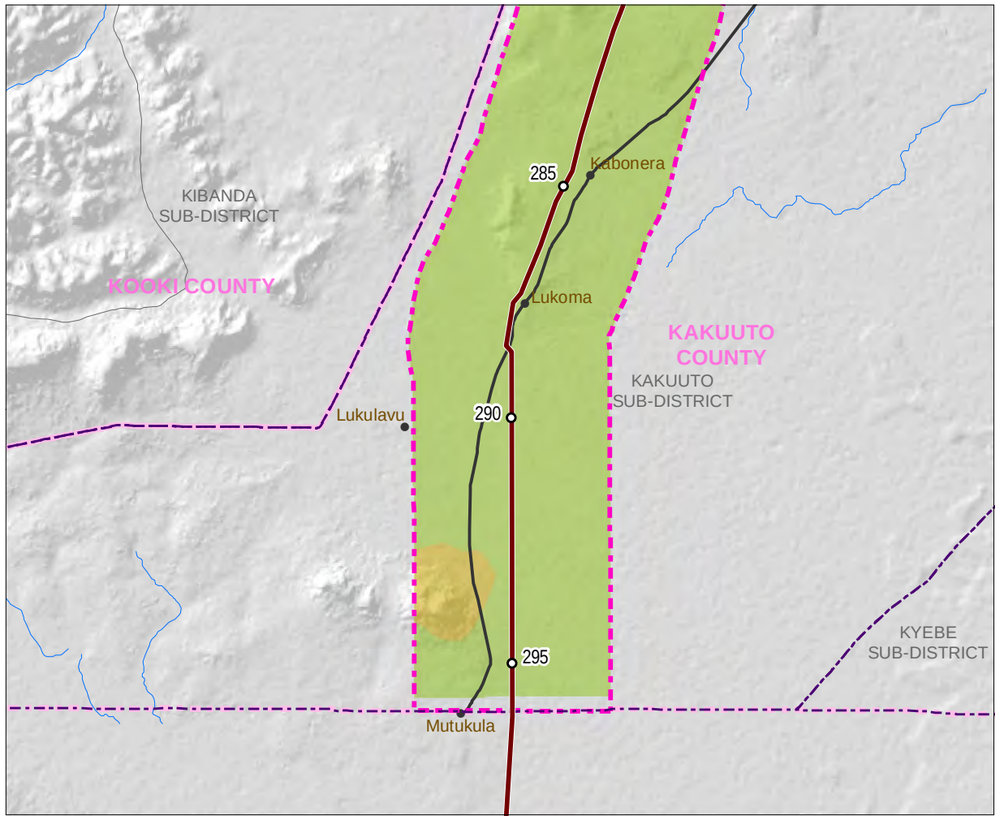
EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

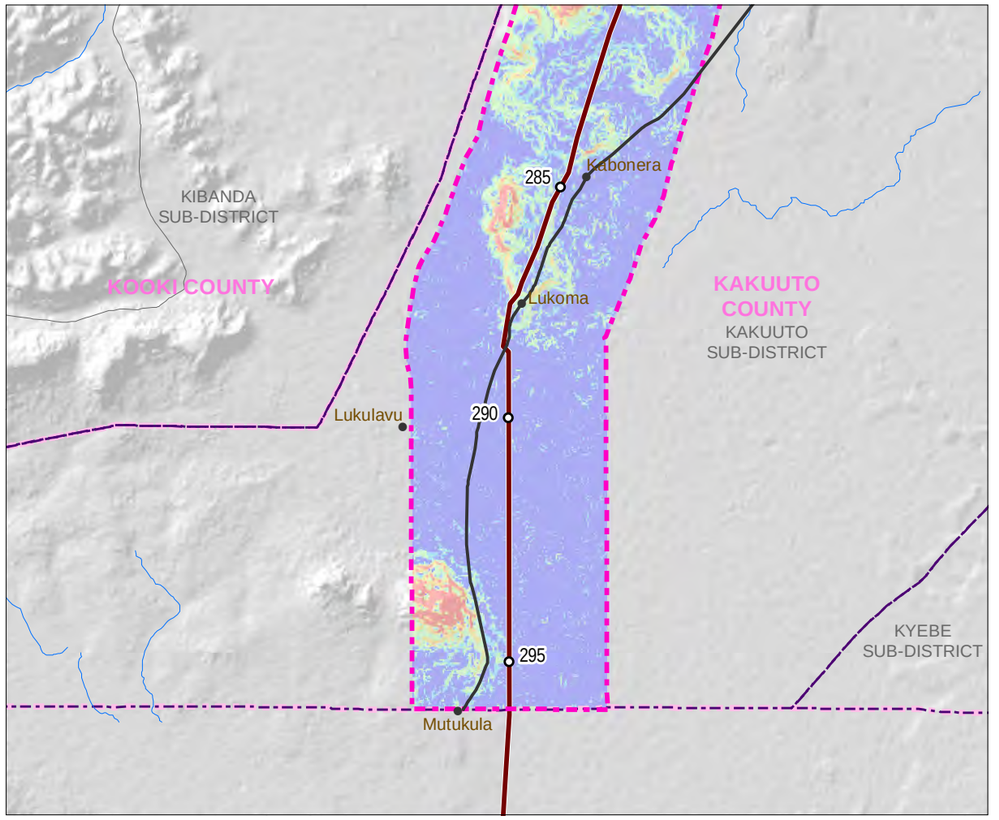
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

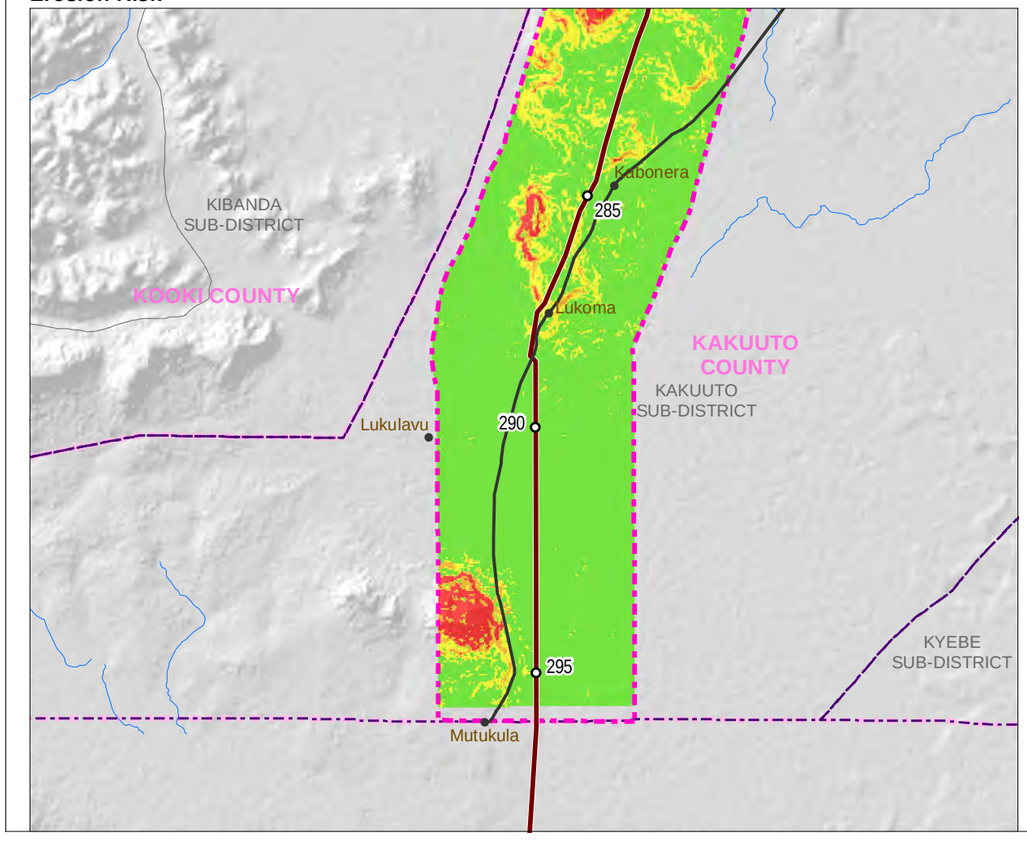
Soil Texture



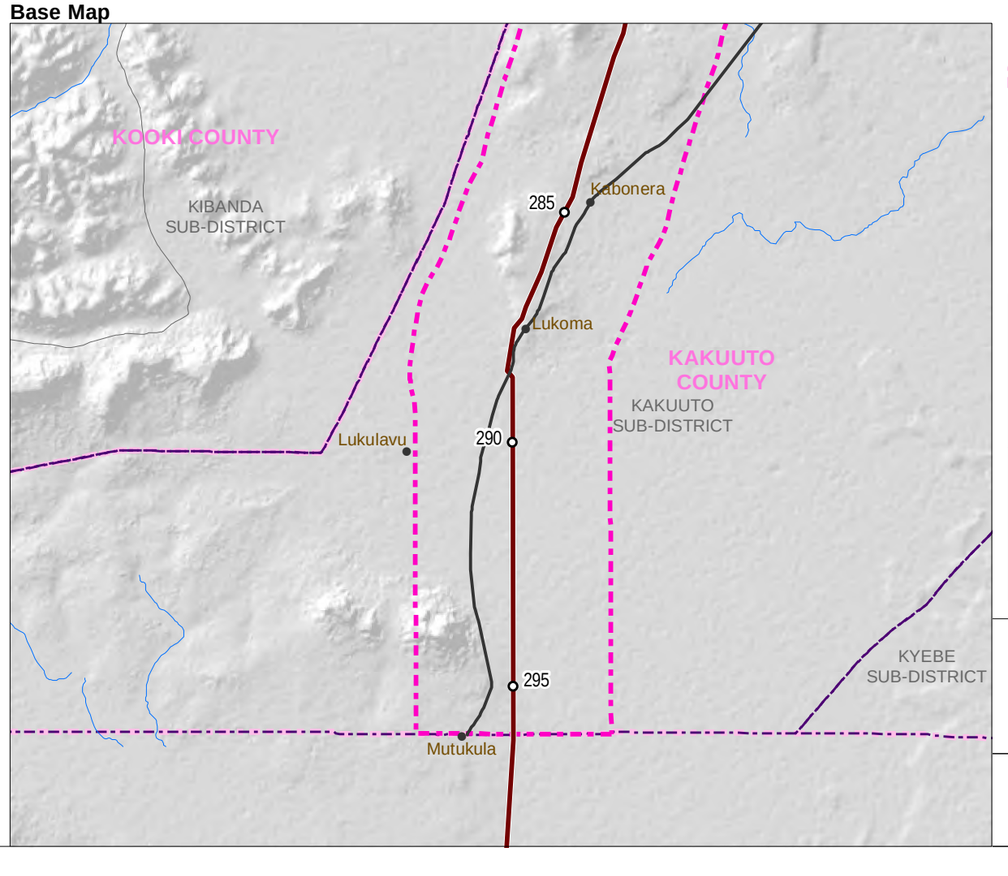
Slope



Erosion Risk



Base Map



Legend

- **East African Crude Oil Pipeline**
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- Kilometre Point
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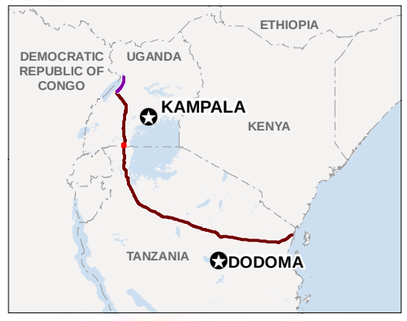

EAST AFRICAN CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:125,000 @ A3

N
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-010[C].mxd

ATTACHMENT G1.2 GIS SURVEY DATA

Table AttG1.2-1 GIS Soil Layers with Texture

Predominant Soil Types along Pipeline (FAO)	Description of Soil Type	Texture
Acric Ferralsol	Good physical properties, poor fertility, less susceptible to erosion than most other intensely weathered tropical soils. Dominated by low-activity iron-rich clays	Medium
Arenosol	Deep sandy soil, sometimes calcareous, low water and nutrient storage capacity	Sandy
Calcisol	Calcareous, mostly alluvial, colluvial and aeolian deposits, occasionally salt affected	Calcareous
Dystric Regosol	Weakly developed, fine grained, extensive on eroded land	Sandy
Gleyic Arenosol	Deep sandy soil, sometimes calcareous, low water and nutrient storage capacity. Wet	Sandy
Gleysol	Saturated, heavy clay or silt. Ecologically valuable	Heavy
Histosol	Organic peaty, swamp forest soil, fragile, nutrient rich	Organic
Leptosol	Coarse and thin, probably gravely, maybe thin layer of peat. Common on slopes. Can be fertile but prone to erosion.	Sandy
Lixic Ferralsol	Good physical properties, poor fertility, less susceptible to erosion than most other intensely weathered tropical soil types. Dominated by low-activity iron-rich clay.	Medium
Luvisol	Higher clay content in subsoil than topsoil. Podzolic. Common on flat or gently sloping land. Fertile, high silt content and prone to erosion on slopes.	Medium

Table AttG1.2-1 GIS Soil Layers with Texture

Predominant Soil Types along Pipeline (FAO)	Description of Soil Type	Texture
Nitisol	Deep, well-drained, red tropical soil with at least 30% clay and moderate to strong angular blocky structure. Rich in iron. Very productive land	Medium
Petric Plinthosol (Acric)	Iron rich, humus poor, kaolinitic clay, strongly cemented	Heavy
Planosol	Periodically waterlogged, coarse topsoil over dense slowly permeable clay subsoil. Medium fertility	Medium

ATTACHMENT G1.3 SOIL SURVEY DATA

Sampling Point (KP)	Published Soil Type (Description and FAO Classification)	Field Description and Classification	Brief Description of Soil Type and Probable Classes According to WRB (FAO 2014)	Classification of Soil for Risk
0 (PS1)	Reddish and reddish brown gritty clay loam. Acric Ferralsol	All the three horizons had dark reddish brown soil with distinct indurations in the lower two horizons. Petric Plinthosol	All the three horizons had dark reddish brown (5YR 2.5/2) soil with distinct indurations in the lower two horizons (plinthic material). Granular structure in the A and B2 horizon and sub-angular blocky structure in the B1 horizon. Soil displays typical characteristic of Petric Plinthosol.	HEAVY Plinthite is a Fe-rich (in some cases also Mn-rich), humus-poor mixture of kaolinitic clay
20	Yellowish-red clay loam occasionally shallow over phyllite. Dystric Regosol	Dark brown clay loam horizon sitting on red clay loam horizon. Rhodic Ferralsol	Dark brown (7.5YR 3/2) clay loam horizon from 0 to 20 cm sitting on red (2.5YR 4/6) clay loam horizon extending from 20 and beyond the depth of 70 cm. All the horizons had sub-angular blocky structure with strong microstructure development. Rhodic Ferralsol	MEDIUM Parent material: unconsolidated, generally fine-grained material.
40 (MYCP1)	Dark brown sandy loam over dark grey clay. Gleysol	Dark grey loamy sand overlying dark brown loamy sand and brown sand. Arenic Arenosol	Dark grey (7.5YR 3/1) loamy sand with clod structure from 0 to 15 cm over dark brown (7.5YR 3/2) loamy sand from 15 to 60 cm and a brown (7.5YR 5/4) sandy texture from 60 cm extending beyond 90 cm depth. The above two horizons were sitting over a brown sandy horizon with clod structure. The soil expresses arenic properties with some gleyic properties in the Bg subsurface horizon. The arenic properties were expressed in A and B horizons. Field classification is given as Arenic Gleysol	SANDY
60	Red gravelly loam underlain with soft laterite. Acric Ferralsol	Black sandy clay loam over yellowish red silty clay loam. Most likely Ferralsol	Deeply weathered soil with black (5YR 2.5/1) well-drained sandy clay loam with granular structure in the first 0–30 cm and yellowish brown (5YR 4/6) in the B-horizon extending from 30 cm and beyond the depth of 100 cm. Field classification given as Ferralsol.	MEDIUM

Sampling Point (KP)	Published Soil Type (Description and FAO Classification)	Field Description and Classification	Brief Description of Soil Type and Probable Classes According to WRB (FAO 2014)	Classification of Soil for Risk
80	Red sandy clay loam with relic murram. Acric Ferralsol	Dark reddish brown clay loam in both horizons. Rhodic Nitisol	Deep dark reddish brown (2.5YR 3/3) in the top 0–20 cm and (2.5YR 3/4) in the subsurface horizon having strongly developed natty structures with clay loam texture, which is typical of Rhodic Nitisol.	MEDIUM
100	Red sandy clay loam with relic murram. Acric Ferralsol	Gravelly sandy loam soil underlain by gravelly sandy clay loam. Skeletic Leptosol	Very gravelly sandy loam in the top 0–20 cm over gravelly sandy clay loam having more than 70% by volume of coarse fragments starting at a depth of 20 cm and extends beyond 70 cm, which is typical of Skeletic Leptosol	SANDY Parent material: various kinds of continuous rock or unconsolidated materials with less than 20% (by volume) fine earth
126 (MYCP2)	Red gravelly loam underlain by soft laterite. Acric Ferralsol	Very dark grey horizon overlying greenish black horizon. Gleysol	Very dark grey (7.5YR 3/1) sandy clay loam with strong brown mottles (7.5YR 4/6) with observable Fe and Mn concretions on the top 0–40 cm overlying greenish black (GLEY1 2.5/1) gleyed sandy clay and olive brown mottles in the Bg horizon. Strong brown mottles in the A horizon. Field classification given as Gleysol	SANDY
160	Brown gravelly loam. Acric Ferralsol	Very dark grey horizon overlying dark reddish brown horizon. Gleysol	Very dark grey (7.5YR 3/1) sandy clay loam with strong brown mottles (7.5YR 4/6) with observable Fe and Mn concretions on the top 0–30 cm overlying dark reddish brown (10YR 4/4) gleyed sandy clay in the Bg horizon starting within 30 cm and going beyond the depth of 80 cm. Field classification given as Gleysol	SANDY
180 (PS2)	Pale yellow fine sand, yellowish red gravelly loam. Gleyic Arenosols	Very dark grey horizon overlying greenish black horizon. Gleysol	Very dark grey (7.5YR 3/1) sandy clay loam overlying greenish black (GLEY1 2.5/1) sandy clay horizon. Strong brown mottles in the A horizon and gleying in the Bg horizon. Field classification given as Gleysol.	SANDY

Sampling Point (KP)	Published Soil Type (Description and FAO Classification)	Field Description and Classification	Brief Description of Soil Type and Probable Classes According to WRB (FAO 2014)	Classification of Soil for Risk
200	Pale yellow fine sand, yellowish red gravelly loam. Gleyic Arenosol	Very dark grey sandy clay loam horizon overlying grey sandy clay horizon. Gleysol	Very dark grey (5YR 3/1) sandy clay loam horizon overlying grey (7.5YR 5/1) sandy clay horizon with blocky structure having brown mottles (7.5YR 4/4). Field classification given as Gleysol	SANDY
220	Pale yellow fine sand, yellowish red gravelly loam. Gleyic Arenosol	Dark reddish brown sandy clay loam horizon overlying yellowish red sandy clay loam horizon. Haplic Ferralsol	Dark reddish brown (5YR 3/2) sandy clay loam horizon in the top 0–20 cm overlying yellowish red (5YR 4/6) sandy clay loam horizon. All the horizons had sub-angular blocky structure. Field classification given as an Haplic Ferrasol.	SANDY
240	Reddish brown clay loam. Acric Ferralsol	Very dark grey sandy clay loam horizon overlying strong brown silty clay horizon. Gleysol	Very dark grey sandy clay loam horizon overlying strong brown silty clay horizon. All the horizons had angular blocky structure. Field classification given as Gleysol.	MEDIUM
260	Reddish brown clay loam. Acric Ferralsol	Very dark grey sandy clay loam horizon overlying strong brown silty clay horizon. Gleysol	Very dark grey (7.5YR 3/1) sandy clay loam horizon on the top 0–25 cm overlying a partly gleyed silty clay horizon extending beyond 100 cm depth showing strong brown (7.5YR 5/6). The Ap and Bg horizons have angular-blocky and blocky structures respectively. Field classification given as Gleysol	MEDIUM
288 (MCPY4)	Yellowish red loam underlain by soft laterite. Acric Ferralsols	Dark grey loamy sand overlying 3 sandy horizons, all with sand and in light brownish grey, white and yellow respectively with increase in depth. Fluvic Arenosol	Dark grey (10YR 3/1) loamy sand in the top 0–20 cm overlying 3 deeper sandy textured horizons showing clear stratifications, all with sand and in light brownish grey (10YR 6/2), white (10YR 8/1) and yellow (10YR 7/6) respectively with increased depth. All the horizons consist of single grain structures. Field classification given as Fluvic Arenosol	SANDY Arenosol comprises deep sandy soils.

Appendix G2: Acoustic Impact Assessment

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
dB	decibel
dB(A)	A-weighted Decibel
dB(lin)	zero or flat weighted decibel
hr	hour
km	kilometre
kgm^{-2}	kilograms per square metre
$L_{eq(T)}$	The sound level in decibels equivalent to the total sound energy measured over a stated period of time. T is over a general period of time where a number illustrates a specific averaging or measurement period (typically $L_{eq,1hr}$).
$L_{90(T)}$	The noise level exceeded for 90% of the time of the measurement duration. Often taken to represent the ambient or background noise level. For time (T) see $L_{eq,(T)}$.
$L_{10(T)}$	The noise level exceeded for 10% of the time of the measurement duration. Often taken to represent traffic related noise. For time (T) see $L_{eq,(T)}$.
L_{max}	root mean squared maximum level of a noise source or given environment.
L_w	sound power level
L_P	sound pressure level
m	metre
mm	millimetre
min	minute
mms^{-1}	millimetre per second
A	
A-weighting	‘A’ weighting is standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. At low and high frequencies, the human ear is not very sensitive, but between 500 Hz and 6 kHz the ear is much more sensitive.
AOI	area of influence
AGI	aboveground installation
B	
blasting	assumed use of charges less than 5 kg for the purpose of this project
L	
linear weighting (zero weighting or flat weighting)	‘l’ or ‘z’ or ‘0’ sound level meter frequency weighting, flat over a frequency range that must be stated. No weighting is applied.

M	
masl	metres above sea level
MCPY	main camp and pipe yard
MIC	maximum instantaneous charge
micro-blasting	assumed use of charges less than 1 kg for the purpose of this project
O	
overpressure	overpressure (or blast overpressure or air overpressure) is the pressure caused by a shock wave over and above normal atmospheric pressure.
octas	unit of measurement used to describe the amount of cloud cover at any given location. Ranging from 0 to 8
P	
PES	project environmental standards
PS	pumping station
PRS	pressure reduction station
PY	pipe yard
R	
RoW	right-of-way
S	
surface density	calculated as mass per unit area
SLM	sound level meter

G2 ACOUSTIC IMPACT ASSESSMENT

G2.1 Introduction

This appendix presents the methodology, source data, predicted impacts and overview of considered mitigation for the valued environmental component (VEC) of acoustics across the Uganda export pipeline. It is intended to be technical in nature and provide the basis for the acoustics impact assessment (Section 8.10).

The appendix includes the following:

- assessment methodology, including:
  - the way assessment criteria have been derived
  - the method used to identify the area of influence (AOI) and sensitive receptors
  - an overview of the baseline noise section for context
  - source considerations
  - modelling and calculation parameters, methods and algorithms
- impact assessment
- mitigation considerations.

G2.2 Assessment Methodology

G2.2.1 Overview

The VEC has been separated into noise and vibration, and the impacts of these have been considered for the following project phases:

- construction of the pipeline; permanent aboveground installations (AGI), including pumping stations (PS), and construction facilities, including the main camp pipe yards (MCPY) and access roads. Construction also includes the operation of construction facilities and use of construction-specific access roads
- commissioning – pipeline pigging and hydrotesting
- operation of the AGIs, access roads
- decommissioning of the pipeline, AGIs, including removal and ground restoration.

Assumptions relating to noise and vibration source emission data, AGI and facility layouts, construction methodology and programmes are reported in Sections G2.2.6 and G2.2.7.

Noise and vibration sources from the project phases with the potential to cause disturbance were derived using field baseline measurements, manufacturer data, relevant standards and guidance, or experience of previous projects. The calculated source data has subsequently been predicted across the AOI.

The predictions have been used to identify the number of sensitive receptors exposed to project noise and vibration levels which are ranked as being significant in accordance with the project magnitude and sensitivity criteria. In addition, where

the predicted noise levels exceed the project environmental standards (PES) (derived from national standards), this is identified.

G2.2.2 Assessment Criteria

G2.2.2.1 Noise

The noise impact assessment criteria and derivation of significance scores (SS) are presented in Appendix D of the ESIA. Noise magnitude, significance criteria have been derived from relevant national and international standards (see Section 4 of the ESIA).

Some impact ranks are fixed for construction and operational noise, which means that there is little variance in the overall SS and the maximum possible score is limited. This is particularly relevant for construction noise where the duration is always 'short term' and impact extent is 'local'.

The national guidelines relevant to noise and vibration include The National Environment (Noise Standards and Control) Regulations, 2003. These cover aspects of operational and construction noise.

The national standards are derived from the World Health Organisation (WHO) Guidelines on Community Noise which in summary stipulate the following:

- maximum (L_{Amax}) of 45 dB (internal) for no more than 10–15 single instantaneous events during a night-time period to avoid sleep disturbance
- internal noise level of no more than 30 dB(A) $L_{eq,night}$ within a bedroom.

The WHO guidelines stress the importance of events as much as the 'steady' noise environment when determining impacts of noise on sleep disturbance. This is the reason for the maximum noise criterion. In addition to the national standards Section 1.7 of the IFC Environmental, Health, and Safety (EHS) Guidelines 'General EHS Guidelines: Environmental' on noise management sets out criteria for assessing noise (operational noise only). In simple terms there are two sets of criteria which should be met:

- noise impacts should not result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site, or
- exceed an upper limit shown in Table G2.2-1.

Table G2.2-1 International Finance Corportation Absolute Limits (Operational Noise - Internal)

Receptor	One Hour L_{Aeq}, dB	
	Daytime 07:00–22:00	Night time 22:00–07:00
Residential, Institutional and educations	55	45
Industrial and commercial	70	70

The IFC criteria are derived from background measurements, a summary of Uganda data is presented below with the equivalent derived IFC criteria.

Table G2.2-2 Uganda International Finance Corporation Criteria (Daytime - Internal)

	$L_{A90,1hr}$, dB (background)	Equivalent IFC, dB(A)
Highest recorded hour	54.7	55.0
Lowest recorded hour	28.7	31.7
Mean	35.5	38.5
Mode	32.0	35.0

Table G2.2-3 Uganda International Finance Corporation Criteria (Night Time - Internal)

	$L_{A90,1hr}$, dB (background)	Equivalent IFC, dB(A)
Highest recorded hour	47.4	45.0
Lowest recorded hour	26.1	29.1
Mean	38.9	41.9
Mode	47.0	45.0

The above standards are all based on an internal assessment and therefore for setting assessment criteria a factor needs to be applied to allow comparison with external predictions. For buildings with brick/stone walls, double glazed window units and insulated roof a worst-case attenuation for an open window is typically given as 10 dB. However, for the dwellings located across the AOI, this is considered an over estimation of potential building facade acoustic performance. Therefore, a level difference of 5 dB is considered a reasonable estimation of the building facade attenuation.

As the AGIs have the potential to operate with the same level of noise emission for 24 hours each day, the night-time criteria (or lowest daytime) is considered the determining factor and has been chosen for the design or compliance criteria.

A comparison of potential assessment criteria for dwellings (high sensitivity receptors) is summarised in Table G2.2-4, alongside the derived PES.

Table G2.2-4 Noise Criteria Summary (Lowest Average Operational)

Standard	Internal Criteria $L_{Aeq,T}$, dB	External Criteria $L_{Aeq,T}$, dB
National Standards	35	40
IFC (lowest mean day or night)	39	44
WHO	30	35
Assumed PES	**30**	**35**

In general practice, national standards and WHO guidelines take precedent over the IFC unless there is a significant variance in criteria. In this case, the IFC criteria is higher than WHO criteria. Therefore, for the operational assessment 35 dB(A) is set as the PES using the WHO criterion. Due to the relatively consistent nature of

the noise emissions from the AGIs the assessment of maximum noise events is not considered appropriate, hence the derivation of PES for an $L_{Aeq,T}$ rather than a L_{Amax}.

G2.2.2.2 Vibration

The vibration impact assessment criteria and derivation of SS are presented in Appendix D of the ESIA. In terms of magnitude, significance criteria have been derived from international standards (see Section 4 of the ESIA). A more cautious approach has been taken with regards to vibration, as the immediate consequences of higher magnitudes of vibration (including structural damage to buildings) have the potential to be more severe than noise. Therefore, where magnitude levels are close to a high or very high score, the worst case level is assumed to provide a more conservative approach. There are no Ugandan standards for vibration, however British Standard BS 5228:-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites Part 2:Vibration' has been used to derive the PES. This has been set at 15 mm/s PPV and is considered appropriate for buildings and structures identified across the AOI relating to transient construction activities. For heritage items a lower limit of 3 mm/s PPV has been identified, as referenced in German Standard DIN 4150–3:1999–02 Vibration in buildings—Part 3: effects on structures.

Blasting is not required for construction of the pipeline in Uganda.

G2.2.3 Area of Influence and Receptor Identification

G2.2.3.1 Area of Influence Boundary

AOIs apply to existing, planned new and upgraded construction access roads, PS1, PS2, MCPY1 to MCPY4 and the RoW.

The AOI for noise was set at a 500-m radius, based on review of engineering information and satellite images taking into consideration likely noise emission levels and to identify the location of potential receptors. The vibration AOI has been set to 50 m.

The planned pumping stations are permanent and will remain operational over the lifetime of the project, so the temporal AOIs will be approximately 25 years. For the temporary construction access roads and MCPYs, the temporal AOI is the period of construction.

G2.2.3.2 Study Area Boundary

The study area boundary for PS1 and PS2 is larger than the 500 m radius AOI, and is set at 1 km. This is because some impacts have the potential to be noticed beyond the AOI where environmental conditions assist with the propagation of sound or where the baseline environment is exceptionally quiet.

The study area boundary is the same as the AOI boundary for MCPY 1–4 and the construction access roads as the potential acoustic impacts will be negligible beyond the 500-m AOI.

G2.2.3.3Receptors

The project size and large quantity of receptors makes it impractical to predict noise levels at all potentially sensitive receptors within the AOI. Therefore, using the VEC-specific sensitivity and magnitude definitions and the results of the noise modelling and vibration calculations, the number of terrestrial sensitive receptors within magnitude bands has been identified.

Terrestrial receptors (i.e., habitable, religious, educational, and health care structures) have been from the GIS database. There will be occasions where a structure may be identified incorrectly. However, where uncertain, the assessment assumes the structure is a sensitive receptor.

G2.2.4 Baseline Noise Environment

A baseline noise survey has been undertaken through the acoustics AOI. The survey included daytime monitoring at 28 locations along the RoW and around the AGIs, including evening and night monitoring at 10 of these. Monitoring was for 1-hour samples to quantify the noise environment and sources of the measured levels were observed by field consultants. In addition, two 1-hour samples, a monitoring period of up to 24 hours was undertaken at location representative of receptors around PS1 and PS2.

Although the landscape and environment changes throughout the acoustics AOI, the noise sources are similar owing to the scarcity of fixed structures or substantial transport network. The main noise sources are:

- wind through vegetation
- insects, birds and amphibians
- traffic (with a higher proportion of small engine motorbikes, some cars and more trucks when close to sealed roads)
- human interactions
- farming (mostly hand tools, some livestock movements).

As a result, the noise environment across the acoustics AOI does not vary significantly and is consistent with levels expected in a rural environment away from major road networks, towns and industry. A summary of the range in noise levels across the acoustics AOI is presented in Table G2.2-5. The detailed baseline noise report is presented in Appendix A10.

Table G2.2-5 Summary of Baseline Noise Levels

Period	Noise Level Range, dB(A)	
	$L_{eq,1hr}$	$L_{90,1hr}$
Daytime	41.3–58.7	27.1–42.4
Night-time	34.5–52.8	26.1–47.0

The ranking magnitude criteria are derived from absolute noise limits specified in the in-country standards and relevant international standards, rather than being relative to existing noise levels. Therefore, the existing noise environment does not influence the magnitude criteria, but it can often be used to provide context for the

impact. The baseline noise across some AOIs is already above the PES for operational noise.

G2.2.5 Baseline Vibration Environment

The existing vibration environment has not been quantified and no discernible sources of vibration were observed during the field survey.

G2.2.6 Noise Source Considerations

G2.2.6.1 Construction

Construction activities have the potential to generate noise to a higher magnitude than operational sources, but the duration of construction emissions is often far shorter and usually restricted to the daytime.

The construction activities assessed as part of this study are presented in Table G2.2-6 also includes notes on the method used to assess each construction type, construction hours and general observations. Some activities include construction and operation, but are classed as a 'construction' related. For example, the MCPYs require construction and are then operated to allow the construction of a section of the pipeline.

Table G2.2-6 Construction Activities – Noise

Construction Activity[1]	Construction Hours[2]	Activities	Method of Calculation[3]	Method of Assessment	Temporal Use[5]
RoW	Standard	Earthworks including rock breaking/ripping Reinstatement	Generic	Construction criteria	<1 year
2 Pumping Stations	Standard	Earthworks including rock breaking/ripping Foundations Steelwork Prefabrication installation Mechanical and electrical (M&E) installation	Generic	Construction criteria	<2 year
4 MCPY (construction)	Standard	Earthworks including rock breaking/ripping Prefabrication installation M&E installation	Generic	Construction criteria	<1 year
4 MCPY (operation)	Standard	Power generation	Generic	Operational criteria[4]	1-5 years

Table G2.2-6 Construction Activities – Noise

Construction Activity[1]	Construction Hours[2]	Activities	Method of Calculation[3]	Method of Assessment	Temporal Use[5]
Access road construction. (impacts from use discussed in Section G2.2.6.5)	Standard	Earthworks	Generic	Construction criteria	<1 year

NOTES: [1] Construction of rather than operation, other than specified

[2] Relevant *The National Environment (Noise Standards and Control) Regulations 2003* do not specify daytime or night-time hours for construction although throughout daytime is referred to as 06:00-22:00, with night time classed as 22:00-06:00. However, under other international guidelines specific to Construction noise such as British Standard BS 5228 -1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites', standard construction hours are taken as Monday–Friday, 08:00–18:00, and Saturday 09:00–13:00. Therefore, for clarity standard hours will be in line with BS 5228. Extended hours for this document mean 24 hours a day potentially 7 days a week.

[3]Generic means the same noise emissions are expected across duplicate sites and the impacts can be assessed on a wider scale. Site specific means sites modelled and assessed on a site-by-site basis.

[4]Operational noise criteria is used for these to account for the extended nature of the construction exercise in a fixed location. Construction criteria allows for elevated levels over a shorter period of time but this is not the case for construction facilities such as the MCPY.

[5]Based on each site rather than the whole area, i.e., per 500-m section of RoW rather than the whole RoW

G2.2.6.2Commissioning

Through the commissioning phase, hydrostatic testing, pigging and cleaning, and drying pipe have the potential to generate high-magnitude noise.

Before hydrostatic testing, the pipeline will be gauged and cleaned by pigging, with associated generator and compressor noise. The pig launchers and receivers will be placed throughout the RoW. Each pigging exercise will typically last less than 24 hours.

Following pipe gauging and cleaning, the pipeline will be pressure tested using hydrostatic tests over 24 hours in 35–50-km segments. The noise associated with these tests will be from pumps, compressors and generators.

The pipeline will then be cleaned and dried using similar noise-emitting equipment as used for the initial pigging exercise.

The noise from each of these commissioning activities will be local and of short duration.

G2.2.6.3Operation

The operational noise sources from PS1 and PS2 will continue for approximately 25-years.

The layout and plant at PS1 and PS2 are considered the same for noise modelling. It is assumed that these facilities will operate, or have the potential to do so, for 24 hours a day, 7 days a week.

It is also assumed that, where high or very high sensitivity receptors are within 200 m of a permanent AGI, a 2-m high barrier, with a minimum surface density of 12 kg/m^2, will be installed around the perimeter of each installation.

Site layouts have been drafted by the design team with an indication of plant they will contain, although specific plant emission data has not yet been established. Therefore, assumptions for plant noise emissions have been made (see Section G2.2.7.6).

G2.2.6.4Decommissioning

The decommissioning and construction processes will be similar, but in reverse, and with cutting rather than welding plant, and excavators rather than trenchers. Similar to construction, the decommissioning plant have been identified and noise calculations undertaken to determine the likelihood of impact.

G2.2.6.5Traffic

Potential project traffic noise sources include construction traffic (moving plant and materials), workforce traffic (buses) and operational traffic (movements associated with pipeline and AGI maintenance). These will use existing, and new temporary and permanent roads. The RoW will also be used in some locations as a temporary access road. This section considers traffic noise associated with the pipeline and AGI construction and operation, rather than noise from the construction or upgrade of roads.

There is the potential for project traffic to change the noise environment in two ways, through:

- an increase in construction and operational traffic on existing roads
- new traffic noise source on new temporary and permanent roads.

Traffic data are not available for most roads through Uganda and therefore it is not possible to undertake a ‘typical’ quantitative noise assessment of existing roads. It is also difficult to assess the current conditions owing to the general surface, variance in gradients of roads used, high percentage of motorbikes, low flows[1] and variance in vehicle usage. In a similar way, the possible traffic use on new temporary and permanent roads is difficult to estimate accurately for assessment purposes. Therefore, a qualitative assessment has been undertaken to identify possible impacts.

The assessment of existing and new roads is based on the following theoretical principles (generic noise levels presented in Table G2.2-7). Many variables can affect traffic noise (as mentioned above), so these principles provide an indication of noise change rather than report absolute noise levels. The principles are:

[1] According to Calculation of Road Traffic Noise, low flows typical ranked as fewer than 200 vehicles in a single hour or fewer than 4000 per day.

- a 25% traffic increase is estimated to result in a 1 dB increase over existing traffic noise, with a 3 dB increase requiring a 100% increase in traffic flows
- an increase from 10% to 50% heavy goods vehicles (HGV), rather than light vehicles, in the traffic composition will increase noise by around 4 dB[2]
- an increase from 25% to 50% HGVs will result in a noise increase of approximately 2 dB.

Table G2.2-7 Construction Activities – Noise

Number of Truck Movements Per Hour	Distance between Road and Receptor				
	Corresponding $L_{eq,T}$, dB(A)				
	5 m	10 m	25 m	50 m	100 m
5	62	59	55	52	49
10	65	62	58	55	52
25	69	66	62	59	56

NOTES:

$$L_{Aeq,T} = L_{WA} - 33 + 10\log_{10}Q - 10\log_{10}V - 10\log_{10}d \quad \text{(F.6)}$$

where:

L_{WA} is the sound power level of the plant, in decibels (dB);

Q is the number of vehicles per hour;

V is the average vehicle speed, in kilometres per hour (km/h);

d is the distance of receiving position from the centre of haul road, in metres (m).

Truck Sound Power (L_w) =110 dB(A)

Vehicle speed average=30 kmh^{-1}

Angle of view = 180 degrees

The qualitative assessment for traffic noise includes the following assumptions:

- traffic on existing roads will not increase by more than 25%, but the composition of heavy vehicles will increase by up to 25% and therefore the increase in traffic noise is likely to be less than 3 dB based on theoretical principles above
- where a new permanent road is constructed within 100 m of high sensitivity receptors, the impacts will be ranked as significant
- where a new temporary road is constructed within 50 m of high sensitivity receptors, the impacts will be ranked as significant
- 90% of the project traffic will be in the daytime (06:00–22:00 as defined in national standards).

The qualitative assessment for construction traffic is presented in Section G2.3.1.5.

G2.2.6.6 Source Data

Source data for inclusion in noise models and calculations have been taken from manufacturers, international standards and engineering assumptions based on previous project experience. All input data have been agreed with the project engineers. Where assumptions in noise emissions for unknown plant are provided, these will become a design target for the detailed design and plant choice.

[2] Based on BS 5228:2009-1 Haul Road Calculation method.

The source input for the noise modelling/calculation exercise is summarised in Table G2.2-8.

Table G2.2-8 Noise Source Data

Activity	Input Data	Assumptions	Source of data
Construction/Decommissioning			
Pipeline	See Attachment G2.1 for construction plant list	Up to 1 month per kilometre of pipeline installation RoW works will be linear and transient Where multiple teams work on different sections, they will be spaced far enough so that there will be no noise increases associated with simultaneous working on the RoW.	Type and quantity of plant presented in EACOP Project Volumes and Quantities and Estimate[3]. Sound emission data taken from BS 5228:1 and manufacturer data. Operational percentage on-times assumptions made.
Two PSs		Construction period up to 18 months	
Four MCPY		Construction period up to 3 months	
Access roads (construction, not use)		Up to 2 weeks per kilometre of new road Haul road works will be linear and transient Where multiple teams work on different sections, they will be spaced far enough so that there will be no noise increases associated with simultaneous working on the access roads	
Access roads (use of by construction traffic)	No quantitative assessment	No quantitative assessment	No quantitative assessment

[3] EACOP Project Volumes and Quantities Estimate. Document No UT-MID-60-0010-000330 Rev00 Dated 13 Sept 2017

Table G2.2-8 Noise Source Data

Activity	Input Data	Assumptions	Source of data
Commissioning			
Pigging (gauging and cleaning)	Pig Launcher and pig receiver inclusive of compressor units, generators and pumps.	In absence of specific locations for launch and receivers, with exception of the PRSs, a generic assessment of the pigging activity has been undertaken Noise emission for pig launching is 68 dB(A) at 10 m (allowing for a single compressor, single generator and single pump, all screened with local barriers)	Project Engineers
Hydrostatic testing	Hydrostatic testing inclusive of compressor units, generators and pumps.	Testing to be undertaken at 35–50 km intervals, but the exact locations are not specified and the assessment will be in line with the pigging methodology Noise emission for pig launching is assumed at 68 dB(A) at 10 m (allowing for a single compressor, single generator and single pump, all screened with local barriers)	Project Engineers
Pipeline drying	Drying of pipeline following hydrostatic testing and cleaning.	Drying and cleaning to be undertaken at 35–50 km intervals, but the exact locations are not specified and assessment will be in line with the pigging methodology Noise emission for drying is assumed at 68 dB(A) at 10 m (allowing for a single compressor, single generator, single blower and single pump, all screened with local barriers)	Project Engineers

Table G2.2-8 Noise Source Data

Activity	Input Data	Assumptions	Source of data
Operation			
RoW	Operational noise from RoW not considered	Operational noise from RoW not considered	Operational noise from RoW not considered
Two Pumping Stations	See Attachment G2.3 for the EACOP HSE Studies – Noise Study Report[4]	Some source emissions are design assumptions at this stage with a target of 85 dB(A) at 1 m A 2-m high barrier surrounding the installation. Bulk oil heaters only at PS1 and PS2. A 2 m high barrier surrounding the installation.	Project Engineers
Four MCPY	4 x Aggreko 350 kVA generators with design to provide a sound pressure level of 80 dB(A) at 1 m. Layout as per Figure 2.3-9 in Section 2 Project Background and Description in the ESIA	3-m high noise wall located around generators at a distance of 2 m Free field noise level target of maximum 80 dB(A) at 1 m from generator enclosure 1 operating during the night, 3 during the day, 1 on standby Located centrally within the MCPY	Project Engineers
Roads (long term operation of new and existing roads. See Section G2.2.6.5 for further information)	No quantitative assessment	No quantitative assessment	No quantitative assessment

G2.2.6.7 General Exclusions and Assumptions

The noise sources with the potential to generate noise at a magnitude likely to be discernible above the existing environment beyond the site boundary are considered. Project components and equipment not assessed include:

- substations
- main line block valve stations
- tunnelling crossings under rail and road.

[4] EACOP HSE Studies – Noise Study Document No.UT-MID60-0010-000090

Impacts from noise and vibration generated by tunnelling for road and rail crossings will be minimal due to the localised and short-term nature. Entry and exit pits will not be piled and drill head will be below ground level. Therefore, it has not been included within the detailed assessment.

This report does not consider occupational health impacts associated with noise or vibration. All criteria, noise predictions and mitigation recommendations are specific to environmental and social impacts, including community impacts. It is acknowledged that some mitigation measures will also assist with protecting project workers although this is not the primary intent.

The occupants of workers camps have not been assessed quantitatively as these are specifically related to the project and given the common location of main camps and pipe yards will be exposed to noise from the facility itself. However, the mitigation measures do account for the occupants of these camps when layout is considered.

Concrete batch plants have been excluded from the assessment as they do not form part of the project.

G2.2.7 Vibration Source Considerations

G2.2.7.1 Construction

The greatest vibration risk is during construction, as many construction activities generate vibration. However, in most cases, vibration generation is largely imperceptible. Exceptions include high-impact compaction activities, rock breaking, blasting and piling, with the level of vibration dependent on the construction method, plant and energy component of the vibration source. The above activities, except for compaction, will be undertaken in small, discreet areas and not across the whole acoustics AOI. In addition, a low-impact compaction method is proposed for ground reinstatement along the RoW and therefore only the vibration sources in Table G2.2-9 are considered.

Table G2.2-9 Construction Activities - Vibration

Construction Phase	Activities
Pipeline	Rock breaking and rock ripping
Pumping stations	Rock breaking and rock ripping

All the activities are considered to be undertaken during daytime periods only.

In a similar way to the prediction and assessment of noise, the vibration levels from each of the above activities will be predicted using empirical formulae and the distances to which magnitude bands are exceeded presented. The number of sensitive structures within such bands is to be reported.

G2.2.7.2 Commissioning

No plant has been identified with the potential to generate vibration at a magnitude detectable beyond the site boundary. Therefore, vibration has not been predicted or assessed for the commissioning operational phase.

G2.2.7.3 Operation

No plant has been identified with the potential to generate vibration at a magnitude detectable beyond the site boundary. Therefore, vibration has not been predicted or assessed for the operational phase.

G2.2.7.4 Decommissioning

No plant has been identified with the potential to generate vibration at a magnitude detectable beyond the site boundary. Therefore, vibration has not been predicted or assessed for the commissioning phase. However, further investigation into the decommissioning plant should be undertaken towards the end of the project life.

G2.2.7.5 Traffic

The large number of existing and proposed unsealed roads to be used during the construction phase increases the potential for vibration induced damage to structures along these roads.

Unsealed roads are more susceptible to damage and deterioration (the creation of ruts, corrugations and potholes) compared with sealed roads. The movement of trucks and buses along the unsealed roads accelerates their deterioration and increases the potential for higher magnitude vibration events from uneven and abnormal load and axle movement.

Quantification of the vibration associated with such movements is dependent on many variables and is therefore not easily quantified. These variables include the:

- road condition
- road foundations
- geology between the road foundations and receptor
- distance between the receptor and road
- vehicle speed
- vehicle weight
- load (the weight distribution across the vehicle, and whether the load is loose or fixed)
- tyre condition
- receptor structure condition
- number of vehicles.

Therefore, a qualitative assessment has been undertaken (see Section G2.4.1.4) taking into account the mitigation measures to be embedded in the construction management plans. These measures will include speed restrictions, sympathetic routing, regular road maintenance, load management and vehicle maintenance.

The above impacts could be noticed during the operation of the pipeline, but the risk is significantly reduced owing to the exceptionally low and intermittent nature of expected vehicle movements during the operational phase compared with the construction phase. Smaller vehicles are also likely to be used. Vibration from operational vehicle movements has therefore been discounted from the assessment.

G2.2.7.6Source Data

The vibration emission levels generated through the construction phase have largely been calculated using empirical formulae, based on plant data provided by project engineers. Where data are unavailable, file data from RSK measurements of similar activities have been used to provide an indication of the impacts. However, these data should be reviewed and refined once specific methods are identified.

The source input for the noise modelling/calculation exercise is summarised in Table G2.2-10.

Table G2.2-10 Vibration Source Data (Construction Only)

Construction Phase	Activity	Input Data	Assumptions	Source of data
RoW	Rock breaking and rock ripping	See Attachment G2.4	Excavator rock breaker or ripper	EACOP approved assumption
Pumping stations	Rock breaking and rock ripping	See Attachment G2.4	Excavator rock breaker or ripper	EACOP approved assumption

G2.2.8 Modelling and Calculation Methodology

The parameters and assumptions for noise modelling and general calculations are presented in Table G2.2-11, Table G2.2-12 and Table G2.2-13 for construction noise, operational noise and construction vibration, respectively. The data source for the noise model and project calculations has been discussed in Sections G2.2.6.6 and G2.2.7.6.

To determine the propagation of noise from the different project phases, a computer noise model has been produced using Soundplan v7.4 software.

For operational noise modelling and calculations, the noise predictions are based on International Standard ISO 9613-2:1996 ‘Attenuation of sound during propagation outdoors – general method of calculation’. ISO 9613 provides a method for the prediction of noise levels in the community from sources of known sound emission.

The noise prediction method described in ISO 9613 is suitable for a wide range of engineering applications where the outdoor noise level is of interest. The noise source(s) may be moving or stationary and the method considers the following major noise-attenuation mechanisms:

- geometrical divergence (also known as distance loss or geometric damping)
- atmospheric absorption
- ground effect
- reflection from surfaces
- screening by obstacles and buildings.

The ISO 9613 method predicts noise levels under meteorological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion as commonly occurs at night.

For construction noise modelling and calculations, the predictions are based on British Standard BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites-Part 1'. In a similar way to ISO9613, the BS 5228 calculation method takes account of environmental variables.

Table G2.2-11 Noise Model Parameters – Construction, Commissioning and Decommissioning

Item	Setting/Information
Algorithms	British Standard BS 5228 -1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites-Part 1 Noise'
Ground Absorption	Acoustically hard (assumed 0.1 coefficient) – roads, water, pavements and hard standing areas; Acoustically soft (assumed 0.8 coefficient) – grassed areas, vegetation;
Meteorological Conditions	28 degrees Celsius 70% humidity Wind from source to receiver
Façade Corrections	No corrections applied with all predictions classed as free-field
Receptor Height	All at 1.5 m above ground as assumed single storey properties
Source Modelling/Calculations	Construction Plant lists derived from project description (see Section G2.2.6.6 and Attachment G2.1). Plant lists assume a percentage operating time and modelled/calculated in a way so that the highest $L_{eq,T}$ is predicted for all receptors, i.e. assuming worst case. **RoW** – Spreadsheet calculations using BS 5228 algorithm to predict highest $L_{eq,T}$ from the works. As works are linear these predictions are used to identify sensitive receptor numbers within the magnitude criteria bands. **PSs**– Noise calculations at a single installation. As the components of the pumping station construction phases are consistent across all project pumping stations, noise predictions for one station have been made and applied across the other stations. As the construction activities are varied, mobile and not time constant the noise emission data is applied across the pumping station site extents which allow the worst case noise levels to be predicted. **MCPY (construction)** – as for PSs **MCPY (operation)** – Noise modelling rather than simple calculations, otherwise same method as PSs
Traffic Information	Not assessed quantitatively
Terrain and source height	All sources from a construction perspective are averaged at a height of 1.5 m aboveground. Terrain used in modelling and calculations is set to be flat.

Table G2.2-11 Noise Model Parameters – Construction, Commissioning and Decommissioning

Item	Setting/Information
Barriers	Noise barriers to a height of 2 m have been included around the pipe yards. Localised 3-m-high barriers around MCPY generators and generators across the project.
Site Layout	Indicative site layouts for all temporary and permanent AGIs and camps provided by EACOP and used for the purpose of modelling.

Table G2.2-12 Noise Model Parameters – Operational

Item	Setting/Information
Algorithms	Source noise - ISO 9613-2:1996 'Attenuation of sound during propagation outdoors – general method of calculation'
Ground Absorption	Acoustically hard (assumed 0.1 coefficient) – roads, water, pavements and hard standing areas; Acoustically soft (assumed 0.9 coefficient) – grassed areas, vegetation;
Meteorological Conditions	28 degrees Celsius 70% humidity Wind from source to receiver
Façade Corrections	No corrections applied with all predictions classed as free-field
Receptor Height	All at 1.5 m above ground as assumed single storey properties
Source Modelling/Calculations	Operational plant noise emission data is presented in Section G2.2.6.6 **RoW** – no operational noise predictions **PSs**– Noise modelling at a single installation. As the components of the pumping station operational phase and layout are consistent across all project pumping stations, noise predictions for one station have been made and applied across the other stations. The predictions will be used to identify sensitive receptor numbers within the magnitude criteria bands
Traffic Information	Not assessed quantitatively
Terrain and source height	All sources from an operational perspective are averaged at a height of 1.5 m aboveground. Terrain used in modelling and calculations is set to be flat. Assuming worst case and always clear line of sight between receptor and source.
Barriers	2 m high barriers have been included as imbedded mitigation around pumping stations. These have a minimum surface density of 12 kgm^{-2}.
Site Layout	Indicative site layouts for all permanent AGIs and camps provided by EACOP and used for modelling.

Table G2.2-13 Vibration Calculation Parameters – Construction Only

Item		Setting/Information
RoW	Rock breaking and ripping	See Section G2.2.7.1
Pumping stations	Rock breaking and ripping	See Section G2.2.7.1

G2.3 Noise Impact Assessment

The noise associated with each project phase has been predicted through specific computational noise modelling software or spreadsheet calculations (see above methodologies). The predictions have been used to identify the number of sensitive receptors within magnitude bands. The overall impact (SS) at each of these receptors has then been calculated using the predictions (see Section G2.2.2.1). These tables report the highest SS for any phase and activity, and the number of receptors exposed to that SS.

The following impact assessments are based on noise predictions for the worst case, with plant operating simultaneously at the same location (with closest separation distance between a work site extent and receptor). In reality, this scenario will occur infrequently and for short durations.

Many scores are not dependent on location, but fixed as a definition of the works. For example, all linear works for the RoW are less than 1 year in duration when considered in sections, therefore resulting in a 1-point duration score. Likewise, the impact score will always be 2 as the impact will be on the local community only. No VEC ‘very high sensitivity’ receptors have been identified within 100 m of the RoW or AGIs, therefore the highest sensitivity ranking for receptors is 4. For this reason the only varying factor is magnitude and this changes with distance from the work or operational areas depending on noise emissions. The scores for the ‘duration’ (D), ‘sensitivity’ (S), and ‘extent’ (E) impacts are defined under each impact assessment table (see below). This means that the highest SS are similar across phases and activities. This is a consequence of the mathematics and not an error. This is the same for noise predictions across the AOI where the ranges in noise are similar given the similarity in plant.

The highest SS is presented in the tables, with the number of receptors exposed to the impact and the magnitude responsible for the impact. The measured baseline noise levels are provided below the tables for reference.

G2.3.1 Construction

See Appendix D for the tables used to rank magnitude, duration, extent and sensitivity, and to calculate SS. The distance at which magnitude criteria is exceeded for each activity is presented in Attachment G2.5.

G2.3.1.1 Pipeline

Table G2.3-1 shows the impact assessment for the construction of the pipeline prior to mitigation.

Table G2.3-1 Construction of Right-of-Way – Impact Assessment Prior to Mitigation

Activity	Period	Highest SS	Magnitude Score	Number of Receptors with Highest SS Prior to Mitigation	Significant Impact Prior to Mitigation (i.e. Greater than 19 SS)
Clearing and Grubbing	Day	17	Very large	296	Not significant
Camp/Site Establishment	Day	17	Very large	232	Not significant
Road Construction	Day	17	Very large	296	Not significant
General Earthworks	Day	17	Very large	296	Not significant
Trenching	Day	17	Very large	296	Not significant
Pipe Laying/Installation	Day	17	Very large	354	Not significant
Backfilling/Reinstatement	Day	17	Very large	296	Not significant
Rock breaking	Day	17	Very large	368	Not significant

NOTES:

For the Noise VEC RoW has the following fixed impacts scores defined:

D = 1 point, E = 2 points, S = 4 points

RoW AOI baseline noise levels (Monitoring point UG1-UG28) – Daytime 40.3-58.7 dB(A) $L_{eq,\ 1hr}$, 27.1-42.4 dB(A) $L_{90,\ 1hr}$

Noise levels are predicted to range from 50–70 dB(A) $L_{Aeq,T}$ throughout the AOI prior to mitigation for works associated with pipeline construction. These levels are higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline $L_{A90.}$

During pipeline construction along the RoW, the noise levels from some activities have the potential to exceed the ‘very large’ magnitude ranking at receptors classed as ‘high sensitivity’. However, the highest SS is 17 and therefore not ranked as significant prior to mitigation. In addition, the linear and transient nature of the of the pipeline works means that the exposure time to the highest levels at individual receptors will be short and far less than the lowest duration raking of 1 year. The highest noise levels are likely to be experienced for up to a week when the works are undertaken at the closest separation distance to receptors.

No PES exceedances are noted.

G2.3.1.2Pumping Stations

Table G2.3-2 and Table G2.3-3 show the impact assessment for the construction of PS1 and PS2 prior to mitigation respectively.

Table G2.3-2 Construction of PS1 – Impact Assessment Prior to Mitigation

Activity	Period	Highest SS	Magnitude Score	Number of Receptors with Highest SS Prior to Mitigation	Significant Impact Prior to Mitigation (i.e. Greater than 19 SS)
Clearing and Grubbing	Day	17	Very large	13	Not significant
General Earthworks	Day	17	Very large	13	Not significant
Concrete Foundations	Day	17	Very large	16	Not significant
Steel and Formwork	Day	17	Very large	16	Not significant
M&E Installation	Day	17	Very large	8	Not significant
Rock Breaking	Day	17	Very large	21	Not significant

NOTES:

For the Noise VEC PS1 has the following fixed impacts scores defined:

D = 1 point, E = 2 points, S = 4 points

PS1 AOI baseline noise levels (Monitoring point UG1) – Daytime 40.1–55.6 dB(A) $L_{eq,\ 1hr}$, 32.2–54.7 dB(A) $L_{90,\ 1hr}$

Table G2.3-3 Construction of PS2 – Impact Assessment Prior to Mitigation

Activity	Period	Highest SS	Magnitude Score	Number of Receptors with Highest SS Prior to Mitigation	Significant Impact Prior to Mitigation (i.e. Greater than 19 SS)
Clearing and Grubbing	Day	17	Very large	16	Not significant
General Earthworks	Day	17	Very large	16	Not significant
Concrete Foundations	Day	17	Very large	20	Not significant
Steel and Formwork	Day	17	Very large	20	Not significant
M&E Installation	Day	17	Very large	11	Not significant
Rock Breaking	Day	17	Very large	23	Not significant

NOTES:

For the Noise VEC PS2 has the following fixed impacts scores defined:

D = 1 point, E = 2 points, S = 4 points

PS2 AOI baseline noise levels (Monitoring point UG14 and UG15) – Daytime 41.3-53.0 dB(A) $L_{eq,\ 1hr}$, 28.7-44.6 dB(A) $L_{90,\ 1hr}$

Noise levels are predicted to range from 50–75 dB(A) $L_{Aeq,T}$ throughout the PS AOIs during construction prior to mitigation. Levels are mostly higher than the existing

ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}.

During PS construction, the noise levels from some activities have the potential to exceed the 'very large' magnitude ranking at receptors classed as 'high sensitivity'. However, the highest SS is 17 and therefore not ranked as significant prior to mitigation. A permanent 2-m high boundary fence (embedded for operation) will be installed at an early phase in the construction project to provide noise reduction.

No PES exceedances are noted.

G2.3.1.3Main Camp Pipe Yards

Table G2.3-4 Construction of Main Camps and Pipe Yards – Sensitivity Points Prior to Mitigation

Phase	Activity	Period	Highest SS	Magnitude Score	Number of Receptors with Highest SS Prior to Mitigation	Significant Impact Prior to Mitigation (i.e. Greater than 19 SS)
MCPY-1	Clearing and Grubbing	Day	17	Very large	18	Not significant
MCPY-1	General Earthworks	Day	17	Very large	18	Not significant
MCPY-1	Prefabrication Installation	Day	17	Very large	6	Not significant
MCPY-1	M&E Installation	Day	17	Very large	15	Not significant
MCPY-1	Operation	Day	18	Very large	18	Not significant
MCPY-2	Clearing and Grubbing	Day	17	Very large	21	Not significant
MCPY-2	General Earthworks	Day	17	Very large	21	Not significant
MCPY-2	Prefabrication Installation	Day	17	Very large	6	Not significant
MCPY-2	M&E Installation	Day	17	Very large	16	Not significant
MCPY-2	Operation	Day	18	Very large	21	Not significant
MCPY-3	Clearing and Grubbing	Day	17	Very large	16	Not significant
MCPY-3	General Earthworks	Day	17	Very large	16	Not significant
MCPY-3	Prefabrication Installation	Day	17	Very large	3	Not significant
MCPY-3	M&E Installation	Day	17	Very large	14	Not significant
MCPY-3	Operation	Day	18	Very large	16	Not significant
MCPY-4	Clearing and Grubbing	Day	9	Negligible	0	Not significant
MCPY-4	General Earthworks	Day	9	Negligible	0	Not significant
MCPY-4	Prefabrication Installation	Day	9	Negligible	0	Not significant
MCPY-4	M&E Installation	Day	9	Negligible	0	Not significant
MCPY-4	Operation	Day	10	Negligible	0	Not significant

NOTES: For the Noise VEC MCPY has the following fixed impacts scores defined:0. D = 1 point for operation and 2 points for other activities, E = 2 points, S = 4 points
MCPY AOI baseline noise levels (Monitoring point UG3, UG27, UG18 and UG28) – Daytime 44.6-54.8 dB(A) $L_{eq,1hr}$, 33.1-40.6 dB(A) $L_{90,1hr}$

Noise levels are predicted to range between 50 dB(A) and 75 dB(A) $L_{Aeq,T}$ throughout the main camp pipe yards AGIs prior to mitigation. When compared with the baseline noise environment levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline $L_{A90.}$

During the construction of the MCPYs the noise levels from some activities have the potential to exceed the 'large' magnitude ranking at receptors classed as 'high sensitivity'. However, accounting for pre-mitigated design (i.e., the 2 m high boundary fence which will be installed at an early phase in the construction), the highest SS is 17 and therefore not ranked as significant prior to mitigation.

During the operation of the MCPYs noise levels are predicted to range between 40 dB(A) and 65 dB(A) $L_{Aeq,T}$ throughout the main camp pipe yards AGIs prior to mitigation. When compared with the baseline noise environment levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline $L_{A90.}$

No PES exceedances are noted during construction or operation of the MCPYs.

G2.3.1.4Decommissioning

Noise associated with the decommissioning phase is likely to closely resemble the predictions and impacts from the construction phase and therefore no further assessment has been undertaken at this stage.

G2.3.1.5Traffic

There is the potential for project traffic to change the noise environment in two ways, through:

- an increase in construction and operational traffic on existing roads
- new traffic noise source on new temporary and permanent roads.

Traffic data for the majority of the roads through Uganda is not available and therefore it is impractical to undertake a 'typical' quantitative noise assessment of existing roads. As a result, a generic assessment has been undertaken for road upgrades and the use by construction traffic of new permanent roads and using the general principles for traffic noise presented in Section G2.2.6.5. This covers the roads associated with the AGIs and construction facilities for the construction phase only.

Table G2.3-5 shows the potential change in noise level prior to mitigation as a result of construction traffic on existing roads. This looks beyond the existing road upgrades and assumes that construction traffic will use the wider road network.

The significance scoring for impact is fixed in certain categories. See notes below the tables for assumed scores. For the extent (E) score, to account for impacts across the wider road network, a level of 3 (sub-national) has been assumed as there is the potential for changes in traffic flows beyond the area around the construction works. Although the changes in traffic noise further afield are much less than local changes (i.e., magnitude impacts will be much smaller), a change is still possible.

Table G2.3-6 presents the potential impacts from new road use before mitigation.

Table G2.3-5 Existing Road Use – Potential Impacts Prior to Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Prior to Mitigation
Permanent Facilities (AGIs)							
PS1	Local	47.9	Approximately 450 trucks. Max 10 movements in any single hour across a road segment. No night movements.	3	Most sensitive will notice	14	Not significant
	Area	58.7	Approximately 50 trucks. No more than 2 trucks along a road segment in a single hour.	<1	Imperceptible	13	Not significant
PS2	Local	52.8	Approximately 450 trucks. Max 10 movements in any single hour across a road segment. No night movements.	3	Most sensitive will notice	14	Not significant
	Area	58.7	Approximately 50 trucks. No more than 2 trucks along a road segment in a single hour.	<1	Imperceptible	13	Not significant
Construction Facilities							
MCPY1	Local	44.6	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	5	Most in local vicinity will notice	16	Not significant
	Area	58.7	Approximately 10 trucks. No more than 1 truck along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY2	Local	54.8	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	5	Most in local vicinity will notice	16	Not significant
	Area	58.7	Approximately 10 trucks. No more than 1 truck along a road segment in a single hour	<1	Imperceptible	13	Not significant

Table G2.3-5 Existing Road Use – Potential Impacts Prior to Mitigation

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Prior to Mitigation
MCPY3	Local	46.5	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	5	Most in local vicinity will notice	16	Not significant
	Area	58.7	Approximately 10 trucks. No more than 1 truck along a road segment in a single hour	<1	Imperceptible	13	Not significant
MCPY4	Local	47.2	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	5	Most in local vicinity will notice	16	Not significant
	Area	58.7	Approximately 10 trucks. No more than 1 truck along a road segment in a single hour	<1	Imperceptible	13	Not significant

NOTES: [1] Extent for local is 2 points, extent for area is 3 points. Area is further than the local road network and assume that there will be traffic coming from greater distances than the local area, and the only purpose is for this project.

[2]Taken from the highest measurements as the highest levels will be experienced in close proximity to roads as this was seen as the main noise source across most areas. For 'Area' baseline a level taken from the highest RoW measurements has been used.

[3]Perception taken as <3 dB change barely noticeable, change by 5 dB most will perceive a change, change by 10 dB a perceived doubling of loudness, change in 20 dB a perceived quadrupling of loudness. This is based on general acoustic principles.

[4]Duration for all <5 years therefore 1 point, Sensitivity assume very high as potential for hospitals, schools to be located within 100 m of the road therefore 5 points,

[5]Derived from Traffic Assessment, see Section 8.17. Total construction traffic per phase divided by number of facilities in phase. Not taking into account worker movements. 'Truck movement' numbers are considered for local road impacts where 'truck numbers' are considered for area as the there is a high likelihood of return trips by trucks along the same roads for local in a single day whereas this is unlikely to be the case for trucks coming from further afield.

[6]Based on theoretical assumptions in Section G2.2.6.5

Table G2.3-6 New Road Use – Potential Impacts Prior to Mitigation (Short Term During Construction)

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Prior to Mitigation
Permanent Facilities (AGIs)							
PS1	Local	47.9	Approximately 450 trucks. Max 10 movements in any single hour across a road segment. No night movements.	10	Local community will notice change	17	Not significant
PS2	Local	52.8	Approximately 450 trucks. Max 10 movements in any single hour across a road segment. No night movements.	10	Local community will notice change	17	Not significant
Construction Facilities							
MCPY1	Local	44.6	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	10	Local community will notice change	17	Not significant
MCPY2	Local	54.8	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	10	Local community will notice change	17	Not significant
MCPY3	Local	46.5	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	10	Local community will notice change	17	Not significant

Facility Type	Vicinity[1]	Existing Noise Environment, dB(A) $L_{eq,T}$[2]	Traffic Flow Assumptions[5]	Potential Numerical Change, dB[6]	Perception[3]	Impact SS[4]	Significance Prior to Mitigation
MCPY4	Local	47.2	Approximately 1000 trucks. Max 10 movements in any single hour across a road segment. No night movements.	10	Local community will notice change	17	Not significant

NOTE: [1] Extent for local is 2 points, no 'Area' impacts associated with new roads.

[2]Taken from the highest measurements as the highest levels will be experienced in close proximity to roads as this was seen as the main noise source across most areas. For 'Area' baseline a level taken from the highest RoW measurements has been used.

[3]Perception taken as <3 dB change barely noticeable, change by 5 dB most will perceive a change, change by 10 dB a perceived doubling of loudness, change in 20 dB a perceived quadrupling of loudness.

[4]Duration for all <5 years therefore 1 point, Sensitivity assume high as routing will be chosen to avoid hospitals and schools therefore 4 points

[5]Derived from Traffic Assessment, see Section 8.17. Total construction traffic per phase divided by number of facilities in phase. Not taking into account worker movements. 'Truck movement' numbers are considered for local road impacts where 'truck numbers' are considered for area as the there is a high likelihood of return trips by trucks along the same roads for local in a single day whereas this is unlikely to be the case for trucks coming from further afield.

[6]Based on theoretical assumptions in Section G2.2.6.5

The noise associated with project construction traffic movements along new and existing roads will not result in a significant impact prior to mitigation. The existing noise environment around the proposed haul and access routes will increase. Increases in noise magnitude are likely to be very high in areas with proposed new roads. However, given the short-term nature of construction, the impact is not ranked as significant.

For new roads which will remain after the construction phase, the change in noise associated with the pipeline operational traffic will be less than 1 dB, far lower than the levels reported above, and will the impacts will therefore not be significant prior to mitigation. There is a likelihood that these permanent new roads will have long-term use by non-pipeline traffic, but these numbers are challenging to estimate and doing so is beyond the scope of this assessment.

G2.3.2 Commissioning

Specific locations for commissioning noise sources are not defined and therefore these activities, although localised, have the potential to be undertaken along the RoW. Therefore, the RoW has been used as the extent for prediction purposes.

Noise emission for (in isolation) of pig launching, hydrostatic testing, cleaning and drying is assumed to be 68 dB(A) at 10 m (allowing for a single compressor, blower and dryer generator, and pump, all screened with 2-m high barriers).

This noise emission is lower than for the pipeline construction sources, and therefore, considering that commissioning will take place along the RoW, the impacts will be lower than those predicted for pipeline construction. Therefore, the noise associated with commissioning is ranked as not significant.

Although classed as not significant, the noise from these activities will be perceptible at receptors close to each commissioning location. This will particularly be the case for drying which will potentially be continuous for up to 48 hours.

G2.3.3 Operation

The permanent AGIs have the potential to operate 24 hours a day, 7 days a week. Where receptors are identified as having a significant impact prior to mitigation, further design mitigation is being progressed during detailed engineering to ensure that meeting PES will be the project target for noise emissions at any receptor.

Noise contour plots showing the operation of these facilities are presented in Attachment G2.6.

G2.3.3.1 Pumping Stations

Table G2.3-7 shows the impact assessment for PS1 operation prior to mitigation.

Table G2.3-7 Operation of PS1 –Assessment of Impact Prior to Mitigation

Activity	Period	Highest SS	Magnitude Score	Number of Receptors with Highest SS	Number of Receptors Exceeding PES	Significant Impact Prior to Mitigation (i.e. Greater than 19 SS)	Significant Impact Prior to Mitigation (Exceeds PES)
Operation	Day	12	Negligible	>100	10	Not significant	Significant
Operation	Night	18	Large	16	53	Not significant	Significant

NOTES: For the Noise VEC PS1 has the following fixed impacts scores defined:

D = 4 point, E = 2 points, S = 4 points

PS1 AOI baseline noise levels (Monitoring point UG1) – Daytime 40.1-55.6 dB(A) $L_{eq,\ 1hr}$, 32.2-54.7 dB(A) $L_{90,\ 1hr}$ - Night 35.7-52.8 dB(A) $L_{eq,\ 1hr}$, 26.1-47.4 dB(A) $L_{90,\ 1hr}$

Noise levels at receptors within 1 km of the installation, are predicted to range between 40 dB(A) and 55 dB(A) $L_{Aeq,T}$ throughout the PS1 study area prior to mitigation. When compared with the baseline noise environment, levels closest to the pumping station are higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline L_{A90}. The greater the distance from the pumping stations the less perceptible the pumping station noise will become.

At PS1 the operational noise is unlikely to be audible day or night at distances greater than 400–500 m.

During PS1 operation, the noise levels are unlikely to exceed the magnitude ranking of ‘very large, and therefore the operation of PS1 will not result in significant impacts as a result of a significance score greater than 18 prior to mitigation.

A 2 m boundary wall is included in the PS1 design. However without further mitigation the levels at 53 receptors within 400–500 m of the installation are likely to be above the PES for receptors. A distance range is provided due to the non-hemispherical propagation from the site layout.

Table G2.3-8 shows the impact assessment for PS3 operation prior to mitigation.

Table G2.3-8 Operation of PS2 – Assessment of Impact Prior to Mitigation

Activity	Period	Highest SS	Magnitude Score	Number of Receptors with Highest SS	Number of Receptors Exceeding PES	Significant Impact Prior to Mitigation (i.e. Greater than 19 SS)	Significant Impact Prior to Mitigation (Exceeds PES)
Operation	Day	12	Negligible	>100	0	Not significant	Not Significant
Operation	Night	18	Large	1	1	Not significant	Significant

NOTES:
For the Noise VEC PS2 has the following fixed impacts scores defined:
D = 4 point, E = 2 points, S = 4 points
PS2 AOI baseline noise levels (Monitoring point UG14 and UG15)– Daytime 41.3-53.0 dB(A) $L_{eq,\ 1hr}$, 28.7-44.6 dB(A) $L_{90,\ 1hr}$, Night 34.5-52.3 dB(A) $L_{eq,\ 1hr}$, 28.9-43.1 dB(A) $L_{90,\ 1hr}$

Noise levels at receptors within 1 km of the installation, are predicted to range between 40 dB(A) and 55 dB(A) $L_{Aeq,T}$ throughout the PS2 study area prior to mitigation. When compared with the baseline noise environment, levels closest to the pumping station are higher than the existing ambient noise environment ($L_{eq,1hr}$) and are likely to be perceptible as a result of the different character to the existing environment and increase over the baseline $L_{A90.}$ The greater the distance from the pumping stations the less perceptible the pumping station noise will become.

During PS2 operation, the noise levels are unlikely to exceed the magnitude ranking of ‘very large’, and therefore the operation of PS2 will not result in significant impacts as a result of a significance score greater than 18 prior to mitigation.

A 2 m boundary wall is included in the PS2 design. However, without further mitigation the noise levels at a single receptor are likely to be above the PES.

G2.3.3.2Traffic

Operational traffic movements will be low level and infrequent and so quantitative assessment is unnecessary. The impacts would therefore be negligible.

G2.4 Vibration Impact Assessment

G2.4.1 Construction

G2.4.1.1Pipeline

The potential for vibration across the RoW for linear works will be restricted to discreet rock breaking (rock ripping)/soil stripping.

Rock breaking and ripping has the potential to occur throughout the RoW where rock obstructions cannot be removed using standard trenching methods. However,

the location of such activity will not be defined until work commences. Therefore, the risk of impact is based on generic predictions for the activities and resultant offset distances.

The vibration resulting from rock breaking and rock ripping is presented in Table G2.4-1 using the methodology in Table G2.2-13. This also shows the highest possible SS assuming a 'very high' sensitivity receptor and a heavy rock breaker (see Attachment G2.4).

Table G2.4-1 Rock Breaking and Ripping – Vibration Predictions

Magnitude[1]	Corresponding Vibration PPV, mms^{-1}	Distance from Activity, m^2	Number of Receptors	Highest Possible SS	Significant Impact (i.e. Greater than 19 SS)
Negligible	< 0.11	50	758	12	Not significant
Small	0.12 – 1.00	15 – 50	296	14	Not significant
Medium	1.01 – 10.00	2 – 15	58	16	Not significant
Large	10.01 – 15.00	< 2	0	18	Not significant
Very Large	>15.01	N/A	-	-	Not significant

NOTES: In a similar way to noise certain impact scores are the set: D = 3 point, E = 2 points, S = 5 points
Assessment and reporting at medium, large and very large magnitudes not applicable due to the small predicted separation distances.

[1]See Section G2.2.2

[2] Distance at which magnitude level is exceeded

The above table shows that rock breaking would be suitable along the RoW as significant impacts will not be expected at any sensitive receptors. No exceedances of the PES are predicted. The predictions and outcome for rock breaking and ripping are also applicable to PS and PRS constructions, with no significant impacts anticipated.

G2.4.1.2Commissioning

No commissioning-phase vibration sources have been identified that require assessment.

G2.4.1.3Operation

No operational phase vibration sources have been identified that require assessment.

G2.4.1.4Traffic

The use of existing and proposed unsealed roads during the construction phase increases the potential for vibration-induced damage to structures along the roads.

Unsealed roads are more susceptible to damage and deterioration (the creation of ruts, corrugations and potholes) compared with sealed roads. The movement of

heavy trucks and buses along the unsealed roads accelerates their deterioration and increases the potential for higher magnitude vibration events from uneven and abnormal load and axle movement.

Therefore, for the purpose of this study, it is assumed that where damage to a sealed or unsealed road is within 10 m of a sensitive structure, there is the potential for vehicle movement to generate vibration through interactions between the axle and vehicle structure, suspension or load movement. The magnitude of the vibration is hard to quantify but has the potential to be generated at a magnitude which causes early signs of structural damage on the lightest of structures.

G2.4.1.5Decommissioning

Vibration associated with the decommissioning phase is likely to closely resemble the predictions and impacts from the construction phase and therefore no further assessment has been undertaken at this stage.

G2.5 Impact Assessment Overview

A general summary of the changes in noise levels across the AOI prior to mitigation is presented in Table G2.5-1 for each of the modelled and calculated phases. This compares the project noise with the measured background noise throughout the AOI as a function of distance, i.e., the AOI around an AGI with a lower background will experience a higher change than an AOI with a higher baseline. This can be used to provide a high-level indication of noise impacts on people and wildlife across the project.

For reference and context, a 3 dB change in noise is often taken as the lowest perceptible change for humans, most people notice a 5 dB change, a 10 dB change is perceived as a doubling of the sound in loudness and a 20 dB change heard as fourfold increase in perceived loudness. In energy terms, a 3 dB change represents a doubling of energy, a 10-dB change a 10× increase in energy and a 20 dB change a 100× increase in energy. Therefore, a sudden change in 20 dB is perceived as 4× the loudness, but has 100× the energy.

Table G2.5-1 Project Summary of Noise Change Prior to Mitigation

Phase	Activity	Period	Possible Change in Baseline Noise with Distance from Source, dB (All Increases in Noise)					
			<50 m	50–100 m	100–250 m	250–500 m	500 m–1 km	>1 km
Construction	RoW	Day	20–30	10–20	5–10	1–5	<1	0
	PS1	Day	20–30	10–20	5–10	1–5	<1	0
	PS2	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY1	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY2	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY3	Day	20–30	10–20	5–10	1–5	<1	0
	MCPY4	Day	20–30	10–20	5–10	1–5	<1	0
Commissioning	Pigging	Day	20–30	10–20	5–10	1–5	<1	0
	Hydro. Testing	Day	20–30	10–20	5–10	1–5	<1	0
Operation	PS1	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0
	PS2	Day	20–30	10–20	5–10	1–5	<1	0
		Night	20–30	10–20	5–10	1–5	<1	0

The impact assessment predicts two areas where significant impacts may occur either as a result of an exceedance of the PES or a SS of 19 or above prior to mitigation:

- PS1 Operational Noise
- PS2 Operational Noise.

G2.6 References

British Standard BS 6472-1:2008 'Guide to evaluation of human exposure to vibration in buildings- Vibration sources other than blasting

British Standard BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Noise'

British Standard BS 5228-2:2009 'Code of Practice for noise and vibration control on construction and open sites- Vibration

British Standard BS 7385-1:1990 'Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings

British Standard BS 7385-2:1993 'Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration

British Standard BS EN 61672-1:2013 'Electroacoustics. Sound level meters. Specifications'

British Standard BS7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'

CRTN-:1988 'Calculation of road traffic noise, Department of Transport UK

EMDC_5_(4145)-Noise_Limits._P3 – Draft . Acoustic – General Tolerance limits for Environmental and Occupational Noise Rev(TZS 932:2007)

German Standard DIN 4150-3:1999 ‘Structural vibration Part 3: Effects of vibration on structures

Uganda 21. Noise and Vibration regulations 2011

Uganda.15 The National Environment (Noise Standards and Control) Regulations, 2003

UK DMRB-7:2008 'Design manual for roads and bridges. Noise and vibration

ATTACHMENT G2.1 CONSTRUCTION SOURCE DATA

RoW

Table AttG2.1-1 Cleaning and Grubbing (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dozer	C7.8	50t	75	20	2	0	-4	71
Hand Tools	-	-	-	-	-	-	0	-
Skip Wagon	C8.21	-	78	25	1	0	-6	72
Dumper	C4.1	25t	81	20	1	0	-7	74
TOTAL Lp								78
Lw								106

Table AttG2.1-2 Camp/Site Establishment (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Lorry with lifting boom	C4.53	6t	77	25	1	0	-6	71
Hand tools	--	--	--	--	--	--	0	--
MEWP	C4.57	8t	67	70	2	0	1	68
Tracked excavator	C2.17	28t	76	30	1	0	-5	71
TOTAL Lp								75
Lw								103

Table AttG2.1-3 Road Construction (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Hand tools	0	0	0	0	0	0	0	0
Tracked excavator	C2.17	28t	76	30	1	0	-5	71
Dumper	C4.1	25t	81	10	1	0	-10	71
grader	C6.31	25t	86	10	1	0	-10	76
Tipper lorry	C8.20		79	10	1	0	-10	69
Roller	C5.19	22t	80	10	1	0	-10	70
TOTAL L_p								79
L_w								107

Table AttG2.1-4 General Earthworks (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Articulated dump truck	C5.16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand tools	-	-	-	-	-	-	0	0
Hand trolley	-	-	-	-	-	-	0	0
Dozer	C2.13	11 t	78	20	1	0	-7	71
TOTAL Lp								78
Lw								106

Table AttG2.1-5 Trenching (ROW)

Plant	Noise Data			On time (%)	Number of plant items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dumper	C4.1	25t	81	10	1	0	-10	71
Hand tools	-	-	-	-	-	-	0	
Trencher	4.63	40t	77	20	1	0	-7	70
Trench wacker	Manufacturer Data	Wacker BS 50-4	79	30	1	-5	-10	69
Wacker plate	C2.41	-	80	15	1	0	-8	72
TOTAL Lp								78
Lw								106

Table AttG2.1-6 HDD Site Establishment (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	20	1	0	-7	69
Dumper	C4.1	25t	81	15	1	0	-8	73
Roller	C2.37	18t	79	15	1	0	-8	71
Telescopic handler	C2.35	10t	71	25	1	0	-6	65
Lorry with lifting boom	C4.53	6t	77	25	1	0	-6	71
Compressor	C5.5	1t	65	20	1	-10	-17	48
Vibratory piling rig	C3.8	52t	88	10	1	0	-10	78
TOTAL L_p								81
L_w								109

Table AttG2.1-7 Pipe Laying/Installation (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	20	1	0	-7	69
Dumper	C4.1	25t	81	25	1	0	-6	75
Hand tools	-	-	-	-	-	-	0	-
Generator	C4.78	-	66	40	1	-10	-14	52
Lorry with lifting boom	C4.53	6t	77	20	1	0	-7	70
Hand trolleys	-	-	-	-	-	-	-	-
Welding equipment	C3.31	-	73	40	1	0	-4	69
Circular saw	C4.70	9kg	91	10	1	-5	-15	76
TOTAL Lp								80
Lw								108

Table AttG2.1-8 Backfilling and Reinstatement (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dumper	C4. 1	25t	81	20	1	0	-7	74
Hand tools	-	-	-	-	-	-	0	-
Wacker plate	C2.41	-	80	15	1	0	-8	72
Roller	C2.37	18t	79	15	1	0	-8	71
Telescopic handler	C2.35	10t	71	20	1	0	-7	64
TOTAL L_p								78
L_w								106

Table AttG2.1-9 Rock Breaking (ROW)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Breaker mounted on excavator	C1.9	15t	90	10	1	0	-10	80
Dumper	C4.1	25t	81	20	1	0	-7	74
Hand tools	-	-	-	-	-	-	-	-
TOTAL Lp								81
Lw								109

Pumping Stations

Table AttG2.1-10 Cleaning and Grubbing (PS)

Plant	Noise Data			On time (%)	Number of plant items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10m) dB(A)					
Excavator	C2.17	28t	76	10	1	0	-10	66
Dozer	C7. 8	50t	75	20	2	0	-4	71
Hand tools	-	-	-	-	-	-	0	-
Skip wagon	C8.21	-	78	25	1	0	-6	72
Dumper	C4.1	25t	81	20	1	0	-7	74
TOTAL Lp								78
Lw								106

Table AttG2.1-11 General Earthworks (PS)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Articulated dump truck	C5.16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand tools	-	-	-	-	-	-	0	0
Hand trolley	-	-	-	-	-	-	0	0
Dozer	C2.13	11 t	78	20	1	0	-7	71
TOTAL Lp								78
Lw								106

Table AttG2.1-12 Concrete Foundations (PS)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
CAT and genny	-	-	-	-	-	-	-	-
Dumper	C4.1	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	76	10	1	0	-10	66
Hand tools	-	-	-	-	-	-	0	-
Concrete pump	C4.32	Pump and boom arm	80	50	1	0	-3	77
Generator	C4.78	-	66	40	1	-10	-14	52
Concrete poker	C4.33	-	78	20	1	0	-7	71
TOTAL L_p								79
L_w								107

Table AttG2.1-13 Steel and Formwork (PS)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Hand tools	-	-	-	-	-	-	0	-
Concrete mixer truck	C4.27	-	79	40	1	0	-4	75
Concrete pump	C4.32	Pump and boom arm	80	25	1	0	-6	74
Crane	C4.50	600t	71	20	2	0	-4	67
Lorry with lifting boom	C4.53	6t	77	25	1	0	-6	71
TOTAL L_p								79
L_w								107

Table AttG2.1-14 Mechanical and Electrical Installations (PS)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Hand tools	-	-	-	-	-	-	0	-
Core drill (electric)	C4.69	250 mm diameter	85	40	1	-5	-9	76
Cable winch	Manufacturer's data	Hand Held	63	75	2	0	2	65
TOTAL Lp								76
Lw								104

Table AttG2.1-15 Cleaning and Grubbing (MCPY)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10 m) dB(A)					
Excavator	C2.17	28t	76	30	1	0	-5	71
Dozer	C 7. 8	50t	75	20	2	0	-4	71
Hand Tools	-	-	-	-	-	-	-	-
Skip Wagon	C 8. 21	-	78	25	1	0	-6	72
Dumper	C 4. 1	25t	81	20	1	0	-7	74
TOTAL Lp								78
Lw								106

Table AttG2.1-16 General Earthworks (MCPY)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10m) dB(A)					
Articulated dump truck	C 5. 16	25t	81	10	1	0	-10	71
Excavator	C2.17	28t	85	10	1	0	-10	75
Hand tools	-	-	-	-	-	-	-	-
Hand trolley	-	-	-	-	-	-	-	-
Dozer	C 2.13	11 t	78	20	1	0	-7	71
TOTAL L_p								78
L_w								106

Table AttG2.1-17 Pre-Fabrication Installation (MCPY)

Plant	Noise Data			On time (%)	Number of Plant Items	Screening/dB	Total Correction/dB	Total Lp at 10 m dB(A)
	Plant Ref	Type	Lp (at 10m) dB(A)					
Telescopic Handler	C2.35	10t	71	25	1	0	-6	65
Hand Tools	-	-	-	-	-	-	0	0
MEWP	C4.58	8t	63	50	1	0	-3	60
Disc Cutter	Stihl TS400	-	73	25	1	-5	-11	62
Oxy Gas Burner	C3.35	Hand-Held	65	20	1	-5	-12	53
Hand Trollerys	-	-	-	-	-	-	-	-
TOTAL L_p								**68**
L_w								**96**

ATTACHMENT G2.2 OPERATION SOURCE DATA

Table AttG2.2.-1 Pumping Stations Source Data

Operation	Noise Source Data			Tag (Reference to Attachment G2.3)	Embedded Mitigation/ Assumptions
	Description	SSL @ 1m[1]	Spectrum		
Pumping Station	Export pumps	85	Generic pump	25-PA-31000A/B/C/D	
	Nitrogen generators	85	Generic compressor	74-UB-5400	
	Diesel fuel supply pumps	85	Generic pump	71-PA-3700A/B	
	Crude fuel oil separator pumps	85	Generic pump	71-UZ-6500	
	Crude/diesel fuel oil pressurisation pumps	85	Generic pump	71-UZ-6550	
	Crude/diesel fuel oil circulation pumps	85	Generic pump	71-UZ-6600A/B/C	Fully enclosed
	Diesel fuel recirculation pumps	85	Generic pump	71-UZ-6800	
	Water distribution pumps	85	Generic pump	52-PA3650A/B	
	Heating medium pump	85	Generic pump	73-UZ-8500	
	Sump tank pumps	85	Generic pump	28-PC-3900A/B	
	Sump tank pumps	85	Generic pump	28-PC-3980A/B	
	Lube oil transfer pump	85	Generic pump	71-PA-3800	
	Power generators	85	Data provided by GIE	60-GE-8600	Fully enclosed
	Power generator exhausts		Data provided by GIE	N/A	Silenced
	Radiator fans	85	Generic axial fan	52-EA-2300	
Daytime and Night	Equivalent Total Noise @ 1m	96.5			2m boundary noise wall minimum 12kg-2 surface density

NOTE: [1]not inclusive of embedded mitigation

ATTACHMENT G2.3 OPERATIONAL NOISE REPORT (EACOP HSE STUDIES – NOISE STUDY DOCUMENT NO UT-MID-60-0010-000090 20/11/17)

EAST AFRICAN CRUDE OIL PIPELINE	**Pipeline Project Team East African Crude Oil Pipeline (EACOP) Project**	GULF INTERSTATE ENGINEERING TÜVRheinland® Risktec

EACOP HSE Studies – Noise Study

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Abbreviations and Acronyms

Abbreviations and acronyms are referenced in PPT document UT-MID-60-0010-000014, EACOP Abbreviations List.

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1 INTRODUCTION

1.1 Background

A description of the PROJECT can be found in the PROJECT Technical Brief, UT-MID-60-0010-000040.

1.2 Purpose of this Document

The purpose of this document is to present the Noise Study undertaken at FEED Phase 2 of the EACOP Project.

The subsequent sections of this report provide details of the technical methodology, results of the analysis and conclusions of the FEED Phase 2 Noise Study.

1.3 Objectives

The objective of the noise study is to assess the noise generated on the EACOP facilities and compare the values with limits in IFC guidance and local regulations [1, 2, 3].

The study develops noise level models using SoundPLAN software (v7.4) based on noise sources identified in the ENVID and from plot plans and equipment lists. The predicted noise levels are compared to IFC safety and environmental criteria for on-site and off-site noise levels and ESHIA commitments.

1.4 Scope

The scope of the noise study covers the following:

- the Kabaale Hub, PS1;
- the pumping stations, PS2-6;
- the pressure reduction stations, PRS1 and 2;
- the Marine Storage Terminal (MST); and
- the Load Out Facility (LOF), onsite noise levels only.

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2 TECHNICAL METHOD

2.1 Inputs and assumptions

The following information is used as input for the noise study:

- Site plot plans
- Basis of design
- Noise emission data (emission spectra, sound power levels in dBA)
- Elevation contour data for the terrain surrounding each facility

2.1.1 Noise Sources

The noise source data used in the model is based on A-weighted sound power levels in octave bands either for the whole unit or per m^2 for area sources.

The human ear does not hear all frequencies with the same intensity and is most sensitive to sounds in the 500 Hz to 8 kHz range. To compensate for this, sound level meters incorporate electronic filtering to correspond with the varying sensitivity of the ear. This filtering is called A-weighting and sound pressure levels obtained with this weighting are referred to as A-weighted and signified as dBA.

Typical noise levels resulting from common activities and equipment are shown in Table 1, to provide context for the results of this study [4].

Table 1: Noise Levels of Common Sounds

Common Sounds	Decibel Levels (dBA)
Rock concert, jet aircraft take-off, gun shot	120 to 140
Chainsaw, sandblasting	100 to 120
Power tools, motorcycle, headphones, manufacturing plant, pneumatic drill	90 to 100
Lawnmower, subway, busy restaurant	75 to 90
City traffic, hairdryer, office equipment, loud radio	70 to 80
Normal conversation	50 to 70
Quiet office	40 to 45
Whisper, countryside with rustling leaves	20 to 50

The noise sources on each site are presented in the following tables, as reported in the assumptions register [5].

Table 2: Kabaale Hub Noise Sources

Noise Source		Sound Pressure dB(A) at 1m	Spectrum
Tag	Description		
25-PA-3100A/B/C/D	Export pumps	85	Generic pump
52-PA-3650A/B	Water distribution pumps	85	Generic water pump
73-UZ-8500	Heating medium pump	85	Generic pump
28-PC-3900A/B	Sump tank pumps	85	Generic pump

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Table 3: Pumping Station Noise Sources

Noise Source		Sound Pressure dB(A) at 1m	Spectrum
Tag	Description		
25-PA-3100A/B/C/D	Export pumps	85	Generic pump
74-UB-5400	Nitrogen generators	85	Generic compressor
71-PA-3700A/B	Diesel fuel supply pumps	85	Generic pump
71-UZ-6500	Crude fuel oil separator pumps	85	Generic pump
71-UZ-6550	Crude/diesel fuel pre-pressurisation pumps	85	Generic pump
71-UZ-6600A/B/C	Crude/diesel fuel circulation pumps[1]	85	Generic pump
71-UZ-6800	Diesel fuel recirculation pump	85	Generic pump
52-PA-3650A/B	Water distribution pumps	85	Generic water pump
73-UZ-8500	Heating medium pump	85	Generic pump
28-PC-3900A/B	Sump tank pumps	85	Generic pump
28-PC-3980A/B	Sump tank pumps	85	Generic pump
71-PA-3800	Lube oil transfer pump	85	Generic pump
60-GE-8600	Power generators[2]	115	Data provided by GIE
-	Power generator exhausts[3]	115 @ 2 m	Data provided by GIE
52-EA-2300	Radiator fans	85	Generic axial fan

[1] Pumps located inside generator building, and modelled with the generators
[2] Power generators are assumed to be fully enclosed within metal-sided buildings
[3] Power generator exhausts are shown to have silencers on the plot plan [8], however these will not be included in the modelling as no design data is currently available.

Table 4: Pressure Reduction Station Noise Sources

Noise Source		Sound Pressure dB(A) at 1m	Spectrum
Tag	Description		
24-PR-3300A/B	Reinjection pumps	85	Generic pump
28-PC-3900A/B	Sump tank pumps	85	Generic pump

Table 5: Marine Storage Terminal Noise Sources

Noise Source		Sound Pressure dB(A) at 1m	Spectrum
Tag	Description		
25-PA-3100A/B/C	Loading pumps	85	Generic pump
24-PZ-3200A/B/C	Recirculation/transfer pumps	85	Generic pump
74-UB-5400	Nitrogen generation	85	Generic compressor
71-PA-3700A/B	Diesel fuel supply pumps	85	Generic pump
52-PA-3650A/B	Water distribution pumps	85	Generic water pump
76-PA-3950	Cooling water pump	85	Generic water pump
73-UZ-8500	Heating medium pumps	85	Generic pump
71-UZ-6500	Crude fuel oil separator pumps	85	Generic pump
71-UZ-6550	Crude/diesel fuel pre-pressurisation pumps	85	Generic pump

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Noise Source		Sound Pressure dB(A) at 1m	Spectrum
Tag	Description		
71-UZ-6600A/B/C	Crude/diesel fuel circulation pumps	85	Generic pump
71-PA-3800	Lube oil transfer pumps	85	Generic pump
60-GE-8600	Power generators[1]	115	Data provided by GIE
-	Power generator exhausts[2]	115 @ 2m	Data provided by GIE
76-EA-2300	Radiator fans	85	Generic axial fan

[1] Power generators are assumed to be fully enclosed within metal-sided buildings.
[2] Power generator exhausts are shown to have silencers on the plot plan [10], however these will not be included in the modelling as no design data is currently available.

Table 6: Load Out Facility Noise Sources

Noise Source		Sound Pressure dB(A) at 1m	Spectrum
Tag	Description		
25-DZ-9200A/B/C	Hydraulic Power Units (Export)	80	Generic pump
25-DZ-9210A/B	Hydraulic Power Units (Import)	80	Generic pump
23-KZ-3590	Compressor Unit for VOC	75	Generic compressor
28-PC-3530A/B	Export MLA Stripping Pumps	85[1]	Generic pump
28-PA-3540A/B	Import MLA Stripping Pumps	85[1]	Generic pump

[1] Equipment only operates intermittently for 1 hour.

Further details on the input data are provided in the Assumptions Register [6].

2.2 Method

Noise levels on the Kabaale Hub, a typical intermediate pumping station, a typical pressure reduction station, the MST and the LOF were modelled in SoundPLAN v7.4.

The first stage in modelling the noise levels was the production of three dimensional models of the sites including large items of equipment (such as large storage tanks) and buildings. Solid site boundary walls are also included in the models for the MST and intermediate pumping station. The terrain around the MST, Kabaale Hub and the intermediate pumping station was imported into the SoundPLAN model from a terrain elevation contour map provided by GIE. The 3D site models have been placed approximately in the centre of the elevation contours provided. The ground areas beneath the sites have been flattened to produce level ground of a constant elevation across the sites.

The elevation data for the MST showed only a small change of 5 m in ground elevation across the site, and it has been assumed in the model that the MST site area is flat and level.

As the locations of the pressure reduction stations are not yet finalised, the terrain around these was modelled as flat. Noise levels at the LOF were assessed against onsite occupational requirements only, offsite noise was not considered.

The noise generating equipment listed in Section 2.1 above was identified from plot plans and added to the model as point or area sources using noise emission data provided by GIE. All equipment added to the model was conservatively assumed to be running during the day and night to provide worst case noise contours.

Noise data is generally given as sound pressure levels at a distance, so the model was

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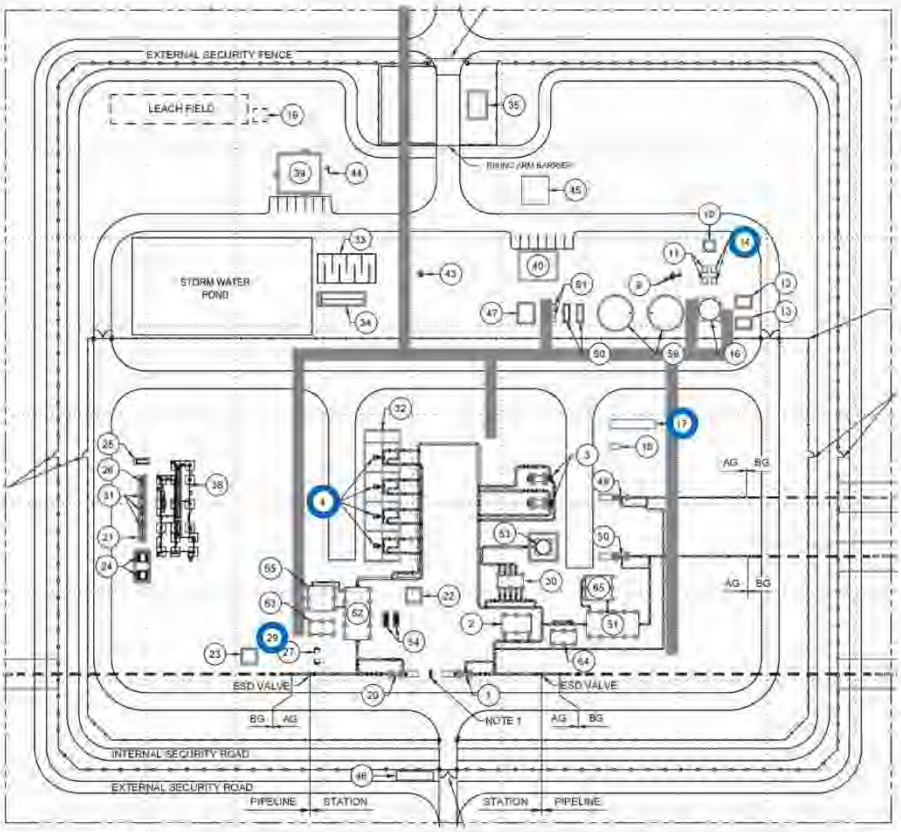
calibrated by calculating the noise level at a receiver at the specified distance and then adjusting the noise emission level to match the given values.

Appropriate noise emission spectra were used to account for the variation in noise levels with frequency.

2.3 Noise Source Locations

The following plots show the locations of the modelled noise sources (as listed in Section 2.1 above and in the Assumptions Register [5]) on each of the sites. Note that the numbers on the drawings correspond to the equipment item number on the plot plans of each site [7, 8, 9, 10]. Noise sources on the LOF were provided by GIE [12].

2.3.1 Kabaale Hub



4	25-PA-3100 Export Pumps	17	73-UZ-8500 Heating Medium Pumps
14	52-PA-3650 Water Distribution Pump	29	28-PC-3900 Sump Tank Pumps

Figure 1: Kabaale Hub Noise Sources

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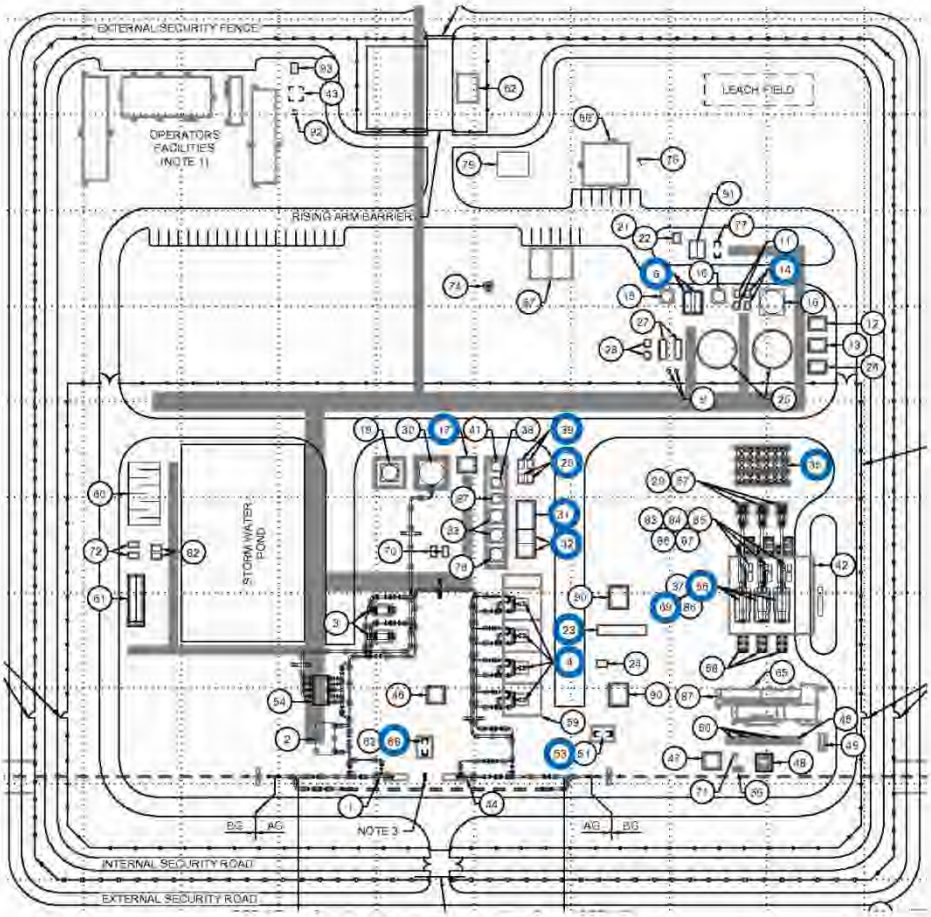
2.3.2 Pumping Station



4	25-PA-3100 Export Pumps	23	73-UZ-8500 Heating Medium Pump	53	28-PC-3900 Sump Pump
6	74-UB-5400 Nitrogen Generator	31	71-UZ-6550 Crude/Diesel Fuel Pre-Pressurisation Pumps	56	60-GE-8600 Power Generators & Exhausts
14	52-PA-3650 Water Distribution Pump	32	71-UZ-6500 Crude Fuel Separation Pumps	68	28-PC-3980 Sump Pump
17	71-UZ-6800 Diesel Recirculation Pump	35	52-EA-2300 Generator Radiator Fans	69	71-UZ-6600 Crude/Diesel Circulation Pumps
20	71-PA-3700 Diesel Fuel Supply Pump	39	71-PA-3800 Lube Oil Transfer Pump		

Figure 2: Pumping Station Noise Sources

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2.3.3 Pressure Reduction Station

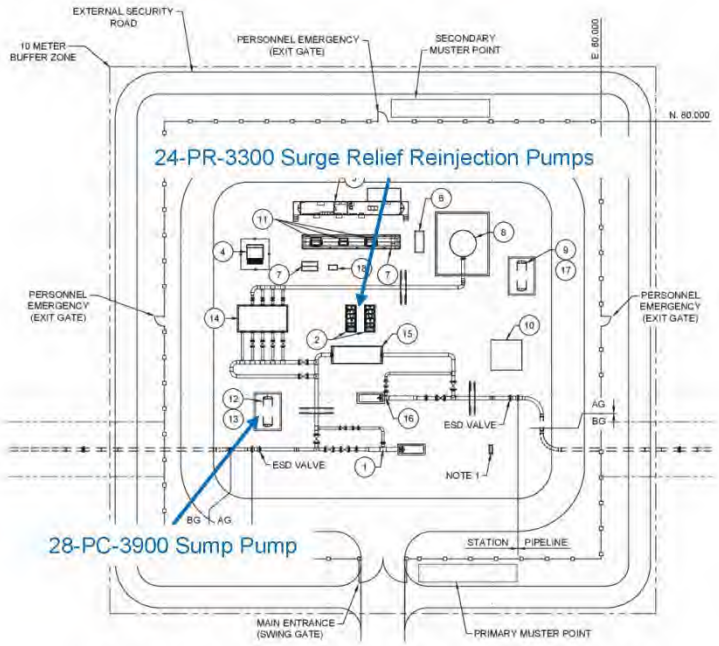

Figure 3: Pressure Reduction Station Noise Sources

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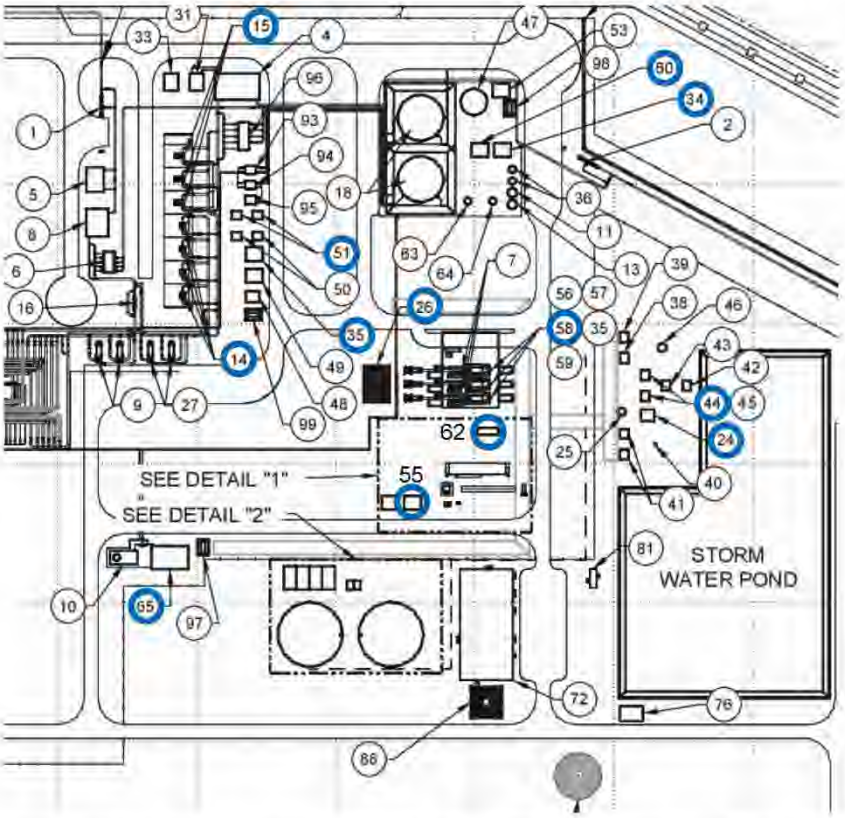
2.3.4 MST



14	24-PZ-3200 Recirculation Transfer Pumps	35	71-UZ-6600 Crude/Diesel Circulation Pumps	60	71-PA-3800 Lube Oil Transfer Pump
15	25-PA-3100 Loading Pumps	44	52-PA-3650 Water Distribution Pump	62	71-UZ-6550 Crude/Diesel Fuel Pre-Pressurisation Pumps
24	74-UB-5400 Nitrogen Generator Skid	51	71-PA-3700 Diesel Fuel Supply Pump	65	73-UZ-8500 Heating Medium Pump
26	76-EA-2300 Generator Radiator Fans	55	76-PA-3950 Cooling Water Pump		
34	71-UZ-6500 Crude Fuel Separation Pumps	58	60-GE-8600 Power Generators & Exhausts		

Figure 4: MST Noise Sources

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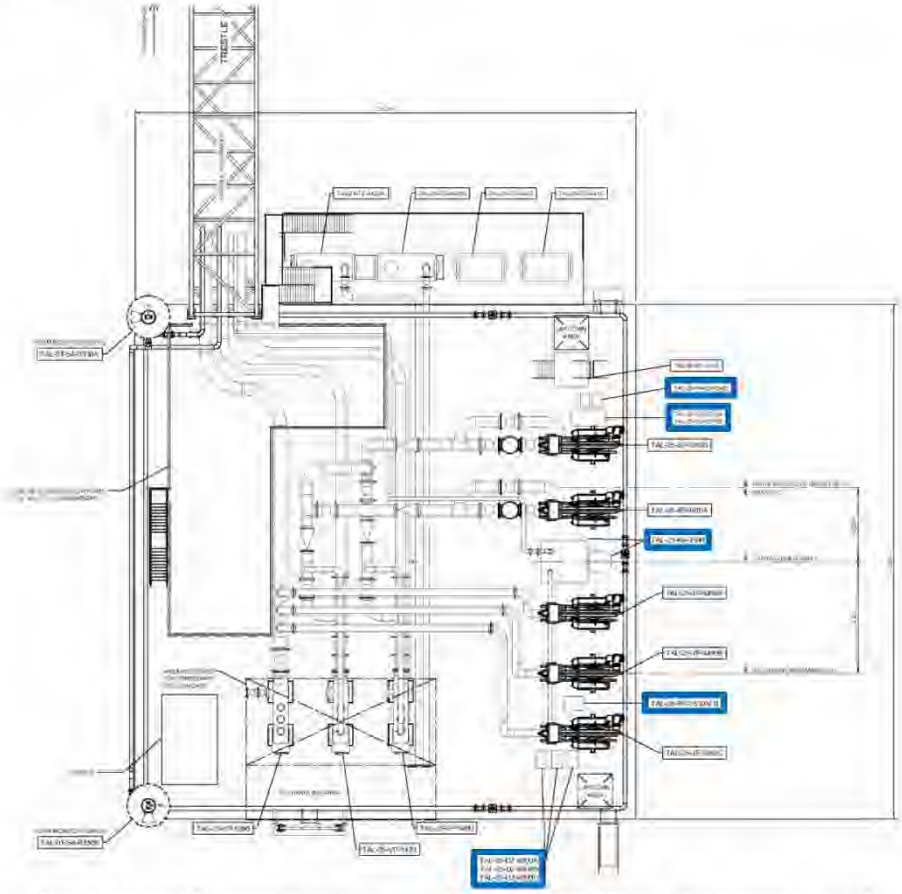
2.3.5 LOF



TAL-25-DZ-9200	Hydraulic Power Unit	TAL-28-PC-3530	Export MLA Stripping Pumps
TAL-25-DZ-9210	Hydraulic Power Unit	TAL-28-PA-3540	Import MLA Stripping Pumps
TAL-23-KA-3590	Compressor Unit for VOC		

Figure 5: LOF Noise Sources

2.4 Noise Level Criteria

Noise levels onsite were compared with the maximum permissible noise level personnel can be exposed to over a period of 8 hours of 85 dBA, as defined in Tanzanian and Ugandan regulations, and the Total Uganda Safety Optimum Requirements [2, 3, 5]. Table 7 lists the permissible exposure durations for noise levels of 85 dBA and above. Where noise levels above 85 dBA occur in locations where personnel are likely to be present, mitigation measures are required, which typically include hearing protection or time limits on access.

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Table 7: Regulatory Noise Limits

Average Noise Level (dBA)	Duration (daily)	Duration (weekly)
85	8 hours	40 hours
88	4 hours	20 hours
91	2 hours	10 hours
94	1 hour	5 hours
97	30 minutes	2.5 hours
100	15 minutes	1.25 hours
103	7.5 minutes	37.5 minutes
106	3.75 minutes	18.75 minutes
109	1.875 minutes	9.375 minutes

Noise criteria for offsite outdoor noise levels are presented in the IFC General EHS Guidelines [1], and are as follows:

Table 8: IFC Offsite Noise Limits

Receptor	One Hour Average Noise Level (dBA)	
	Daytime 06:00-22:00[1]	Nighttime 22:00-06:00[1]
Residential, institutional, educational	55	45
Industrial, commercial	70	70
[1] Day/night boundaries are 07:00 to 22:00 in the IFC guidelines and 06:00 and 22:00 in Tanzanian/Ugandan regulations		

Offsite noise levels were compared with the night-time value for residential buildings of 45 dBA as shown in Table 8.

Additional, lower noise limits with a night time value of 35 dBA are presented in Ugandan and Tanzanian noise regulations [2, 3], however these are for indoor noise levels rather than outdoor. The SoundPLAN modelling has been used to present outdoor noise contours to a minimum value of 45 dBA, as this is considered to bound the 35 dBA indoor requirement.

Where noise levels outside the site boundary were found to be above 45 dBA, additional modelling was carried out to consider potential noise reduction measures.

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3 ANALYSIS / RESULTS

The following sections present the results of the noise modelling for the five EACOP sites listed in Section 1.4.

3.1 Kabaale Hub

The noise contours produced for the Kabaale hub show that noise levels of 45 dBA around 50 m outside the site boundary, as presented in Figure 7: Kabaale Hub Noise Contours (with concrete wall)

. There are also small areas to the south and east of the site where the noise levels are between 50 and 55 dBA, however it is unlikely that any offsite populations will be present this close to the site. It has been assumed that the Kabaale hub will not have a concrete wall around the perimeter of the site.

The onsite noise levels are below 85 dBA, except very close to the items of noise generating equipment, so noise reduction and/or hearing protection are not required on this site.

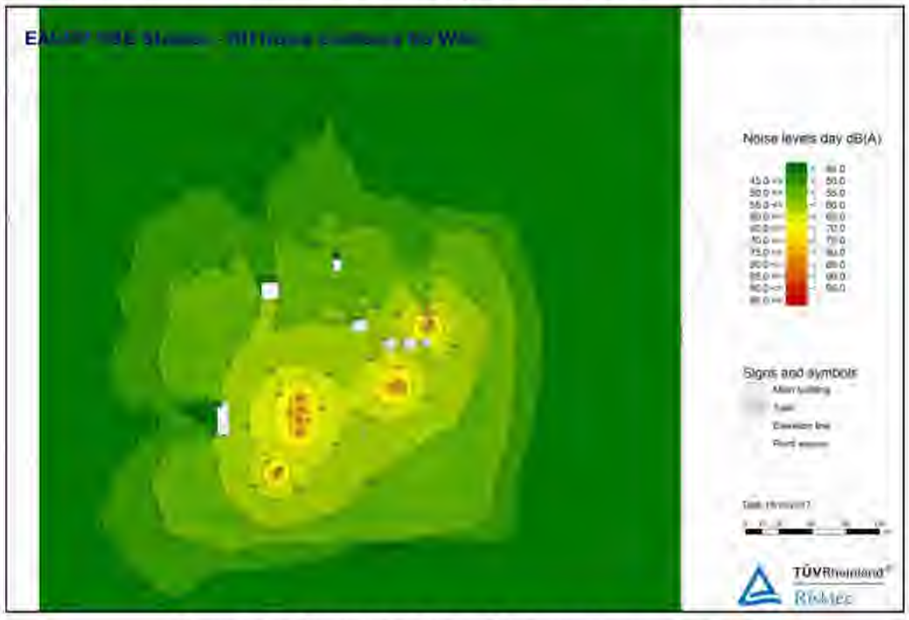

Figure 6: Kabaale Hub Noise Contours (no concrete wall)

If the Kabaale hub had a solid concrete wall around the site boundary, the noise levels offsite would be reduced by around 5 dBA, as shown in Figure 7. There are only small areas to the east and south of the site with noise levels above 45 dBA in this case.

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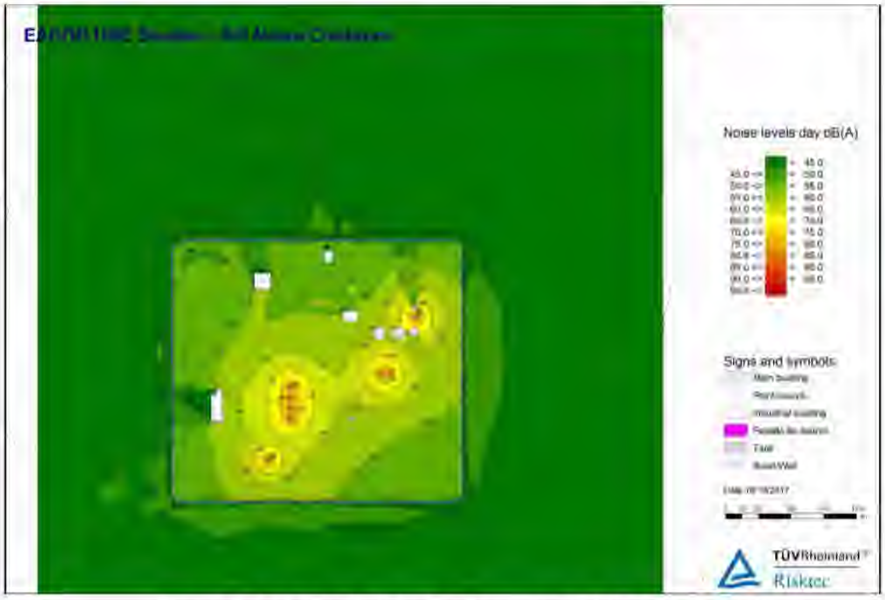

Figure 7: Kabaale Hub Noise Contours (with concrete wall)

3.2 Pumping Station

The noise contours for a typical pumping station (PS2) show that significant noise levels are predicted across most of the site, with a maximum offsite noise level of 85-90 dBA to the east of the site, as presented in Figure 8. The contours show that the site's concrete perimeter wall provides some noise attenuation, reducing noise levels offsite by between 5 and 10 dBA.

Some of the pumping stations may not have a concrete boundary wall, so an additional model was run to assess the noise levels without the wall. The results of this modelling are presented in Figure 9 and show that the noise travels slightly further without the attenuating effect of the concrete wall. It should be noted that the same ground elevation profile was used for each model, with and without the concrete wall, so the noise contours are indicative of the worst-case noise emission from a pumping station.

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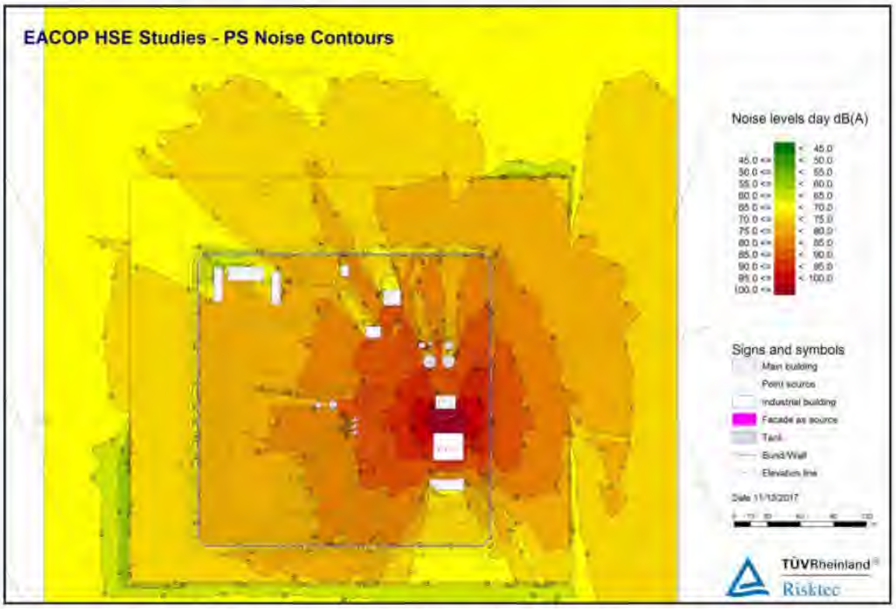

Figure 8: Pumping Station Noise Contours (with concrete wall)

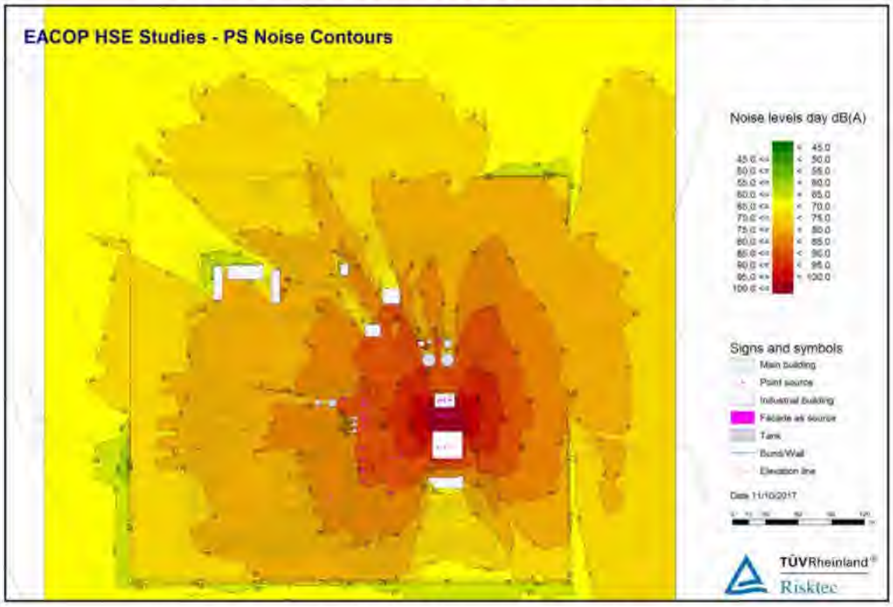

Figure 9: Pumping Station Noise Contours (no concrete wall)

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The pumping station has a generator building containing three crude power generation units which are a significant source of noise. The generators were modelled using data provided by GIE [14] as producing a sound pressure level of 115 dBA at 1 m, and the exhausts modelled as producing 115 dBA at 2 m.

In order to reduce the noise levels at the site boundary to around 45 dBA, mitigation to reduce the sound power of these noise sources will be required. Reducing the overall sound power of the exhausts by 30 dBA (which could be achieved using exhaust silencers) and reducing the sound power of the generator engines by 15 dBA (which could be achieved with an enclosure) results in the noise levels across the site shown in Figure 10.

Using these reduced noise emission levels, there are small areas offsite which are predicted to be exposed to noise levels of around 55 dBA, and the 45 dBA contour extends to a maximum of 150 metres from site boundary on the east side of the site. This is comparable to the noise levels from the Kabaale hub presented in Section 3.1, and it is assumed that offsite populations will not be present so close to the site boundary.

With the reduced noise emission from the generators, onsite noise levels are shown to be below 85 dBA except within 1 m of the noise sources.

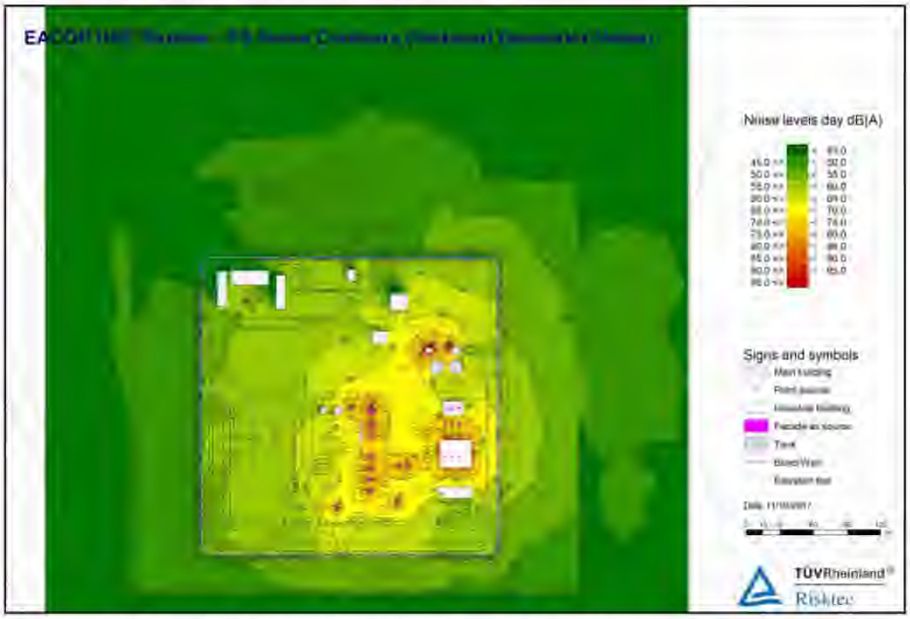

Figure 10: Pumping Station Noise Contours (reduced generator noise, concrete wall)

Noise contours without the concrete boundary wall are presented in Figure 11, and show that the offsite noise levels increase by around 5 dBA, and the size of the 45 dBA contour increases slightly to the east of the site.

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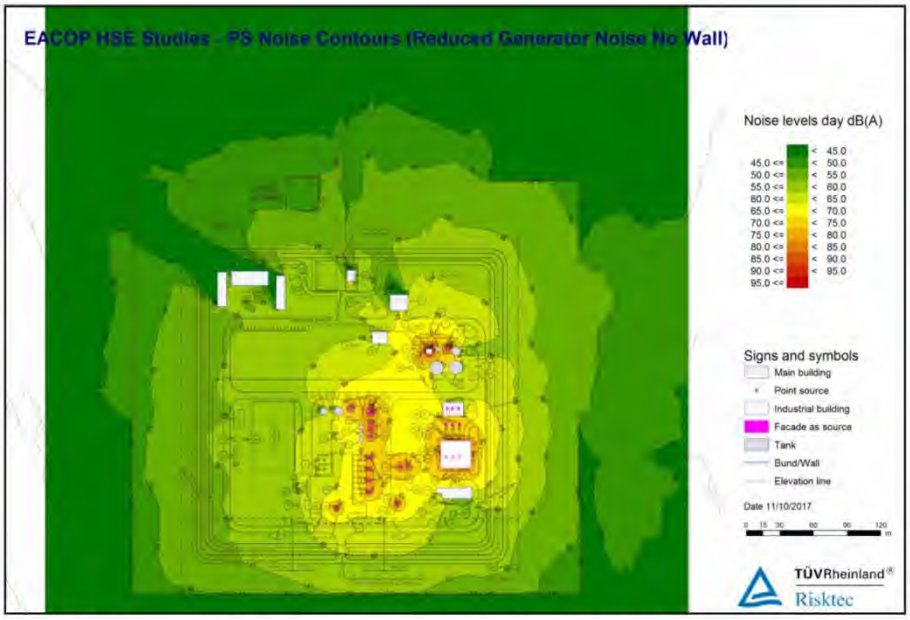

Figure 11: Pumping Station Noise Contours (reduced generator noise, no concrete wall)

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3.3 Pressure Reduction Station

The noise contours for a typical pressure reduction station are presented in Figure 12.

As there are only two noise sources on the site, the modelled noise levels are generally low and onsite are below 85 dBA except in the region very close to the reinjection pumps. Offsite noise levels exceed 55 dBA to the west and south of the site, close to the sump tank pump. There is potential for noise levels above 45 dBA up to approximately 100 metres from the site boundary fence.

No account has been taken for noise reduction afforded by the metal site boundary fence, as it is assumed that this is not a solid structure.

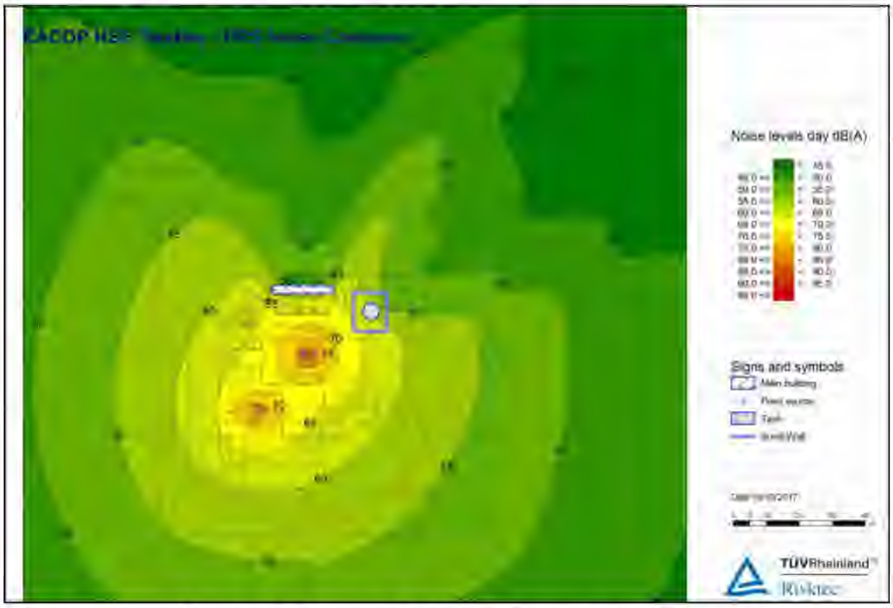

Figure 12: Pressure Reduction Station Noise Contours

3.4 Marine Storage Terminal

The noise contours for the MST show a large area around the generator building that is predicted to be exposed to noise levels above 85 dBA, as presented in Figure 13. Offsite noise levels are shown to be a maximum of 75-80 dBA in a small area to the north of the site. The contours show that the site's concrete perimeter wall provides some noise attenuation, reducing noise levels offsite by between 5 and 10 dBA.

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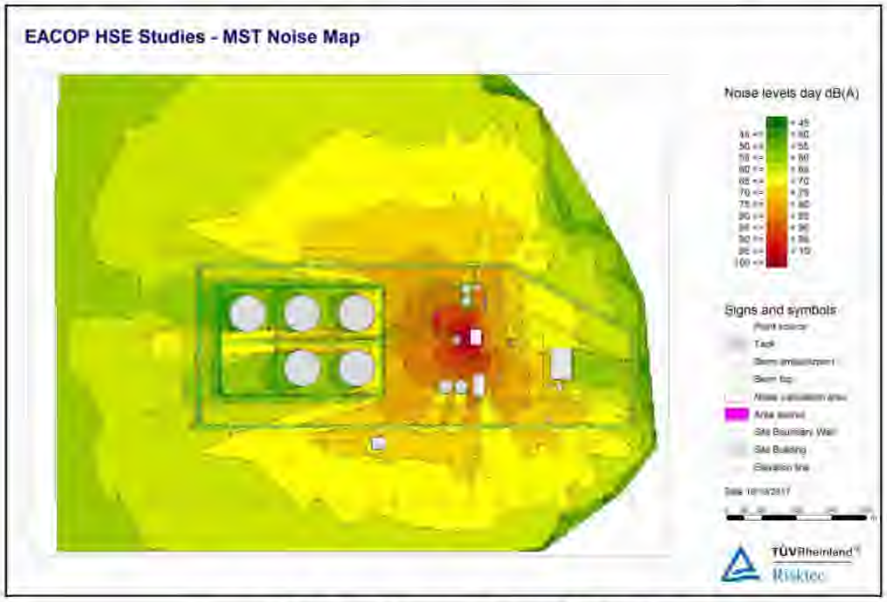

Figure 13: Marine Storage Terminal Noise Contours

The generator building contains three crude power generation units and is a significant source of noise, similarly to the pumping station described in Section 3.2. The generators were modelled as producing a sound pressure level of 115 dBA at 1 m, and the exhausts modelled as producing 115 dBA at 2 m.

In order to reduce the noise levels at the site boundary to around 45 dBA, some mitigation to reduce the sound power of these noise sources will be required. Reducing the overall sound power of the exhausts by 30 dBA (which could be achieved using exhaust silencers) and reducing the sound power of the generator engines by 15 dBA (which could be achieved with an enclosure) results in the noise levels across the site shown in Figure 14.

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EACOP HSE Studies – Noise Study			Document number: UT-MID-60-0010-000090	
			Revision : 01	Status : AFD
Document Type : REP	System / Subsystem :	Discipline : HSE	Rev Date :	20/11/2017
Contractor document number :	GIE-02-R15		Page 21 of 26	

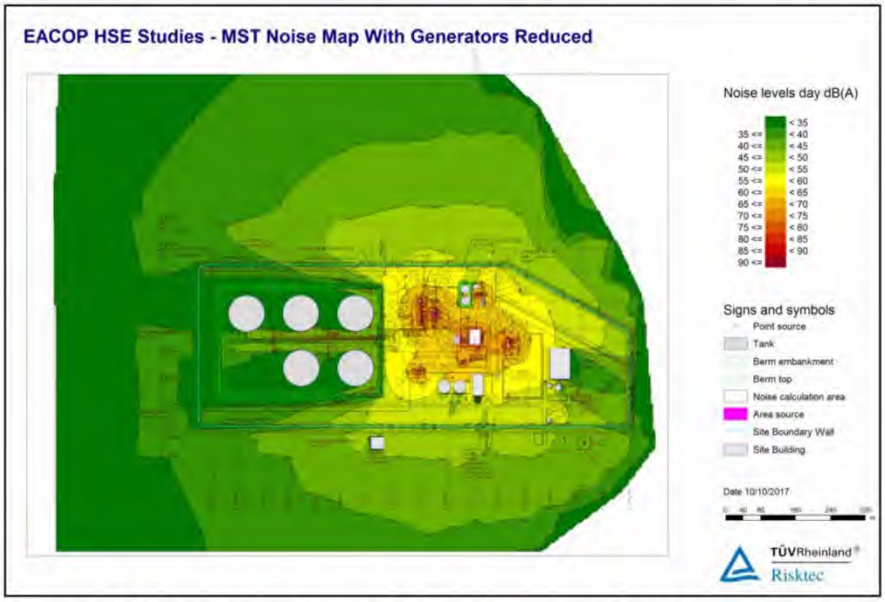

Figure 14: Marine Storage Terminal Noise Contours (Reduced Generator Noise)

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3.5 Load Out Facility

Three noise contour plots have been produced for the LOF; one for the export equipment (Figure 15), one for the import equipment (Figure 16) and a third for the export equipment and intermittently running pumps (Figure 17). It is assumed that import and export will not occur simultaneously, so these two cases are presented separately. The third case, including the export equipment and intermittently running pumps, is presented as a worst-case scenario showing noise levels that could occur for a maximum of one hour per day.

Figure 15 shows a maximum noise level of 85 dBA within 1 m of the hydraulic power units and Figure 16 shows a maximum noise level of 80 dBA.

Figure 17 presents noise contours for equipment that will be in use for a maximum of 1 hour per day, so although there are some small areas at 85 dBA, personnel will not be exposed to this level of noise for sufficient time for hearing protection to be required.

In the area above the LOF platform, noise contours are plotted at 1.5 m above the platform itself. Over the sea, the contours are plotted at 1.5 m above sea level, this explains the sharp drop in noise levels past the perimeter of the platform.

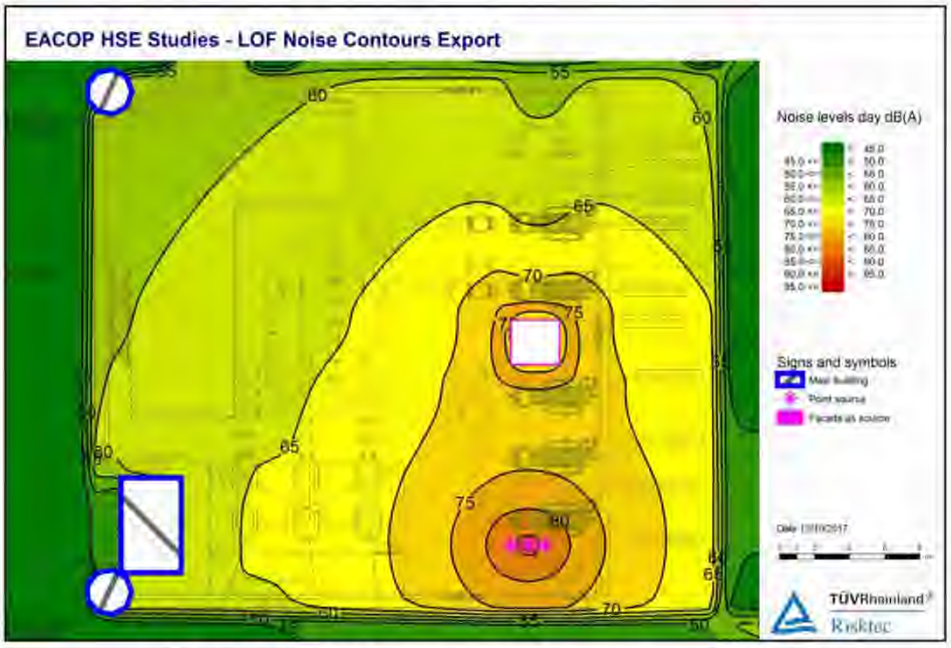

Figure 15: Load Out Facility Export Equipment Noise Contours

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			Revision : 01	Status : AFD
Document Type : REP	System / Subsystem :	Discipline : HSE	Rev Date :	20/11/2017
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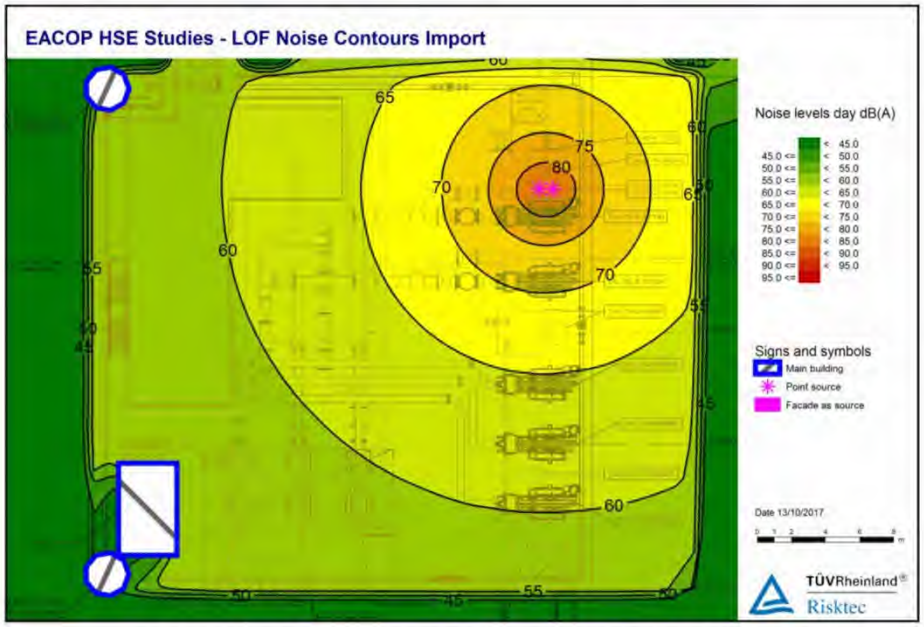

Figure 16: Load Out Facility Import Equipment Noise Contours

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			Revision : 01	Status : AFD
Document Type : REP	System / Subsystem :	Discipline : HSE	Rev Date :	20/11/2017
Contractor document number :	GIE-02-R15		Page 24 of 26	

Figure 17: Load Out Facility Export and Intermittent Equipment Noise Contours

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4 CONCLUSIONS & RECOMMENDATIONS

4.1 Conclusions

Noise contour maps have been produced for the Kabaale Hub, a typical pumping station, a typical pressure reduction station, the MST and the LOF using SoundPLAN v7.4.

Onsite noise levels on the Kabaale Hub, pressure reduction station and the LOF were found to be below 85 dBA except for some small regions around the noise generating equipment. The MST and pumping stations contain power generators which emit significant noise and result in large areas of the sites being exposed to noise levels above 85 dBA.

Offsite noise levels close to the Kabaale Hub and pressure reduction station were shown to be around 45 dBA, which is the IFC night-time limit for offsite residential buildings. Around the MST and pumping stations, noise levels were much higher, up to a maximum of 80-85 dBA just outside the site boundary, away from shadowing effect provided by the wall, due to the noise from the generators.

Solid concrete boundary walls were shown to reduce offsite noise levels around the pumping station by around 5 dBA, and to reduce the offsite distance to 45 dBA.

The generators were modelled using sound power levels producing 115 dBA at 1m from the generators and 115 dBA at 2 m from the exhausts. Reducing the sound power levels of the generators by 15 dBA and the exhausts by 30 dBA results in much lower noise across the sites, with no outdoor areas on site being exposed to more than 85 dBA. This also reduced the offsite noise levels to a maximum of 50 dBA.

4.2 Recommendations

The following recommendations should be considered:

1. Reducing the sound power level of the generators by 15 dBA, which could be achieved by using an acoustic enclosure around the engines.
2. Reducing the sound power level of the power generation unit exhausts by 30 dBA, which could be achieved by using an exhaust silencer.
3. For sites with offsite exposure above 45 dBA ensure that any existing or new residential locations close to the sites are beyond the indicated contours and not exposed to outdoor noise levels above 45 dBA.

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ATTACHMENT G2.4 ROCK BREAKING SOURCE DATA

Table AttG2.4-1 Typical Maximum Vibration Levels From Rock Hammering

Distance from Activity (m)	PPV Vibration Level (mm/s) at Distance (m)					
	5	10	20	30	40	50
Heavy rock hammer (1.5 t)	4.5	3	1.5	0.4	0.35	0.3
Medium rock hammer (0.6 t)	0.2	0.06	0.02	0.01	-	-

ATTACHMENT G2.5 CONSTRUCTION NOISE PREDICTION SEPARATION DISTANCES

Separation Distance for Exceedance of Magnitude criteria (construction)

Based on these distances, this is where receptors are likely to be exposed to magnitude criteria as a result of the plant included in the assessment for each task, activity or AGI. Many distances are the same due to similar noise emissions and the way in which the works have been modelled to account for worst case and without defined construction plans.

Phase	Activity	Period	Distance at Which Magnitude is Exceeded, m				
			Magnitude 2 (55 (dB(A))	Magnitude 4 (60 (dB(A))	Magnitude 6 (65 (dB(A))	Magnitude 8 (70 (dB(A))	Magnitude 10(75 (dB(A))
RoW	Clearing and Grubbing	Day	100	56	32	18	18
RoW	Camp/Site Establishment	Day	71	40	22	13	13
RoW	Road Construction	Day	100	56	32	18	18
RoW	General Earthworks	Day	100	56	32	18	18
RoW	Trenching	Day	100	56	32	18	18
RoW	Pipe Laying/Installation	Day	126	71	40	22	22
RoW	Backfilling/Reinstatement	Day	100	56	32	18	18
RoW	Rock Breaking	Day	141	79	45	25	25
PS1	Clearing and Grubbing	Day	100	56	32	18	18
PS1	General Earthworks	Day	100	56	32	18	18
PS1	Concrete Foundations	Day	112	63	35	20	20
PS1	Steel and Formwork	Day	112	63	35	20	20
PS1	M&E Installation	Day	79	45	25	14	14
PS1	Rock Breaking	Day	141	79	45	25	25
PS2	Clearing and Grubbing	Day	100	56	32	18	18
PS2	General Earthworks	Day	100	56	32	18	18
PS2	Concrete Foundations	Day	112	63	35	20	20
PS2	Steel and Formwork	Day	112	63	35	20	20
PS2	M&E Installation	Day	79	45	25	14	14
PS2	Rock Breaking	Day	141	79	45	25	25
MCPY1	Clearing and Grubbing	Day	100	56	32	18	18
MCPY1	General Earthworks	Day	100	56	32	18	18
MCPY1	Prefabrication Installation	Day	32	18	10	6	6
MCPY1	M&E Installation	Day	79	45	25	14	14
MCPY1	Operation	Day	100	56	32	18	18
MCPY2	Clearing and Grubbing	Day	100	56	32	18	18
MCPY2	General Earthworks	Day	100	56	32	18	18
MCPY2	Prefabrication Installation	Day	32	18	10	6	6
MCPY2	M&E Installation	Day	79	45	25	14	14

Phase	Activity	Period	Distance at Which Magnitude is Exceeded, m				
			Magnitude 2 (55 (dB(A))	Magnitude 4 (60 (dB(A))	Magnitude 6 (65 (dB(A))	Magnitude 8 (70 (dB(A))	Magnitude 10(75 (dB(A))
MCPY2	Operation	Day	100	56	32	18	18
MCPY3	Clearing and Grubbing	Day	100	56	32	18	18
MCPY3	General Earthworks	Day	100	56	32	18	18
MCPY3	Prefabrication Installation	Day	32	18	10	6	6
MCPY3	M&E Installation	Day	79	45	25	14	14
MCPY3	Operation	Day	100	56	32	18	18
MCPY4	Clearing and Grubbing	Day	100	56	32	18	18
MCPY4	General Earthworks	Day	100	56	32	18	18
MCPY4	Prefabrication Installation	Day	32	18	10	6	6
MCPY4	M&E Installation	Day	79	45	25	14	14
MCPY4	Operation	Day	100	56	32	18	18

ATTACHMENT G2.6 OPERATIONAL NOISE CONTOURS

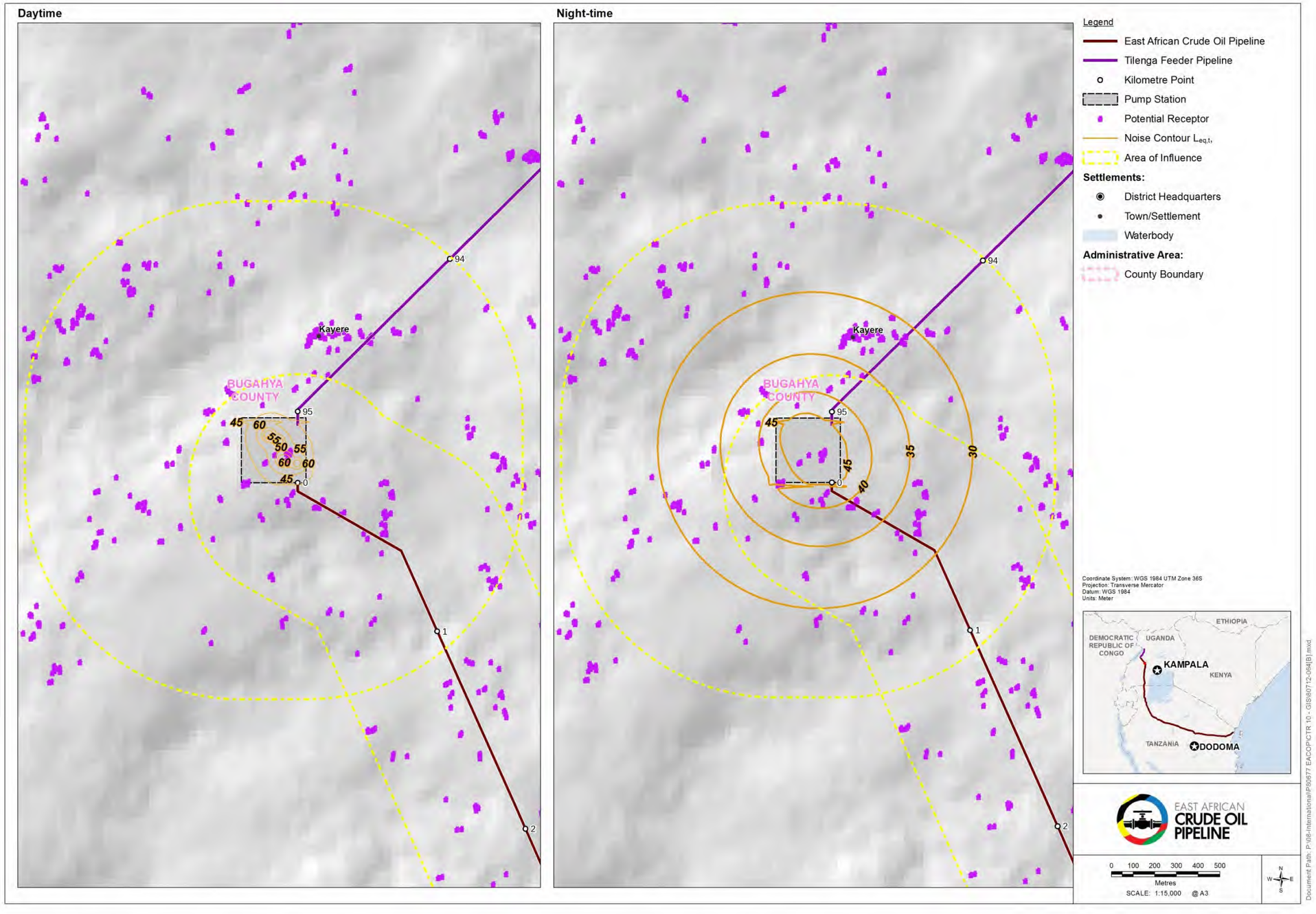

Figure AttG2.6-1 PS1 Operational Noise

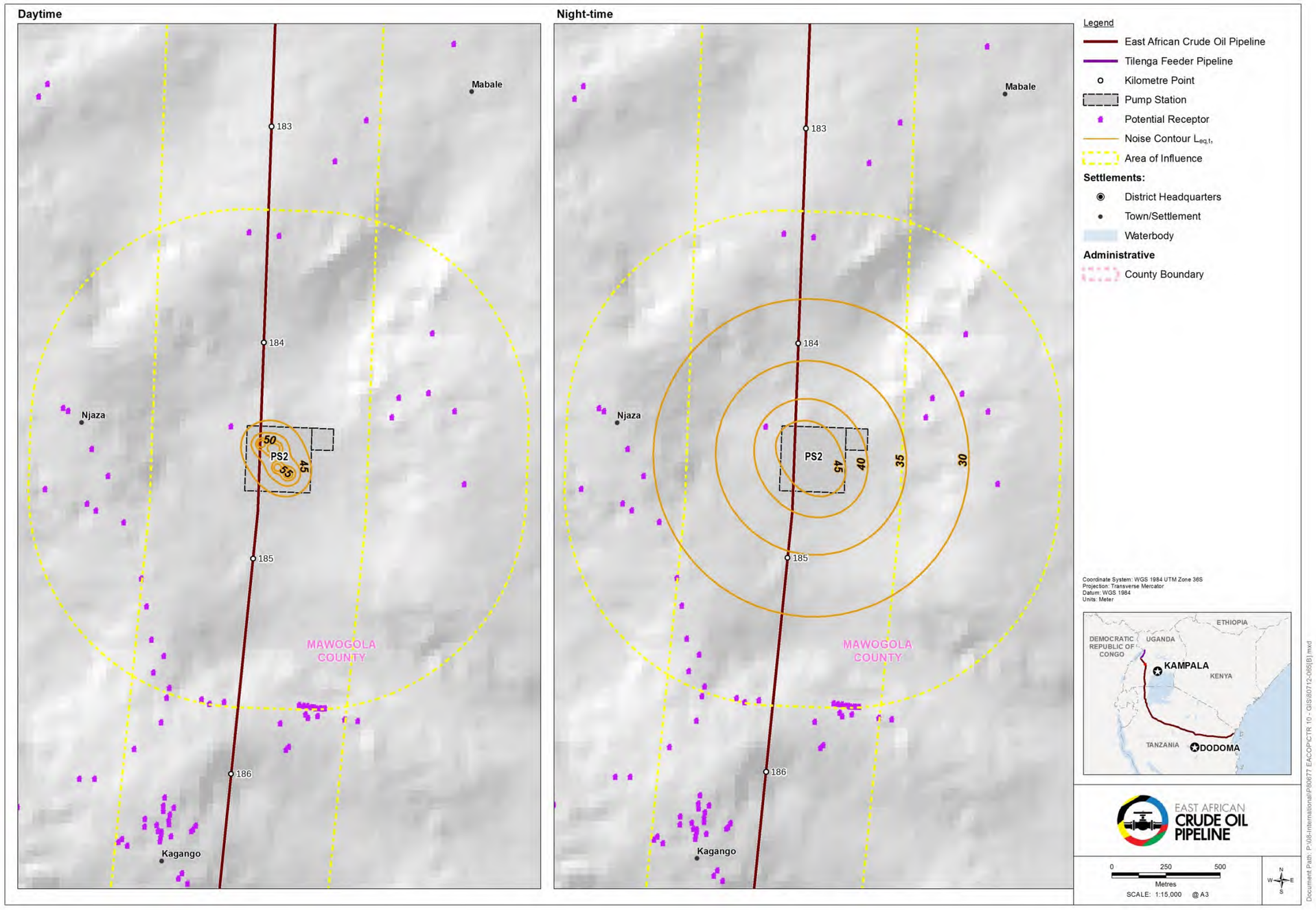

Figure AttG2.6-2 PS2 Operational Noise

Appendix G3: Greenhouse Gas Emissions Calculations

February 2020

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GLOSSARY AND ACRONYMS

Symbols	
%	percent
B	
BH	bulk heater
C	
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent, a standard unit for measuring GHG emissions (carbon footprints). The impact of each different greenhouse gas is expressed in terms of the amount of carbon dioxide that would create the same amount of warming. A GHG emission consisting of different greenhouse gases can be expressed as a single number.
E	
ESIA	environmental and social impact assessment
G	
GHG	greenhouse gas
K	
kbod	thousand barrels of oil per day
M	
m^3	cubic metre
MW	megawatt
N	
N_2O	nitrous oxide
T	
tCO_2e	tonnes of carbon dioxide equivalent

G3 GREENHOUSE GAS EMISSIONS CALCULATIONS

G3.1 Purpose and Scope of Report

This report describes the inputs, methods and assumptions used to calculate the predicted greenhouse gas emissions from the EACOP project.

G3.2 Construction Phase

G3.2.1 Introduction

The emissions for the construction phase are from a diverse range of sources, spread across the project's activities and transient, both geographically and temporally. The emissions are uncertain at this stage, before the precise methods, quantities and sources are fully defined by the project construction execution plan.

This section summarises the basis of the emissions data presented in Section 8.22.2. It details the methods, data sources and assumptions used.

The basic method is to multiply a quantity of **activity** by an **emission factor** or set of emission factors. The activity is done by a defined **population** of sources (a fleet of vehicles or equipment made up of various types, or a set of stationary sources such as power generators).

Emission factors are available for many types of atmospheric emission in published literature. The primary source used in this study was the Emep[1]/EEA air pollutant emission inventory guidebook 2019 (EEA 2019, internet site) which will be referred to as the EIG (emissions inventory guidebook) from this point.

G3.2.2 Categories

The major construction activities were divided into categories as described in Table G3.2.1.

Table G3.2.1 Construction Emission Source Categories

Category	Description	Type
1	The non-road construction equipment used to build the pumping stations	Non-road
2	The road vehicles used in the construction of the pumping stations	Road
3	The non-road construction equipment used on the pipeline spread	Non-road
4	The road vehicles used on the pipeline spread	Road

1 The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (known as Emep, stemming from the unofficial name of 'European Monitoring and Evaluation Programme')

Table G3.2.1 Construction Emission Source Categories

Category	Description	Type
5	The power generators at the main camp/pipe yards (MCPY)	Stationary
6	The transport of workers to and from the camps, and their daily travel to and from the right-of-way (RoW)	Road
7	The transport of pipe and cable materials to the MCPYs and on to the RoW	Road
8	The transport of the mechanical and electrical equipment that forms a pumping station and the construction equipment and vehicles to build it. In the case of the construction equipment this means the mobilisation and demobilisation to and from the sites. The equipment's activity in building the PSs is captured in categories 1 and 2	Road
9	The transport of supplies to the MCPYs from local sources	Road
10	The transport of the construction equipment and vehicles used for a pipeline spread. This means the mobilisation and demobilisation to and from the sites. The equipment's activity in actually working the spread is categories 3 and 4	Road
11	The transport of the equipment for an MCPY (except the pipe, which is covered in category 7)	Road
12	The transport of murram from local sources for new roads and road upgrades	Road

The types of the category define the activity data that is required as an input:

- Road source emission factors are based on the distance travelled by various types of road going vehicle and are in units of grams of emitted substance per kilometre (g/km).
- Non-road emission factors are based on the energy output of the engine, which in turn is based on its power rating (maximum power output), a load factor (what fraction of that maximum power it typically operates at) and the hours of operation of the source type. These emission factors are in grams per kilowatt-hour (g/kWh).
- The stationary emission source factors used in this assessment are based on the energy content of the fuel input. They are US factors and are originally published in units of lb/MMBtu.

The following subsections cover each category in turn and describe the data sources, assumptions and full calculation methodology for the three main input types: source population, activity and emission factors.

G3.2.3 Category 1: Non-road Equipment Building the Pumping Stations

G3.2.3.1 Source Population

The equipment to be used per AGI is set out in Appendix 1 of the project document 'Volumes and Quantities Estimate' (UT-MID-60-0010-000330, rev 00, 13

September 2017), hereafter "V&Q". This was separated into road vehicles and non-road equipment. The road vehicles are covered in Category 2.

G3.2.3.2 Emission Factors

The emission and fuel consumption factors and the quantification method used were as per the EIG, part B, chapter 1.A.4 'non road mobile machinery' and specifically the Tier 3 equipment-specific and technology-stratified approach described in section 3.4 of that document.

The equipment was classified into categories according to both the US EPA's MOVES model and table C1 in the EIG chapter and the typical power ratings obtained from a model simulation run in MOVES.

The base emission factors were taken from table 3-6 of the EIG chapter, according to the power ratings. Stage V technologies were assumed for all equipment[2].

The emission factors were adjusted according to equations 5 and 18 in the EIG chapter. The load factor adjustment is 1 for all stage V equipment. To calculate the deterioration factor adjustment according to equation 18, average equipment lifetimes were taken from table C1 and the age of all the items of equipment to be used was assumed to be three years. Deterioration factors were taken from table 3-11 of the EIG chapter.

The adjusted emission factors were multiplied by the activity for each equipment type, derived as described below.

Additional emission factors were added for carbon dioxide and sulphur dioxide based on the calculated fuel consumption and mass balance-based equations as follows:

$CO_2 = FC \times 3.186$

where CO_2 = carbon dioxide emission (tonne), FC = calculated fuel consumption (tonne), 3.186 = emission factor (CO_2/FC) (GHG Protocol 2014, internet site)

$SO_2 = FC \times 50 / 1{,}000{,}000 \times 2$

where SO_2 = sulphur dioxide emission (kg), FC = calculated fuel consumption (kg), 50 = maximum sulphur content of diesel fuel in Uganda in parts per million by weight (UNEP 2018, internet site), 2 = (rounded) mass ratio of SO_2 to sulphur.

The three greenhouse gases CO_2, methane (CH_4) and nitrous oxide (N_2O) were additionally aggregated into carbon dioxide equivalent (CO_2e) as described in Section G3.3.4.

These methods of CO_2, SO_2 and CO_2e determination apply to all the categories. There are no methane or nitrous oxide factors for Category 5 (camp generators). These GHGs therefore don't contribute to the CO_2e in that category cases. This will not cause a material misstatement as CH_4 and N_2O are not significant relative to CO_2 in GHG emissions from fuel combustion, as shown in other categories.

[2] Stage V is the latest (2016) set of emissions control technology requirements for non-road mobile machinery as explained in section 2.6 of EIG B1.A.4. It is assumed that all equipment used on the project will be of this standard.

G3.2.3.3 Activity

Activity for non-road equipment is calculated by

$P \times LF \times H$

where P is the power rating (kW), LF is the load factor (dimensionless) and H is the hours of operation over the period of interest.

P was obtained as described in the emission factors section above, LFs were taken from appendix A of the "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" (US EPA 2010, internet site) and the hours were assumed to be 10 hours per day (assumed) over a 150-day construction period (5 months, as used in the ESIA's traffic study). Further factors for the source population (number of each type of equipment in use at each PS) and the number of PS (two) were used to derive the total activity (kWh).

G3.2.4 Category 2: Road Vehicle Use in Building the Pumping Stations

G3.2.4.1 Source Population

See Section G3.2.3.

G3.2.4.2 Emission Factors

The emission factors and the quantification method used were as per the EIG, part B, chapter 1.A.3.b.i-iv, 'road transport' and specifically the Tier 2 approach described in section 3.3 of that document.

Heavy duty vehicles were classified into weight categories using the unit weights specified in appendix 1 of V&Q, other vehicle categories were assigned using judgement.

The emission and fuel consumption factors were taken from table 3-17 to table 3-27 of the EIG chapter, according to the assigned vehicle type. Euro 6 equivalent emissions performance was assumed for all vehicles. If further delineation was required, the 2017-2019 subcategory was used. The exception is methane, for which there is no Tier 2 factor. The factors from Tier 3 in table 3-48 were used, with rural driving assumed.

The emission factors were multiplied by the activity for each vehicle type, derived as described below.

G3.2.4.3 Activity

Every vehicle in this category was assumed to drive 30 km/day over the 150-day construction period. Further factors for the source population (number of each type of vehicle in use at each PS) and the number of PS (two) were used to derive the total activity (km).

G3.2.5 Category 3: Non-road Equipment on the Pipeline Spread

G3.2.5.1 Source Population

The equipment to be used per spread is set out in Appendix 3 of V&Q. This was separated into road vehicles and non-road equipment. The road vehicles are covered in Category 4.

G3.2.5.2 Emission Factors

The emission factors are as per Category 1, described in Section G3.2.3

G3.2.5.3 Activity

The activity is as per Category 1, described in Section G3.2.3, except the total duration of construction was estimated to be 450 days (15 months, (Spiecapag constructability study technical narrative, p57/167)). The 'number of PS' factor was also excluded as there is one spread.

G3.2.6 Category 4: Road Vehicle Use on the Pipeline Spread

G3.2.6.1 Source Population

See Section G3.2.5

G3.2.6.2 Emission Factors

The emission factors are as per Category 2, described in Section G3.2.4.

G3.2.6.3 Activity

Every vehicle in this category was assumed to drive 30 km/day over the 450-day construction period. A further factor for the source population (number of each type of vehicle in use on each spread) was used to derive the total activity (km).

G3.2.7 Category 5: Generators at the Main Camp Pipe Yards

G3.2.7.1 Source Population

Power generation is assumed to be provided by four Aggreko 350 kVA canopy generators at each MCPY, though under no expected (normal operation) scenario are all four operational at the same time. This assumption is consistent with that of the acoustics assessment (Table G2.2-8).

G3.2.7.2 Emission Factors

The emission factors used are from the US EPA's Compilation of Air Pollutant Emission Factors, AP42 (US EPA 1996, internet site), chapter 3.3, 'Gasoline and Diesel Industrial Engines'. The diesel, fuel-input-based factors from table 3.3-1 are used. The CO_2 and Sox factors are not used; these emissions are instead calculated from the fuel consumption rate as described in Section G3.2.3.

G3.2.7.3 Activity

The occupation of a camp is split into a main occupied period of 90 days (Spiecapag, p28/167) and a 270-day period of lower occupation and less activity (270 days being based on the average MCPY occupation period of 12 months (Spiecapag, p38/167, alternative case used owing to the lower number of spreads in that case) less the 90-day main occupied period.

In the main occupied period, three generators are assumed to operate at full load during the day and one at night (acoustics assessment, Table G2.2-8). In the lower activity period, one generator is assumed to operate at full load during the day and at half load during the night. The day-night split is 12 hours for each.

The fuel consumption rates per generator are:

- at full load – 62.7 l/h
- at half load – 33.3 l/h

(Aggreko 2019, internet site)

The fuel input rate is converted from a volumetric basis to an energy basis using the calorific value for diesel of 38.6 MJ/l, and to a mass basis for the CO_2 and SO_2 calculations using a density of 0.846 kg/l (Engineering Toolbox 2019, internet site).

The final factor is a multiplication by four for the number of camps.

G3.2.8 Category 6: Transport of Workers

G3.2.8.1 Emission Factors

The road vehicle factors as described in Section G3.2.4 were used. For transport by car, the type ‘diesel medium’ was assumed and for transport by bus, the type ‘coaches standard’ was assumed.

G3.2.8.2 Source Population and Activity

This category estimated the emissions from three journey types:

- initial mobilisation of workers who will reside in the camps (and their demobilisation)
- daily commuting of more locally-based workers between their homes and the camps
- daily transfers between the camps and the RoW.

The number of workers operating from each camp was assumed to be 1000 people, with 785 resident at the camp and 215 commuting locally. Of the commuters, 50% were assumed to travel by car and 50% by bus.

The 785 residents were assumed to all travel to the camp initially by bus, with 30 people per bus meaning 785/30 = 26 trips. Each trip was assumed to be 200 km (one way). These buses are assumed to return to their bases once they have transferred the workers. The process is repeated for demobilisation of these workers at the end of the construction period. These journeys apply to MCPY4 only, as the workforce is assumed to transfer along the spread rather than demobilising and mobilising to the next camp.

Therefore, the activity for this journey type is:

785 people/30 per bus = 26.2 trips × 400 km return journey distance × 2 (mobilisation and demobilisation) = 20,934 km.

The car commuters are assumed to travel 3 people per car on average, 20 km (one way), therefore the activity for this journey type is:

215 commuters × 0.5 fraction by car/3 people per car × 40 km daily return journey distance × 90 days main occupational period per camp × 4 camps = 516,000 km

The equation is the same for the bus commuters except the bus capacity is 30 rather than 3 therefore the distance is 51,600 km.

For the daily transfer between the camps and the ROW, 300 people are assumed to make this journey daily. The same 30-person buses are assumed to make the 30 km (average) one-way journey and return to the camp, then repeat at the end of the working day, i.e., 120 km travelled in total. The total activity is therefore:

300 workers/30 people per bus = 10 buses × 120 km/day × 90 days × 4 camps = 432,000 km.

G3.2.9 Category 7: Transport of Pipe and Cables

G3.2.9.1 Emission Factors

The road vehicle factors as described in Section G3.2.4 were used. The only type of vehicle active in this category was deemed to be the 'Diesel 16-32 t' heavy duty vehicle.

G3.2.9.2 Source Population and Activity

All pipe and cable is assumed to come from Tanzania – either from the coating yard or directly from the ports. This inventory is only concerned with the Ugandan parts of the journeys, therefore distances begin at the border.

The number of pipe pieces to travel to each MCPY and the required number of trips (based on six pipe pieces per truck) are stated in section 3.3.2.2 (p34/167) of the Spiecapag constructability report[3].

For the cabling, the trips were calculated from the total weight of cable of 5937 tonnes (traffic assessment) for all six spreads of the EACOP system and the Tilenga feeder pipeline. This means that 5937/6 = 989.5 tonnes are delivered to each spread. The deliveries to the EACOP spread in Uganda were split equally between the four MCPYs. The trips to each MCPY were then calculated based on a truck capacity of 20 tonnes.

The distances from the Tanzanian border to the MCPYs were calculated using the logistics route depicted on the Project Synoptic diagram (UT-MID-60-0010-000401, rev D0); 30 km was added to each one-way distance to include the final delivery from the MCPY to the RoW.

[3] It is acknowledged that the KP points of the MCPYs are slightly outdated, therefore the distribution of the pipe piece deliveries among the MCPYs may be inaccurate, but the effect on the overall activity and emissions will not be significant.

The total activity was then calculated by number of trips (pipe + cables) × one-way distance from border to RoW × 2 (for return journey). This was done for each MCPY/ROW and aggregated.

G3.2.10 Category 8: Transport of Equipment for Pumping Stations

G3.2.10.1 Source Population

The activity in this category is of two types:

- the transport of the mechanical, electrical and non-road construction equipment for the construction of the pumping stations on heavy duty vehicles from Tanzania
- the mobilisation of the road-going construction equipment for the construction of the pumping stations under its own power from Tanzania.

The construction equipment is that whose actual activity onsite is covered in categories 1 (non-road) and 2 (road-going). This category is concerned with its mobilisation and demobilisation to and from the PS construction project sites, together with the mobilisation of the mechanical and electrical equipment that comprises the pumping station (but not the demobilisation of this, as that is part of the decommissioning phase).

G3.2.10.2 Emission Factors

The road vehicle factors as described in Section G3.2.4 were used. The two types of vehicle active in this category were deemed to be the ‘Diesel 16-32 t’ and the ‘Diesel <7.5 t’ heavy duty vehicles.

G3.2.10.3 Activity

The total weight to be transported by HDVs to each PS was calculated by the sum of:

- the mechanical equipment per pumping station (7711 tonnes total for 6 PS (V&Q section 5.1)/6 = 1285 t
- the electrical equipment per pumping station (2340 tonnes total for 6 PS (V&Q section 5.1)/6 = 390 t
- the non-road construction equipment per pumping station (fleet composition and weights as per category 1, plus the 595 t for the ‘camp 180 pers’ - data from Appendix 1 of V&Q) = 2183 t.

Total 3859 t / 20 t per truck = 193 trips to each of PS1 (425 km) and PS2 (162 km).

Only the third element of this weight (the non-road construction equipment) is demobilised, therefore the return trips are 2183/20 = 109 trips.

The road-going vehicle fleet per PS as per Category 2 drives under its own power from the Tanzania–Uganda border to the PS sites and returns the same distance at the end of construction.

G3.2.11 Category 9: Local supplies to the MCPYs

G3.2.11.1 Source Population

The activity in this category is by heavy duty vehicles delivering fuel and goods from local sources to the MCPYs and the spread. Fuel is assumed to be delivered by HDVs in the 'Diesel 16-24 t' class, and other goods by 'Diesel 7.5 – 16 t' trucks.

G3.2.11.2 Emission Factors

The road vehicle factors as described in Section G3.2.4 were used.

G3.2.11.3 Activity

As with other categories relating to the MCPYs, the activity is split into a peak period of three months per MCPY, when the spread is principally supported from that MCPY and occupation is at its peak, and a nine month-period of lower activity

Fuel deliveries include both deliveries for the camp generators and for the pipeline spread equipment. Other supplies will include food, general goods and waste collection, but are aggregated for the purposes of this inventory as they are assumed to be made by the same vehicle type.

The activity schedule is as follows:

Peak period (3 months, per other categories): fuel - 40 trips per month per spread (ESIA traffic assessment); other supplies – 261 supply trips per month per spread (also ESIA traffic assessment, being the sum of 80 'MCPY supplies' and 181 'general materials').

Off-peak period (nine months, per other categories): all deliveries reduced to a quarter of peak period (assumption).

All trips are assumed to be 50 km one way. The return journey is accounted for.

G3.2.12 Category 10: Transport of Equipment for Pipeline Spread

G3.2.12.1 Source Population

The activity in this category is of two types:

- the transport of the non-road construction equipment for the pipeline spread on heavy duty vehicles from overseas via Tanzania
- the mobilisation of the road-going construction equipment for the pipeline spread under its own power from Tanzania.

The construction equipment is that whose activity onsite is covered in categories 3 (non-road) and 4 (road-going). This category is concerned with its mobilisation and demobilisation to and from the pipeline spread.

G3.2.12.2 Emission Factors

The road vehicle factors as described in Section G3.2.4 were used. The non-road equipment is deemed to be transported by 'Diesel 16-32 t' heavy duty vehicles. The road going fleet consists of a variety of vehicle types, classified into the EIG

categories by their weight or by judgement based on their description, including 150 'Toyota Hilux pickups', classified as 'light commercial vehicles').

G3.2.12.3 Activity

The total weight of non-road equipment to be transported by HDVs to the spread was calculated using the fleet composition and weights as per Category 3, plus the 719 t of 'screw anchors' - data from Appendix 3 of V&Q). The total weight is 3093 t.

Total 3093 t/20 t per truck (ibid) = 155 trips to PS1 (425 km) and back to demobilise the equipment. There is no mobilisation contribution, as construction starts at the border.

The road-going vehicle fleet per spread as per category 4 makes the same journeys under its own power.

G3.2.13 Category 11: Transport of Equipment for Establishment of MCPYs

G3.2.13.1 Emission Factors

The road vehicle factors as described in Section G3.2.4 were used. The only type of vehicle active in this category was deemed to be the 'Diesel 16-32 t' heavy duty vehicle.

G3.2.13.2 Source Population and Activity

The weight to be transported per camp is 3088 t (V&Q, Appendix 3). Truck capacity is 20 t, therefore 154 trips are required. The distances to each MCPY are as previous categories.

Demobilisation activity was estimated at 20% of the mobilisation of the camp equipment, as it is assumed that much of the camp equipment will either be left in place or reused locally.

G3.2.14 Category 12: Transport of Murram for Road Upgrades and New Roads

G3.2.14.1 Emission Factors

The road vehicle factors as described in Section G3.2.4 were used. The only type of vehicle active in this category was deemed to be the 'Diesel 16-32 t' heavy duty vehicle.

G3.2.14.2 Source Population and Activity

The number of trips was taken from the ESIA traffic assessment, which detailed lengths of new and upgraded road per AGI and per camp and associated trips. It showed that there are new roads to be built at MCPY4 and upgrades to be done at MCPYs 3 and 4 and PS2. The traffic assessment deemed each of these locations to need 300 trips, except at PS2 which was estimated to need 150 trips as the length of the planned upgrade is smaller.

Each trip was estimated to be 50 km (each way) from a relatively local source of murram. The return journey was accounted for.

G3.2.15 Results Summaries

Table G3.2.2 Activity and Fuel Consumption

Category		Activity	Activity Units	Diesel Consumption (Tonne)
Non-road				
1	Non-road equipment building the pumping stations	84,615	MWh engine output	21,160
3	Non-road equipment on the pipeline spread	203,144	MWh engine output	50,786
5	Generators at the MCPYs[1]	9,084	MWh engine output	1,969
Road				
2	Road vehicle use in building the pumping stations	162,000	km	19
4	Road vehicle use on the pipeline spread	2,727,000	km	303
6	Transport of workers	1,020,533	km	153
7	Transport of pipe and cables	1,288,846	km	271
8	Transport of equipment for pumping stations	375,797	km	77
9	Local supplies to the MCPYs	632,100	km	103
10	Transport of equipment for pipeline spread	217,296	km	37
11	Transport of equipment for establishment of MCPYs	296,819	km	62
12	Transport of murram for roads	75,000	km	16
Total (road km only for activity)		6,795,391	km	74,956

NOTE: [1] The power output of the generators at the MCPYs (Category 5) was converted from the energy input in the fuel (the actual activity data used in the calculation) for comparison with the other non-road categories using an engine efficiency of 7000 BTU/hp.hr (note a under table 3.3-1, US EPA 1996).

Table G3.2.3 Emissions

Category		Air Pollutants (Tonne)					Greenhouse Gases (Tonne)			
		NOx	**NMVOC**	**CO**	**PM**	**SO_2**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
1	Non-road equipment building the pumping stations	212.1	11.2	132.3	3.3	2.1	67,417	0.3	3.0	68,308
2	Road vehicle use in building the pumping stations	0.1	0.0	0.0	0.0	0.0	59	0.0	0.0	60
3	Non-road equipment on the pipeline spread	650.0	26.6	314.4	10.0	5.1	161,804	0.6	7.1	163,944
4	Road vehicle use on the pipeline spread	1.3	0.1	0.2	0.0	0.0	967	0.1	0.0	978
5	Generators at the MCPYs	170.4	13.9	36.7	12.0	0.2	6,274	No factor	No factor	6,274
6	Transport of workers	0.4	0.0	0.1	0.0	0.0	487	0.0	0.0	494
7	Transport of pipe and cables	0.5	0.0	0.1	0.0	0.0	862	0.1	0.0	878
8	Transport of equipment for pumping stations	0.2	0.0	0.0	0.0	0.0	245	0.0	0.0	250
9	Local supplies to the MCPYs	0.2	0.0	0.0	0.0	0.0	327	0.0	0.0	334
10	Transport of equipment for pipeline spread	0.1	0.0	0.0	0.0	0.0	118	0.0	0.0	120
11	Transport of equipment for establishment of MCPYs	0.1	0.0	0.0	0.0	0.0	199	0.0	0.0	202
12	Transport of murram for roads	0.0	0.0	0.0	0.0	0.0	50	0.0	0.0	51
Total		**1035.4**	**51.8**	**483.8**	**25.3**	**7.4**	**238,809**	**1.2**	**10.2**	**241,893**

G3.3 Operational Phase – Bulk Heater Emissions at PS1 and PS2

This section details the process by which the greenhouse gas (GHG) emissions from the bulk heaters at PS1 and PS2, as presented in Section 8.22.2, were calculated.

G3.3.1 Flow Rate Profile

Firstly, the pipeline system's flow rate over its operational life was determined. The source for this was figure 147 in the engineering document ref UT-MID-60-0010-000172 rev 01, "TPS + EPS Steady State Analysis Report" (the "steady state analysis").

The curve exclusive of the refinery take-off was used, and the flow rate indicated for each year was approximated to the nearest point at which the steady state analysis had specific calculations. The resulting flow rate profile is shown in Table G3.3.1.

Table G3.3.1 EACOP Flow Rate Profile Over Operational Life

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Flow rate (kbod)	90	190	216	216	216	216	190	150	110	90	70	70	
Year	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Flow rate (kbod)	50	50	50	35	35	35	35	35	35	35	35	35	35

G3.3.2 Active Bulk Heaters and Their Duties

The upper half of table 68 in the steady state analysis details which bulk heaters are required for the pipeline sections at each flow rate. The statuses for PS1 and PS2 are shown in the middle two rows of Table G3.3.2. Table 71 of the steady state analysis gives the total bulk heating duty for the same flow rates. This is the total duty of all the bulk heaters of the export system, in both Uganda and Tanzania. These data are reproduced in the bottom row of Table G3.3.2.

Table G3.3.2 PS1 and PS2 Bulk Heater Statuses; and Total Bulk Heating Duty at Varying Flow Rate

Flow Rate (kbod)	**246**	**216**	**190**	**170**	**150**	**130**	**110**	**90**	**70**	**50**	**35**
PS1 bulk heater status	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
PS2 bulk heater status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
Total bulk heating duty (MW)	0	0	18.4	15.9	26.4	28.3	29.7	30.7	32.2	26.3	19.8

The next step is to allocate this total bulk heating duty to the active bulk heaters (activity statuses for Tanzanian bulk heaters, in addition to the Ugandan units' statuses as shown in Table G3.3.2, are shown in table 68 of the steady state analysis). This was done by assuming that each bulk heater shares the load according to the ratio of its capacity to the total capacity of the active bulk heaters.

The capacity of each bulk heater was taken from engineering document UT-MID-82-0010-000641 rev 01, "Calculation Notes - Crude Bulk Heaters (PS1-6)". The capacities are reproduced in Table G3.3.3.

Table G3.3.3 Bulk Heater Capacities

Pumping Station	PS1	PS2	PS3	PS4	PS5	PS6
Bulk heater capacity (MW)	11.99	7.56	16.22	18.23	14.17	20.38

The allocation of duty to the bulk heaters at PS1 and PS2 is shown in Table G3.3.4.

Table G3.3.4 Duty of PS1 and PS2 Bulk Heaters at Varying Flow Rate

Flow Rate (kbod)	246	216	190	170	150	130	110	90	70	50	35
Total capacity of active BHs (MW)	0	0	20.4	18.2	36.6	50.8	62.8	81.0	88.6	88.6	88.6
PS1 BH share of duty (MW)	0	0	0.0	0.0	0.0	0.0	5.7	4.5	4.4	3.6	2.7
PS2 BH share of duty (MW)	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	2.2	1.7

G3.3.3 Fuel Consumption

The fuel consumption rate of the bulk heaters was calculated from the data in table 71 of the steady state analysis. This shows a total bulk heating crude consumption rate (in m^3/day) at the varying flow rates (and therefore the varying total bulk heating demand as shown in Table G3.3.4). Dividing the crude consumption rate by the demand gives a specific crude consumption rate in m^3/d/MW. The figure for a flow rate of 170 kbod was used. The calculation is:

$$\frac{\text{Total bulk heater fuel consumption rate} = 39.9\ m^3/d}{\text{Bulk heater heat demand} = 15.9\ MW} = 2.509\ m^3/d/MW$$

This only varies slightly (by no more than 0.01 m^3/d/MW) for the other flow rates, with differences only likely to be caused by rounding, as the bulk heater fuel consumption is based on a fixed efficiency of 92% as stated in the note under table 71 of the steady state analysis.

The crude oil consumption of each bulk heater was then calculated by multiplying the heat demand on each bulk heater for that year of operation (based on the flow rate in that year, as per Table G3.3.1 and the duty share as shown in Table

G3.3.4). For example, the crude consumption for year 11 (flow rate 70 kbod) at PS1 is:

4.4 MW × 2.509 m^3/d/MW × 365 days = 3994 m^3 [4]

G3.3.4 Emissions

The final step is to convert the fuel consumption to emissions.

The crude consumption was converted to mass units using a density of 868 kg/m^3. This is the density of blend E1 as used in appendix 2 of the steady state analysis.

The greenhouse gases emitted from the combustion of crude oil are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Emission factors for these substances were taken from the US EPA's 2014 emission factors for GHG inventories (the latest of this dataset available at the time of undertaking the calculations) (US EPA 2014, internet site).

The raw emission factors are:

- 10.29 kgCO_2/gal
- 0.41 gCH_4/gal
- 0.08 gN_2O/gal

These were converted into units of tonne pollutant per tonne of crude oil by dividing by the density of 868 kg/m^3 and by 0.003785 m^3/gal (US). An extra divisor of 1000 is required for CO_2 as the raw factor is in kg/gal whereas the others are in g/gal. This gives:

- 3.13 tCO_2/t_{crude}
- 1.25×10^{-4} tCH_4/t_{crude}
- 2.43×10^{-5} tN_2O/t_{crude}

Rather than reporting the emissions of these individual gases, we chose to report emissions of total GHGs, expressed as CO_2 equivalent (CO_2e). This is done by applying a global warming potential to each GHG, as shown in Table 8.22-1 of the ESIA, giving a composite GHG factor of 3.14 tCO_2e/t_{crude} (which shows that CO_2 is the dominant greenhouse gas, and emissions of methane and nitrous oxide are relatively insignificant, even though they are more powerful GHGs than CO_2 per unit mass).

The emissions are then calculated by multiplying the crude consumption in each year by this emission factor. For example, in year 11 for PS1:

3994 m^3 × 868 kg/m^3 × 3.14 tCO_2e/t_{crude} = 10,896 tCO_2e [5]

The complete results for PS1 and PS2's bulk heaters are shown in Table G3.3.5.

[4] The result shown is the precise result, calculated in an Excel spreadsheet using precise, unrounded input numbers. Performing the calculation using the rounded input numbers presented in this appendix will yield a slightly different result.

[5] The previous footnote regarding rounding also applies here

Table G3.3.5 Year by Year GHG Emissions Inventory, PS1 and PS2

Year	GHG emission (tonne CO_2e)		
	PS1	**PS2**	**Total**
1	11358*	0	11358*
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	14179	0	14,179
10	11,358	0	11,358
11	10,896	6,870	17,765
12	10,896	6,870	17,765
13	8,899	5,611	14,510
14	8,899	5,611	14,510
15	8,899	5,611	14,510
16	6,700	4,224	10,924
17	6,700	4,224	10,924
18	6,700	4,224	10,924
19	6,700	4,224	10,924
20	6,700	4,224	10,924
21	6,700	4,224	10,924
22	6,700	4,224	10,924
23	6,700	4,224	10,924
24	6,700	4,224	10,924
25	6,700	4,224	10,924
Total	**152,381**	**72,817**	**225,198**

*Due to production ramp up, the indicated flow rate for year 1 is 90 kbod and, at this flow rate, the steady state analysis indicates that the bulk heater at PS1 will be active and an emission is calculated according to the method described. However, in practice, the bulk heaters at PS1 and PS2 will not be installed until later in the project life, therefore if the lower flow rate during ramp up requires additional heat, it would need to be provided by the heat tracing system powered from the Tilenga CPF. EACOP's emissions may therefore be overestimated owing to that anomaly.

The data in red are the annual maximums, as reported in Table 8.22-2 in kilotonnes, rounded to the nearest whole kilotonne.

G3.4 References

G3.4.1 Internet Sites

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Appendix H: Cumulative Impact Assessment

February 2020

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H1 SOURCES OF CUMULATIVE IMPACT

Table H1.1 presents the associated facilities that have been screened in to the cumulative impact assessment, and Table H1.2 shows the third-party developments that have been screened in to the cumulative impact assessment based on the criteria defined in Section 5 of the ESIA.

Table H1.1 Screened-In Associated Facilities

ID[1]	Project	Proponent	Description	Reference[2]
AF01	Tilenga Project	Total E&P Uganda BV	Tilenga Project comprises a field development that will supply oil to the Tilenga feeder pipeline. **Field Development** • Six production fields within which 412 wells (190 producers, 190 water injectors and 32 observation wells) from 34 well pads • Production and injection network of buried pipelines to transport oil, gas and produced water extracted from the producing wells to the CPF and injection water to the well pads from the CPF and Lake Albert. The network will include a tunnelled (via horizontal directional drilling) section under the Victoria Nile • The Industrial Area, containing o 190,000 BOPD capacity CPF, including electrical power generation, oil heating facility and a pump station for the Tilenga feeder pipeline. From the CPF, the treated and stabilised oil will be sent to the oil export system via Tilenga feeder pipeline and gas will be used for power generation o auxiliary facilities including permanent operation and security camps, maintenance facilities and offices, and integrated waste management area • Water abstraction system from Lake Albert for reinjection at the well pads to maintain production pressure • Victoria Nile ferry crossing facility • New access roads In addition to the above, the project will upgrade and use existing Tangi Operation Support Base, Bugungu Airstrip and a number of roads. During construction, the project will require the following temporary facilities: • Buliisa and Bugungu construction camps (existing facilities originally constructed to support exploration activities) • Temporary camp and construction facilities at the Industrial Area • Temporary facilities at the Tangi construction support base	Information received from the Tilenga Project, including EA-1/EA-1A & EA-2 North Project – ESIA Scoping Report/Terms of Reference, 2015 Tilenga Feeder Pipeline ESIA, 2018

Table H1.1 Screened-In Associated Facilities

ID[1]	Project	Proponent	Description	Reference[2]
			• Masindi vehicle check point. **Feeder Pipeline** The feeder pipeline is a 95 km long, 24-in.-diameter, insulated, electrically trace heated, buried pipeline from the Tilenga central processing facility (CPF), Buliisa to pumping station-1 (PS1) at Kabaale Industrial Park. The pipeline will have several aboveground installations, namely four standalone main line block valve station and one main block valve station combined with an electric substation, all located in the pipeline operational right of way (RoW). In the construction phase, the project will have one main construction camp and pipe yard at KP44, and 3.7 km of new or upgraded construction facility access roads. At the time of writing, exact construction timeframes are not confirmed.	
AF02	Kingfisher Oil Project	CNOOC	The Kingfisher oil project is on the southeast shoreline of Lake Albert and will consist of the following components: • The Kingfisher Development Area (KFDA) mainly on the Buhuka Flats: • four onshore well pads with total of 31 wells (20 producer wells and 11 water injection wells) • produced well fluids will be conveyed to the CPF through the buried infield flowlines. • CPF which includes oil separators, water treatment facilities, a water injection unit, a gas processing unit, an LPG unit, oil storage tanks and power generation. • Feeder pipeline • 46 km,12 to 14-inch in diameter, insulated, trace heated, buried feeder oil pipeline from the CPF to a delivery point in the Kabaale Industrial Park • At the delivery point, there will be metering of the crude oil, which will be piped to the refinery or, as required, exported through the EACOP line • An MCPY is located at approximately KP27	Information received from the Kingfisher project, including Scoping Report for the ESIA for Kingfisher Discovery Area, 2014

Table H1.1 Screened-In Associated Facilities

ID[1]	Project	Proponent	Description	Reference[2]
			• supporting facilities including construction and permanent camps, material yards, a jetty, an airstrip and roads • Access roads will be used for the development area and the feeder pipeline. The permanent right of way will be 10 m wide. Grazing of stock over the right of way will be permitted, but cultivation and settlement will be prohibited. At the time of writing, exact construction timeframes are not confirmed.	

NOTES: [1] The ID number is used to identify developments in the cumulative impact assessments in Section 8.

[2] This column lists the sources of information received on the development. This information has been used to identify and assess the impacts of the development in the cumulative impact assessments in Section 8.

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
UG0A	Electricity transmission line from the Tilenga Project CPF to Kabaale	UETCL	Hoima	0	0	A 132-kV transmission line from the Tilenga project to the Kabaale Industrial Park. The line will evacuate excess power generated at the Tilenga Project CPF and import power to the Tilenga Project CPF when excess gas is reduced or depleted. The line will also be used to provide power to the Kabaale Industrial Park and surrounding areas. The transmission line is likely to be supported by steel towers. Installation of this type of transmission line typically involves: • clearance of the right of way • installation of the towers • installation of power stations • stringing of the overhead transmission line. A preliminary route is available at time of writing.	Tilenga Project shapefiles

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
UG04	Kabaale International Airport	Uganda Civil Aviation Authority (UCAA) and International Civil Aviation Organisation (ICAO)	Hoima	0	1.6	The primary objective of Kabaale International Airport is to provide air access to the Kabaale region and particularly to provide capacity for large cargo aircraft which will bring in equipment and tools for construction of the refinery and petrochemical plants. Subsequently, it is expected that the airport will offer passenger services domestically and internationally. The airport's runway will be 3500 m long and 75 m wide and be constructed within the 29-km^2 area of land already acquired for the Kabaale Industrial Park. Approximately 174 acres of the land will be required for the airport facilities including the runway, air traffic control tower, fuel farm and terminal buildings. Between 50 and 4000 workers will be hired over a 3 year construction period. A workers' camp site will be established within the site boundary for the construction phase.	ESIA for the Proposed Kabaale International Airport, 2016

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
UG05	Transmission lines to Kabaale Airport	Uganda Electricity Transmission Company Limited (UETCL)	Hoima	12	Crosses the pipeline	Two 33-kV transmission lines associated with the Kabaale Airport (see UG04). The power lines will be constructed within a 10m corridor (way leave) from the road reserve and require a 5 m RoW. Power transmission line 1 will start from Hydromax dam (Kabalega hydropower station) through Kaiso-Tonya road to the airport site. The total distance of this line along the existing road network is 24 km. Power transmission line 2 will start in Kiziranfumbi and follow the Kiziranfumbi-Kabaale road to the airport site for approximately 18 km. The two power transmission lines will be 33 kV bare conductor overhead lines connected on wooden poles. Construction involves clearance of the 10 m corridor, installation of the poles and conductor stringing. The project is expected to have a construction workforce of about 20 people, of which half will be casual labourers.	ESIA for two 33 kV Power Transmission Lines for the Proposed Kabaale International Airport, 2016

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
UG07	Refinery	Government of Uganda	Hoima	0	0	60,000 barrel per stream day hydrocracker and coker refinery at Kabaale within the 29-km^2 area of land already acquired for the Kabaale Industrial Park Key project components will include a tankage area, process units, utilities, buildings, flare area and expansion area.	Environmental Baseline Report for the Proposed Oil Refinery
UG08	Hoima–Buloba Pipeline	Government of Uganda	Hoima	4.5	127.2m	210-km pipeline for transporting refined petroleum products from the refinery in Hoima (see UG07) to the distribution terminal in Buloba, Kampala. Part of the Kampala–Mpigi pipeline corridor	Ramboll Group website

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
UG19	Lot 4 critical oil road upgrades:	Uganda National Roads Authority (UNRA)	Hoima	3, 12	Crosses the pipeline at KP12	The proposed upgrade of the following roads in: • R4 (Kabaale–Kiziranfumbi, 26 km) • R5 (Kaseeta Lwera via Bugoma Forest, 16 km) • R7 (Hohwa-Kyarushesha-Karokarungi, 25 km). The roads will be upgraded from gravel to paved standard covering a total distance of 67km. The carriageway will be increased from 4.5 m to a maximum of 12 m. The roads will have a maximum RoW of 50 m.	ESIA for the Proposed Upgrade of Lot 4 Critical Oil Roads, 2017
UG20	Lot 5 critical oil road upgrades: Buhimba–Nyalweyo–Kakindo–Kakumiro road upgrade	Uganda National Roads Authority (UNRA)	Hoima and Kakumiro	39.5	Crosses the pipeline	Upgrade of the 93-km Buhimba–Nyalweyo–Kakindo–Kakumiro road from gravel to bitumen with a 30–50m RoW. Approximately 75% of the proposed road follows the existing alignment with minor inclinations to the left or right hand side of the existing road and the increase in the RoW. This forms Lot 5 and 6 of the critical oil roads project.	ESIS for the for the Buhimba-Nalweyo-Kakindo-Kakumiro road, 2017

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
UG21	Construction camp for Bulima – Kabwoya road	China Railway Number Five Engineering Group Co., Ltd.	Hoima	19	3.3	Construction of 4.4-acre contractor's camp for 30 workers and equipment yard for the Bulima-Kabwoya road upgrade (see UG22). Camp will be fenced and will include housing units, bathroom facilities, kitchen, storage yard, workshop, parking yard and water tanks. Over 50 people are anticipated to be employed during the construction of the camp.	Project Brief for the Proposed Workers Camp and Equipment Yard, 2017
UG22	Bulima – Kabwoya road upgrade	Uganda National Roads Authority (UNRA)	Hoima	19 & 25	Crosses the export pipeline	Upgrade of 66-km Bulima-Kabwoya road from gravel to bitumen. The road is divided into two sections of 3.5-m carriageway and 1.5-m shoulder: 1. 22 km from Hoima town (Kinubi village) to Bulima village 2. 44 km from Hoima town to Kabwoya village. The government of Uganda, African Development Bank (AfDB) and Department of International Development (DFID) fund this project.	Project Brief for the Proposed Workers Camp and Equipment Yard, 2017
UG34	Transmission line extension	Rural Electrification Agency	Mubende	133	Crosses the pipeline	The proposed grid extension project covers a distance of 95 km of 33-kV overhead lines, 52.2 km of low-voltage network and 27 distribution transformers with a total installed capacity of 1,550 kVA serving at	Project Brief for the Proposed 33kV Electricity Distribution Grid Extension Lines and Associated

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
						least 23 load centres including towns, or rural growth centres or villages. The project covers the subcounties of Kiganda, Kitenga, Kigando, Kasambya, Nabingola and Kibalinga. The subcounty traversed by EACOP is Kitenga in Mubende district. The 33kv power lines will be constructed with 12 m high creosote treated wooden poles, with an average spacing of 110m. Approximately 850, 12 m wooden poles will be required for the 33kv line. The LV distribution network will require approximately 1300, 10m wooden poles. The distance between poles for the LV distribution is 50m maximum. Construction activities will include: • RoW clearance • Installation of poles • Conductor stringing. Maximum construction workforce requirement is 30 people. Although it is hoped that the power lines run along the road reserves i.e. the strip of land at the side of a road where it is prohibited to use the land, in some cases the lines may not strictly go along the road reserve	Low Voltage Networks, 2014

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
						Part of the World Bank funded Energy for Rural transformation Project Phase III project.	
UG38	Gold mine	Zhong Quan Ltd	Mubende	98.5	29.6	A 5-acre open cast gold mine in the hills of Kamusenene Village, Kitumba subcounty, Mubende District. There is an existing access road therefore the company will not make big changes to the existing infrastructure. Workers will be housed in rented accommodation or will commute from home.	EIS for a Proposed Gold Mine, 2017
UG39	Gold processing plant	Kisita Mining Company Limited (KMCL)	Mubende	104	7.9	A gold processing plant on 0.873-ha of land for the existing gold mine in the Namwasa forest reserve. Ore that contains gold will be extracted from the ground using open pit mining methods, and will be processed on-site to be sold. On-site facilities will include: ore crusher, ore processing plant, tailings storage facility, topsoil and overburden stockpiles, laboratory and administration buildings, fuel storage and internal roads.	ESIS for the Proposed New Gold Processing Plant, 2015
UG41	Kyotera–Rakai road upgrade	UNRA	Rakai	258	Crosses the pipeline	Upgrade of 20 km of the Kyotera–Rakai road to bitumen. The road will have a RoW of between 30-50 m inclusive of a 7 m-wide carriageway (two 3.5-m lanes) and 1.5 m-wide shoulders.	ESIS for the proposed upgrade of Kyotera–Rakai road, Critical Oil

Table H1.2 Screened-in Third Party Developments

ID[1]	Project	Proponent	District	Nearest KP	Approximate Distance From Pipeline (km)	Description	Reference[2]
						This forms Lot 2 of the critical oil roads project.	Roads Project Lot 2, 2017
UG44	ICT infrastructure	Government of Uganda (GoU)	National	223, 223.5 and 269.5	Crosses the pipeline	1536.39 km of buried optical fibre cable to be laid across the country to build the National Data Transmission Backbone.	Second National Development Plan (NDPII) 2015/16 – 2019/20

NOTES: [1] The ID number is used to identify developments in the cumulative impact assessments in Section 8.
[2] This column lists the sources of information received on the development. This information has been used to identify and assess the impacts of the development in the cumulative impact assessments in Section 8.

H2 LOCATION OF SCREENED-IN THIRD-PARTY DEVELOPMENTS

Figure H2.1 presents the location of the screened-in associated facilities and third-party developments in Uganda.

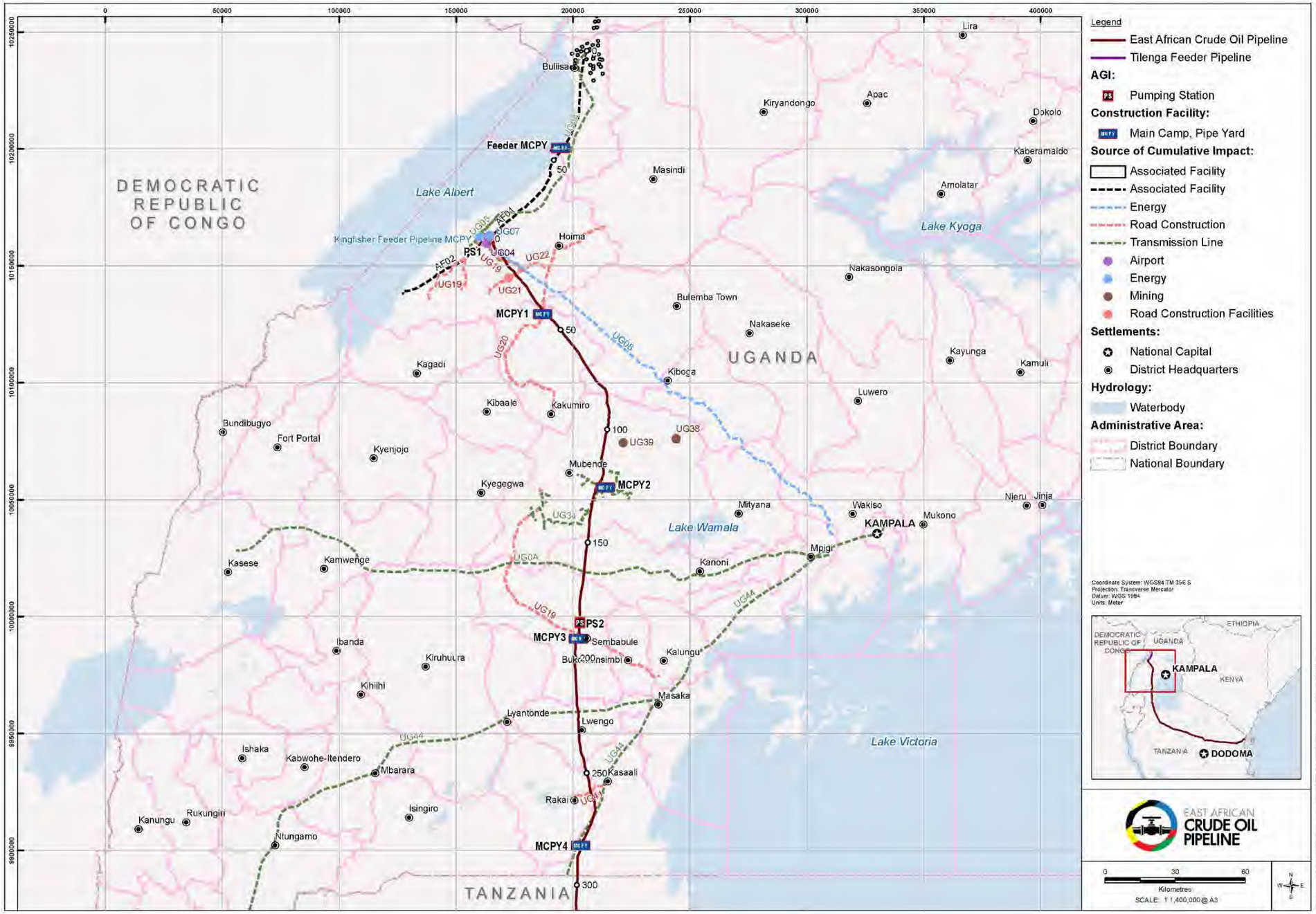

Figure H2.1 Screened-In Third-Party Developments in Uganda

H3 CUMULATIVE IMPACTS ASSESSMENT SCREENING MATRICES

Table H3.1 present the cumulative impacts and assessment screening matrix for associated facilities and the EACOP project, and Table H3.2 presents the matrix for third party developments and the EACOP project.

The assessment screening categories are described in Section 5.6.2.5 and 8.1.2 and presented below in Table H3.1 and Table H3.2.

Table H3.1 Cumulative Impacts Assessment Matrix: Associated Facilities

VEC	Source of Cumulative Impact		Rationale for Screening in to the CIA[1]
	AF01 Tilenga Project	**AF02 Kingfisher Oil Project**	
Biodiversity			
Habitats of conservation importance			No interactions identified, therefore no cumulative impact.
Flora and fauna species of conservation			
Chimpanzees in the broad landscape	Category 3	Category 3	Industrial activity in the Albertine Graben is leading to increased pressure on the land resulting in disturbance to the forests where the chimpanzees live. However, with the mitigation measures proposed by EACOP and the AFs, the contribution to cumulative impacts are negligible.
Legally protected, internationally or nationally recognised onshore areas			There are no cumulative impacts identified that are likely to affect the integrity or ecological function of a protected area.
Physical Environment			
Soil	Category 3	Category 3	Potential cumulative impact on soil around KP0, where the EACOP project and the Tilenga and Kingfisher feeder pipelines converge at the manifold at PS1. The overlapping AOI is limited in extent and therefore the EACOP contribution to residual cumulative impacts is negligible.
Surface water: Wambabya River crossing		Category 3	Potential cumulative impact on an ephemeral tributary of the Wambabya River from EACOP permanent access road to PS1 and the Tilenga feeder pipeline resulting in reduced water quality owing to increased suspended sediment concentrations and the accidental release of oil and chemicals. Both projects have committed to reinstatement and therefore the contribution to a residual cumulative impact is negligible.
Surface water: Abstraction			No interactions identified, therefore no cumulative impact.
Groundwater: Abstraction			No interactions identified, therefore no cumulative impact.
Groundwater: Discharge	Category 3	Category 3	Potential cumulative impact on groundwater around KP0, where the EACOP project and the Tilenga and Kingfisher feeder pipelines converge at the manifold at PS1. Potential cumulative impacts are from accidental releases of contaminants which may migrate to the groundwater during the construction and operation of the projects where activities are undertaken above the same aquifer. This will lead to localised short-term deterioration of groundwater quality. Any potential releases of contaminants are likely to be small in volume, localised to the working area or plant being used and readily visually observable, allowing immediate emergency spill response actions. The projects will implement pollution prevention measures and therefore the contribution to a residual cumulative impact is negligible.
Landscape	Category 1	Category 1	Potential cumulative impacts are predicted on landscape character and visual receptors where PS1 is close to the Tilenga and Kingfisher feeder pipelines around KP0. See Section 8.8.6.
Air quality	Category 1	Category 1	Potential cumulative impact on air quality around KP0, where the EACOP, and the Tilenga and Kingfisher feeder pipelines converge at the manifold at PS1. Construction of the EACOP project and the AFs will generate dust resulting in cumulative temporary deterioration of local air quality. See Section 8.9.6.
Acoustic environment	Category 1	Category 1	Construction activities may incrementally temporarily affect the local acoustic environment where the EACOP project and the AF AOIs overlap around PS1. See Section 8.10.6.
Climate			The climate VEC has a global AOI and in effect, every source of GHG emissions is a source of cumulative impact. See Section 8.23.5.

[1] Category definitions:

- Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC.
- Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.
- Category 3: The residual EACOP project impacts have a limited contribution to cumulative impacts.

VEC	Source of Cumulative Impact		Rationale for Screening in to the CIA[1]
	AF01 Tilenga Project	AF02 Kingfisher Oil Project	
Socio-economic and Health			
Local economy	Category 1	Category 1	Cumulative impacts are predicted on employment and economic development. See Section 8.12.6.
Land-based livelihoods	Category 1	Category 1	Cumulative impacts are predicted from the loss of land. See Section 8.13.6.
River and lake-based livelihoods			No interactions identified, therefore no cumulative impact.
Land and property	Category 1	Category 1	Cumulative impacts are predicted from land speculation and conflicts. See Section 8.15.6.
Workers' health, safety and welfare			No interactions identified, therefore no cumulative impact.
Social infrastructure and services	Category 1	Category 1	Cumulative impacts are predicted from increased traffic congestion on common transport routes. See Section 8.17.6.
Community health	Category 1	Category 1	The combined use of transport routes by both EACOP and AFs increases the potential spread of communicable diseases as main transport route rest stops are known for being areas of potentially increased risk of sexually transmitted diseases (STDs). See Section 8.18.6.
Community safety, security and welfare	Category 1	Category 1	Cumulative impacts are predicted from PIIM from the EACOP project and the AFs and impacts on community dynamics from changes in social climate in the PACs. See Section 8.19.6.
Cultural heritage: Tangible			No interactions identified, therefore no cumulative impact.
Cultural heritage: Intangible			No interactions identified, therefore no cumulative impact.

NOTES: Blue shading = Interaction. White shading = No interaction. Yellow shading = Transboundary VEC.

Table H3.2 Cumulative Impacts Assessment Matrix: Third Party Development Interactions

VEC	Source of Potential Cumulative Impact														Interaction and Rationale for Screening in to the CIA[2]
	UG0A	UG04	UG05	UG07	UG08	UG19	UG20	UG21	UG22	UG34	UG38	UG39	UG41	UG44	
	Transmission Line Tilenga CPF–Kabaale	Kabaale International Airport	Transmission Lines to Kabaale Airport	Refinery	Hoima–Buloba Pipeline	Lot 4 Critical Oil Road Upgrades	Lot 5 Critical Oil Road Upgrades	Construction Camp for Bulima–Kabwoya Road	Bulima–Kabwoya Road Upgrade	Transmission Line Extension	Gold Mine	Gold Processing Plant	Kyotera–Rakai Road Upgrade	ICT Infrastructure	
Biodiversity															
Habitats of conservation importance															
- Kafu River							Cat 3								Potential cumulative impacts are predicted on aquatic habitats where the EACOP project and the proposed road upgrade between Buhimba and Kakumiro cross the Kafu River, its associated floodplain and wetlands. The project crosses the river at KP37 and the road crosses the river 1.5 km upstream from the pipeline crossing. Potential cumulative impacts on the Kafu River are disturbance and mobilisation of silt from the riverbed, marginal habitat or riparian land and riverbanks from the construction of both projects. This can adversely affect water quality, the physical habitat (e.g., by smothering spawning habitat) and can also cause sub-lethal or lethal affects to aquatic life (e.g., through smothering aquatic flora and fauna including prey items and plants which might form important physical habitat components). Both projects have committed to soil management practices and pollution control measures and therefore the contribution to a residual cumulative impact is negligible.
- Salongo and Kawenda Rivers													Cat 3	Cat 3	Potential cumulative impacts are predicted on aquatic habitats in the Salongo and Kawenda Rivers from the EACOP project, the proposed Kyotera–Rakai road upgrade and the installation of buried fibre optic ICT infrastructure. The pipeline and the road upgrade cross the Salongo River at KP258. The pipeline crosses the Kawenda River at KP268.2 and the buried ICT infrastructure crosses 0.89 km downstream. Potential cumulative impacts are from disturbance and mobilisation of silt from the riverbed, marginal habitat or riparian land and river banks from the construction of both projects. This can adversely affect water quality, the physical habitat (e.g., by smothering spawning habitat) and can also cause sub-lethal or lethal affects to aquatic life (e.g., through smothering aquatic flora and fauna including prey items and plants which might form important physical habitat components). UNRA and EACOP have committed to soil management practices and pollution control measures (an ESIA for the ICT infrastructure was not available at time of writing) and therefore the contribution to a residual cumulative impact is negligible.

[2] Category definitions:

- Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC.
- Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.
- Category 3: The residual EACOP project impacts have a limited contribution to cumulative impacts.

Table H3.2 Cumulative Impacts Assessment Matrix: Third Party Development Interactions

VEC	Source of Potential Cumulative Impact														Interaction and Rationale for Screening in to the CIA[2]
	UG0A	UG04	UG05	UG07	UG08	UG19	UG20	UG21	UG22	UG34	UG38	UG39	UG41	UG44	
	Transmission Line Tilenga CPF–Kabaale	Kabaale International Airport	Transmission Lines to Kabaale Airport	Refinery	Hoima–Buloba Pipeline	Lot 4 Critical Oil Road Upgrades	Lot 5 Critical Oil Road Upgrades	Construction Camp for Bulima–Kabwoya Road	Bulima–Kabwoya Road Upgrade	Transmission Line Extension	Gold Mine	Gold Processing Plant	Kyotera–Rakai Road Upgrade	ICT Infrastructure	
Flora and fauna species of conservation importance															
- Wambabya–Bugoma Corridor		Cat 1	Cat 1	Cat 1	Cat 1	Cat 1									The land between the Wambabya and Bugoma Forest Reserves is an important wildlife corridor for chimpanzees. The linear projects will result in chimpanzee movement disruption between the reserves. Although the refinery and the airport will not directly affect this wildlife corridor, their presence will cause increased traffic movement along the roads which will exacerbate the existing habitat severance.. See Section 8.3.6.
Legally protected, internationally or nationally recognised onshore areas															Potential cumulative impacts on habitats and species of conservation importance within protected areas are described in Sections 8.2.6 and 8.3.6. There are no cumulative impacts identified that are likely to affect the integrity or ecological function of a protected area.
Physical Environment															
Soil							Cat 3						Cat 3		EACOP and the SCIs are dispersed over a large area, across a variety of soil types and have relatively small footprints, Overlapping AOIs are limited in extent and therefore contribution to cumulative impacts are negligible.
Surface Water															
Wambabya River crossing		Cat 3		Cat 3	Cat 3										Potential cumulative impacts are predicted on an ephemeral tributary of the Wambabya River which crosses the permanent access road to PS1 at KP4.8, and a second tributary (KP1) which drains the Tilenga feeder pipeline, the Kabaale international airport, the refinery and the Hoima-Buloba pipeline. Concurrent construction may result in reduced water quality owing to increased suspended sediment concentrations and the accidental release of oil and chemicals. With mitigation the contribution to cumulative impacts are negligible.
Kafu River crossing							Cat 3								The EACOP pipeline crosses the Kafu River at KP36.5 and approximately 1.5 km downstream, the Buhimba–Kakumiro road upgrade (UG20) crosses the river. The Kafu River could potentially experience a direct transient reduction in channel stability and in water quality as a result of the construction of both projects. The vegetation in the channel and floodplain of the Kafu River means that the cumulative impacts are negligible
Crossing of ephemeral watercourses at KP189.2, 258 and 268.2						Cat 3							Cat 3	Cat 3	The lot 4 road upgrade crosses EACOP on a hillslope above a watercourse at KP189.2; the Kyotera–Rakai road upgrade crosses both the EACOP pipeline and an ephemeral watercourse at KP258; the ICT infrastructure installation crosses the same watercourse 0.8 km downstream from EACOP KP268.2.

Table H3.2 Cumulative Impacts Assessment Matrix: Third Party Development Interactions

VEC	Source of Potential Cumulative Impact														Interaction and Rationale for Screening in to the CIA[2]
	UG0A	UG04	UG05	UG07	UG08	UG19	UG20	UG21	UG22	UG34	UG38	UG39	UG41	UG44	
	Transmission Line Tilenga CPF–Kabaale	Kabaale International Airport	Transmission Lines to Kabaale Airport	Refinery	Hoima–Buloba Pipeline	Lot 4 Critical Oil Road Upgrades	Lot 5 Critical Oil Road Upgrades	Construction Camp for Bulima–Kabwoya Road	Bulima–Kabwoya Road Upgrade	Transmission Line Extension	Gold Mine	Gold Processing Plant	Kyotera–Rakai Road Upgrade	ICT Infrastructure	
															The stripping of vegetation and soils at the crossing decreases channel stability and reduces water quality through sediment suspension and accidental spills of oil or fuel from equipment and machinery. UNRA and EACOP have committed to soil management practices and pollution control measures (an ESIA for the ICT infrastructure was not available at time of writing) and therefore the contribution to a residual cumulative impact is negligible.
Surface water: abstraction															No interactions identified, therefore no cumulative impact.
Groundwater: abstraction				Cat 3	Cat 3										Simultaneous abstraction of groundwater by EACOP, refinery and the Hoima–Buloba pipeline may directly affect the elevation of the water table and indirectly impact the local communities that rely on groundwater. EACOP and the SCIs will be required to apply for the necessary abstraction licences which will include conditions to manage the groundwater, and therefore the contribution to a residual cumulative impact is negligible.
Groundwater: discharge		Cat 3		Cat 3	Cat 3	Cat 3	Cat 3		Cat 3		Cat 3	Cat 3	Cat 3		Potential cumulative impacts are from accidental releases of contaminants which may migrate to the groundwater during the construction and operation of the developments where activities are undertaken above the same aquifer. This will lead to localised short-term deterioration of groundwater quality. Any potential releases of contaminants are likely to be small in volume, localised to the working area or plant being used and readily visually observable, allowing immediate emergency spill response actions therefore the contribution to a residual cumulative impact is negligible.
Landscape		Cat 2	Cat 2	Cat 2	Cat 2	Cat 2									Potential cumulative impacts are predicted on landscape character and visual receptors where the PS1 and third party development AOIs overlap. The overall industrialising of the area will be large in magnitude from the landscape and visual perspectives, but the contribution of EACOP and the associated facilities is small. See Section 8.8.6.
Air quality			Cat 1		Cat 1	Cat 1	Cat 1		Cat 1	Cat 1			Cat 1	Cat 1	Construction of the EACOP project and the SCIs will generate dust resulting in cumulative temporary deterioration of local air quality. See Section 8.9.6
Acoustic environment			Cat 1		Cat 1	Cat 1	Cat 1		Cat 1	Cat 1			Cat 1	Cat 1	Construction activities may incrementally temporarily affect the local acoustic environment where the EACOP project and the SCI AOIs overlap. See Section 8.10.6
Climate															The climate VEC has a global AOI and in effect, every source of GHG emissions is a source of cumulative impact. See Section 8.23.5

Table H3.2 Cumulative Impacts Assessment Matrix: Third Party Development Interactions

VEC	Source of Potential Cumulative Impact														Interaction and Rationale for Screening in to the CIA[2]
	UG0A	UG04	UG05	UG07	UG08	UG19	UG20	UG21	UG22	UG34	UG38	UG39	UG41	UG44	
	Transmission Line Tilenga CPF–Kabaale	Kabaale International Airport	Transmission Lines to Kabaale Airport	Refinery	Hoima–Buloba Pipeline	Lot 4 Critical Oil Road Upgrades	Lot 5 Critical Oil Road Upgrades	Construction Camp for Bulima–Kabwoya Road	Bulima–Kabwoya Road Upgrade	Transmission Line Extension	Gold Mine	Gold Processing Plant	Kyotera–Rakai Road Upgrade	ICT Infrastructure	
Socio-economic and Health															
Local economy	Cat 1	Cat 2	Cat 1	Cat 2	Cat 1	Cat 1	Cat 1	Cat 1		Cat 1				Cat 1	Cumulative impacts are predicted on employment and economic development. See Section 8.12.6.2
Land-based livelihoods	Cat 1	Cat 2	Cat 1	Cat 2	Cat 1	Cat 1	Cat 1	Cat 2		Cat 1				Cat 1	Cumulative impacts are predicted from the loss of land. See Section 8.13.6.2
River and lake-based livelihoods							Cat 3								**River-based Livelihoods** Potential cumulative impacts are predicted on individuals and households that rely on the Kafu River where the project and the proposed road upgrade between Buhimba and Kakumiro cross the river, its associated floodplain and wetlands around KP37. The concurrent construction of the project and the road upgrade may affect water quality, the physical habitat and aquatic life in the river, affecting fish catches. UNRA and EACOP have committed to soil management practices and pollution control measures and therefore the contribution to a residual cumulative impact is negligible.
Land and property	Cat 1	Cat 2	Cat 1	Cat 2	Cat 1	Cat 1	Cat 1	Cat 1	Cat 1	Cat 1			Cat 1	Cat 1	Cumulative impacts are predicted from land speculation and conflicts. See Section 8.15.6.2
Workers' health, safety and welfare															No interactions identified, therefore no cumulative impact
Social infrastructure and services		Cat 2		Cat 2	Cat 1		Cat 1	Cat 1	Cat 1					Cat 1	Cumulative impacts are predicted from increased traffic congestion on common transport routes. See Section 8.17.6.2
Community health	Cat 1	Cat 2	Cat 1	Cat 2	Cat 1	Cat 1	Cat 1	Cat 1	Cat 1	Cat 1				Cat 1	The combined use of transport routes by both EACOP and SCIs increases the potential spread of communicable diseases as main transport route rest stops are known for being areas of potentially increased risk of sexually transmitted diseases. See Section 8.18.6.2
Community safety, security and welfare	Cat 1	Cat 2	Cat 1	Cat 2	Cat 1	Cat 1	Cat 1	Cat 1	Cat 1	Cat 1				Cat 1	Cumulative impacts are predicted from PIIM from the EACOP project and the SCIs and impacts on community dynamics from changes in social climate in the PACs. See Section 8.19.6.2
Cultural heritage: tangible															No interactions identified, therefore no cumulative impact
Cultural heritage: intangible															No interactions identified, therefore no cumulative impact

NOTES: Blue shading = Interaction. White shading = No interaction. Yellow shading = Transboundary VEC.

H4 SCREENED-OUT SOURCES OF CUMULATIVE IMPACT

Table H4.1 presents the associated facilities that have been screened out of the cumulative impact assessment, and Table H4.2 shows the third-party developments that have been screened out of the cumulative impact assessment based on the criteria defined in Section 5 of the ESIA.

Table H4.1 Screened-Out Associated Facilities

ID	Project	Proponent (Where Available)	Description
AF04	Kaiso Tonya development	Tullow Oil Ltd	The Kaiso Tonya licence area on the central part of the east shoreline of Lake Albert. Kaiso Tonya is due to come online in approximately 10 years from first oil in Uganda. It will also be a tie-back to the Kingfisher Central Processing Facility. Screened out of the CIA because development is not due until 2030 and is therefore not considered reasonably foreseeable under the IFC guidelines.
AF05	Waste management facilities, concrete batching plants and borrow pits	Total East Africa Midstream BV	These facilities are considered associated facilities where they meet all the following criteria: • facility was not in existence before the project or expanded because of the project • facility is not viable as a business after the project. Locations are not currently defined and therefore screened out of CIA.

Table H4.2 Screened-Out Third-Party Developments

ID	Project	Proponent (Where Available)	Description	Reason for Screening Out[3]
UG01	Piped water systems	Not available	Construction of piped water systems described in the subcounty development plans	Subcounty chiefs and districts confirmed that, other than the administrative boundaries for the proposed projects presented in the development plans, specific locations are only determined at the implementation phase, i.e., when the budget has been approved and money allocated. Coordinates and detailed information therefore not available.
UG02	Latrine construction and borehole drilling	Not available	Latrine construction and borehole drilling	Subcounty chiefs and districts confirmed that, other than the administrative boundaries for the proposed projects presented in the development plans, specific locations are only determined at the implementation phase, i.e. when the budget has been approved and money allocated. Coordinates and detailed information therefore not available.
UG03	Large-scale farming developments	Oola Loilm Farm and Amatheon AGRI Uganda Limited	Large-scale farming developments Oola Lolim Farm and Amatheon AGRI Uganda Limited, which together cover over 4000 acres of land located in Wii Anaka	No further information available. It was therefore not reasonably defined and thus screened out.
UG06	Airstrip upgrade	Not available	Airstrip upgrade at Pakuba	There will be no development of the Pakuba airstrip, therefore not considered a source of cumulative impact.

[3] Screened-out developments did not meet the following criteria (as described in Section 5 Methodology):

1. Is the development reasonably defined, as described in IFC Performance Standard 1?
2. Is the development reasonably predictable or a foreseeable future development, as defined in the IFC CIA Handbook?
3. What is the nature of development?
4. Do the EACOP project VEC AOIs overlap with the third-party development AOIs?

Table H4.2 Screened-Out Third-Party Developments

ID	Project	Proponent (Where Available)	Description	Reason for Screening Out[3]
UG11	Ecotourism lodge	Uganda Jungle Lodge	Construction, installation and operation of Bugoma Jungle Lodge for the development of an ecotourism site in Kabwoya	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG13	Booma Ground upgrade	Ministry of Land, Housing and Urban Development, Government of Uganda	The beautification of Booma grounds, located within Hoima Municipality	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG14	Abattoir	Ministry of Land, Housing and Urban Development, Government of Uganda	Construction of a modern abattoir within Hoima municipality funded by World Bank	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG17	Mubende–Kakumiro–Kibaale–Kagadi road	Uganda National Roads Authority (UNRA)	Construction of the proposed 113-km-long Mubende–Kakumiro–Kibaale–Kagadi road and 2 km of secondary town link roads in each of the four towns. The road will be constructed to class II paving standard with an overall construction width of 20–30 m. Construction expected to take three years	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG25	Waste facilities	Total EP Uganda BV	Waste facilities required for the Tilenga upstream development	Adequate information to perform an assessment not available at the time of writing, therefore considered not reasonably defined

Table H4.2 Screened-Out Third-Party Developments

ID	Project	Proponent (Where Available)	Description	Reason for Screening Out[3]
UG26	Aggregate washing and storage facility	China Railway Number Five Engineering Group Co., Ltd.	Temporary aggregate washing and material stockpile area on Hoima–Bulima road in Buhimba East Village to support the upgrading of the Bulima–Kabwoya road (see UG22)	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG29	Solar photo-voltaic (PV) plant	Cambridge Clean Energy (CCC)	Construction of a 30-kW mini off-grid solar-PV power generation plant in Sebagoro Village, Kabwoya Subcounty. Footprint required is 30 m × 30 m. There will be no deforestation, relocation of facilities or resettlement required. Construction will involve: • vegetation clearance • installation of the PV panels on piled supports • trenching for buried AC/DC cables • installation of 40-ft modified shipping container on concrete foundations to house battery and inverter • pole intallation and cable stringing. Project design life is minimum 10 years.	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG31	Access road construction	PA Technical Services	A 4.4-km access road to the Nkusi Hydropower plant	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG32	Sewage waste disposal lagoon	Hoima Regional Referral Hospital	A proposed lagoon to treat and handle sewage generated from the hospital under aerobic conditions	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs

Table H4.2 Screened-Out Third-Party Developments

ID	Project	Proponent (Where Available)	Description	Reason for Screening Out[3]
UG35	Construction camp for Mubende–Kakumiro–Kibaale–Kagadi road	China Communications Construction Company Ltd	Construction of 39.54-acre construction camp for the Mubende–Kakumiro–Kibaale–Kagadi road works (see UG17). The camp will comprise workers' accommodation, toilet facilities, bitumen stock area, bitumen heating facilities, offloading and parking area for trucks. The construction camp is expected to be in place for three years.	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG36	Standard Gauge Railway	Standard Gauge Railway Uganda	The development of a standard gauge railway network, with a total length of 1614 km. An indicative route is available.	It has been confirmed that the SGR will be built a long time after the construction of the EACOP project, therefore the AOIs will not overlap temporally.
UG37	Ayago power station	UEGCL	A proposed 840-MW power station along the Victoria Nile at Ayago, upstream of Murchison Falls National Park. UEGCL was appointed by the Ministry of Energy and Mineral Development as the implementing agency working on behalf of the Government of Uganda.	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG40	Solar-powered boreholes for water supply	Not available	Three solar-powered boreholes have been planned for Lwengo Town. 50,000-L storage facilities are to be set up for communal use, mainly on the grounds of clinics, churches and schools and 50 boreholes will be rehabilitated.	No further information available therefore considered not reasonably defined or predictable

Table H4.2 Screened-Out Third-Party Developments

ID	Project	Proponent (Where Available)	Description	Reason for Screening Out[3]
UG42	Piped water system	National Water and Sewerage Corporation	Infrastructure service delivery plans and performance improvement programmes	No further information available therefore considered not reasonably defined or predictable
UG43	Waste treatment plants	Water and Sanitation Development Facility- South West Branch	Construction of faecal sludge treatment plants (FSTP) around the large towns in Rakai district, with collection and transportation trucks stationed in the larger towns and serving a cluster of small towns as and when services are demanded. The proposed FSTP site is in Kalagala village, Kasaali subcounty, Rakai District. The project is estimated to employ around 50 workers during the construction phase, mostly local residents.	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs
UG45	Kabaale–Kampala road capacity expansion	GoU	Upgrade and expansion of the existing road from Kabaale to Kampala	EACOP project VEC AOIs unlikely to overlap with the SCI AOIs

Appendix I: Oil Spill Modelling

February 2020

EXECUTIVE SUMMARY

Introduction

Oil spill modelling (OSM) has been completed for the Uganda pipeline. The main objective of the OSM was to assess the consequence of a spill in terms of the potential effect on valued environmental and social components (VEC).

Several locations were determined to be at greater risk from accidental oil releases, and specific impacts were quantitatively assessed for these locations using modelling software. A detailed description of the modelling, including descriptions of the software used, the operational scenarios modelled and the model input parameters are provided in this appendix.

Initial Screening

The first stage of the OSM process comprised sensitivity screening to identify those parts of the pipeline route which are of greater potential sensitivity with respect to VECs, considering groundwater, surface water and ecology, and the greater sensitivity of the resource as a result of its likely use by humans. The output of this process was a series of oil-spill receptor sensitivity maps that graphically present the relative sensitivity of 10-km pipeline sections to an oil spill.

Preliminary Quantitative Risk Assessment (PQRA)

The second stage of the OSM process was to select a limited number of locations at which a preliminary quantitative risk assessment (PQRA) was conducted to estimate the potential extent of impacts associated with an oil spill. The process used modelling software (RBCA and MIKE 21) to predict theoretical extents of free-phase oil migration (i.e., non-aqueous phase liquid, NAPL), and the migration of dissolved-phase oil components in the environment, under several different scenarios. The potential lateral dispersal of the oil in the scenario in which it is released directly to a watercourse was also modelled.

Key to the evaluation of potential impacts arising from a potential oil release are the selection of input parameters for the risk assessment. These parameters can be separated into two broad categories: those relating to the source term (the volume and chemical composition of the oil released) and those relating to the pathway by which any released oil can migrate and potentially impact sensitive receptors. The locations selected for the risk assessment are those where potential receptors have a higher relative sensitivity and have been prioritised.

The oil release scenario being modelled has been predetermined, and so there is little or no variability in these input parameters to the risk assessment. The largest degree of uncertainty relates to the parameters that define the pathway between the source (fixed) and the identified receptors. The key pathway parameters, which include the hydraulic gradient, soil permeability and the nature of biodegradation in the groundwater, are usually confirmed by intrusive investigation to reduce uncertainty. In the absence of some site-specific measurements, a range of values has been selected based on the literature and preliminary scoping studies to determine the likely outcomes, which was supported by a sensitivity analysis.

In addition, it is expected that following any release of oil to the environment, emergency response and cleanup activities would follow to mitigate the impact. Further analysis has been undertaken to assess how removing free oil from the environment in one year might reduce potential impacts.

Results Summary

Model Scenario	Number of Locations Assessed	Assumed Soil Type	Extent of Potential Impact (m)			Comments
			Remediation within 1 year	Most Likely	Reasonable Worst Case	
Oil release to land – NAPL vertical migration modelling	2 (KP1.5 and KP256)	Sandy clay	-	-	1.38	Modelling indicates up to 380 m^3 of NAPL could reach GW shallower than 1.38 m bgl along RoW.
		Silty Sand	-	-	1.38	
Oil release to land along RoW – dissolved phase migration to groundwater VECs	2 (KP1.5 and KP256)	Sandy clay	35*	210**	300	Ranges in values between the clay and sand materials due to slight variations in hydraulic gradient (0.0175 in sandy clay and 0.031 in silty sand). Reasonable worst case assumes lower rate of biodegradation (anaerobic), whereas most likely assumes a higher biodegradation rate (aerobic) due to likely aerobic GW conditions. Under reasonable worst-case scenario groundwater VECs will be impacted at these locations before theoretical maximum distance is reached.
		Silty Sand	45*	240**	340	
Oil release to land along ROW– dissolved phase migration in groundwater to surface water VECs	5 (KP15.4, KP36.5, KP164.7, KP274 and KP289.3)	Clean Sand	30*	60**	85	The values reported for clean sand and silty sand to not differ significantly from each other. However, the values do change significantly for a weathered, crystalline bedrock, inferred to be the aquifer at KP164. However, the groundwater is assumed to be much deeper at this location (6.4 m bgl) due to the steeply sided slopes at either side of the Katonga River. Reasonable worst case assumes lower rate of biodegradation (anaerobic), whereas most likely assumes a higher biodegradation rate (aerobic) due to likely aerobic GW conditions and shallower gradient.
		Silty Sand	5 - 30*	25-65**	35 - 90	
		Sand (crystalline bedrock) – groundwater at 6m bgl	0.5	3	4	

Model Scenario	Number of Locations Assessed	Assumed Soil Type	Extent of Potential Impact (m)			Comments
			Remediation within 1 year	Most Likely	Reasonable Worst Case	
Oil release to surface water – direct entry at surface water crossings***	5 (KP15.4, KP36.5, KP164.7, KP274.1 and KP289.3)	N/A	N/A	3,000	15,000	Most likely distance shows highest modelled distance which applied to two watercourses (3 km). Reasonable worst case shows the effect of inclusion of the low risk zone (15 km)

NOTES: *Values taken as the predicted extent of impact after 1 year with a 30% reduction factor to allow for aerobic conditions as indicated by sensitivity analysis

**Most likely values calculated as a 30% reduction from reasonable worst-case extents, as demonstrated by sensitivity analysis for aerobic degradation rates

***Reasonable Worst Case represents low risk zone and Most Likely shows modelled distance applied to oil release to surface water

Modelling of NAPL migration in soil gave a conservative estimate of maximum vertical migration of 1.38 m in different types of soil; silty sand and sandy clay, indicating that the potential for NAPL migration is not substantially dependant on the soil type at the location of the spill.

Modelling of dissolved phase migration of constituents of oil in groundwater following a release of oil to land based on reasonable worst case predicted extents of impact drinking water of up to 340 m beyond the extent of the oil spill. The results for the two locations on the pipeline showed the extent of impact is dependent on the soil type and hydraulic gradient of groundwater. Similarly, for surface water VECs, there was a wide range in predicted extents of impact between 4 m and 90 m for the modelled locations on the pipeline. Again, the migration distances were substantially affected by soil type, but particularly groundwater depth. If remedial action were undertaken within one year of the modelled spill, predicted extents reduce to a maximum of 45 m at KP256 for the modelled groundwater VECs and 30 m at KP289.3 for surface water VECs.

Oil dispersal modelling for releases direct to surface water VECs based on reasonable worst case predicted extent of 3 km at KP164.7 and KP274.1.

To represent input uncertainties, an estimated ‘low risk zone’ for impact on human health and environment should be considered in addition to the modelled affected length. The designation of a low risk zone is aligned with the concept of a “safety factor”. Safety factors are often applied in situations where there is uncertainty in an assessment of risk and the potential scale of an impact to human health and the environment.

The effect of applying a safety factor creates a zone, in which impact to the river environment presents a risk to human health or the environment cannot be entirely discounted. This would include, for example dissolved phase hydrocarbons originating from the oil, minor isolated patches of oil or tar balls transported further downstream than the modelled length.

The magnitude of the low risk zone is derived by multiplying the modelled affected length by a factor of 5. For example, a modelled affected length of 1km should be considered to be associated with an additional 4km low risk zone. This factor has been determined based on professional judgement and in consideration of the cumulative uncertainties of key input parameters which are described below. Clearly, improvements in model input data quality would be expected to result in a smaller safety factor.

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GLOSSARY AND ACRONYMS

B	
BTEX	benzene, toluene, ethylbenzene and xylene
C	
CSM	conceptual site model
D	
DWRM	Directorate of Water Resources Management
DWS	drinking water standard
E	
ESIA	environmental social impact assessment
G	
GIS	geographic information system
M	
mAOD	Metres above ordnance datum
m bgl	metres below ground level
mg/L	milligrams per litre
µg/L	micrograms per litre (1 mg/L = 1000 µg/L)
N	
NAPL	non-aqueous phase liquid
O	
OSM	Oil spill modelling
P	
PAC	project affected communities
PQRA	Preliminary quantitative risk assessment
T	
TPH	total petroleum hydrocarbons
V	
VEC	valued environmental [and social] components
W	
WAT	wax appearance temperature
WRD	Water resources division

I1 OIL SPILL MODELLING

I1.1 Introduction

Oil spill modelling (OSM) was undertaken to assess potential environmental risks from the EACOP Uganda pipeline during its operational lifetime. The assessment was designed to identify areas of relative high environmental sensitivity along the pipeline route and to quantify potential risks from an unexpected pipeline failure.

I1.1.1 Purpose and Scope of Report

The report presents initial qualitative screening of environmental sensitivity and the preliminary quantitative risk assessment (PQRA) results. It describes the possible extent and severity of direct impacts to surface water and groundwater VECs and of indirect impacts to human and ecological VECs.

This report presents:

- the results of the geographic information system (GIS) environmental sensitivity screening assessment for risks due to an unexpected failure of the EACOP pipeline, considering human, surface water, groundwater and ecological VECs
- a review of the GIS sensitivity assessment, with consideration of additional baseline information, to identify high-sensitivity sites for PQRA
- the PQRA results for migration of NAPL via subsurface migration routes
- the PQRA results for migration of dissolved-phase oil contaminants via groundwater to drinking water and surface water VECs
- the PQRA results for direct release of oil to surface water at selected high-sensitivity river crossings.

I1.1.2 Data Considerations

This assessment considers only the potential risks from an unexpected failure of the EACOP Uganda pipeline during the period of operation. It does not consider risks associated with construction or decommissioning of the pipeline.

The assessment considers human VECs only in the context of potential human contact with impacted surface water and groundwater and does not consider risks due to direct contact with oil in the vicinity of the leak site. The preliminary quantitative assessment does not consider risks from direct contact of oil with land, which may result in impact to ecological VECs or crops.

The assessment was undertaken based on the oil blend information for blends E1 to E4 (EACOP Studies 2017). The results of the assessment may not be applicable to oil blends that vary substantially from those stated.

The qualitative sensitivity assessment was carried out with the information available as of December 2017. Any additional information made available after this time, including information from the baseline assessments, was considered in the PQRA selection process where possible, but is not included in the GIS outputs in attachments I1.2–I1.4.

I1.2 GIS Environmental Sensitivity Screening Assessment

I1.2.1 Assessment Methodology

An understanding of the sensitivity of areas through which the pipeline passes is important to the assessment of potential risks posed to the environment by potential leaks.

The method chosen to evaluate relative environmental sensitivity is a qualitative assessment of the following environmental receptors (VECs):

- groundwater (including humans)
- surface water (including humans)
- ecology.

The sensitivity assessment was carried out within a zone covering 2 km either side of the pipeline route.

The sensitivity model is based on the selection of key features that contribute to the sensitivity of each of the individual VECs. The key features chosen for each of groundwater, surface water and ecology are presented in Sections I2.1.2-I2.1.4.

I1.2.1.1 Sensitivity Scoring

Each key feature is further divided into categories or ranges, with each category or range scored between 1 and 5. For example, for the proximity of human VECs to surface water VECs, a score was assigned based on the distance from the pipeline.

The scoring system aligns with the five sensitivity rankings used in the sensitivity table in Section 8 of the environmental social impact assessment (ESIA), i.e., very low, low, medium, high and very high. Ranges and ratings were chosen for each feature to reflect the potential for local conditions to provide a pathway between the oil pipeline and environmental receptor. Details of the ranges and ratings for each feature are given in the sensitivity model in Attachment I1.1.

I1.2.1.2 Groundwater Assessment Features

The qualitative groundwater sensitivity assessment was based on the following available information. Details of the scoring for each feature are given in Attachment I1.1.

Aquifer Productivity

This is an indication of whether the underlying consolidated or unconsolidated rock material can produce sufficient quantities of water for use. Scoring was applied based on the Uganda region of the British Geological Survey (BGS) hydrogeology map of Africa (BGS 2017). The map shows the nature of the uppermost aquifer below the ground, and combines information on geology, aquifer productivity, and aquifer flow and storage into a single map that indicates the relative aquifer productivity, from very high to very low.

Recharge Potential

The recharge potential gives an indication of the relative proportion of water reaching the land surface that could infiltrate into the aquifer. This is an important feature in determining the availability of recharge water to transport a contaminant from the surface to the aquifer. Factors included in this assessment are the level of precipitation, topography (the slope of the land based on the 2014 Shuttle Radar Topography Mission (SRTM) digital elevation model) and soil permeability (discussed below). The precipitation data were sourced from the Tropical Rainfall Measuring Mission (TRMM) and represent the mean annual precipitation over the period 1998–2014.

Soil Permeability

The soil permeability is dependent on the soil drainage characteristics and is considered important because it affects how much recharge penetrates the unsaturated zone. The model also considers the sensitivity of the soil as a potential growing medium; in the Scoping Report submitted to NEMA by EACOP this is referred to as soil productivity. Scores were attributed to the different soil types on the pipeline RoW, based on their combined productivity and drainage potential.

Settlement Proximity and Density

Scores were allocated to nearby settlements within the assessment area based on their density (number of buildings per 50 m^2), on the basis that larger communities are more likely to have their own groundwater source. A second level of scores was given based on the distance outward from these settlements, such that areas close to settlements are given higher sensitivity scores. All built settlements and structures were digitised in a desktop GIS from high-resolution aerial imagery captured for the project in 2017. The distance scoring was designed on the likely distances that residents would travel to a water well i.e., the likelihood of a drinking water well at a location.

I1.2.1.3 Surface Water Assessment Features

The qualitative surface water sensitivity assessment was based on the following available information. Details of the scoring for each feature are given in Attachment I1.1.

Surface Water Type

Surface water features were given scores based on their type, as an indication of their importance to human and ecological VECs. Features were split into three types: perennial rivers and wetlands; ephemeral rivers; and wetlands and irrigation channels. Rivers were primarily identified based on the ESIA surveys. Ephemeral watercourses were modelled using a 30 m digital elevation model from the Esri ArcGIS Hydrology toolset. Further details are provided in Attachment I1.1.

Distance to Surface Water and Water Crossings

Scores were given based on the distance of surface water from the pipeline RoW, with an additional score given to those water features that the pipeline directly crosses.

Settlement Density

Similar to the groundwater assessment, settlements were given scores based on the density of buildings in a 50 m^2 area. The rationale is that as settlement density and size increases the number of people potentially utilising the surface water body also increases.

Distance of Settlements from Surface Water Downstream of the Pipeline

Scores were given to surface water features based on the distance from these features to nearby settlements, as an indication of the likelihood of human usage of the water source. This scoring was only applied to surface water downstream of the pipeline since the contamination from a potential spill is more likely to affect water quality downstream than upstream.

I1.2.1.4 Ecology Assessment Features

The qualitative ecological sensitivity assessment was based on the following available information. Details of the scoring for each feature are given in Attachment I1.1.

Legally Protected, Internationally or Nationally Recognised Areas

Scoring was applied to ecologically important areas, based on the sensitivity rankings given for protected areas in accordance with the ecology section of the sensitivity table in Section 8 of the ESIA. These areas include nationally designated wildlife reserves and national parks.

Aquatic Habitats of Conservation Importance

Scoring was applied to aquatic habitats identified in the baseline assessment survey in line with the sensitivity rankings set out in the ecology section of the sensitivity table in Section 8 of the ESIA. These areas include perennial and ephemeral rivers, and wetlands.

Distance to Habitats and Protected Areas

Scores were assigned to distance ranges from the pipeline to the ecological VEC. Habitats and protected areas nearest to, or directly crossed by the pipeline, were scored as higher sensitivity due to the increased likelihood of impact from any leak or failure of the pipeline.

I1.2.1.5 Sensitivity Scoring and Weightings

Numerical weightings are applied to each feature in the GIS to reflect their relative importance.

A relative sensitivity score was then calculated in the GIS for each environmental VEC (surface water, groundwater and ecology), through summation of the numerical products of rating and weights for each feature. The overall sensitivity score is a measure of relative sensitivity to impact by a potential spill or leak, rather than an intrinsic value.

Selected features and GIS layers and the combined score for each VEC were mapped using a five-point colour scale to indicate the relative sensitivity along the

pipeline RoW for that feature. These sensitivity plots were then used for an initial screen of the most suitable sites for PQRA (see Section I1.3). Sensitivity plots for groundwater, surface water and ecology are presented in attachments I1.2, I1.3 and I1.4 respectively.

The use of this model approach to evaluate relative environmental sensitivity is consistent with a source–pathway–receptor (VEC) risk-based approach as it provides information about the sensitivity of the pathway–receptor linkage.

Weightings were also given to each VEC based on their perceived relative importance. In addition to the individual VEC sensitivity plots, a combined weighted oil-spill receptor sensitivity map was produced considering all VECs. This map provided an indication of the relative sensitivity to a potential spill along the pipeline route. An example of the combined sensitivity output is presented in Figure I1.2-1, and plots for the full length of the EACOP Uganda pipeline are presented in Attachment I1.5.

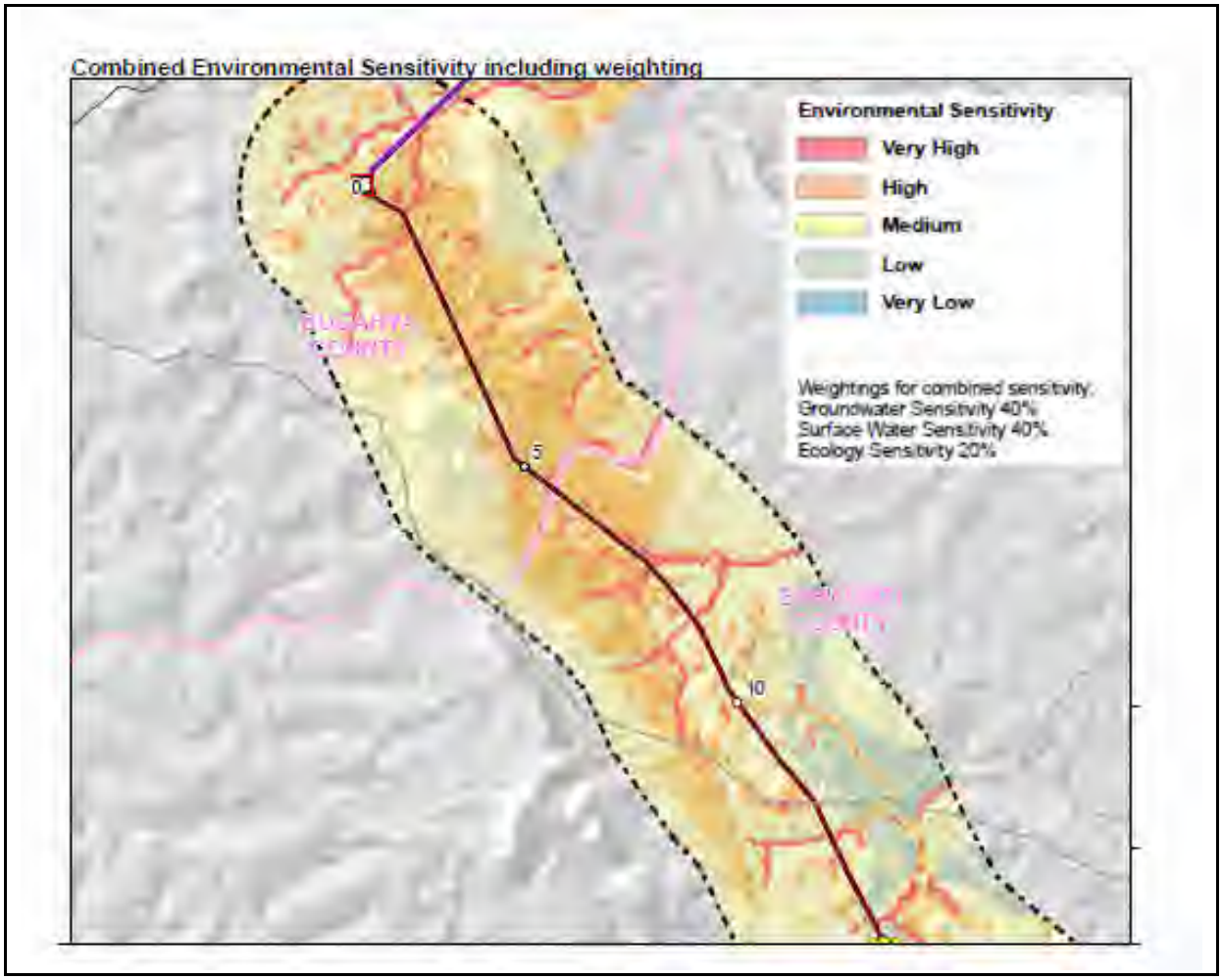


Figure I1.2-1 Sensitivity Mapping for EACOP Uganda Pipeline KP0–14 km.

NOTE: Full mapping and legend is presented in Attachment I1.5.

The features and weightings of each receptor are summarised in Table I1.2-1.

Table I1.2-1 Summary of VEC Features and Weightings

VEC	Feature	Weighting Within VEC	Overall VEC Weighting
Groundwater	Aquifer productivity	3	0.4
	Soil permeability	2	
	Recharge potential	5	
	Settlement density and proximity	5	
Surface waters	Pipeline crosses surface water	5	0.4
	Distance to surface water	4	
	Surface water type	4	
	Settlement density and proximity to downstream surface water	3	
Ecology	Legally protected, internationally or nationally recognised areas	5	0.2
	Habitats of conservation importance (aquatic)	3	

A description of each of the features along with any assumptions made is included in the EACOP sensitivity model presented in Attachment I1.1.

Several individual receptors are intrinsically linked to one another, for example, surface water via groundwater (through base flow to rivers), humans via surface water or groundwater (direct contact, potable abstraction and irrigation), and ecology via surface waters. Some double counting in the assessment of environmental sensitivity is unavoidable for some receptors; this reflects the multiple exposure scenarios considered and the relative individual receptor sensitivity scores.

It is important to note that the weightings listed in Table I1.2-1 were derived for each environmental VEC separately, with relative weightings reflecting the comparative contribution for each feature towards the overall sensitivity of each receptor. Thus, for example, a rating score of 5 for the recharge potential for groundwater should not be taken as being equivalent to a pipeline crossing a surface water body (rating score 5) in terms of their contribution to overall environmental sensitivity (total sensitivity of all environmental receptors).

The features and weightings summarised in Table I1.2-1 and the associated ranges and ratings for each receptor were based on professional judgement, experience and evaluation of available information. Satellite imaging was also used to assess some VECs and features, particularly surface water (identification of rivers and wetlands) and settlements.

The combined oil-spill receptor sensitivity maps were used with GIS system to generate a summary oil-spill receptor sensitivity map. The output (presented as Attachment I1.6) represents the average sensitivity score for each 10-km section of

the pipeline route with an associated chart showing the proportion of land within a particular sensitivity category (very high to very low).

I1.2.2 Selection of Locations for Preliminary Quantitative Assessment

The GIS screening assessment was used to identify the most environmentally sensitive locations (to an oil spill) on the pipeline route, with respect to surface water and groundwater. Undertaking PQRA at these positions provides an illustration of the potential consequences of spills in the most sensitive of contexts. Ecological VECs are not quantitatively assessed in their own right in the PQRA but are considered in the selection of PQRA sites. Human VECs are considered indirectly in the assessment of surface water and groundwater, given the likelihood of physical human contact with these VECs (e.g. through drinking water). Areas identified as potentially high sensitivity from the screening process were further assessed using secondary sources of information collected for baseline reporting, and satellite imagery. This phase of assessment further refines the identification of the potentially high-sensitivity locations.

A summary of the selection rationale and the information and parameters used in the refinement process for each VEC are summarised in Table I1.2-2.

Following this screening, PQRAs were completed at selected locations where the high sensitivity means that environmental risks associated with oil release to surface waters, or sensitive groundwater aquifers, are considered potentially high.

Table I1.2-2 Secondary Data Sources - High-Sensitivity Locations

VEC	Factors Considered	Data Sources
Groundwater	Proximity of existing or historic water wells Likelihood of shallow groundwater Proximity of communities to pipeline in areas of likely shallow groundwater	Communities surveys– information on water wells Directorate of Water Resource Management (DWRM) district reports – groundwater depth ranges Baseline groundwater sampling borehole survey Hydrocensus borehole information Satellite imagery – topography and populations
Surface water	The most significant perennial water crossings with: downstream communities – therefore possible use for bathing, farming activities and drinking water downstream ecological receptors proximity of other downstream surface water features e.g., Lake Albert.	Satellite imagery – topography and population Communities surveys – more detailed population information

The number and types of quantitative assessment undertaken for the 296-km EACOP Uganda pipeline are summarised in Table I1.2-3.

Table I1.2-3 Preliminary Quantitative Assessments

VEC	Assessment Description	Number of High-Sensitivity Locations Modelled
Sensitive groundwater	Modelling potential impact associated with migration of free oil (NAPL) within unsaturated soil	2
Sensitive groundwater	Modelling potential impact associated with migration of dissolved-phase contaminants within groundwater, following dissolution from NAPL	2
Sensitive surface water features	Modelling potential impact associated with migration of dissolved-phase contaminants within groundwater, following dissolution from NAPL, considering subsequent entry into surface water features via base flow contribution	5
Sensitive surface water features	Modelling potential impact associated with dispersion of oil on surface water following a direct spill into a watercourse	5

I1.2.2.1 Selection of Locations for Preliminary Quantitative Assessment: NAPL and Dissolved Phase Migration to Sensitive Groundwater

Further refining the high groundwater sensitivity areas identified by the qualitative assessment, the areas of highest sensitivity groundwater are considered to be those where potential shallow groundwater may be near settlements and possible drinking water wells.

These sensitivities apply to potential impact from NAPL migration and dissolved phase migration, and so these two assessment types have been considered at coincident locations.

The areas initially identified as having high-sensitivity scores in the groundwater qualitative assessment were further assessed for the likelihood of meeting these criteria. Two locations were selected for preliminary quantitative assessment. The justifications for these selections are summarised in Table I1.2-4.

The locations that were not selected for further assessment were generally considered less sensitive than the selected locations on the basis of topography, distance of potential water wells from the pipeline and depth to groundwater.

Table I1.2-4 Groundwater Receptor Locations Selected

KP	Model	Rational for Selection
1.5	NAPL and dissolved-phase migration	This location was ranked as high, based on the qualitative assessment AND Pipeline near Katooke village and trading centre approximately 400 m to the east Community survey data (location 8-3) reports shallow wells and a community pump, communal water reported at trade centre Village is down topographic gradient from the pipeline
256	NAPL and dissolved-phase migration	This location was ranked as high, based on the qualitative assessment AND Pipeline in proximity of community <100 m to the east and west, including school No community survey data for this village, however surveys for villages at KP255 at similar elevation to KP256 (locations 30-2, 30-3 and 30-4) report boreholes including shallow wells. Therefore, water wells and possibly shallow wells are considered likely to be present at KP256 River or wetland visible nearby to the east therefore shallow groundwater likely Village is down topographic gradient from the pipeline

I1.2.2.2 Selection of Locations for Preliminary Quantitative Assessment: Dissolved phase Migration and Direct Spills to Surface Water

Locations for modelling impacts to surface water by direct spills, and migration of dissolved-phase oil via groundwater were considered together.

Particularly sensitive watercourses are considered as those with significant perennial watercourses with downstream community use, protected land status or downstream wetlands.

Areas identified initially as having high sensitivity scores on the surface water qualitative assessment were further assessed for the likelihood of meeting these criteria. Five locations were selected for preliminary quantitative assessment. The justifications for these selections are summarised in Table I1.2-5. The locations that were not selected for further assessment were generally less preferential than the selected locations on the basis of topography, distance to downstream settlements, surrounding land use and in some cases similarity in surrounding conditions to the five locations that were selected.

Table I1.2-5 Surface Water Receptor Locations Selected

KP	River	Modelled Pathway	Rational for Selection
15.4	Wambabya Tributary	Direct spill to watercourse and dissolved-phase migration in groundwater	Communities and farming downstream, including close to pipeline crossing Crossing in a World Wildlife Fund (WWF) ecoregion
36.5	Kafu River	Direct spill to watercourse and dissolved-phase migration in groundwater	Flows to the Victoria Nile downstream of Lake Kyoga Local communities downstream use water for domestic supply Crossing in a WWF ecoregion
164	Katonga River	Direct spill to watercourse and dissolved-phase migration in groundwater	Communities downstream, local communities using surface water for domestic supply (it is unclear whether this refers to water from the Katonga River or other up-gradient streams)
274	Kibale River	Direct spill to watercourse and dissolved-phase migration in groundwater	Flows to downstream wetlands
289	Jemakunya River	Direct spill to watercourse and dissolved-phase migration in groundwater	Flows to Lake Victoria (therefore potentially transboundary)

The locations selected for PQRA using the four assessment methods are shown in Attachment I1.6.

I1.3 PQRA

The methodology and results from the models assessing the unexpected release of oil to land and direct release to surface water are presented in the following sections.

I1.3.1 Spill Volume and Oil Type

For KP locations, the model types consider the worst-case spill scenario, a surface spill due to erosion of the soil above the pipeline, exposing it, and breach of the pipe from a subsequent third-party collision.

Medium and large pipeline releases are assumed to be capable of projecting soil cover and excavating a clear path to the surface such that momentum-driven jets are anticipated. Large releases are expected to have relatively low velocity and so are expected to rain out, forming a pool on the ground rather than maintaining a liquid spray.

The resultant surface oil spill that has been modelled is based on oil loss from a large hole diameter of 610 mm, resulting in a maximum oil pool range at the surface

of 127 m and a release volume of 1430 m^3 over a one-hour period. For all modelled locations along the pipeline route, the volume released does not account for the location of block valves in relation to the leak location, or other mitigation measures

It is assumed that the oil that will be present within the export pipeline would comprise a blend of oils, namely the export pipeline blends E1 to E4.

For each model type, the worst-case oil blend from the applicable range of blends has been selected based on the oil properties that are considered most likely to drive the risks in the respective assessments.

For the dissolved-phase modelling to surface water and groundwater VECs, the environmental fate and transport properties of the constituent components of the oil will drive the extent of potential impact (i.e., compound solubility and attenuation potential). As such, blend E4 has been used for modelling in this assessment.

Conversely, for the NAPL modelling it is the physical properties of the oil that will determine the extent of impact (i.e., oil viscosity, waxing temperature and pour point). As such, blend E2 has been considered in this assessment.

Details and justification for all the model inputs selected are given in the relevant model appendices.

I1.3.2 Oil Release to Land – NAPL Modelling

I1.3.2.1 Introduction

A preliminary quantitative assessment has been undertaken for the chosen locations, to establish the potential vertical extent of NAPL migration through unsaturated soil and characterise potential associated risks.

I1.3.2.2 Estimation of Migration in Unsaturated Zone

The final depth, z, to which the NAPL will migrate vertically through an unsaturated zone (under gravity), is a function of the:

- NAPL volume in the source zone
- residual NAPL saturation within the unsaturated zone
- density of the unsaturated zone materials
- density of the NAPL
- depth of impacted soil in the source zone
- porosity of the unsaturated zone materials.

For the purposes of the modelling, it has been assumed that the soil temperature in the unsaturated zone is warm enough to allow the NAPL to remain fluid. It has also been assumed that the soil horizon is homogenous in composition, with no preferential flow pathways. Importantly, the model assumes the oil remains in situ and is not remediated. In reality, the oil spill would quickly be cleaned up (within 1 year) which would effectively limit the extent to which NAPL would migrate vertically. Further details on remedial actions are provided in Section I1.3.3.3.

Country-specific field data gathered for Uganda (presented in the groundwater baseline assessment, Attachment A7.2) reports groundwater temperatures in the

region to be between 22.3–30.4°C, and it is considered reasonable to assume that shallow soil temperatures would be higher than groundwater temperatures, although reducing with depth. The lowest pour point and blend waxing temperatures for the E2 oil blend are 31°C and 45°C respectively. Soil temperatures are likely to fall within this range, most likely at the lower end, and hence NAPL mobility through the unsaturated zone is considered a valid worst-case assumption. The degree of mobility of the NAPL through the unsaturated zone will depend on the ground temperature at the time of oil release, and the rate of cooling of the oil once it has leaked from the heated pipeline.

However, given the groundwater temperatures, it is assumed that upon reaching the groundwater table, the NAPL would solidify and lateral movement would be very limited thereafter. It is assumed that all components of the NAPL mixture would be immobilised at the same temperature and hence lateral NAPL migration on the surface and within groundwater is not considered a viable pathway.

The basis of the calculation of vertical NAPL migration through the unsaturated zone assumes that the volume of NAPL originally contained in the source zone must equal the volume of NAPL once it has migrated fully vertically. This is described in the equation below (ESI, 2014) NAPL scoping calculations and spreadsheet tool (equation 92). This assumes no lateral spread of NAPL and can be applied to each layer of unsaturated material in turn, until either the source volume is exhausted or until NAPL reaches the groundwater table.

$$V = S_{ro} n A z$$

Where:

V is the volume of NAPL (m^3),

S_{ro} is the residual NAPL saturation in the unsaturated zone material (dimensionless),

n is the porosity of the unsaturated zone material (dimensionless),

A is the source area across which the NAPL remains in the unsaturated zone (m^2),

z is the thickness of the unsaturated zone through which NAPL will migrate until it reaches equilibrium conditions (m).

This rearranges to:

$$Z = \frac{V}{S_o n A}$$

On this basis, if the vertical migration of NAPL ceases before it reaches the water table (due to mass depletion as it migrates through the unsaturated zone), then the total depth of migration within the unsaturated zone can be calculated.

If any NAPL reaches the water table, the volume of NAPL at the base of the unsaturated zone can be estimated, providing the depth to the water table is known.

I1.3.2.3 NAPL Source Characteristics

The spill scenario considered is a circular spill of 1430 m^3 of crude oil collecting on the ground surface, with a diameter of 127 m, caused by accidental damage to the pipeline. Since the NAPL is under pressure in the pipeline, the source is assumed to form an initial cylindrical source term at the surface (with a thickness of 0.11 m) before migrating vertically through the unsaturated zone towards the water table.

It should be noted that the residual NAPL saturation values used in the model are based on literature values for generic oil types and soil conditions. Full details of the NAPL input parameters are presented in Attachments I1.7 and I1.8.

Dissolution of mobile oil fractions from NAPL in contact with groundwater and subsequent migration are considered in Section I1.3.3.

I1.3.2.4 Conceptual Site Model (CSM) Summary: KP1.5, Katooke Village and Trading Centre

The pipeline at KP1.5 passes approximately 400 m to the west of the Katooke trading centre and the nearest dwelling is approximately 65 m from the pipeline.

A community survey reports one protected well and three shallow wells in Katooke Village.

A water source survey indicates that there is a borehole at the trading centre, located down topographic gradient from the pipeline at KP1.5. The boreholes reported in the community and water source surveys are, however, not listed in the hydrocensus data available for the area as this data source only includes deep boreholes. Parameters such as depth to water and yields associated with these wells are unknown.

Due to the reported presence of shallow wells in the village and the presence of a stream and swamp land nearby, it is assumed that a shallow groundwater body is present in this area, at around 1 m bgl.

The schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.7.

I1.3.2.5 CSM Summary: KP256, Rakai District (Unknown Village with School)

The pipeline at KP256 passes near several villages and schools in the Rakai district, the closest of which is approximately 60 m east of the pipeline. No community survey data is available for this village, however, surveys for villages at KP255 at a similar topographical elevation to KP256 report boreholes including shallow wells, and so the existence of shallow wells at KP256 is considered likely. There is also a river and wetland nearby to the east and therefore shallow groundwater is assumed at around 1 m bgl.

The schematic CSM the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.8.

I1.3.2.6 Results and Discussion: NAPL Migration in Soil

The model output sheets are presented in attachments I1.7 and I1.8. The model calculates the predicted depth of migration in an infinite unsaturated zone and the

volume of NAPL reaching the water table. The results for both locations are summarised in Table I1.3-1.

Table I1.3-1 NAPL Modelling - KP1.5 and KP256

Location	Depth of NAPL Migration if Unsaturated Zone Infinitely Thick (m bgl)	Location-Specific Assumed Depth to Water Table (m bgl)	Comment	Volume Reaching Water Table (m^3)
KP1.5	1.38	1	NAPL reaches water table	380
KP256	1.38	1	NAPL reaches water table	380

The modelled depth of NAPL migration was calculated as 1.38 m below the base of the surface spill for both of the sites studied. It should be noted that these depths are based on literature values for residual NAPL saturation published for generic oil types and so are not specific to the oil transported within the EACOP Uganda pipeline.

The model assumes the oil is at conditions where it is free flowing. The model cannot account for the reduction in mobility that would occur when the oil cools to below its waxing point temperature. Due to the relatively low wax appearance temperature (WAT) (45°C for blend E2) of the oil type specific to the EACOP Uganda pipeline, compared to the likely range in ground temperatures, the migration depths modelled are likely to be conservative. However, given that ground temperatures could be above the pour point (31°C for blend E2), some limited vertical migration is likely to occur and the modelled scenario is considered to represent the possible worst case.

I1.3.2.7 Sensitivity Analysis

The availability of site-specific data for the assessment is very limited, and as a result the assessment also relies on literature-sourced data derived largely from laboratory-scale tests. A sensitivity analysis has therefore been carried out to understand the implications of this uncertainty on the model results.

The results and details of the parameters are described in Table I1.3-2 and the results of the sensitivity analysis in Table I1.3.3.

Due to the large scale of this project and the lack of site-specific data, by necessity, most of the parameters used in these scoping calculations have been obtained from literature sources. The literature sources of the parameters used in the calculations are described in the model inputs table in Attachments I1.7 and I1.8 and are often taken from limited studies. Factors such as timescale for NAPL to migrate or volatilisation have not been considered in the assessment.

Table I1.3-2 Sensitivity Analysis Parameters – KP1.5

Parameter	Original Value	Change 1 Value	Change 2 Value	Rationale for Change Values
Shape of source term	Cylinder diameter 127 m (area 12658 m^2) by depth 0.11 m	Cylinder diameter 62.5 m (area 3067 m^2) by depth 0.466 m	Cylinder diameter 93.75 m (area 6903 m^2) by depth 0.207 m	Used approximately half and three quarters of radius while retaining total volume of 1430 m^3
Effective aquifer porosity	0.4	0.17	0.46	Minimum: McWorter and Sunada (1977) value of mid-point between the arithmetic mean of a fine gravel (0.28) and clay (0.06) Maximum: Contaminated Land Exposure Assessment (CLEA) value for silty clay loam water filled porosity
Residual saturation	0.2	0.18	0.26	Minimum:light oil and gasoline in sand Maximum: water in sandy clay loam Cohen and Mercer

Table I1.3-3 Sensitivity Assessment - KP1.5 (Blend E2)

Change	Value	Depth of Migration if Unsaturated Zone Infinitely Thick (m bgl)	Volume of NAPL Potentially Reaching Water Table (m^3)
Size of source term (diameter)	Original 127 m	1.38	380
	62.5 m	4.44 (into underlying clay)	1196
	93.75 m	2.65	1013
Effective porosity	Original 0.4	1.38	380
	0.17	3.23	962
	0.46	1.20	228
Residual saturation	Original 0.2	1.38	380
	0.18	1.53	481
	0.26	1.06	76

NOTE: Groundwater assumed to be present at around 1 m bgl.

Based on the assessment completed above, it is estimated that the depth to which a spill could migrate within the unsaturated zone is in the order of 1.1–4.4 m. It is noted that the model is most sensitive to the source thickness i.e., the thickness of the oil pool at the surface. This parameter is likely to vary significantly between potential spill locations due to factors such as the size of a hole in the pipeline and local ground surface topography. Although it is noted that residual saturation values

are based on the limited data available for generic oil and soil types, the effect of varying this parameter is limited.

I1.3.2.8 Conclusions

Modelling of NAPL migration in unsaturated soil identified that the oil could migrate vertically to 1.38 m below the surface spill area. Sensitivity analysis showed that the oil thickness at the surface has a significant effect on vertical migration with a thicker spill source driving the oil deeper into the ground, as would be expected.

However, as discussed above, there is inherent conservatism within the model, in particular the required use of available literature values for residual NAPL saturation that were derived on the basis of the oil being free flowing. Due to the relatively low waxing and pour point temperatures for the oil blends transported by the EACOP Uganda pipeline, compared to the likely range in ground temperatures, the migration depths modelled are likely to be conservative and the modelled scenario is considered to represent the possible worst case.

I1.3.3 Oil Release to Land – Dissolved Phase Migration in Groundwater Modelling

I1.3.3.1 Introduction

PQRA has been undertaken for the chosen locations to assess the potential risks posed by the migration of dissolved-phase oil in groundwater. The assessment considers the potential of NAPL coming into direct contact with groundwater, and subsequent partitioning to dissolved phase as the risk driving scenario. The subsequent migration of this dissolved-phase to groundwater and surface water VECs has been considered. Modelling of NAPL migration in unsaturated soils reported in Section I1.3.2 indicated that the maximum vertical NAPL migration would be 1.38 m. For sites where it is considered infeasible for NAPL to reach groundwater, due to the assumed depth of groundwater, the leaching pathway from impacted soils to groundwater is modelled instead.

The assessment has been undertaken via fate and transport modelling using the widely accepted (RBCA) Tool Kit for Chemical Releases (version 2.6) (GSI Environmental, 2011). RBCA has been used to calculate concentrations of key chemicals present in the dissolved phase in groundwater down hydraulic gradient from the pipeline, and the maximum distance of exceedances of the target concentrations for groundwater and surface water VECs.

I1.3.3.2 Exposure Scenarios

The fate and transport modelling has considered the instantaneous release of total oil volume (1430 m^3 with a circular pool diameter of 127 m) to a location, considering the following pathways and VECs:

- partitioning of mobile oil components into groundwater from any NAPL that may be in direct contact with the groundwater
- leaching of mobile oil components from soil to groundwater due to rainwater ingress through the unsaturated zone (modelled only for sites where expected groundwater depth is greater than 1.25 m bgl)

- migration of dissolved phase components via groundwater to public water supply wells and surface water features
- subsequent potential exposure to humans through consumption of water (groundwater and surface water)
- subsequent potential exposure to ecological receptors in surface waters.

Modelling of free-phase oil (i.e., NAPL) migration has been undertaken separately and is described in Section I1.3.2.

It should be noted that dissolved phase modelling considers only the size of the source and not the volume of oil present within the spill zone. This is due to the model assumption of a continuous source term and the fact that the source concentrations relate to the composition of the oil and the aqueous solubility of the individual substances and are not dependent on volume.

Schematic CSMs for the two groundwater PQRA locations are presented in Attachments I1.9 and I1.10. The five surface water PQRA locations are presented in Attachments I1.11–I1.15.

I1.3.3.3 Oil Spill Response and Remediation

Importantly, the models presented assume the oil remains in situ and is not remediated. However, the oil spill would quickly be cleaned up (within 1 year) which would effectively limit the extent to which groundwater impact could migrate from the spill zone. In responding to a release of oil to the environment, the first activity is to contain the oil and prevent further spreading. This is followed by recovery activities to remove and dispose of the oil from the surface of the land and/or water following appropriate waste management procedures. Regulatory approvals may also be required at this stage.

As previously discussed in Section I3.2, following a spill, certain components of the oil are likely to have penetrated the sub surface soils and may reach groundwater if this is shallow. Before remediation activity could take place, it would be necessary to undertake an assessment of the potential impact and subsequently design the mitigating actions. All these activities take time to plan, procure and execute and so for the purposes of this assessment a time frame of one year has been set to complete all remedial activities from the time of the initial release. It should be noted that some remedial activities can take significantly longer than one year to complete, depending on the complexity of the impact and sensitivity of the receptors.

The remedial approach considered, assumes that all NAPL in the soil and groundwater is removed by direct excavation and replaced with unimpacted soil. Section I3.2, indicates the maximum depth of NAPL penetration into the soil to be less than 1.3m which would easily be in the reach of mechanized excavation equipment.

Removal of the NAPL from the soil and groundwater is aimed at reducing the source term in the groundwater modelling to zero, which would leave in-situ the residual dissolved phase plume, downgradient of the source area at the time of the source removal. It is considered highly likely that with the source removed, substance concentrations within the downgradient plume will immediately begin to

reduce via normal fate and transport processes including advection, dispersion, sorption and degradation.

I1.3.3.4 Modelling for Remediation within One Year

Modelling was undertaken to predict the reduced extent of impact if remediation of the source was to occur within one year. To achieve this, indicative modelling of a decoupled plume with a decreasing source term was undertaken using UK EA RTM Worksheet. Results showed no increase in down gradient plume concentration at the plume margins. Therefore, the maximum extent of the plume post remediation (after source removal) can be approximated to the plume length with the source in-situ at the 1-year time horizon (taken from the RBCA model), further reduced by 30% due an assumption that the “most likely” groundwater conditions at the site will be aerobic. The reduction by 30% is consistent with the findings of sensitivity analysis undertaken for the RBCA models, to understand the effect of aerobic conditions, presented in Sections I1.3.3.7 and I1.3.3.8. Results for the predicted extent of groundwater impact for benzene (the most mobile oil component), if remediation is completed within one year are presented alongside the predicted reasonable worst-case results for each location studied in Sections I1.3.3.7 and I1.3.3.8.

I1.3.3.5 Substances

For the purposes of the risk assessment, the constituents within the crude oil blends that present the greatest risk to the receptors were selected for PQRA. Only hydrocarbon constituents with a high or moderate relative mobility in groundwater have been included and indicator compounds selected to represent a wider range of compounds (CL:AIRE 2017). The following risk drivers are therefore considered in the PQRA:

- benzene, toluene, ethylbenzene and xylene (BTEX)
- total petroleum hydrocarbons (TPH) aliphatic C5-C6
- TPH aliphatic C6-C8
- TPH aromatic C8-C10
- TPH aromatic C10-C12
- TPH aromatic C12-C16.

It is noted that the longer chain hydrocarbons account for a higher proportion of the oil blends transported in the pipeline, with carbon chains greater than C20 accounting for 66% molar fraction of blend E4. However, test modelling of these fractions found that these contaminants do not readily transport from soil to groundwater, and the resultant dissolved-phase concentrations were very low compared to the shorter chain fractions listed above. On this basis, assessment of longer chain hydrocarbon fractions (greater than C16) was not included. The mobile components listed above are regarded as the key potential risk drivers due to their higher mobility in soil and higher solubility in groundwater compared with longer chain (and higher molecular weight) hydrocarbons.

The E4 oil blend was selected from the relevant blends applicable to the Uganda export pipeline (E blends) based on it having the highest proportion (based on %

molar fraction) of the lighter end hydrocarbon fractions (i.e., BTEX). The higher proportion of lighter end fractions means that the E4 blend would have the highest potential mobility in terms of dissolution to groundwater and lateral migration, and hence is considered the highest risk blend with respect to environmental risks.

Representative groundwater source concentrations were estimated using the calculated effective solubility of each component in the crude blend. This calculation used Raoult's Law and considers the relative proportion of each constituent in the blend and the pure phase solubility, as presented in Table I1.3-4.

Raoult's Law is given by the formula:

Concentration of chemical in water (mg/L) (i.e., effective solubility) = x S

Where: x = mole fraction of chemical in organic phase (mole chemical / mole oil) and S = Pure phase solubility of chemical in water (mg/L)

Similarly, soil source concentrations were calculated based on the theoretical soil saturation limit considering the % molar fraction of each fraction in the mixture, as presented in Table I1.3-4.

Table I1.3-4 Groundwater and Soil Source Concentrations

Crude Oil Component	% Mol in Oil Blend E4	Aqueous Solubility Limit[1] (mg/L) (Pure Phase)	Dissolved Phase Groundwater Source Concentration (mg/L)	Soil Saturation Limit[2] (mg/kg) (Pure Phase)	Soil Source Concentration (mg/kg)
Benzene	0.08	1770	1.42	732.2	0.59
Toluene	0.34	530	1.80	300.4	1.02
Ethylbenzene	0.14	169.0	0.24	118.3	0.17
Xylene	0.86	178.0	1.53	152.2	1.31
Aliphatics >EC5-EC6	2.77	36.0	1.00	191.7	5.31
Aliphatics >EC6-EC8	6.73	5.4	0.36	410.4	27.62
Aromatics >EC8-EC10	7.02	65.0	4.56	226.1	15.87
Aromatics >EC10-12	1.64	25.0	0.41	132.4	2.17
Aromatics >EC12-16	3.45	5.8	0.20	59.7	2.06

NOTE: % molar fraction in oil blend data taken from EACOP Studies. [1]Aqueous solubility limits sourced from RBCA database. [2]Theoretical soil saturation limits calculated in RBCA assuming a loam (UK CLEA Loam) soil type

I1.3.3.6 Assumptions and Input Parameters

The RBCA modelling process simulates the reduction in constituent chemical concentrations as they migrate along a defined pathway due to the processes of dilution, dispersion and degradation.

While the modelling has been designed to represent real life conditions, data gaps and uncertainties meant that some conservative assumptions were necessary in the model set-up, in particular:

- Due to the absence of sufficient information on aquifer conditions, it has been conservatively assumed that the aquifer is under anaerobic conditions, which for petroleum substances relates to longer degradation half-lives when compared to aerobic conditions.
- The pipeline failure scenario considered for modelling is the worst case in terms of spill volume and oil pool size. Some dimensions for a more moderate spill volume of 600 m^3, which is the average of possible release volumes along the pipeline wherever it crossed an Environmentally Sensitive Area, is also considered within the sensitivity analysis undertaken for each model.
- For most of the assessment locations there is uncertainty regarding the groundwater depth. It is therefore assumed that groundwater in the lowlands or near rivers is at around 1 m bgl.

The input parameters used in the PQRA and the assumptions and justifications for these inputs are presented for each model in attachments I1.9 and I1.15.

Since site conditions and literature-sourced parameters are not well constrained, a sensitivity analysis has been carried out to understand the level of uncertainty in the assessment results i.e., predicted oil concentrations. Sensitivity analysis was undertaken to assess the variability in model output. The following sensitivity analysis was undertaken:

- Source size – reduced to represent a volume of 600 $m^{3.}$
- hydraulic gradient and hydraulic conductivity – combination of increased gradient and reduced conductivity, and reduced gradient and increased conductivity (compared to combination considered in the main modelling)
- Oxygen conditions within the aquifer, aerobic bio-degradation rates were compared with the default assumption of anaerobic degradation conditions for benzene.

I1.3.3.7 PQRA for Groundwater VECs

Target Concentrations

The target concentrations (and source of the target concentration) used in the DQRA for groundwater VECs are given in Table I1.3-5. In accordance with the Project Environmental Standards, World Health Organisation (WHO) drinking water standards (DWS) have been used in the absence of Uganda-specific standards.

Consistent with the approach taken for the development of the WHO standards, modelling has been undertaken using the specific indicator compounds for TPH fractions as presented Table I1.3-5.

Table I1.3-5 Drinking Water Standards - PQRA

Crude Oil Component	DWS (mg/L)	Source	Dissolved Phase Groundwater Concentrations Directly Beneath the Spill Location if NAPL in Contact with Groundwater	Do Dissolved Phase Groundwater Concentration Exceed the DWS?
Benzene	0.01	WHO (2011)	1.42	Yes
Toluene	0.7	WHO (2011)	1.80	Yes
Ethylbenzene	0.3	WHO (2011)	0.24	No
Xylene	0.5	WHO (2011)	1.53	Yes
Aliphatic C5-C6 (n-hexane)	15	WHO (2008)	1.00	No
Aliphatic C6-C8 (n-heptane)	15	WHO (2008)	0.36	No
Aromatic C8-C10 (1,2,4-trimethylbenzene)	0.3	WHO (2008)	4.56	Yes
Aromatic C10-C12 (naphthalene)	0.09	WHO (2008)	0.41	Yes
Aromatic C12-C16 (methylnaphthalene)	0.09	WHO (2008)	0.20	Yes

NOTE: The TPH fraction indicator compounds are given in brackets after each fraction.

For the sites considering NAPL in contact with groundwater, only those substances that exceed the DWS were taken forward to modelling. For sites where the leaching pathway is considered, all mobile oil components were modelled to determine dissolved phase groundwater concentrations for comparison to the DWS.

KP1.5 – Katooke Village Trade Centre.

CSM Summary

The pipeline at KP1.5 passes approximately 400 m to the west of the Katooke trading centre and the nearest dwelling is approximately 65 m from the pipeline. A community inventory report details one No. protected well and three No. shallow wells in Katooke Village. A water source survey undertaken for the baseline assessment indicates that there is a borehole located at the trading centre, located down topographic gradient from the pipeline at KP1.5.

Due to the reported presence of shallow wells in the village and the presence of a stream and swamp land nearby, it is assumed that a shallow groundwater body is present in this area and therefore it is considered that NAPL could come into contact with groundwater. Ground conditions beneath KP1.5 have been inferred based on the ground conditions reported in borehole records, as well as the ESIA scoping report, Table 6.3.3.

Ground conditions beneath KP1.5 have been inferred as gritty clay loam superficial deposits to approximately 3 m, underlain by the parent rock, Basement Complex granites, gneisses and schists based on the ESIA Scoping report, Table 6.3.3.

The schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.9.

Results and Discussion

The model output sheets are presented in Attachment I1.9.

The RBCA model calculates the predicted extent of impact for the modelled oil components. The RBCA model also calculates an estimated travel time for each of the oil components to reach the defined receptor points.

The modelling results are reported in Table I1.3-6.

Table I1.3-6 Summary of Predicted Concentrations: KP1.5 – Katooke Village Trade Centre

Pathway modelled – NAPL in Contact with Groundwater			
Oil Component	**DWS (mg/L)**	**Maximum Extent of Impact* Beyond Surface Spill Area (m)**	**Time Taken to Reach Furthest Exceedance (Years)**
Reasonable worst-case			
Benzene	0.01	300	16
Toluene	0.7	20	2
Xylene	0.5	30	5
Aromatic C8-C10 (1,2,4-trimethylbenzene)	0.3	40	30
Aromatic C10-C12 (naphthalene)	0.09	35	25
Aromatic C12-C16 (methylnaphthalene)	0.09	16	40
Remediation within 1 year			
Benzene	0.01	35	1

NOTES: The TPH fraction indicator compounds are given in brackets after each fraction. *Maximum extent of impact is the maximum distance beyond the lateral extent of the spill, at which predicted groundwater concentrations exceed the DWS. Where the distance is <20 m, exact distances have been reported. For distances >20 m but <100 m distances are rounded to the nearest 5 m and distances >100 m are rounded to the nearest 10 m. It should also be noted that these distances relate to the distance from the furthest extent of the spill, which is assumed to extend 127 m from the pipeline.

The results of the modelling indicate that the potential exists for drinking water wells to be impacted by the migration of dissolved-phase benzene up to a distance of 300 m from the furthest extent of the spill (427 m from the pipeline) with travel times of approximately 16 years, allowing time for remedial action to be undertaken. The other contaminants are only predicted to reach a maximum extent of 40 m from the spill.

KP256 – Rakai District (Unknown Village with School)

CSM Summary

The pipeline at KP256 passes near several villages in the Rakai district, the closest of which is approximately 60 m east of the pipeline and is known to contain a school. The general topography of the area lies at an elevation of 1222 m and slopes downwards in an easterly direction to an unnamed river which lies at an elevation of 1191 m approximately 1.2 km away. No community survey data is available for the closest village, however surveys for villages at KP255 at similar elevation to KP256 report boreholes including shallow wells, and so the existence of shallow wells at the village closest to KP256 is considered likely. Further to this, river and wetland is visible nearby to the east so it is assumed that a shallow groundwater body is present and therefore it is considered that NAPL could come into contact with groundwater.

Ground conditions beneath KP256 have been inferred as sandy loam superficial deposits to approximately 3 m, underlain recent river alluvium, based on the ESIA Scoping report, Table 6.3.3.

The schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.10.

Results and Discussion

The model output sheets are presented in Attachment I1.10.

The modelling results are reported in Table I1.3-7.

Table I1.3-7 Summary of Predicted Concentrations: KP256 – Rakai District

Pathway modelled – NAPL in contact with groundwater			
Oil Component	**DWS (mg/L)**	**Maximum Extent of Impact* Beyond Surface Spill Area (m)**	**Time Taken to Reach Furthest Exceedance (Years)**
Reasonable worst-case			
Benzene	0.01	340	13
Toluene	0.7	25	2
Xylene	0.5	35	4
Aromatic C8-C10 (1,2,4-trimethylbenzene)	0.3	45	14
Aromatic C10-C12 (naphthalene)	0.09	40	18
Aromatic C12-C16 (methylnaphthalene)	0.09	20	45
Remediation within 1 year			
Benzene	0.01	45	1

NOTES: The TPH fraction indicator compounds are given in brackets after each fraction. *Maximum extent of impact is the maximum distance beyond the lateral extent of the spill, at which predicted groundwater concentrations exceed the DWS. Where the distance is <20 m, exact distances have been reported. For

distances >20 m but <100 m distances are rounded to the nearest 5 m and distances >100 m are rounded to the nearest 10 m. It should also be noted that these distances relate to the distance from the furthest extent of the spill, which is assumed to extend 127 m from the pipeline.

The results of the modelling indicate that the potential exists for drinking water wells to be impacted by the migration of dissolved-phase contaminants up to a maximum distance of 340 m from the furthest extent of the spill (467 m from the pipeline), with travel times in the region of 13 years, allowing time for remedial action to be undertaken.

Discussion of Sensitivity Analysis Results

Sensitivity analysis has been undertaken on the assessment location that has been shown to be the most sensitive when varying key parameters.

The sensitivity analysis was completed for the oil constituent benzene based on the fact that benzene is generally the most mobile constituent of the oil.

Sensitivity analysis has been undertaken on key parameters including oil spill size, hydraulic conductivity and hydraulic gradient and degradation rate.

The results of the sensitivity analysis for groundwater assessment: KP256 – Rakai District (unknown village with school) are summarised in Table I1.3-8.

Table I1.3-8 Summary of Sensitivity Analysis Results for Benzene: KP256 – Rakai District

Pathway Modelled – NAPL in Contact with Groundwater		
DWS (mg/L)		**Benzene**
		0.01
Parameter (Original Setting)	**Input Value**	**Extent of Impact Beyond Surface Spill Area (m)***
Original result		340
Source Dimension (127 m)	53 m (change 1)	300
Hydraulic gradient (0.031) & hydraulic conductivity (1.27)	Gradient: 0.0372 Conductivity: 0.127 (change 1)	80
	Gradient: 0.0248 Conductivity: 12.7 (change 2)	>500
Degradation rate (724 days, adjusted) (equivalent to 416 days unadjusted)	348 days (change 1) (equivalent to 200 days unadjusted)	200

NOTES: Concentrations are reported as steady state. All units reported as mg/L. * For benzene, where distances are >500m, sensitivity has been conducted over 50 m increments and for distances <500 m sensitivity is rounded to the nearest 10 m. Values presented for the extent of impact beyond surface area spill area are the last increment at which impacts are predicted to exceed the DWS.

Reducing the width of the oil spill from 127 m (reported for a volume of 1430 m^3) to 53 m (an equivalent size for a volume of 600 m^3) results in a decrease in the predicted extent of impact from 340 m to 300 m.

Increasing the hydraulic conductivity by an order of magnitude from 1.27 m/d to 12.7 m/d and reducing the hydraulic gradient by 20%, reduces the concentration of benzene at the source (due to increased dilution in the aquifer) but lengthens the extent of impact distance considerably. The modelled extent of impact for benzene under these conditions was 1350 m, however this result has been capped at 500 m as it is considered highly unlikely that benzene would migrate to this distance.

Conversely, when the hydraulic conductivity is reduced by an order of magnitude to 0.127 m/d and the hydraulic gradient in increased by 20%, the initial concentrations encountered at the source are higher, but concentrations reduce over a much shorter distance , reducing the extent of impact to 80 m.

The models have conservatively assumed anaerobic aquifer conditions, however if aerobic aquifer conditions were present, this is shown to reduce the extent of impact from 340 m to 200 m.

Conclusions

For the range of conditions modelled at the two groundwater locations the results indicate exceedances of DWS at distances of up to 340 m beyond the extent of the surface oil spill.

Sensitivity analysis showed that the model had limited sensitivity to source volume and dimensions and was most sensitive to changes in hydraulic conductivity and gradient and depth to groundwater, as would be expected. When modelling assuming aerobic conditions, decreased biodegradation times resulted in a reduction of the predicted extent of impact by approximately 40% to 200m.

Thus, it is concluded that a failure of the EACOP Uganda pipeline may impact groundwater quality with respect to drinking water use up to distances of approximately 340 m beyond the extent of the oil spill area in regions associated with shallow groundwater resting in granular deposits, and up to 300 m beyond the extent of the oil spill area in regions associated with more cohesive geology.

However, it should be noted that travel times for contaminants in groundwater over distances greater than 200 m would likely be greater than 10 years. Furthermore, the maximum modelled distances for contaminant migration would relate only to the areas of the pipeline route that have the most sensitive ground conditions for NAPL and dissolved phase contaminant migration, such as shallow groundwater, permeable soil and the absence of aerobic biodegradation. For other areas of the pipeline, migration distances may be significantly less.

I1.3.3.8 PQRA for Surface Water VECs

Water Quality Concentration Targets

The target concentrations (and source of the target concentration) used in the PQRA for surface water VECs are given in Table I1.3-9.

Table I1.3-9 Receiving Water Standards – PQRA

Crude Oil Component	Surface Water Screening Values (mg/L)	Source	Dissolved phase groundwater concentrations directly beneath the spill location if NAPL in contact with groundwater	Do dissolved phase groundwater concentration exceed the Surface Water Screening Value?
Benzene	0.2	Ugandan Standards limit 1999 for industrial discharge	1.42	Yes
Toluene	10 – number for TPH divided by 8 fractions/ compounds, resulting in an individual screening value of 1.25 for each component	Project standards (International Finance Corporation guideline value for effluent)	1.80	Yes
Ethylbenzene			0.24	No
Xylene			1.53	Yes
Aliphatic C5-C6			1.00	No
Aliphatic C6-C8			0.36	No
Aromatic C8-C10			4.56	Yes
Aromatic C10-C12			0.41	No
Aromatic C12-C16			0.20	No

For the sites considering NAPL in contact with groundwater, only those substances that exceed the surface water screening values were taken forward to modelling. For sites where the leaching pathway is considered, all mobile oil components were modelled to determine dissolved phase groundwater concentrations for comparison to the surface water screening values.

KP15.4 – Wambabya Tributary

CSM

The Wambabya Tributary flows in a northerly direction towards a small lake located to the north of the village of Kidoma in the district of Hoima. The pipeline passes under the Wambabya Tributary in a northwest to southeast direction, through superficial deposits of sandy loam with alluvium on the northeastern and southwestern banks of the river. The Wambabya Tributary lies at an approximate elevation of 1043 m, gently rising in a northeasterly direction towards an elevation of 1059 m after 1 km, but rising more steeply over the same distance in a southwesterly direction (elevation of 1069 m after 1 km southwest of the river).

Given the low or gently sloping topography immediately northeast and southwest of the river, a shallow groundwater body is assumed to be present in this area, increasing to approximately 15 m bgl in the highland areas approximately 1.5–2 km away from the river. Due to the assumed shallow groundwater, it is considered for

modelling that NAPL could come into contact with groundwater. A small number of single dwellings are scattered within 20–200 m of the pipeline route, with a small community located between 80–150 m from the pipeline approximately 1.8 km northeast of the Wambabya Tributary.

A schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.11.

Results and Discussion

The model output sheets are presented in Attachment I1.11.

The RBCA model calculates the predicted extent of impact for the modelled oil components. It also calculates an estimated travel time for each of the oil components to reach the defined receptor points.

Model results are reported in Table I1.3-10.

Table I1.3-10 Summary of Predicted Concentrations: KP15.4 – Wambabya Tributary

Pathway Modelled – NAPL in Contact with Groundwater			
Oil Component	**Surface Water Screening Value (mg/L)**	**Maximum Extent of Impact* Beyond Surface Spill Area (m)**	**Time Taken to Reach Furthest Exceedance (years)**
Reasonable worst-case			
Benzene	0.2	40	16
Toluene	1.25	2.5	6
Xylene	1.25	2	10
Aromatic C8-C10	1.25	5	35
Remediation within 1 year			
Benzene	0.2	5	1

NOTES: *Maximum extent of impact is the maximum distance beyond the lateral extent of the spill, at which predicted groundwater concentrations exceed the surface water screening values. Where the distance is <20 m, exact distances have been reported. For distances >20 m but <100 m distances are rounded to the nearest 5 m. It should also be noted that these distances relate to the distance from the furthest extent of the spill, which is assumed to extend 127 m from the pipeline.

The results of the modelling indicate that the potential exists for surface water VECs to be impacted by the migration of dissolved-phase contaminants up to a maximum distance of 40 m from the furthest extent of the spill (167 m from the pipeline). The modelled time for migration in the dissolved phase to this distance is greater than ten years, allowing time for remedial action to be undertaken.

KP36.5 – Kafu River

CSM

The Kafu River forms the boundary between the regions of Hoima to the north and Kibale to the south. The river flows in an easterly direction. The proposed pipeline passes under the Kafu River in a northwest to southeast direction, through superficial deposits of sandy loam with alluvium on the northern and southern banks of the river. The Kafu River lies at an approximate elevation of 1070 m, rising in a northwesterly direction towards an elevation of 1118 m after 2 km, but gently rising over the same distance in a southerly direction (elevation of 1085 m after 2 km southeast of the river).

Given the low or gently sloping topography immediately north and south of the river, a shallow groundwater body is assumed to be present in this area, increasing to approximately 15 m bgl in the highland areas approximately 1.5–2 km north of the river. Due to the assumed shallow groundwater, it is considered for modelling that NAPL could come into contact with groundwater. A small number of single dwellings are scattered within 30–150 m of the proposed pipeline route along the 4-km length assessed.

A schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.12.

Results and Discussion

The model output sheets are presented in Attachment I1.12.

Model results are reported in Table I1.3-11.

Table I1.3-11 Summary of Predicted Concentrations: KP36.5 – Kafu River

Pathway Modelled – NAPL in Contact with Groundwater			
Oil Component	**Surface Water Screening Value (mg/L)**	**Maximum Extent of Impact* Beyond Surface Spill Area (m)**	**Time Taken to Reach Furthest Exceedance (years)**
Reasonable worst-case			
Benzene	0.2	90	4.5
Toluene	1.25	6	1
Xylene	1.25	5	1
Aromatic C8-C10	1.25	12	1
Remediation within 1 year			
Benzene	0.2	30	1

NOTES:. *Maximum extent of impact is the maximum distance beyond the lateral extent of the spill, at which predicted groundwater concentrations exceed the surface water screening values. Where the distance is <20 m, exact distances have been reported. For distances >20 m but <100 m distances are rounded to the nearest 5 m. It should also be noted that these distances relate to the distance from the furthest extent of the spill, which is assumed to extend 127 m from the pipeline.

The results of the modelling indicate that the potential exists for surface water VECs to be impacted by the migration of dissolved-phase contaminants up to a maximum distance of 90 m from the furthest extent of the spill (217 m from the pipeline). The modelled time for migration in the dissolved phase to this distance is greater than four years, allowing time for remedial action to be undertaken.

KP164.7 – Katonga River

CSM Summary

The Katonga River forms the boundary between the regions of Gomba to the north and Sembabule to the south. The river flows in a westerly direction from Lake Victoria in the east to Lake George in the west. The pipeline passes under the Katonga River in a north to south direction, through superficial deposits of gravelly loam with likely alluvium on the northern and southern banks of the river. The Katonga River lies at an approximate elevation of 1174 m, rising steeply to the north and south to elevations of 1231 m and 1236 m after 2 km respectively.

Groundwater information reported in the Sembabule District Groundwater Report produced by the DWRM (October 2008) states that the groundwater depth in the region is assumed to be between 6.4–76.3 m bgl with an average of 40.5 m bgl. Given the variations in the topography within 4 km north and south of the river, it has been assumed that groundwater lies at an elevation of 6.4 m bgl within the vicinity of the river channel and extends to 40.5 m bgl further from the channel, in the highlands. The NAPL modelling exercise suggests that the NAPL will not reach the water table under steady state conditions and therefore the soil leaching pathway has been considered.

A small number of single dwellings are scattered within 80–160 m of the pipeline route.

A schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.13.

Results and Discussion

The model output sheets, are presented in Attachment I1.13.

Model results are reported in Table I1.3-12.

Table I1.3-12 Summary of Predicted Concentrations: KP164.7 – Katonga River

Pathway Modelled – Leaching in Unsaturated Soils			
Oil Component	**Surface Water Screening Values (mg/L)**	**Maximum Extent of Impact* Beyond Surface Spill Area (m)**	**Time Taken to Reach Furthest Exceedance (years)**
Reasonable worst-case			
Benzene	0.2	4	3
Toluene	1.25	-	-
Ethylbenzene	1.25	-	-
Xylene	1.25	-	-
Aliphatic C5-C6	1.25	-	-
Aliphatic C6-C8	1.25	-	-
Aromatic C8-C10	1.25	-	-
Aromatic C10-C12	1.25	-	-
Aromatic C12-C16	1.25	-	-
Remediation within 1 year			
Benzene	0.2	0.5	1

NOTES: *Maximum extent of impact is the maximum distance beyond the lateral extent of the spill, at which predicted groundwater concentrations exceed the surface water screening values. Where the distance is <20 m, exact distances have been reported. It should also be noted that these distances relate to the distance from the furthest extent of the spill, which is assumed to extend 127 m from the pipeline.

The results show that the predicted concentrations resulting from a soil-based source exceed the surface water screening value only for benzene up to 4 m from the furthest extent of the spill, i.e., 130 m from the pipeline when including the oil pool diameter. Benzene, being the most mobile oil constituent, will take approximately three years to reach the maximum extent of spill impact, allowing for remedial action to be undertaken.

KP274 – Kibale River

CSM

The Kibale River flows in an easterly direction into a small lake to the west of Lake Victoria. The pipeline passes under the Kibale River in a northeast to southwest direction, through superficial deposits of sandy loam with likely alluvium on the northern and southern banks of the river.

The Kibale Tributary lies at an approximate elevation of 1161 m, lying within an ostensibly flat environment. The topography to the north and south of the river gently rises to a maximum elevation of 1174 m (increase of 13 m) to the north over a distance of 2 km. Given the low or gently sloping topography immediately northeast and southwest of the river, a shallow groundwater body is assumed to be present in this area and therefore it is considered for modelling that NAPL could

come into contact with groundwater. Satellite imagery shows no dwellings or communities within the 4 km of pipeline viewed at KP274.

A schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.14.

Results and Discussion

The model output sheets are presented in Attachment I1.14.

Model results are reported in Table I1.3-13.

Table I1.3-13 Summary of Predicted Concentrations: KP274 – Kibale River

Pathway Modelled – NAPL in Contact with Groundwater			
Oil Component	**Surface Water Screening Values (mg/L)**	**Maximum Extent of Impact* Beyond Surface Spill Area (m)**	**Time Taken to Reach Furthest Exceedance (years)**
Reasonable worst-case			
Benzene	0.2	35	8
Toluene	1.25	2	2
Xylene	1.25	1.5	3.5
Aromatic C8-C10	1.25	4	8
Remediation within 1 year			
Benzene	0.2	8.5	1

NOTES: *Maximum extent of impact is the maximum distance beyond the lateral extent of the spill, at which predicted groundwater concentrations exceed the surface water screening values. Where the distance is <20 m, exact distances have been reported. For distances >20 m but <100 m distances are rounded to the nearest 5 m. It should also be noted that these distances relate to the distance from the furthest extent of the spill, which is assumed to extend 127 m from the pipeline.

The results of the modelling indicate that the potential exists for surface water VECs to be impacted by the migration of dissolved-phase contaminants up to a maximum distance of 35 m from the furthest extent of the spill (162 m from the pipeline), The modelled time for migration in the dissolved phase to this distance is eight years, allowing time for remedial action to be undertaken.

KP289.3 – Jemakunya River

CSM

The Jemakunya River lies in the south of the Rakai district and flows in an easterly direction in to a small lake to the west of Lake Victoria, presumed to ultimately flow in to Lake Victoria. The pipeline passes under the Jemakunya River in a north to south direction, through superficial deposits of grey coarse sand with likely alluvium on the northern and southern banks of the river channel.

The Jemakunya River lies at an approximate elevation of 1165 m, gently rising in a northerly direction towards an elevation of 1175 m after 1 km, then continuing to rise more steeply over the same distance further north (reaching 1201 m elevation 2 km north of the river). Given the low or gently sloping topography immediately north of the river, a shallow groundwater body is assumed to be present in this area, increasing to approximately 15 m bgl in the highland areas approximately 1–2 km north of the river. Due to the assumed shallow groundwater, it is considered for modelling that NAPL could come into contact with groundwater. A small number of single dwellings are scattered within 40–120 m of the pipeline route, with a major road network located approximately 1 km north.

A schematic CSM and the model input parameters used to represent the CSM in the PQRA are presented in Attachment I1.15.

Results and Discussion

The model output sheets are presented in Attachment I1.15.

Model results are reported in Table I1.3-14.

Table I1.3-14 Summary of Predicted Concentrations: KP289.3 Jemakunya River

Pathway modelled – NAPL in Contact with Groundwater			
Oil Component	**Surface Water Screening Values (mg/L)**	**Maximum Extent of Impact* Beyond Surface Spill Area (m)**	**Time Taken to Reach Furthest Exceedance (years)**
Reasonable worst-case			
Benzene	0.2	85	3.5
Toluene	1.25	6	1
Xylene	1.25	5	1
Aromatic C8-C10	1.25	13	1.5
Remediation within 1 year			
Benzene	0.2	30	1

NOTES: *Maximum extent of impact is the maximum distance beyond the lateral extent of the spill, at which predicted groundwater concentrations exceed the surface water screening values. Where the distance is <20 m, exact distances have been reported. For distances >20 m but <100 m distances are rounded to the nearest 5 m. It should also be noted that these distances relate to the distance from the furthest extent of the spill, which is assumed to extend 127 m from the pipeline.

The results of the modelling indicate that the potential exists for surface water VECs to be impacted by the migration of dissolved-phase contaminants up to a maximum distance of 85 m from the furthest extent of the spill (212 m from the pipeline), The modelled time for migration in the dissolved phase to this distance is greater than three years, allowing time for remedial action to be undertaken.

Discussion of Sensitivity Analysis Results

Sensitivity analysis has been undertaken on KP289.3 which has been shown to be the most sensitive when varying key parameters.

The sensitivity analysis was completed for the oil constituent benzene on the basis that benzene is the most mobile constituent of the oil.

Sensitivity analysis has been undertaken on key parameters including oil spill volume, hydraulic conductivity and hydraulic gradient and degradation rate.

The results of the sensitivity analysis for KP289.3 – Jemakunya River are summarised in Table I1.3-15.

Table I1.3-15 Sensitivity Analysis - Benzene: KP289.3 – Jemakunya River

Surface Water Screening Values (mg/L)		**Benzene**
		0.2
Parameter (Original Setting)	**Input Value**	**Maximum Extent of Impact Beyond Surface Spill Area (m)**
Original result		85
Source Dimension (127 m)	53 m (change 1)	85
Hydraulic gradient (0.005) & hydraulic conductivity (6.35)	Gradient:0.006 Conductivity: 0.635 (change 1)	18
	Gradient: 0.004Conductivity: 63.5 (change 2)	270
Degradation rate (432 days, adjusted) (equivalent to 416 days unadjusted)	207 days (change 1) (equivalent to 200 days unadjusted)	50

NOTES: Concentrations are reported as steady state. All units reported as mg/L. Values presented for the extent of impact beyond surface area spill area are the last increment at which impacts are predicted to exceed the target concentration.

Since the model predicts concentrations along the centre-line of the plume from a large source and the input concentrations are not dependent on source dimensions, the model shows low sensitivity to source size. Reducing the source size from 127 m (volume of 1430 m^3) to 53 m (volume of 600 m^3) does not noticeably alter the extent of impact beyond the surface spill area.

Increasing the hydraulic conductivity by an order of magnitude from 6.35 m/d to 63.5 m/d and reducing the hydraulic gradient by 20%, reduces the concentration of benzene at the source (due to increased dilution in the aquifer) but lengthens the extent of impact distance by a factor of 3.

Conversely, when the hydraulic conductivity is reduced by an order of magnitude to 0.635 m/d and the hydraulic gradient in increased by 20%, the initial concentrations encountered at the source are higher, but concentrations reduce over a much

shorter distance, reducing the extent of impact by a factor of >4 to 18m beyond the spill area.

The models have conservatively assumed anaerobic aquifer conditions, however if aerobic aquifer conditions were present, this is shown to reduce the extent of impact to 50 m.

Conclusions

Due to the low proportion of high-mobility small-chain fractions within the source oil, the concentrations of these risk driving substances predicted to enter the groundwater by the model is generally low. For the range of conditions modelled across the five sites, the results indicate exceedances of surface water standards at distances between 35 and up to 90 m beyond the extent of the surface oil spill for areas of shallow groundwater and granular soils. For location KP 164.7 where the groundwater is expected to be within the crystalline bedrock at a depth of 6 m bgl, a significantly shorted distance of exceedance was reported of just 4 m beyond the extent of the spill.

Sensitivity analysis showed that the model had very low sensitivity to source size. This is due to the large source area considered in the modelling. The model predicts down gradient concentrations on the centre line of the plume. As the source width increases, the sensitivity of this parameter on the modelled results decreases.

The model was most sensitive to changes in hydraulic conductivity and gradient, as would be expected. A change from anaerobic to aerobic degradation rates reduced the predicted extent of impact by more than 40% to 50 m.

Thus, it is concluded that a failure of the EACOP Uganda pipeline may impact surface water quality in surface water bodies (VECs) in a zone with a radius of 90 m beyond the extent of the oil spill area. It should be noted that the maximum modelled distances for contaminant migration would relate only to the areas of the pipeline route that have the most sensitive ground conditions for contaminant leaching and migration, such as shallow groundwater, permeable soil and down-gradient VECs. For other areas of the pipeline, migration distances may be significantly less.

I1.3.4 Oil Release to Surface Water

I1.3.4.1 Introduction

PQRA has been undertaken for the chosen surface water crossing locations to quantify the potential risks posed by the dispersion of oil in the surface water body using the MIKE 21 mathematical model. The method, input parameters and results of the oil dispersion modelling at the five selected locations along the EACOP Uganda pipeline are presented in a standalone report, included as Attachment I1.16 of this report. A brief description of the modelled scenario and results are presented below.

I1.3.4.2 Modelled Scenario

Consistent with the assessments detailed above, the model considers an unexpected failure of the pipeline at the surface water crossing with a release volume of 1430 m^3 over a period of 3600 s (1 hour). The oil blend E4 was selected for model input parameters as this blend has the lowest reported viscosity and therefore is likely to exhibit the largest spreading when coming into contact with the surface water. In each case, the dispersal of oil following a spill has been modelled. The model is allowed to run until a point in time at which dispersal produced by the model reaches an equilibrium state at which point no further substantial oil migration is observed. In this scenario that state was achieved after 5 days. The length of affected river is then estimated using the model output.

I1.3.4.3 Results and Discussion

A summary of the modelled impact lengths five days after the spill event for the five modelled VECs is presented in Table I1.3-16.

Table I1.3-16 Oil Release to Surface Water Modelling

VEC	Length of River with Substantial Impact – Modelled (km)
Wambabya (KP15.4)	0.6
Kafu (KP36.5)	2
Katonga (KP164.7)	3
Kibale (KP274.1)	3
Jemakunya (KP289.3)	0.1*

NOTE: *Oil not mobilised due to very limited wet area. Affected length based on oil pool diameter

The distances reported represent the potential length of substantial impact, defined as the length of river where the majority of the oil will stay, e.g., 90–95%. To represent input uncertainties, an estimated ‘low risk zone’ for impact on human health and environment should be considered in addition to the modelled affected length. The designation of a low risk zone is aligned with the concept of a “safety factor”. Safety factors are often applied in situations where there is uncertainty in an assessment of risk and the potential scale of an impact to human health and the environment.

The effect of applying a safety factor creates a zone, in which impact to the river environment presents a risk to human health or the environment cannot be entirely discounted. This would include, for example dissolved phase hydrocarbons originating from the oil, minor isolated patches of oil or tar balls transported further downstream than the modelled length.

The magnitude of the low risk zone is derived by multiplying the modelled affected length by a factor of 5. For example, a modelled affected length of 1 km should be considered to be associated with an additional 4km low risk zone. This factor has been determined based on professional judgement and in consideration of the cumulative uncertainties of key input parameters which are described below.

Clearly, improvements in model input data quality would be expected to result in a smaller safety factor.

It is noted that with the 40°C pour point temperature of the E4 oil, the oil will stiffen in the water, limiting the spread of the oil. It is expected that the solidifying oil will either stick to the river banks, or will drift along the river, causing less harm to the environment when compared with liquid oil. In a solid state the oil will quickly introduce the barrage effect, creating a barrier that will further reduce drift and spreading, particularly in narrow areas of rivers.

Details of the model parameters and further discussion around the results are presented in the modelling report presented in Attachment I1-16.

I1.3.5 PQRA Conclusions

A summary of the results for the PQRA for potential oil release to land or surface water is presented in Table I1.3-17. For dissolved phase in groundwater modelling, results relate to predicted benzene migration as the most mobile oil fraction. As well as the reasonable worst-case impact predicted by the model using conservative assumptions, a most likely impact distance is reported, allowing for the more likely scenario of aerobic degradation conditions. A third and significantly reduced predicted impact distance is also given assuming that remediation of the spill site is undertaken within one year.

Table I1.3-17 Summary of Results

Model Scenario	Number of Locations Assessed	Assumed Soil Type	Extent of Potential Impact (m)			Comments
			Remediation within 1 year	Most Likely	Reasonable Worst Case	
Oil release to land – NAPL vertical migration modelling	2 (KP1.5 and KP256)	Sandy clay	-	-	1.38	Modelling indicates up to 380 m^3 of NAPL could reach GW shallower than 1.38 m bgl along RoW.
		Silty Sand	-	-	1.38	
Oil release to land along RoW – dissolved phase migration to groundwater VECs	2 (KP1.5 and KP256)	Sandy clay	35*	210**	300	Ranges in values between the clay and sand materials due to slight variations in hydraulic gradient (0.0175 in sandy clay and 0.031 in silty sand). Reasonable worst case assumes lower rate of biodegradation (anaerobic), whereas most likely assumes a higher biodegradation rate (aerobic) due to likely aerobic GW conditions. Under reasonable worst-case scenario groundwater VECs will be impacted at these locations before theoretical maximum distance is reached.
		Silty Sand	45*	240**	340	
Oil release to land along ROW– dissolved phase migration in groundwater to surface water VECs	5 (KP15.4, KP36.5, KP164.7, KP274 and KP289.3)	Clean Sand	30*	60**	85	The values reported for clean sand and silty sand to not differ significantly from each other. However, the values do change significantly for a weathered, crystalline bedrock, inferred to be the aquifer at KP164. However, the groundwater is assumed to be much deeper at this location (6.4 m bgl) due to the steeply sided slopes at either side of the Katonga River. Reasonable worst case assumes lower rate of biodegradation (anaerobic), whereas most likely assumes a higher biodegradation rate (aerobic) due to likely aerobic GW conditions and shallower gradient.
		Silty Sand	5 - 30*	25-65**	35 - 90	
		Sand (crystalline bedrock) – groundwater at 6m bgl	0.5	3	4	

Model Scenario	Number of Locations Assessed	Assumed Soil Type	Extent of Potential Impact (m)			Comments
			Remediation within 1 year	Most Likely	Reasonable Worst Case	
Oil release to surface water – direct entry at surface water crossings****	5 (KP15.4, KP36.5, KP164.7, KP274.1 and KP289.3)	N/A	N/A	3,000	15,000	Most likely distance shows highest modelled distance which applied to two watercourses (3 km). Reasonable worst case shows the effect of inclusion of the low risk zone (15 km)

NOTES: *Values taken as the predicted extent of impact after 1 year with a 30% reduction factor to allow for aerobic conditions as indicated by sensitivity analysis

**Most likely values calculated as a 30% reduction from reasonable worst-case extents, as demonstrated by sensitivity analysis for aerobic degradation rates

*** Reasonable Worst Case represents low risk zone and Most Likely shows modelled distance applied to oil release to surface water

I1.4 References

BGS, 2017. Available at: http://earthwise.bgs.ac.uk/index.php/Hydrogeology_of_Uganda. Accessed April 2017.

CL:AIRE. 2017. CL:AIRE, Petroleum hydrocarbons in groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies.

ESI. 2014. NAPL scoping calculations and spreadsheet tool.

ATTACHMENT I1.1 GIS ENVIRONMENTAL SENSITIVITY SCREENING ASSESSMENT

Table AttI1.1-1 Groundwater VECs (Weighting 0.4)

EACOP ERA sensitivity model

Groundwater VECs (weighting 0.4)			
Feature	**Feature weighting**	**Scoring**	**Data Sources/comments**
Aquifer Productivity	**3**	High / very high 5 Moderate 4 Low-moderate 3 Low 2 Very low 1	Scoring was applied, based on the Uganda region of the BGS hydrogeology map of Africa (BGS 2017). http://earthwise.bgs.ac.uk/index.php/Hydrogeology_of_Uganda; accessed 24.4.17.
Soil permeability Two sub-feature scores added together	**2**	**Productivity scores** Nil / Nil-low 1 Low 2 Mention of medium and below 3 Mention of high and below 4 **Drainage Scores - added to the productivity score** Well drained (W) 1 Poorly drained (P) 0	Scores based on the classifications in of EACOP ESIA Scoping Report, 2017, Table 6-3-3 Soils were been classified according to the Food and Agriculture Organization (FAO)–United Nations Educational, Scientific and Cultural Organization (UNESCO) system and based on data from the National Agricultural Research Laboratories (NARL) and Global Yield Gap Atlas (K. Kaizzi 2017) and Ministry of Lands, Housing and Urban Development (2006).
Recharge potential Three sub-feature scores added together	**5**	**Mean annual rainfall** 0-500mm 1 500-1000mm 2 1000-1500mm 3 1500-2000mm 4 >2000mm 5 **Topographic slope (degrees)** 0-2 5 2-5 4 5-10 3 10-15 2 >15 1 **Soil permeability - as above**	Rainfall data supplied by EACOP, was sourced from the Tropical Rainfall Measuring Mission (TRMM), representing the mean annual precipitation over the period 1998-2014. Slope data were derived from the 2014 Shuttle Radar Topography Mission (SRTM) Digital Elevation Model As above
Settlement proximity / density ranking Two sub-feature scores added together	**5**	**Distance to settlements (using 50m squares)** 0-100m 5 100-500m 4 500-1000m 3 1000-2000m 2 >2000m 1 **Settlement density (buildings per 50m square)** 0-0.5 1 0.5-1 2 1-2 3 2-5 4 5-20 5	Measured in GIS using aerial imagery All man-made settlements and structures were digitised in a desktop GIS from high resolution aerial imagery captured for the project in 2017.

Table AttI1.1-2 Surface Water VECs (Weighting 0.4)

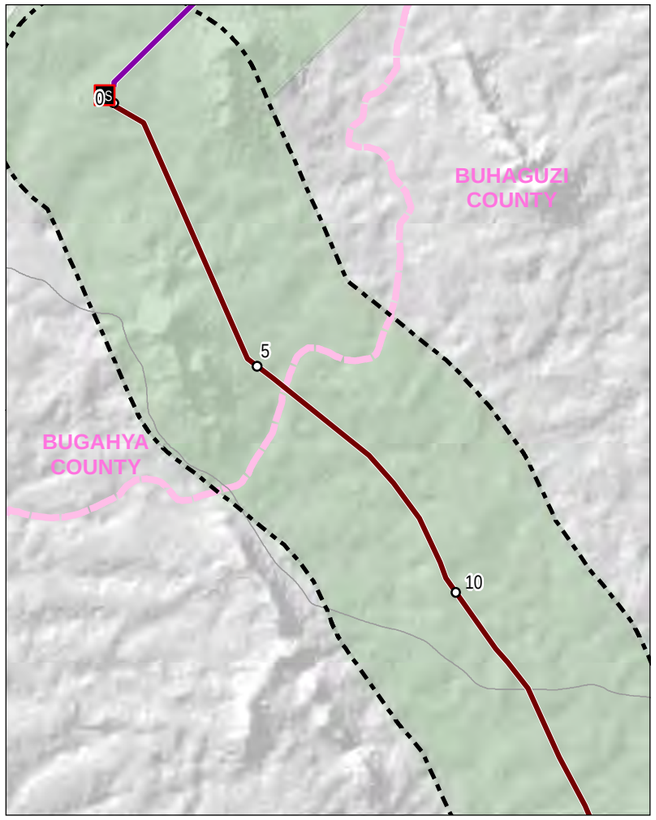
Surface water VECs (weighting 0.4)				
Feature	**Feature weighting**	**Scoring**		**Data Sources/comments**
Distance to surface water	**4**	0-150m 150-500m >500m	5 3 1	Measured in GIS using aerial imagery
Surface water crossings	**5**	Yes No	5 0	Rivers were primarily identified on the basis of the baseline surveys conducted as part of the ESIA. Ephemeral watercourses were modelled using a 30m Digital Elevation Model (DEM) using the ESRI ArcGIS Hydrology toolbox. Watercourses were derived through determining the flow direction and accumulation from the DEM and setting a minimum sub-catchment size to only select watercourses that were visible on the high resolution aerial imagery. These watercourse features were buffered to create 50m wide polygons which could be converted to a 50m raster layer for input into the model. Where additional field data was available wetlands were digitised to reflect the extent of papyrus dominated swamps.
Surface water type	**4**	Permanently wet river/wetland Seasonally wet river/wetland Irrigation channel	5 3 1	
Distance to downstream settlements	**3**	0-100m 100-500m 500-1000m 1000-2000m >2000m	5 4 3 2 1	Measured in GIS using aerial imagery
Settlement density	**3**	**Settlement density (buildings per 50m square)** 0-0.5 0.5-1 1-2 2-5 5-20	 1 2 3 4 5	All man-made settlements and structures were digitised in a desktop GIS from high resolution aerial imagery captured for the project in 2017.

Table AttI1.1-3 Ecology VECs (Weighting 0.2)

Ecology VECs (weighting 0.2)				
Feature	**Feature weighting**	**Scoring**		**Data Sources/comments**
Habitats of Conservation Importance (aquatic) Two sub-feature scores multiplied together	**3**	**Habitat**		Aquatic habitat survey undertaken for Uganda EACOP Baseline report - Uganda Export Pipeline, Environmental and Social Impact Assessment – Appendix A2: Aquatic Biodiversity Baseline Report, 2018
		Wetlands and water courses (not linking the Albertine Rift Lakes)	3	
		Habitats providing connectivity (such as but not limited to) riparian corridors and wetlands providing ecological linkages between the Albertine Rift Lakes	4	
		Wetlands identified by Wetlands International's Critical Site Network Tool.	5	
		Distance to ecology receptor		Distances calculated in GIS
		0-50m	5	
		50-100m	3	
		>100m	1	
Legally protected, Internationally or Nationally Recognised Areas - Two sub-feature scores multiplied together	**5**	Legally protected sites under international treaty - **RAMSAR, World Heritage Convention**	5	
		Nationally designated sites specifically designed for biodiversity purposes - **National Parks, Wildlife Reserves, Wildlife Management Areas, certain Open Areas, Game Controlled Areas and Forest Reserves**	4	
		Nationally designated sites that are not specifically designed for biodiversity purposes but have biodiversity value - **e.g. Ecological stepping stone sites** Internationally recognised areas - **Key Biodiversity Area, important Bird Areas, Endemic Bird Areas**. Global Ecoregions - **assessed by WWF as being critical/endangered conservation status**	3	
		Broad landscape scale internationally recognised areas - **High biodiversity Wilderness Areas, Biodiversity Hotspots.** Global Ecoregions - **assessed by WWF as being valuable conservation status**	2	
		Nationally designated areas not specifically designed for biodiversity purposes - **Forest Reserves designated for non-native timber plantations**	1	
		Distance to ecology receptor		Distances calculated in GIS
		0-50m	5	
		50-100m	3	
		>100m	1	

ATTACHMENT I1.2 SENSITIVITY SCREENING – GROUNDWATER VECS

Aquifer Productivity



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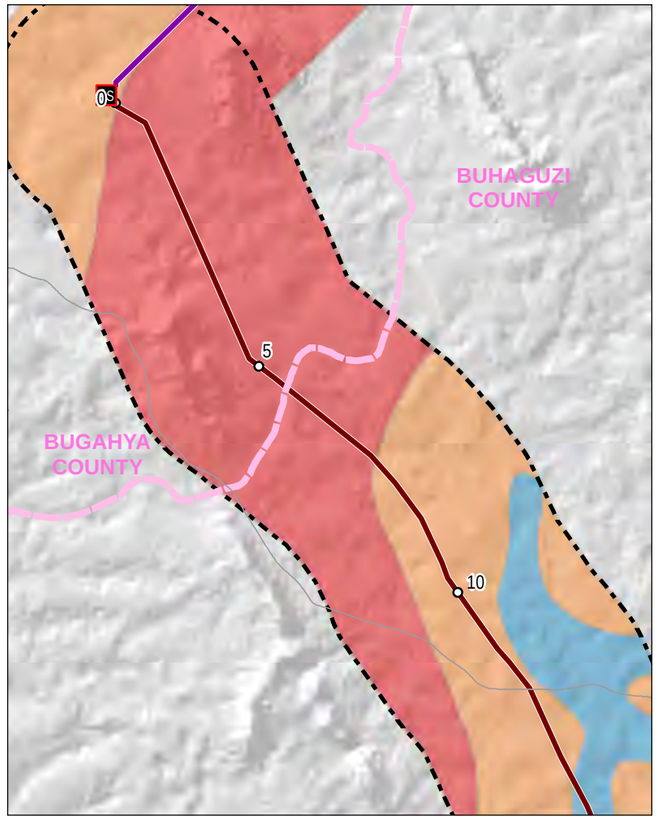

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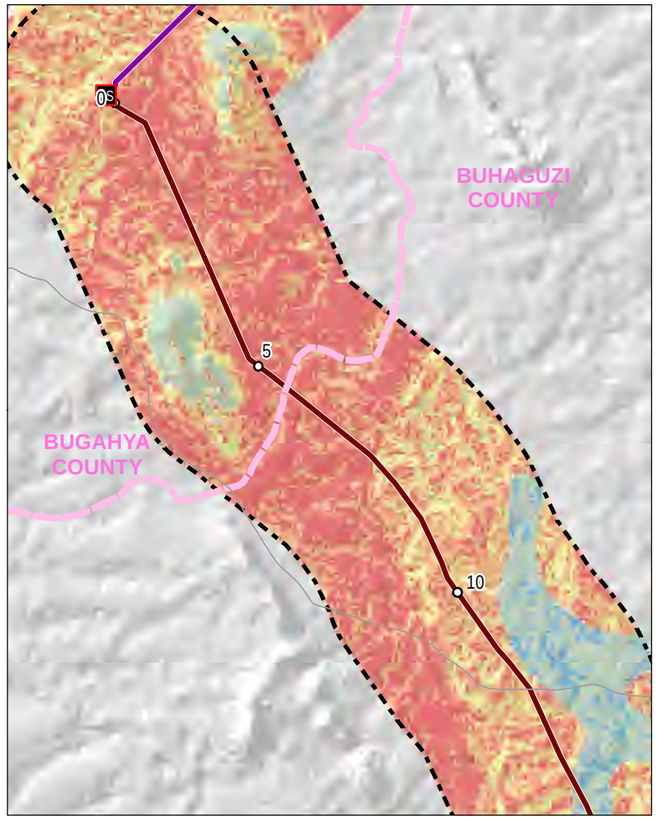


Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- PS — Pumping Station
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

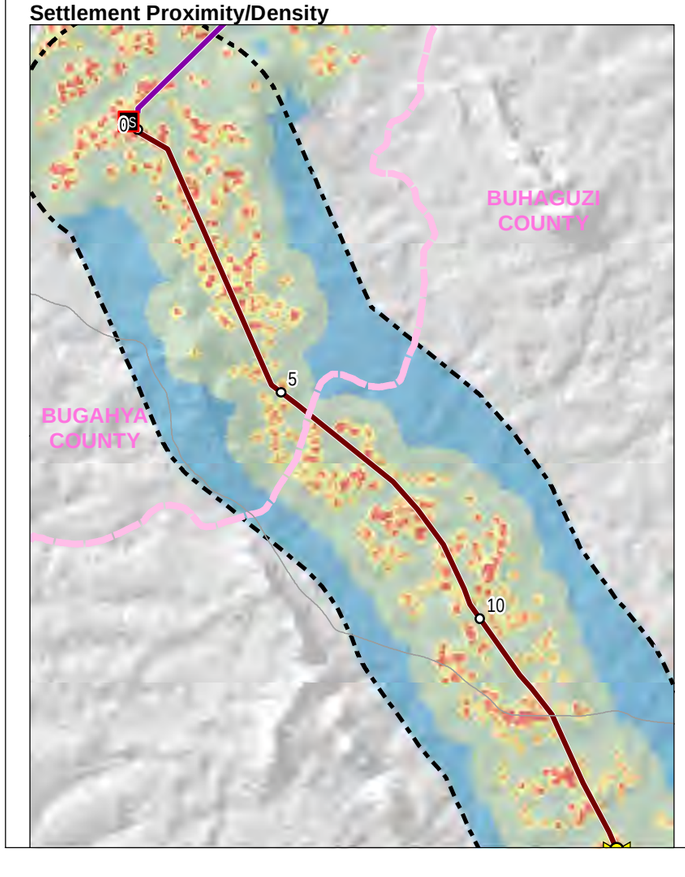
Administrative Area:

- County Boundary

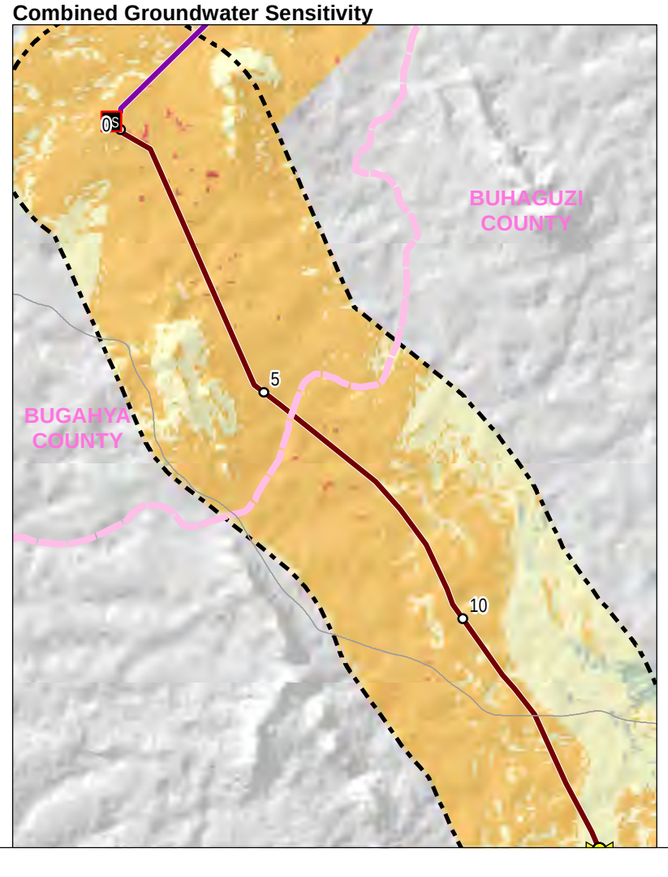
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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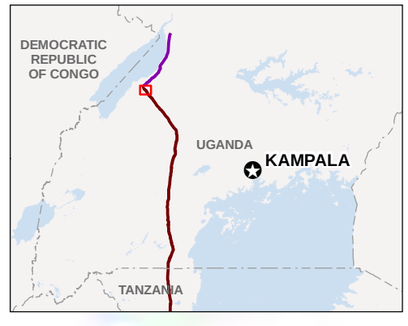

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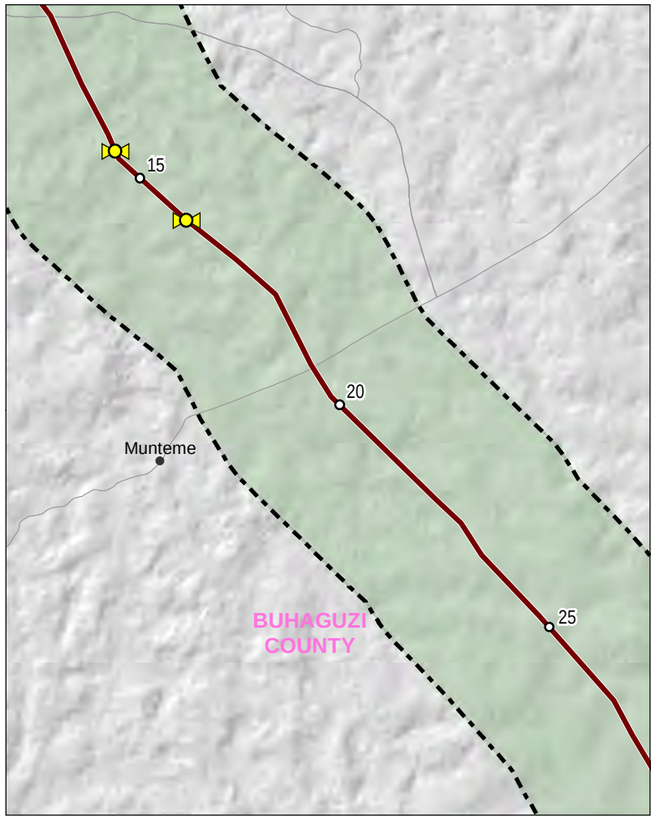
Aquifer Productivity



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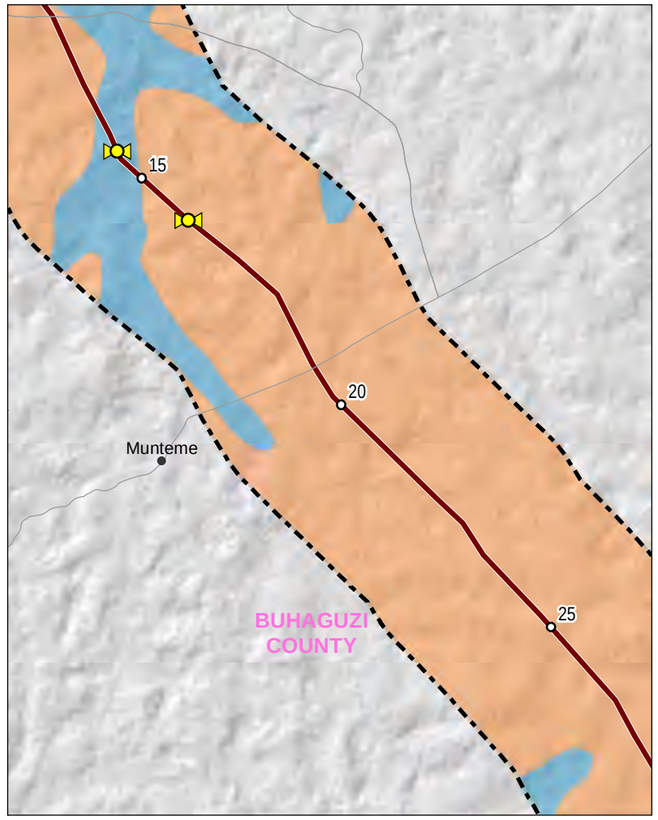
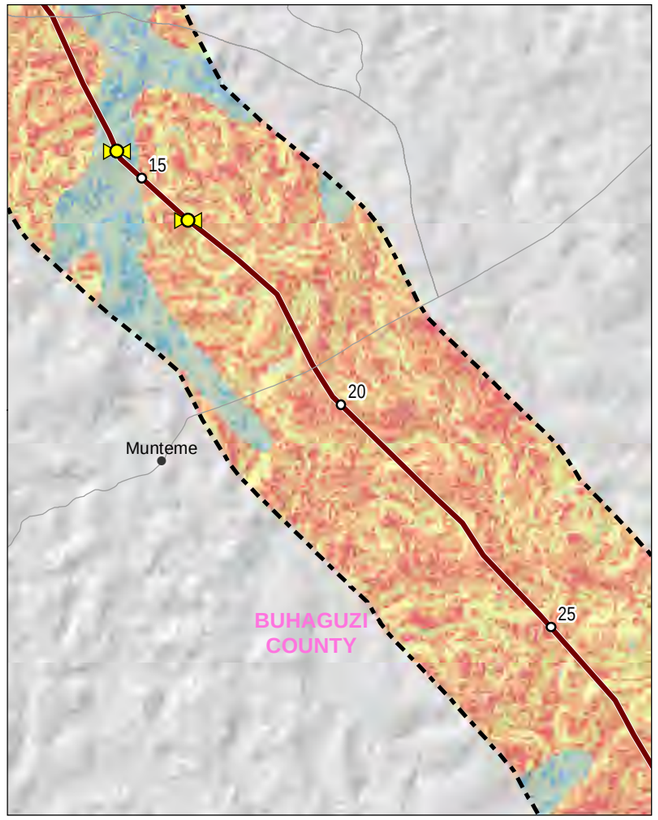


Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

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Hydrology:

- Lake

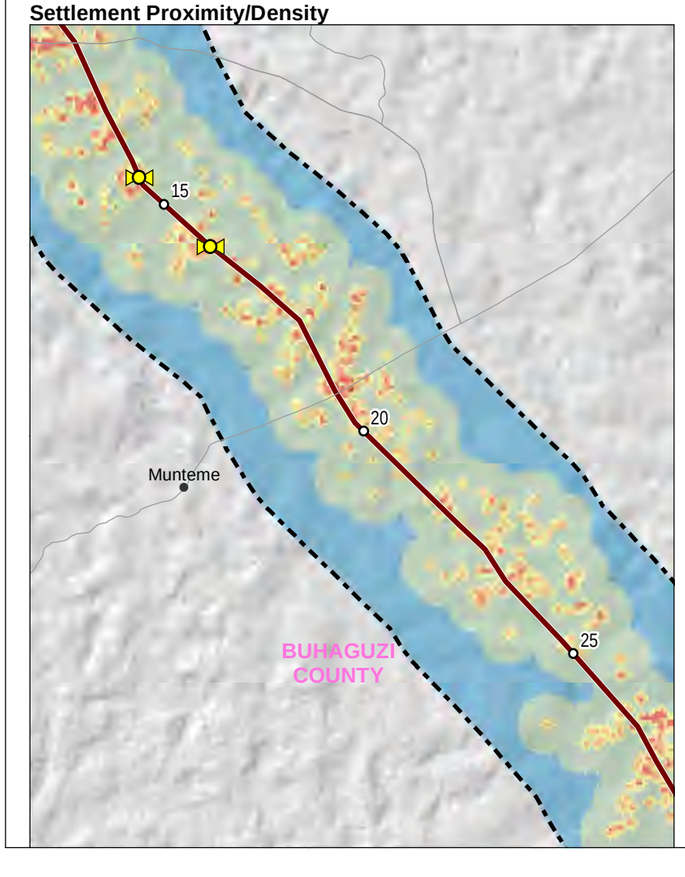
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



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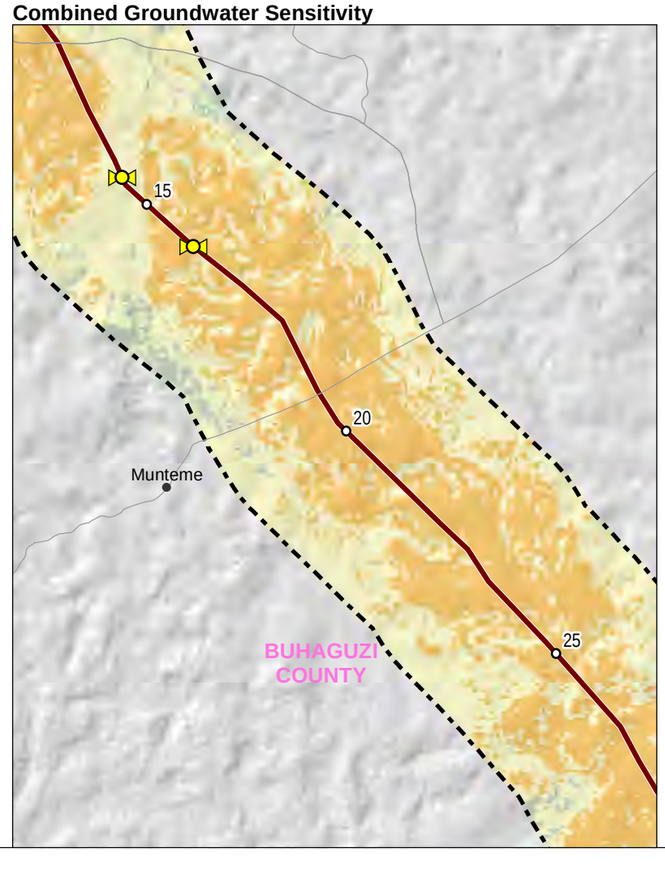

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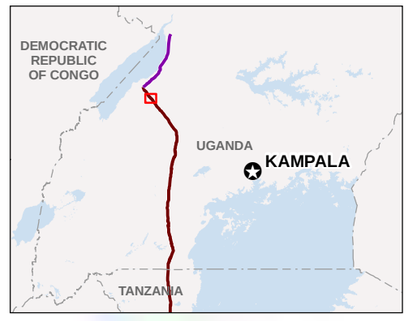

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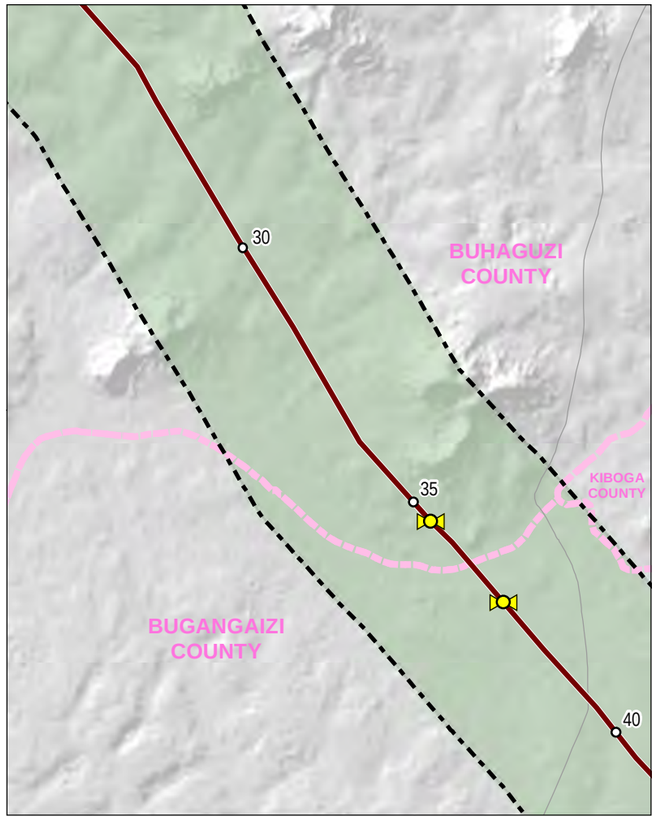
Aquifer Productivity



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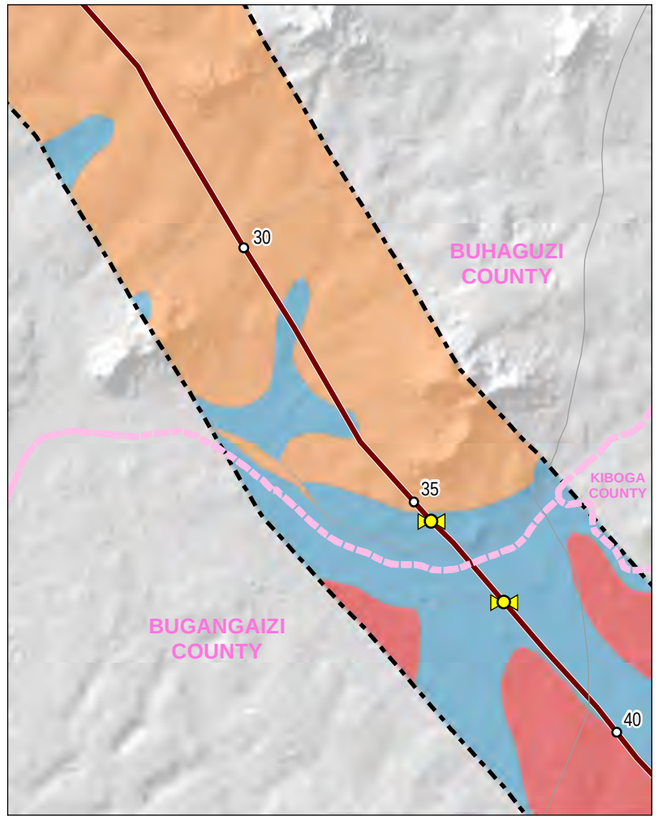
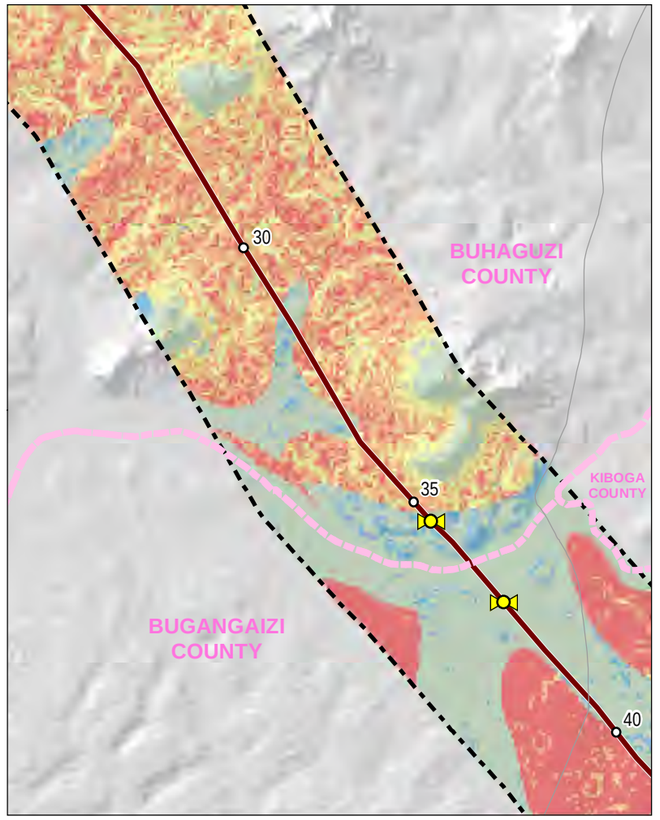


Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
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- Area of Investigation

Settlements:

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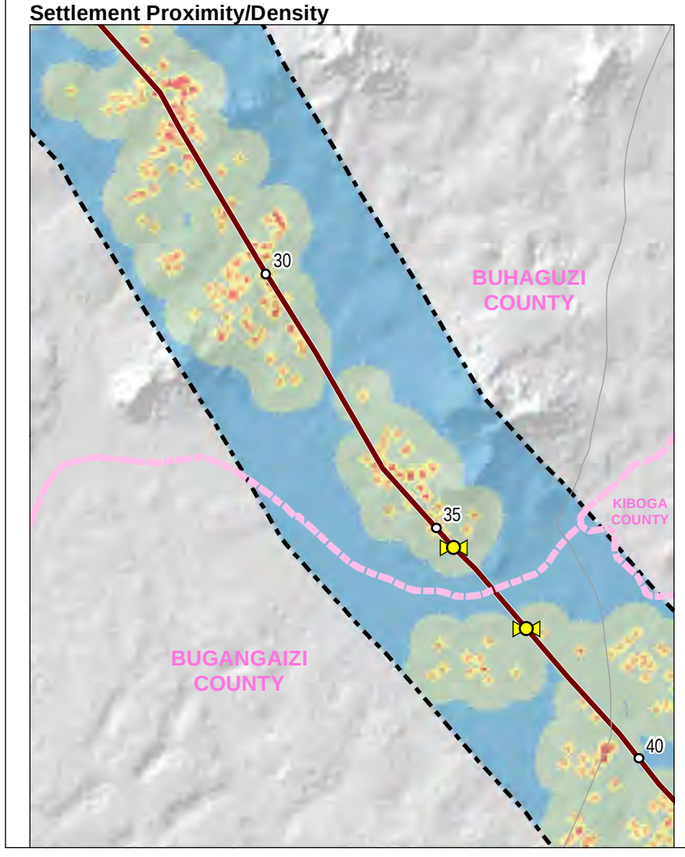
Administrative Area:

- County Boundary

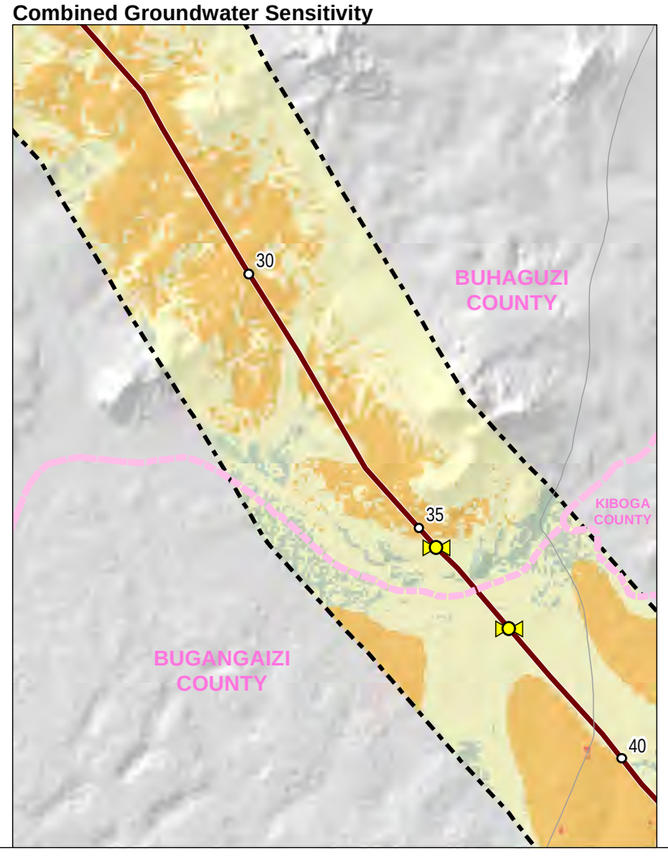
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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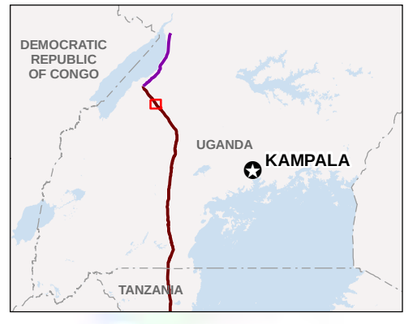

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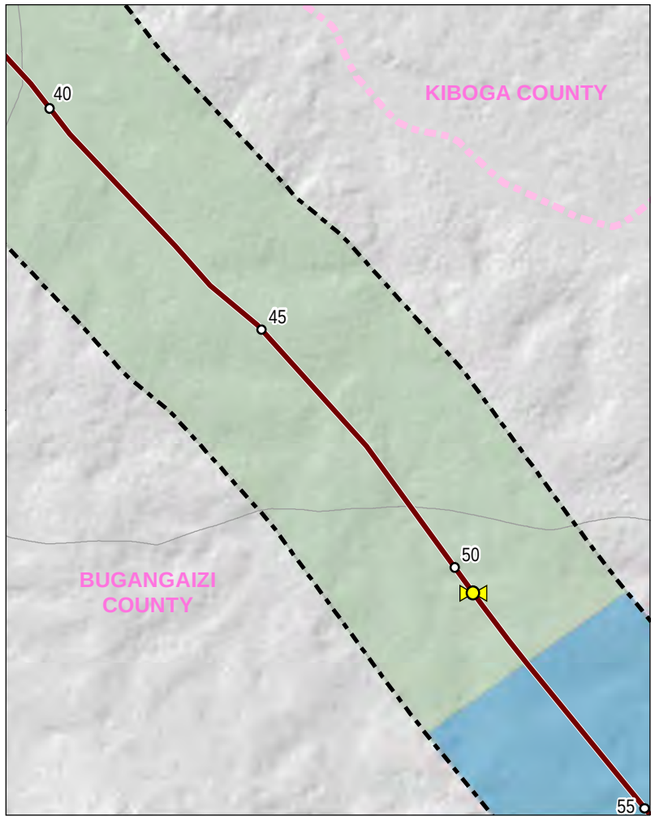
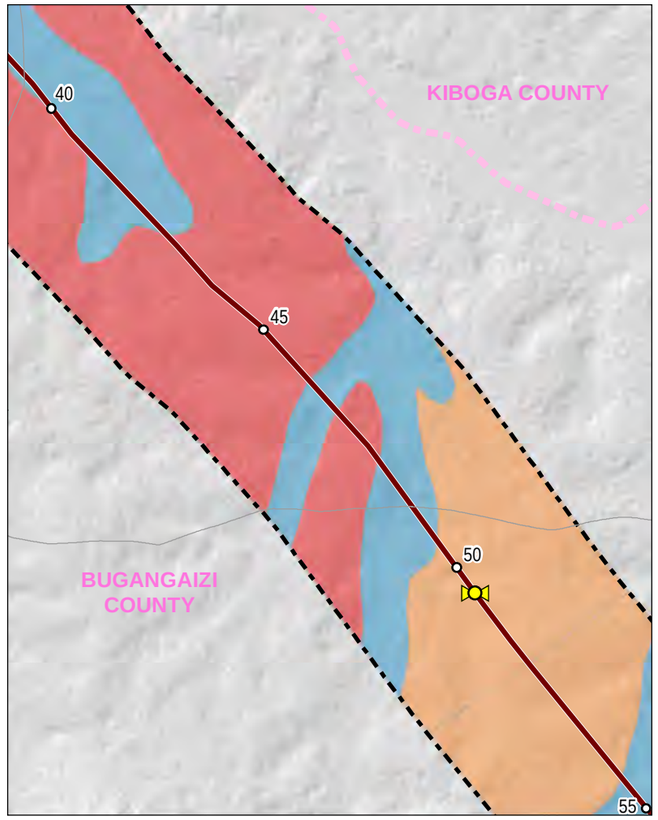
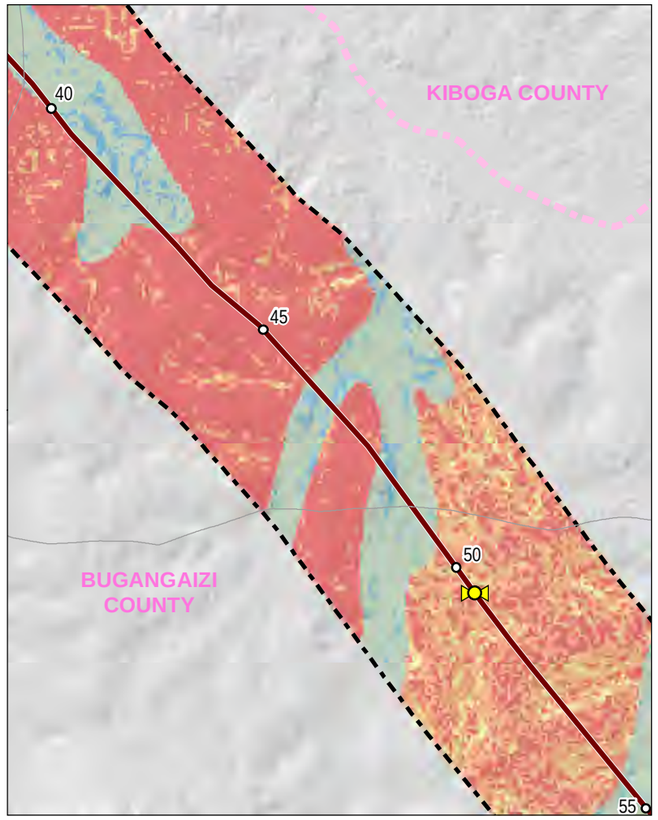
Aquifer Productivity



Soil Permeability



Recharge Potential



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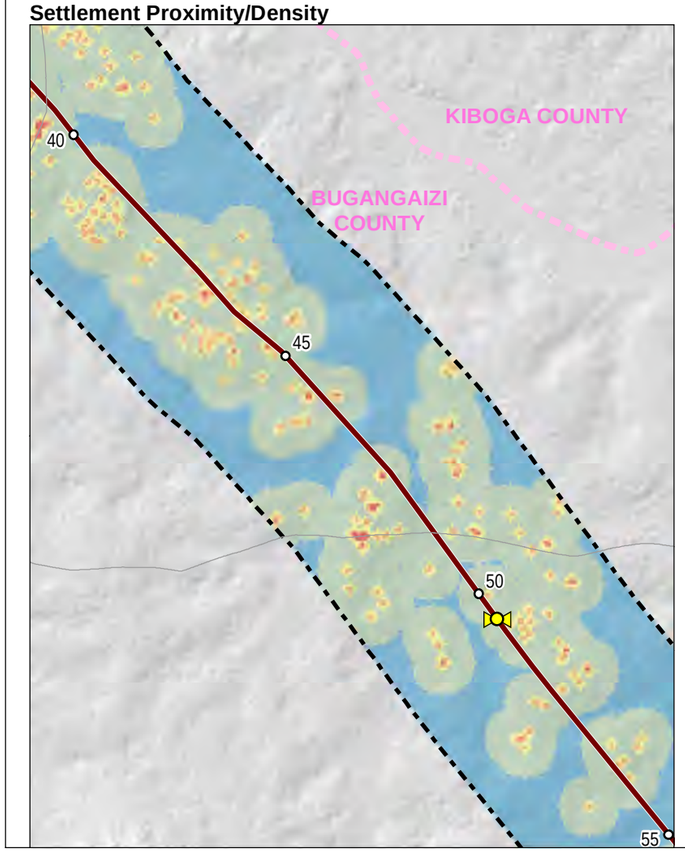
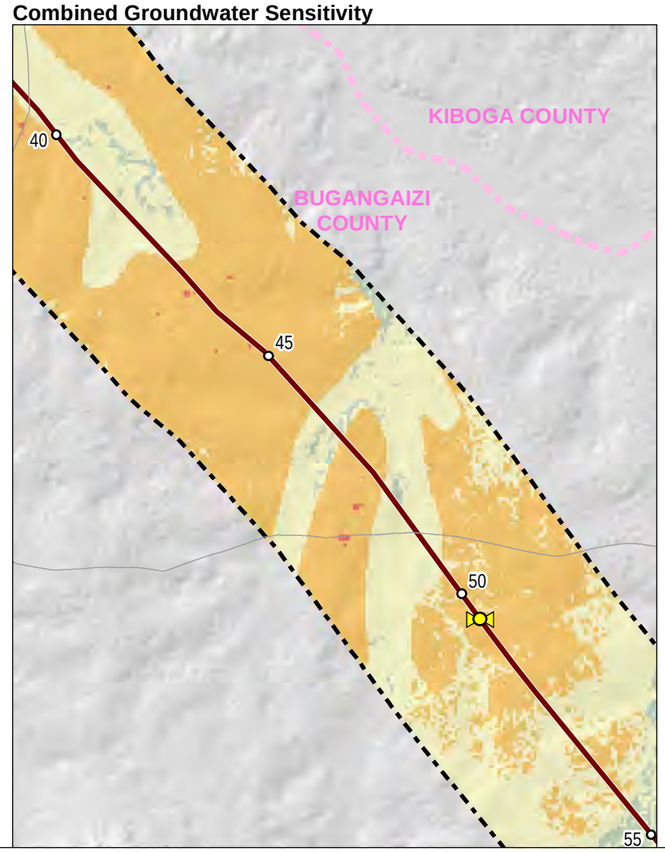


Combined Groundwater Sensitivity



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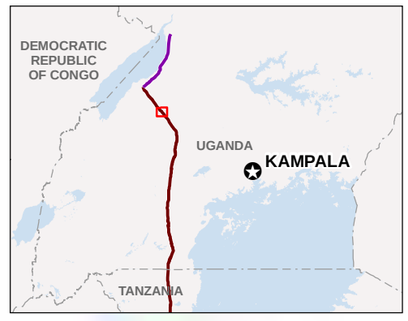

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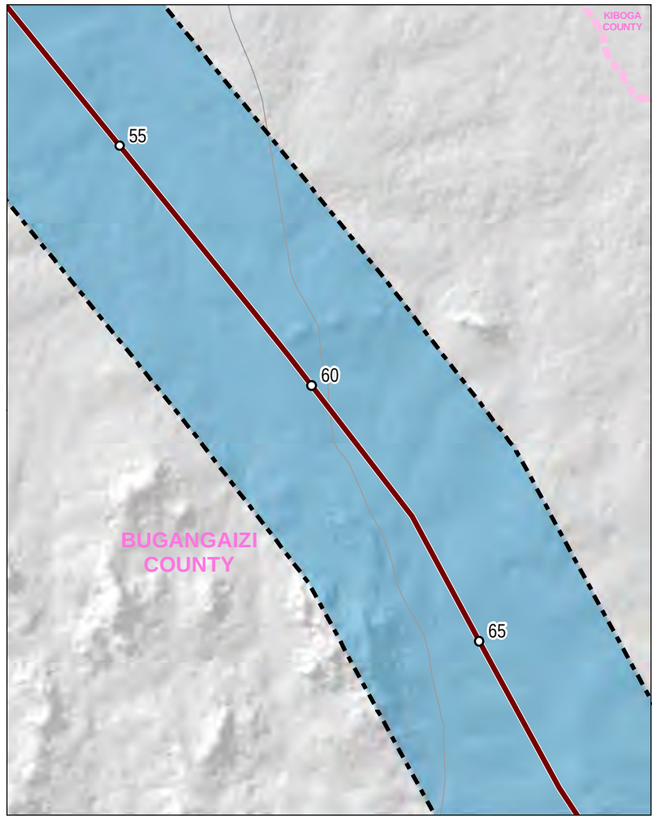
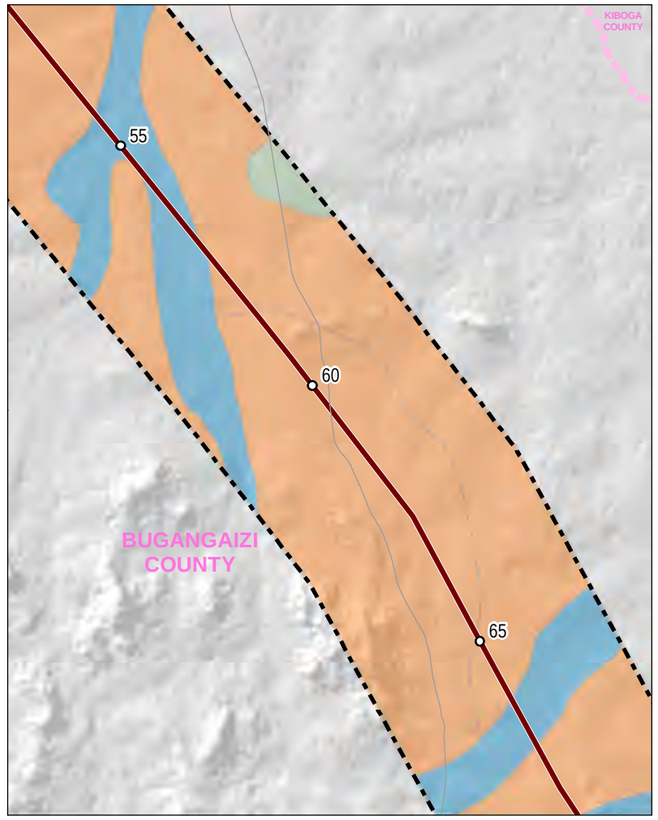
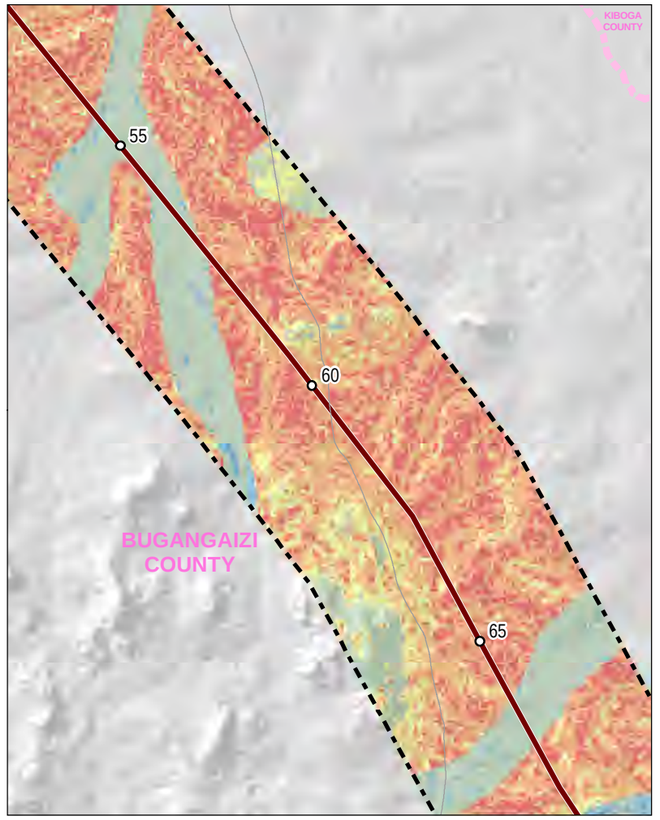
Aquifer Productivity



Soil Permeability



Recharge Potential



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Hydrology:

- Lake

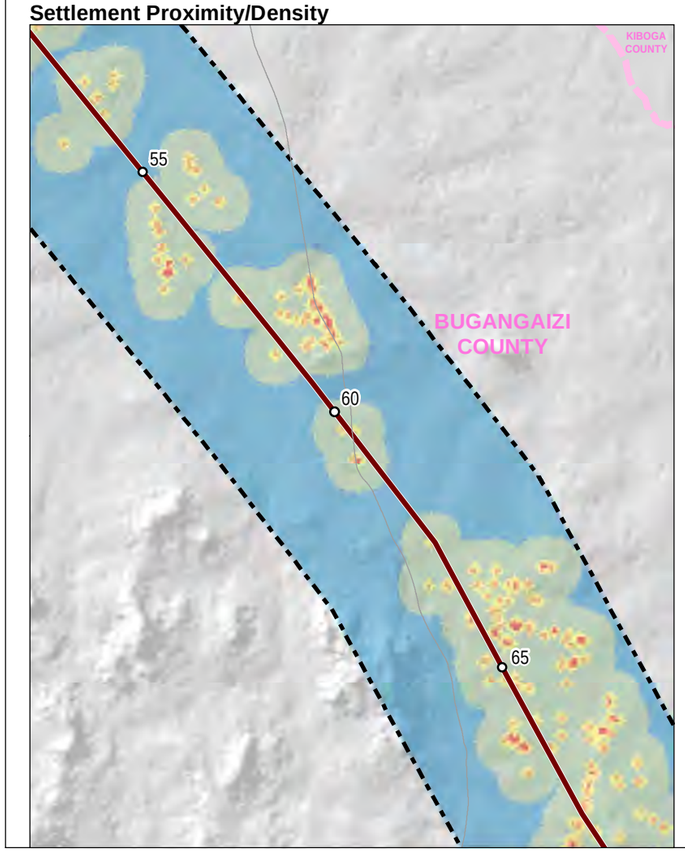
Administrative Area:

- County Boundary

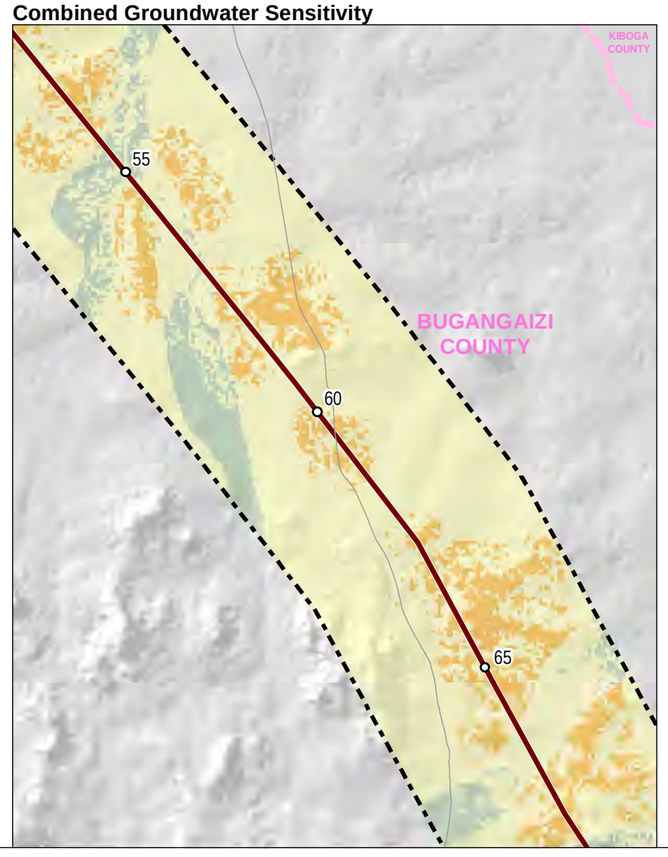
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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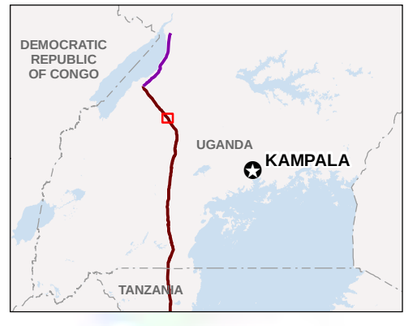
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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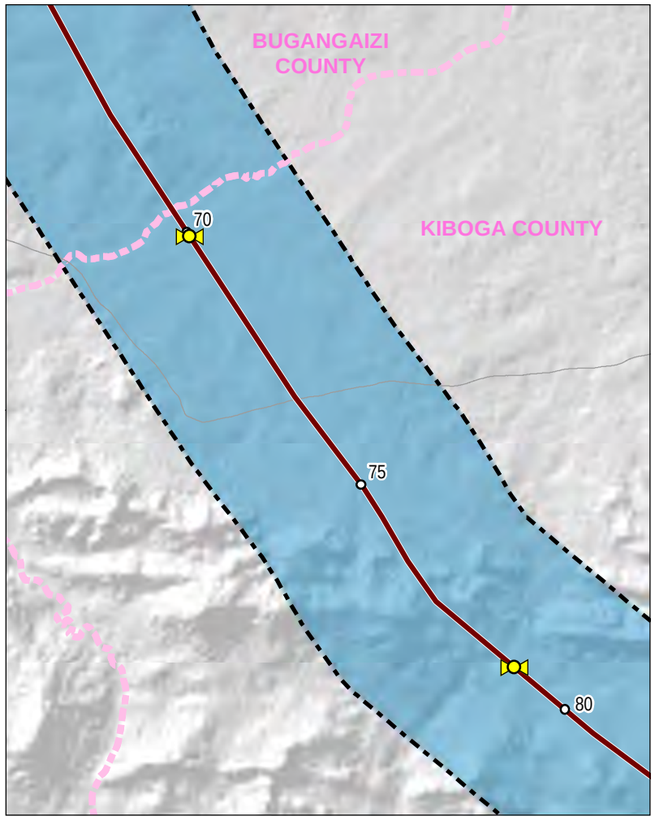
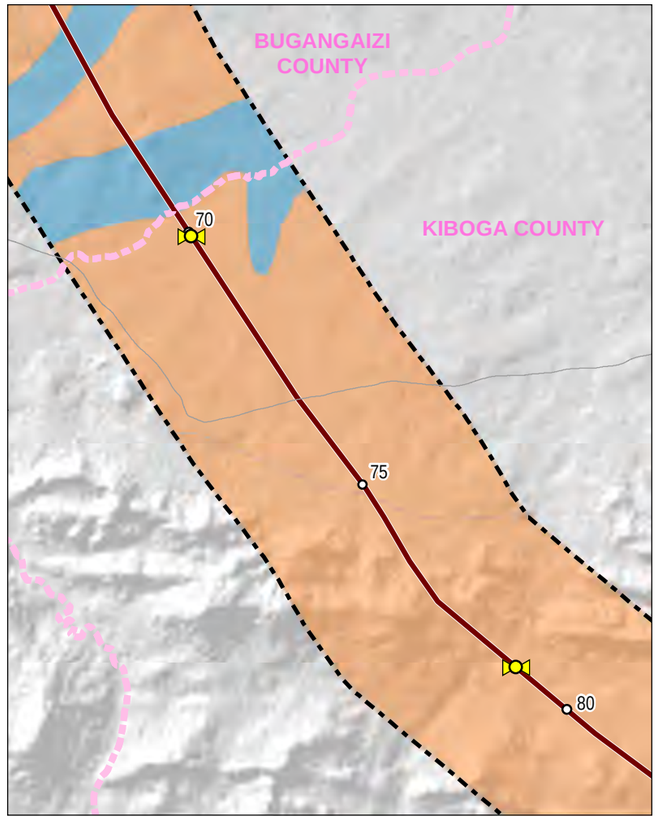
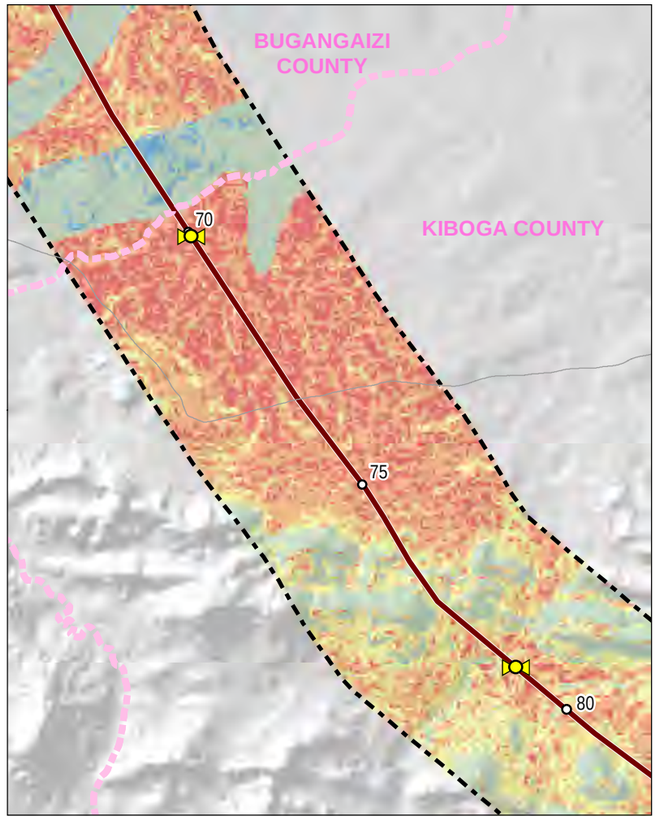
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
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Settlements:

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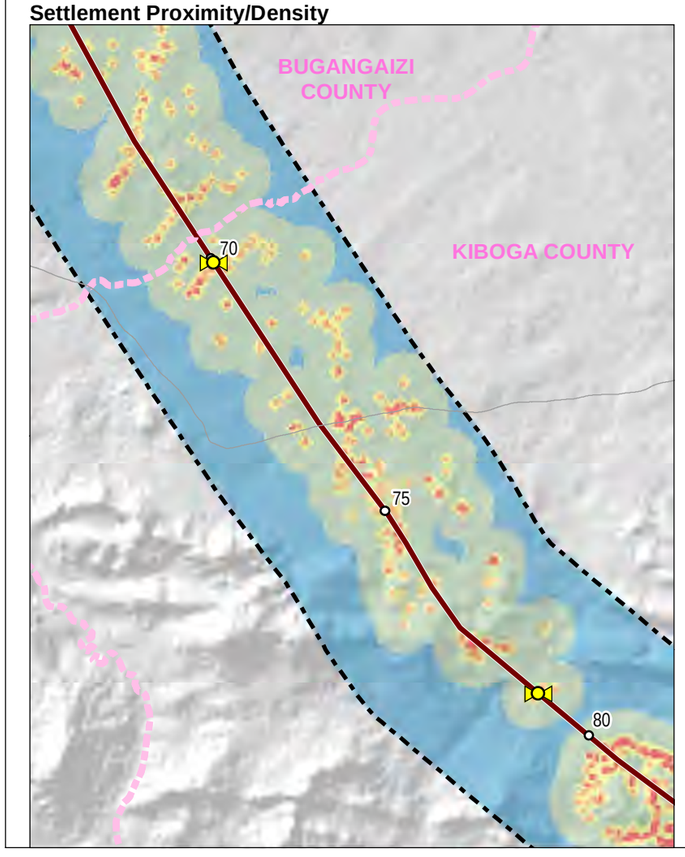

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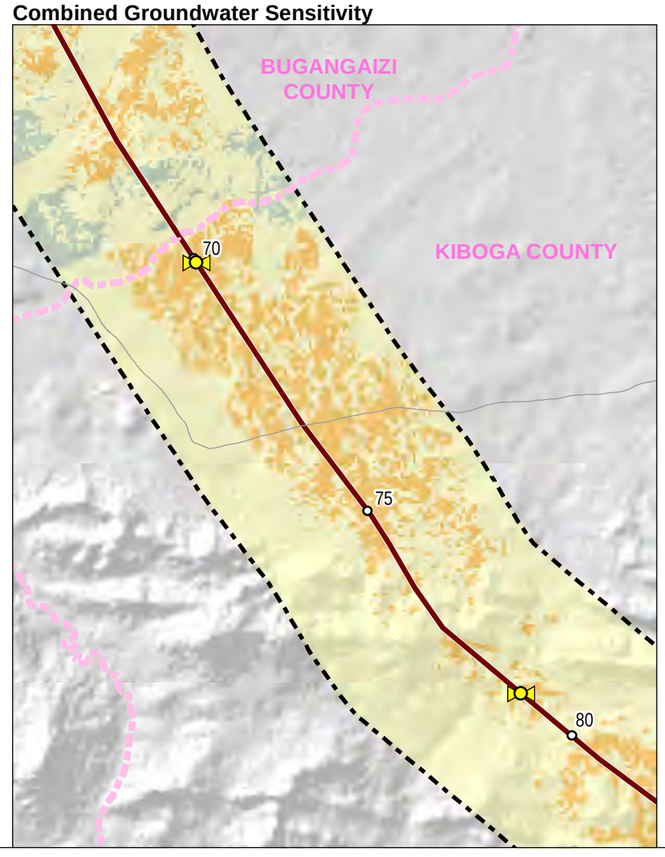

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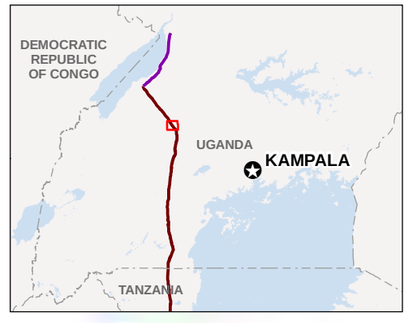
Units: Meter



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0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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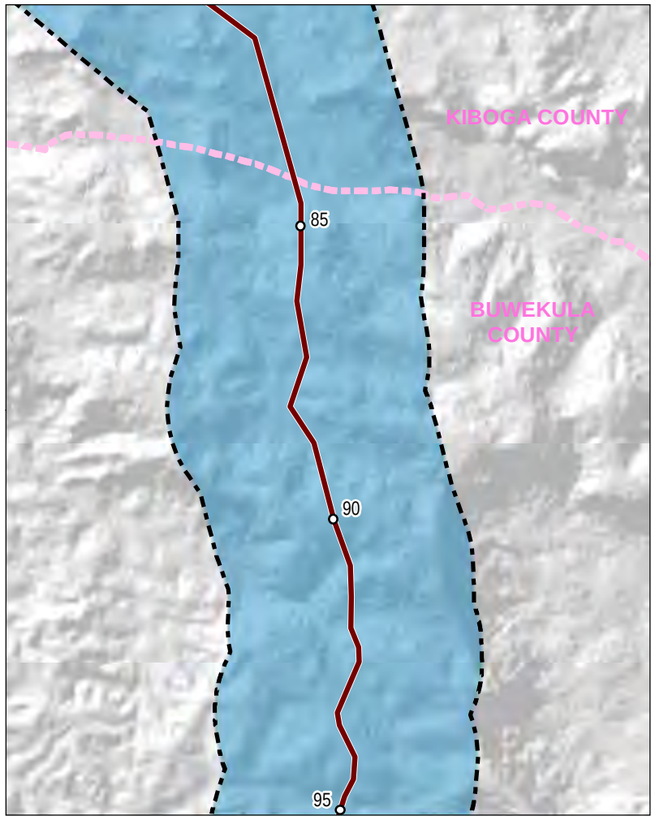
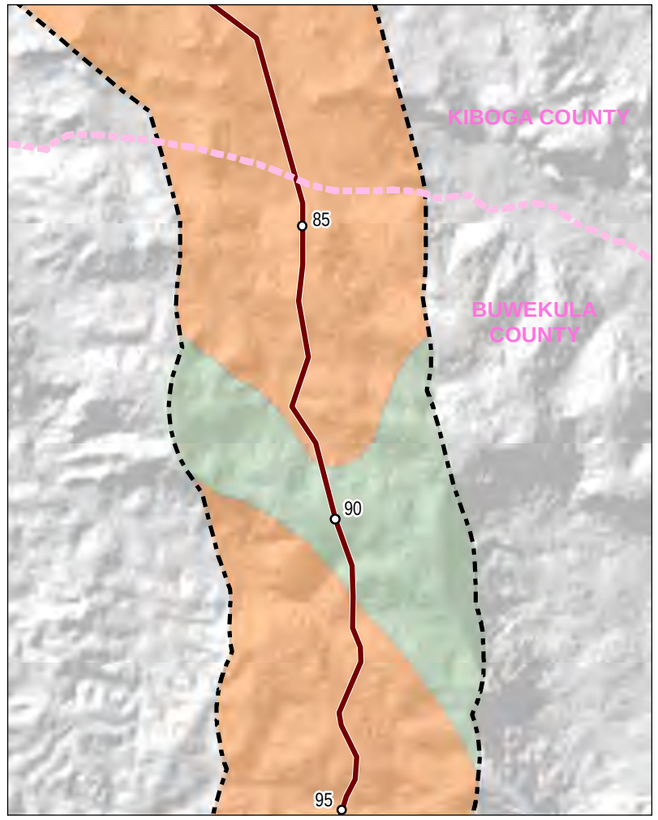


Soil Permeability



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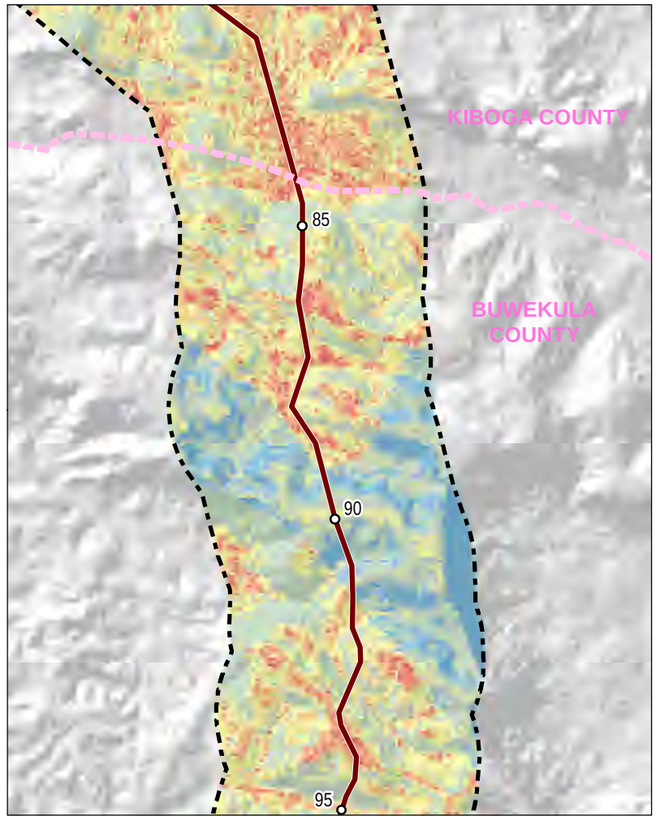

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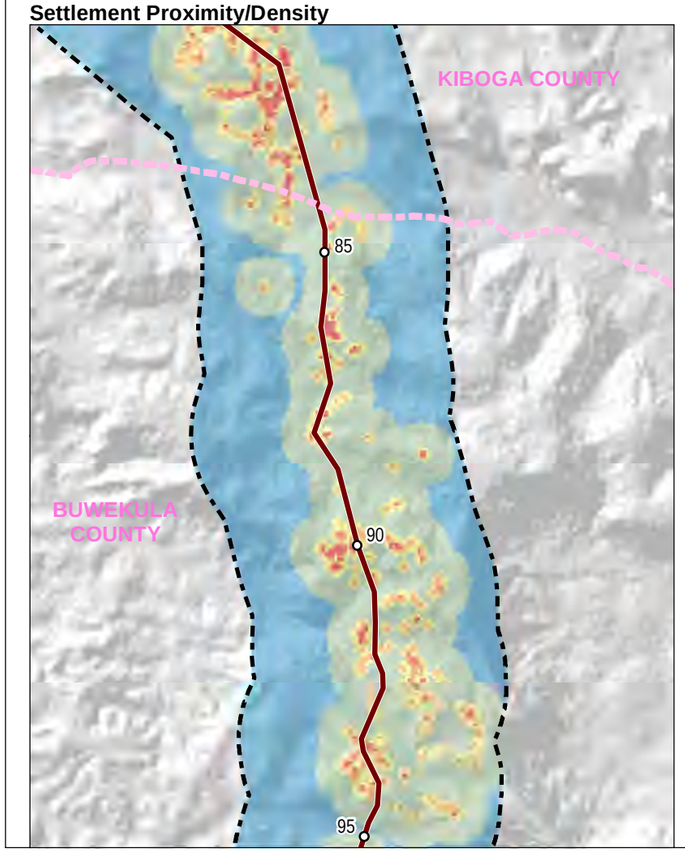

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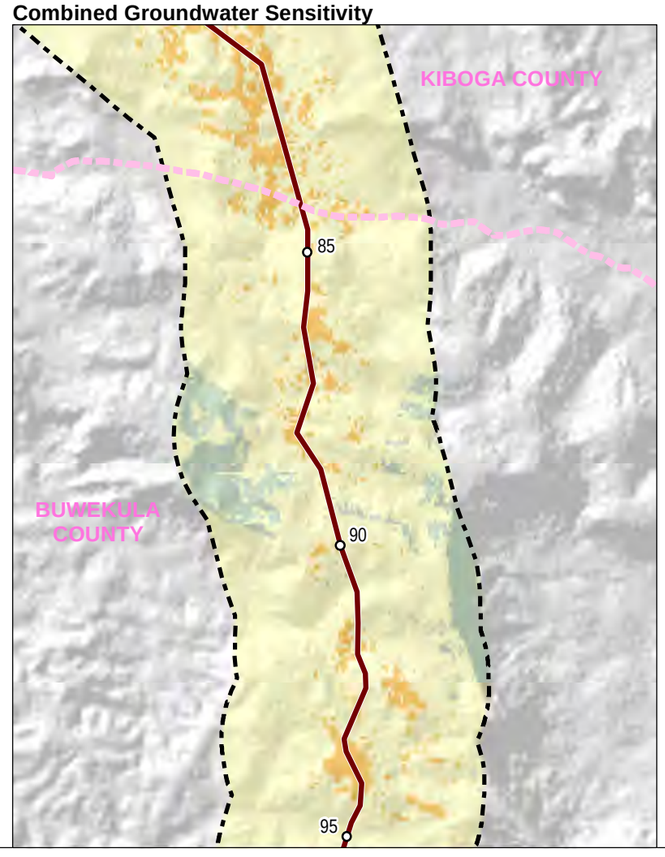

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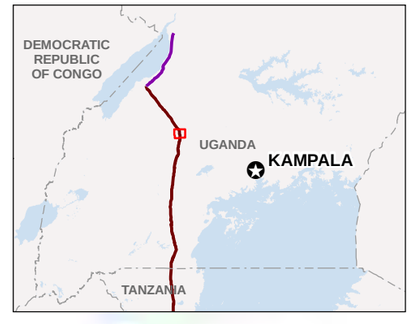
Units: Meter



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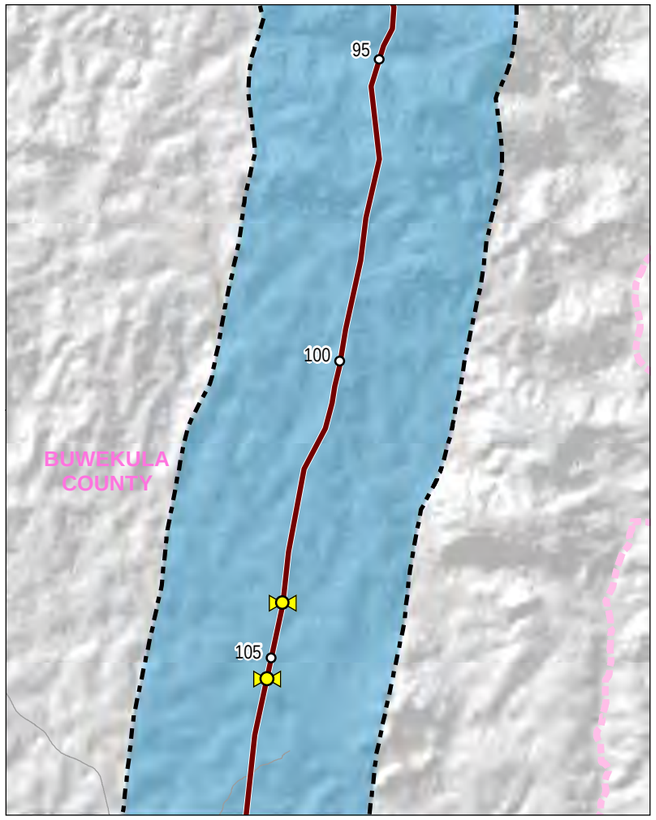

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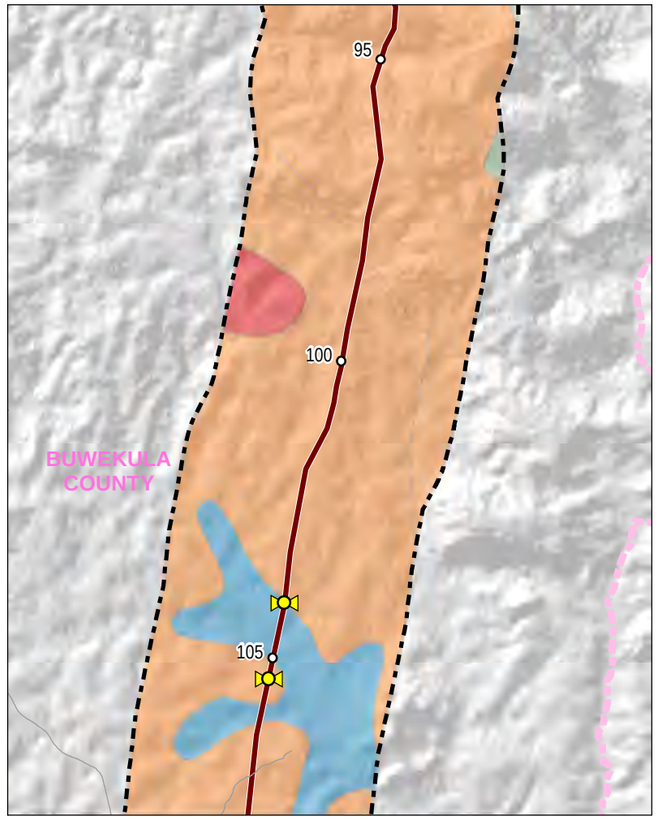

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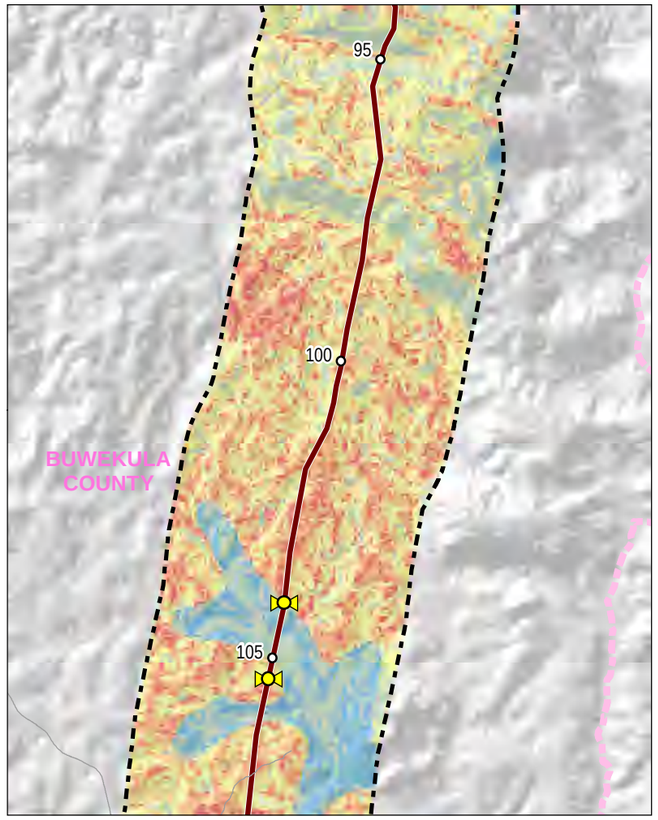

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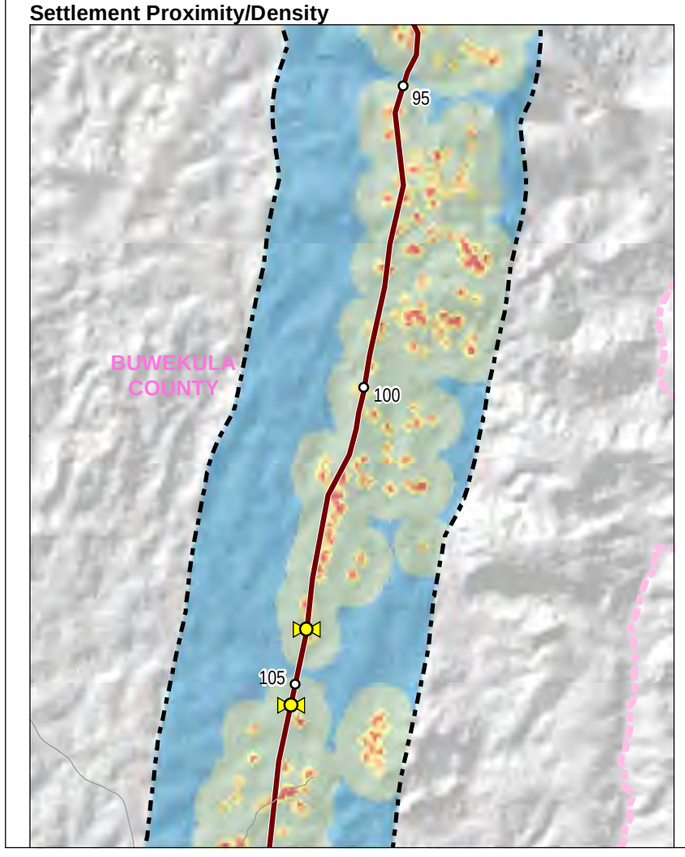

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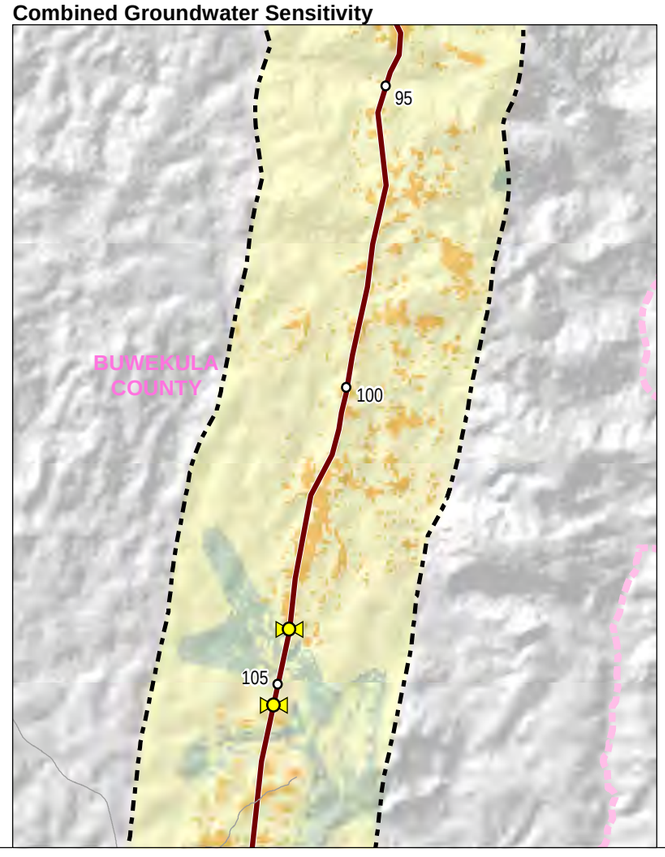

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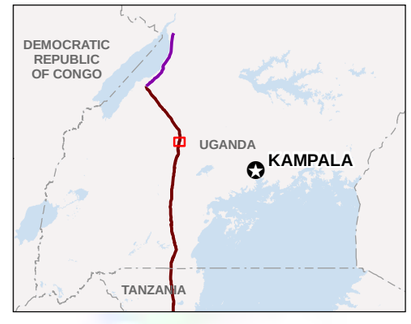

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0 1 2 3 4 5
Kilometres
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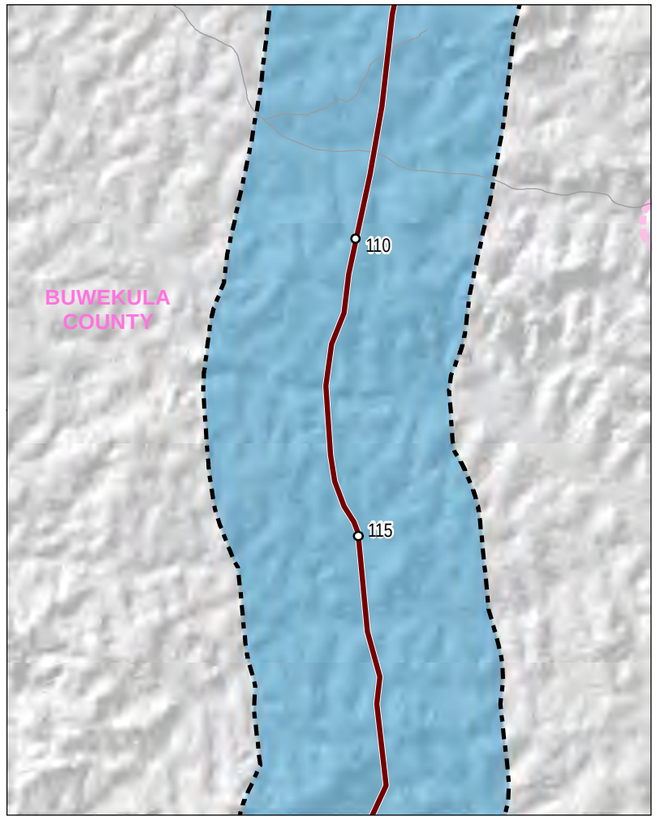
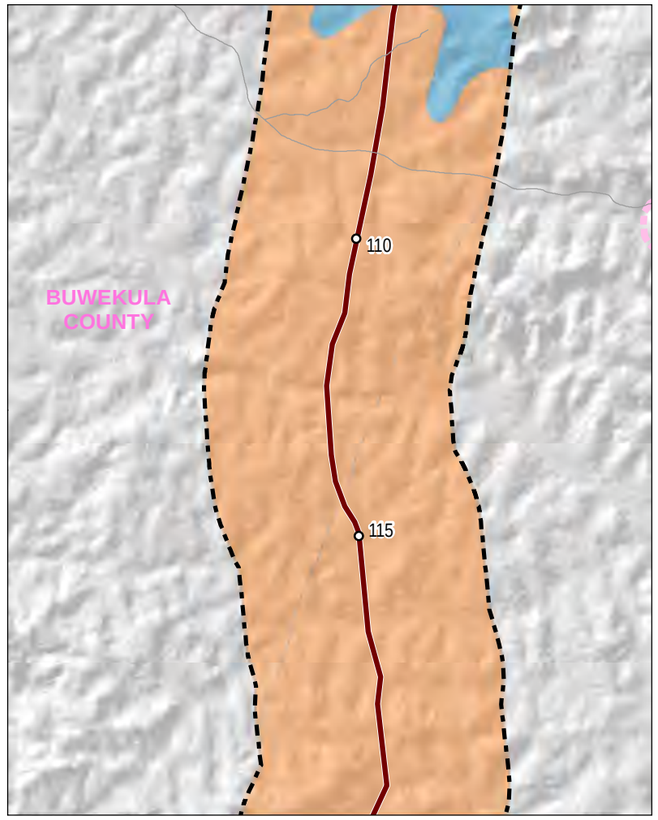
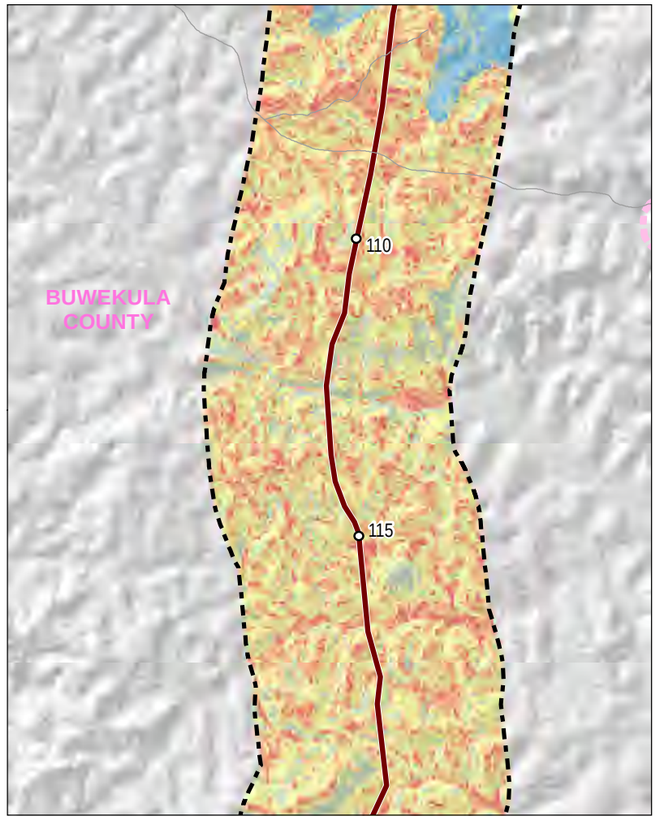


Soil Permeability



Recharge Potential



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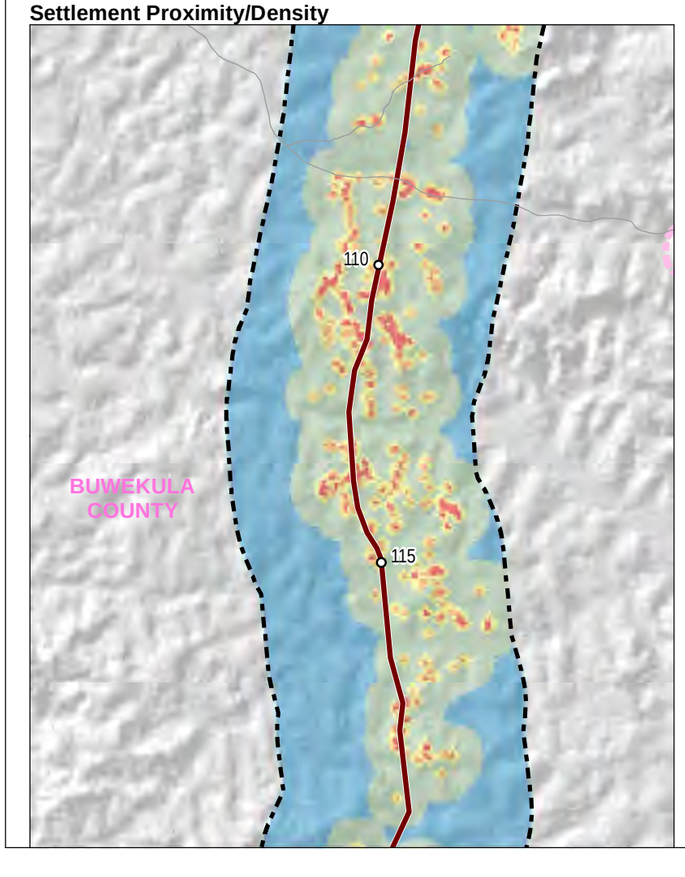

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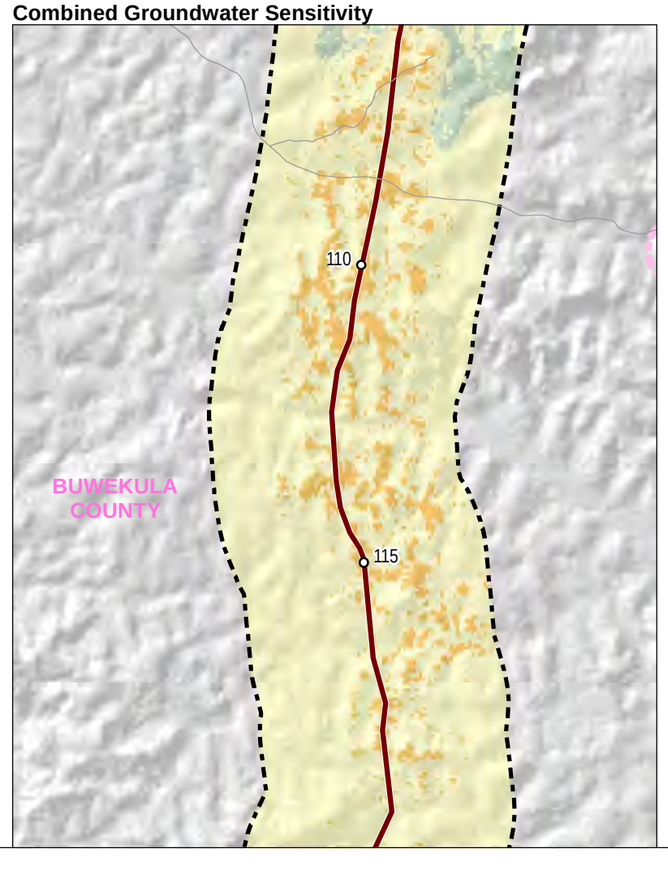

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Projection: Transverse Mercator
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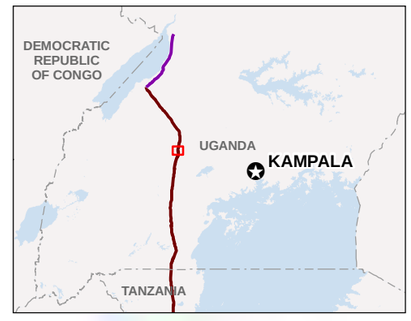

CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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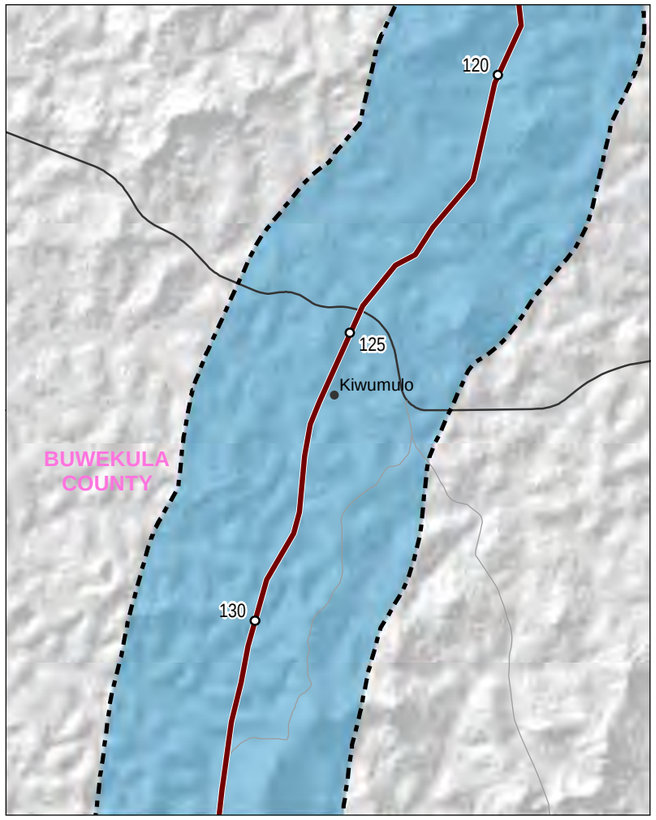
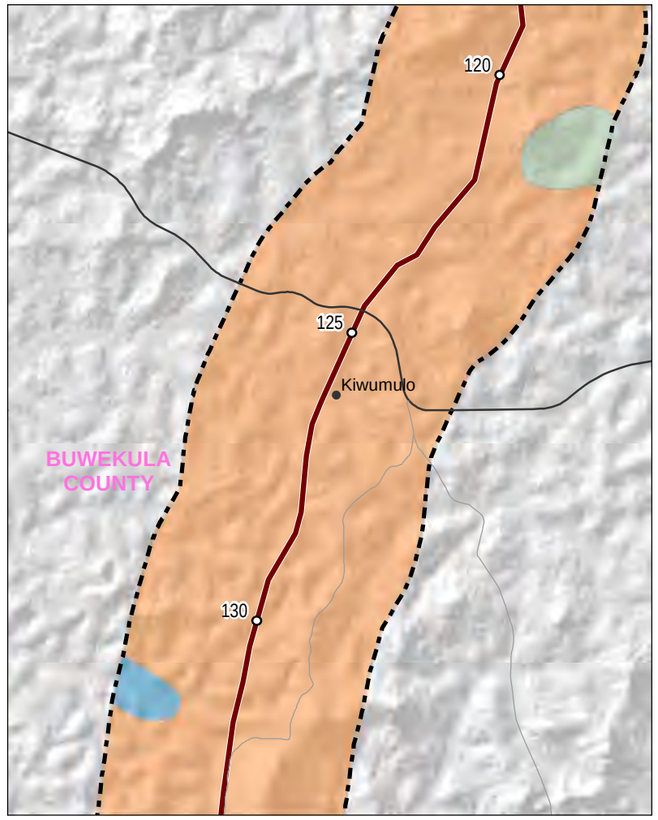
Aquifer Productivity



Soil Permeability



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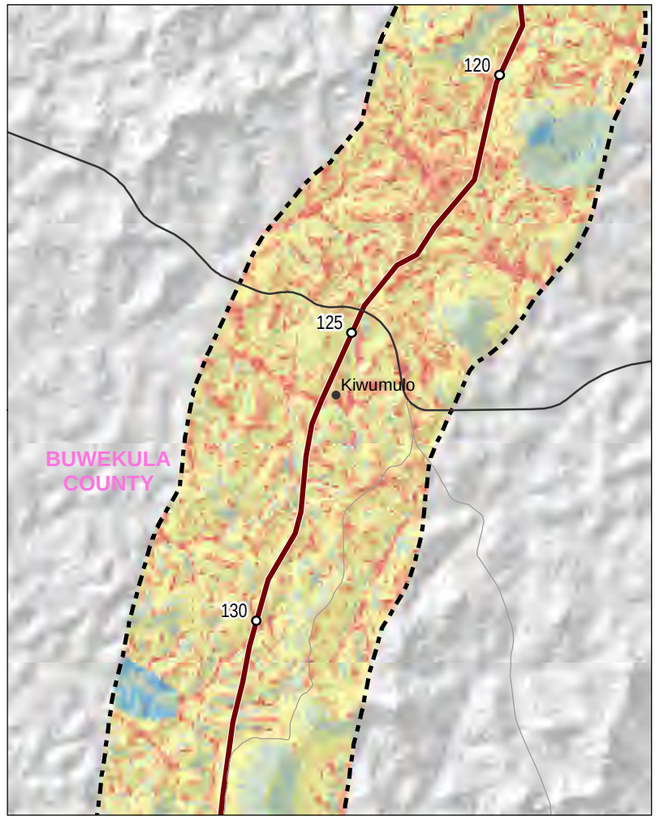

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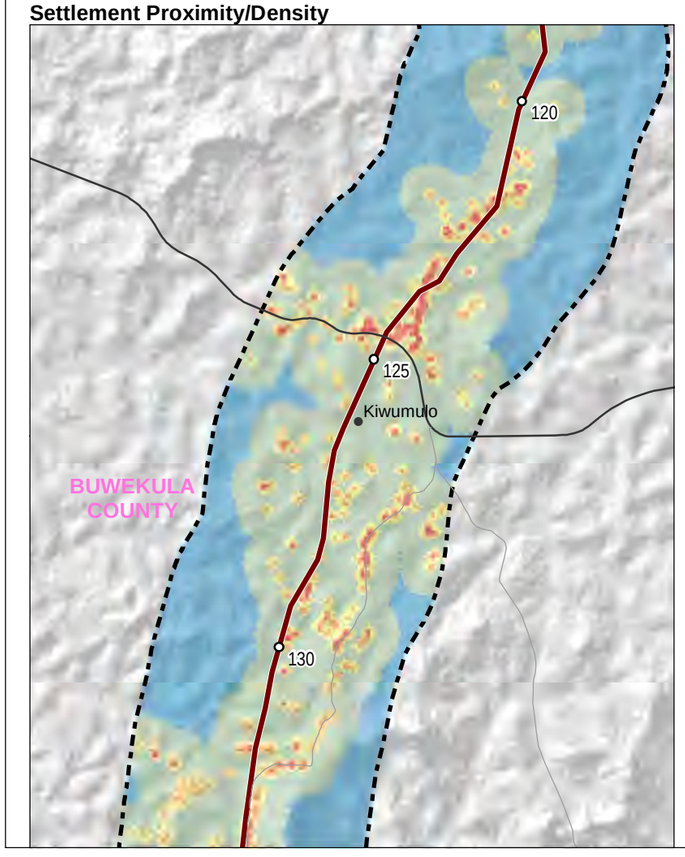

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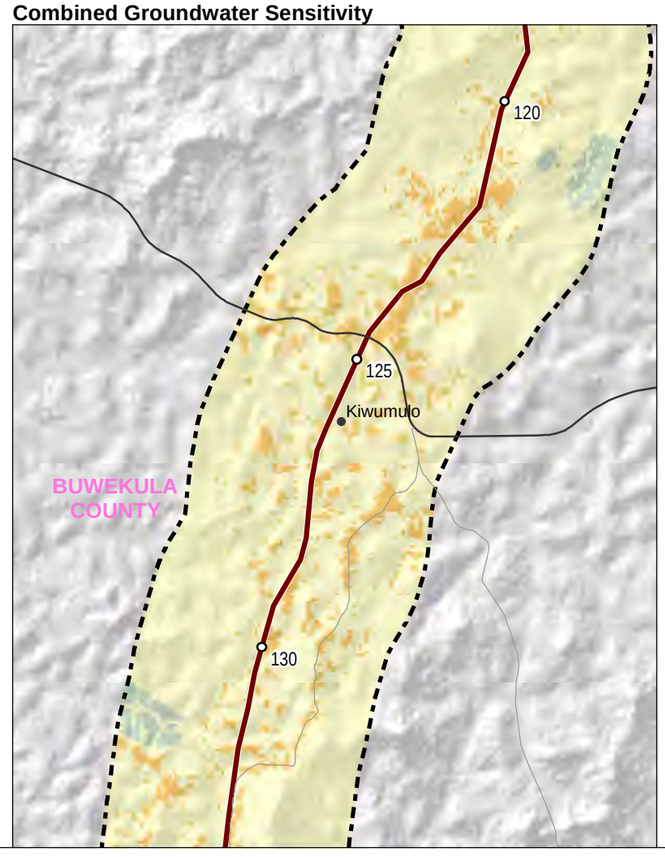

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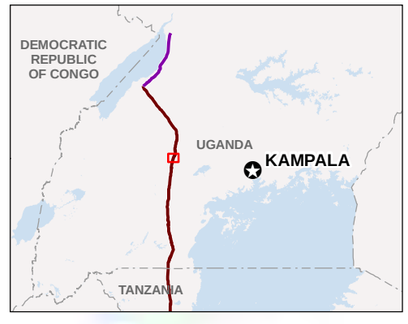

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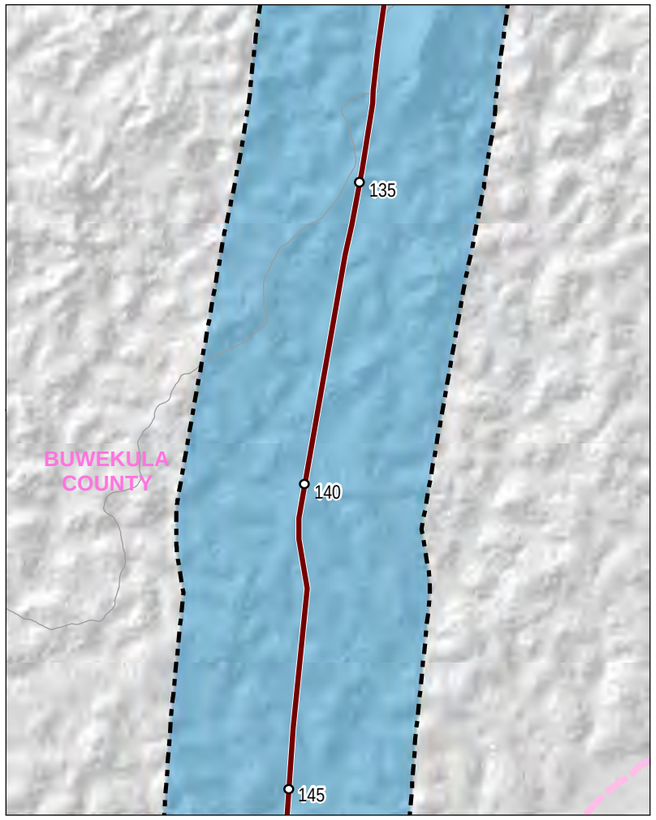

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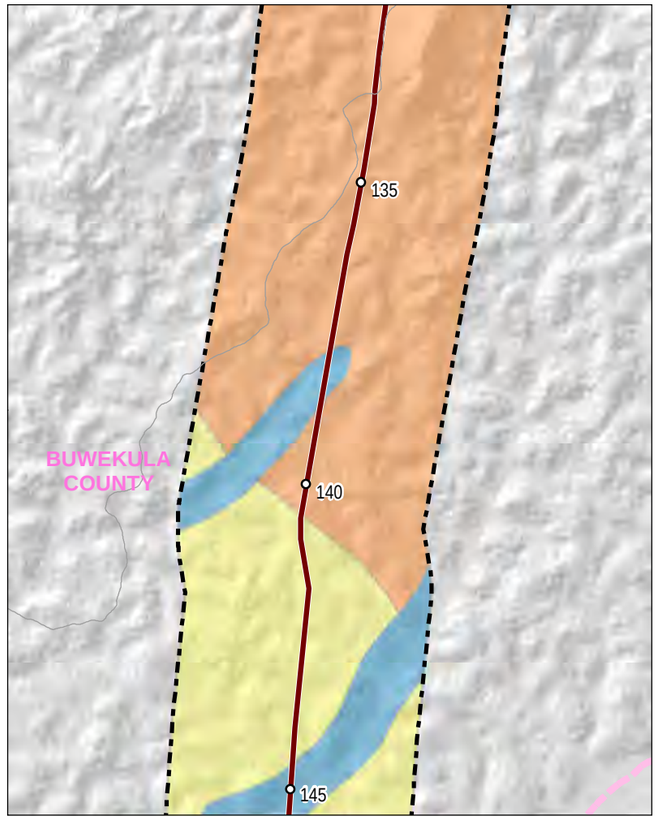

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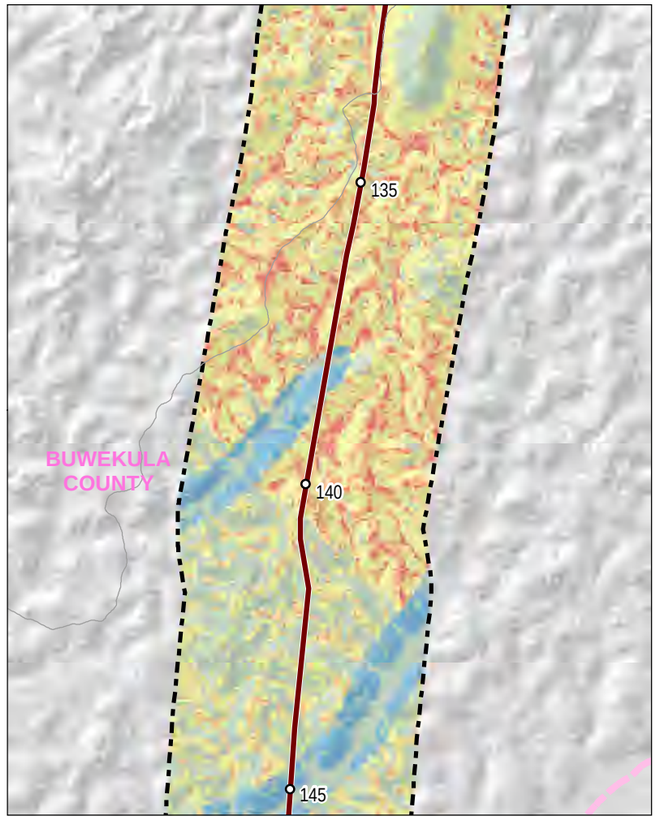

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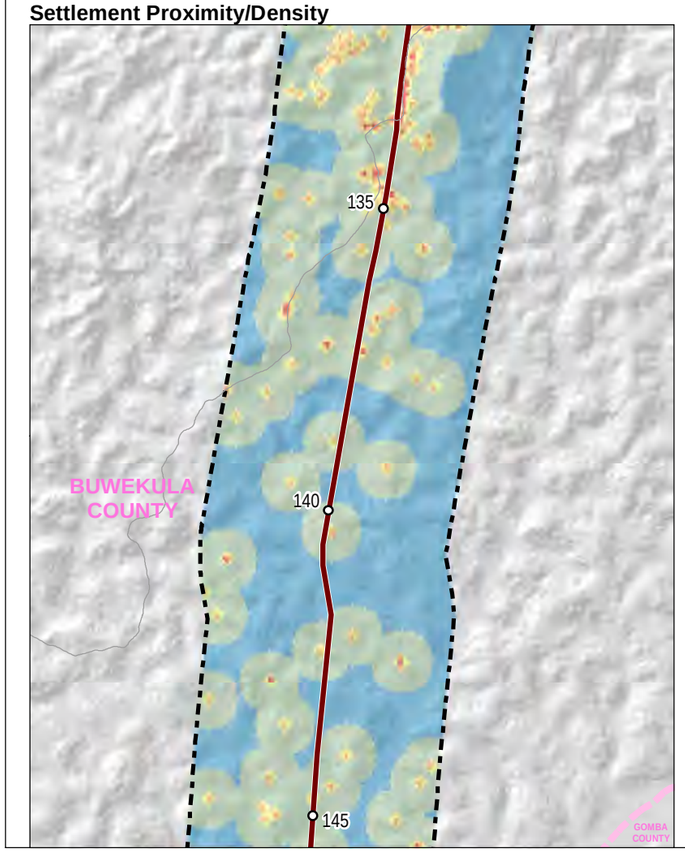

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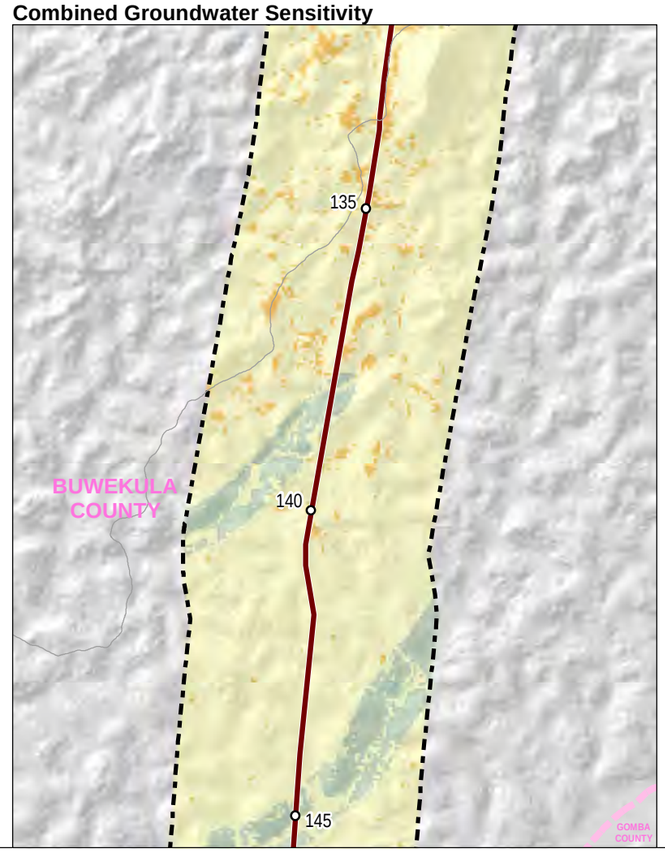

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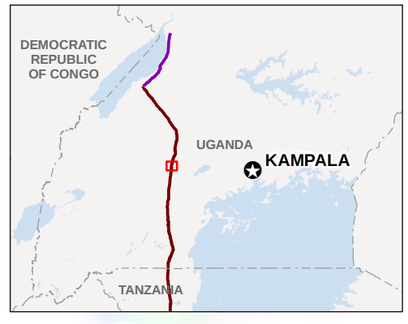

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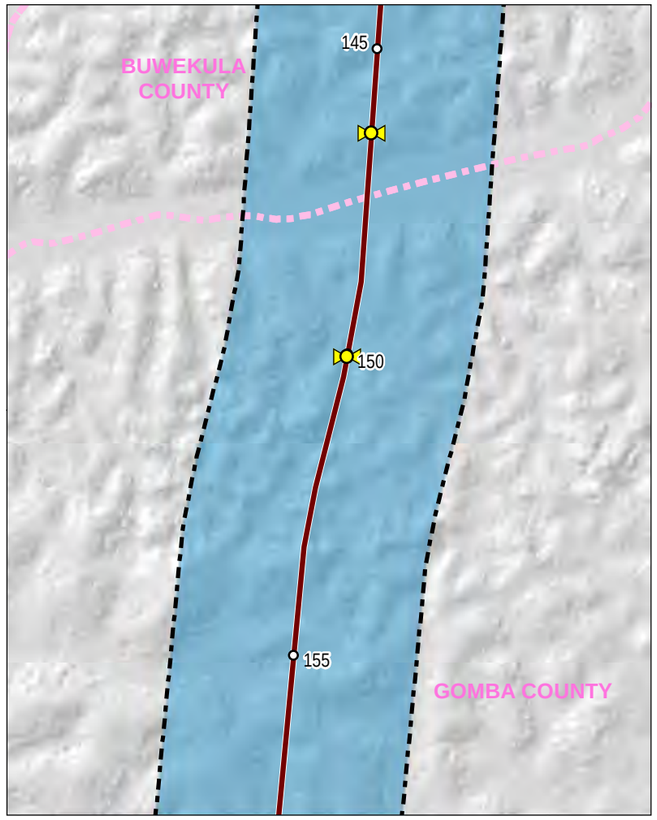

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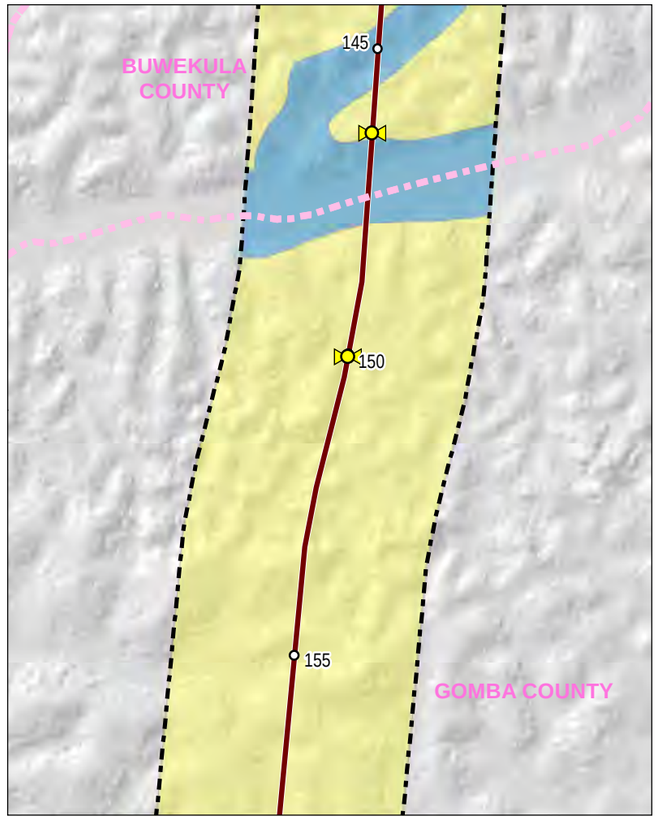

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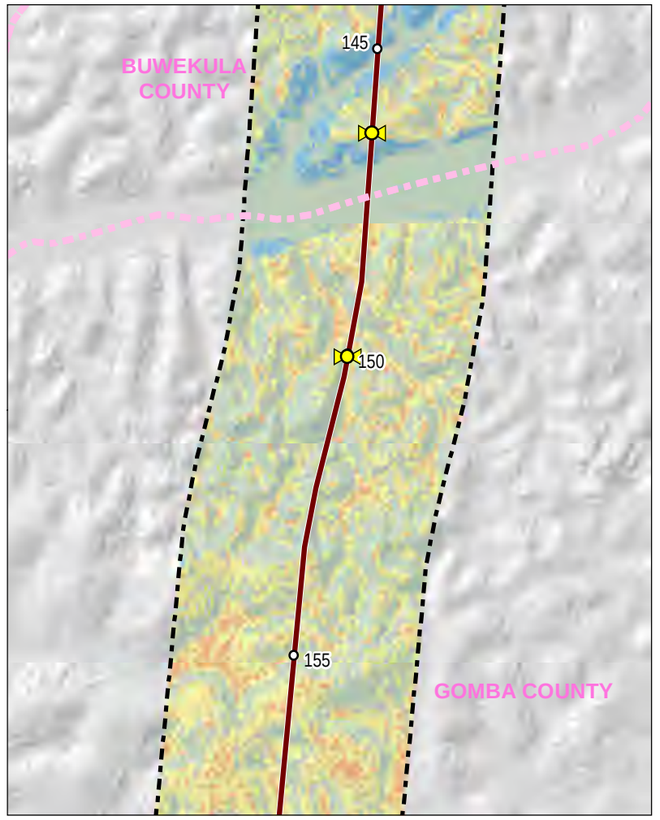

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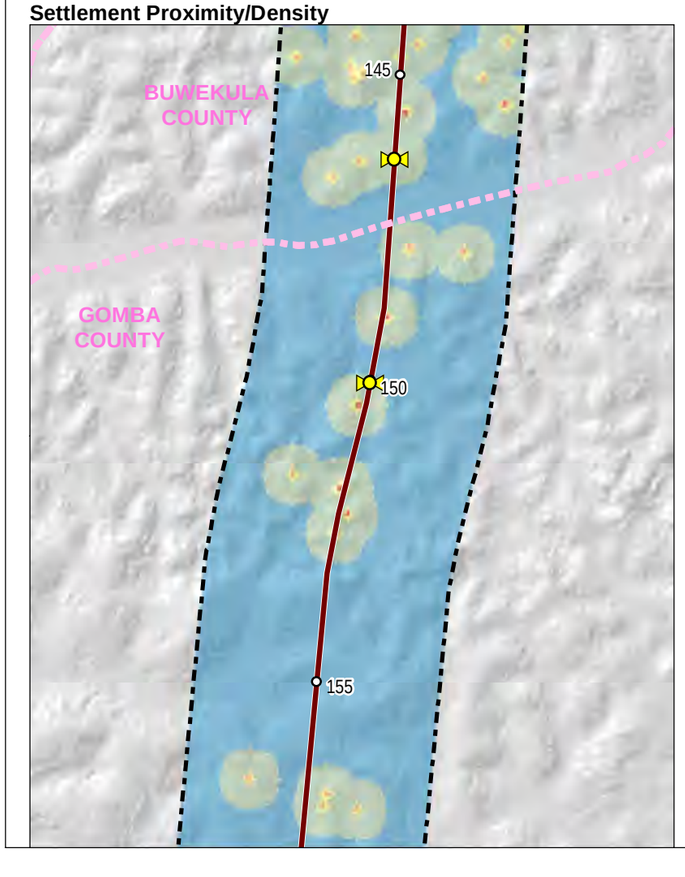

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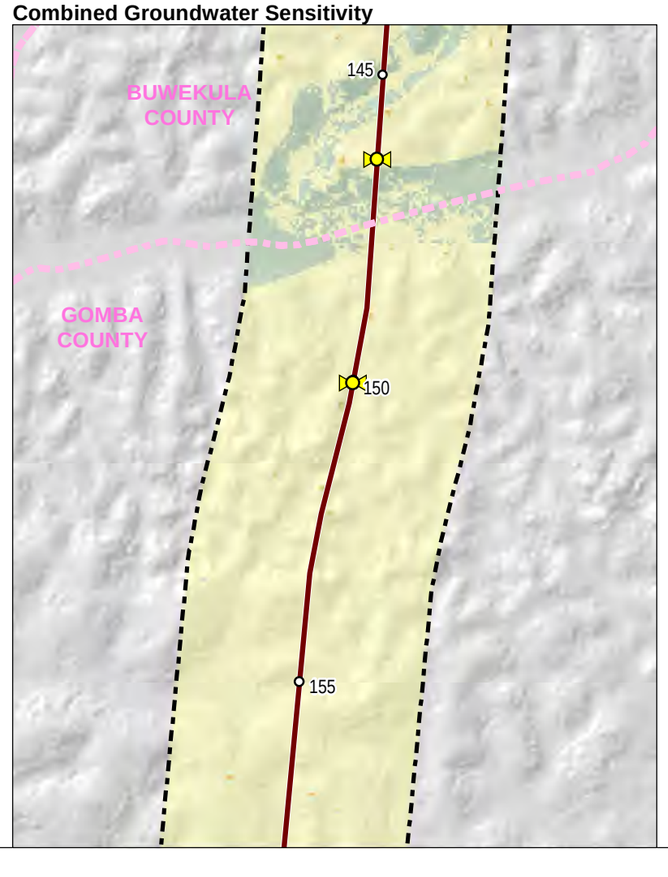
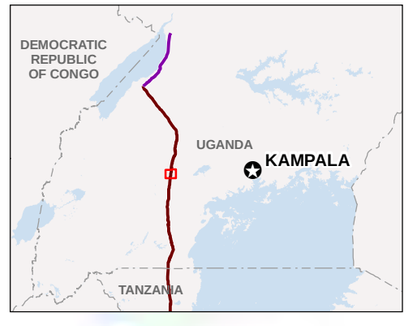


Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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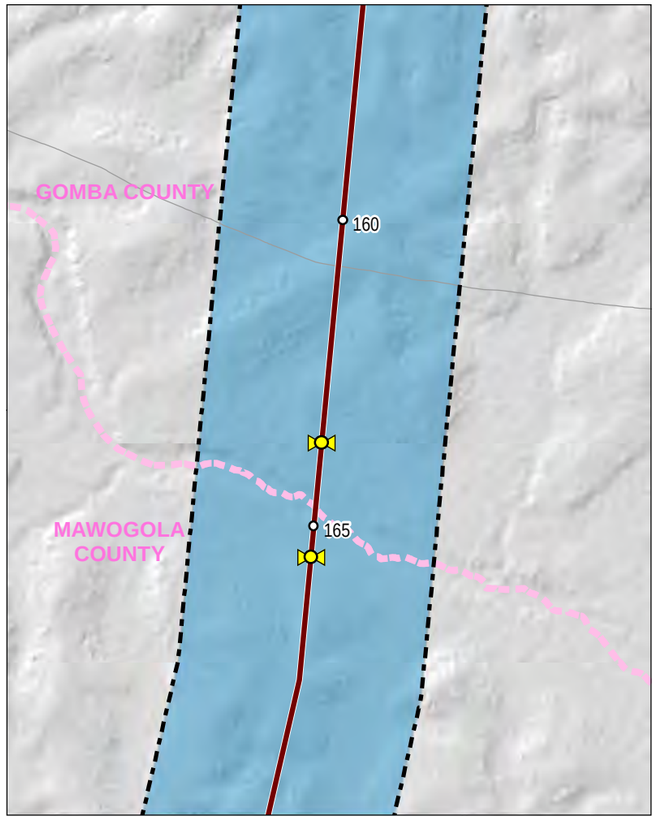
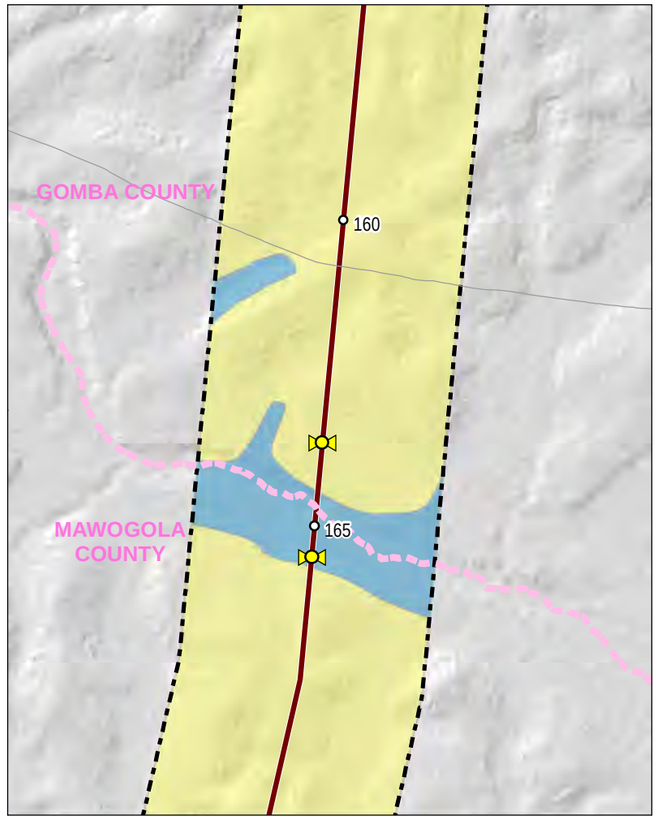
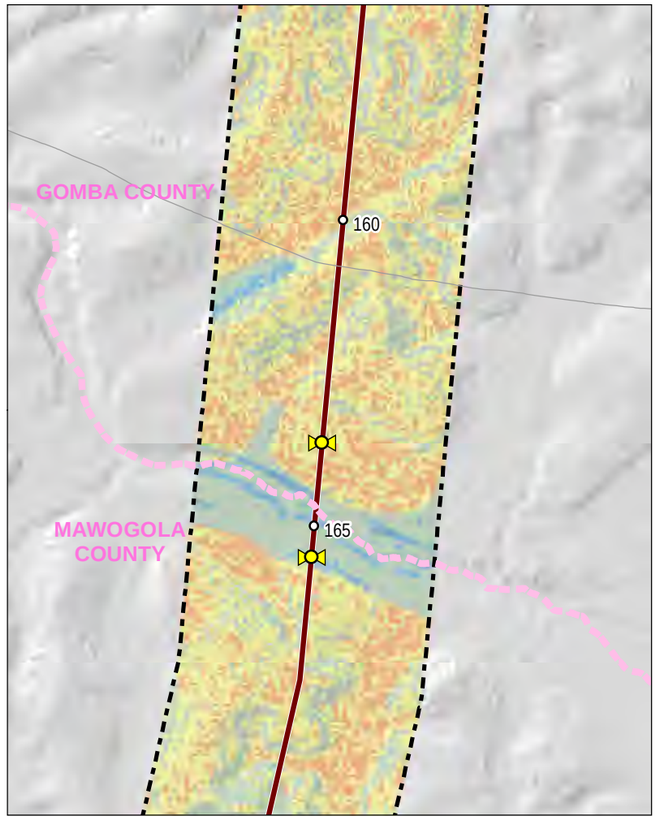
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

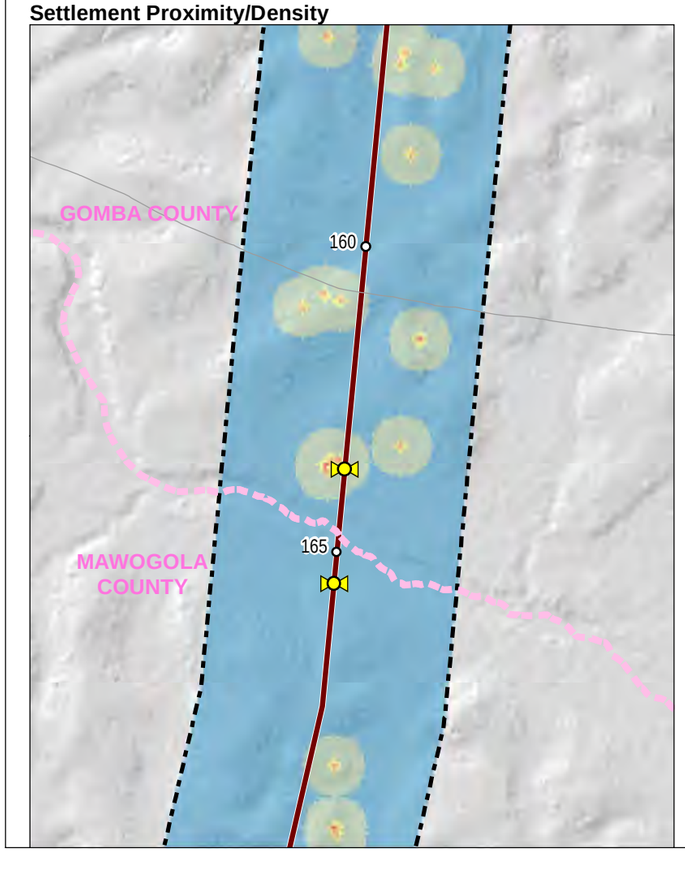
Administrative Area:

- County Boundary

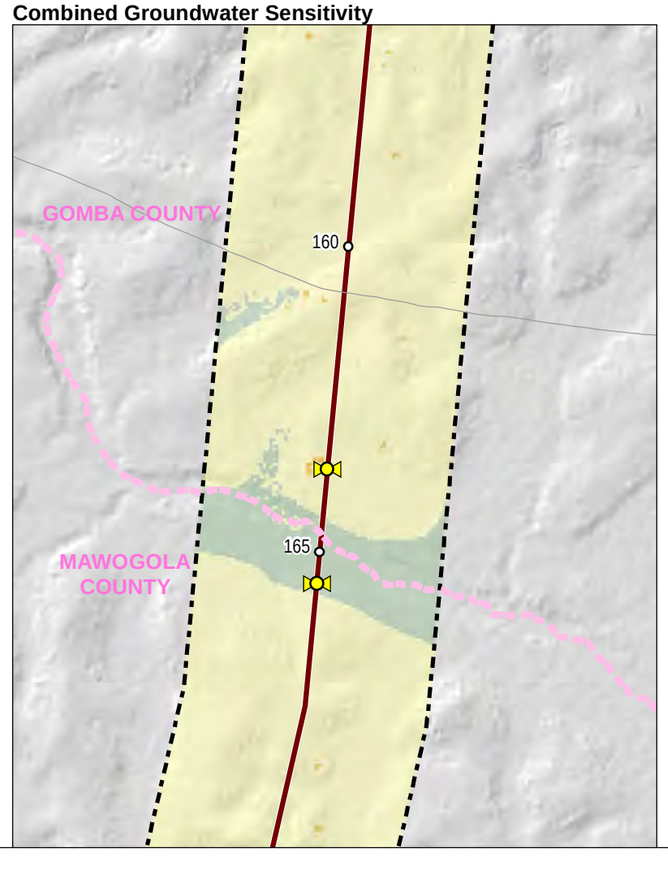
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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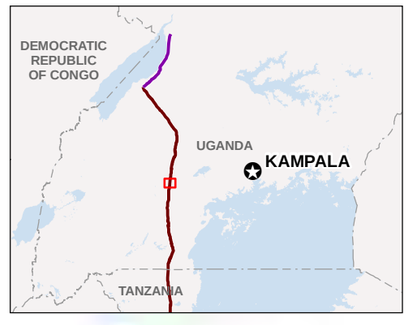

CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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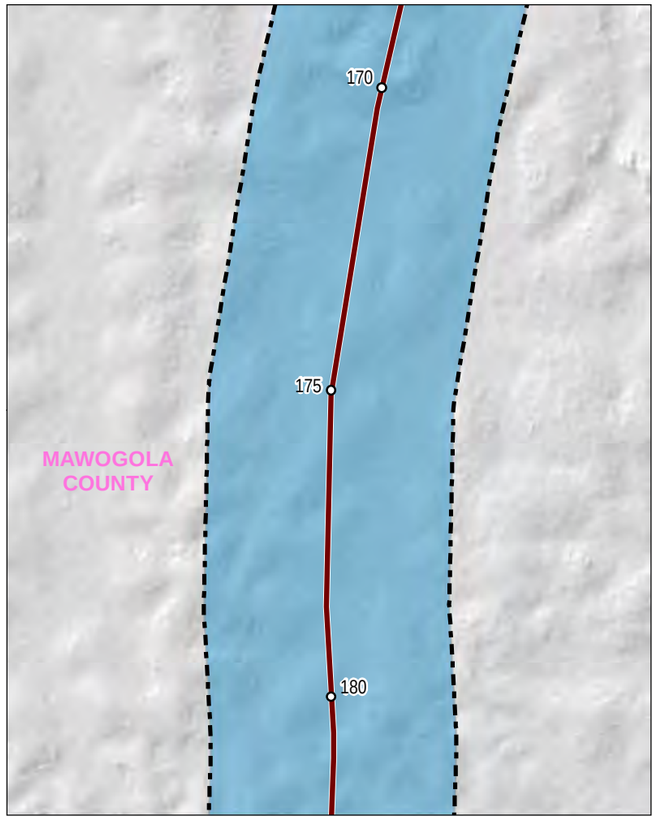
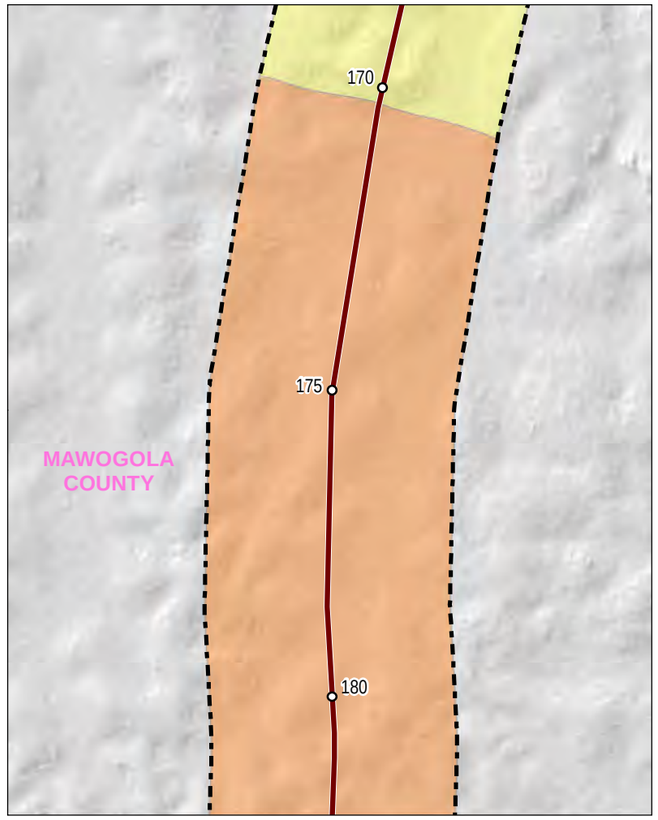
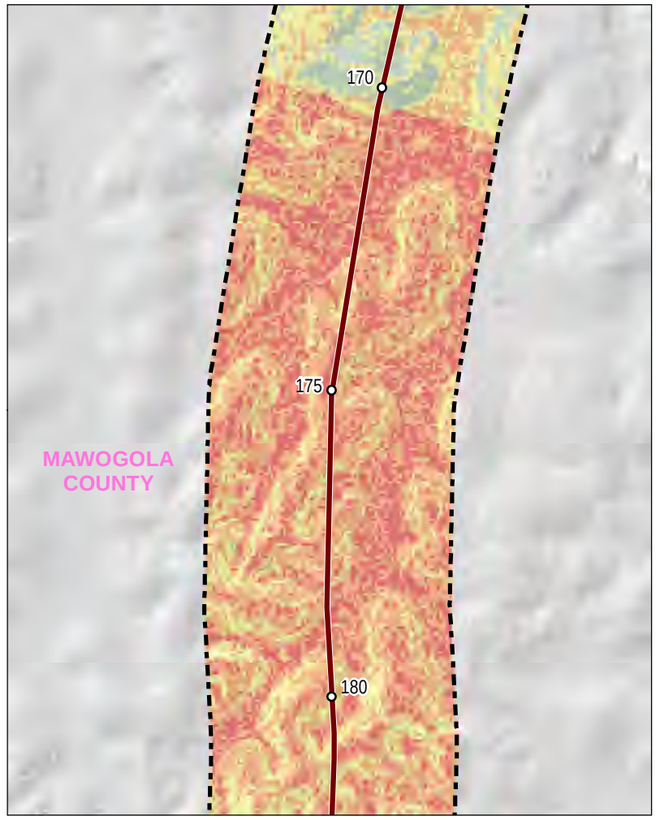
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

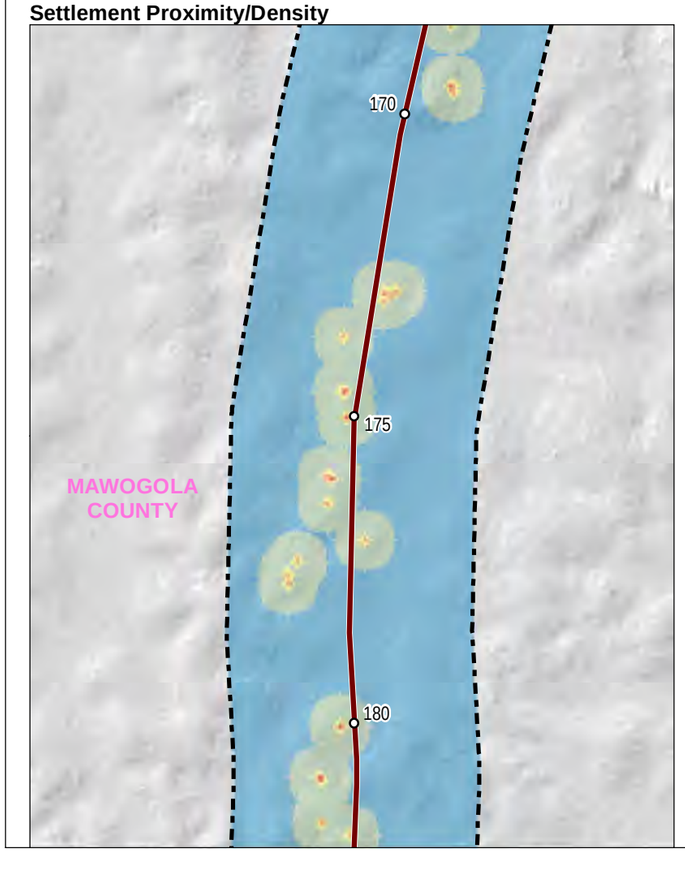
Administrative Area:

- County Boundary

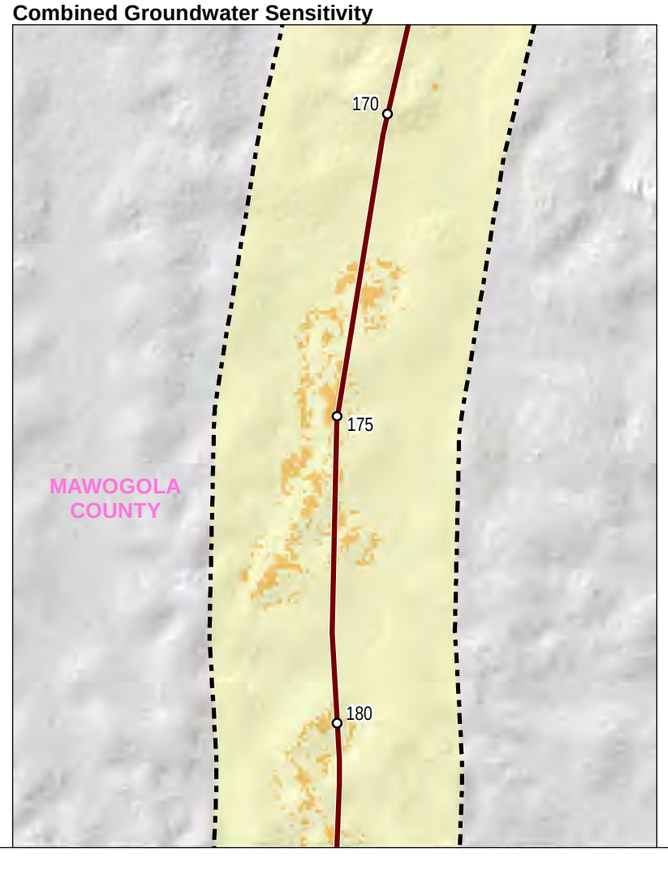
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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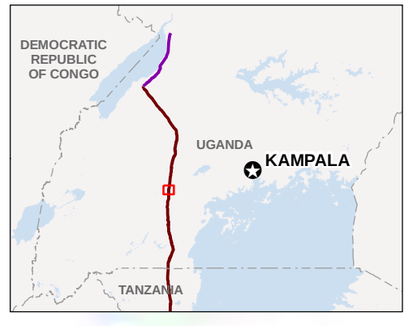

CRUDE OIL PIPELINE

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Kilometres
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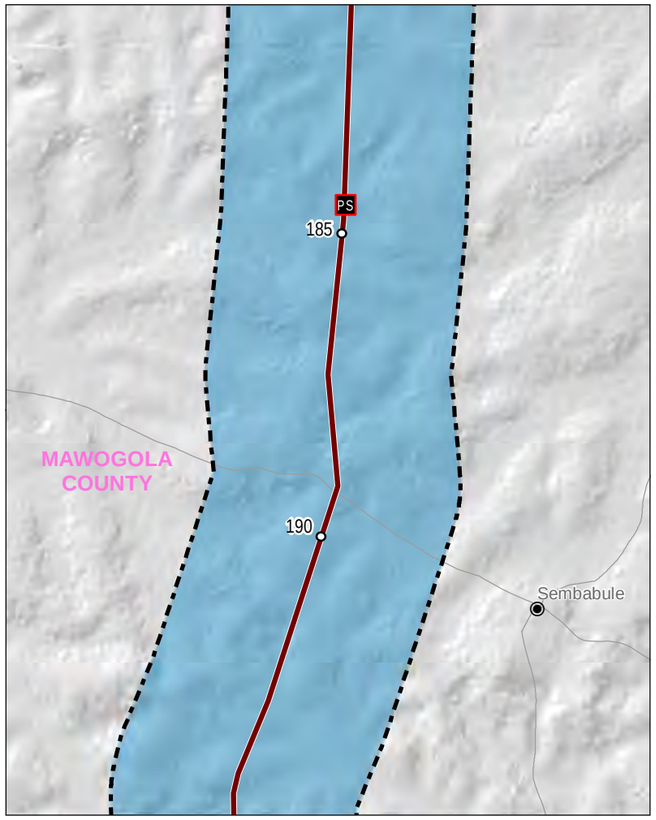
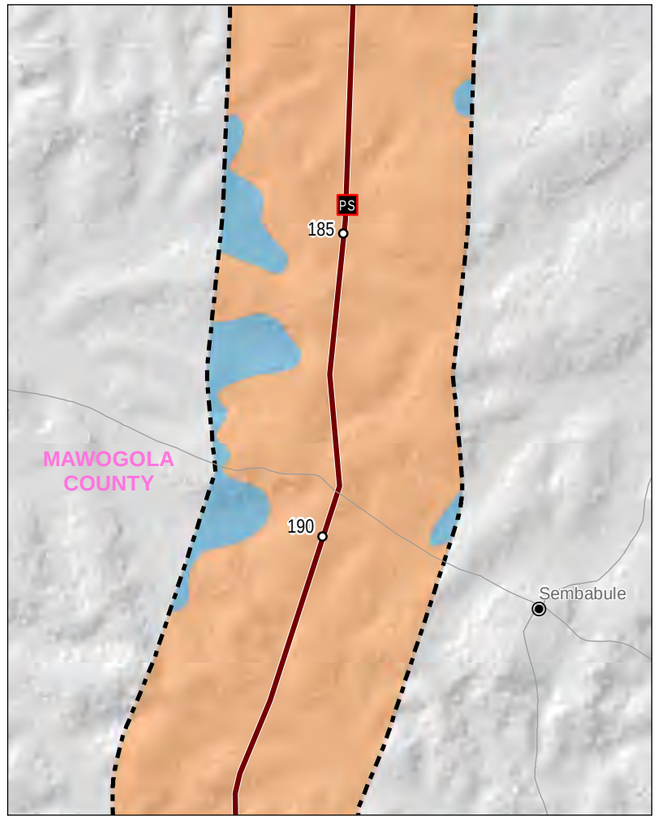
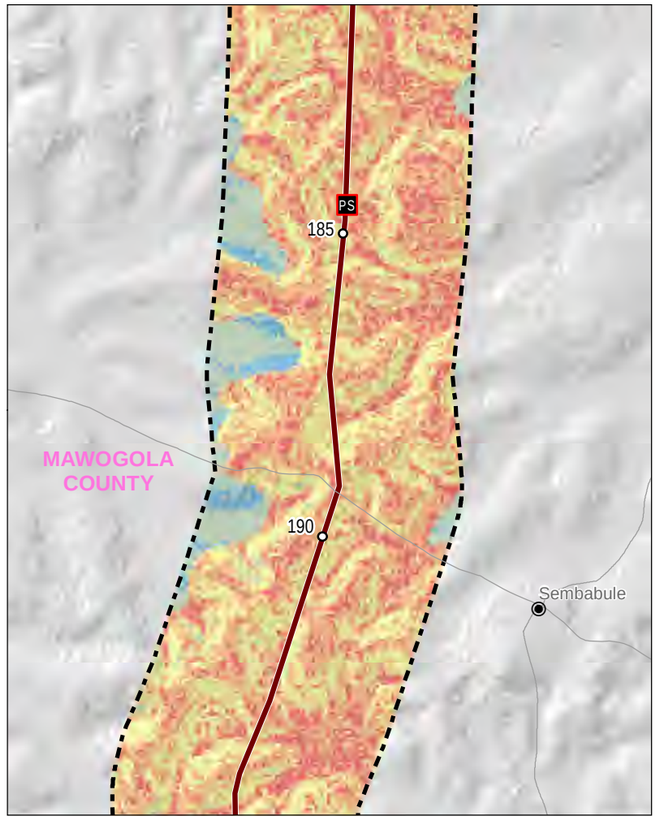
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- PS — Pumping Station
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

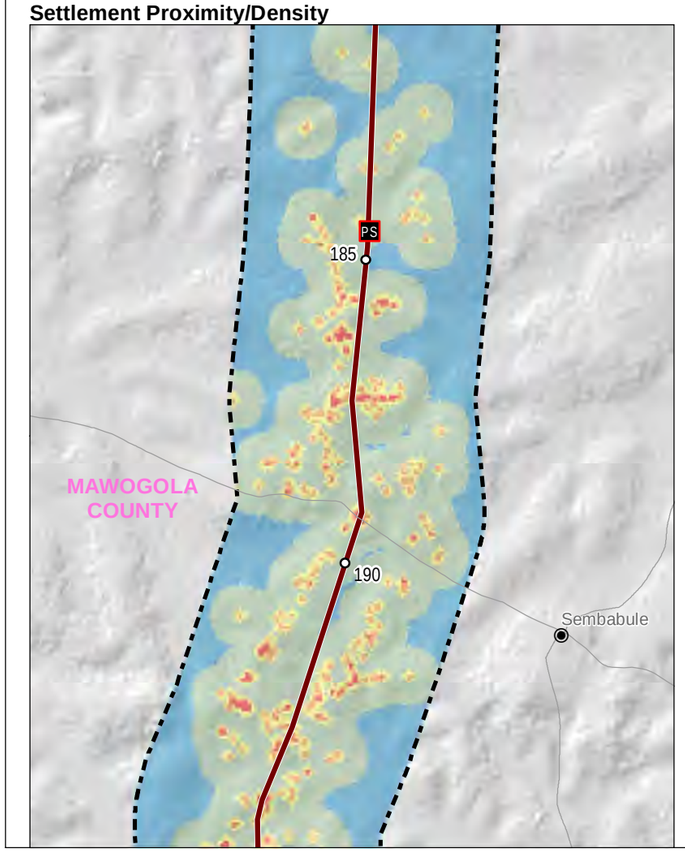
Administrative Area:

- County Boundary

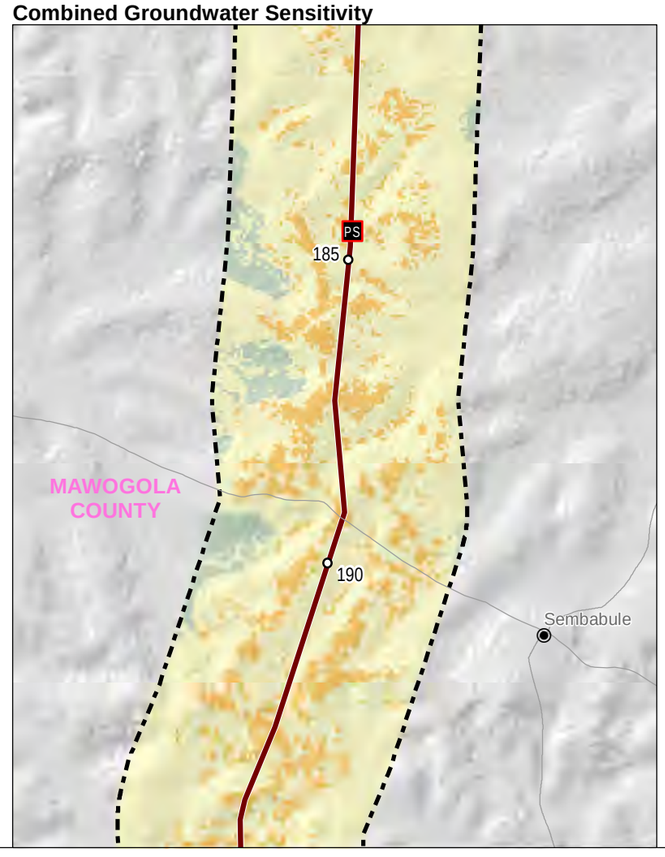
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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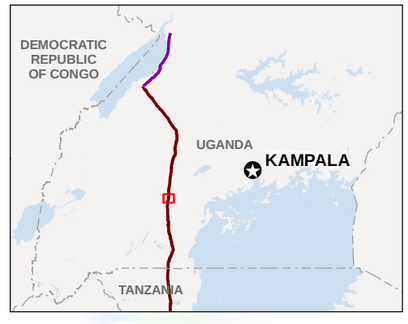

CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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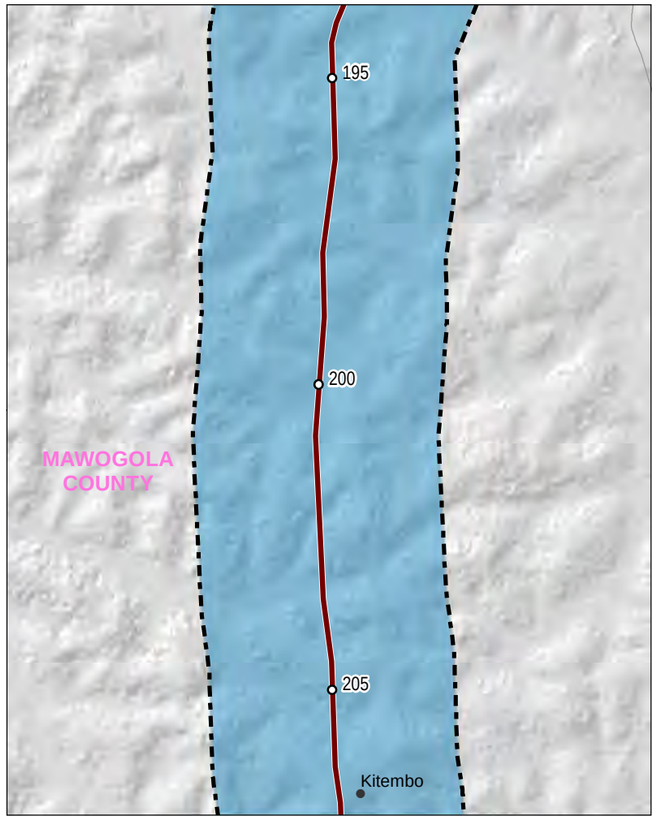
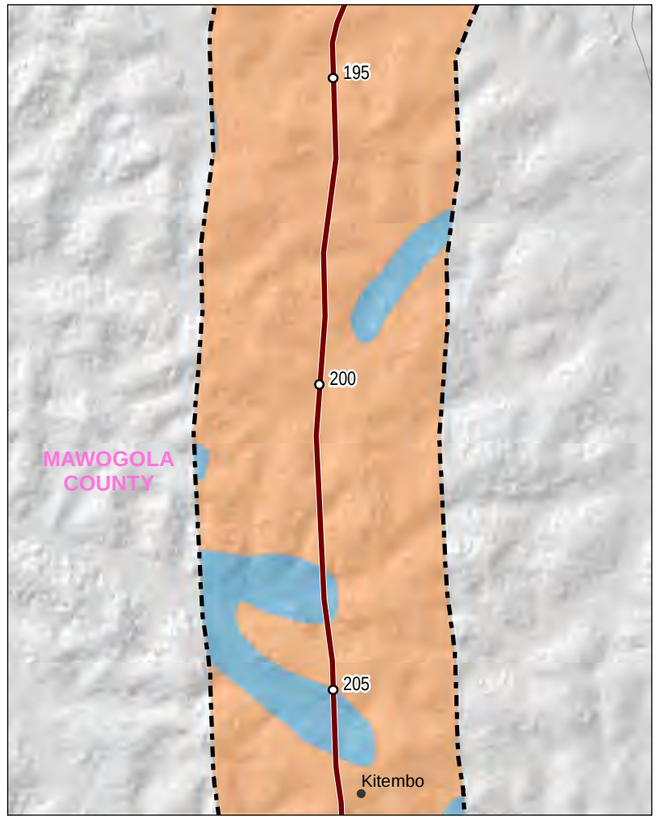
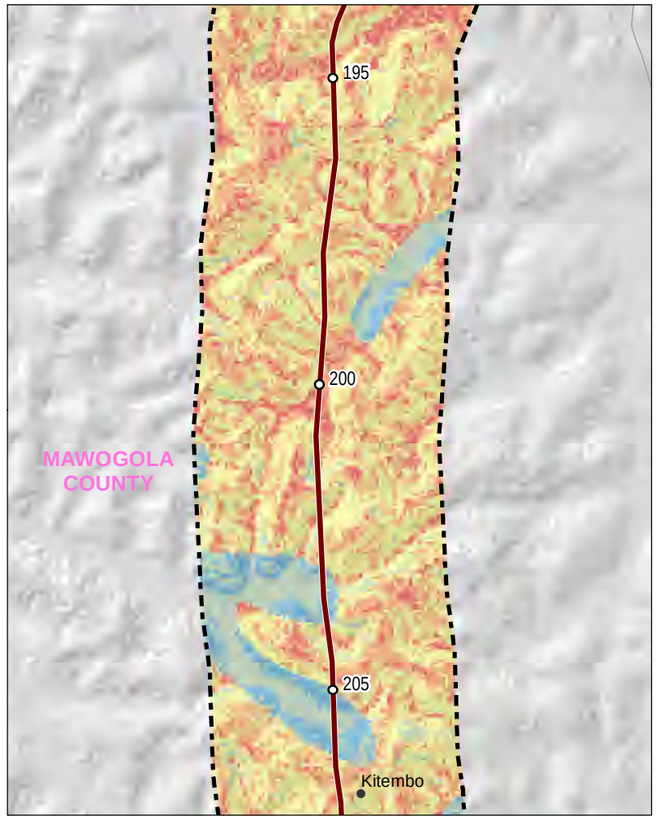
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

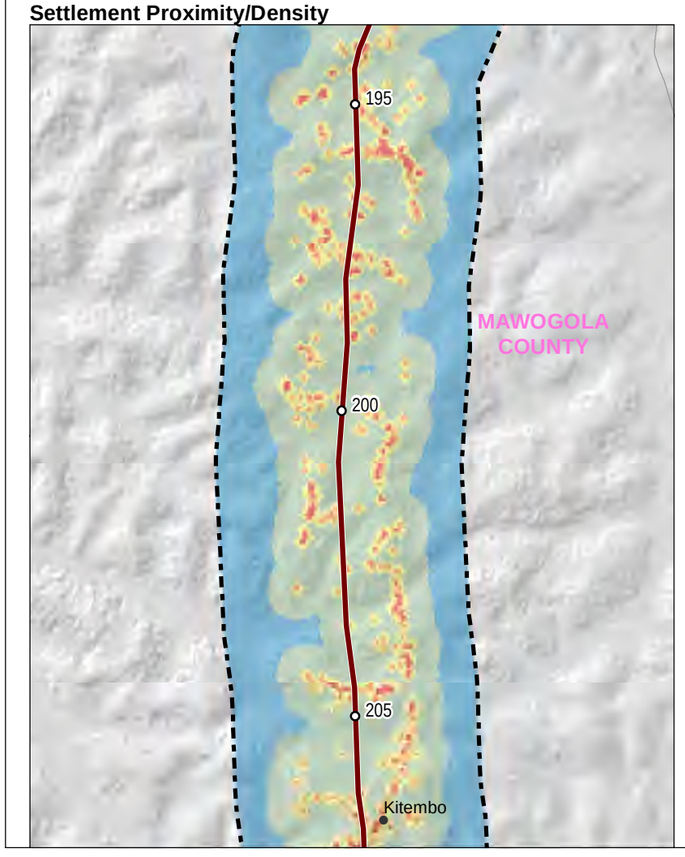
Administrative Area:

- County Boundary

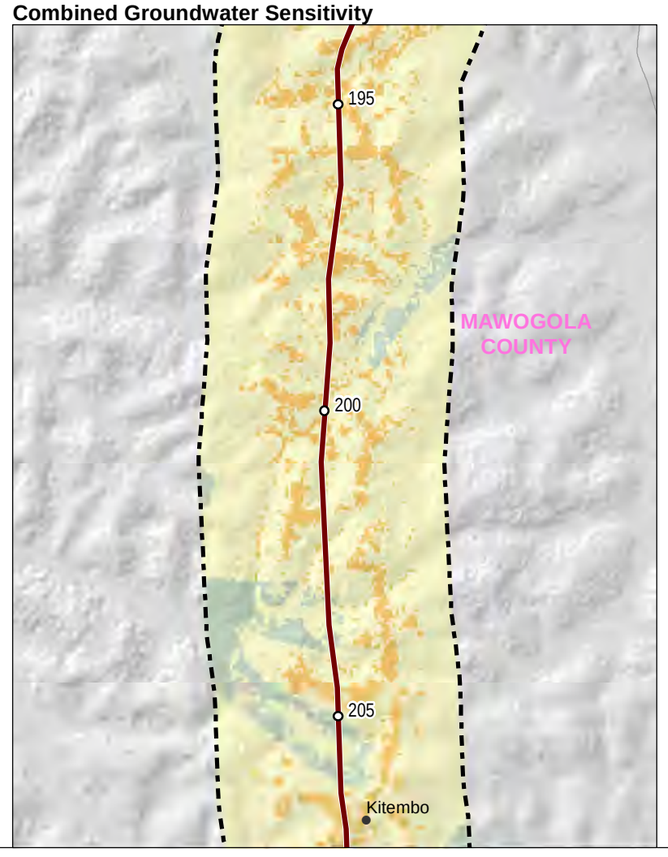
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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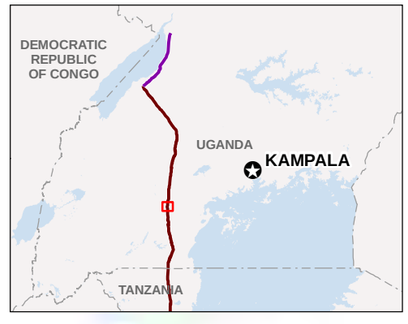

CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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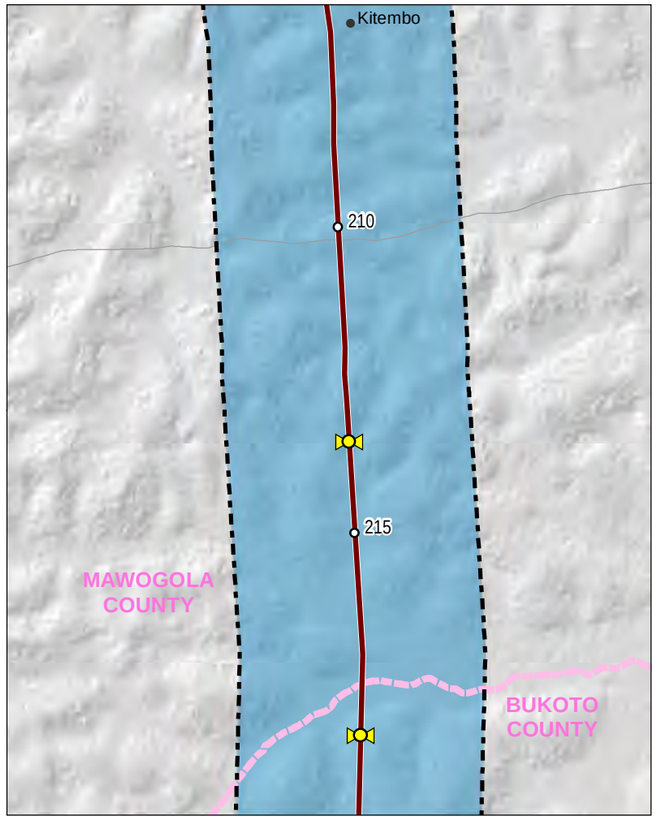
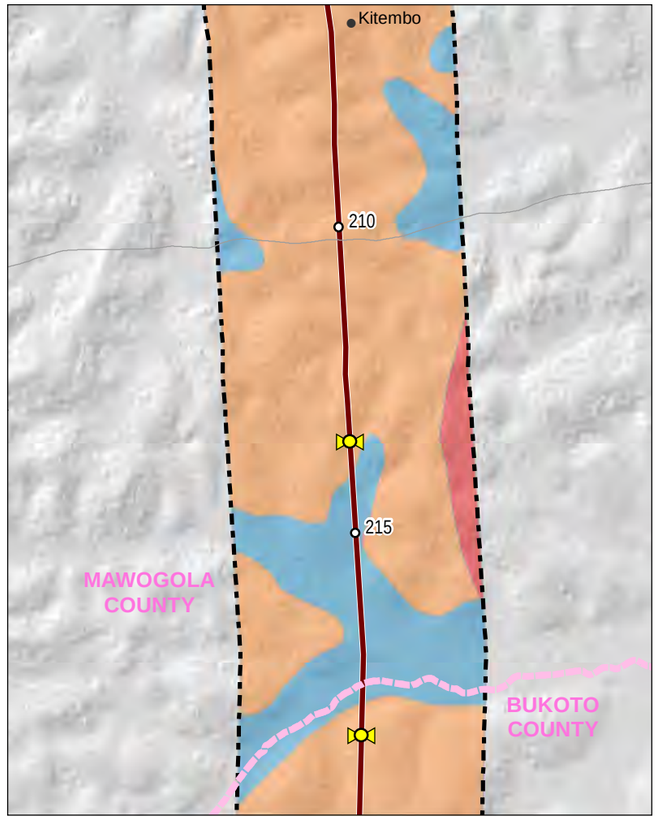
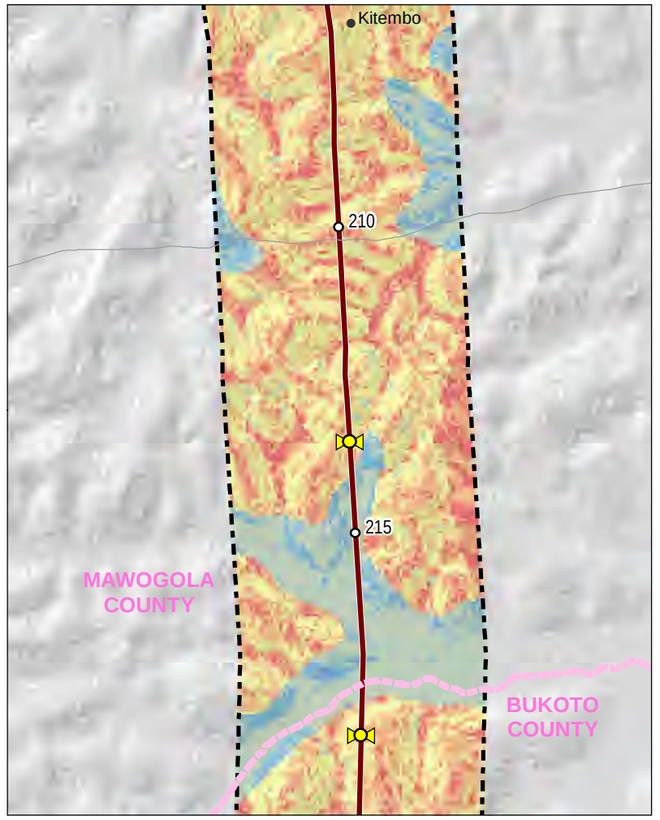
Aquifer Productivity



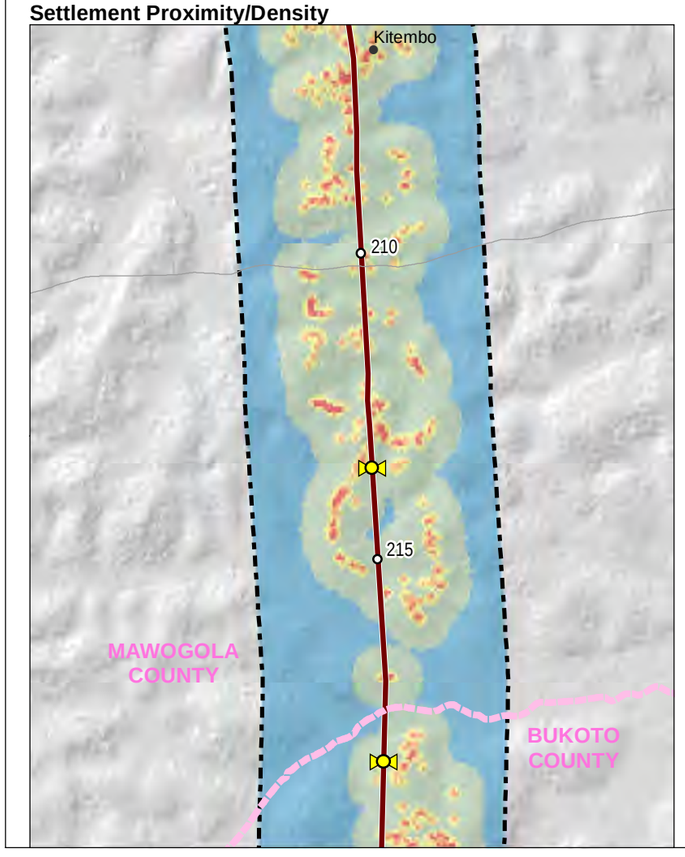
Soil Permeability



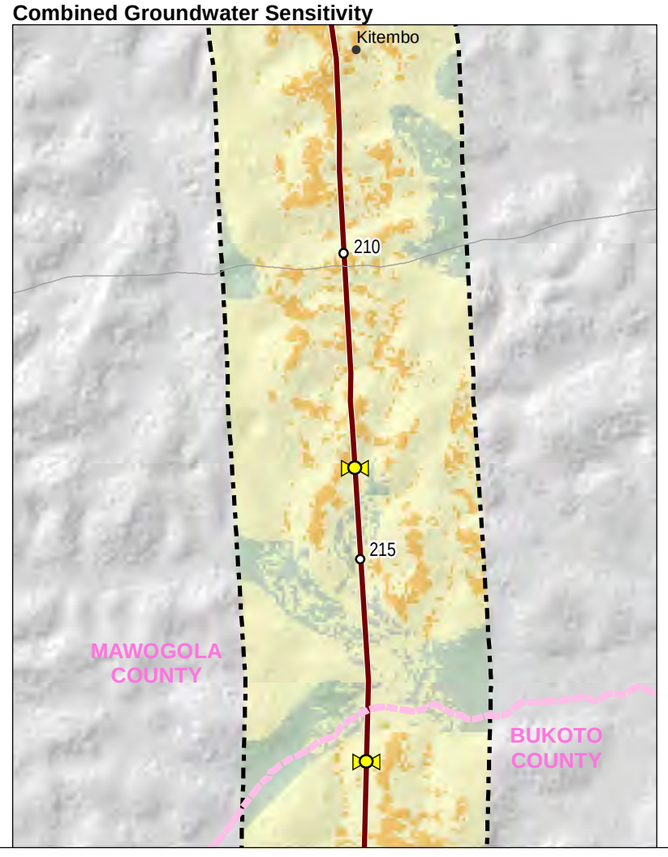
Recharge Potential



Settlement Proximity/Density



Combined Groundwater Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

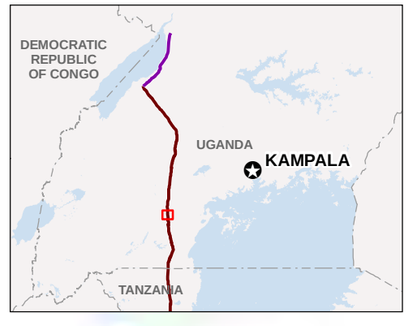
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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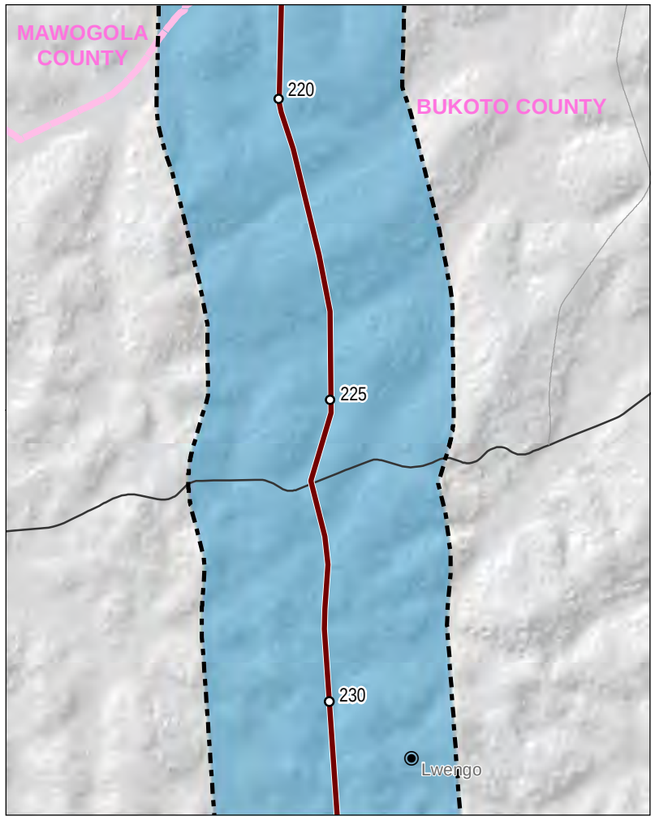
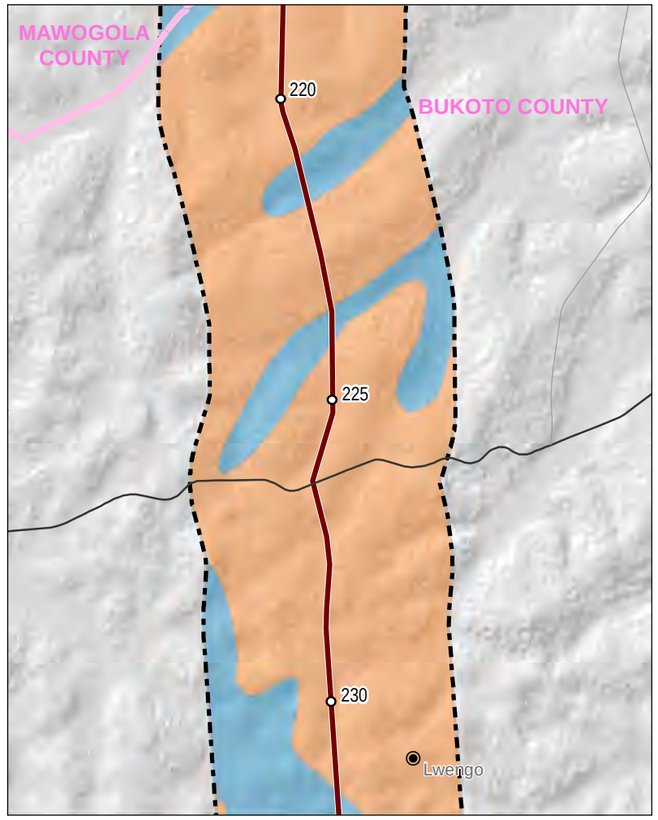
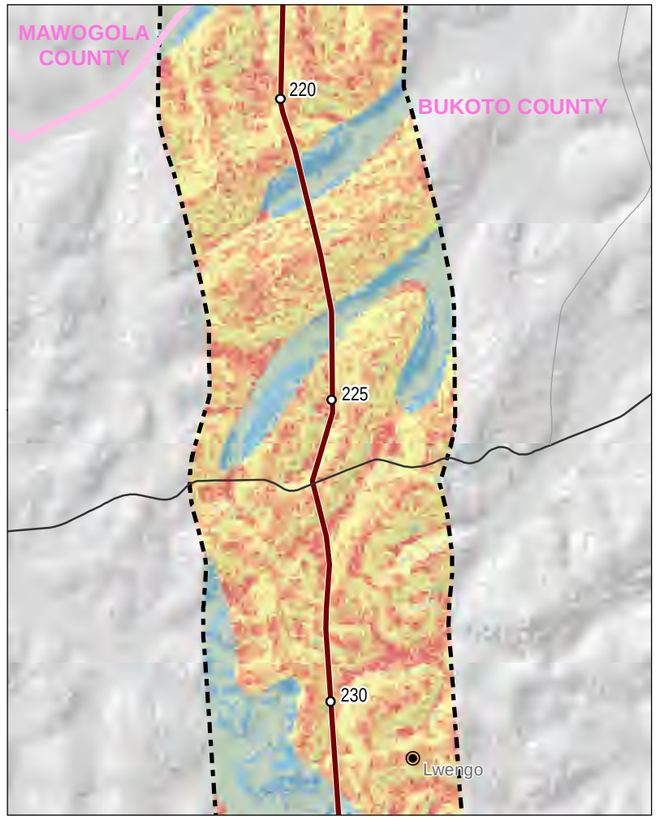
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
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Hydrology:

- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
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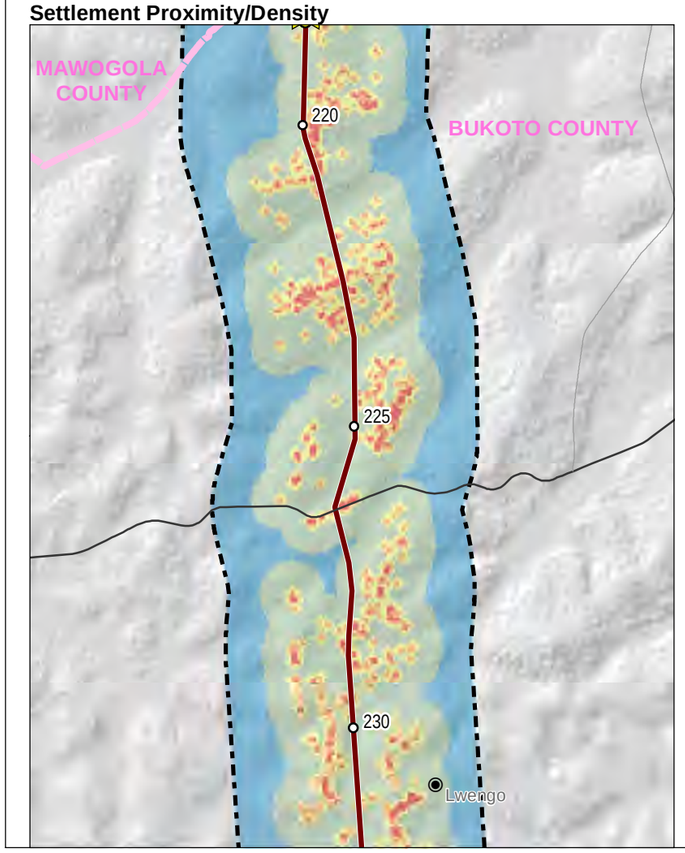
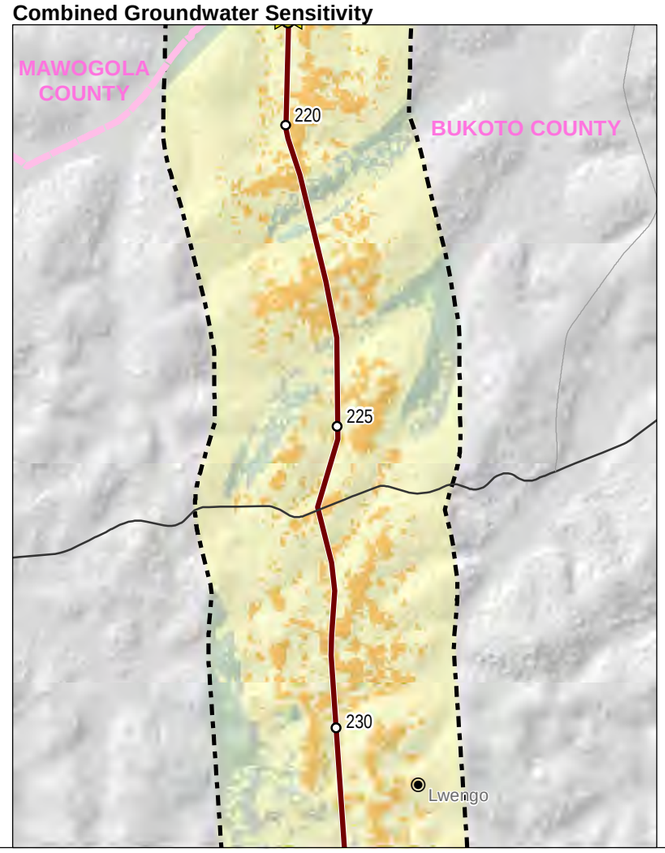
Settlement Proximity/Density



Combined Groundwater Sensitivity



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Datum: WGS 1984
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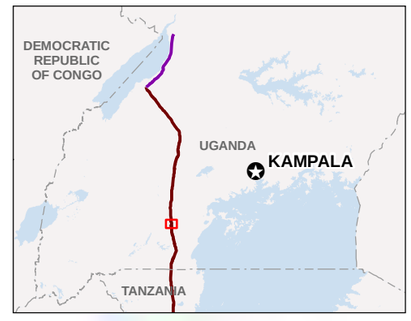

CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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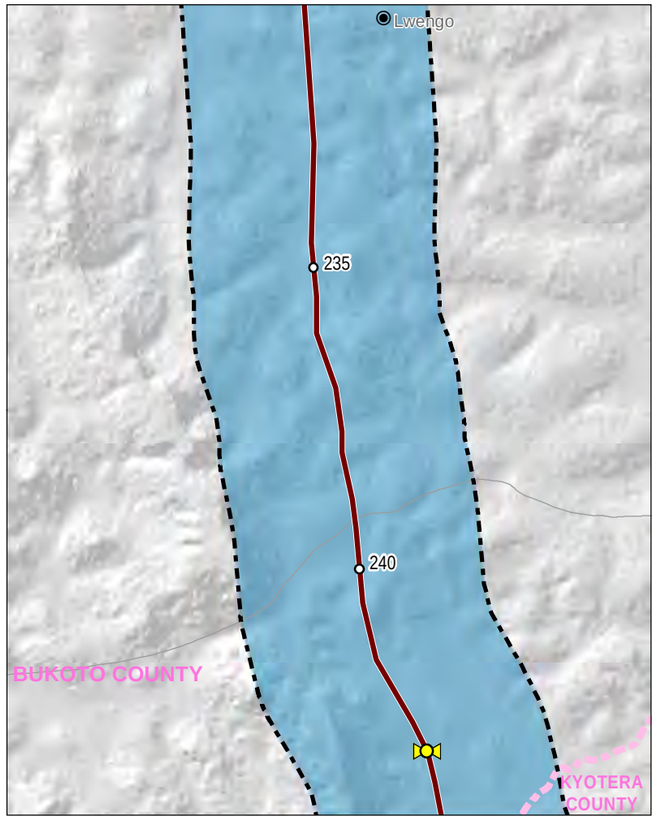
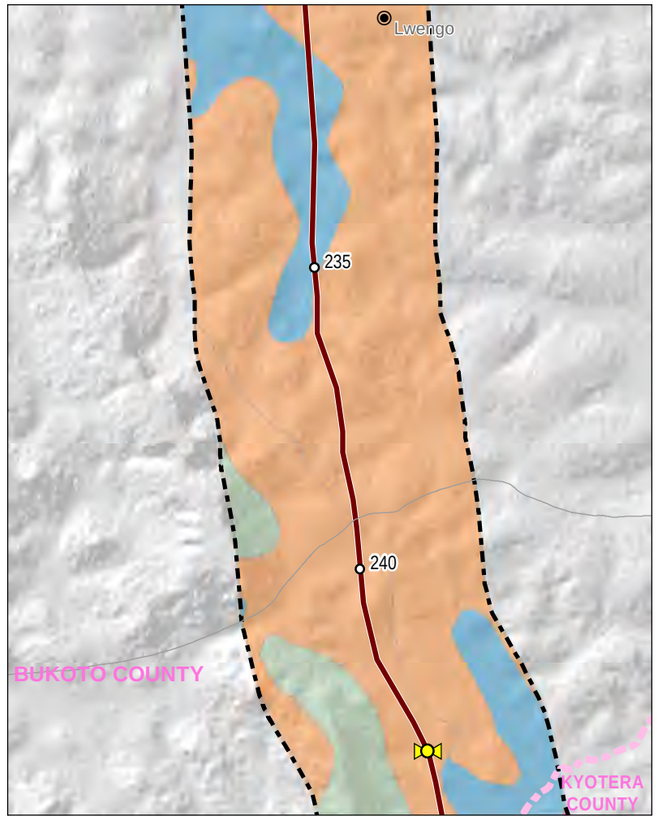
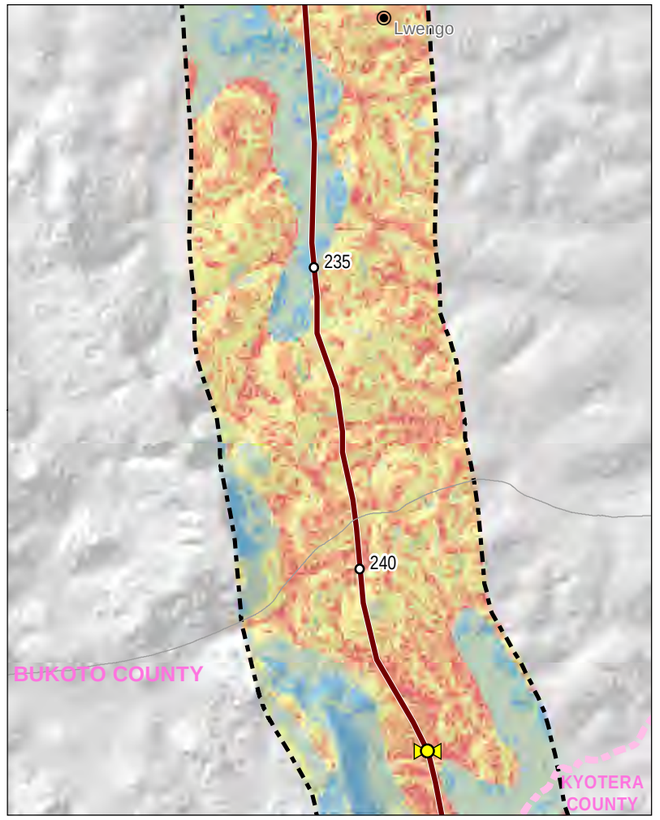
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
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- Low
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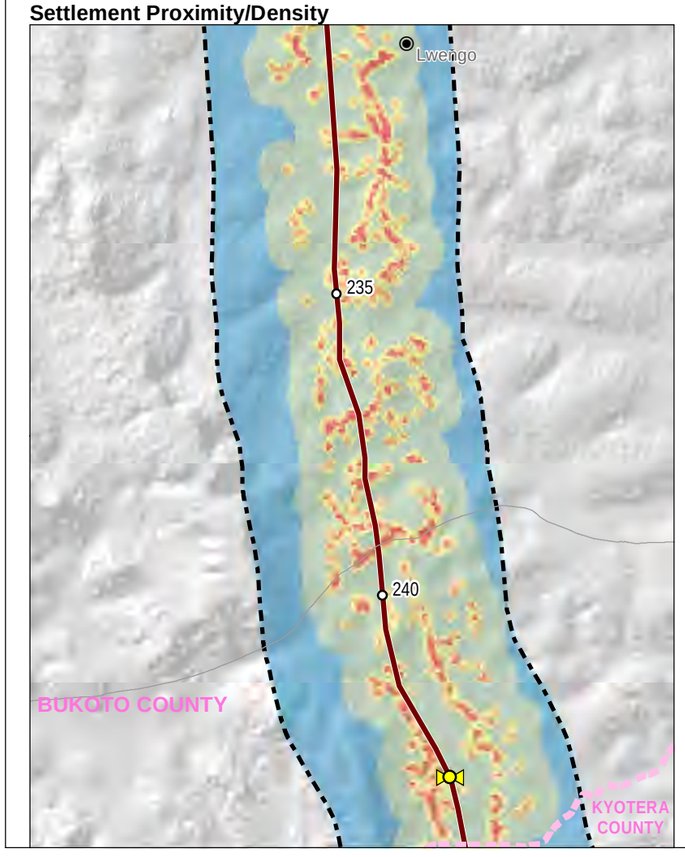
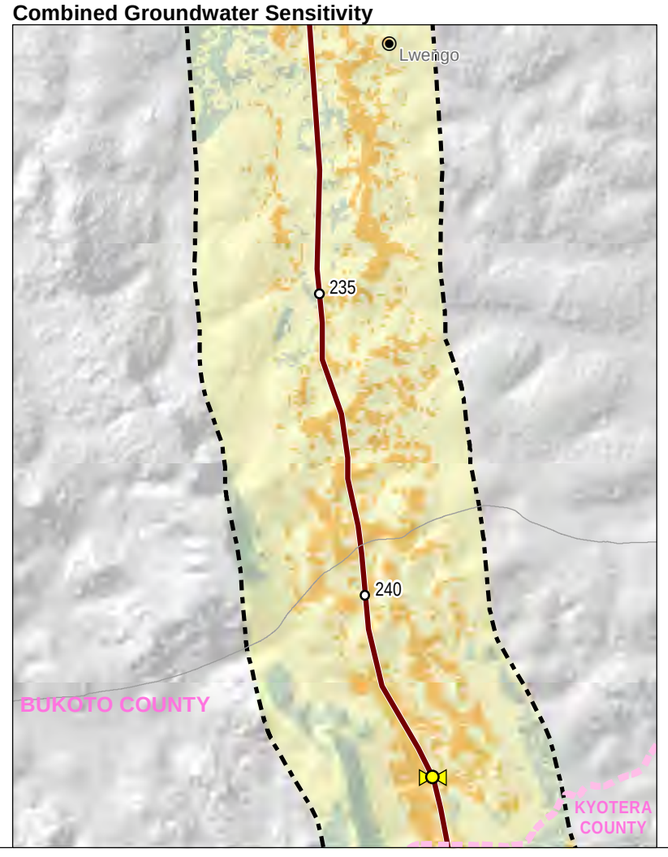
Settlement Proximity/Density



Combined Groundwater Sensitivity



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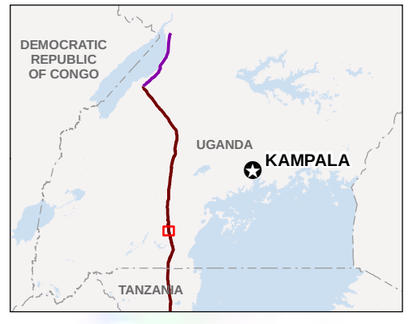
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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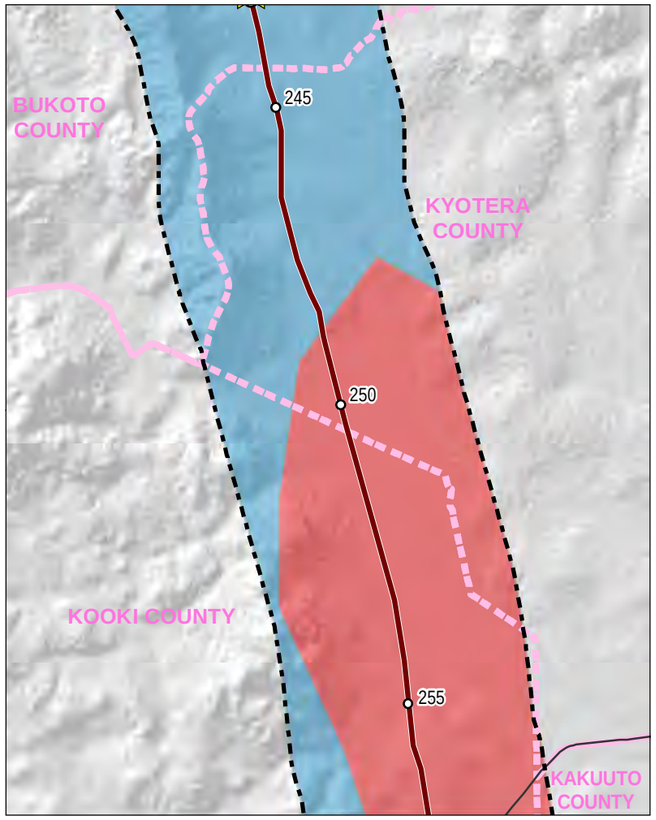
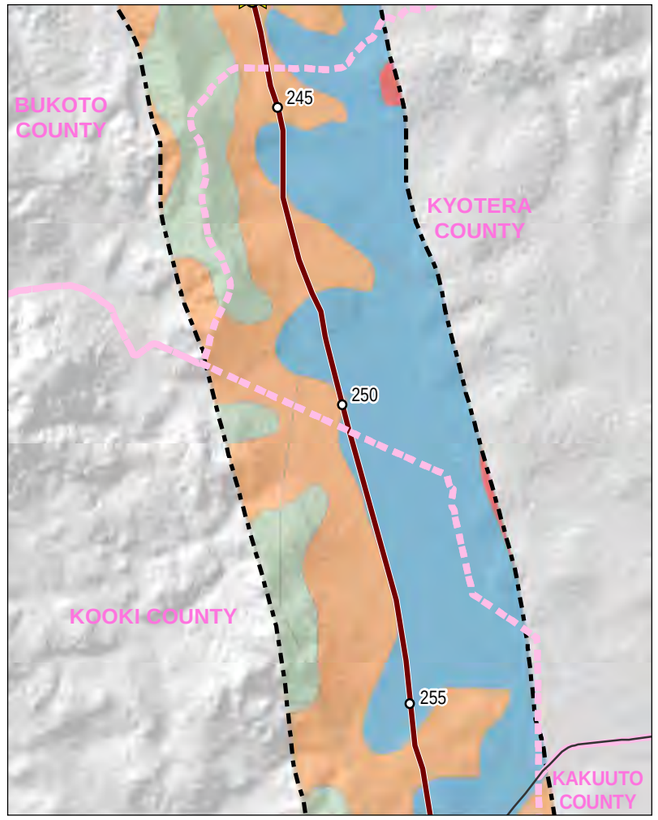
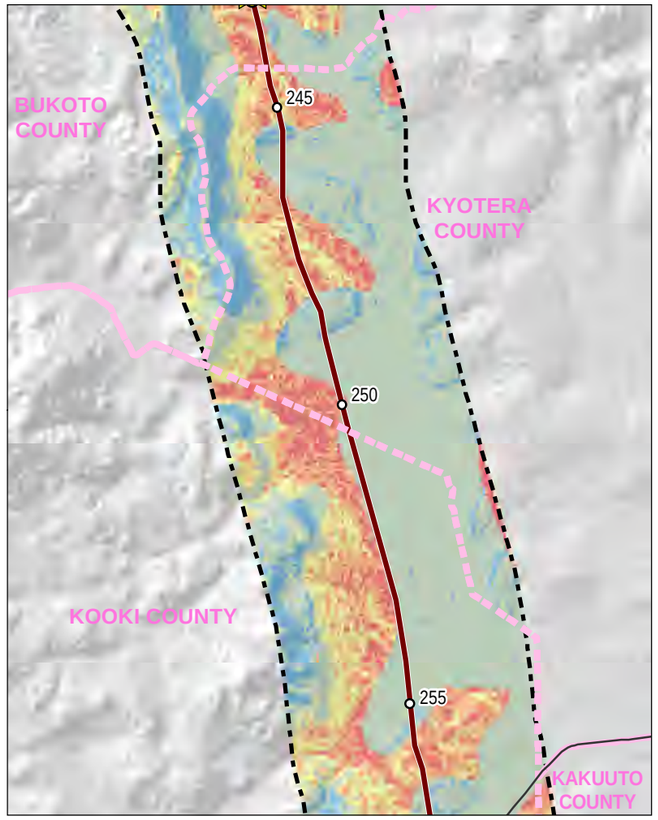
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

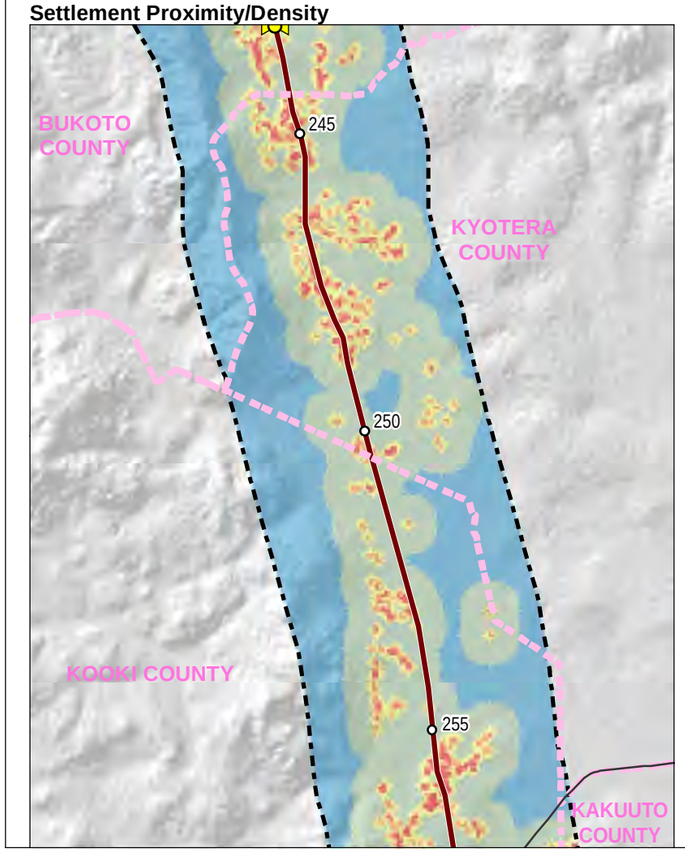
Administrative Area:

- County Boundary

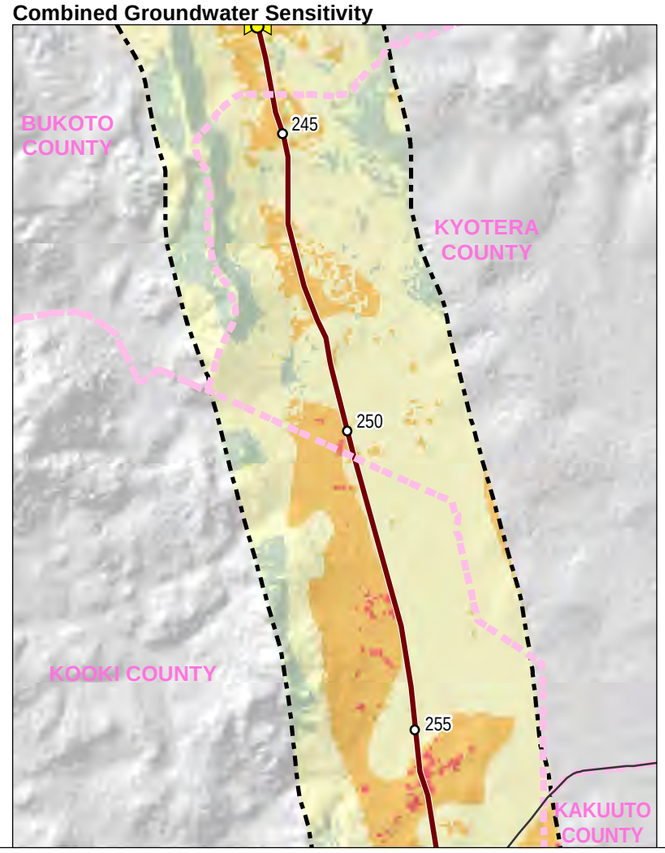
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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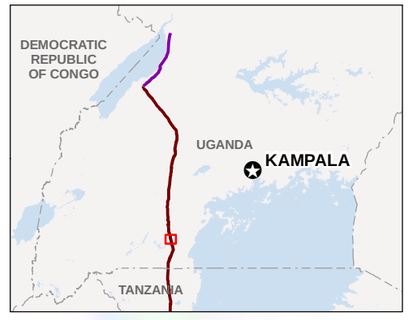
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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W E
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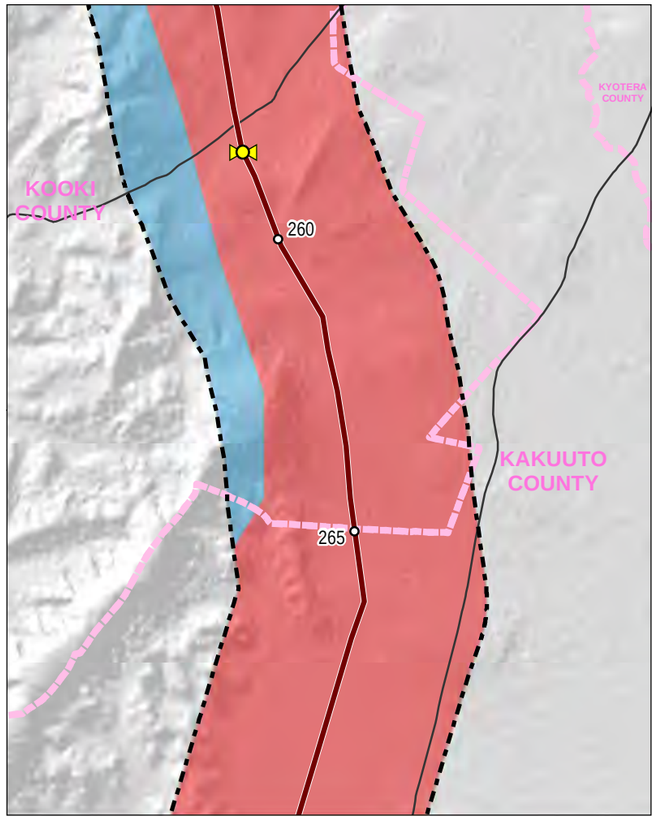
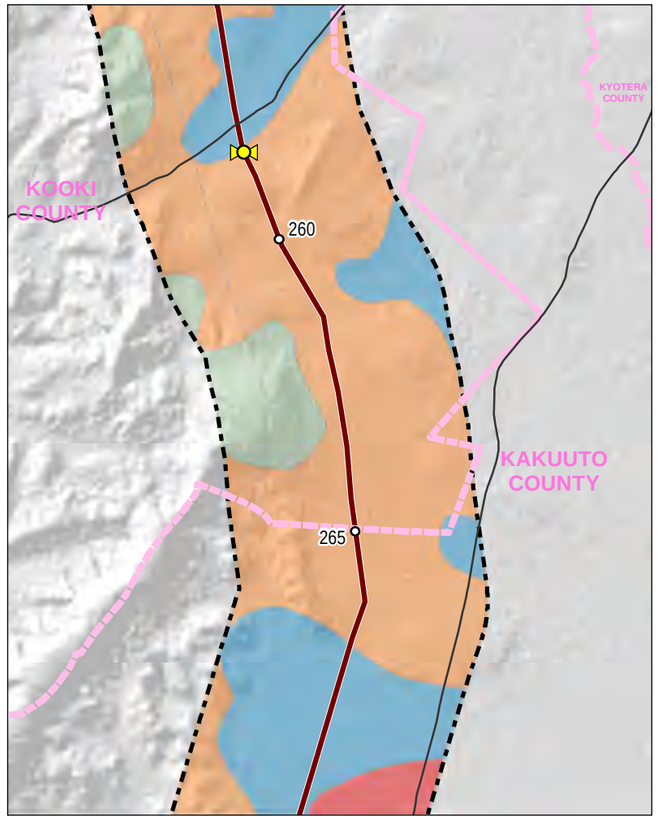
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-055[A].mxd

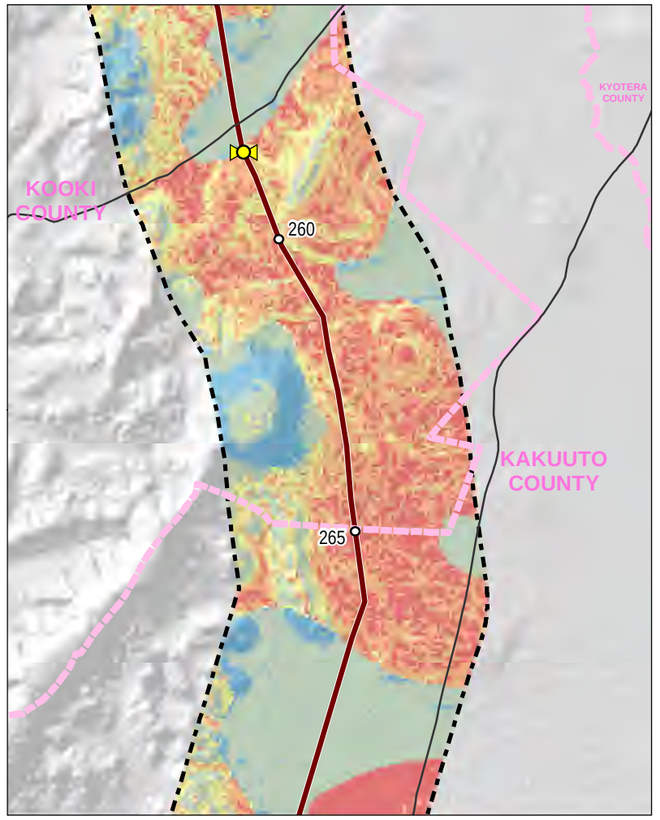
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

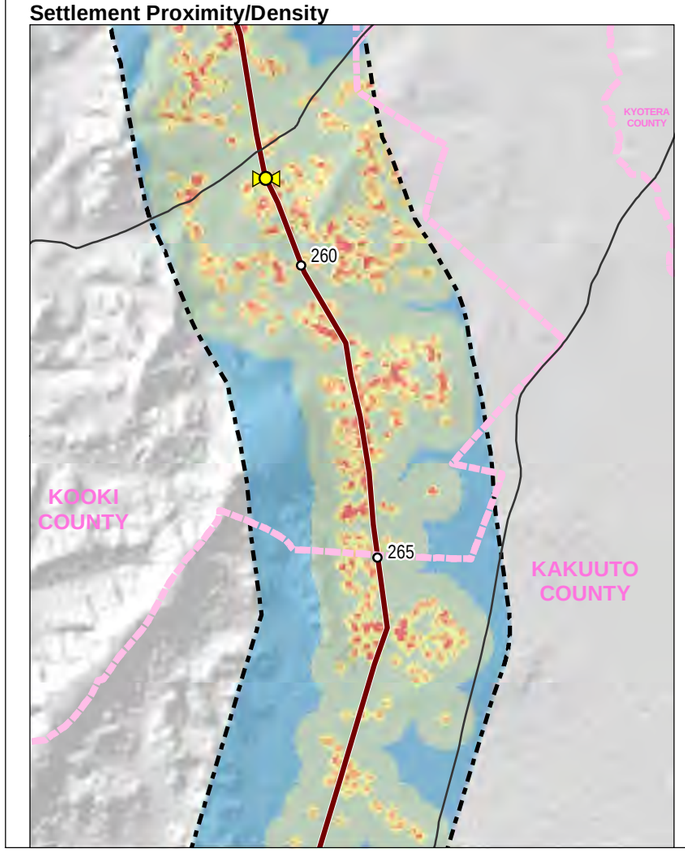
Administrative Area:

- County Boundary

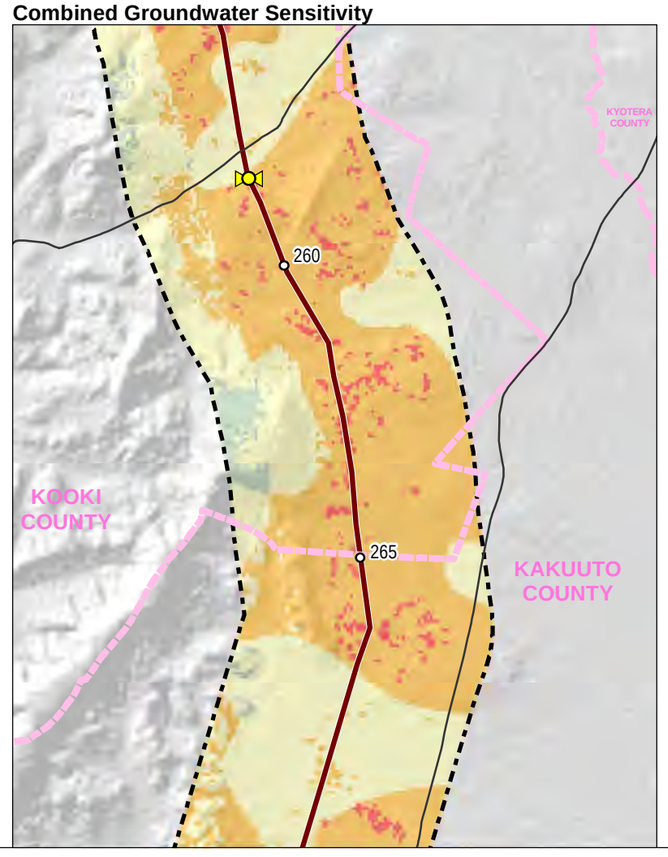
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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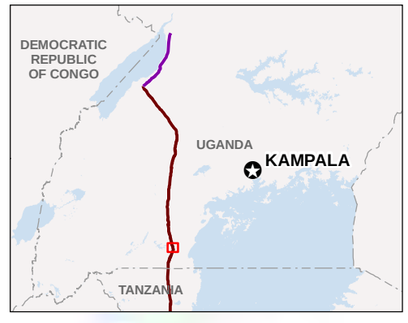

CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

N W E S

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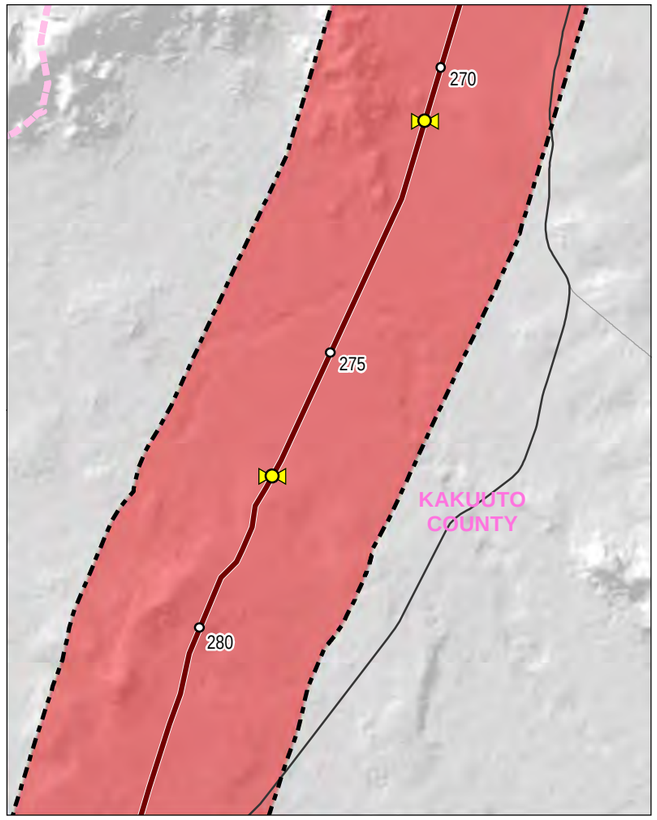
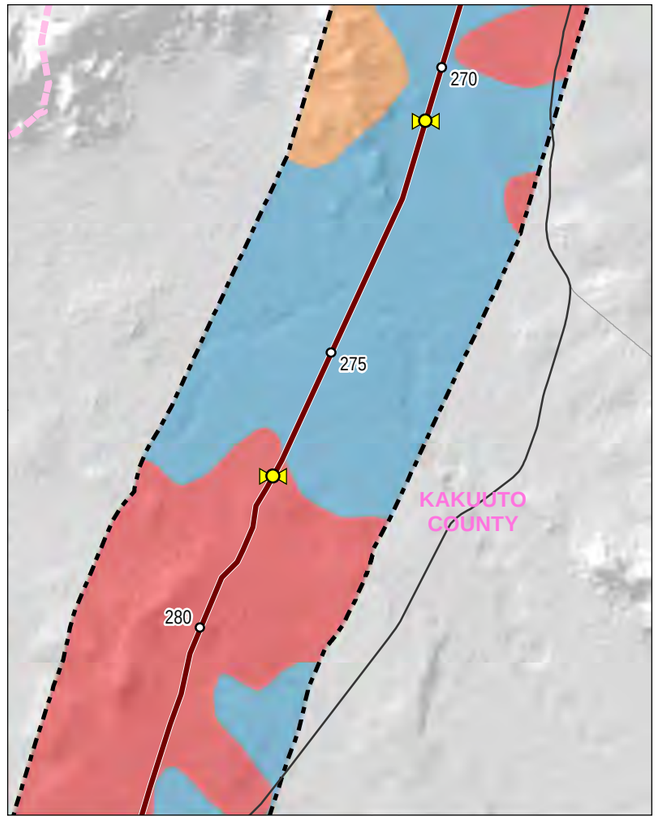
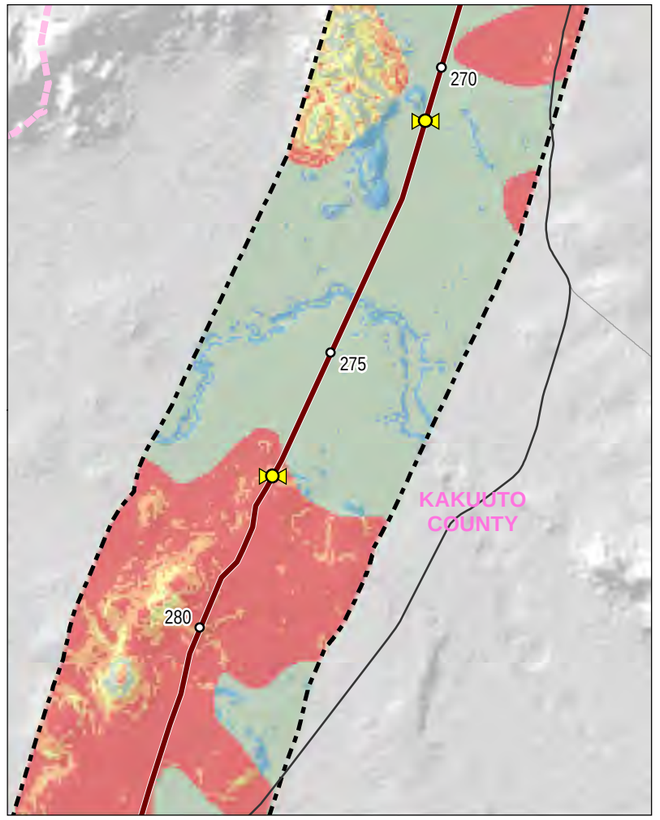
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

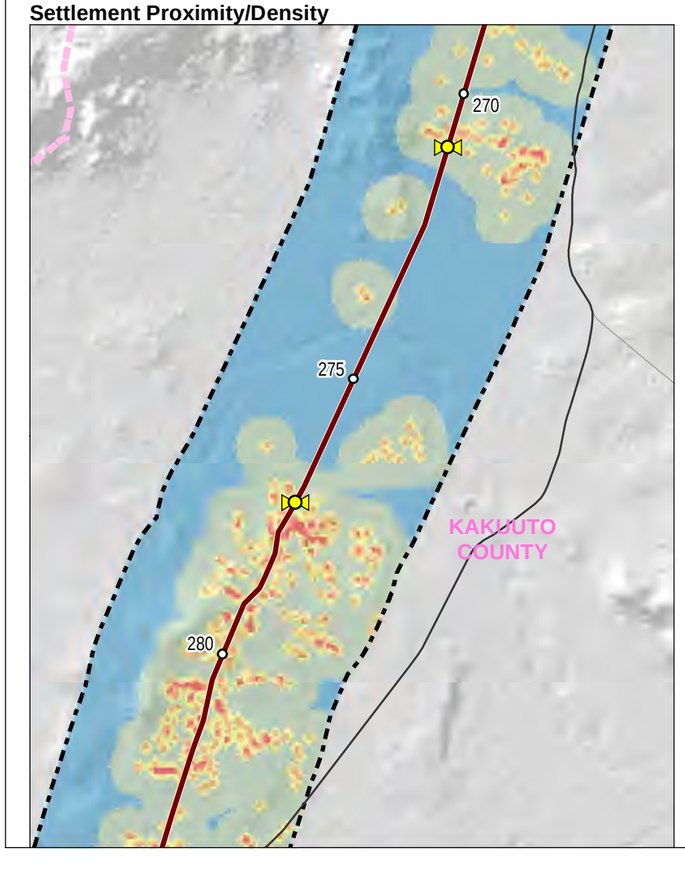
Administrative Area:

- County Boundary

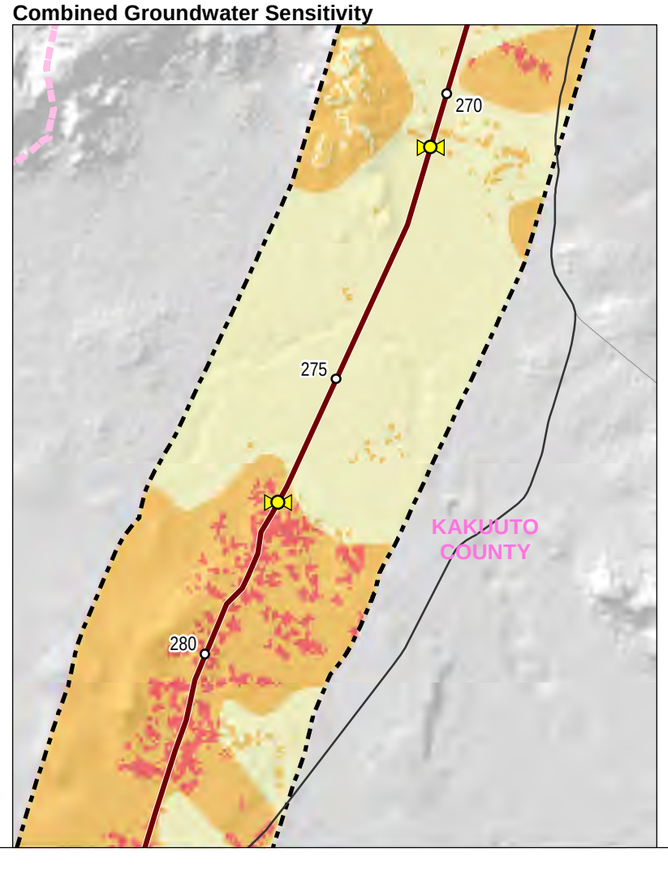
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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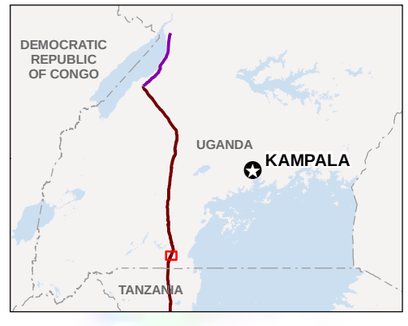
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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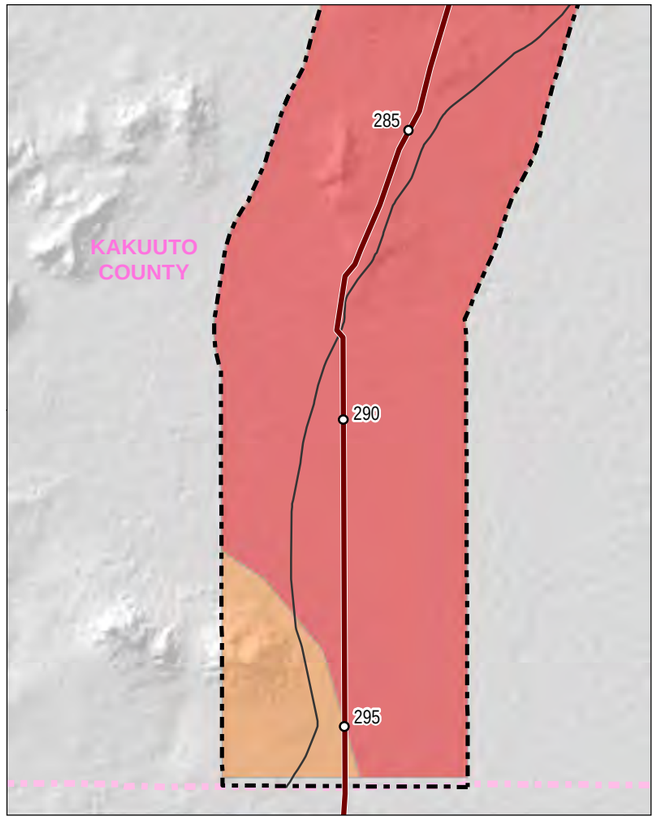
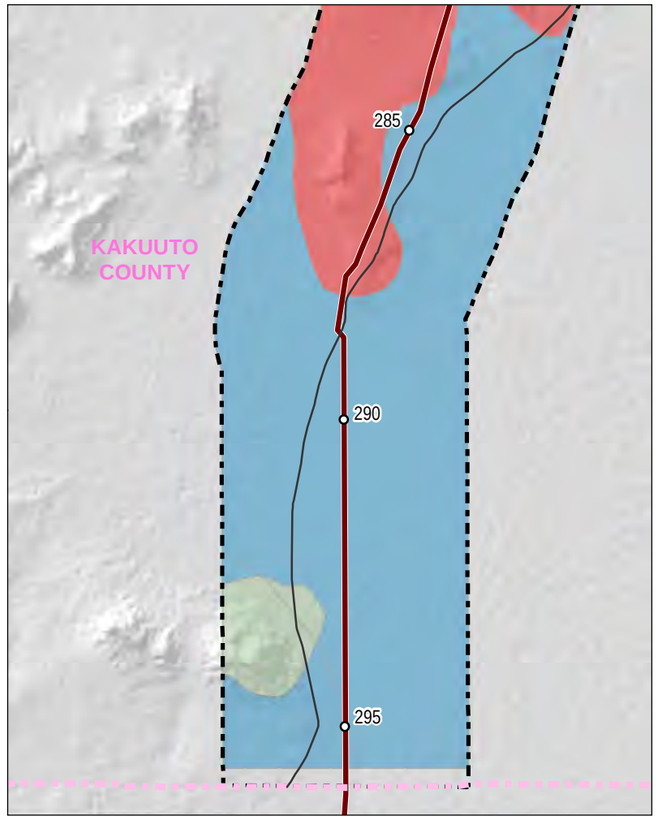
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-055[A].mxd

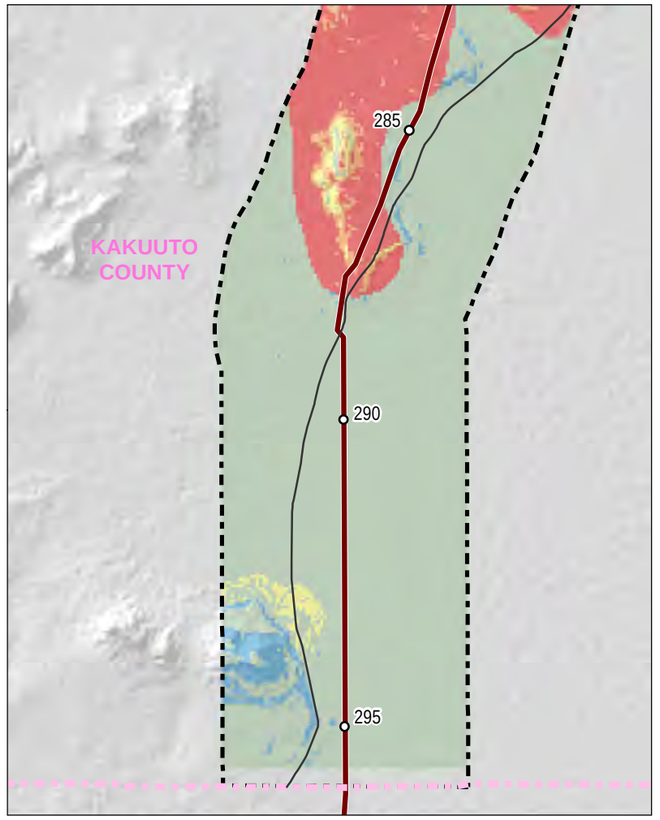
Aquifer Productivity



Soil Permeability



Recharge Potential



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Lake

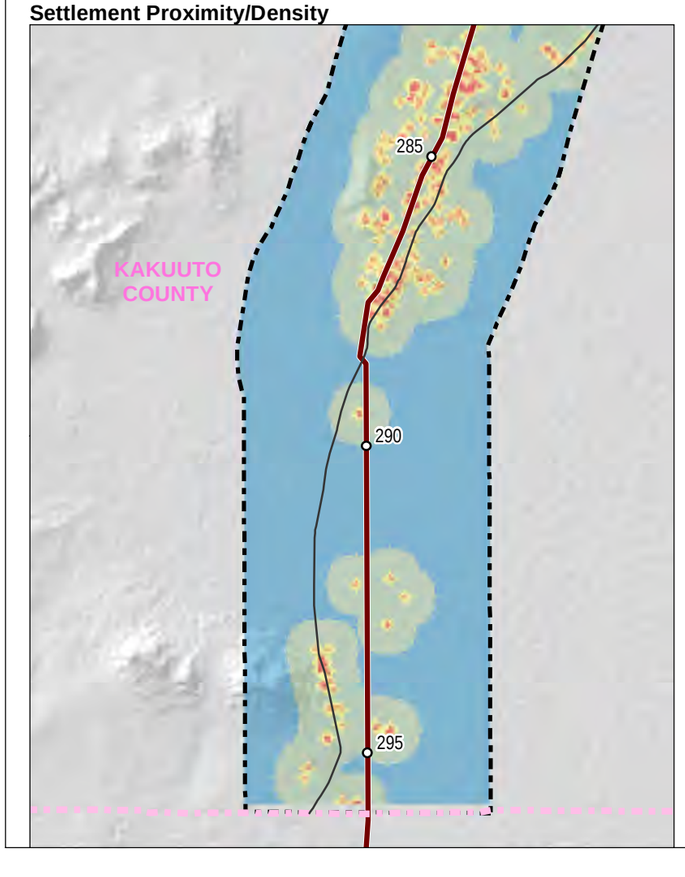
Administrative Area:

- County Boundary

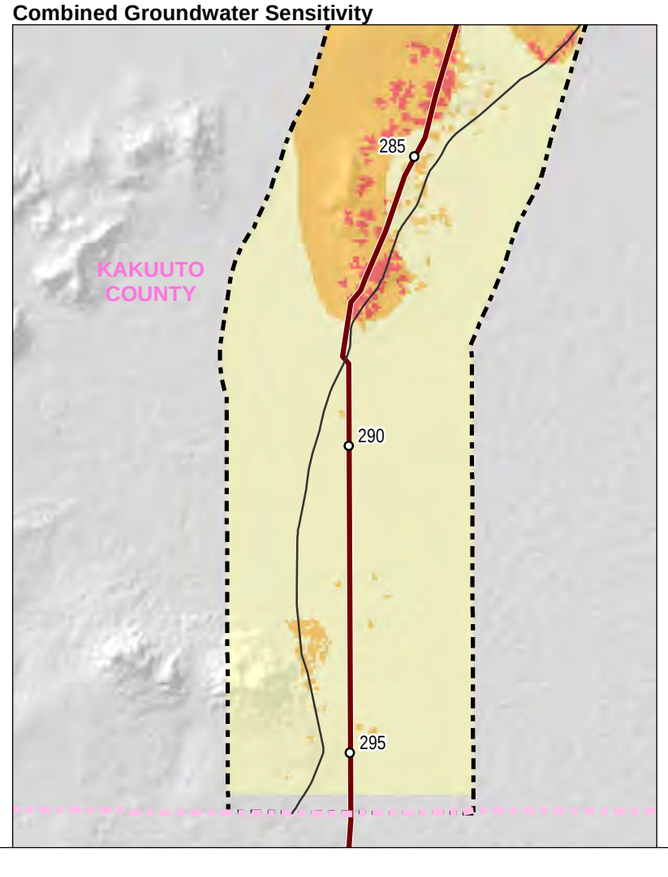
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Settlement Proximity/Density



Combined Groundwater Sensitivity



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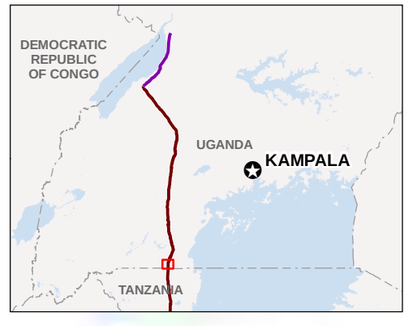
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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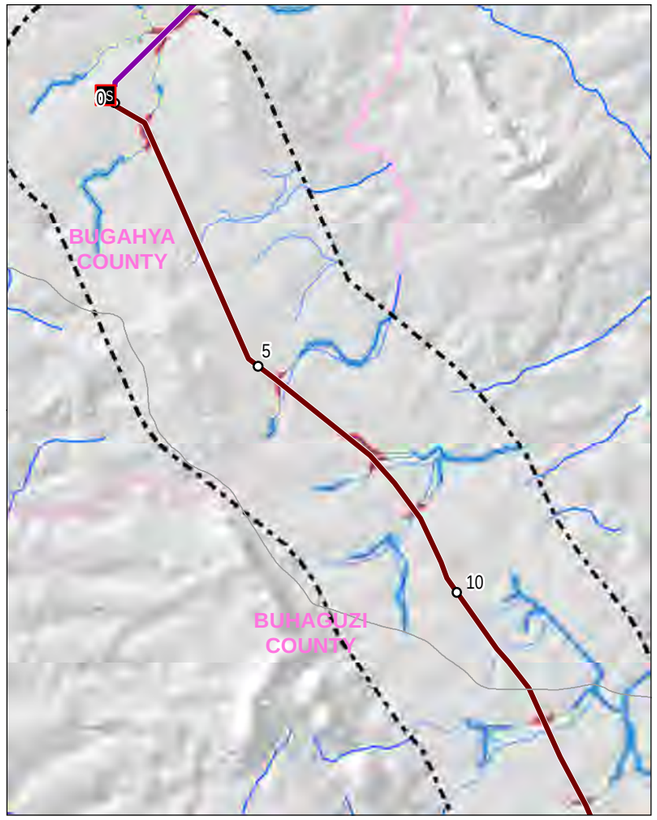
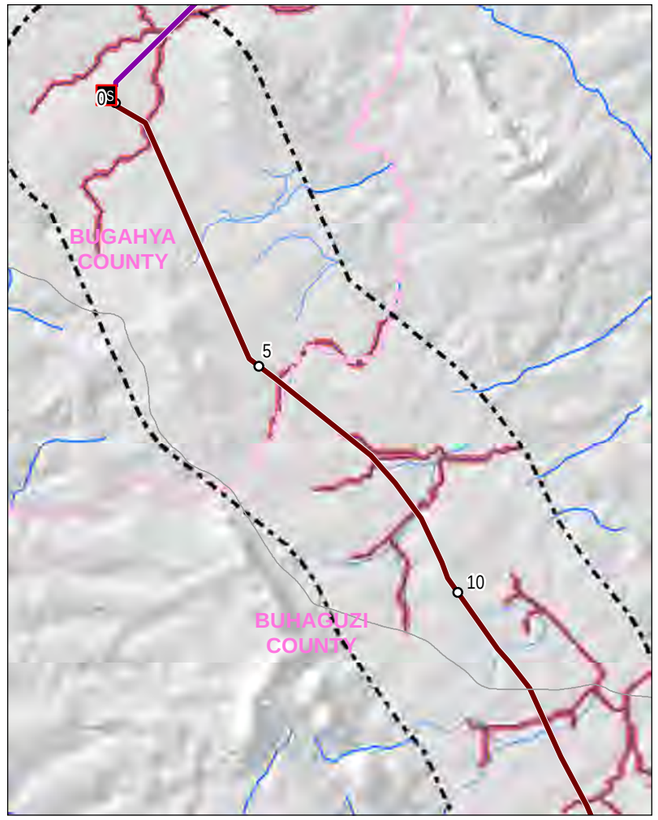
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-055[A].mxd

ATTACHMENT I1.3 SENSITIVITY SCREENING – SURFACE WATER VECS

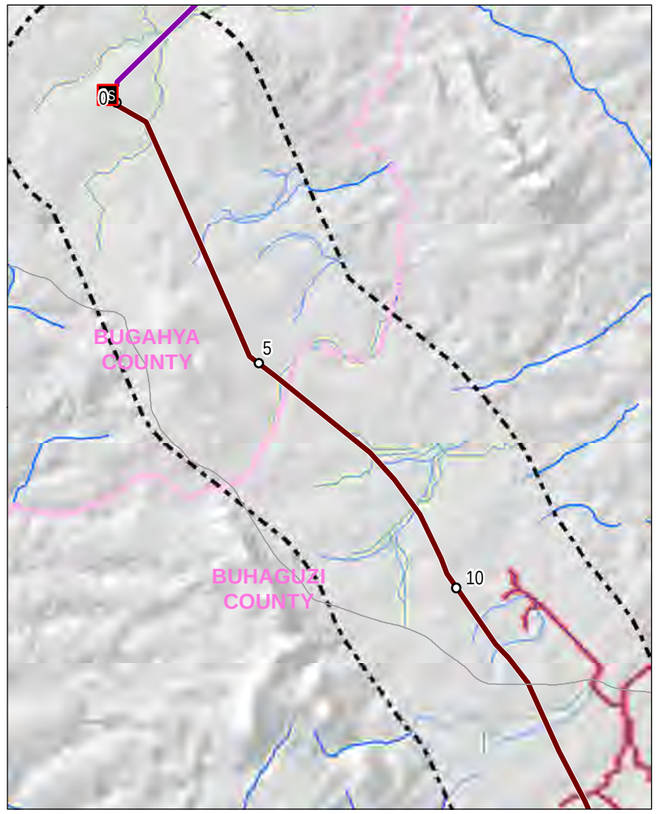
Distance to Surface Water



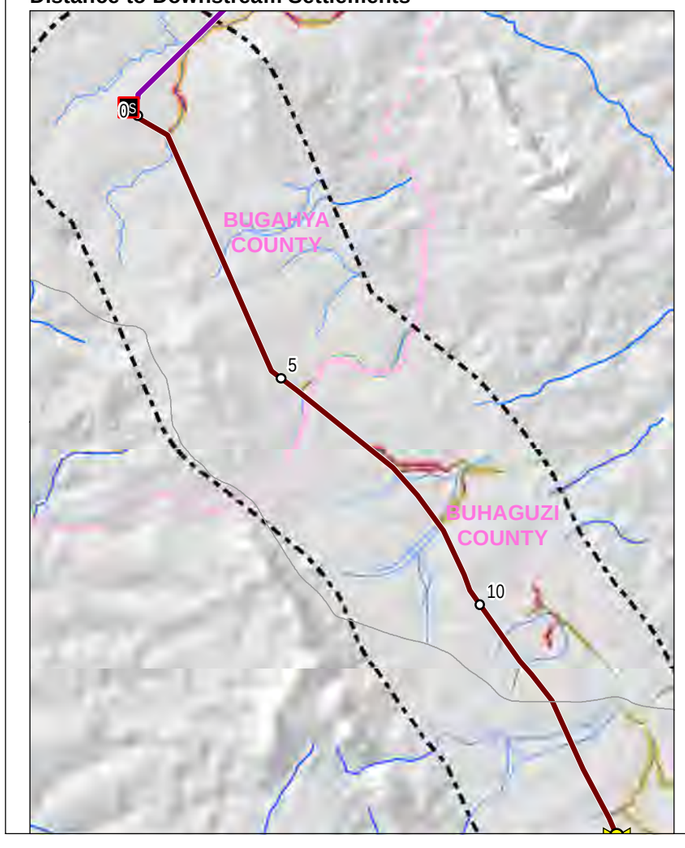
Surface Water Crossings



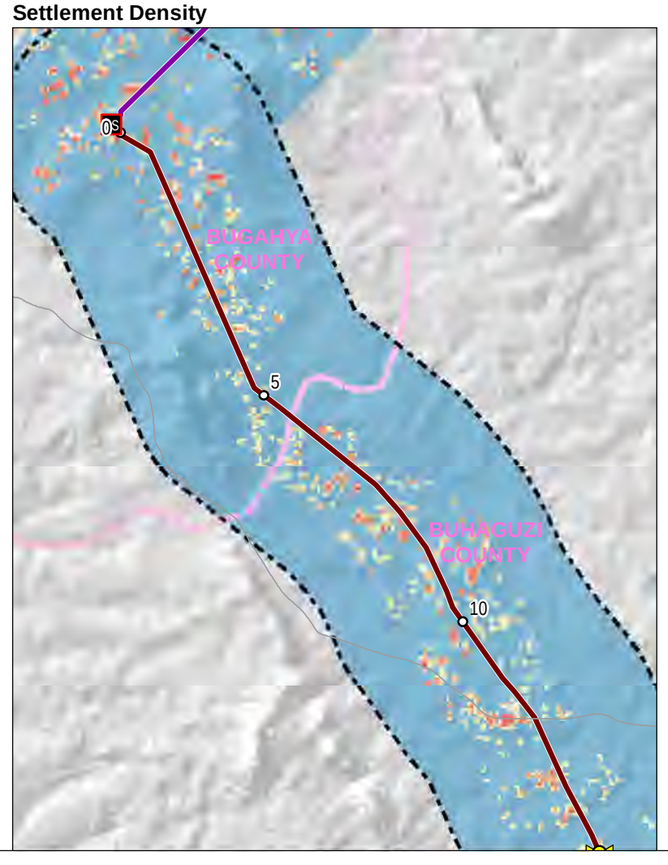
Surface Water Type



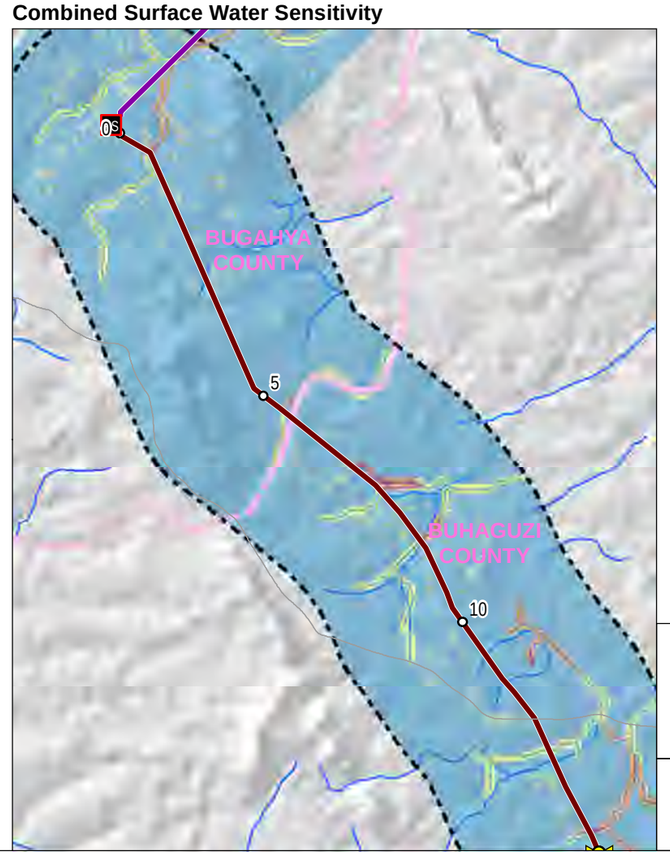
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Pumping Station
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

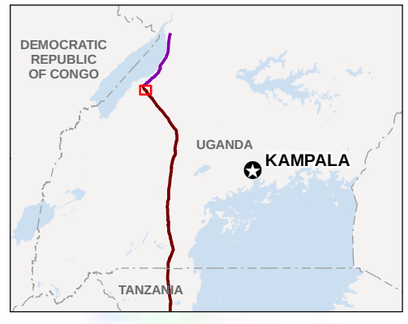
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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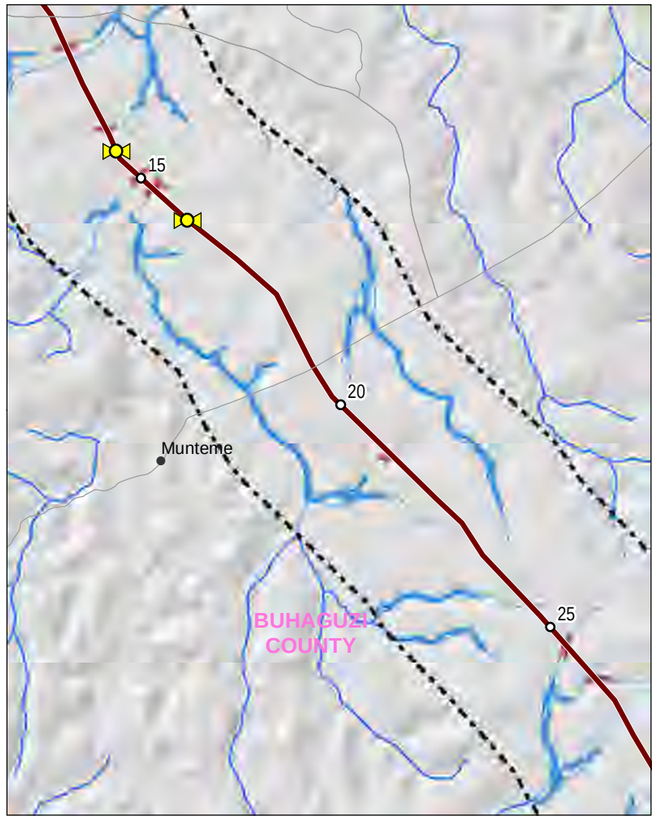
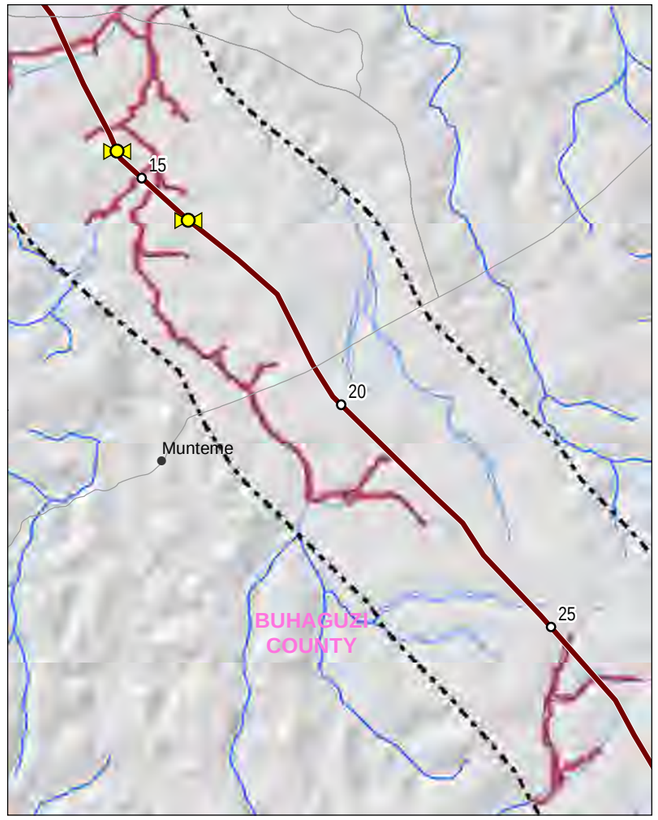
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

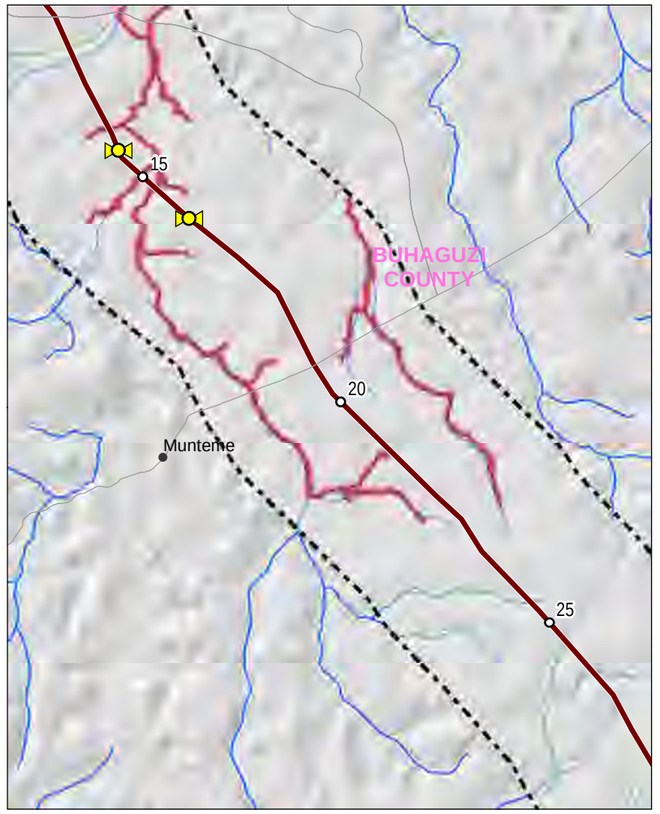
Distance to Surface Water



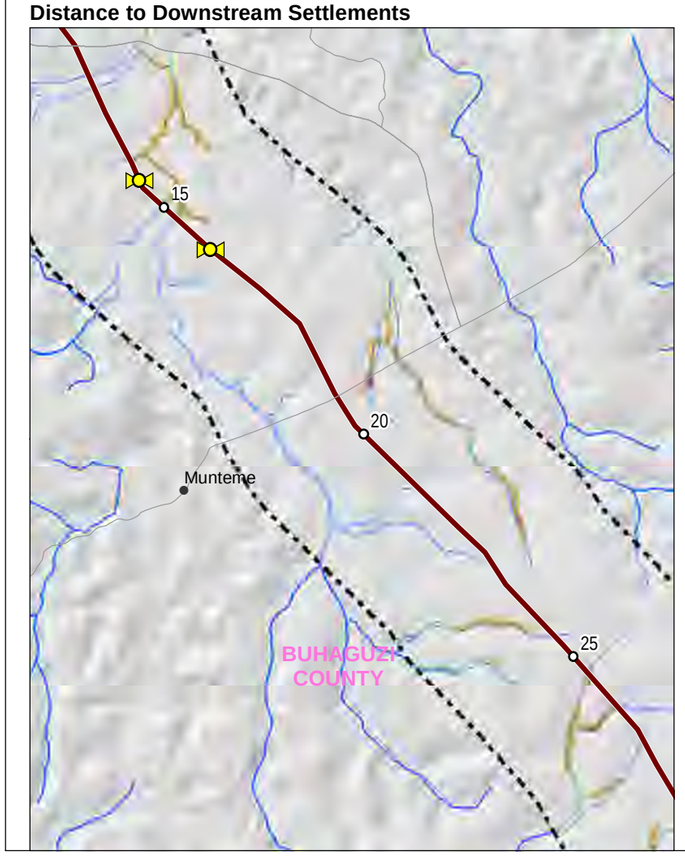
Surface Water Crossings



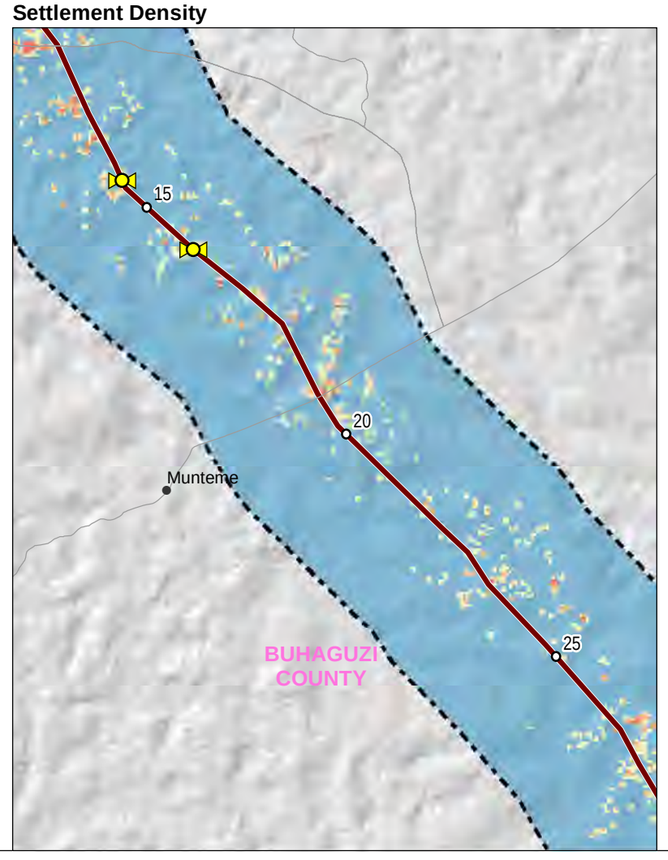
Surface Water Type



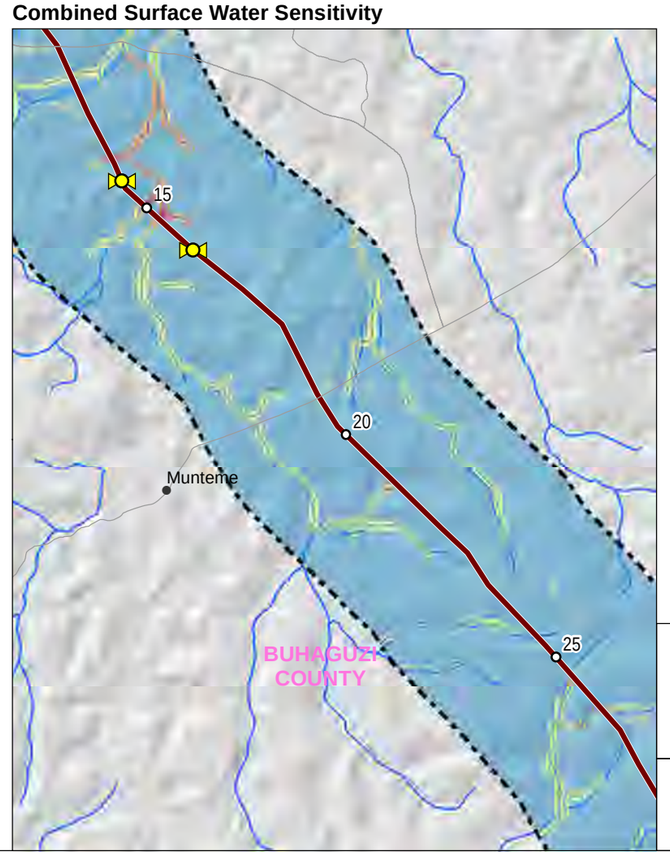
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

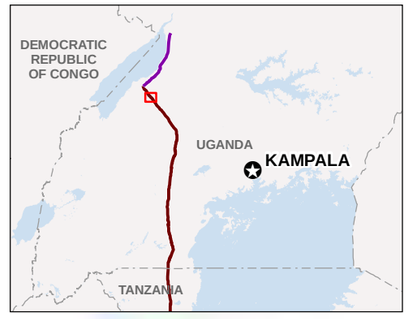
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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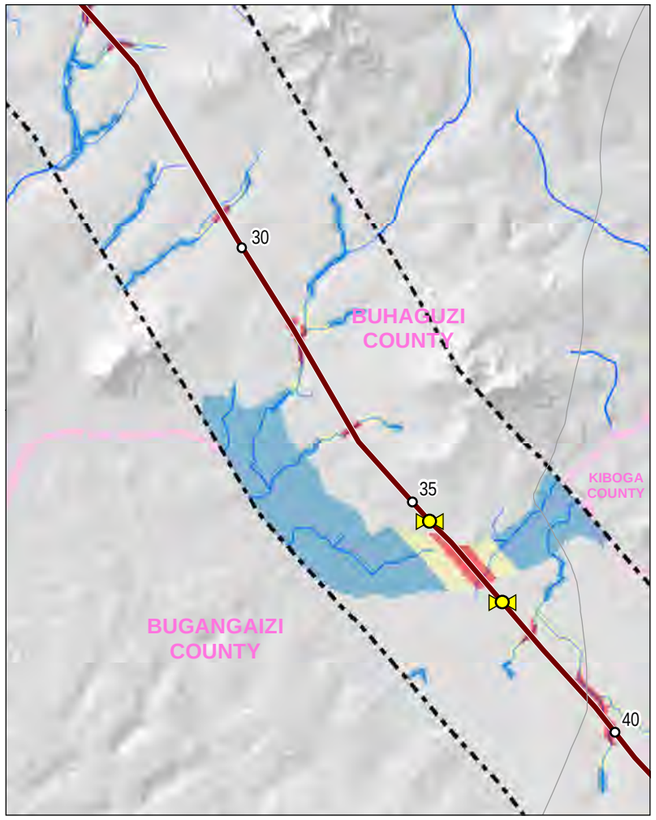
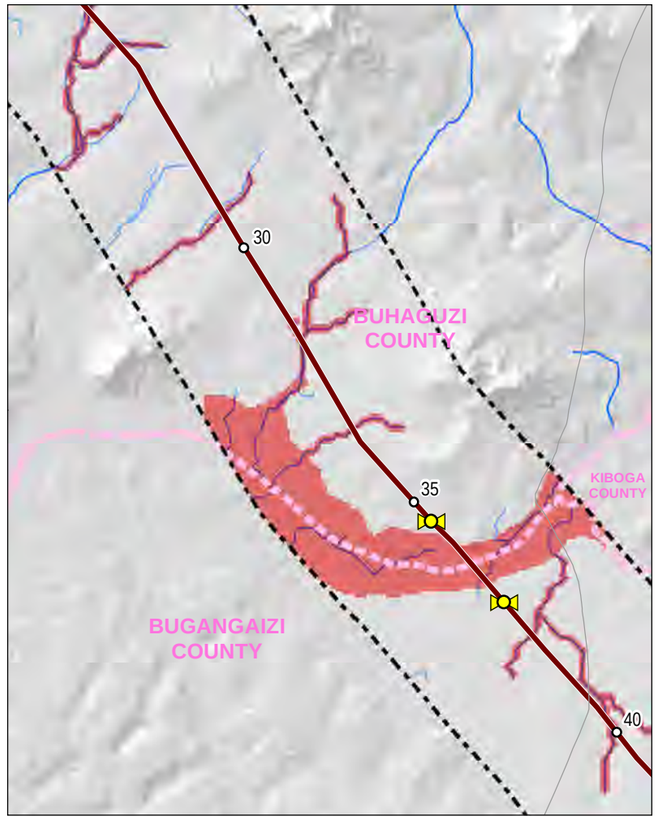
W E
S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056(A).mxd

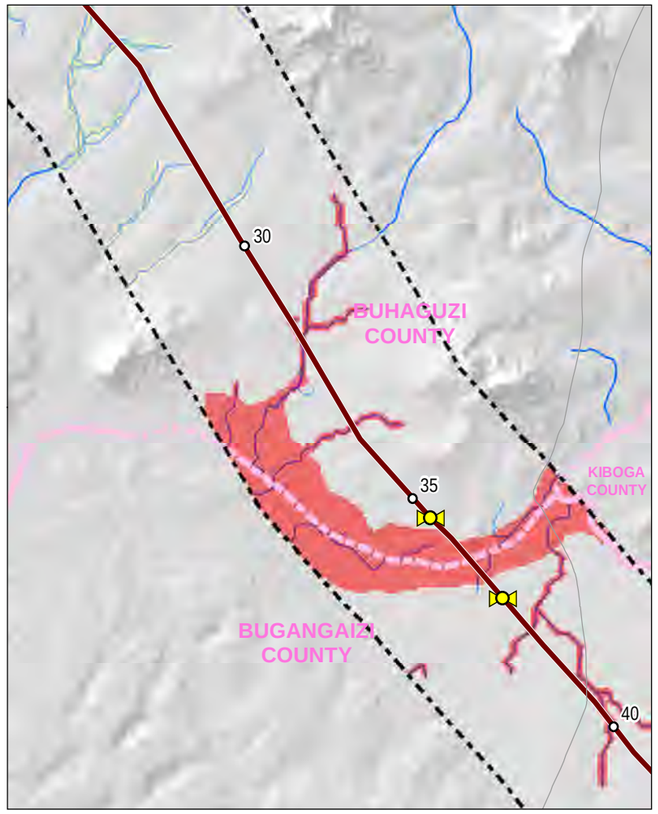
Distance to Surface Water



Surface Water Crossings



Surface Water Type



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

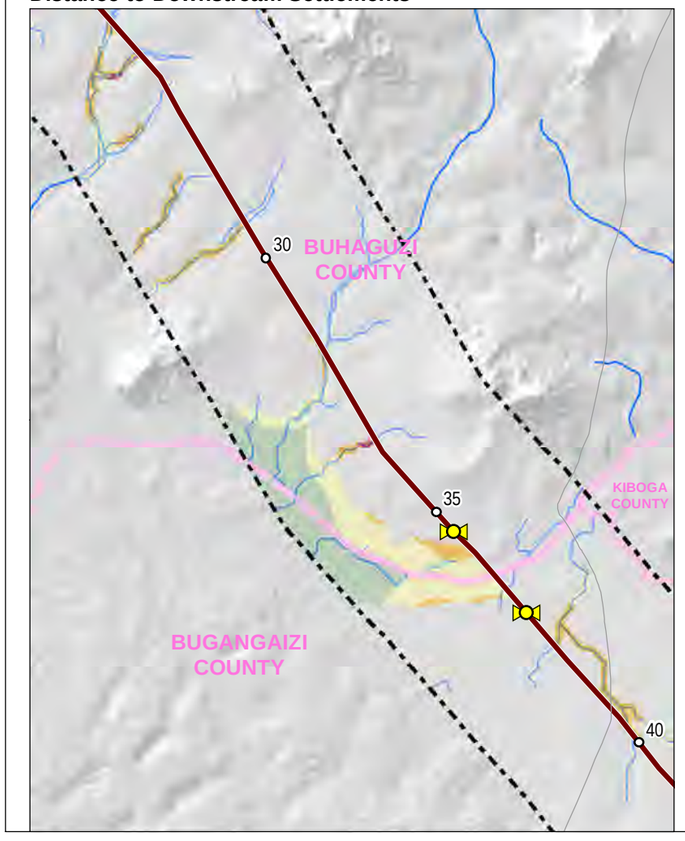
Administrative Area:

- County Boundary

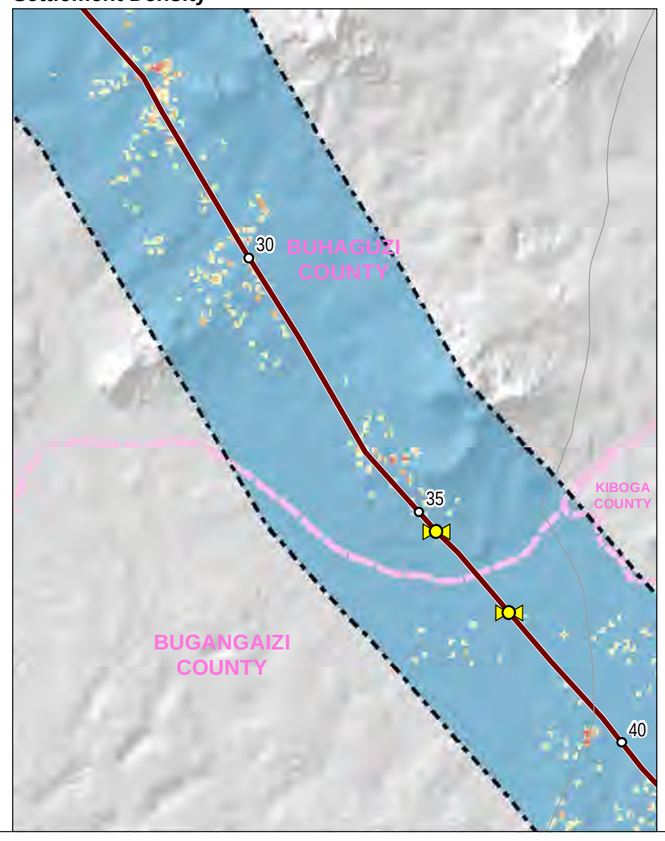
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

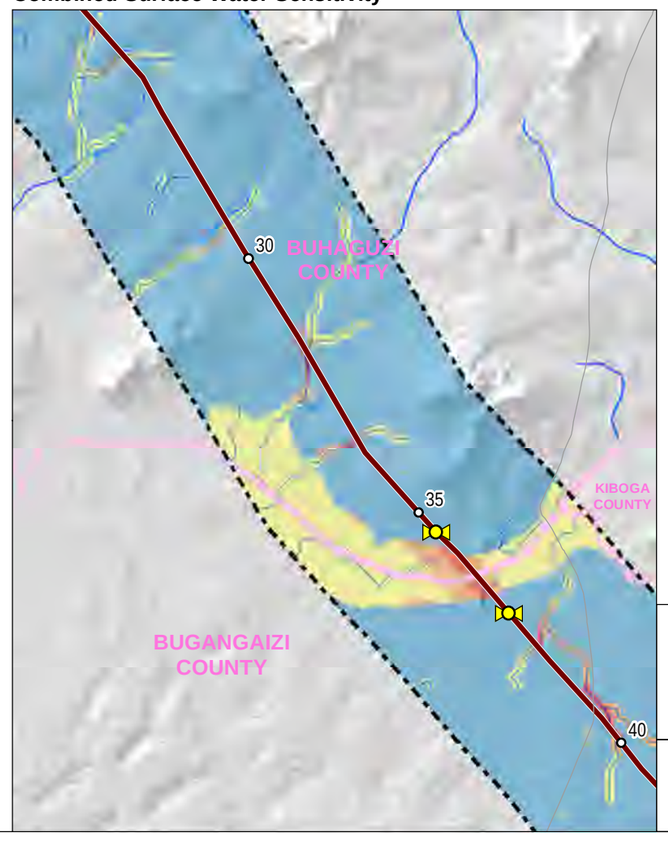
Distance to Downstream Settlements



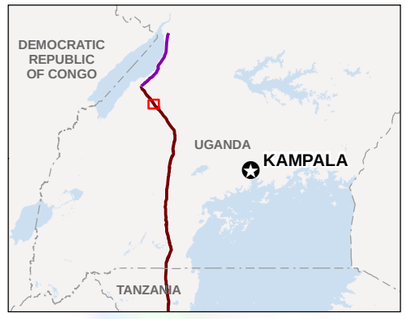
Settlement Density



Combined Surface Water Sensitivity



Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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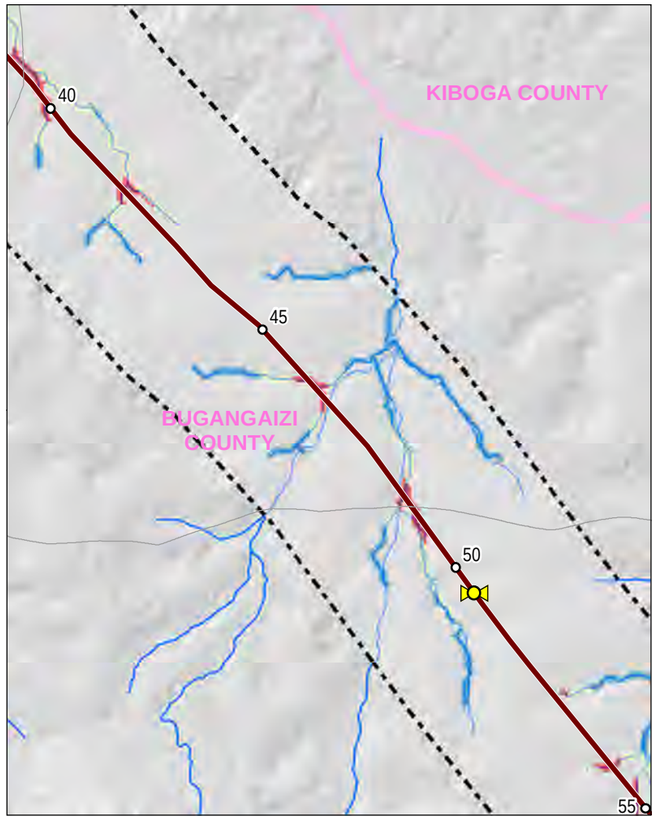
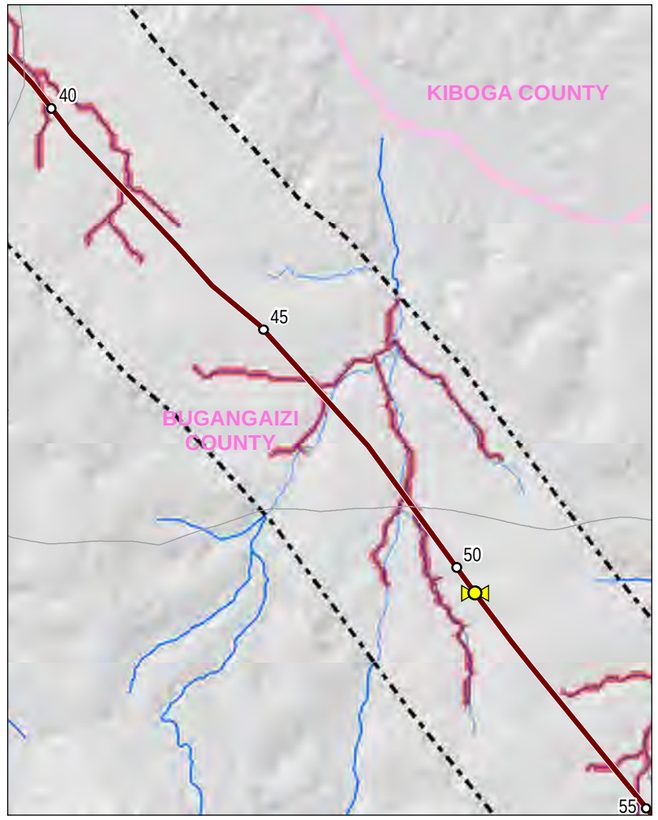
Document Path: P:\08-International\P806\77 EACOP\CTR 10 - GIS\806712-056(A).mxd

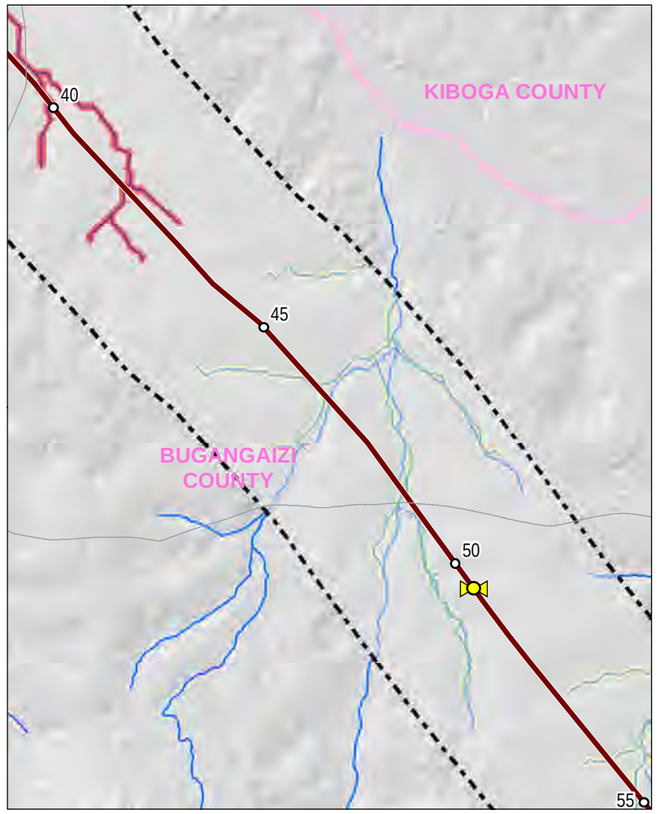
Distance to Surface Water



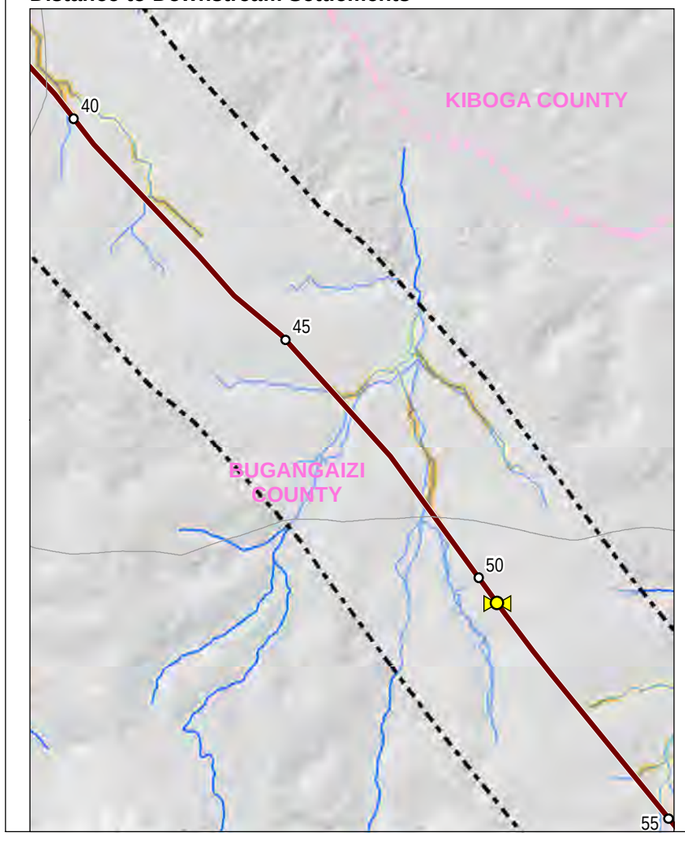
Surface Water Crossings



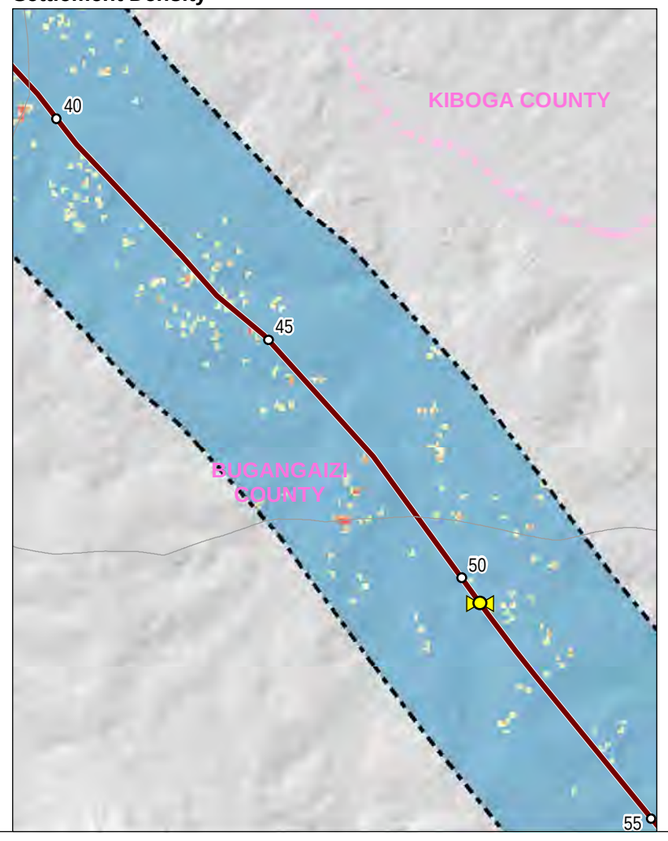
Surface Water Type



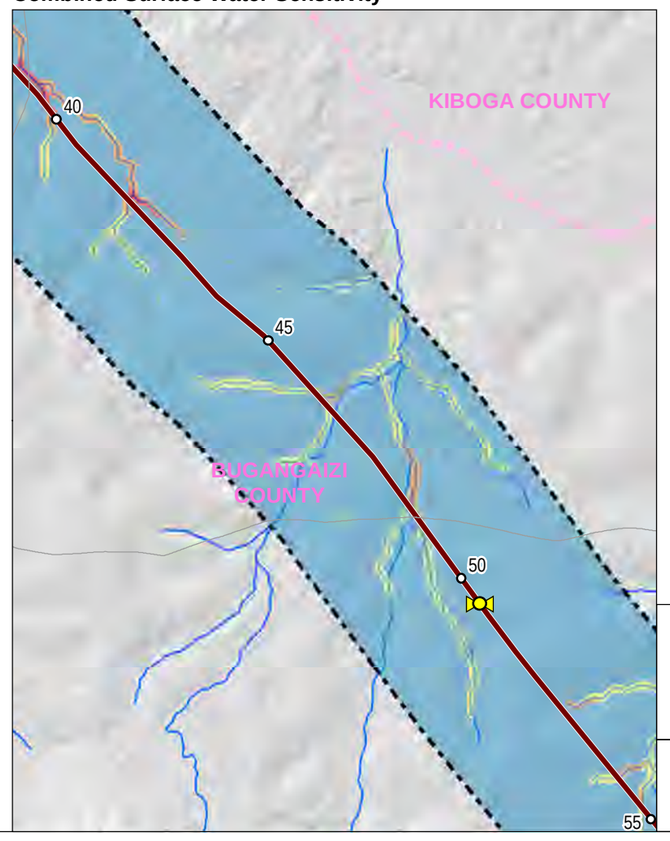
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

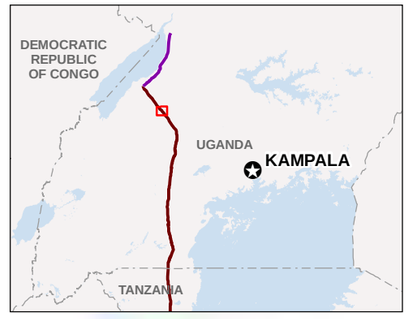
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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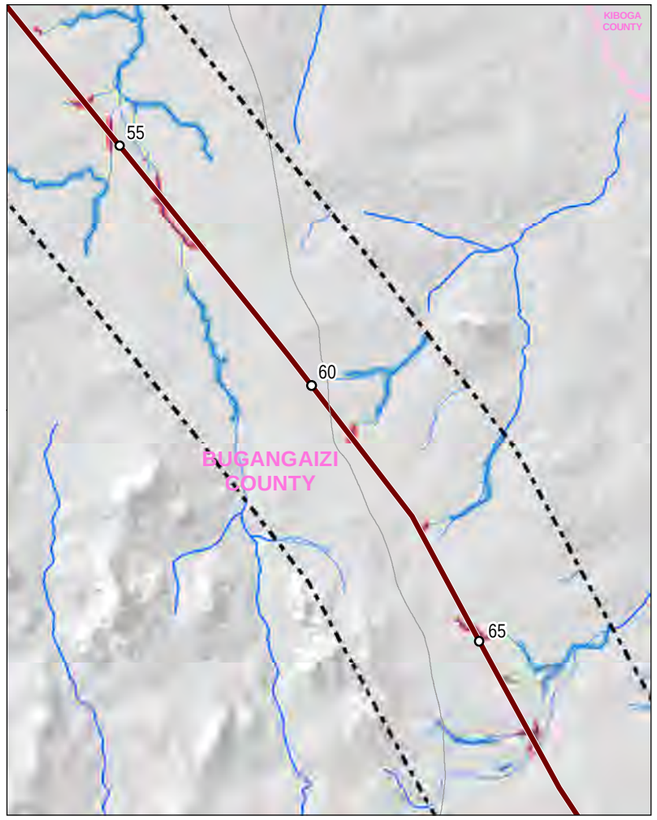
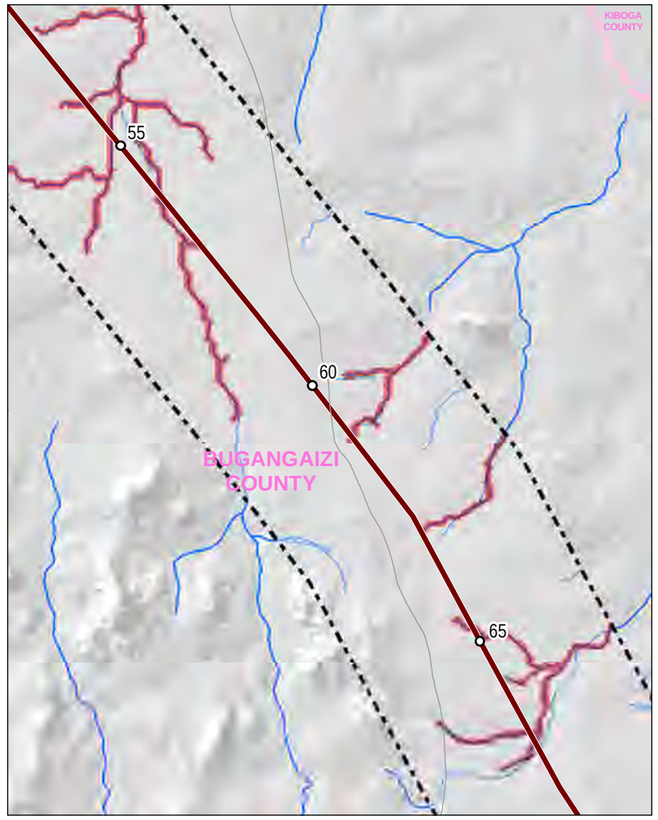
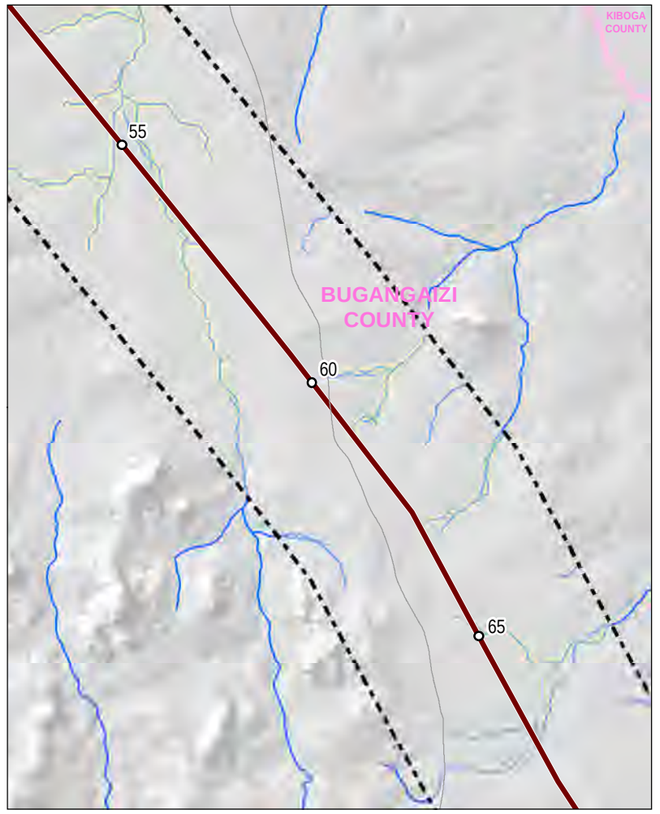
Distance to Surface Water



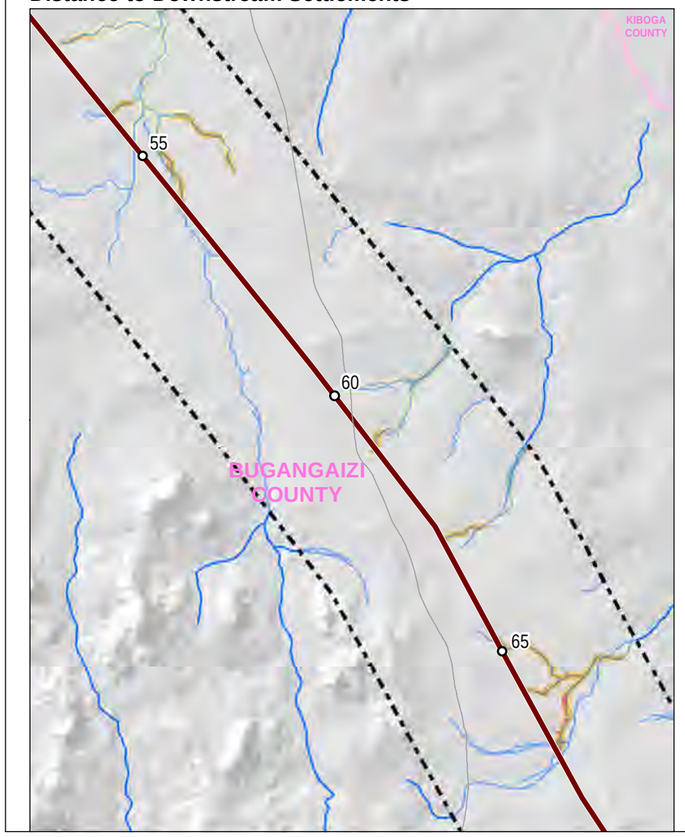
Surface Water Crossings



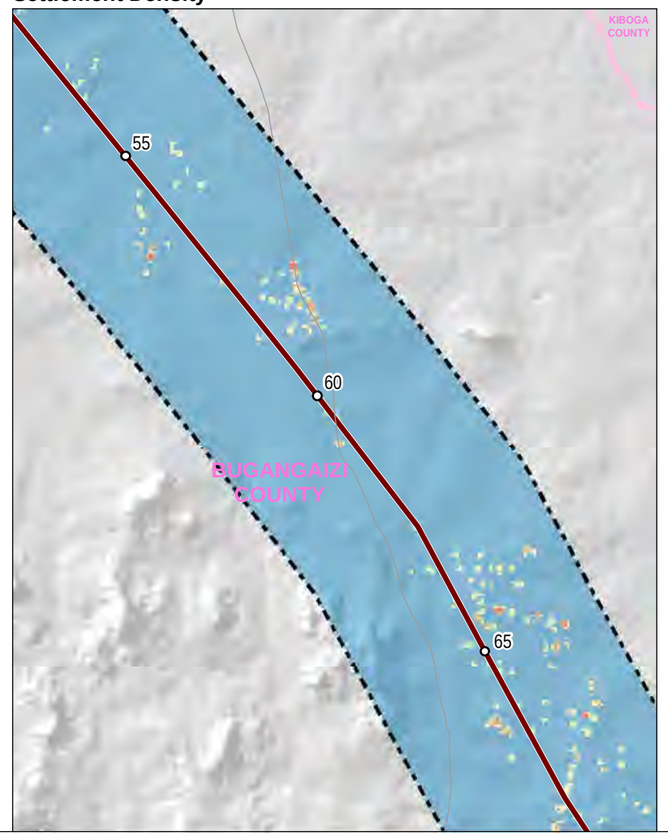
Surface Water Type



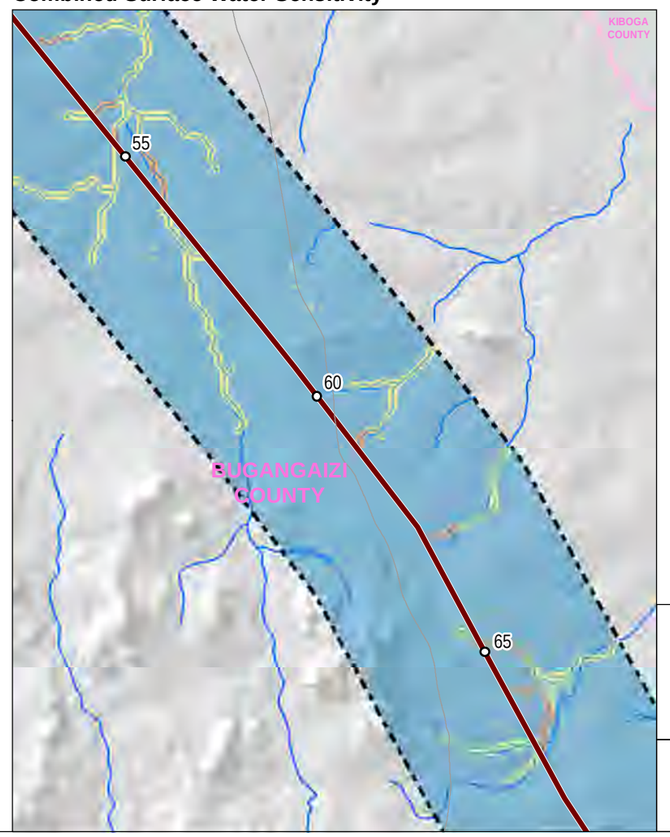
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

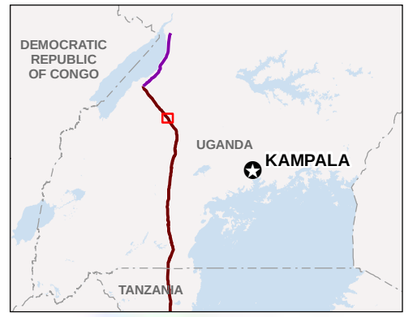
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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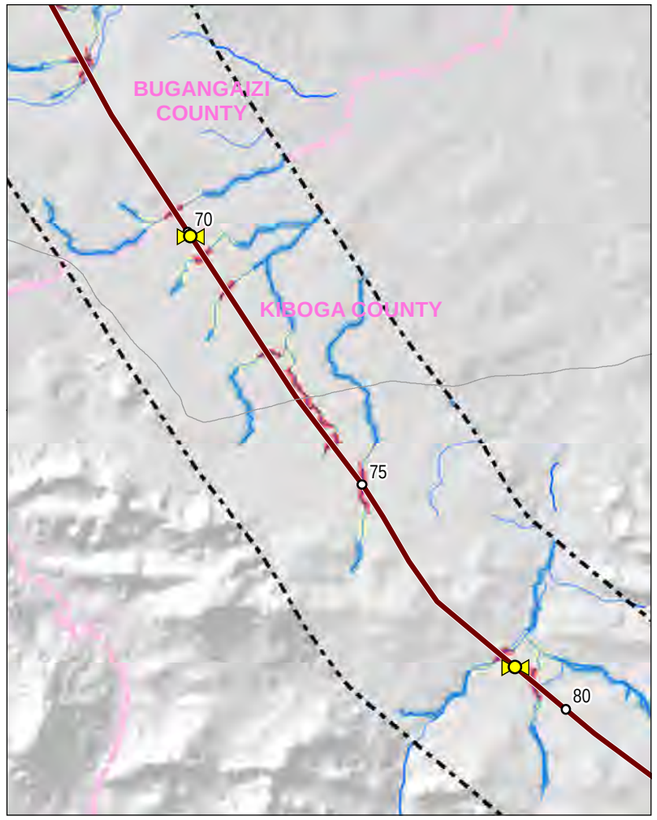
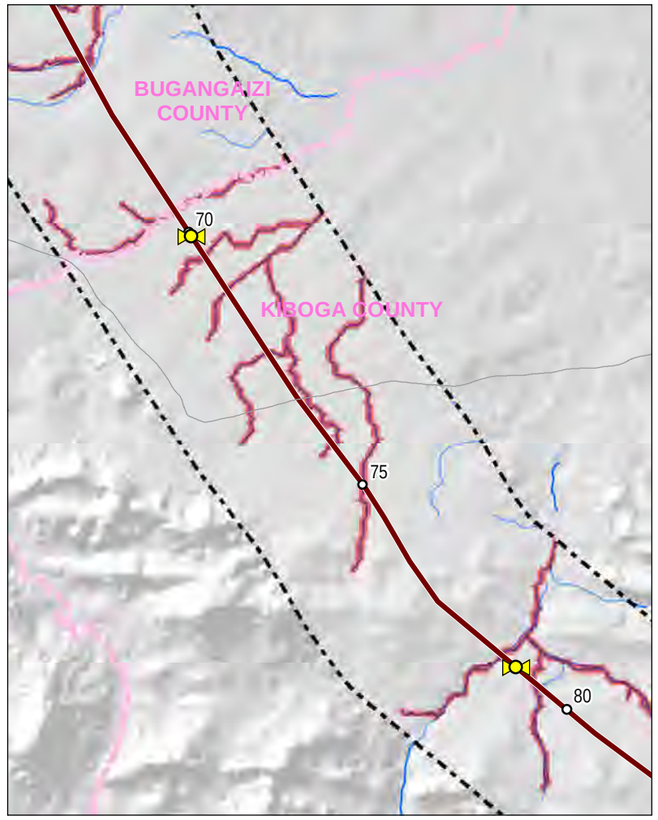
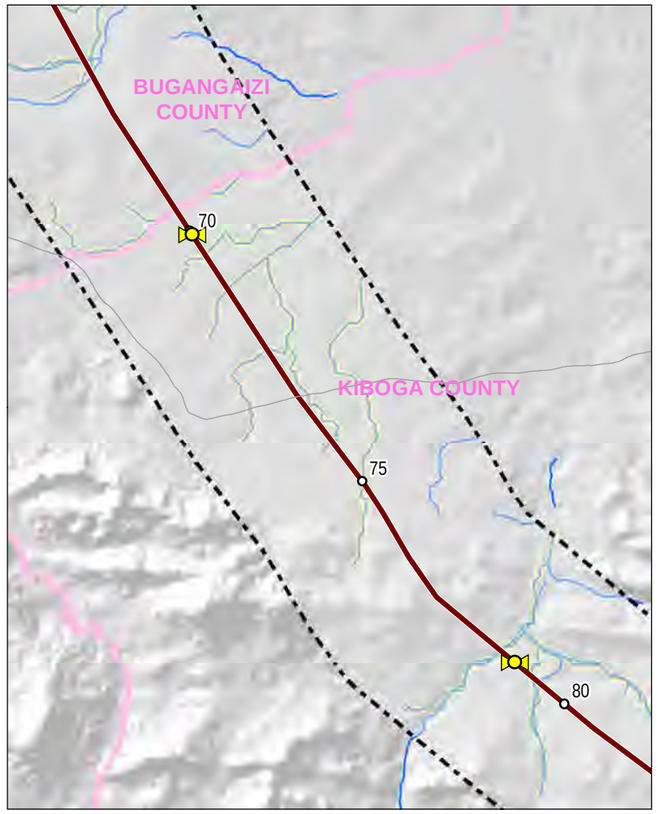
Distance to Surface Water



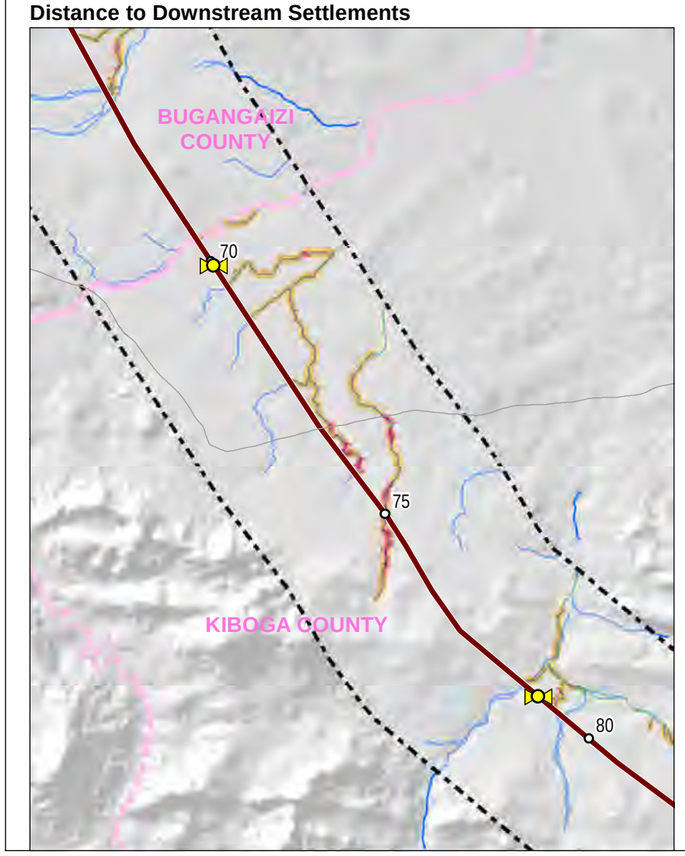
Surface Water Crossings



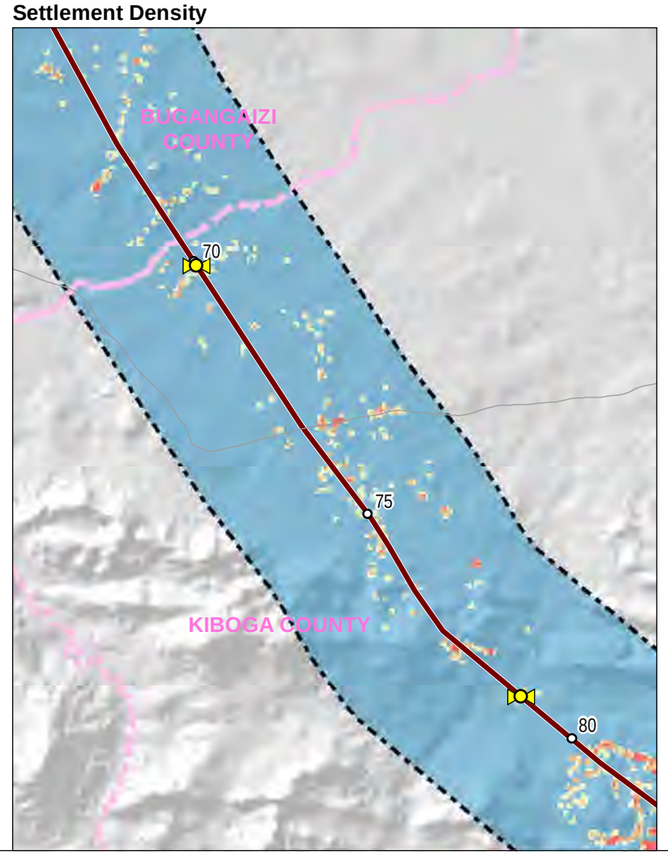
Surface Water Type



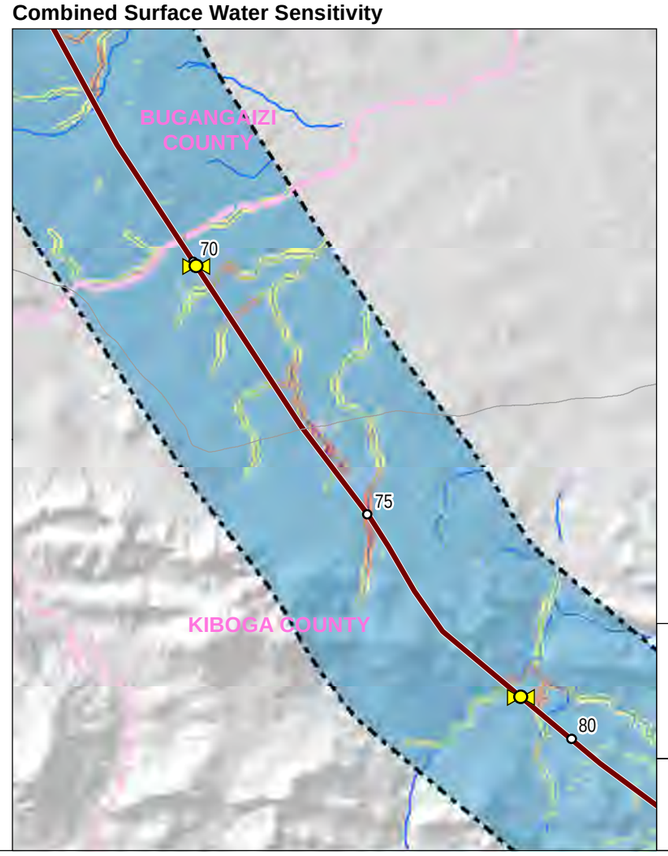
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

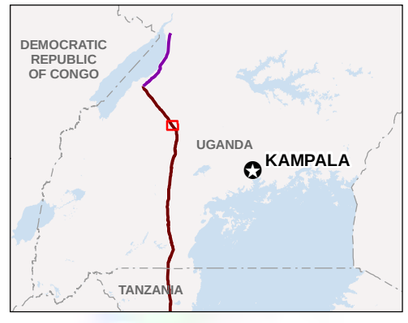
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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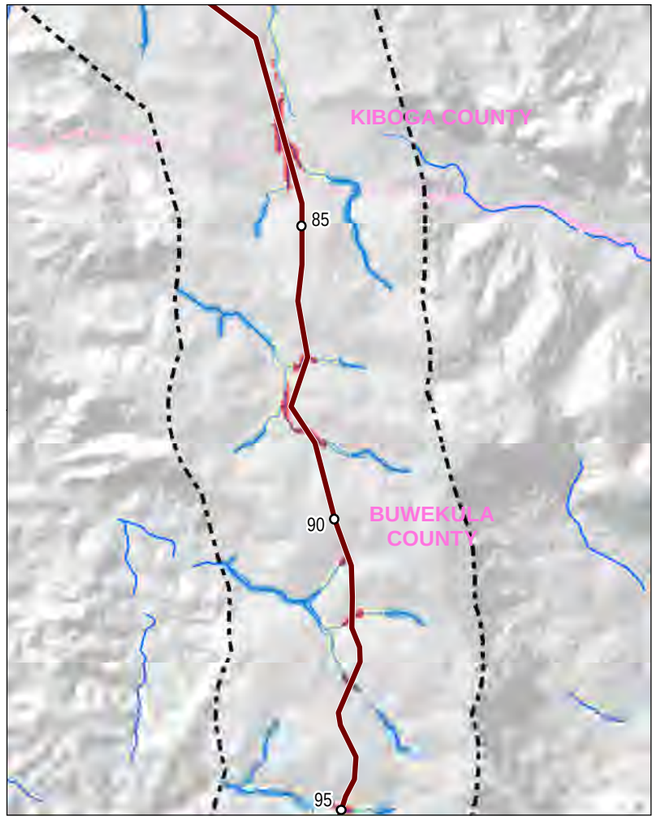
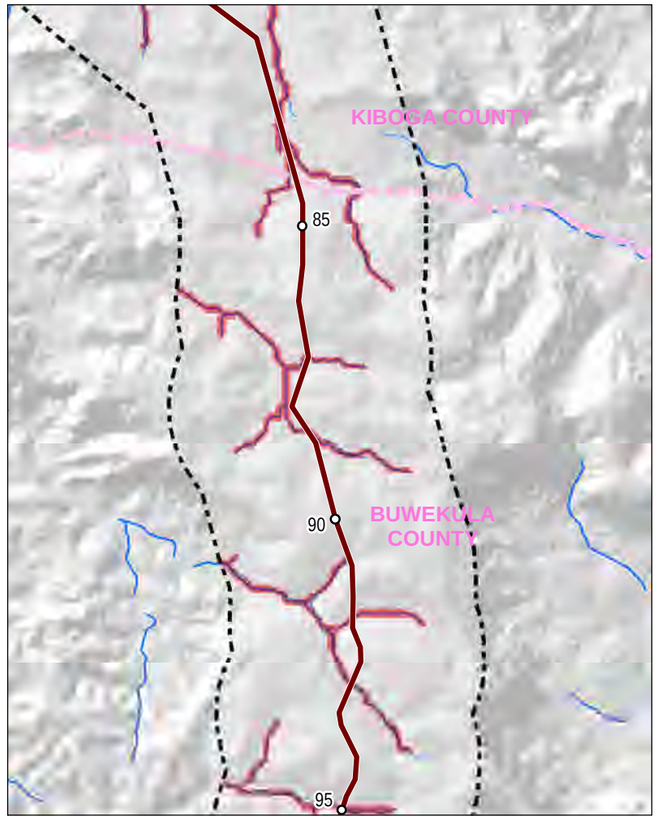
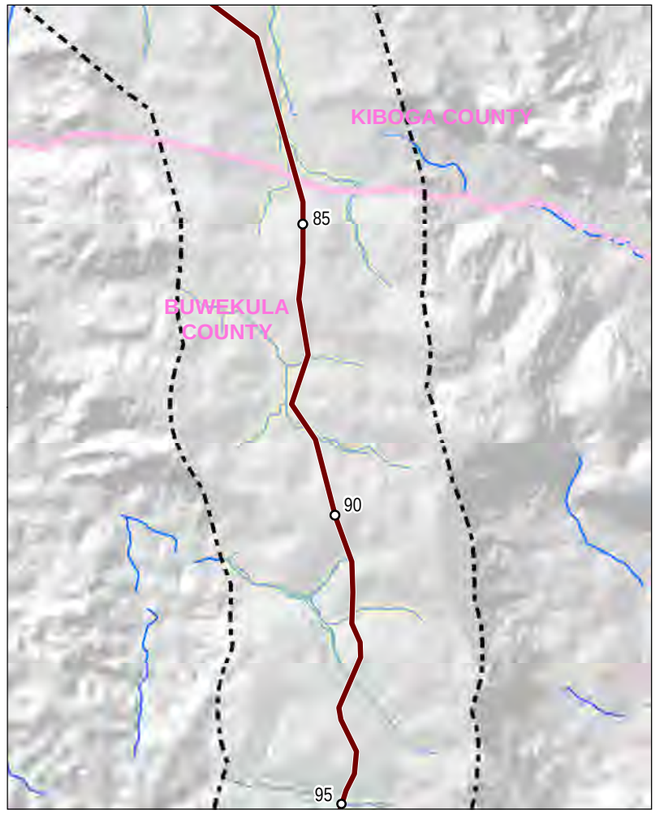
Distance to Surface Water



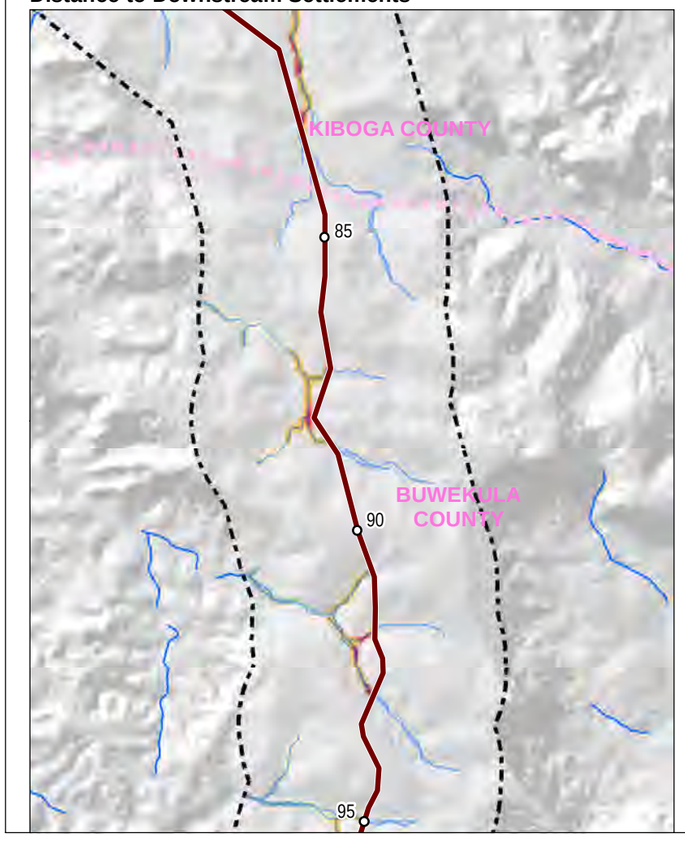
Surface Water Crossings



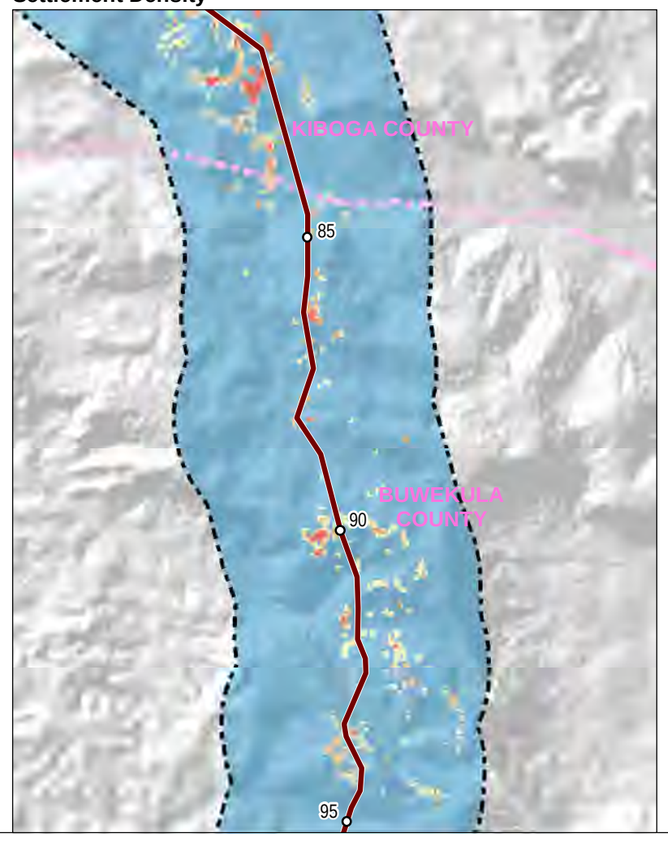
Surface Water Type



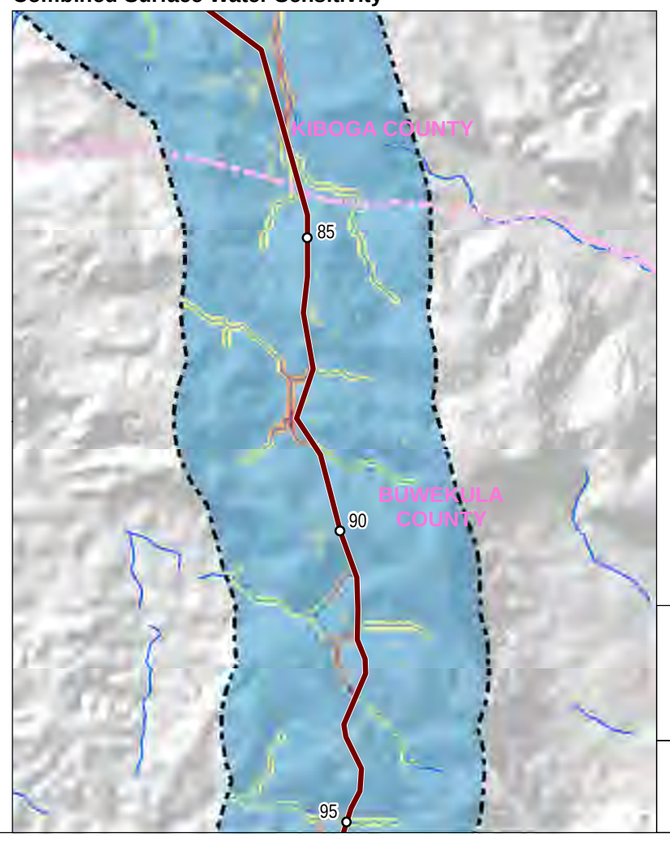
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

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- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
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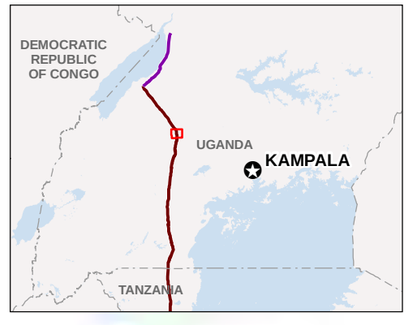
Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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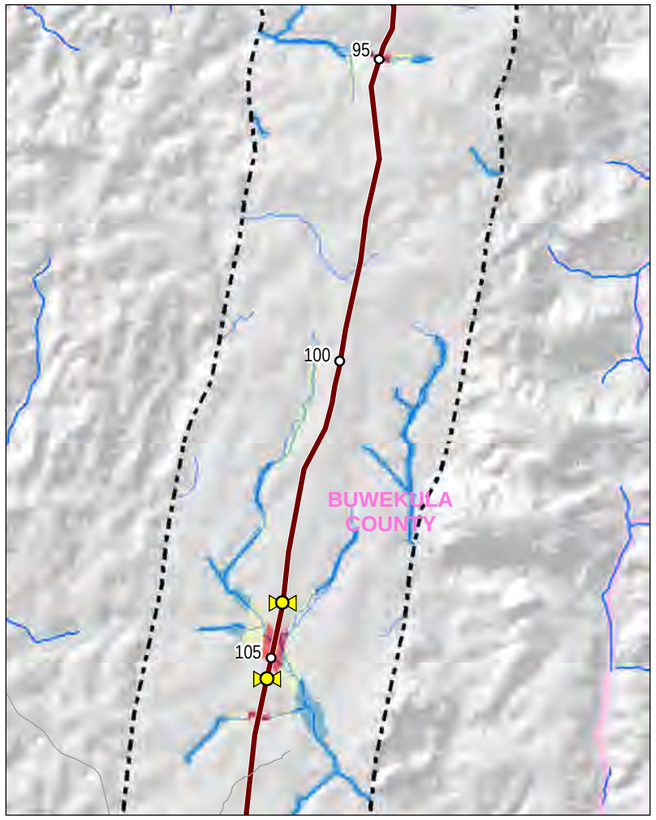
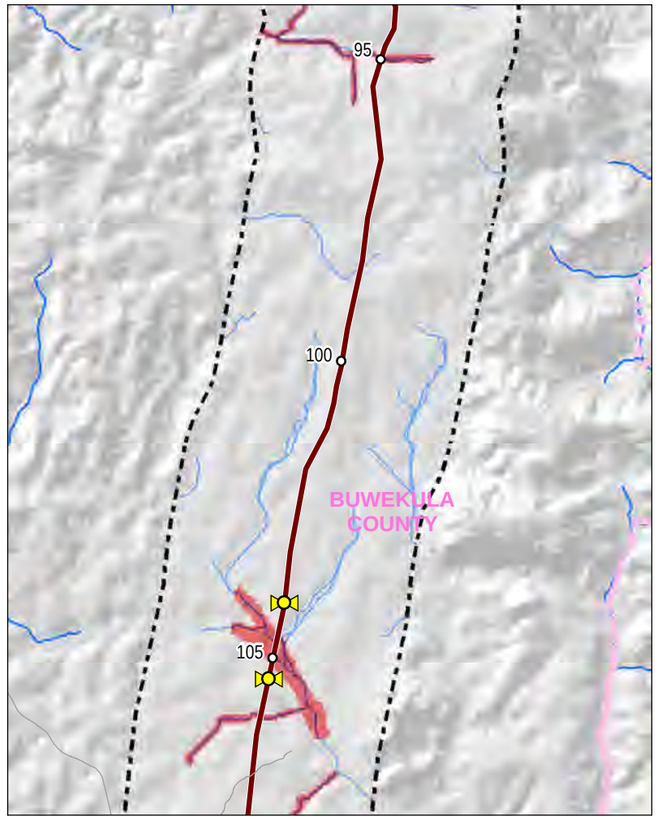
Document Path: P:\08-International\P80677 EACOPCTR 10 - GIS\80712-056[A].mxd

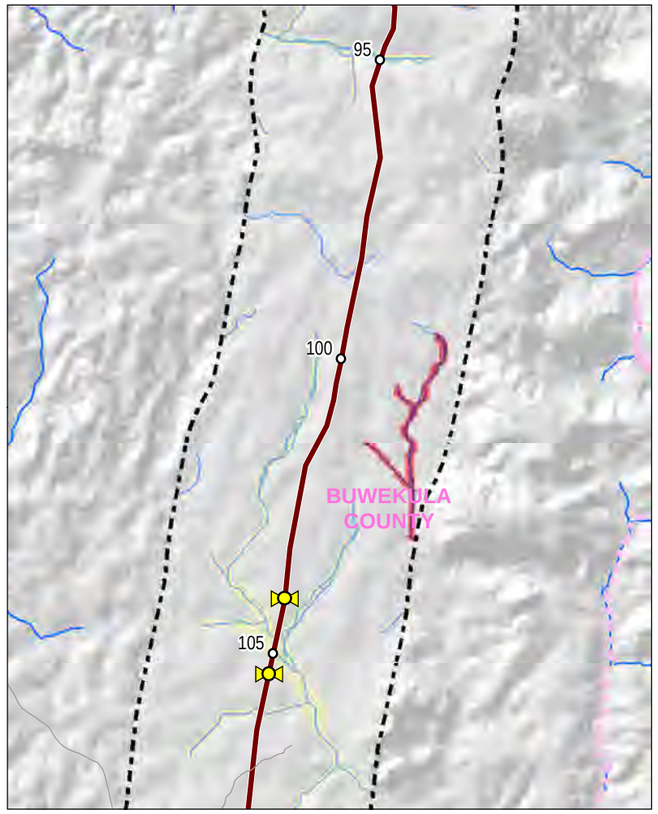
Distance to Surface Water



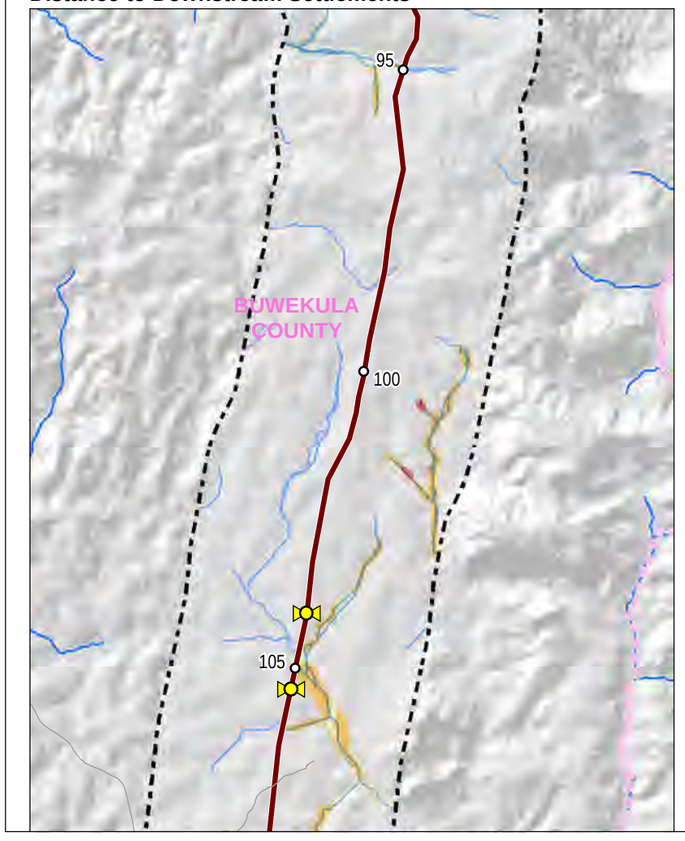
Surface Water Crossings



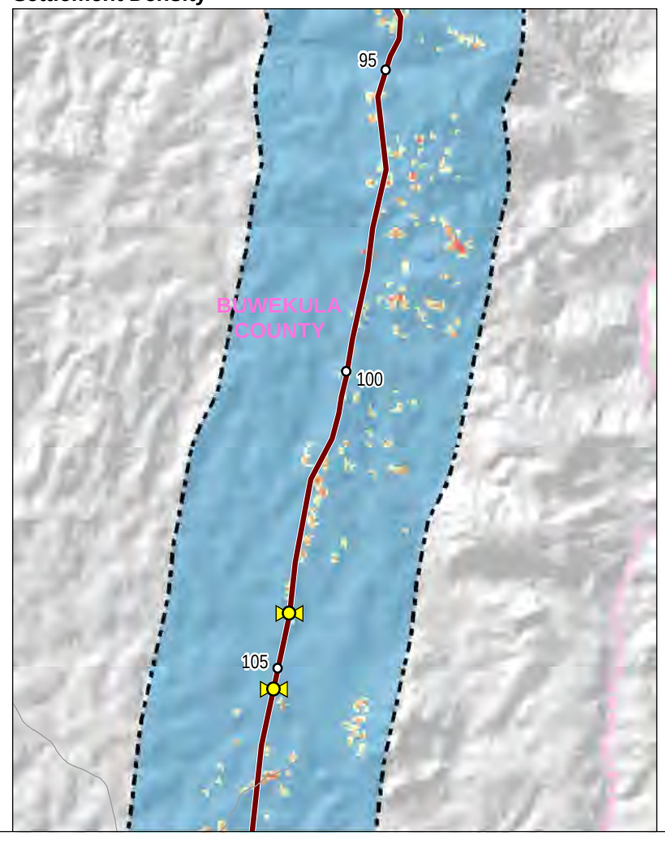
Surface Water Type



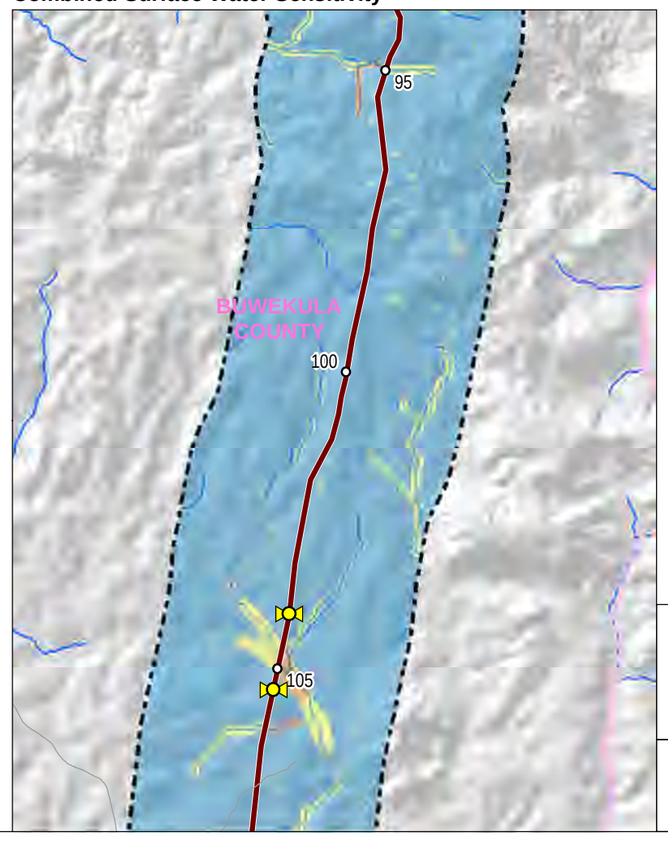
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
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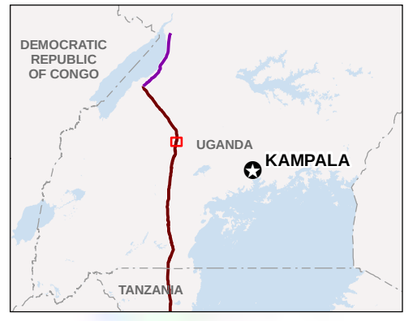
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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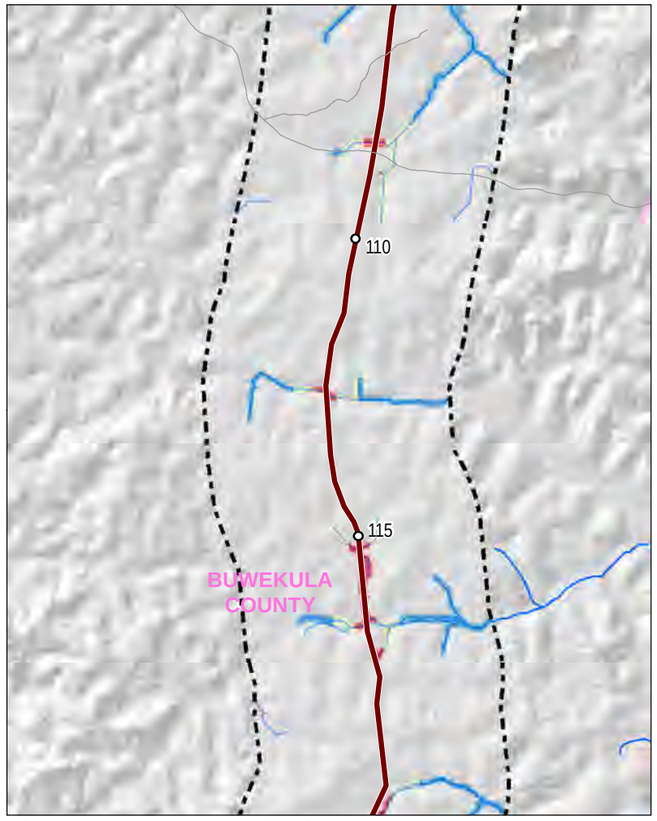
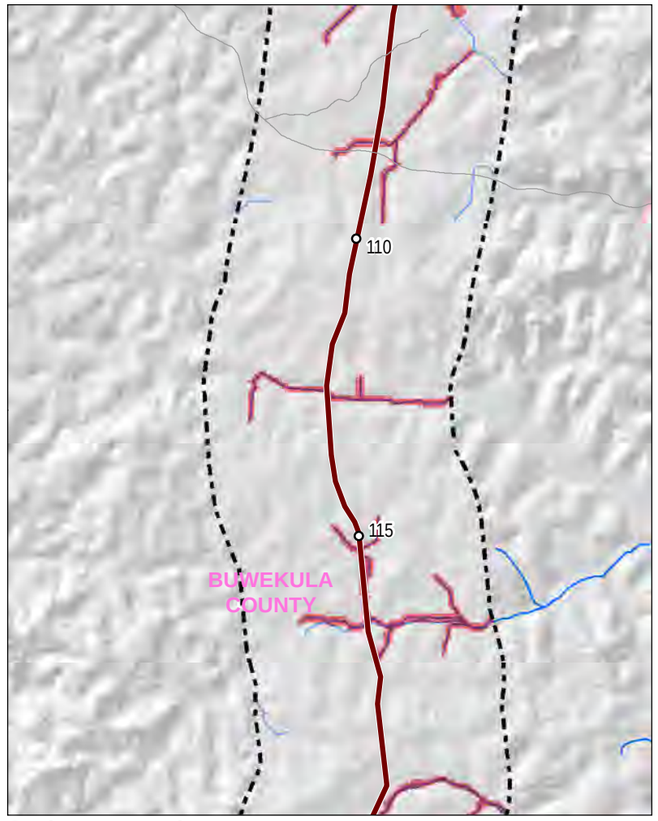
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056(A).mxd

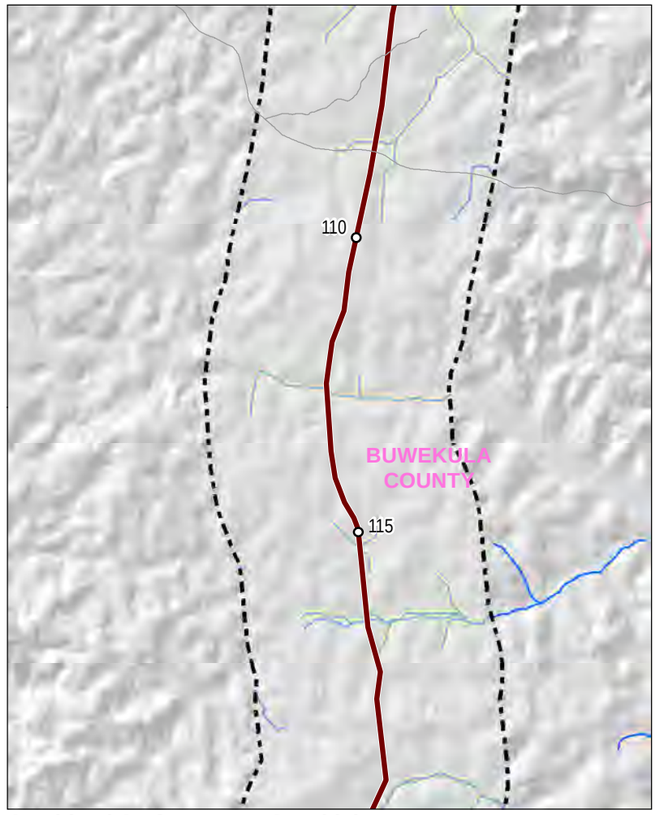
Distance to Surface Water



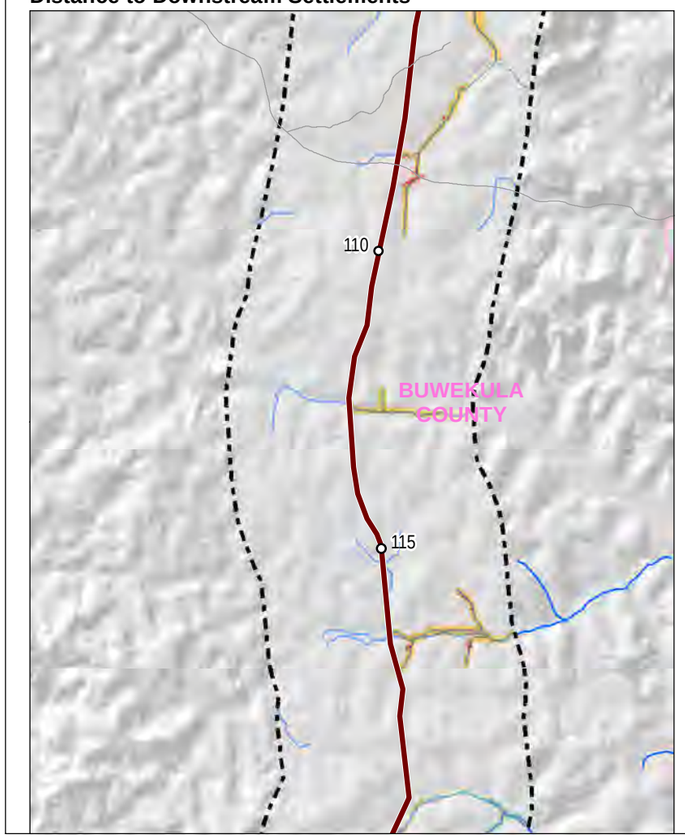
Surface Water Crossings



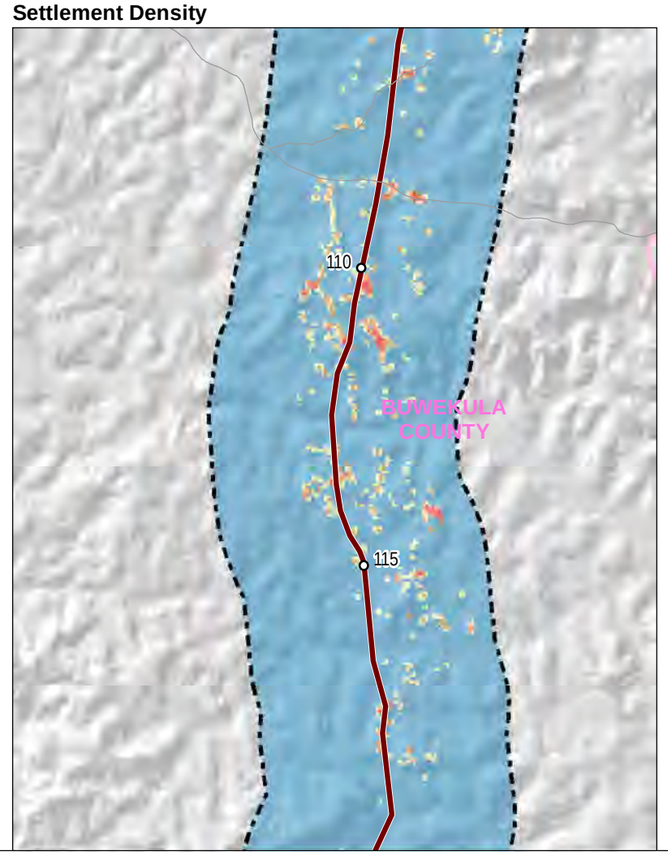
Surface Water Type



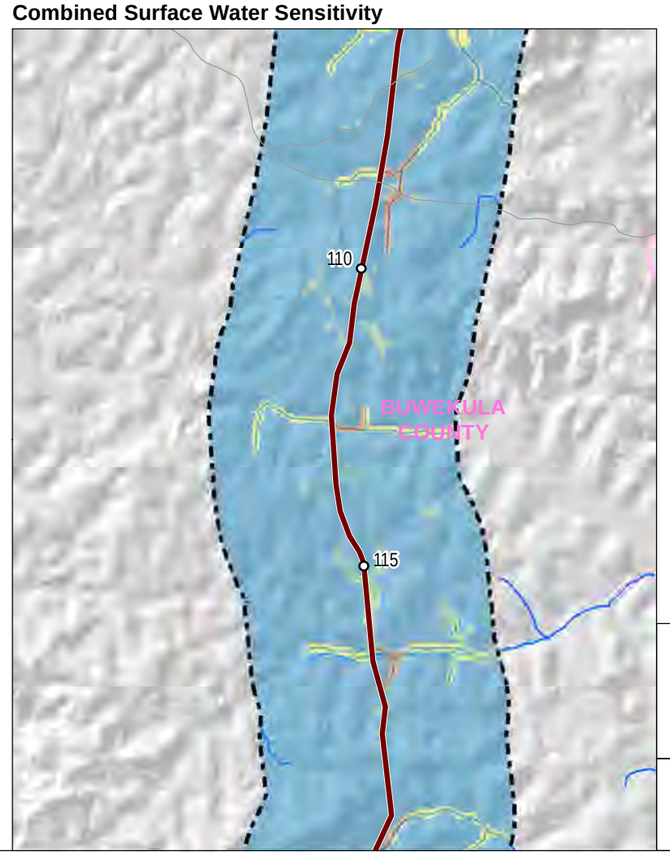
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

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- Major Road

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- Lake

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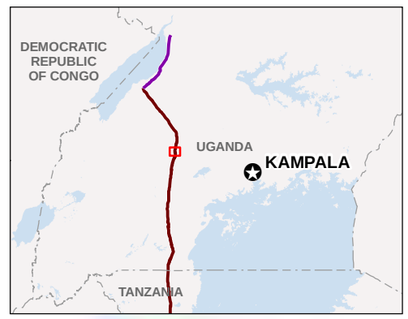
Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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W E
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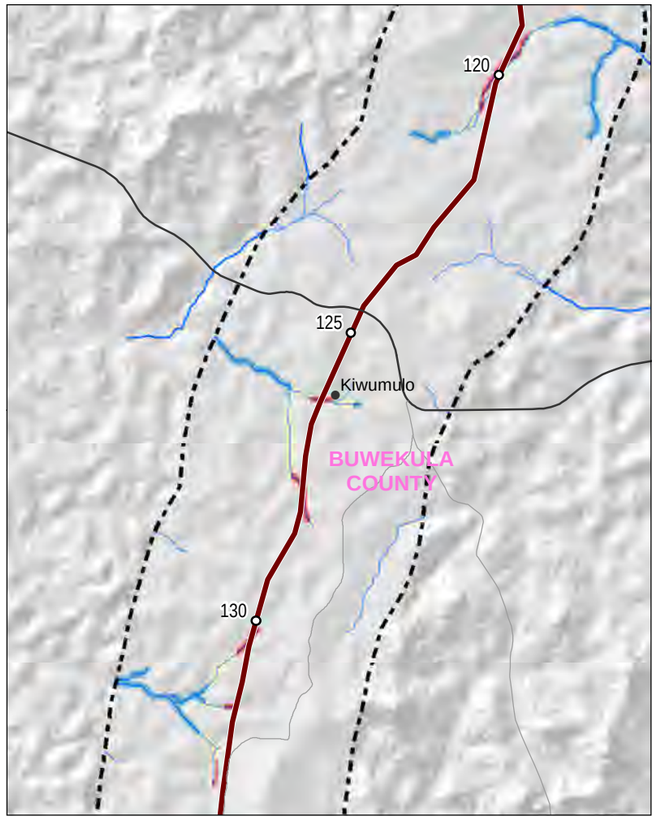
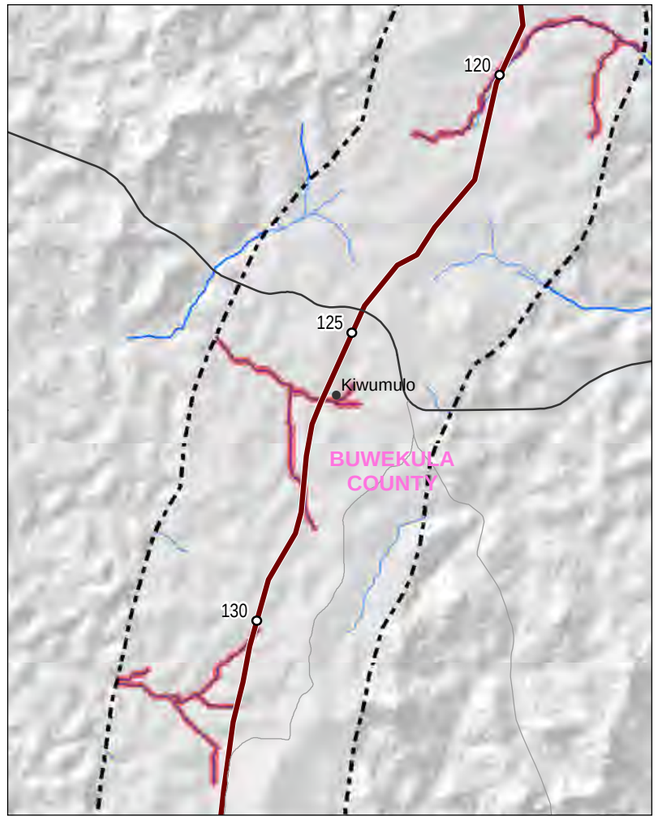
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

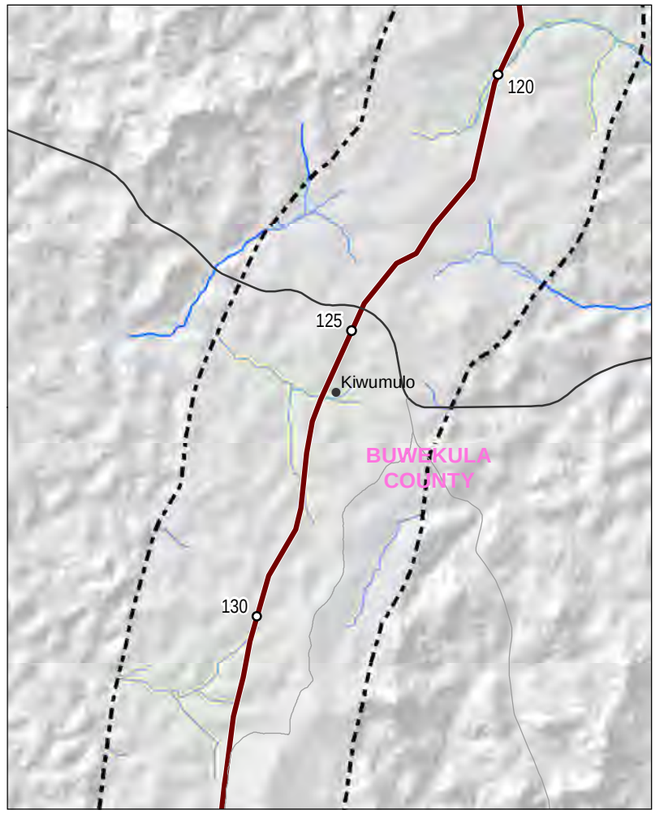
Distance to Surface Water



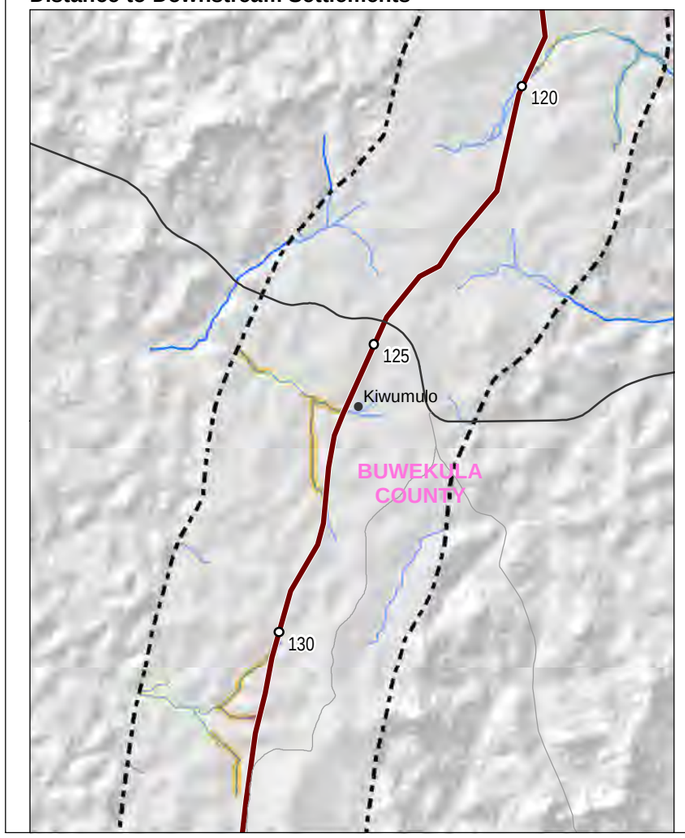
Surface Water Crossings



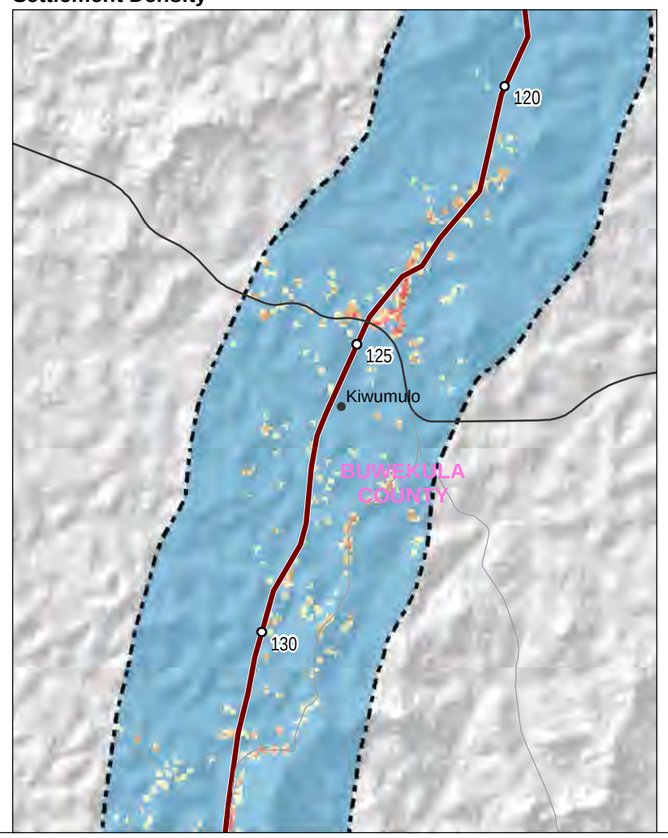
Surface Water Type



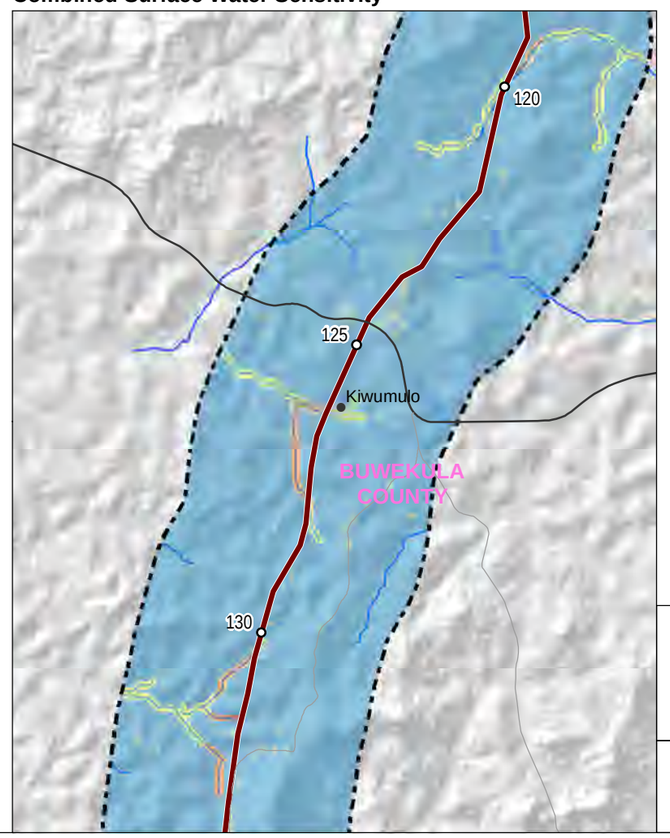
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

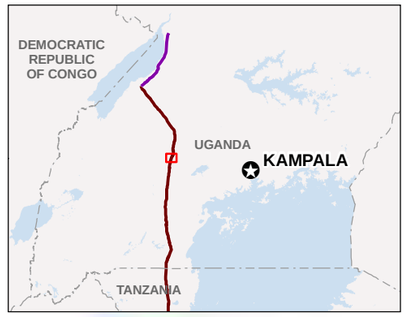
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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W E
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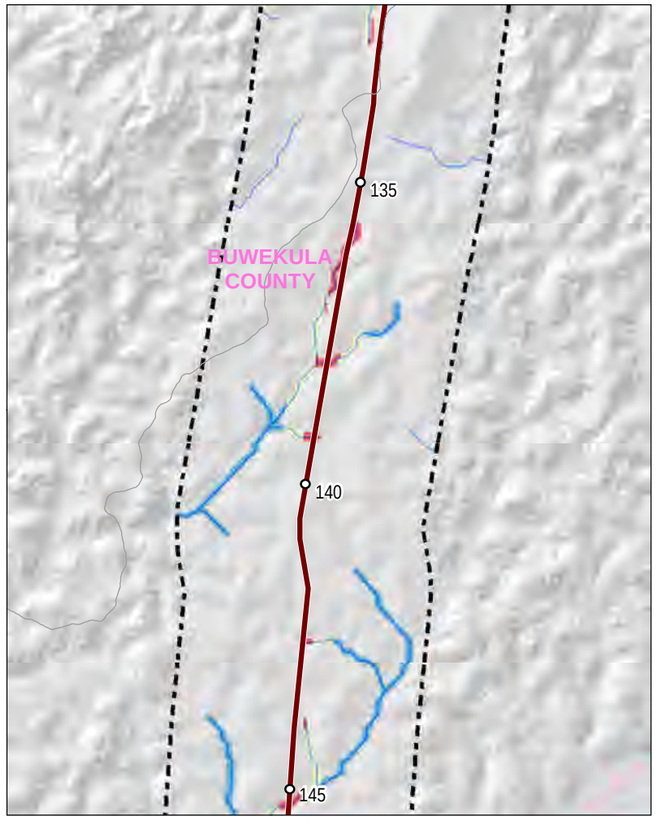
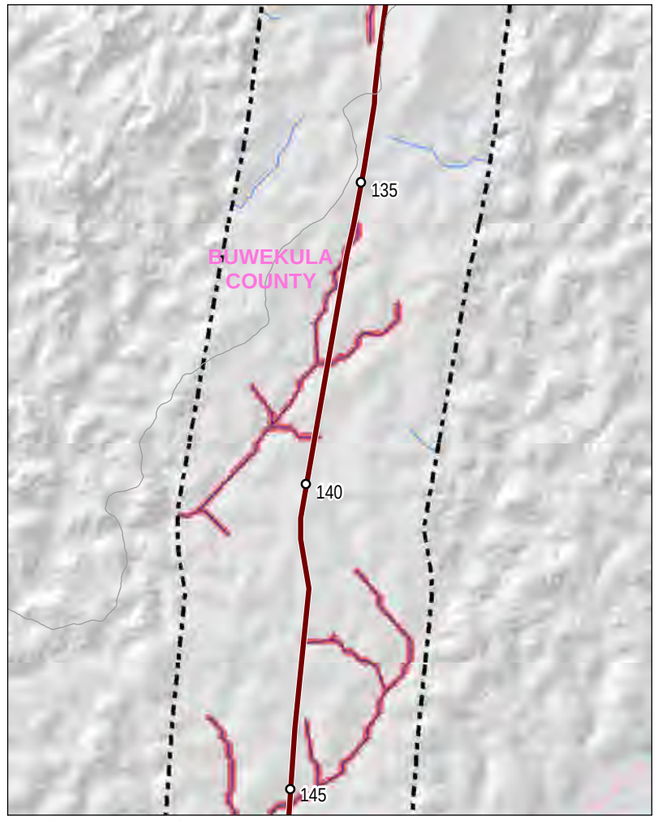
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

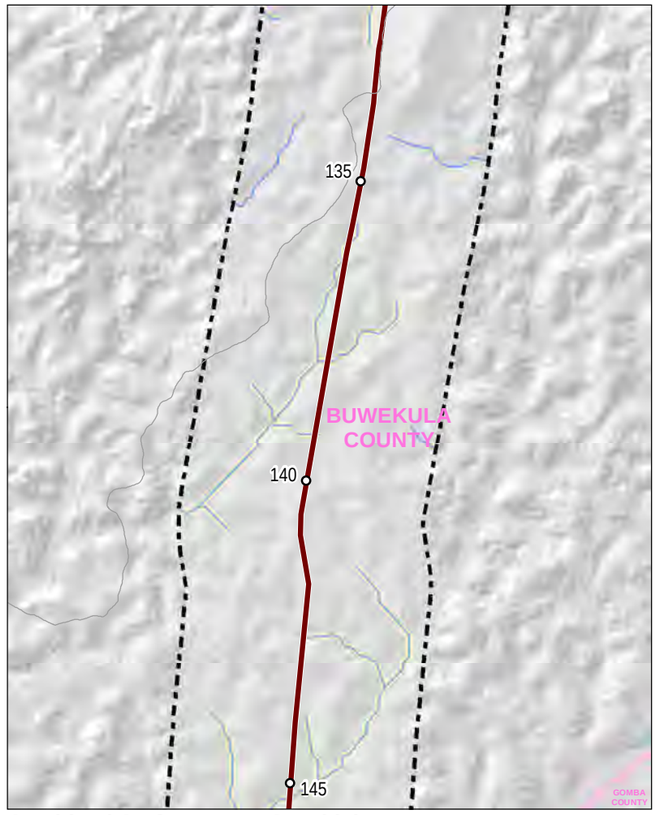
Distance to Surface Water



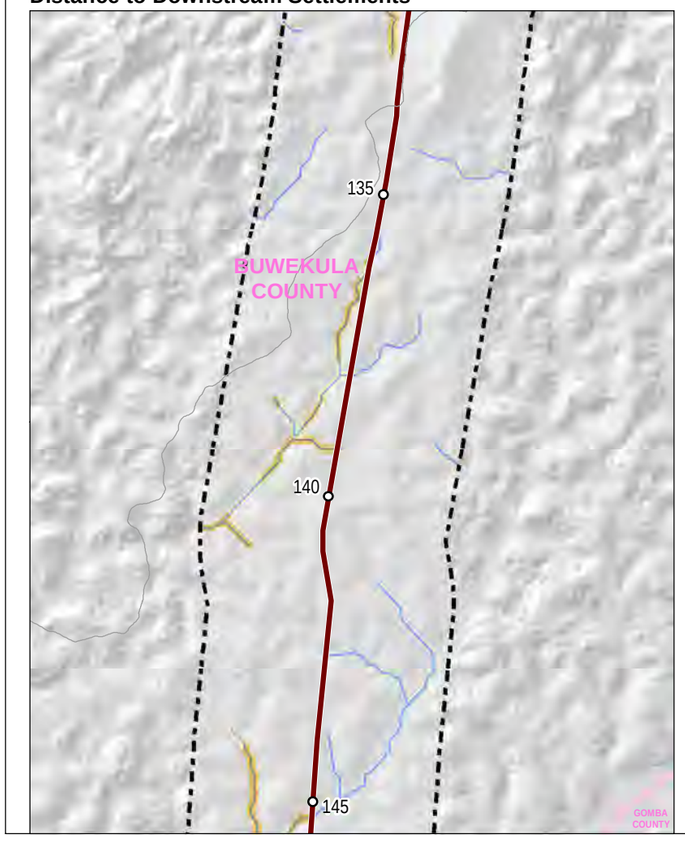
Surface Water Crossings



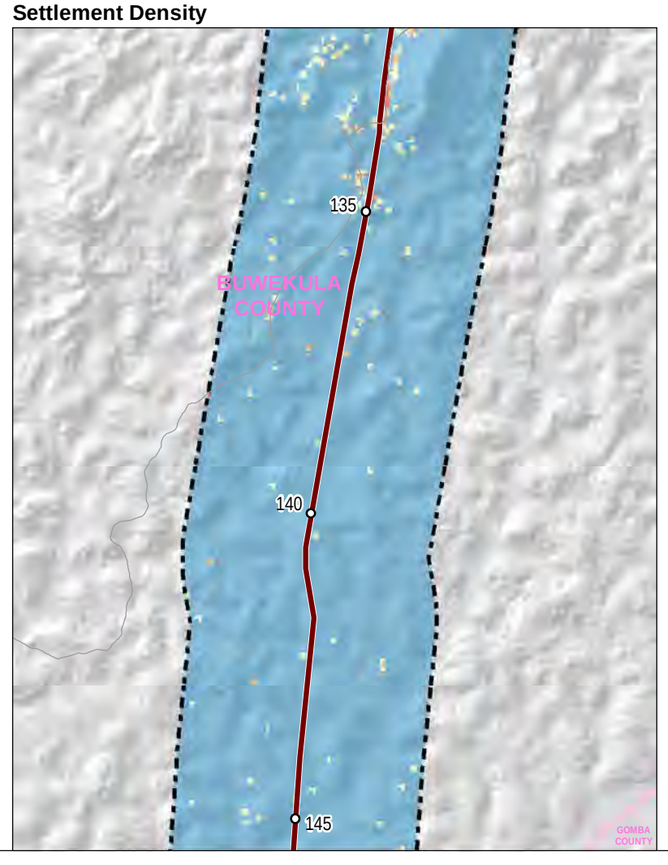
Surface Water Type



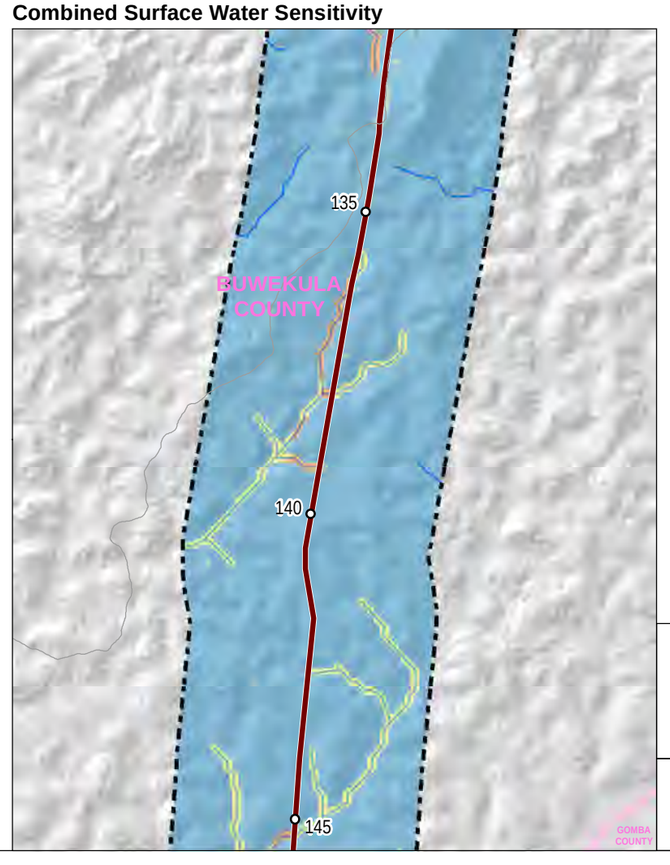
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

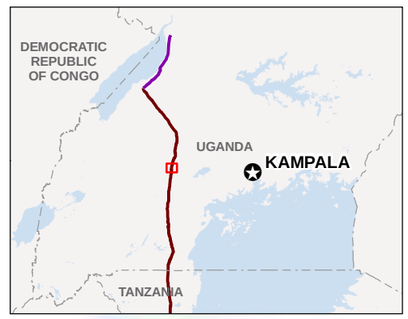
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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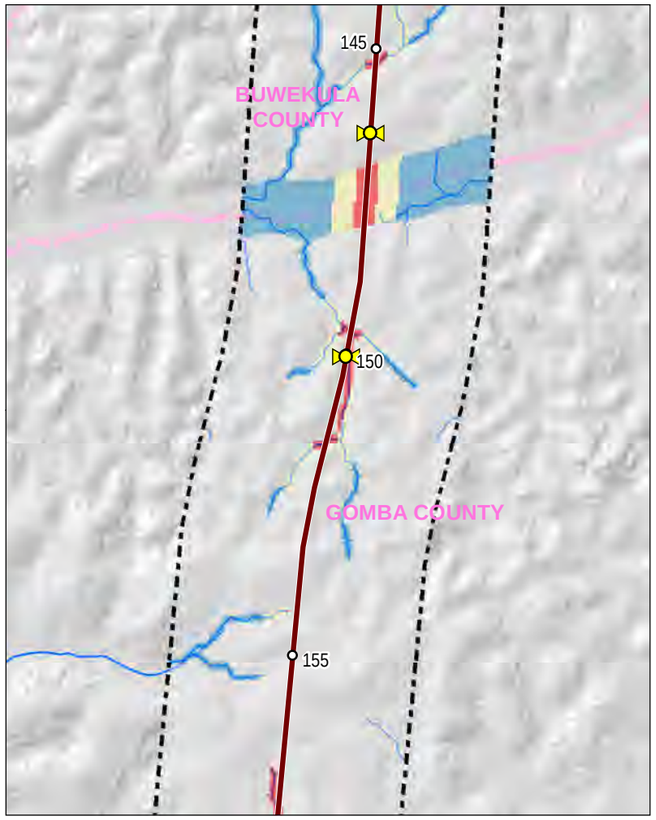
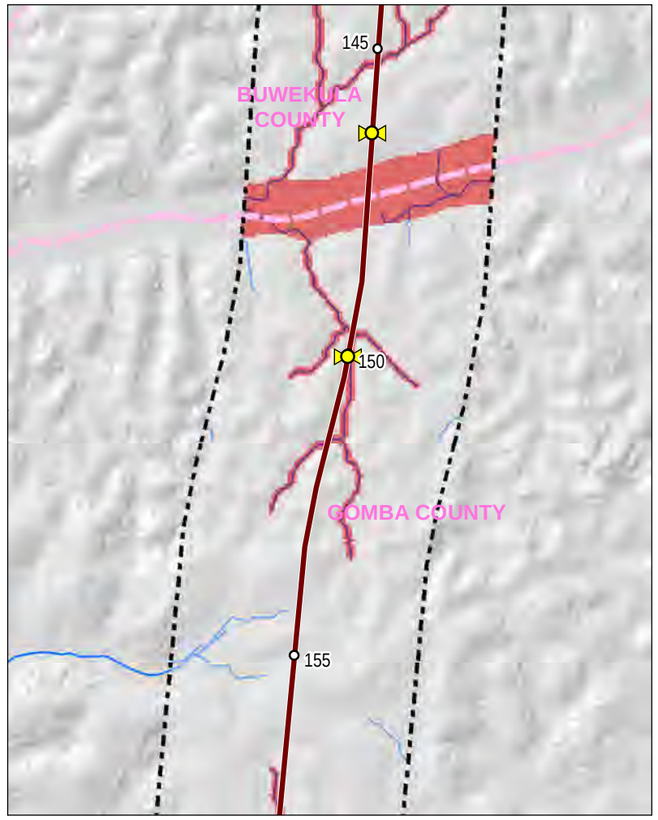
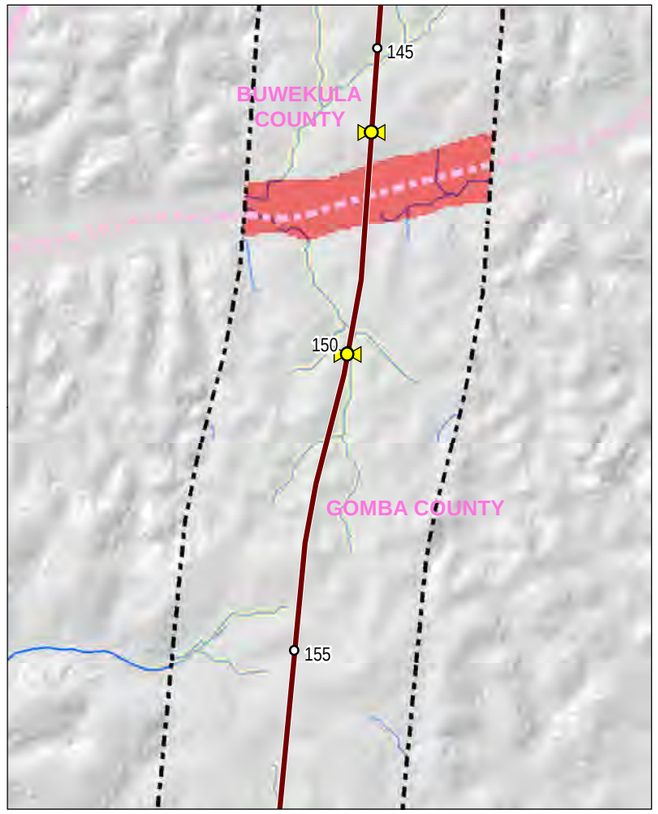
Distance to Surface Water



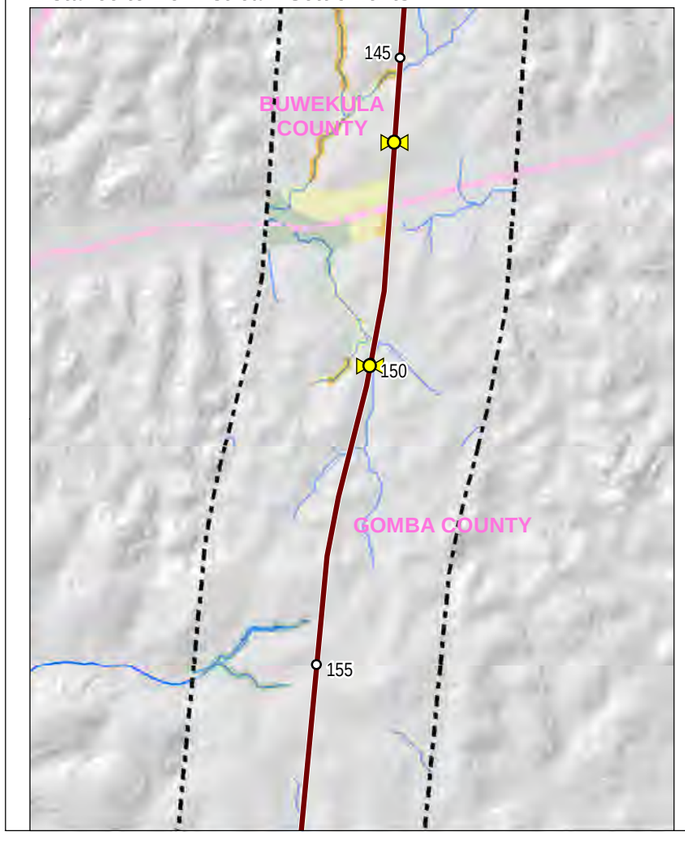
Surface Water Crossings



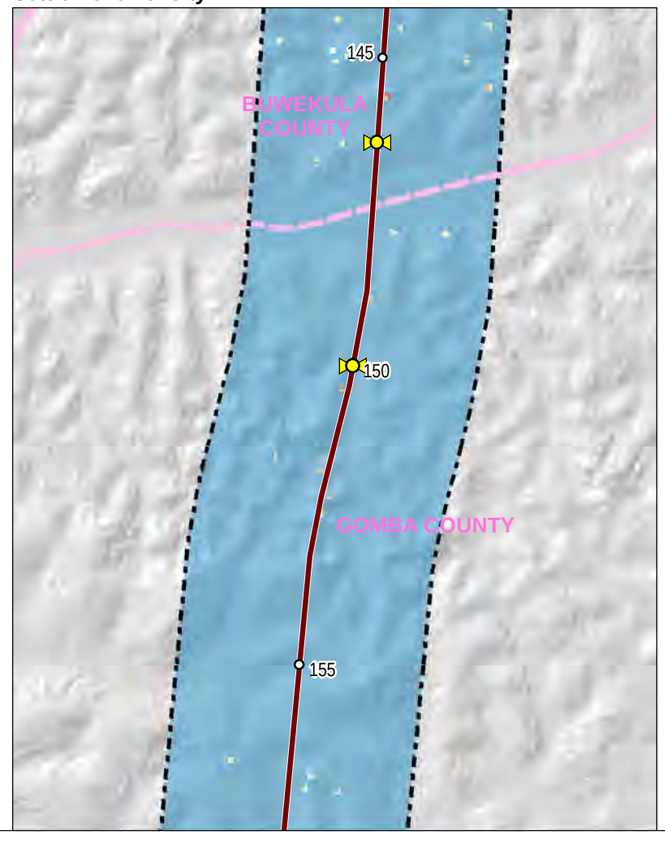
Surface Water Type



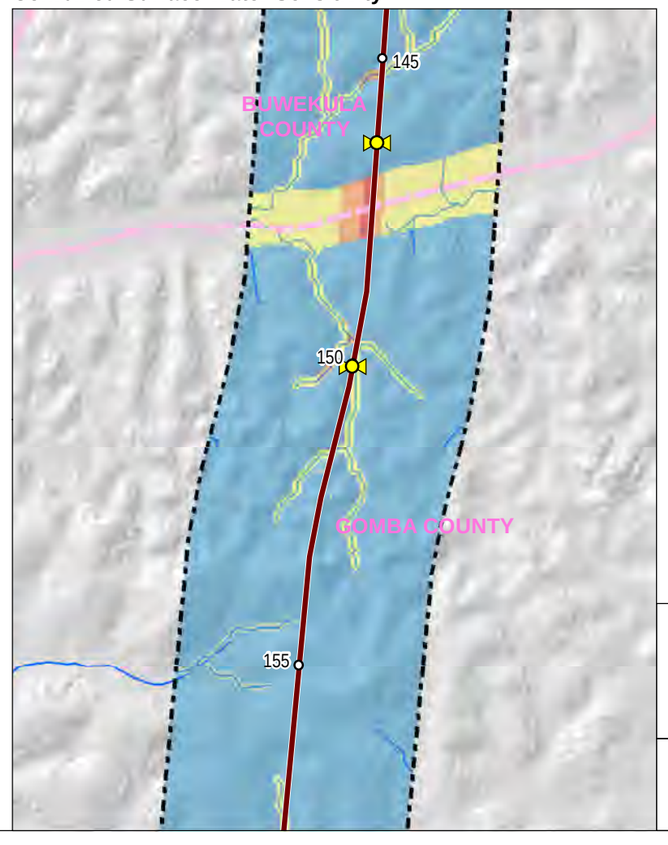
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

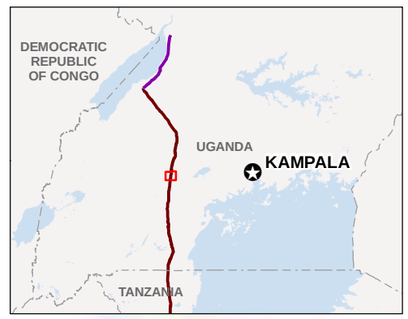
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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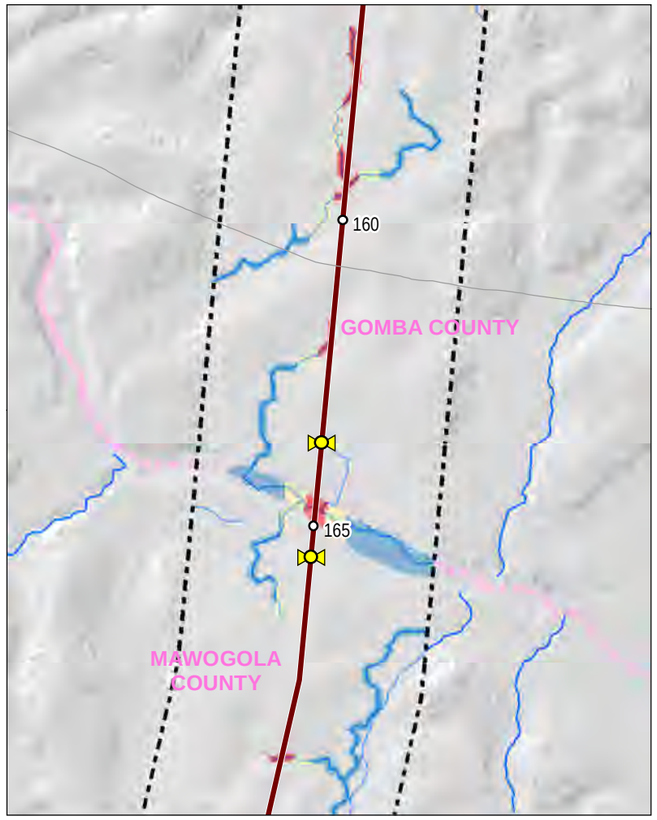
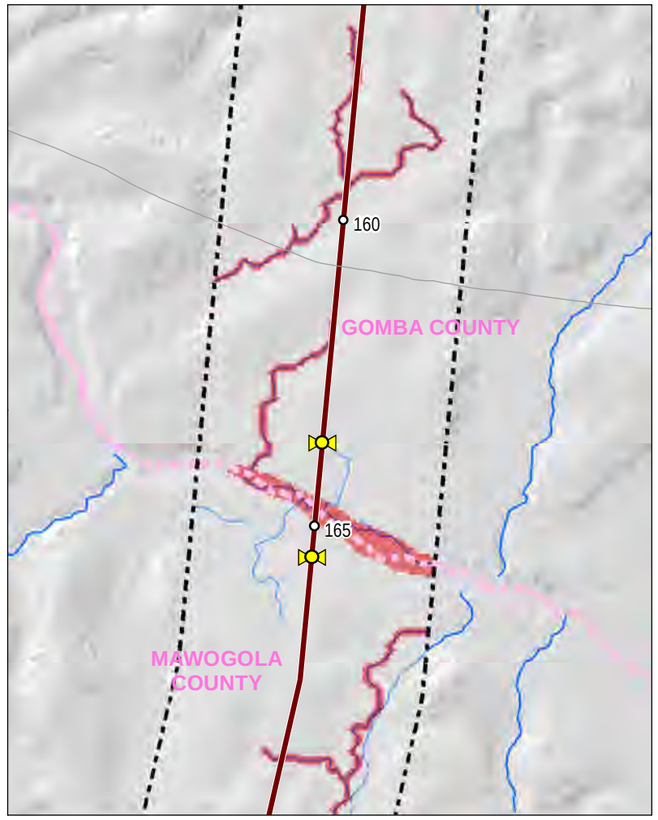
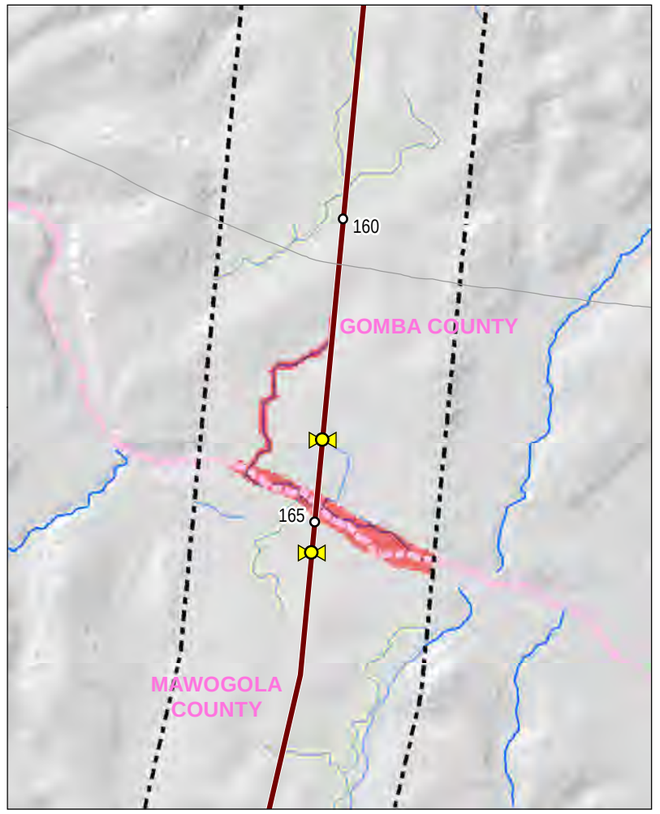
Distance to Surface Water



Surface Water Crossings



Surface Water Type



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

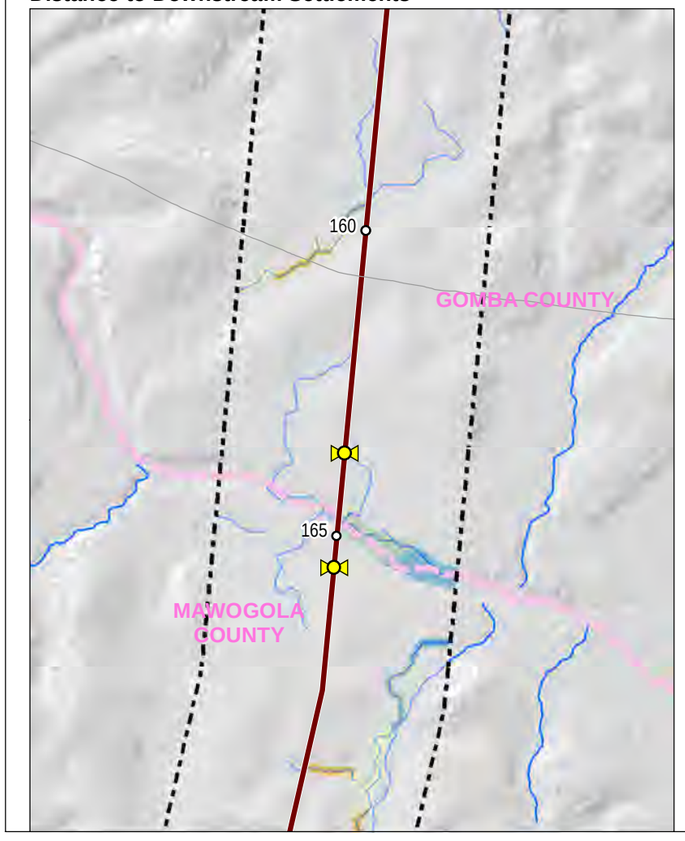
Administrative Area:

- County Boundary

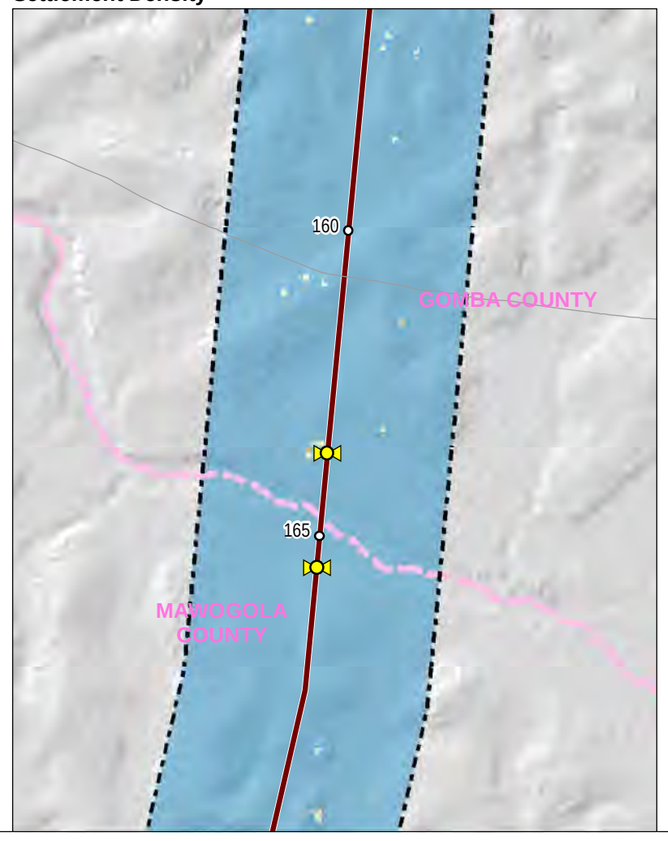
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

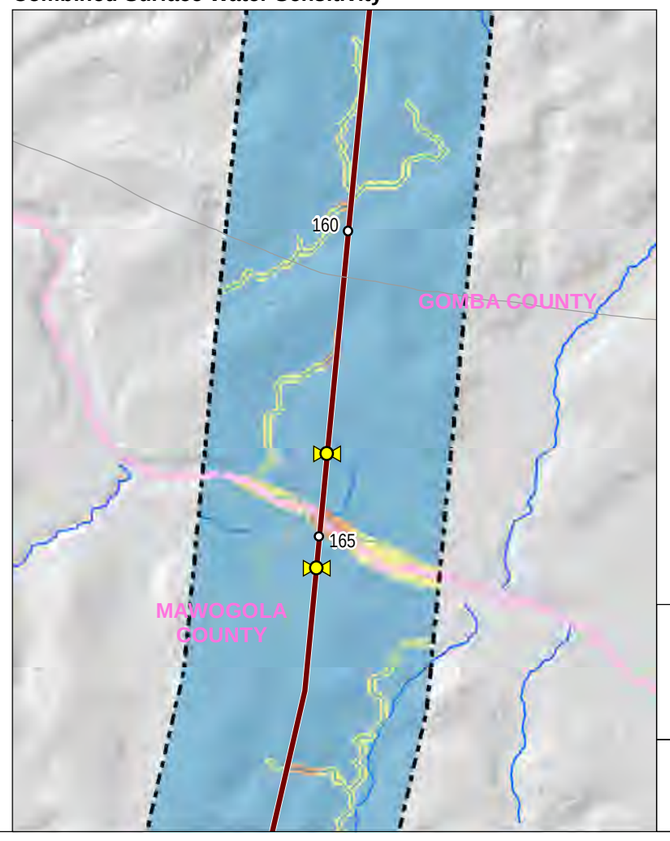
Distance to Downstream Settlements



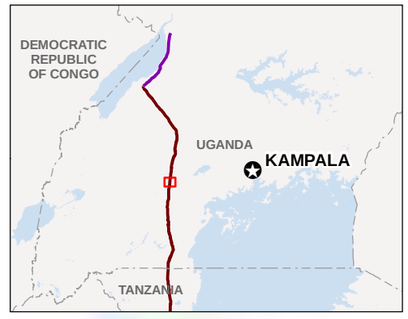
Settlement Density



Combined Surface Water Sensitivity



Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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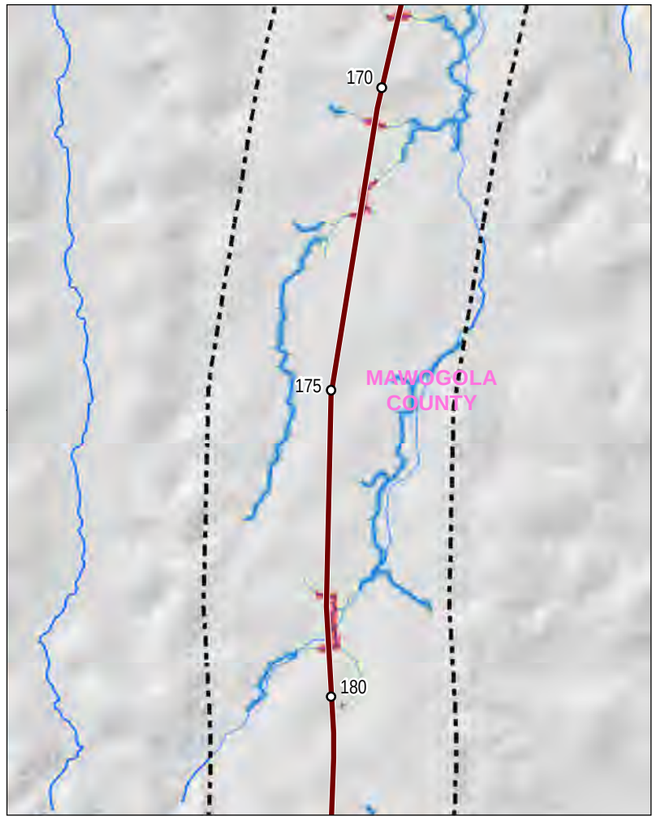
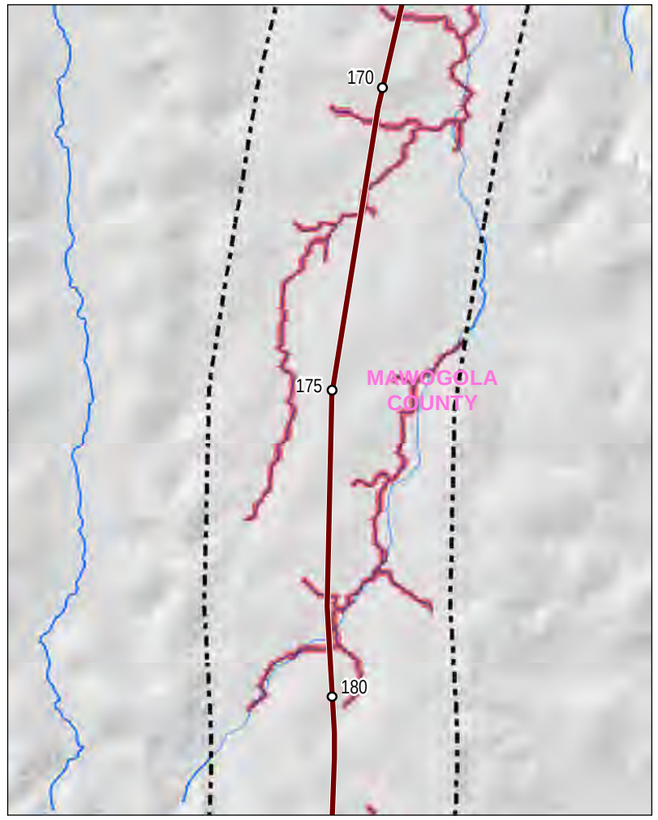
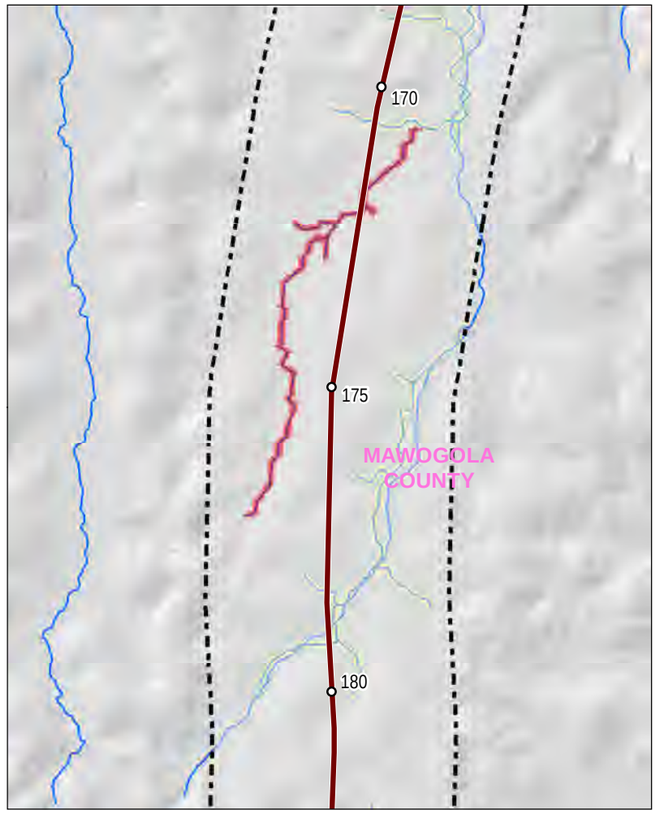
Distance to Surface Water



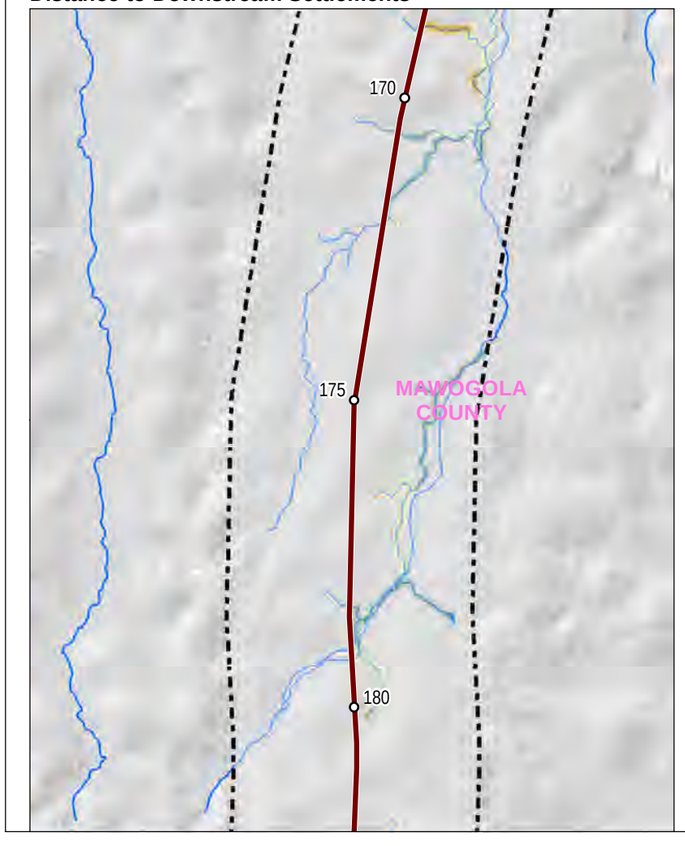
Surface Water Crossings



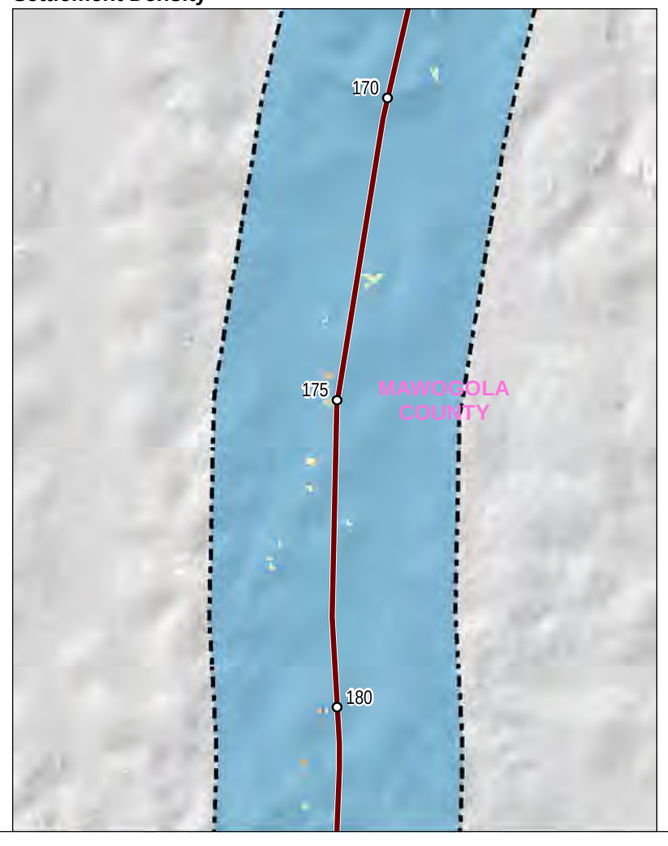
Surface Water Type



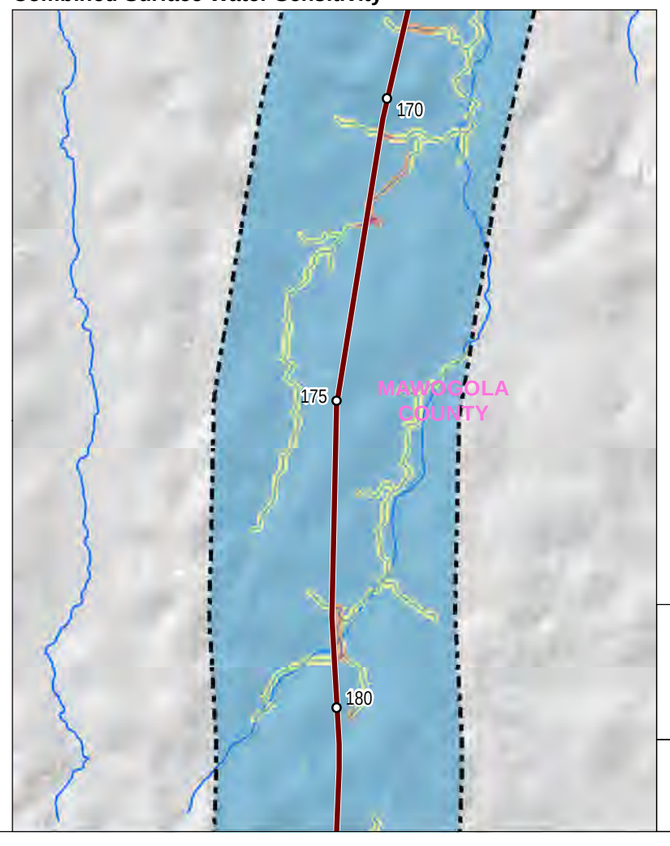
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

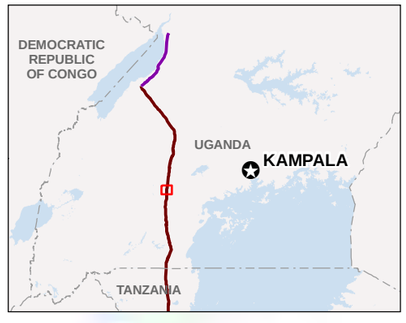
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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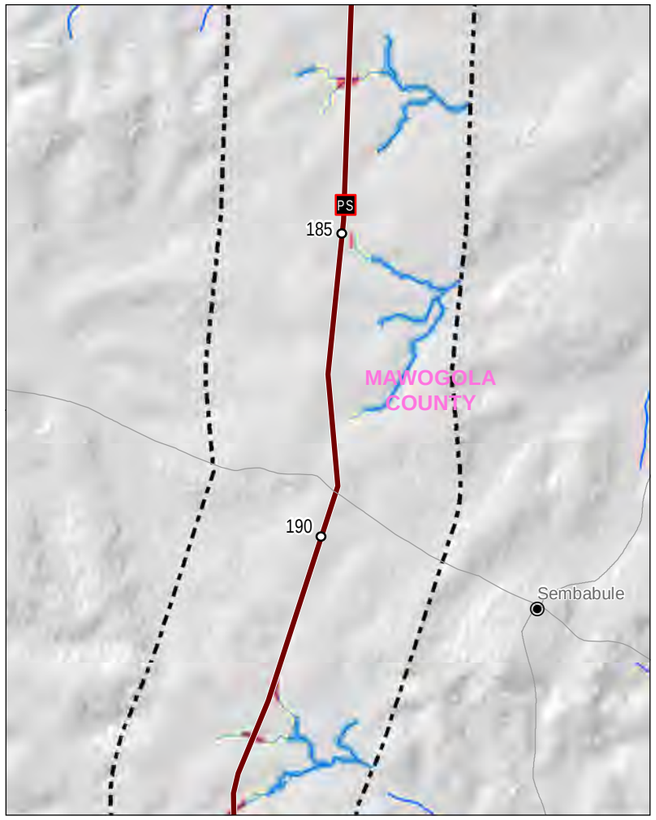
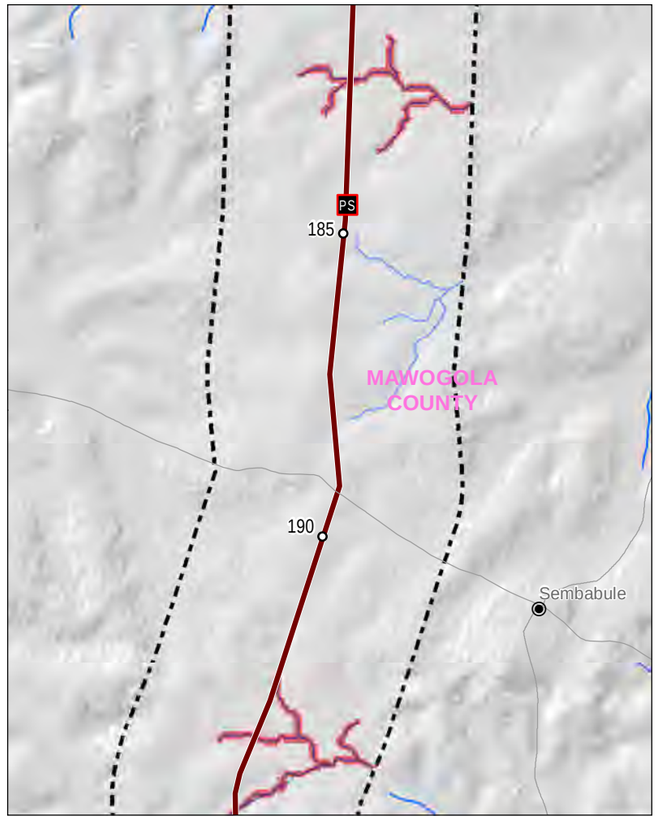
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

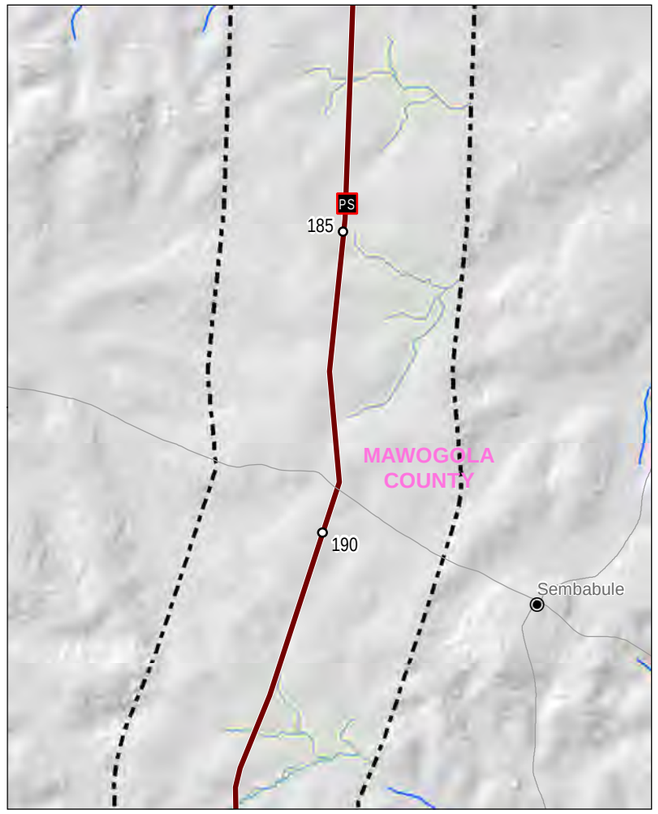
Distance to Surface Water



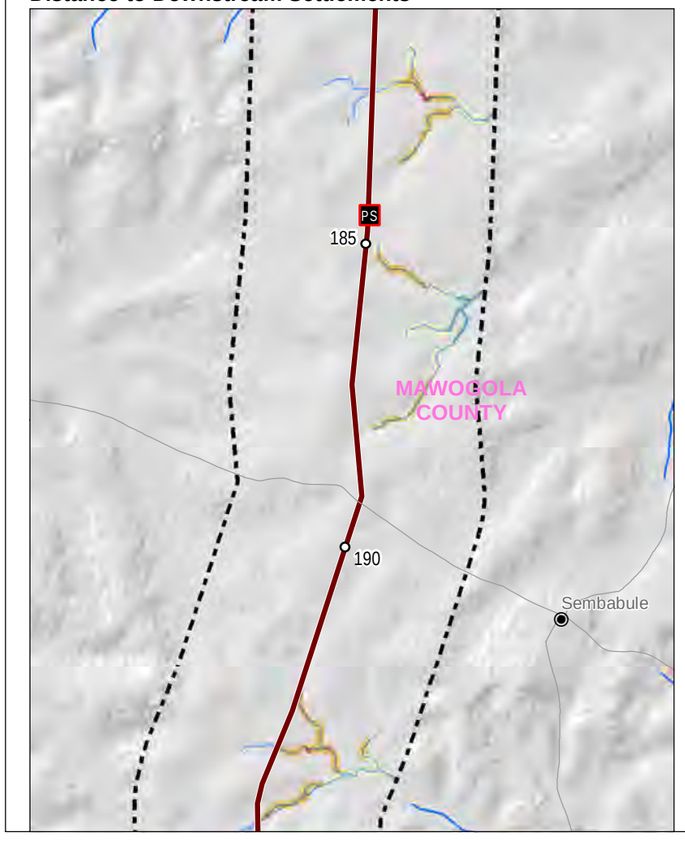
Surface Water Crossings



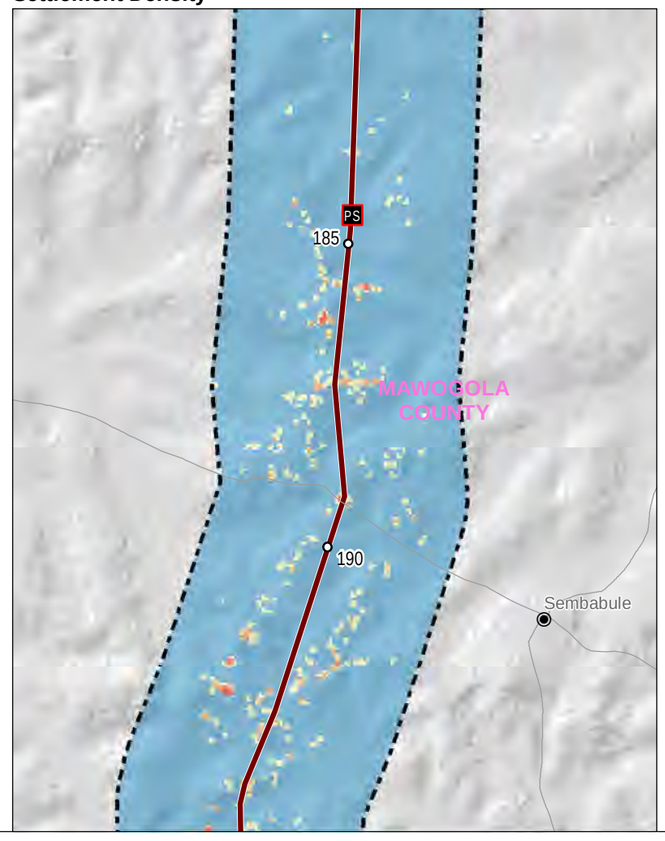
Surface Water Type



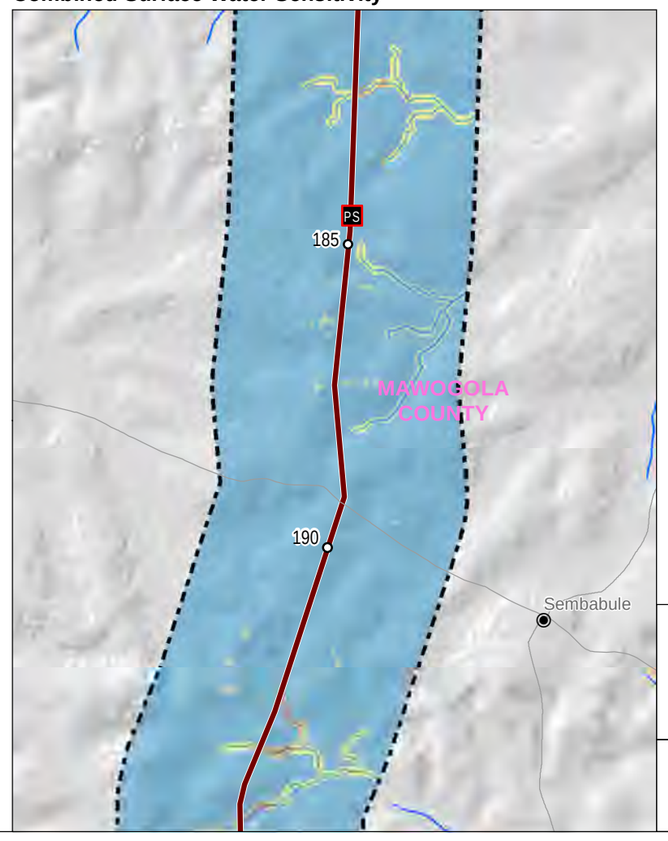
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Pumping Station
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

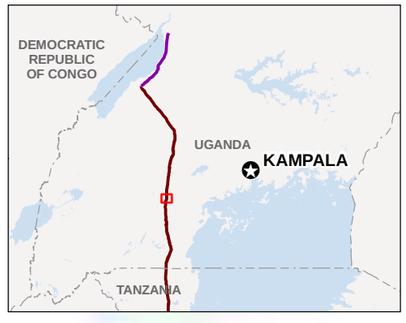
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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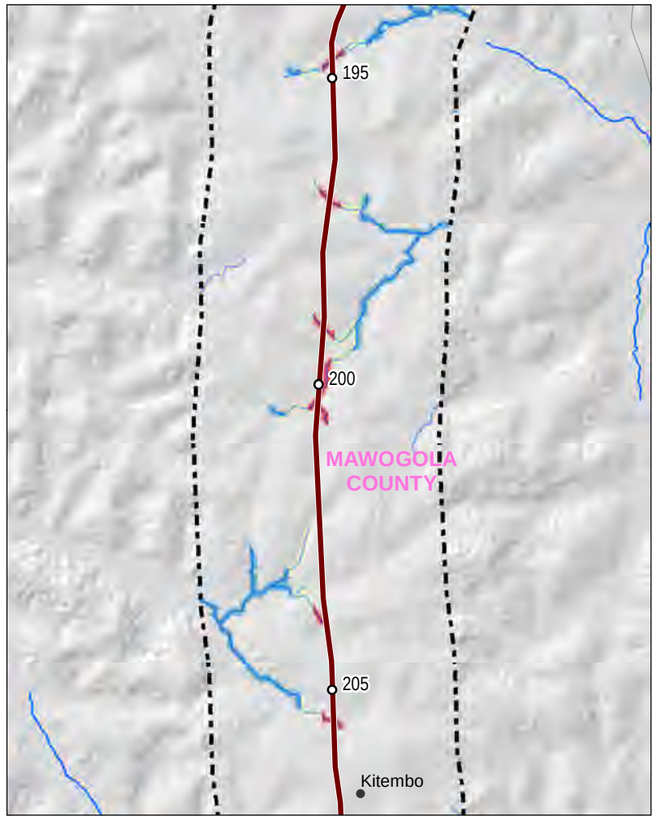
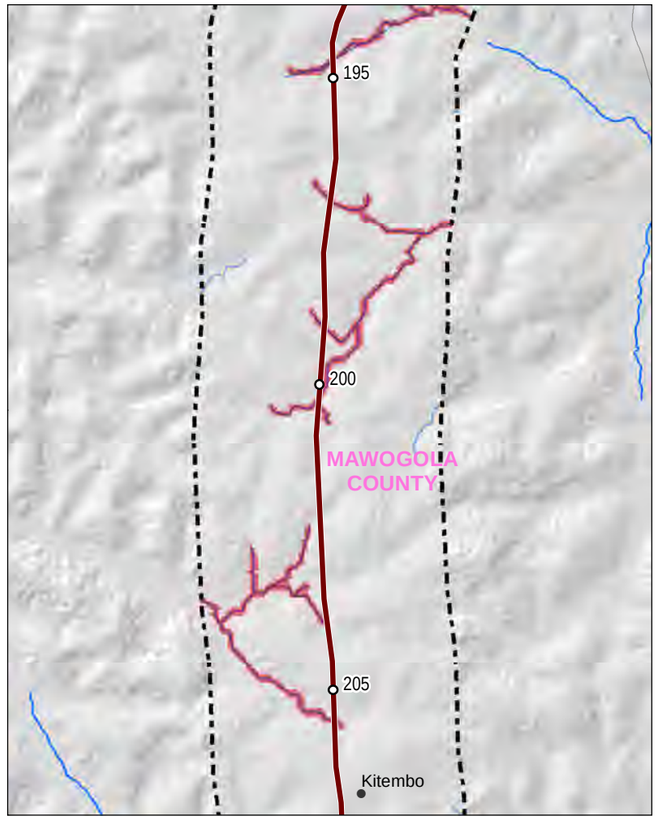
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

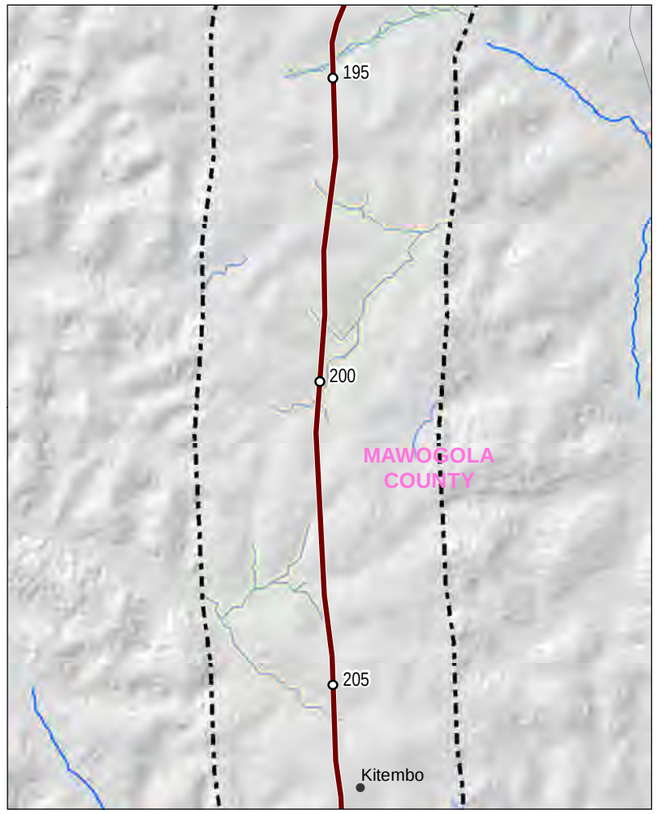
Distance to Surface Water



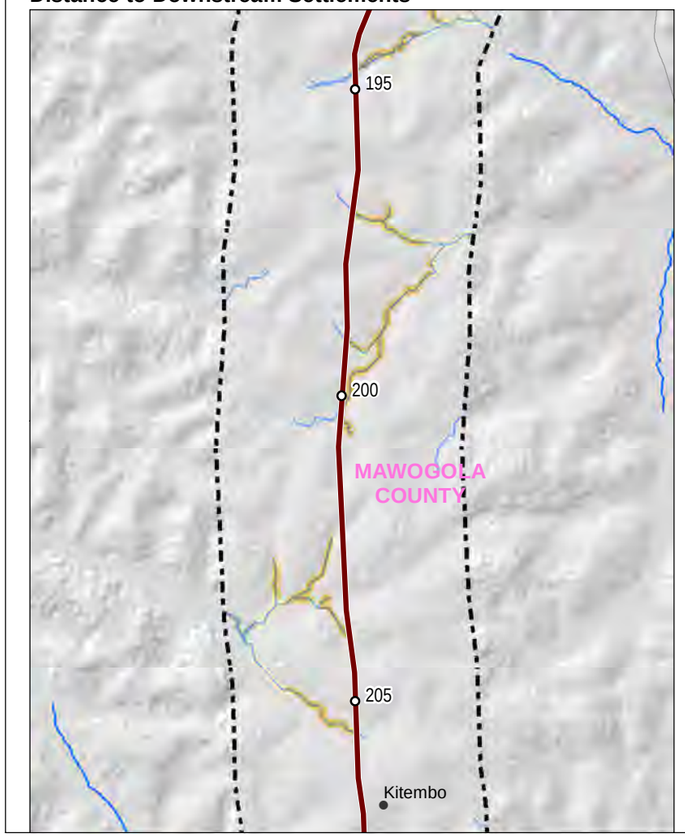
Surface Water Crossings



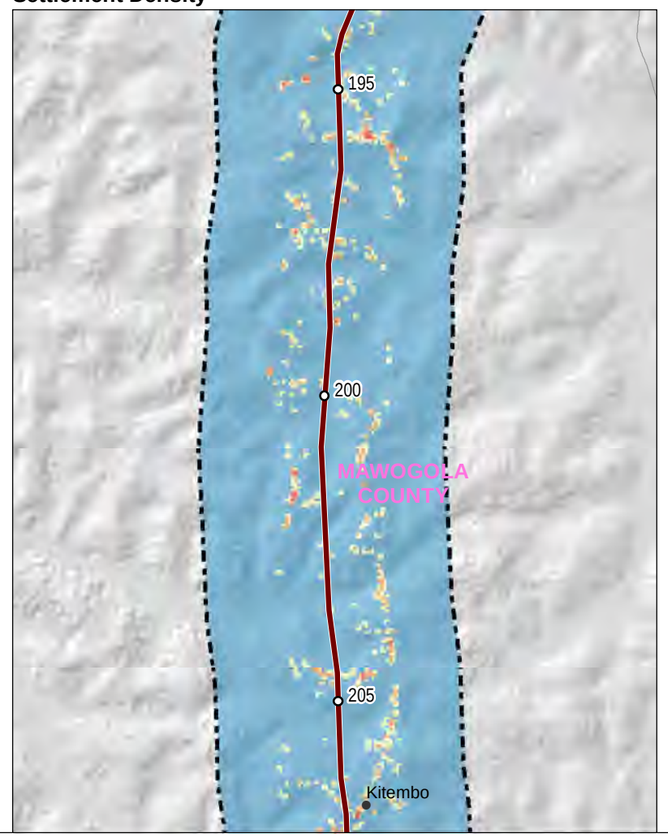
Surface Water Type



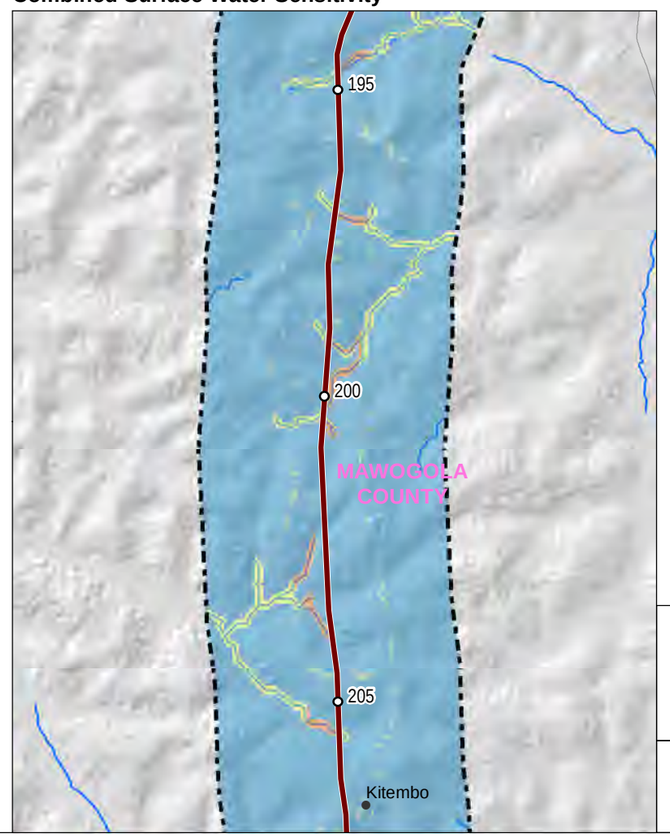
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

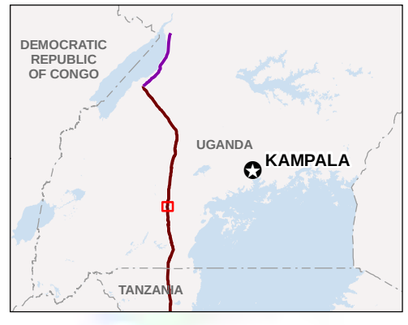
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

N
W E
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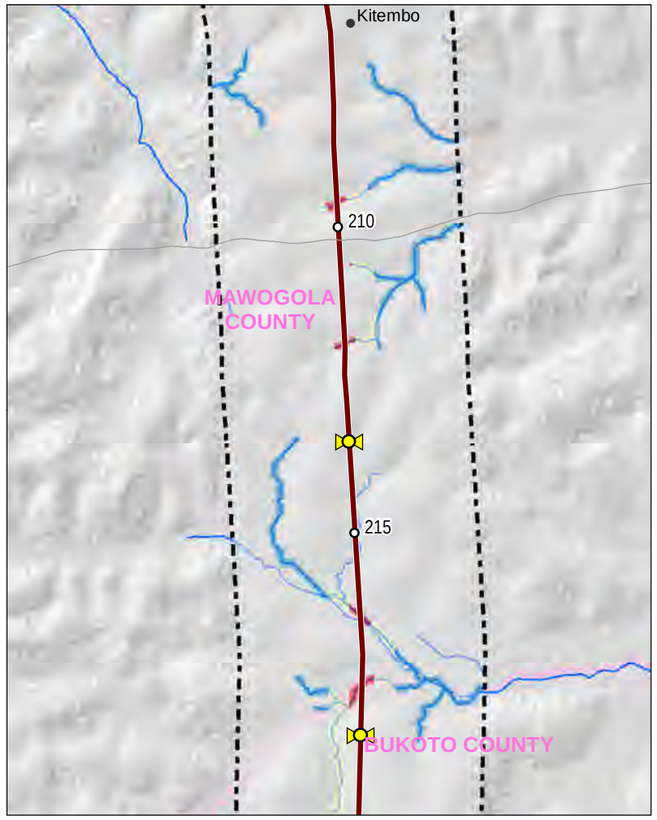
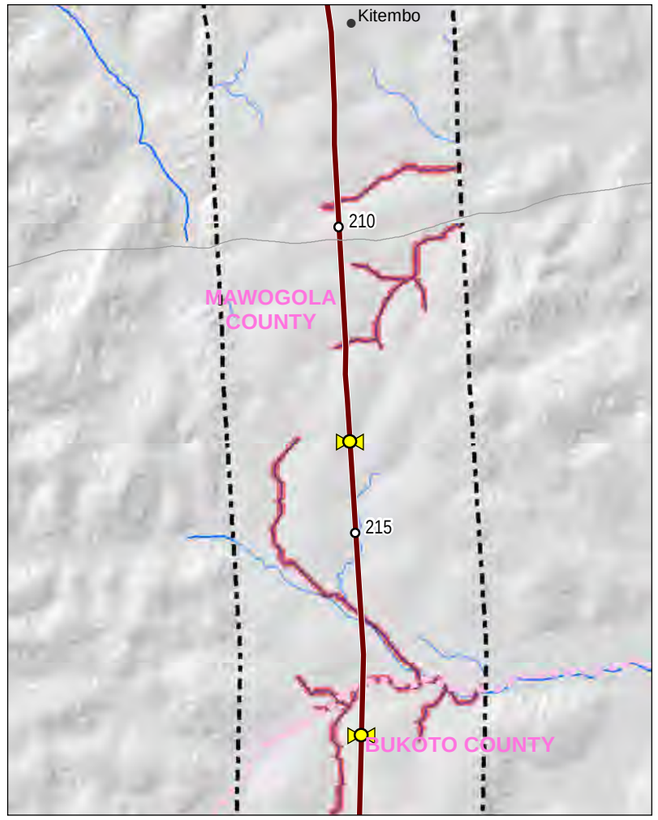
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

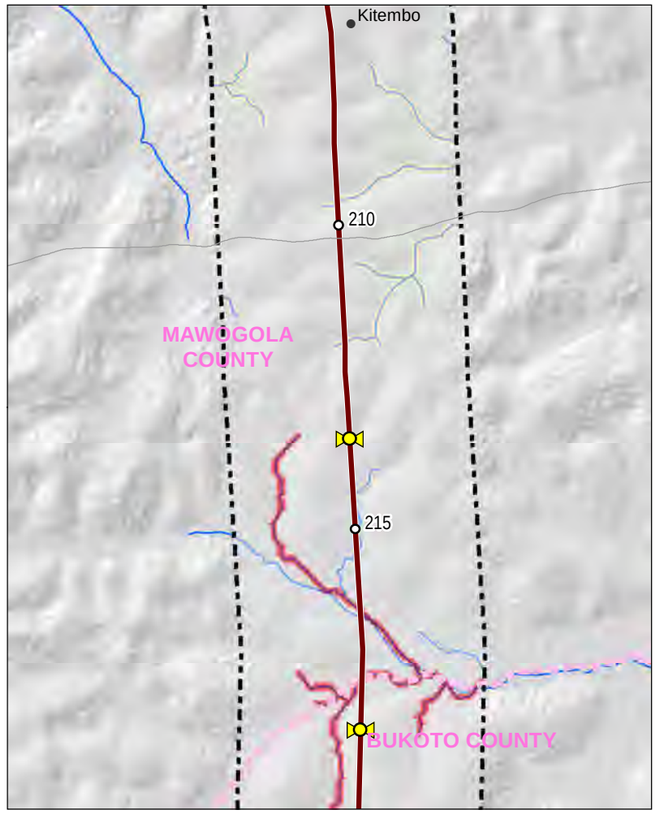
Distance to Surface Water



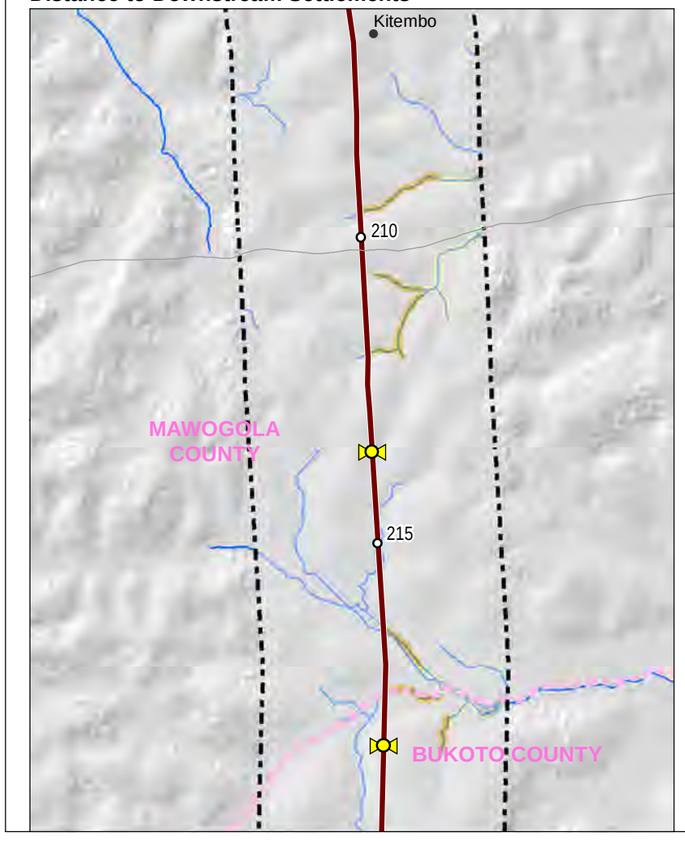
Surface Water Crossings



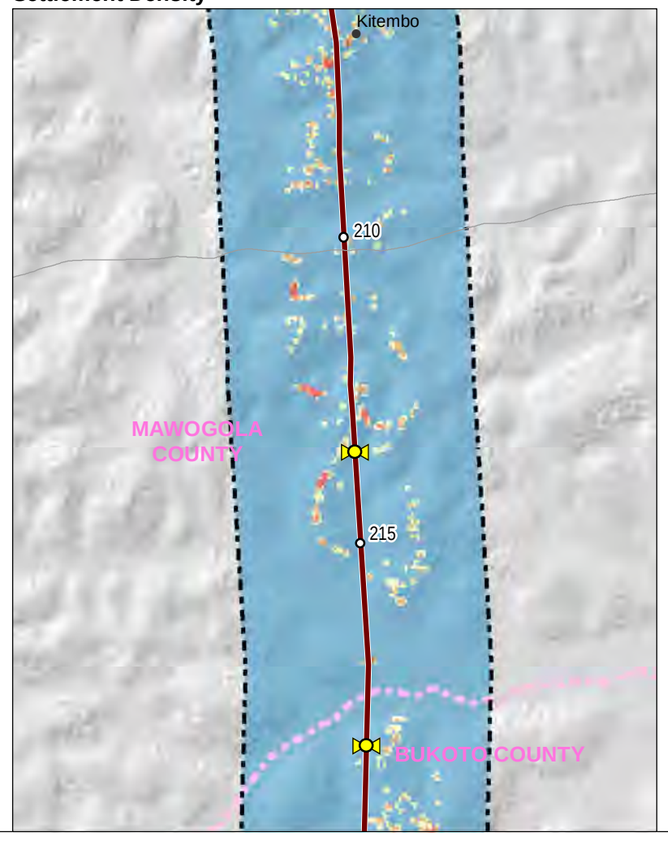
Surface Water Type



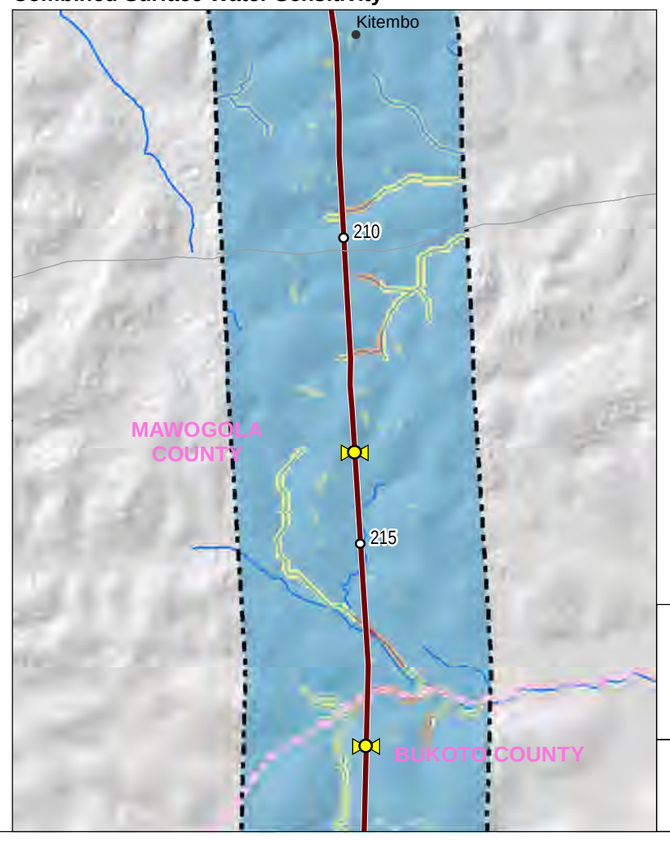
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

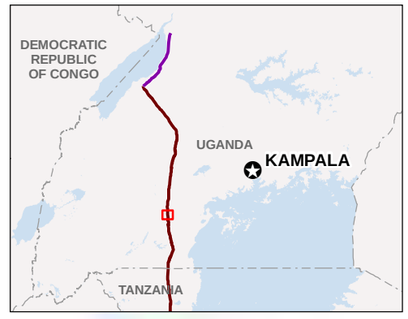
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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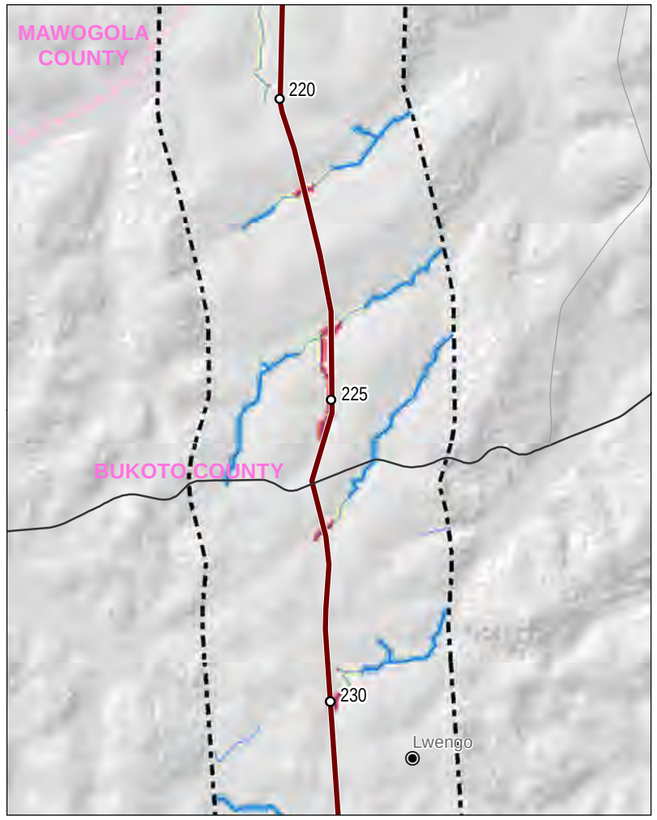
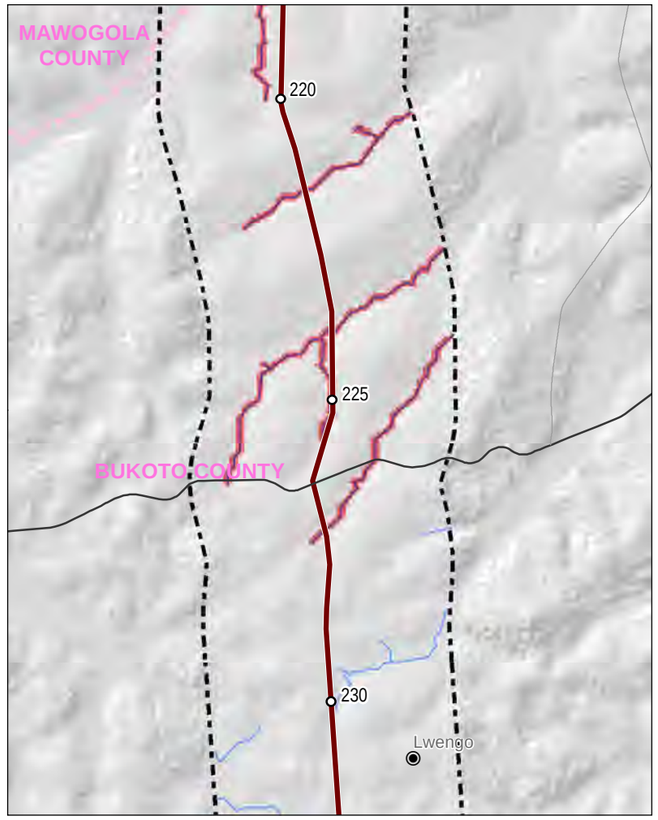
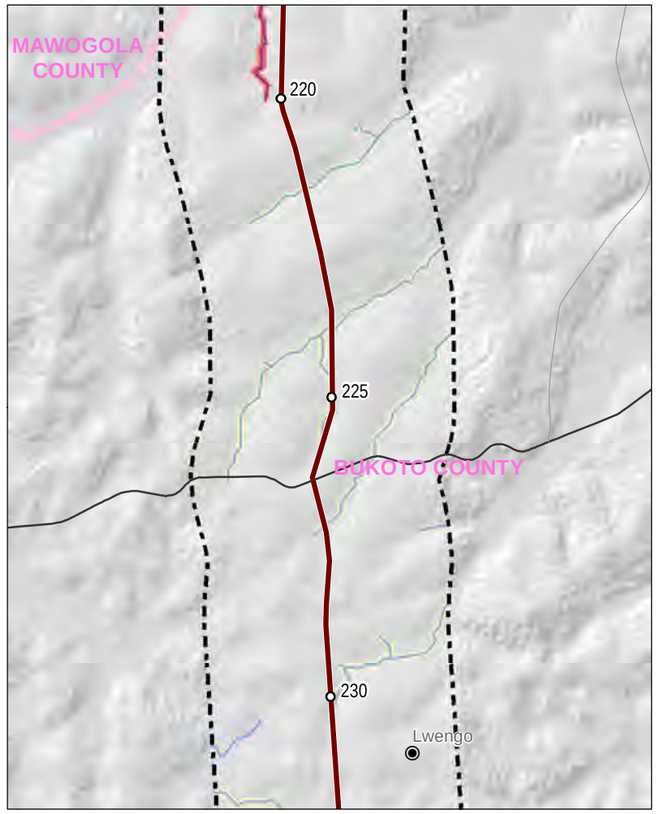
Distance to Surface Water



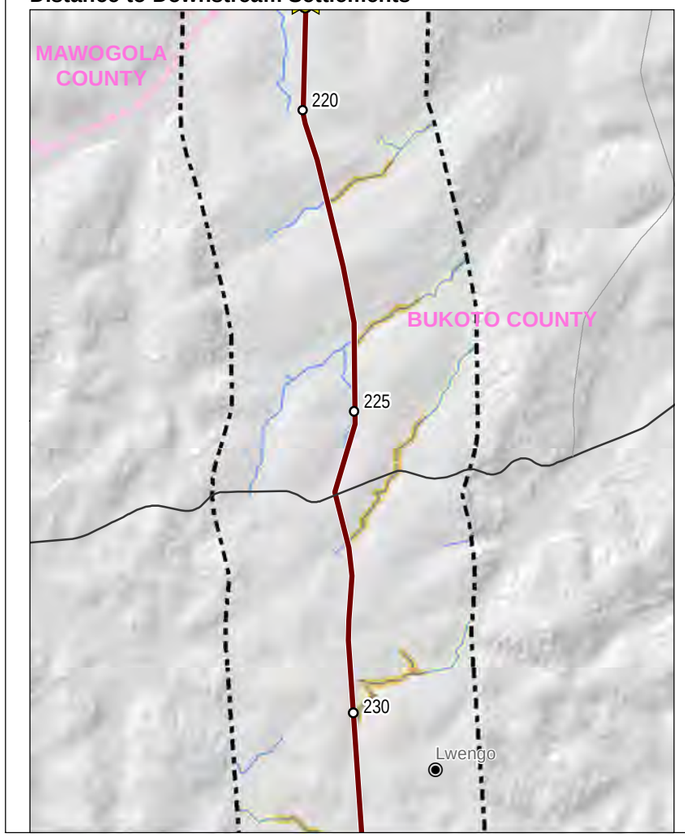
Surface Water Crossings



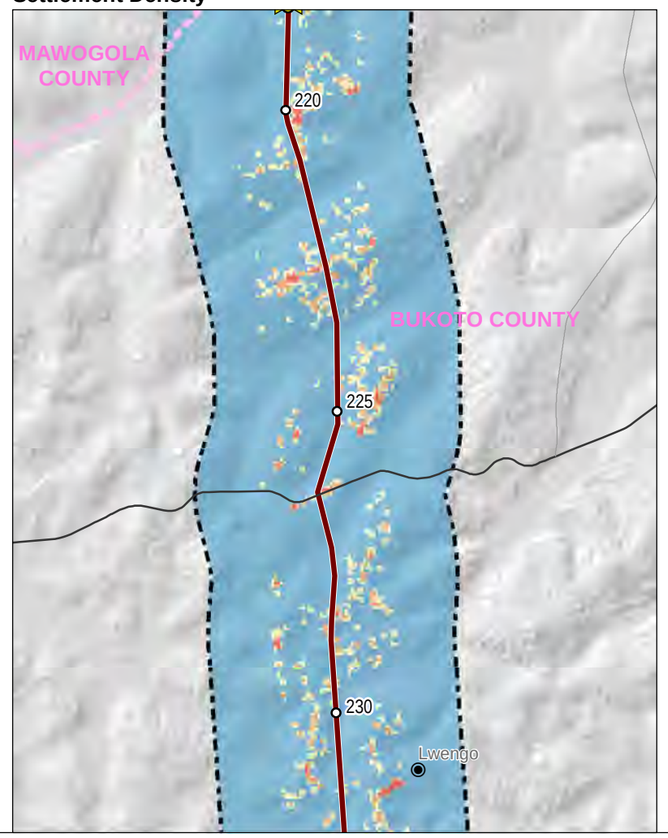
Surface Water Type



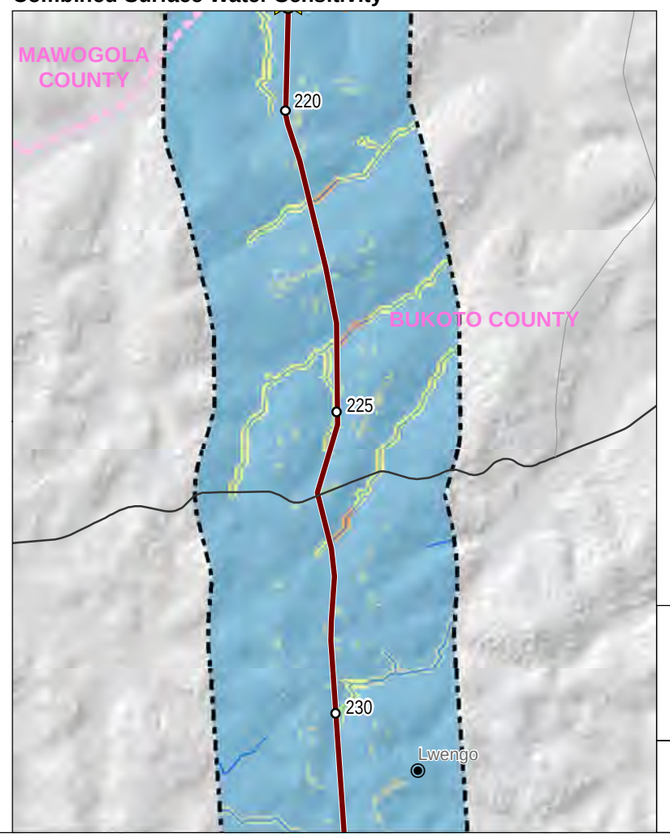
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

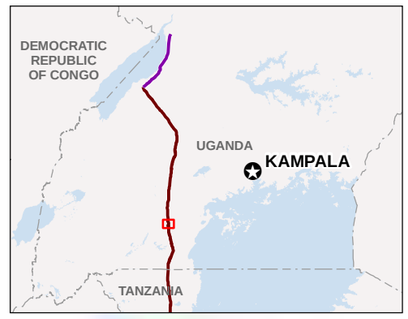
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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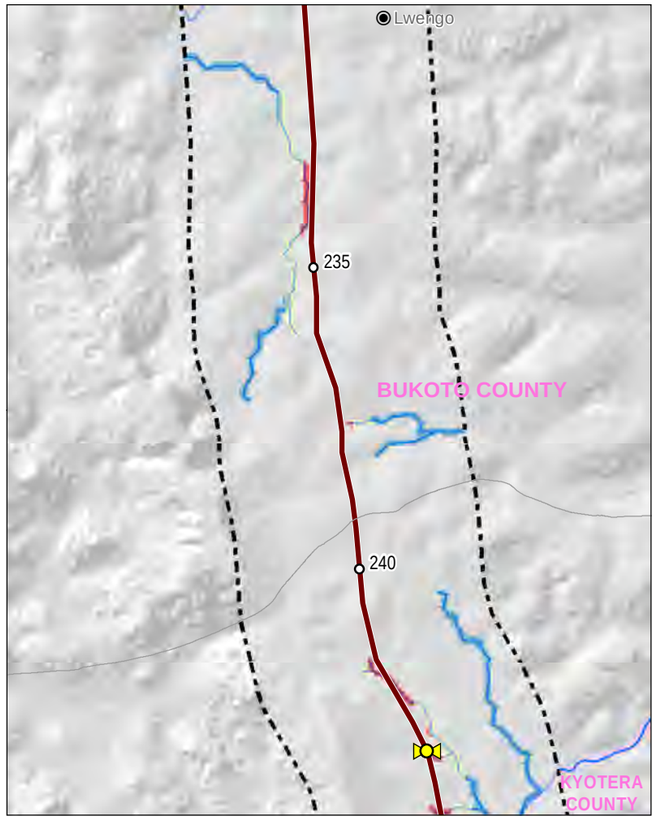
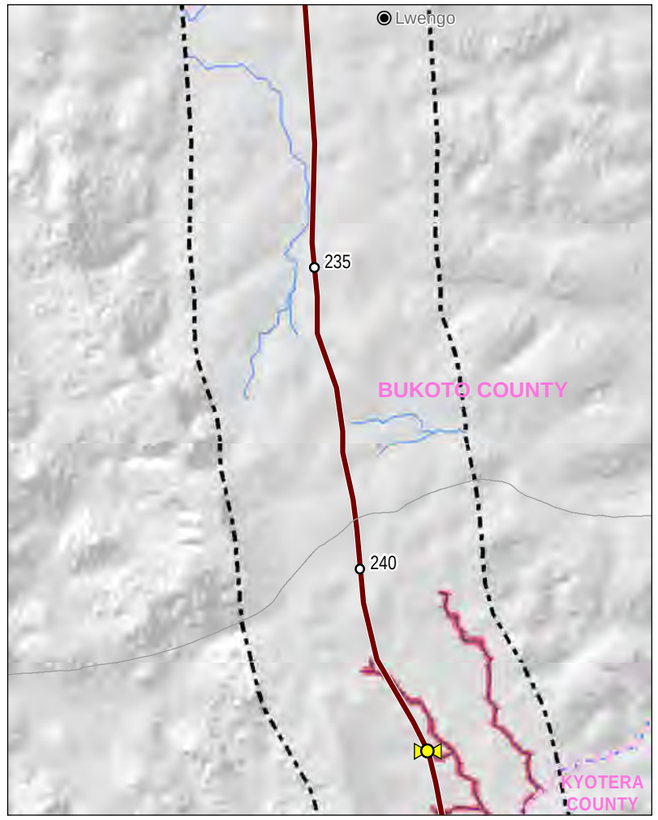
Document Path: P:\08-International\P80677 EACOPCTR 10 - GIS\80712-056[A].mxd

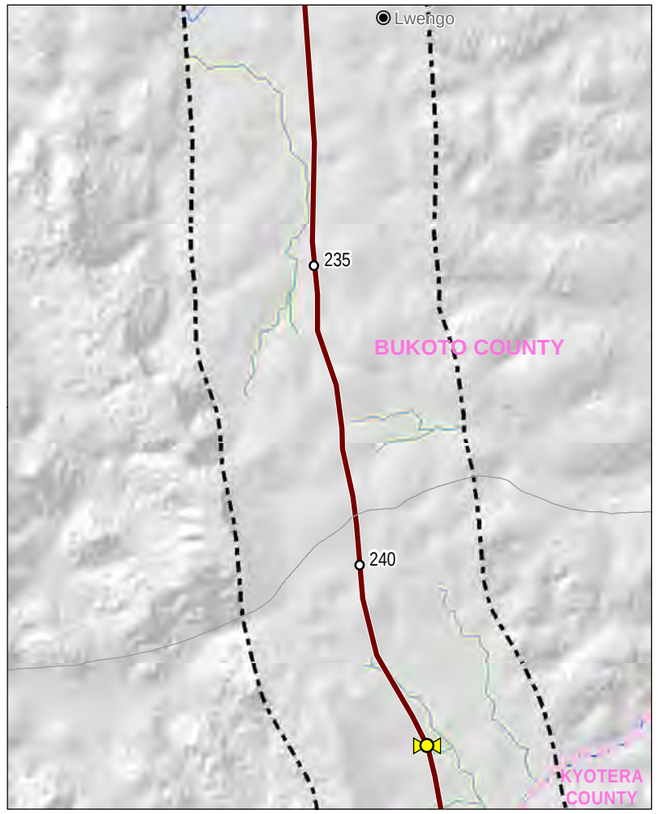
Distance to Surface Water



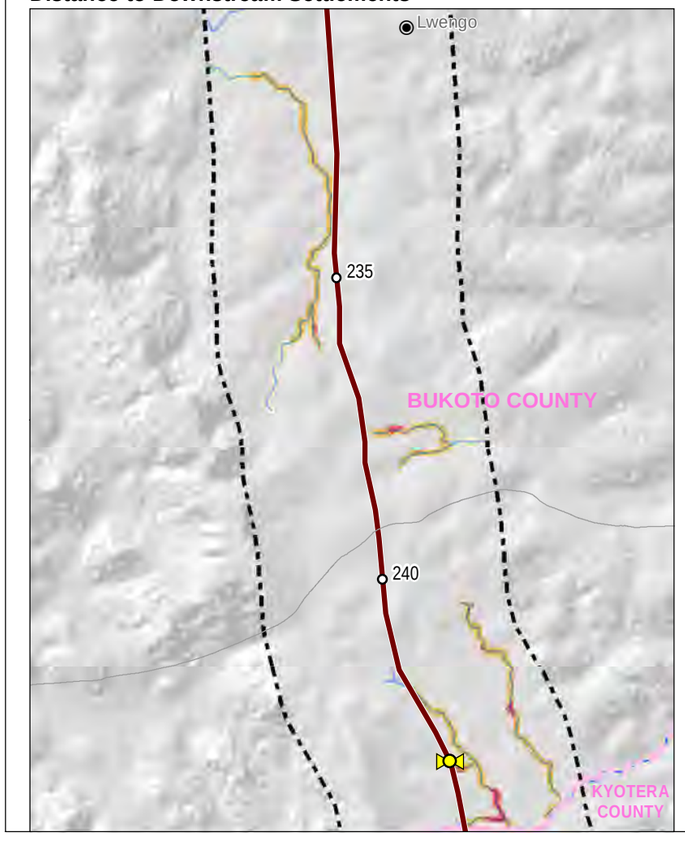
Surface Water Crossings



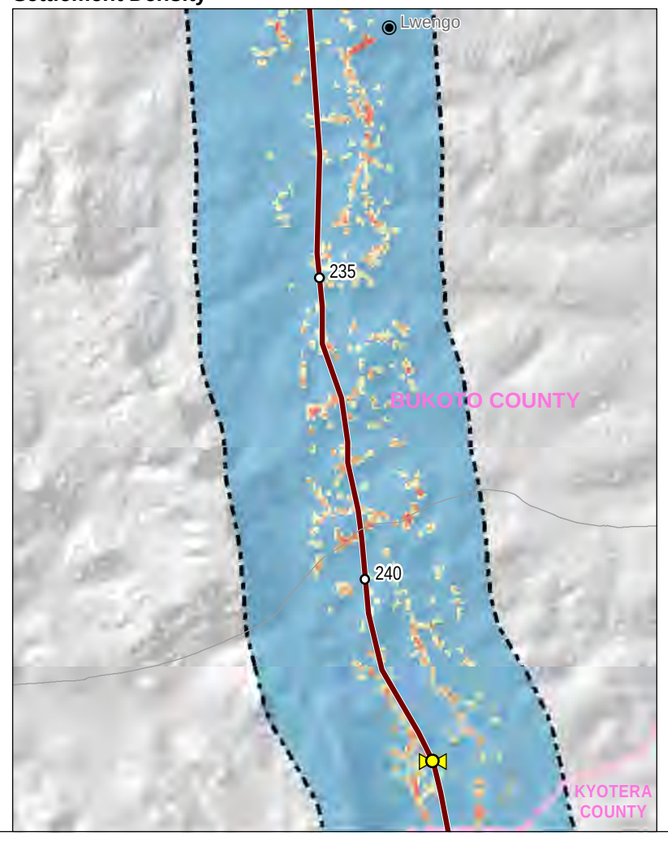
Surface Water Type



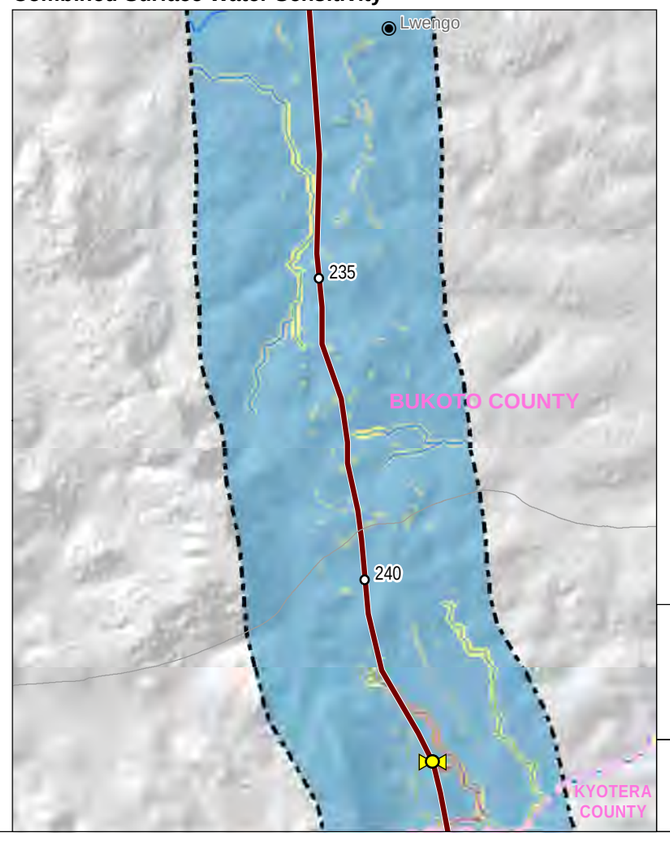
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

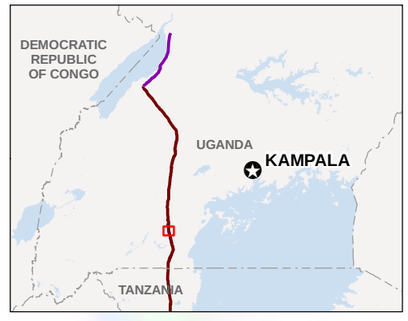
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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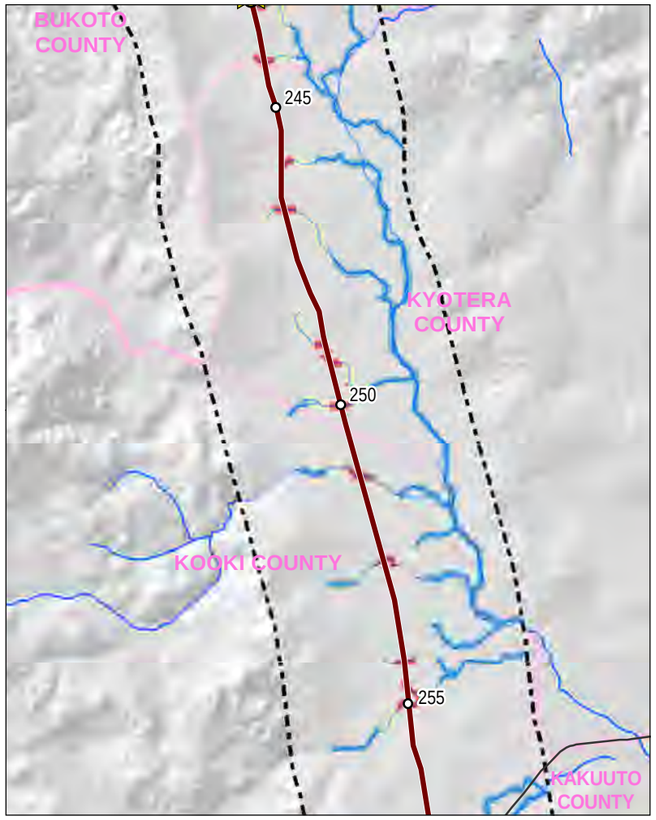
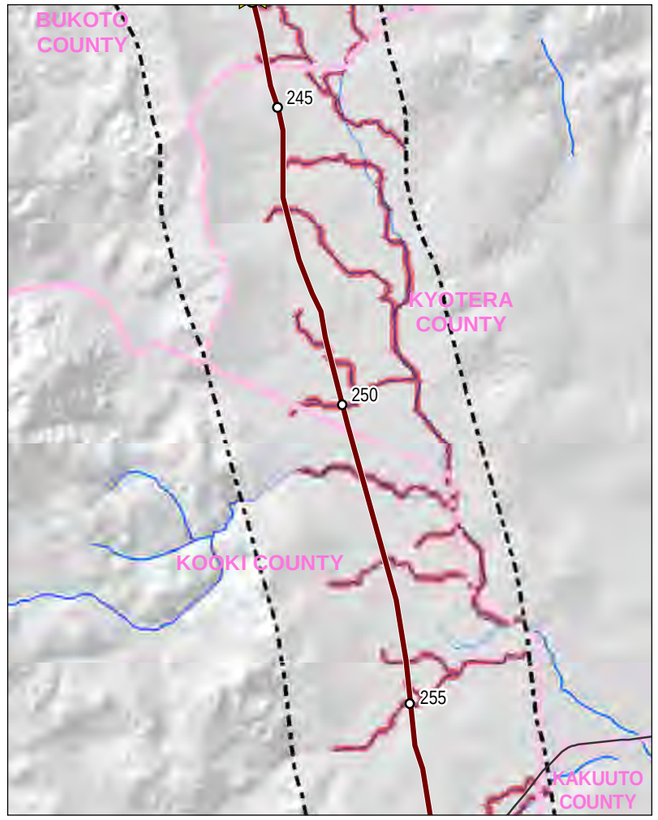
Document Path: P:\08-International\P806\77 EACOP\CTR 10 - GIS\80712-056(A).mxd

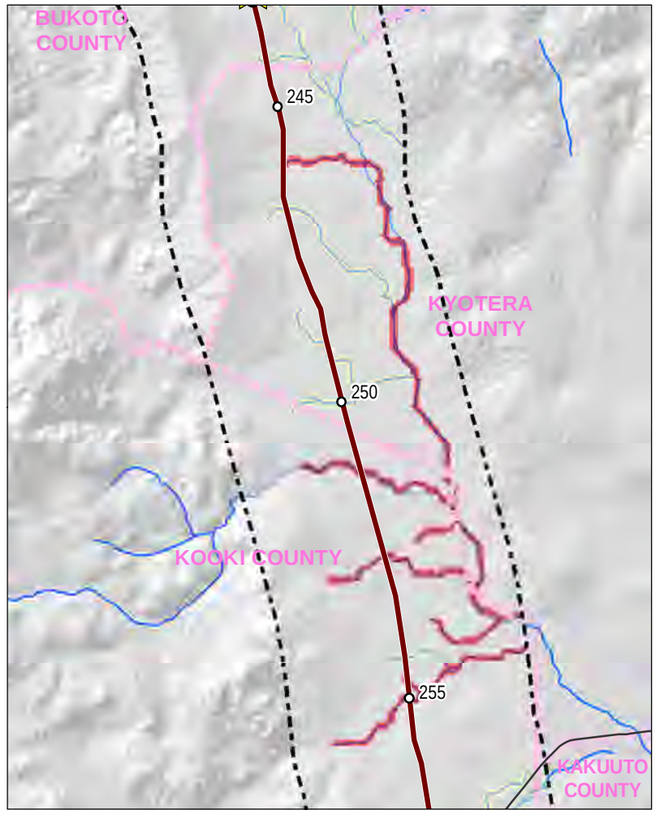
Distance to Surface Water



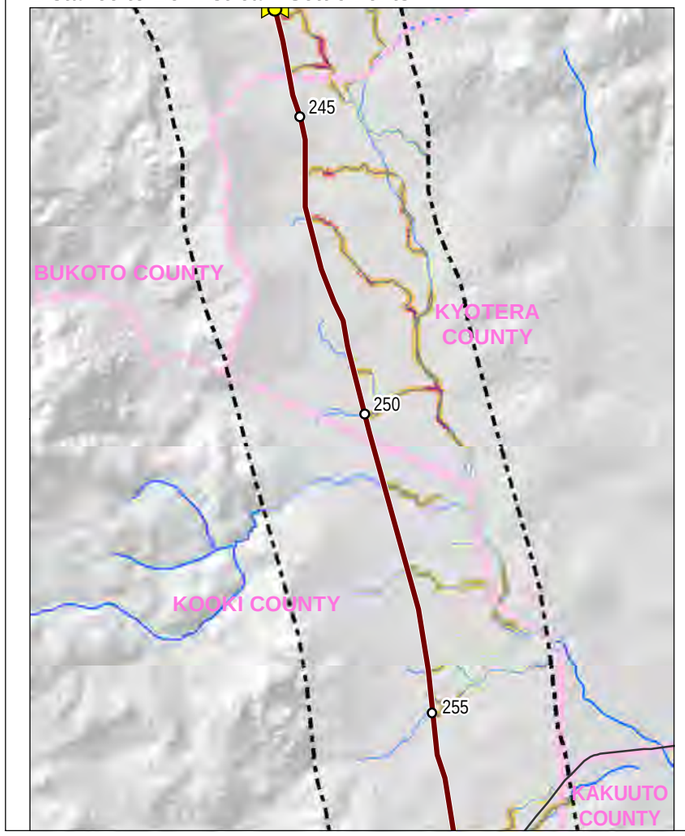
Surface Water Crossings



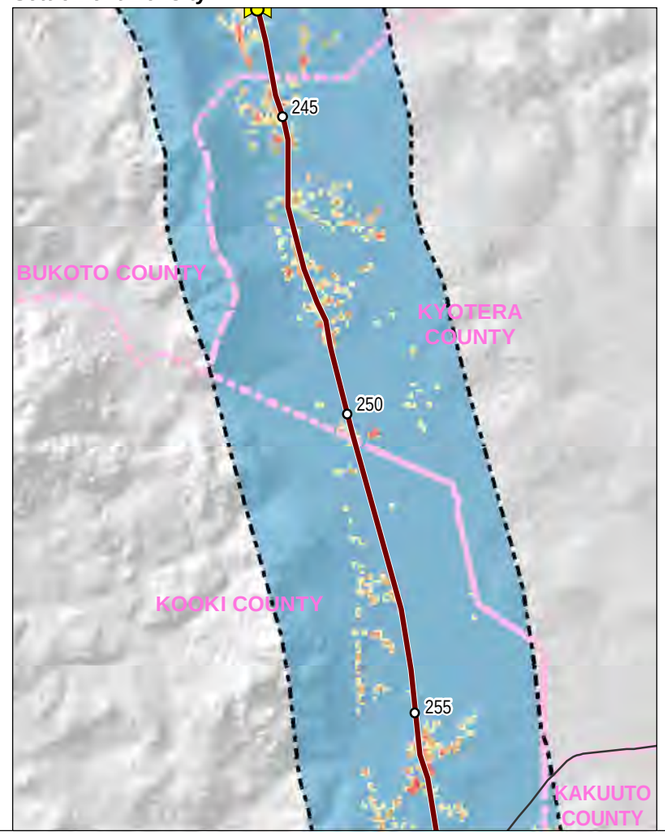
Surface Water Type



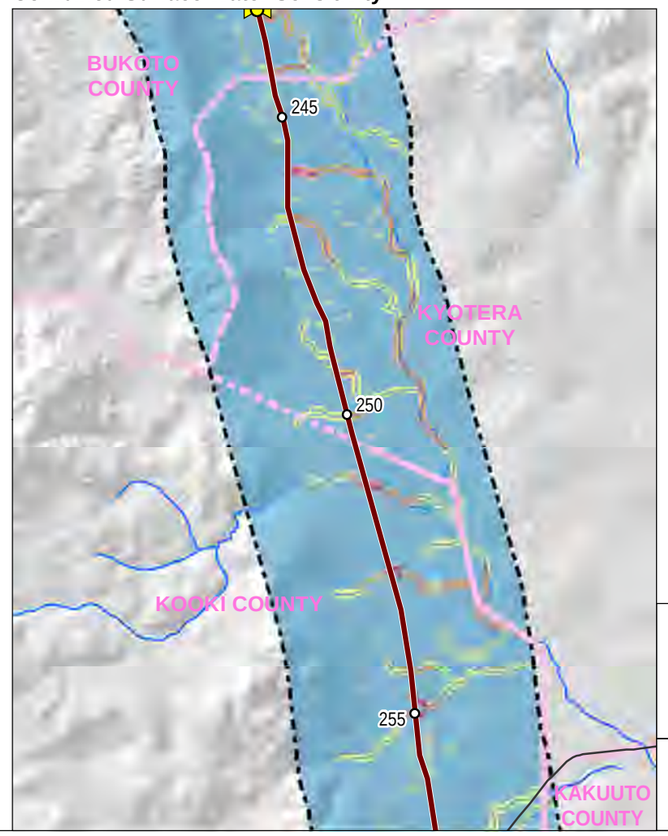
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

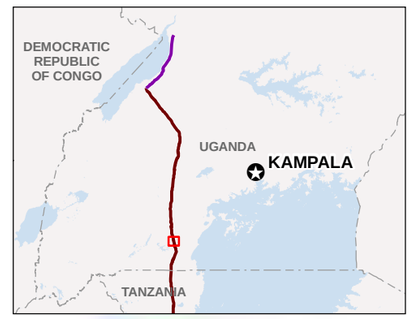
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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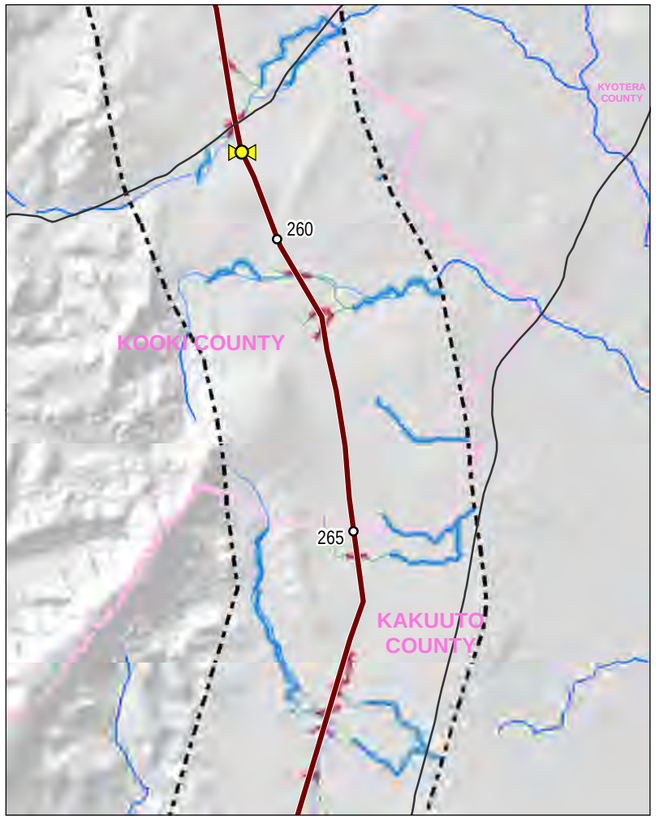
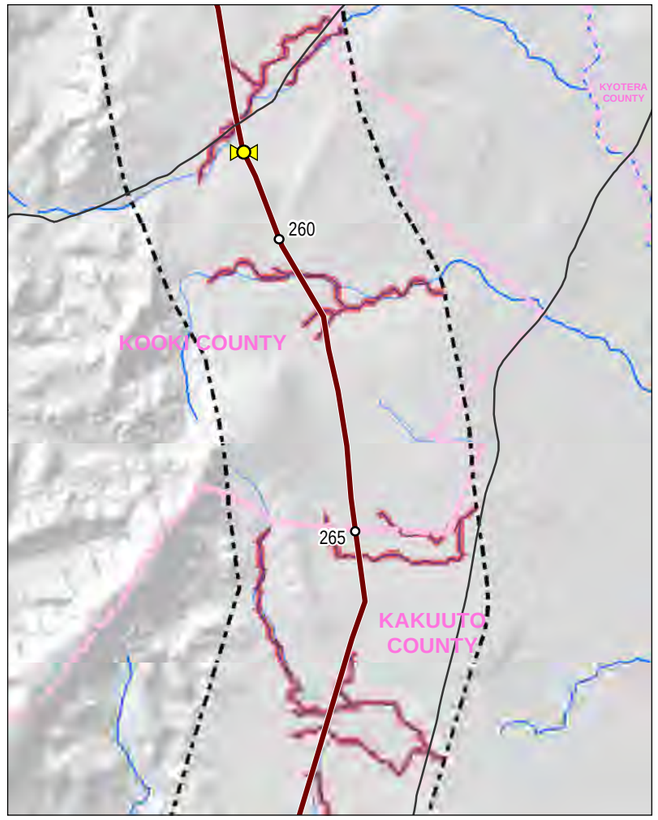
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

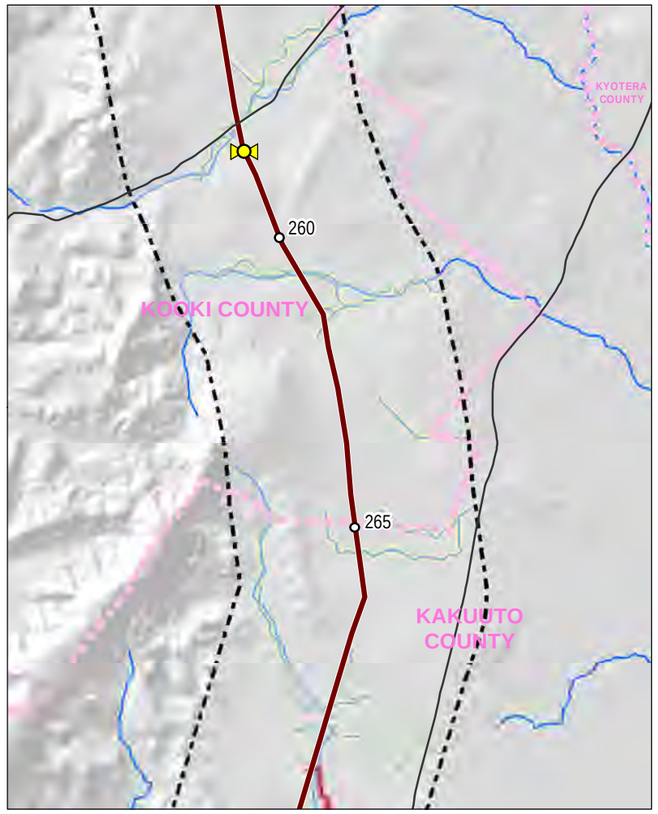
Distance to Surface Water



Surface Water Crossings



Surface Water Type



Legend

- East African Crude Oil Pipeline
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- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
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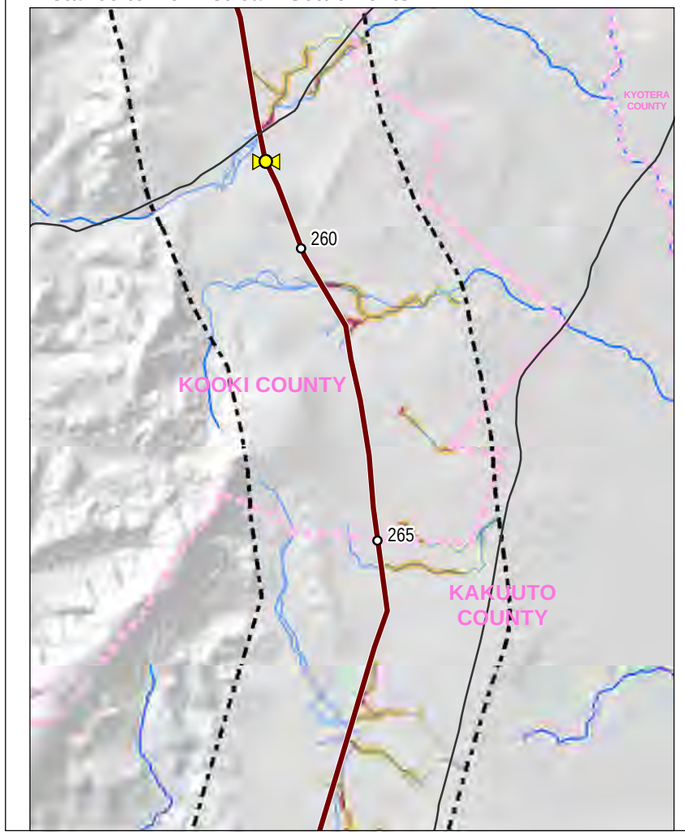
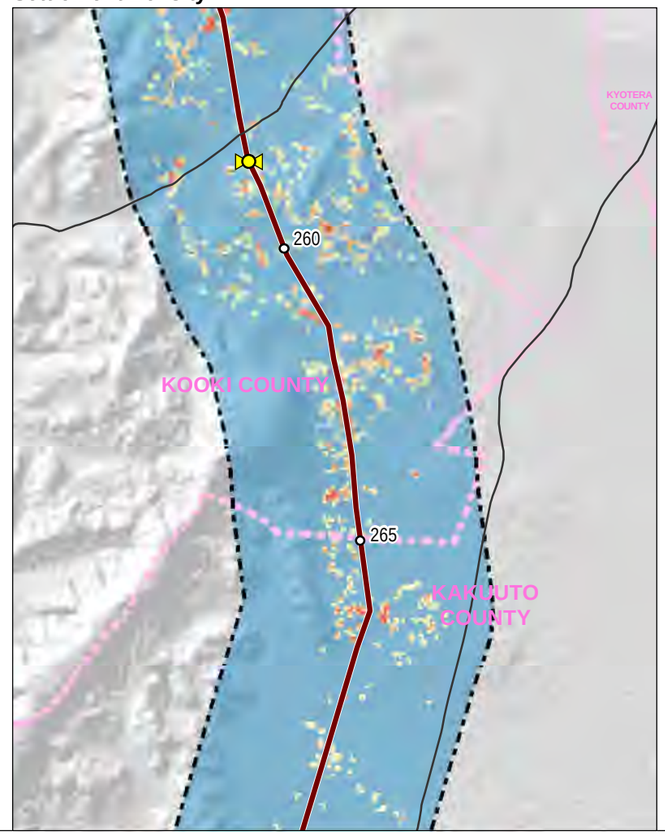
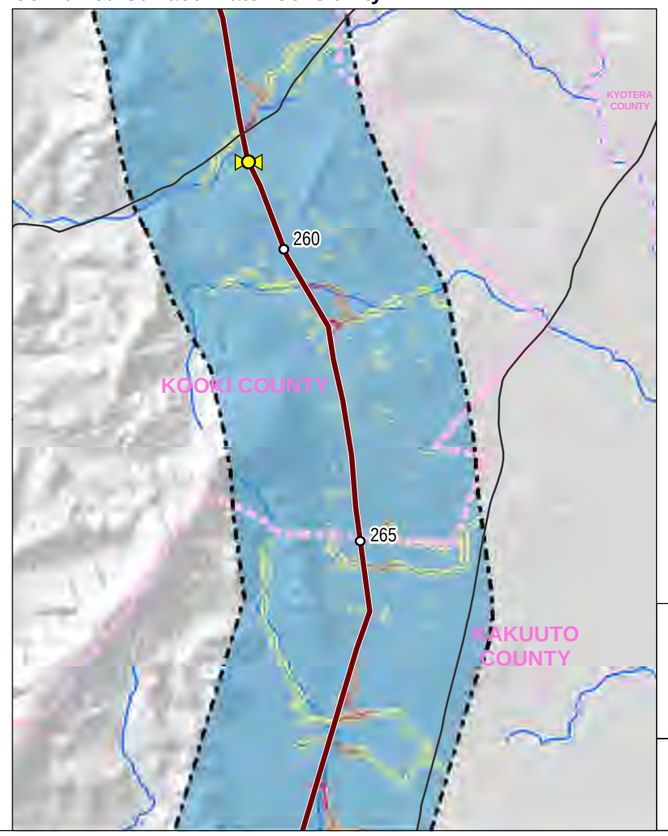
Distance to Downstream Settlements



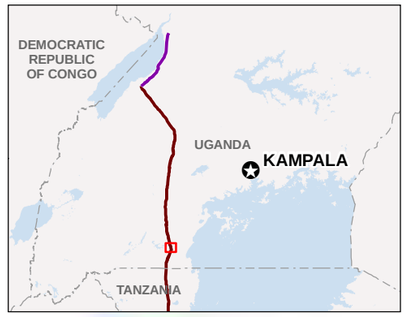
Settlement Density



Combined Surface Water Sensitivity



Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



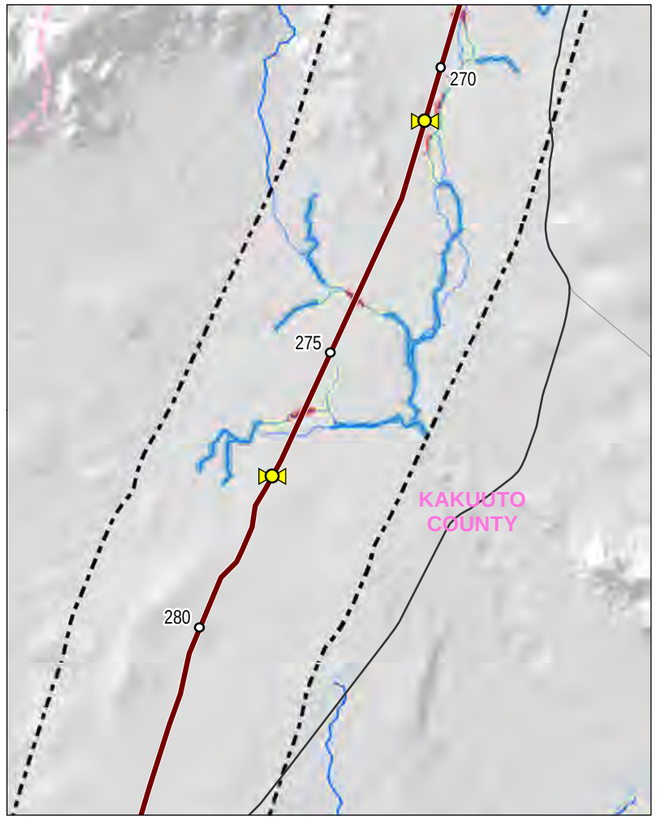
CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

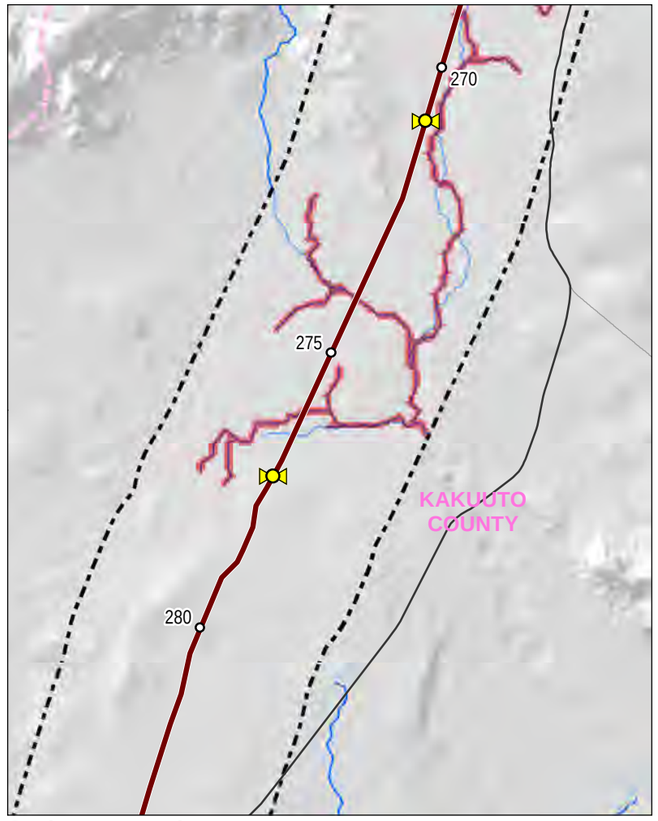
N W E S

Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-056[A].mxd

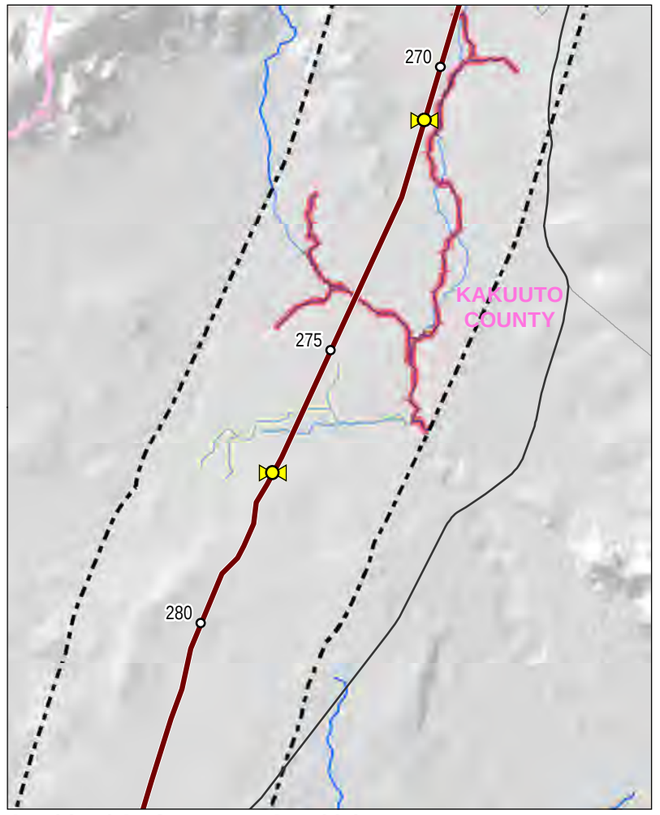
Distance to Surface Water



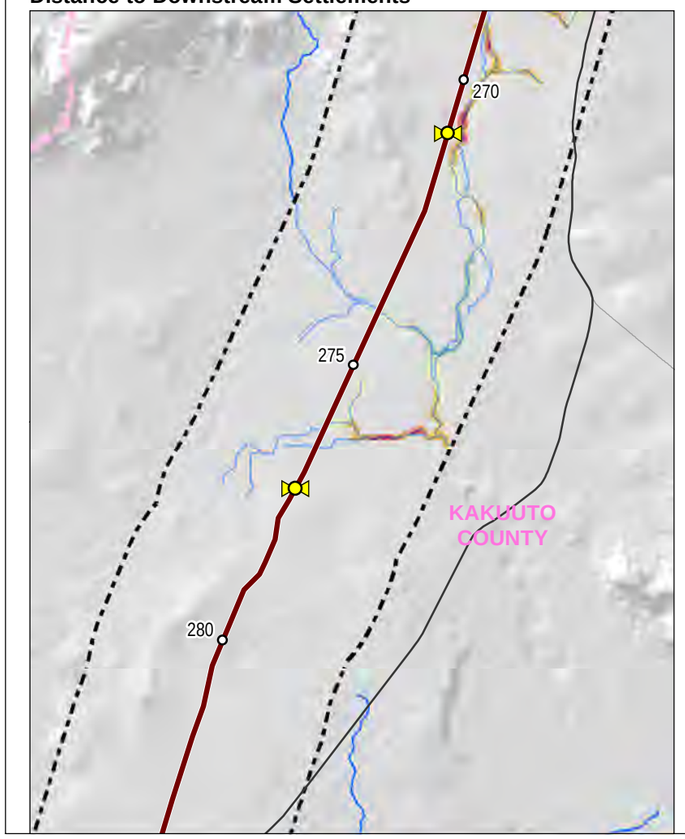
Surface Water Crossings



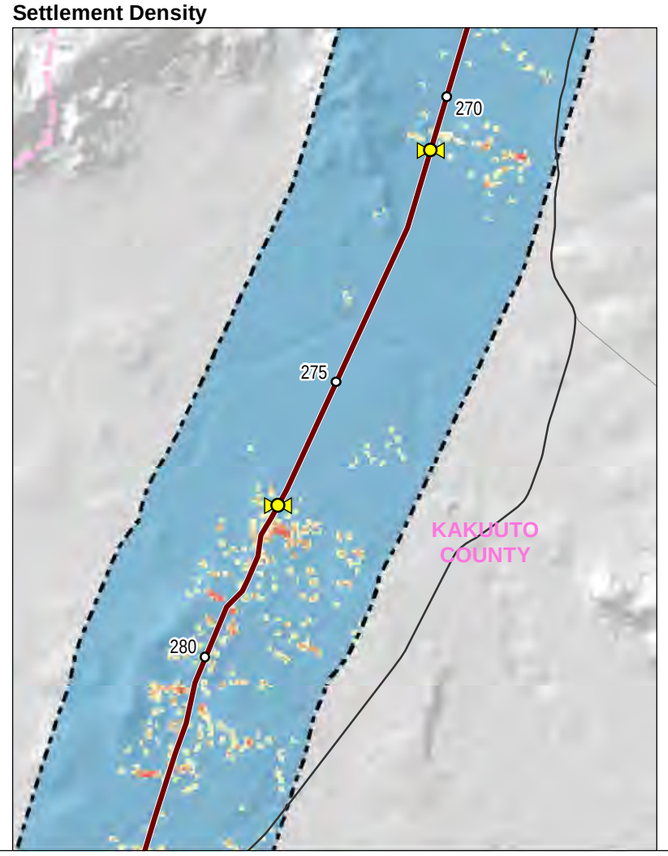
Surface Water Type



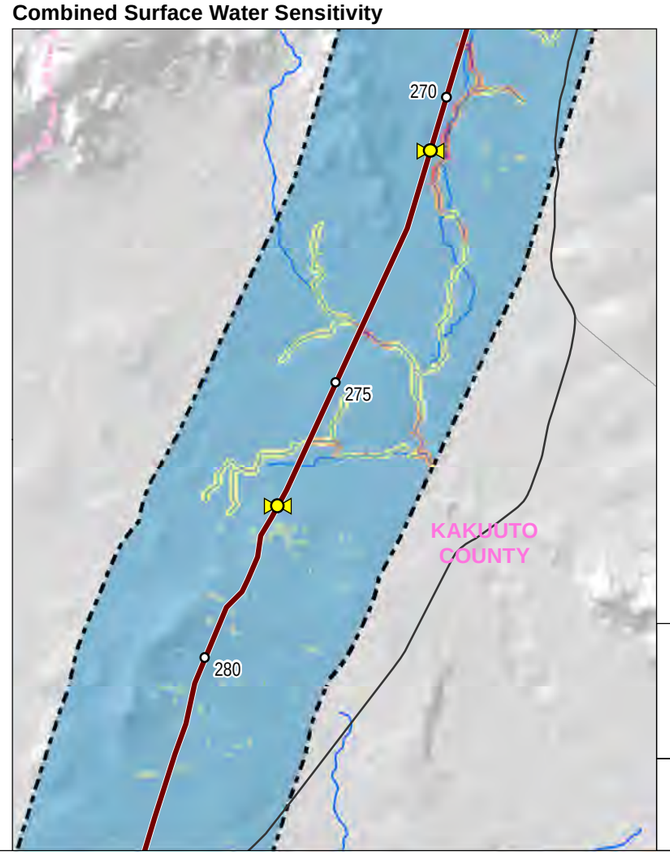
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

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- Highway
- Major Road

Hydrology:

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- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

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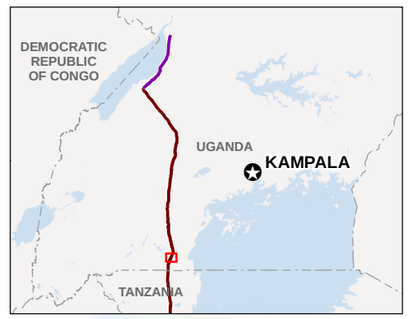
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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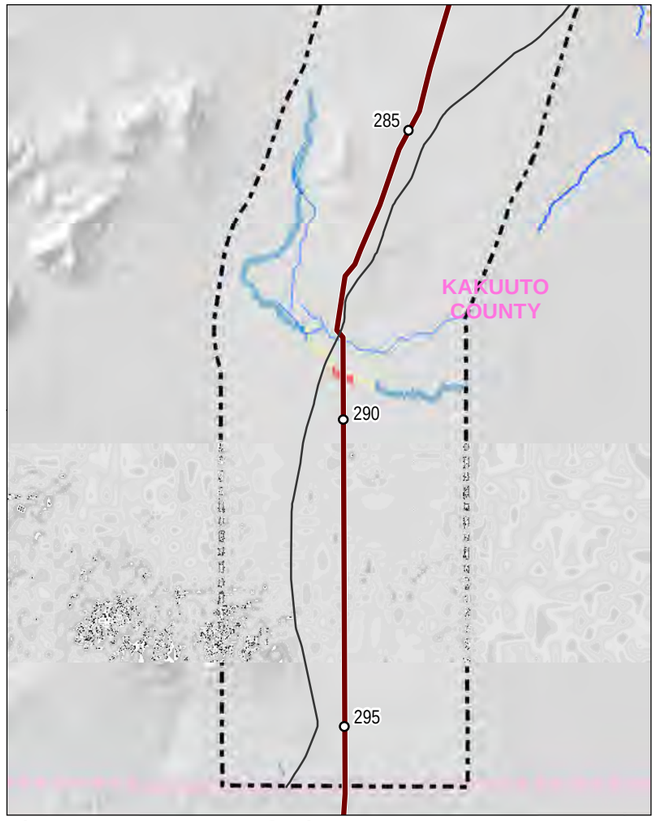
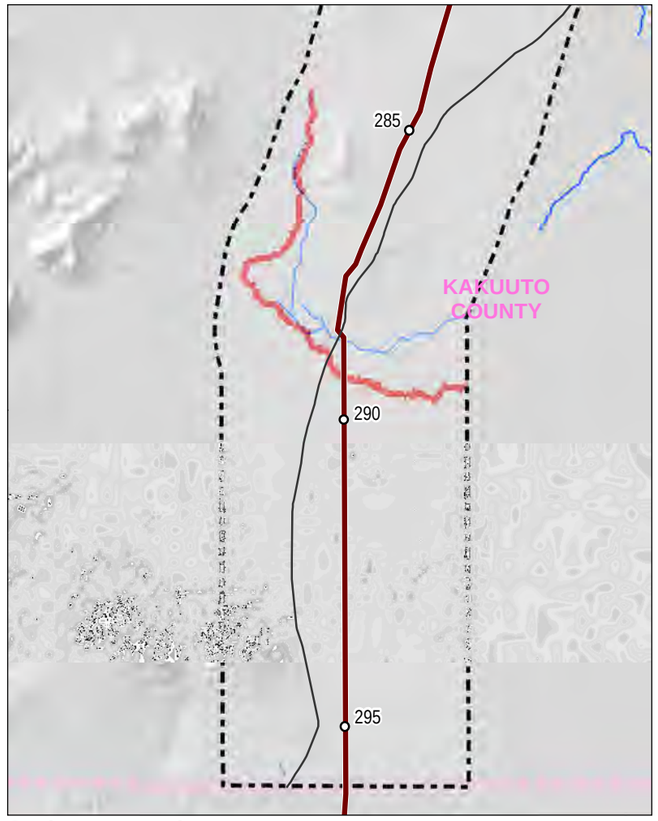
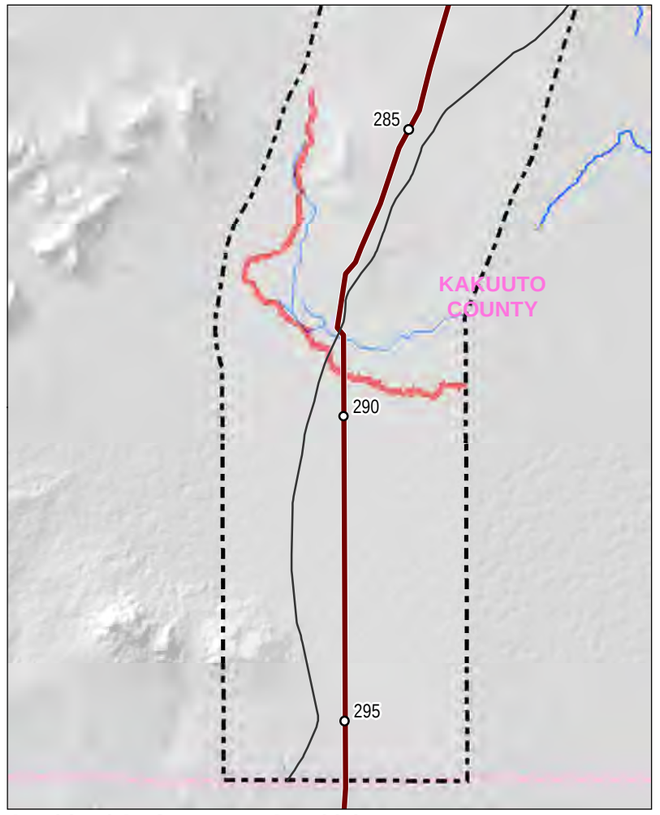
Distance to Surface Water



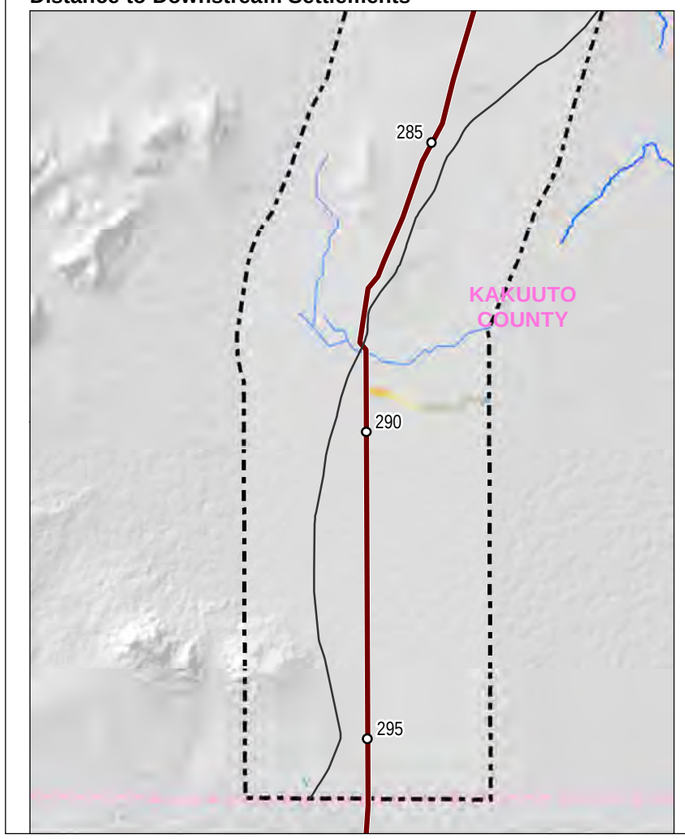
Surface Water Crossings



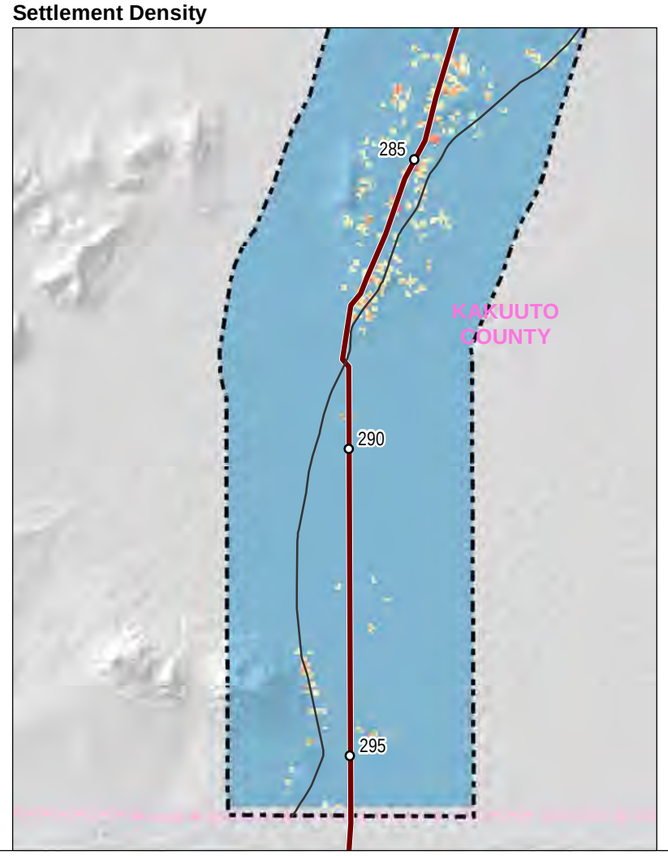
Surface Water Type



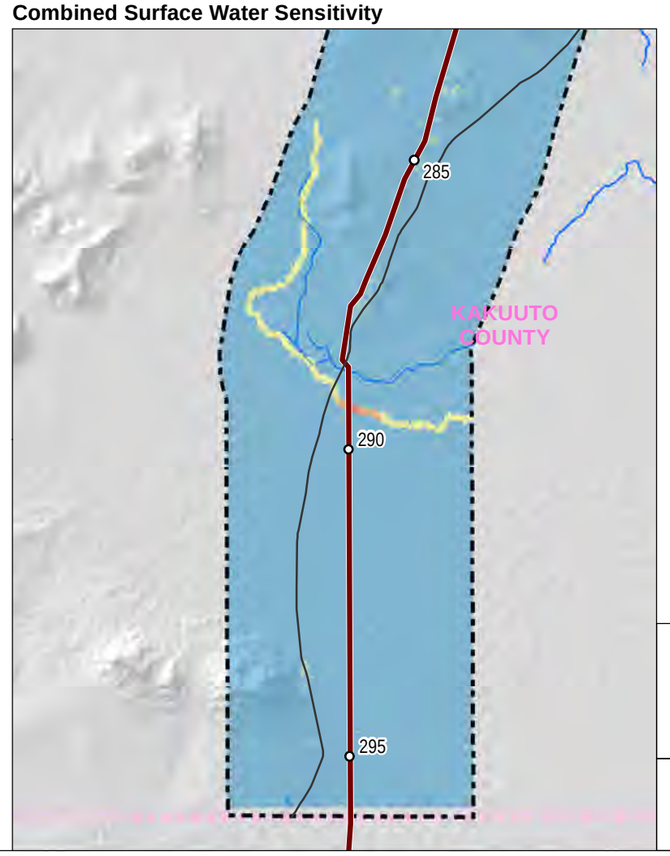
Distance to Downstream Settlements



Settlement Density



Combined Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

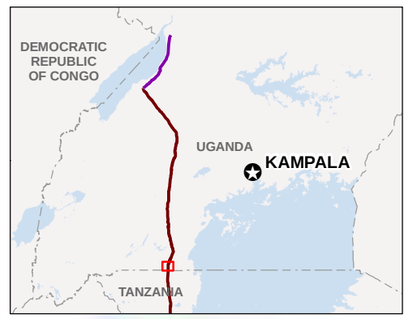
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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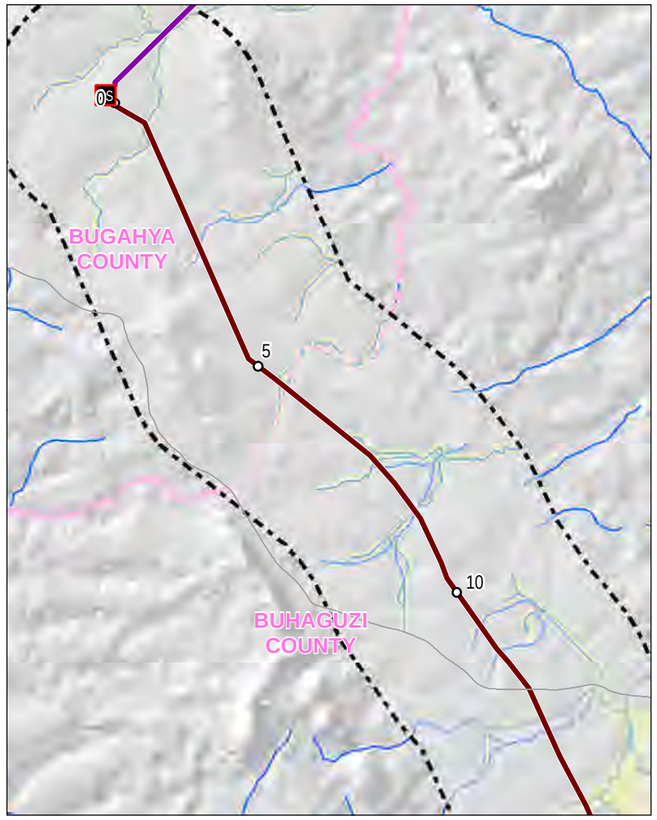
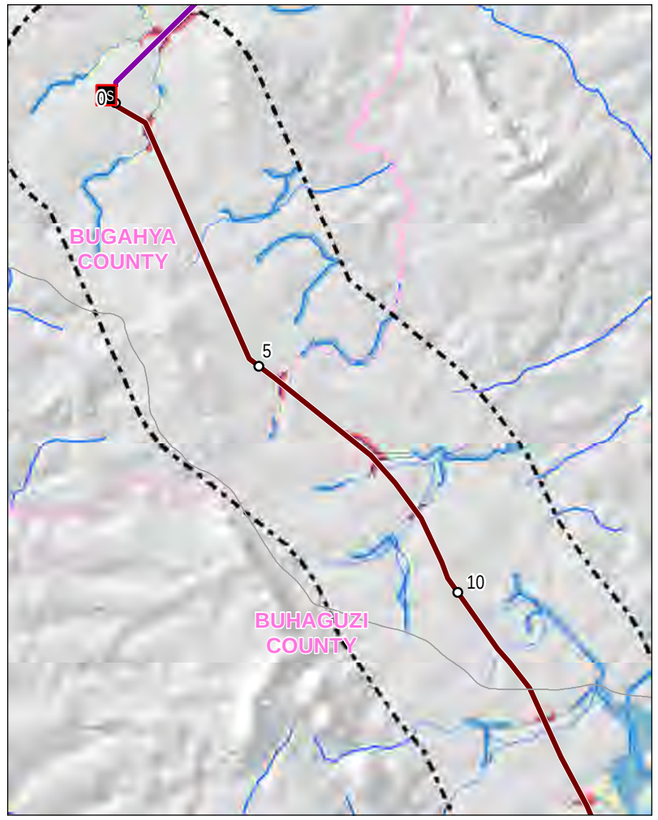
ATTACHMENT I1.4 SENSITIVITY SCREENING – ECOLOGY VECS

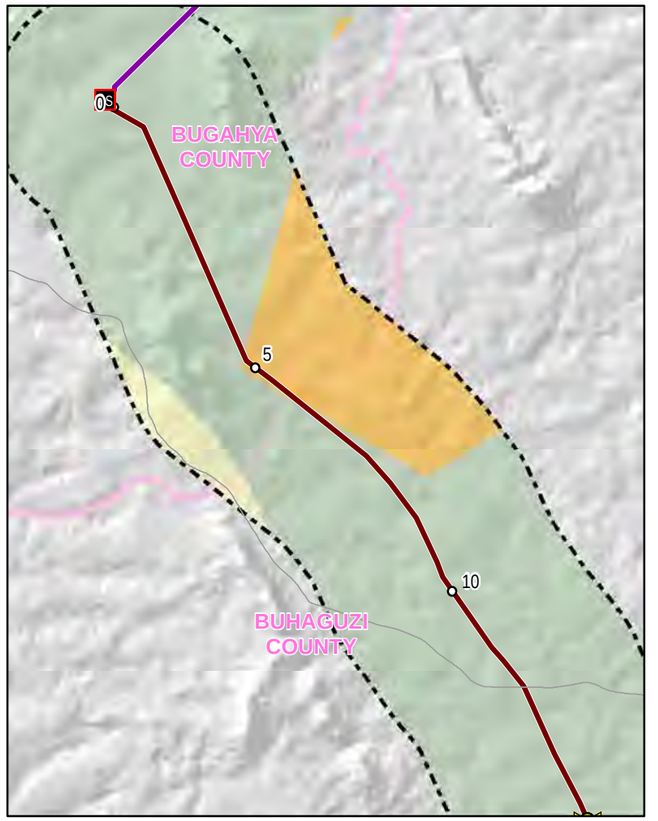
Aquatic Habitat



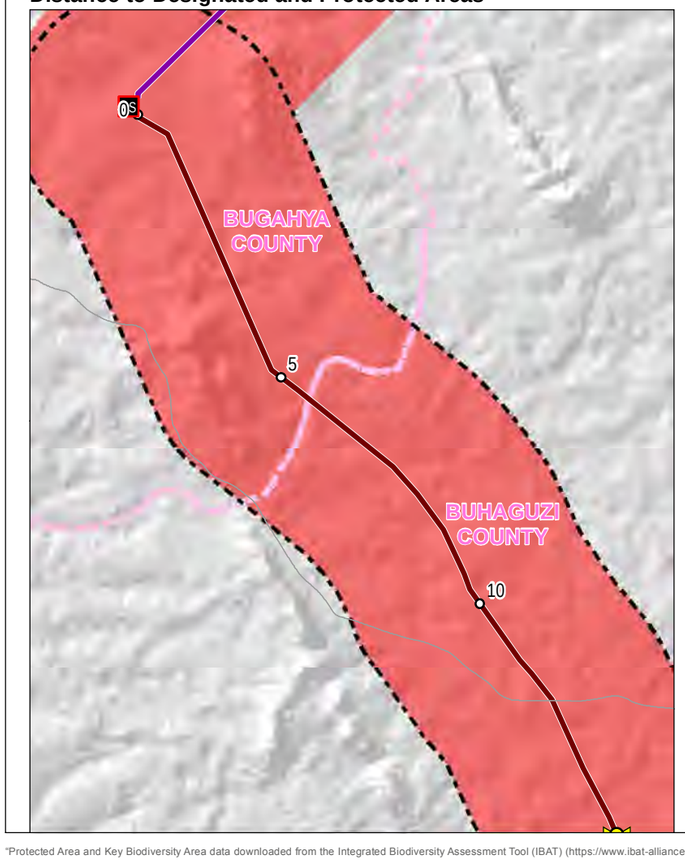
Distance to Aquatic Habitat



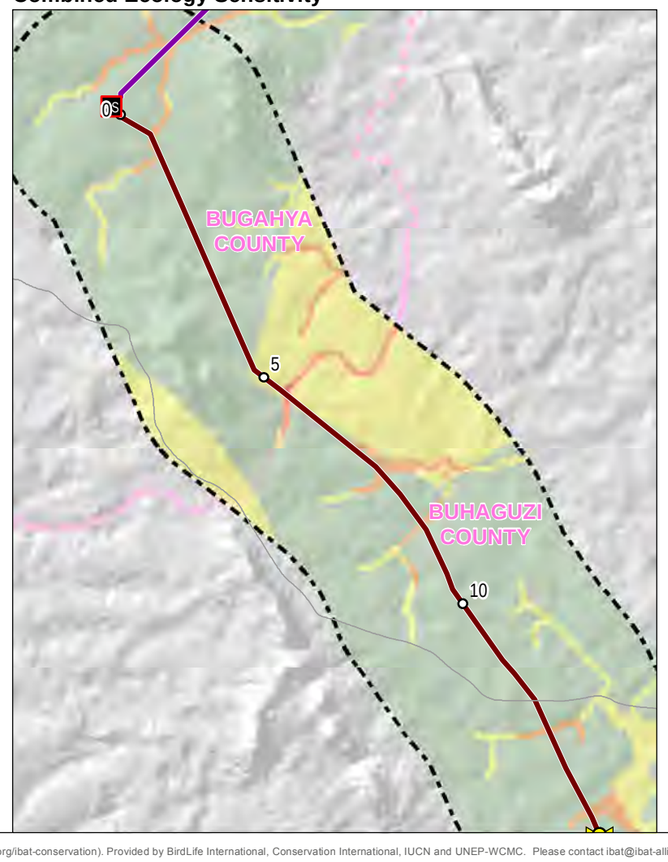
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- PS Pumping Station
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

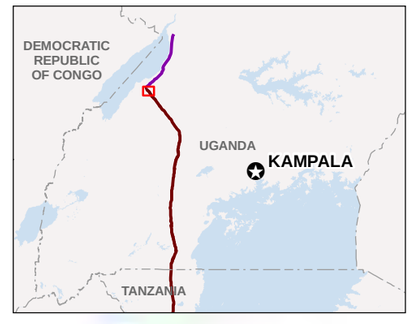
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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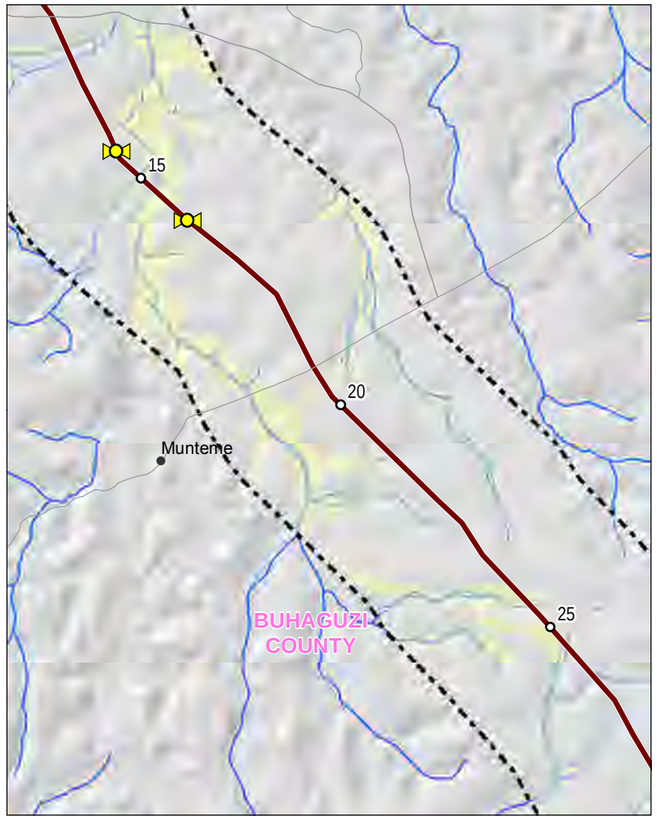
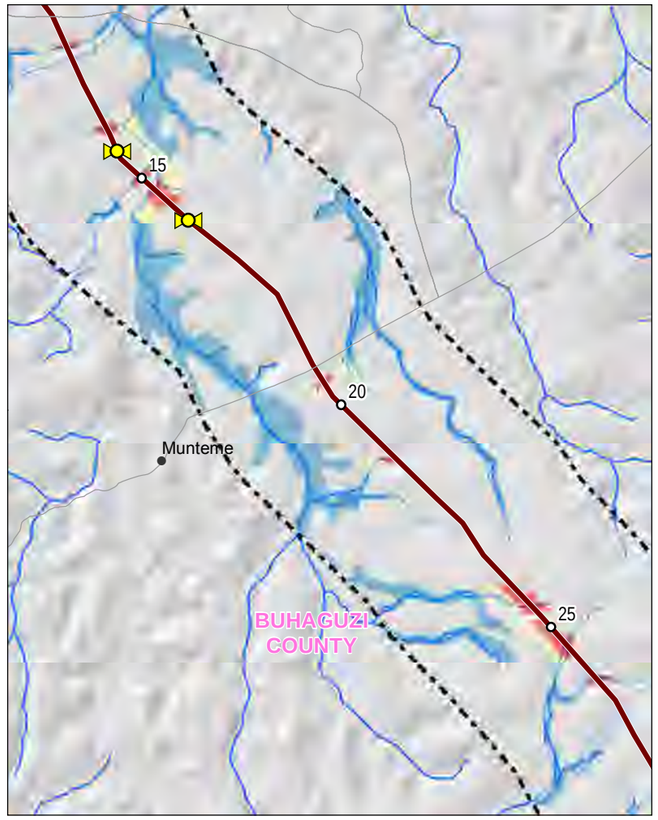
"Protected Area and Key Biodiversity Area data downloaded from the Integrated Biodiversity Assessment Tool (IBAT) (https://www.ibat-alliance.org/ibat-conservation). Provided by BirdLife International, Conservation International, IUCN and UNEP-WCMC. Please contact ibat@ibat-alliance.org for further information."

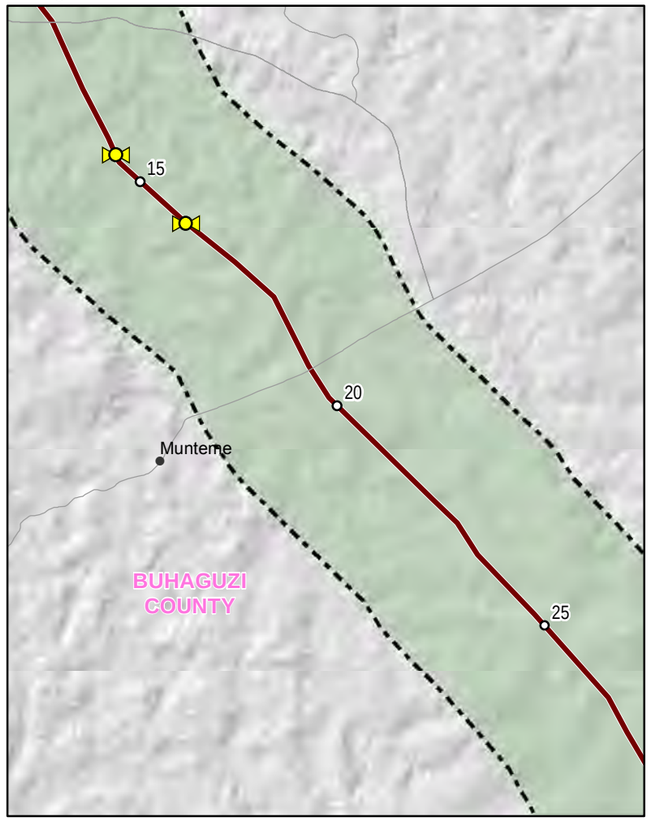
Aquatic Habitat



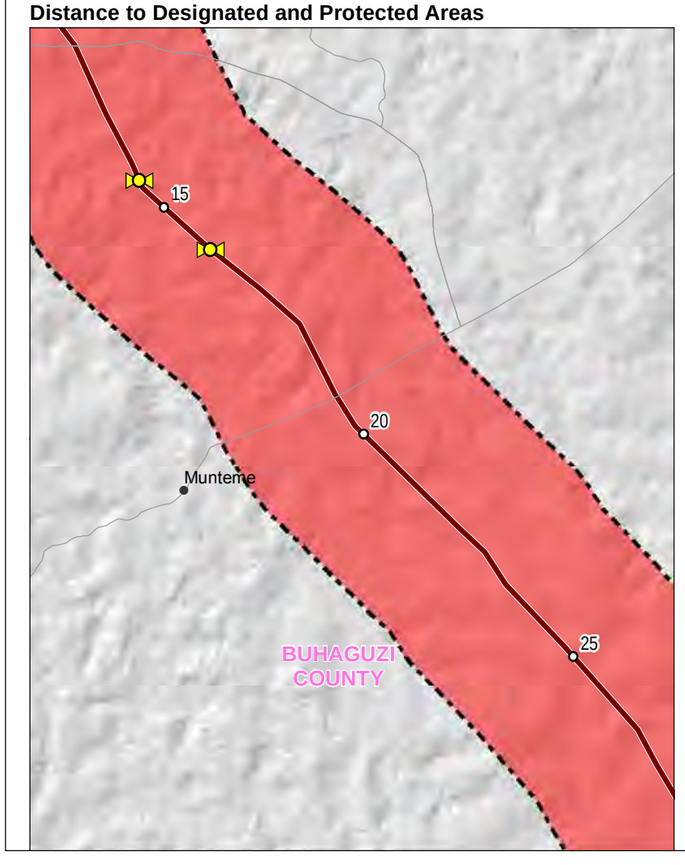
Distance to Aquatic Habitat



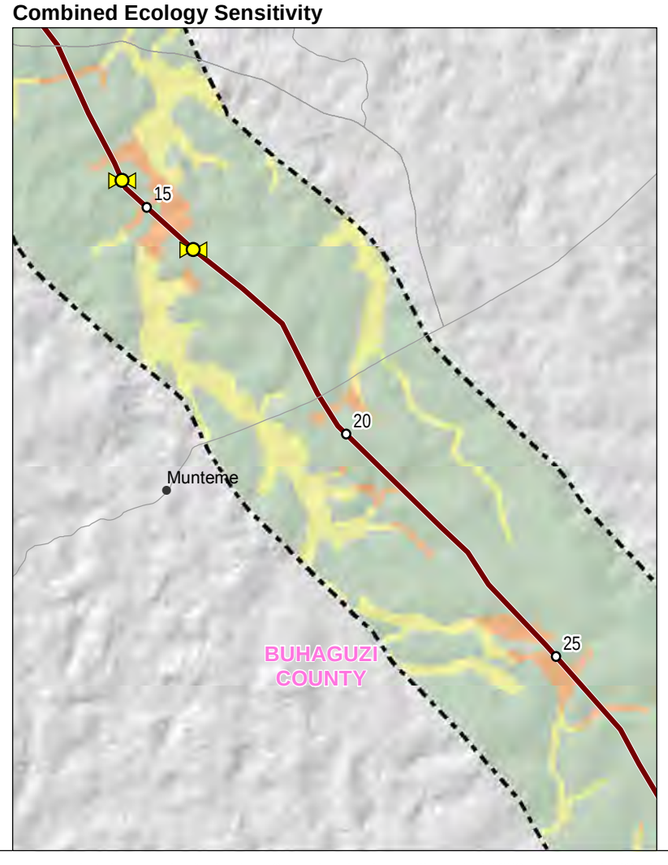
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

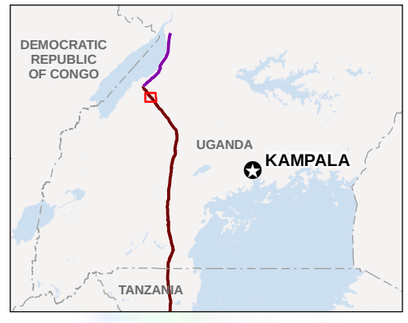
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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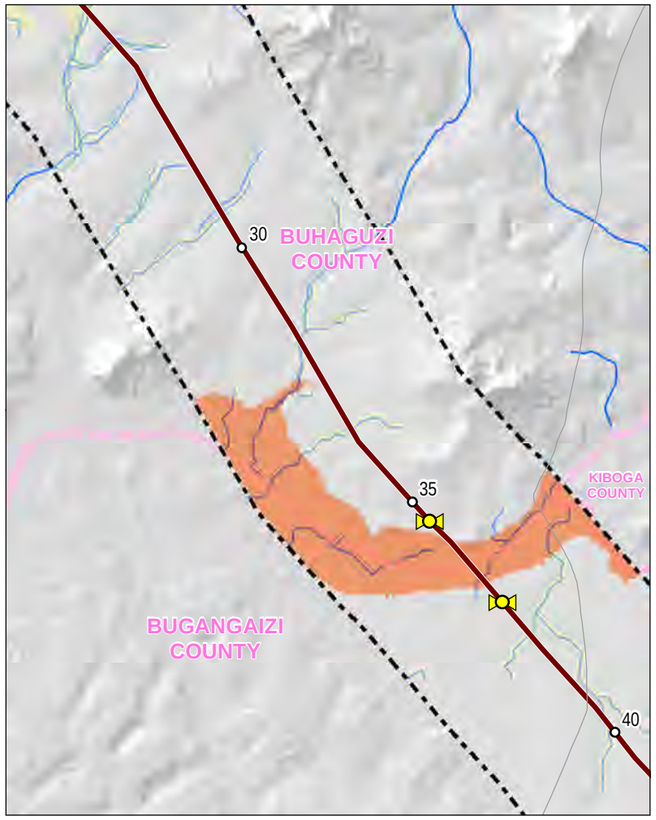
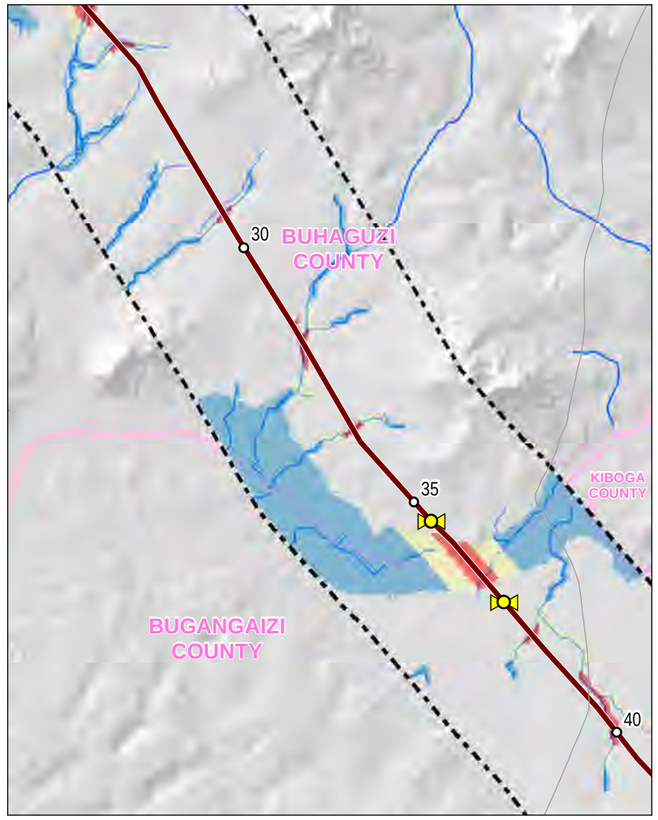
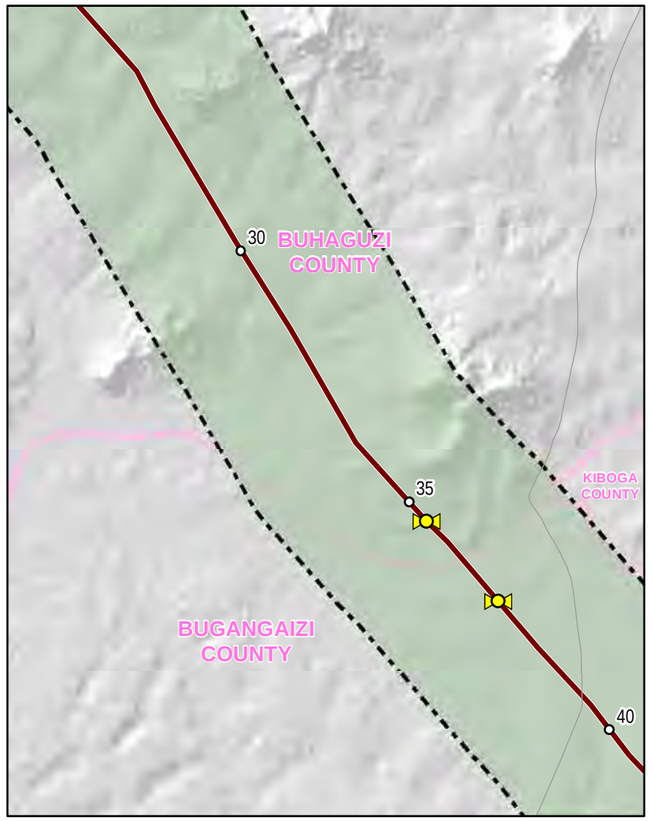
Aquatic Habitat



Distance to Aquatic Habitat



Designated and Protected Areas



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

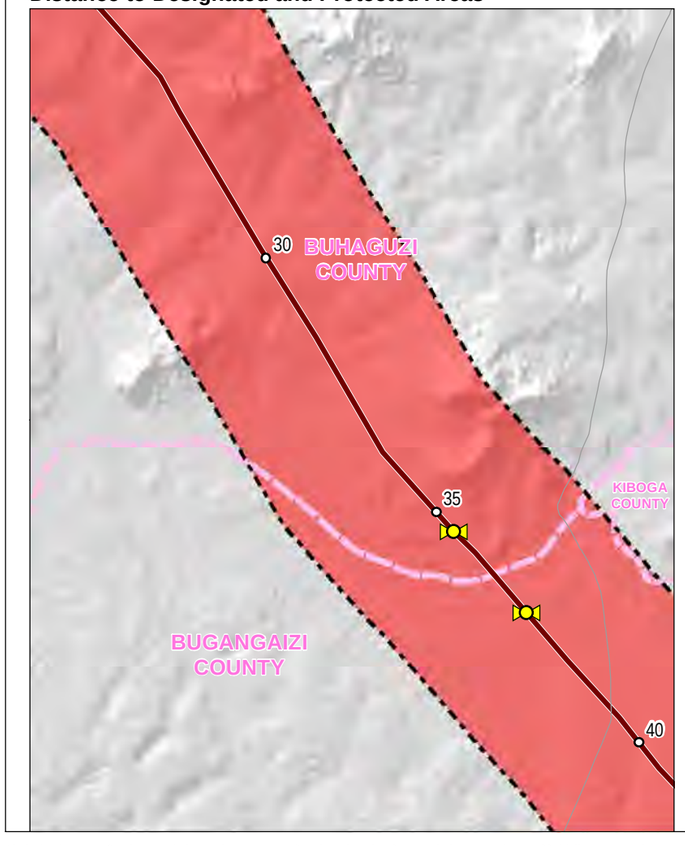
Administrative Area:

- County Boundary

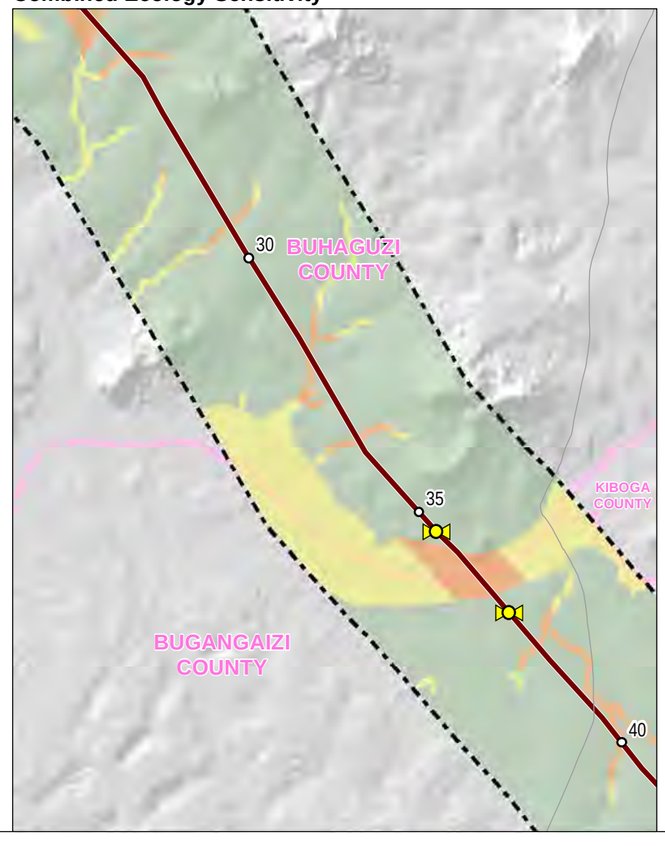
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Coordinate System: WGS84 TM 35E S
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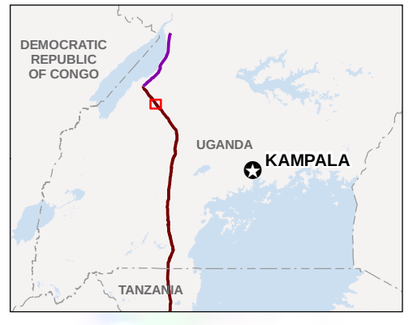

CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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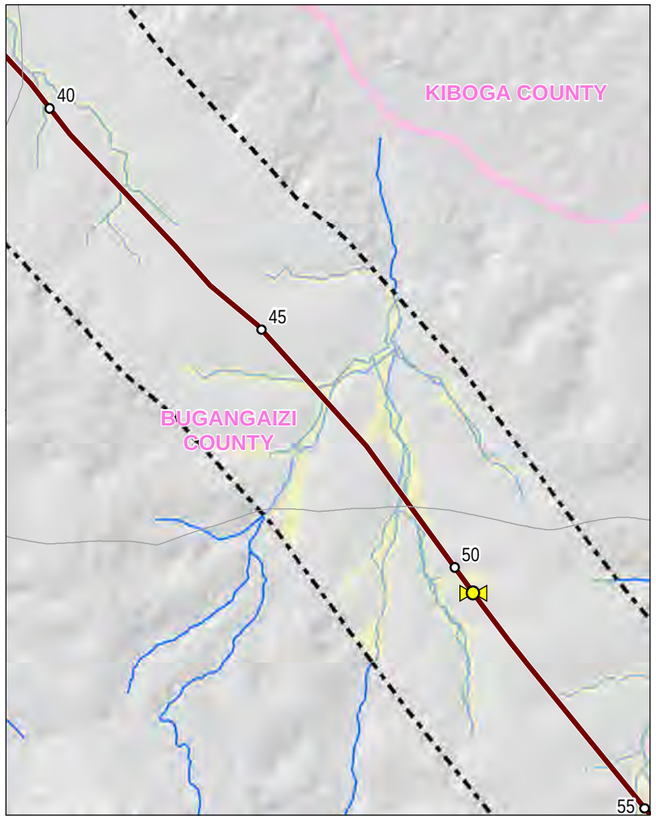
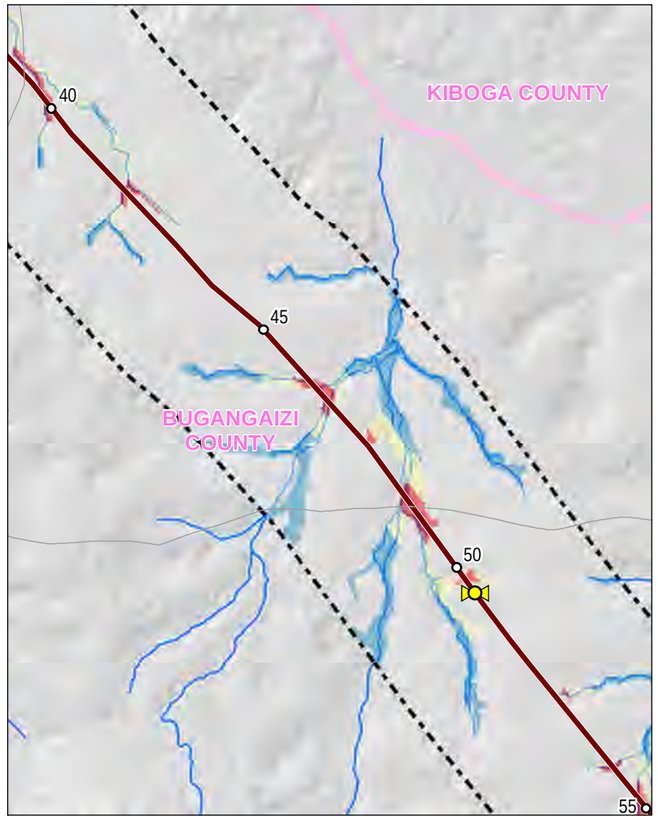
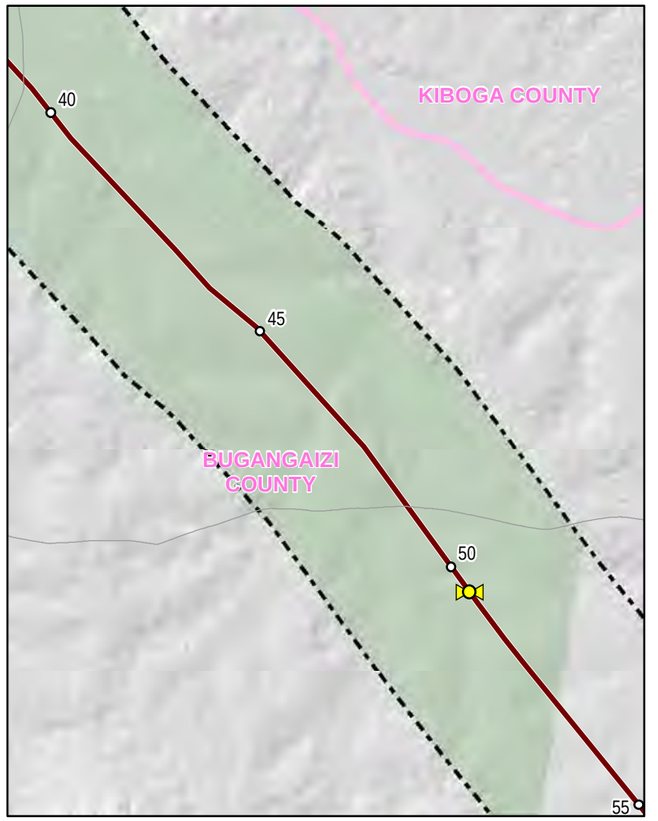
Aquatic Habitat



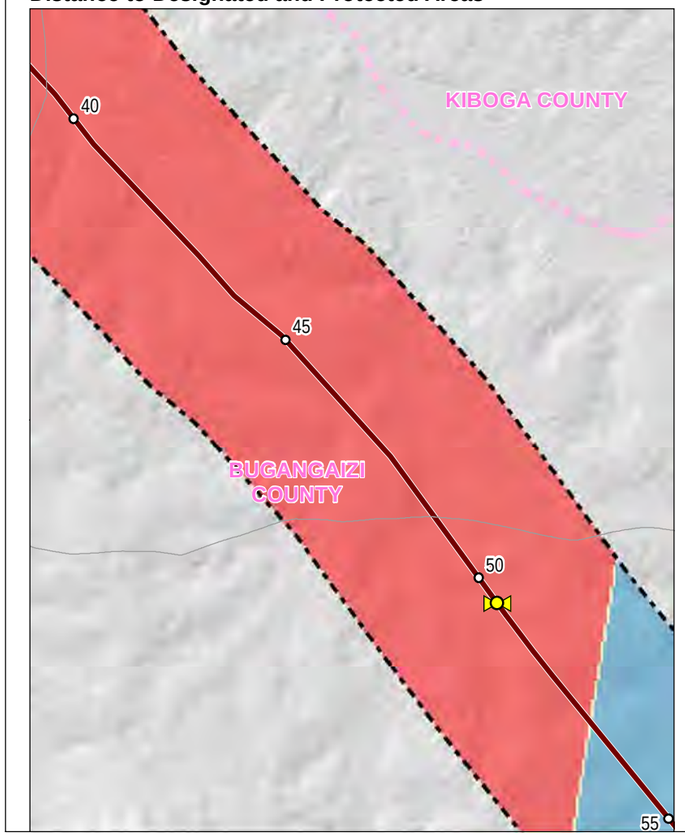
Distance to Aquatic Habitat



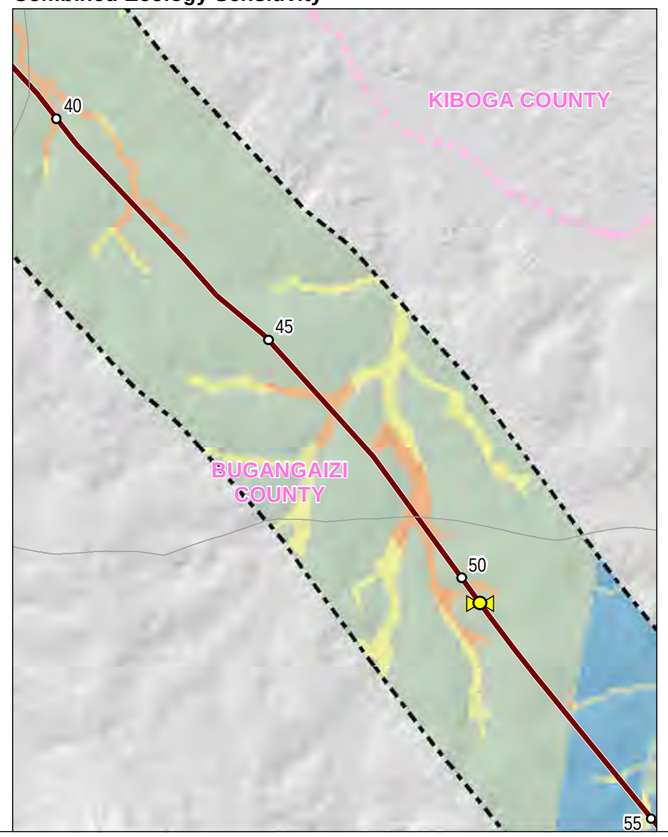
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

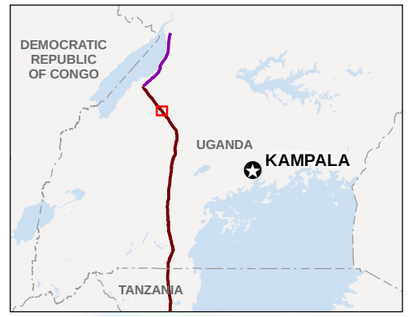
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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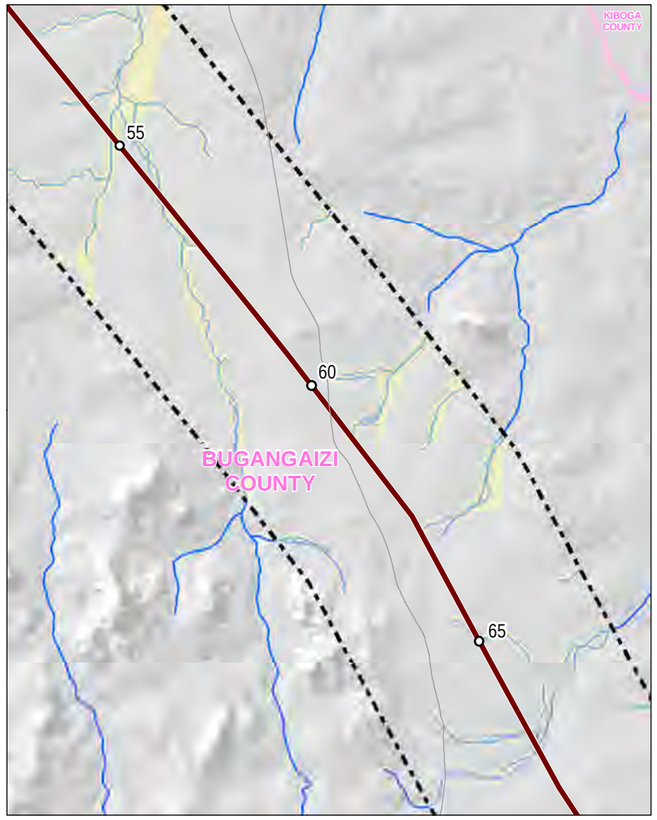
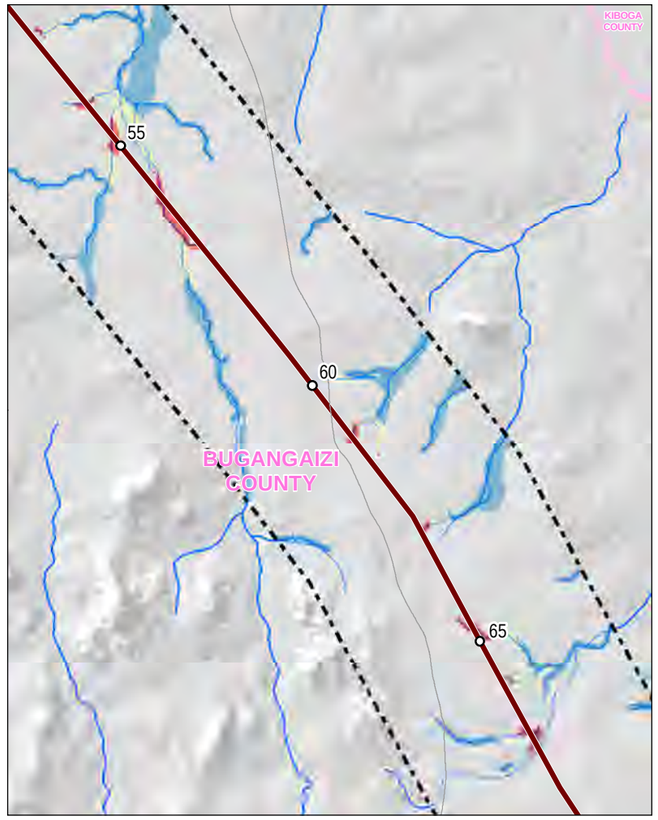
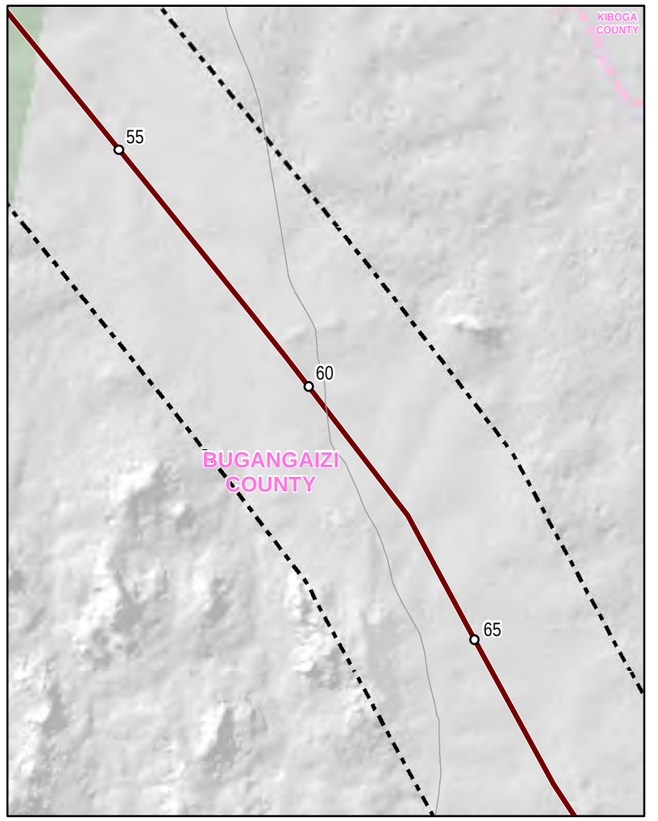
Aquatic Habitat



Distance to Aquatic Habitat



Designated and Protected Areas



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

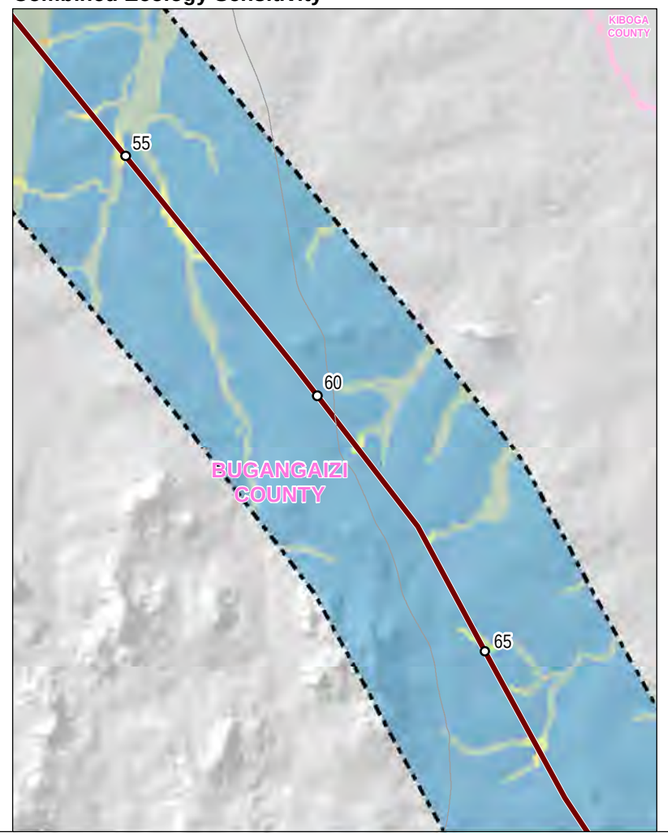
- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Distance to Designated and Protected Areas

Combined Ecology Sensitivity



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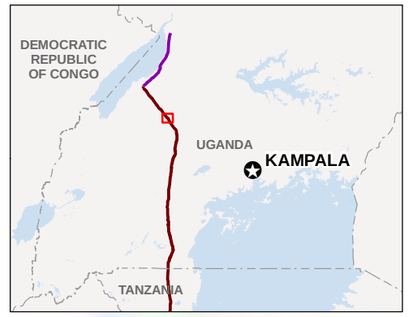

CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-054[A].mxd

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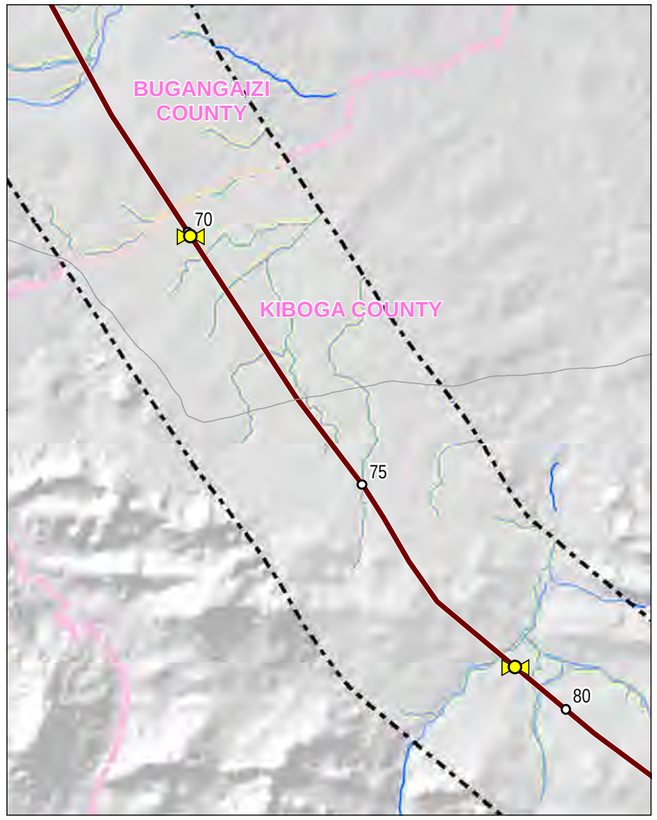
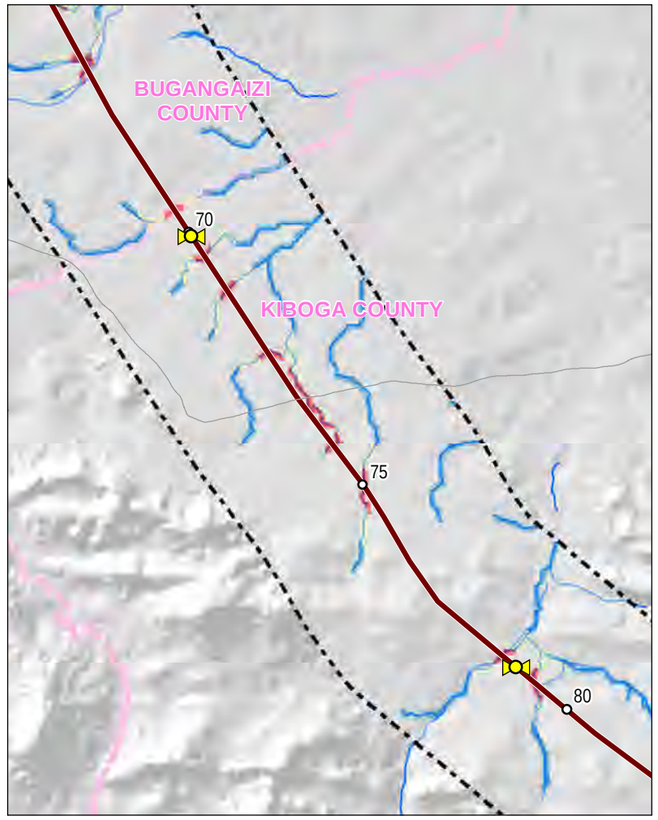
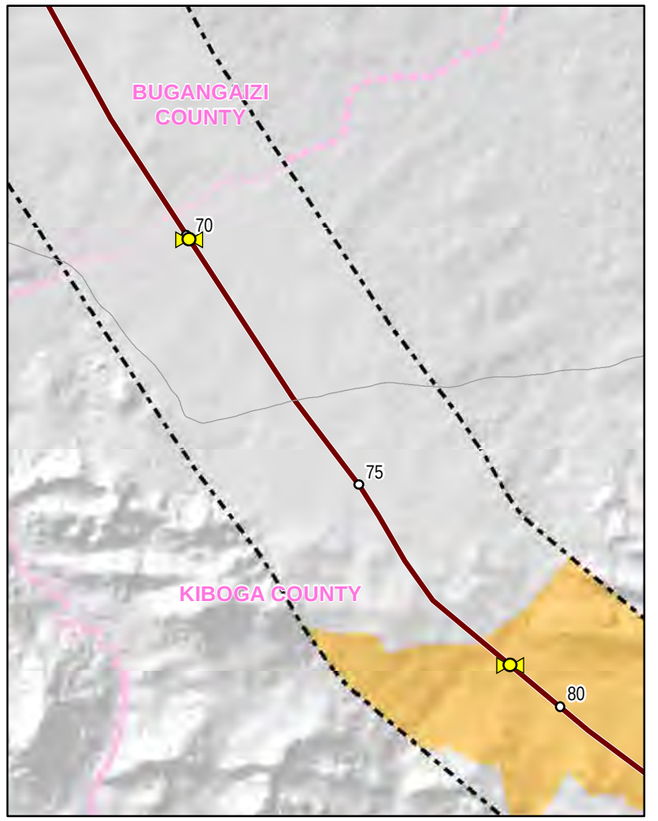
Aquatic Habitat



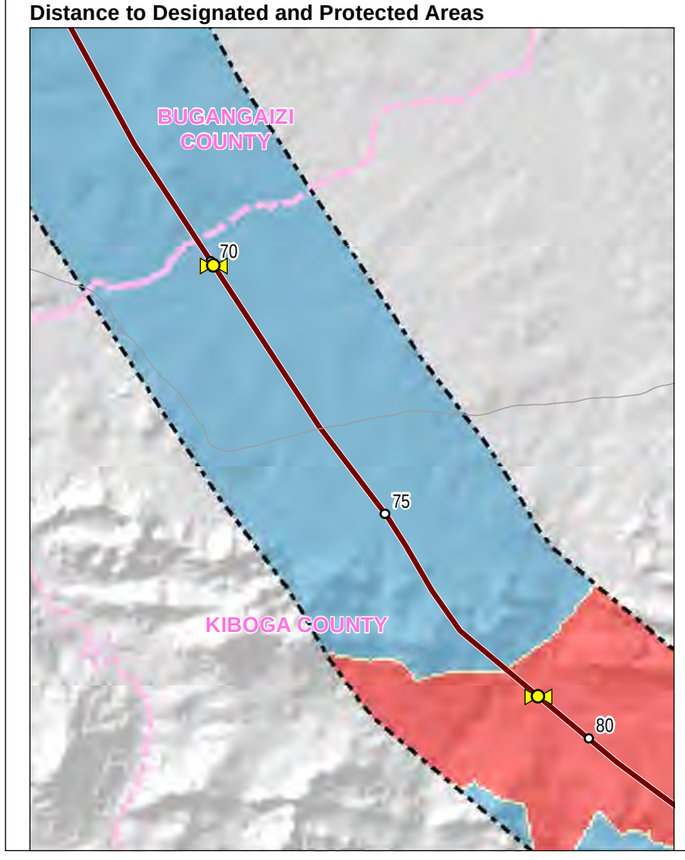
Distance to Aquatic Habitat



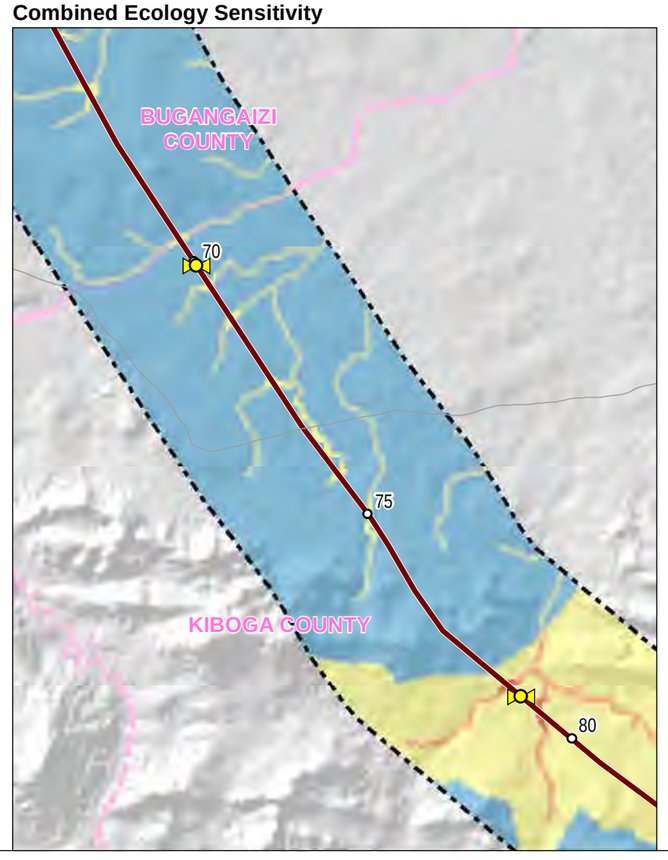
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
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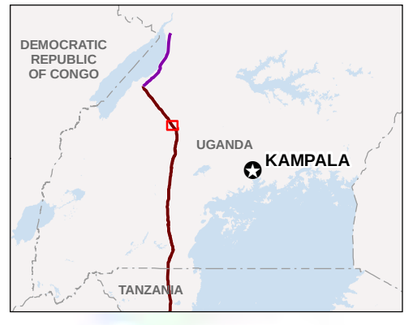
Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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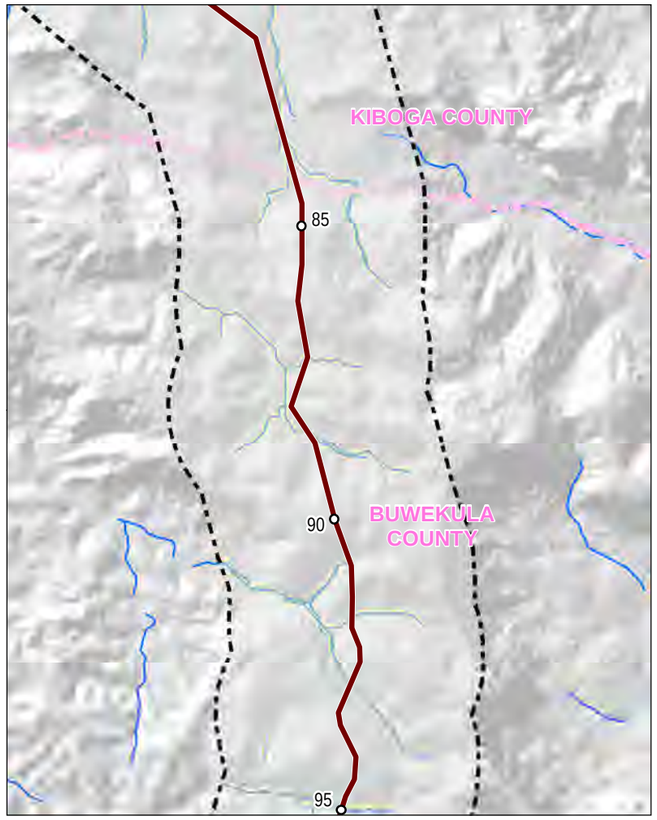
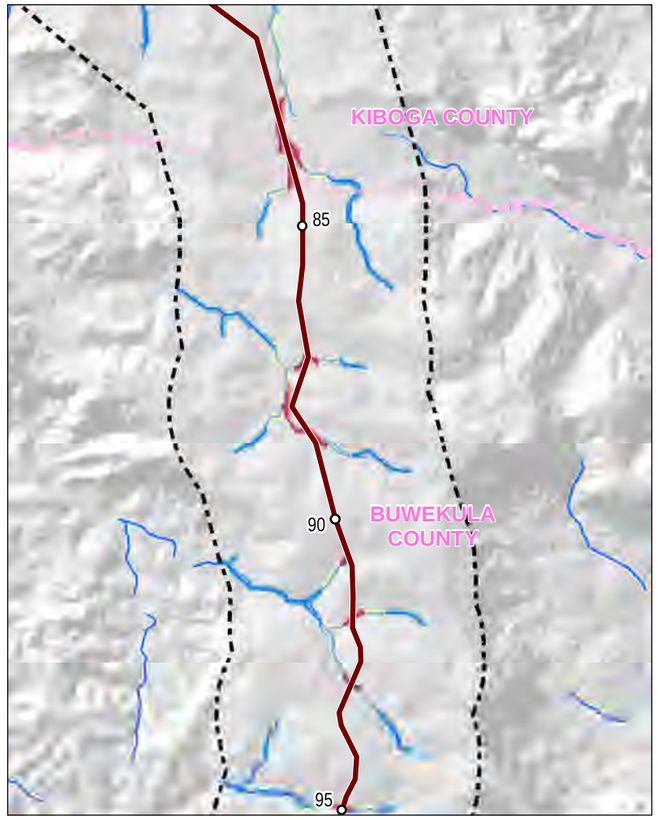
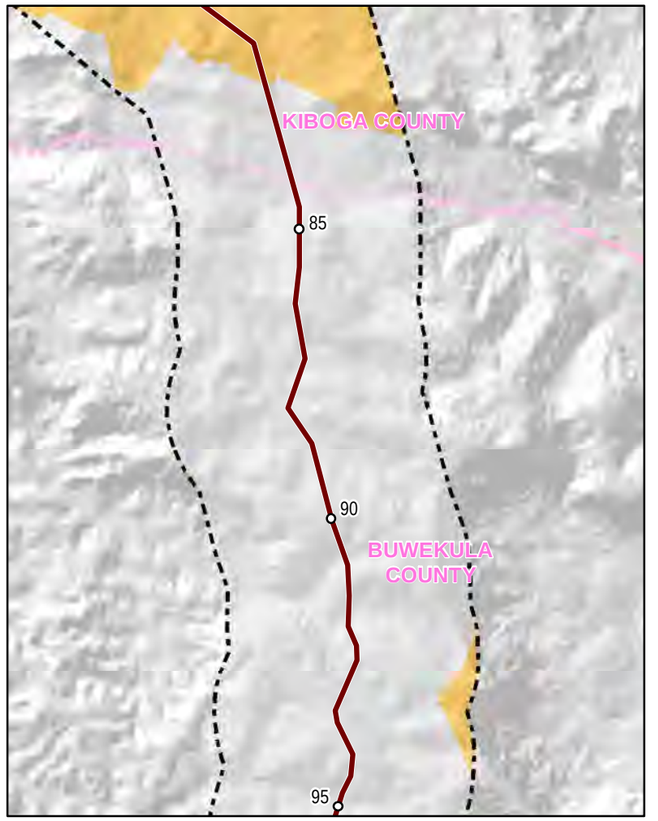
Aquatic Habitat



Distance to Aquatic Habitat



Designated and Protected Areas



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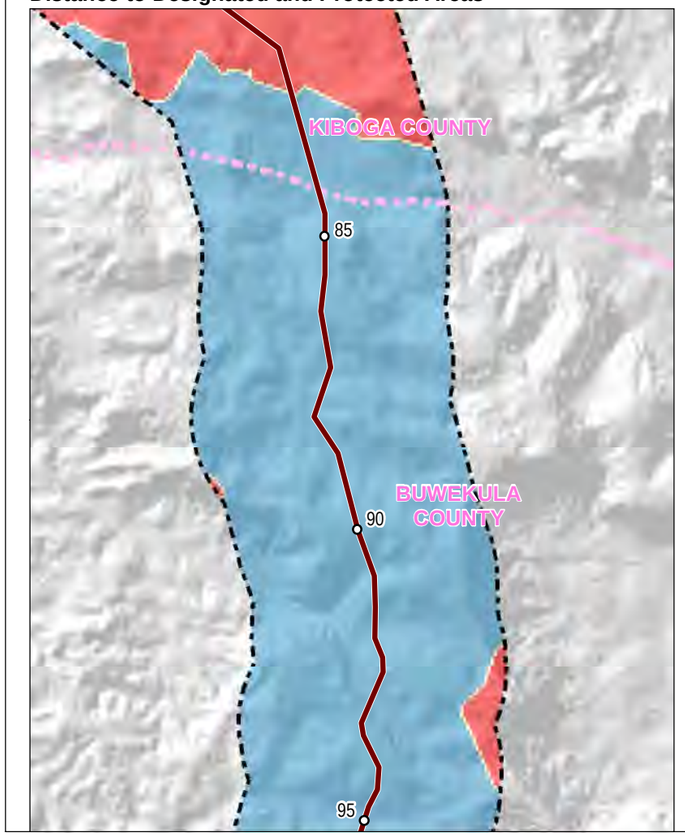
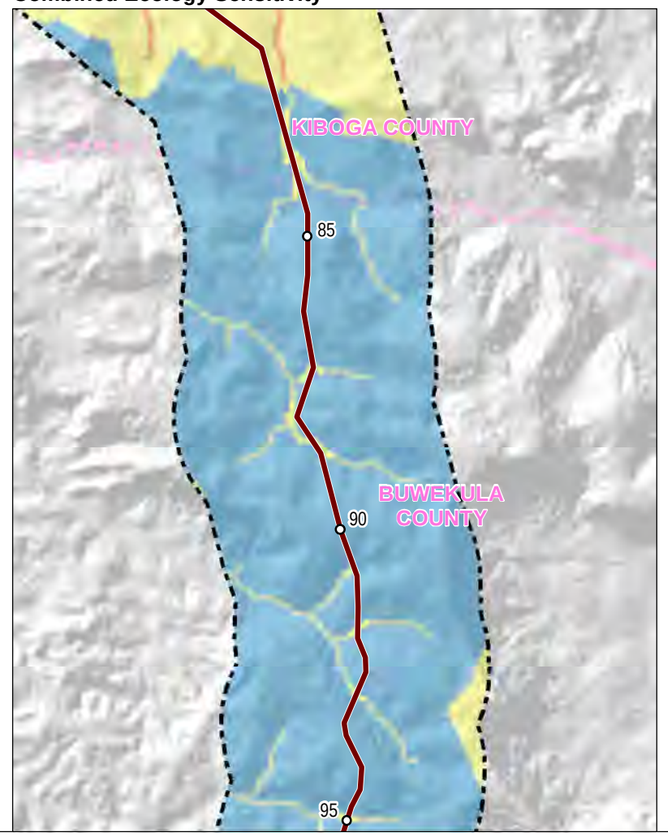


Combined Ecology Sensitivity



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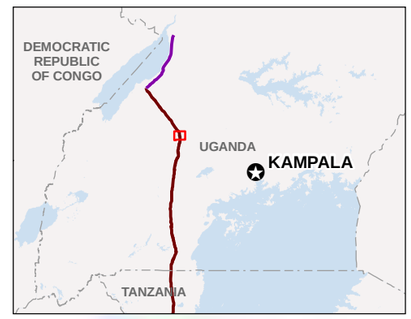

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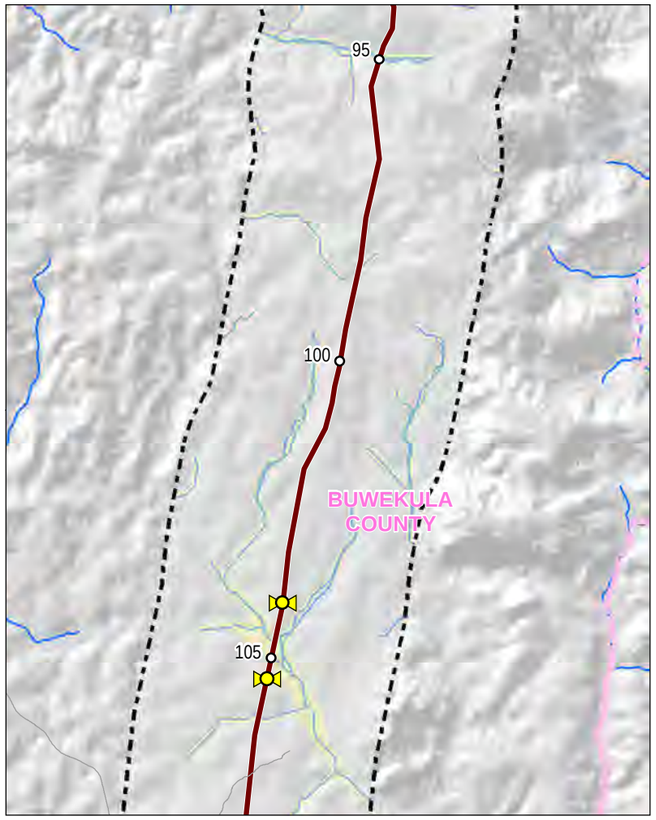

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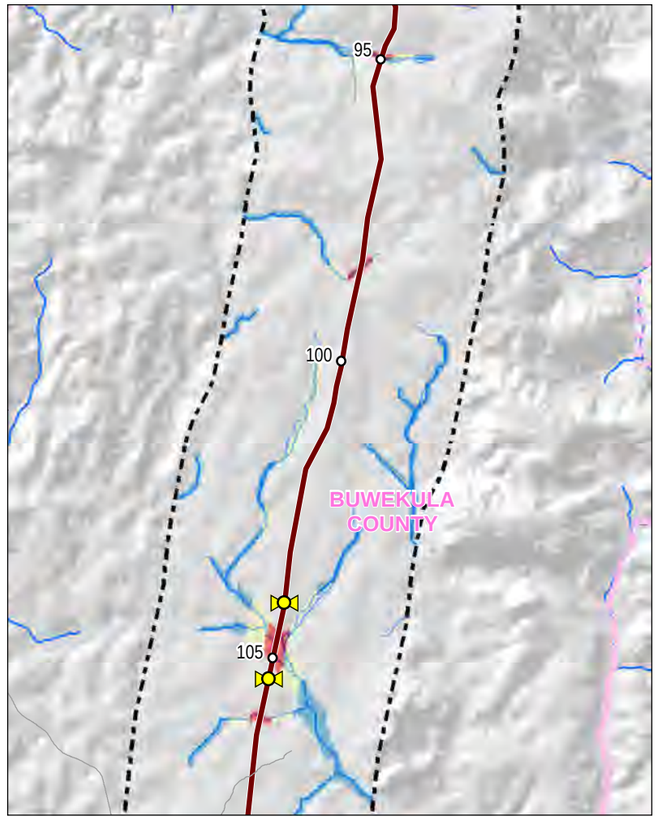

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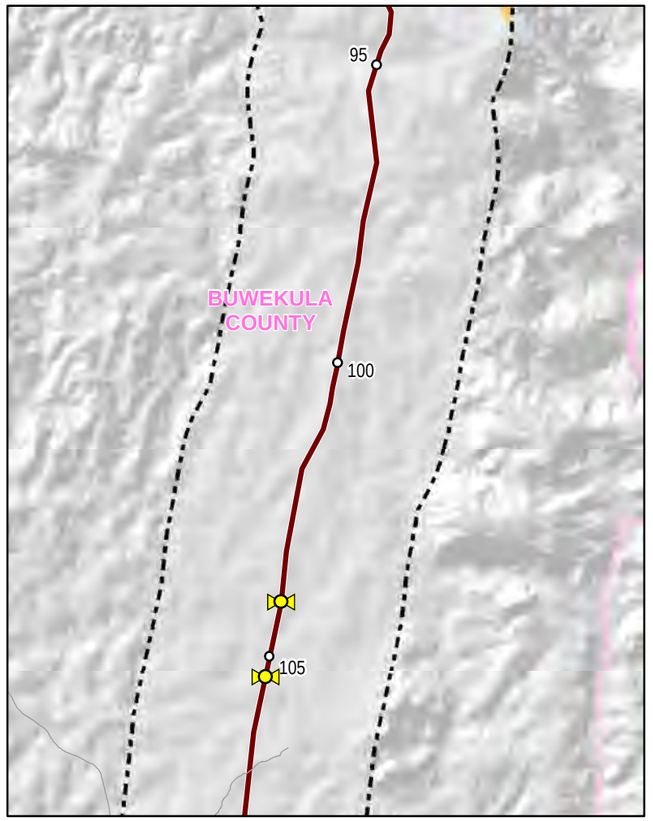

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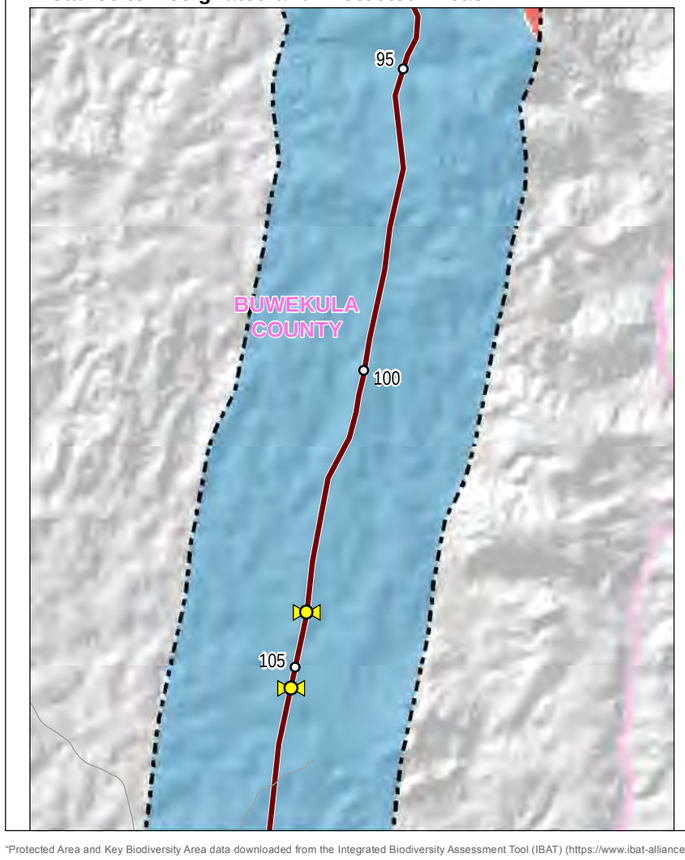

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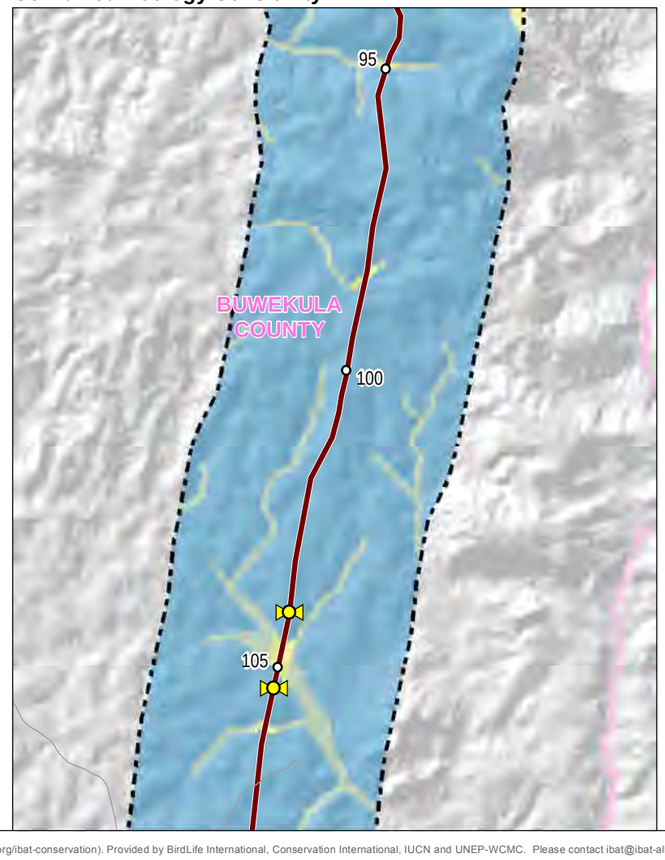

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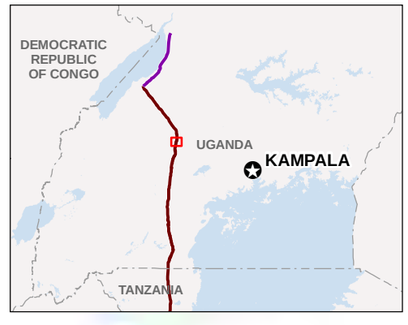

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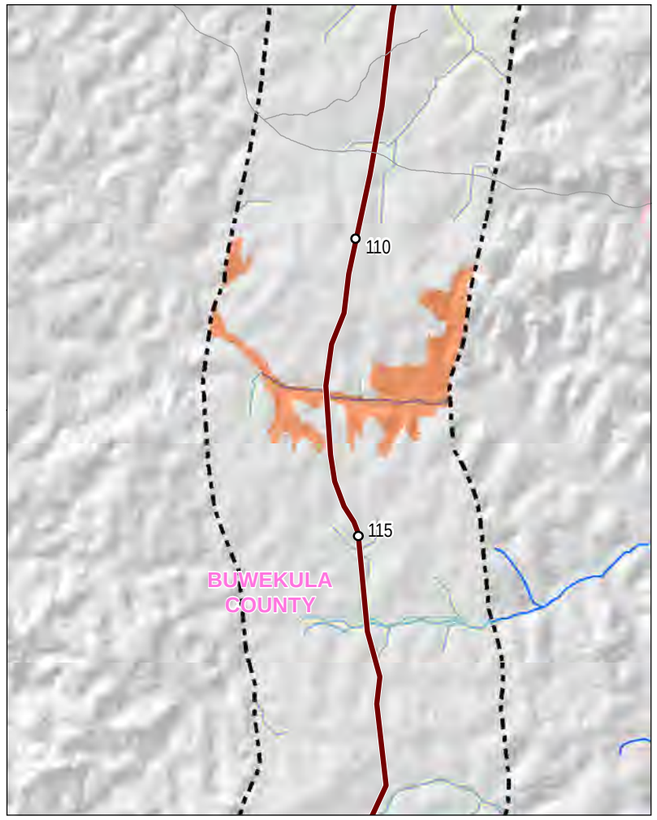

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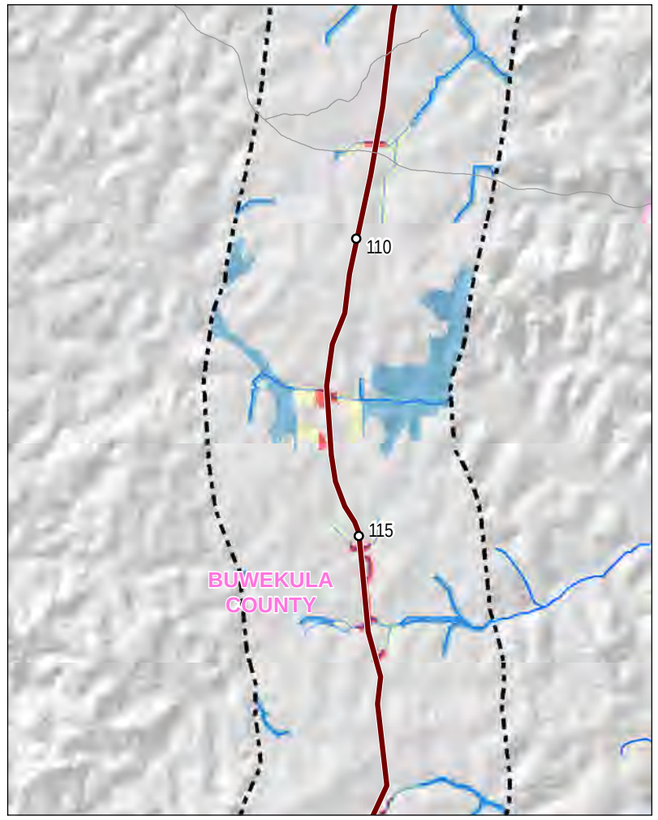

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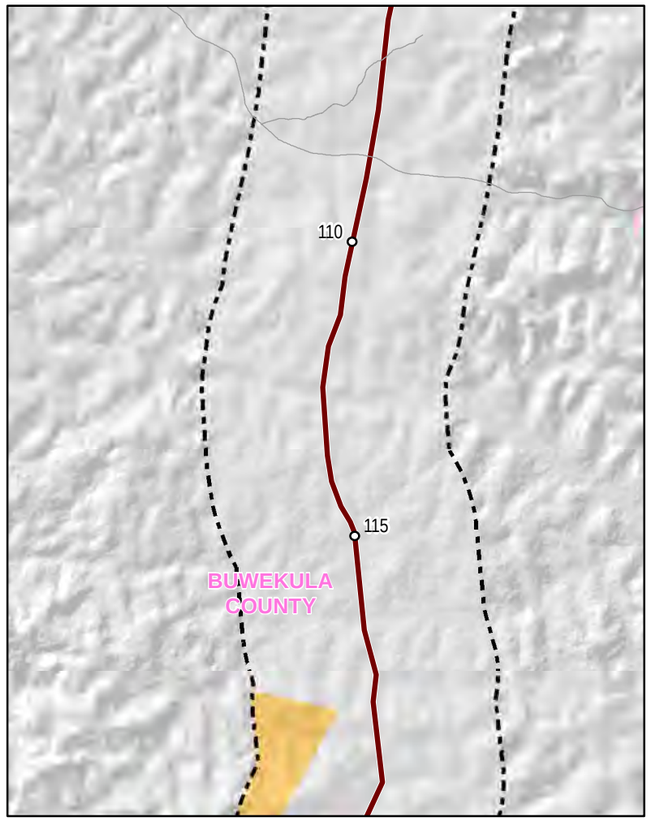

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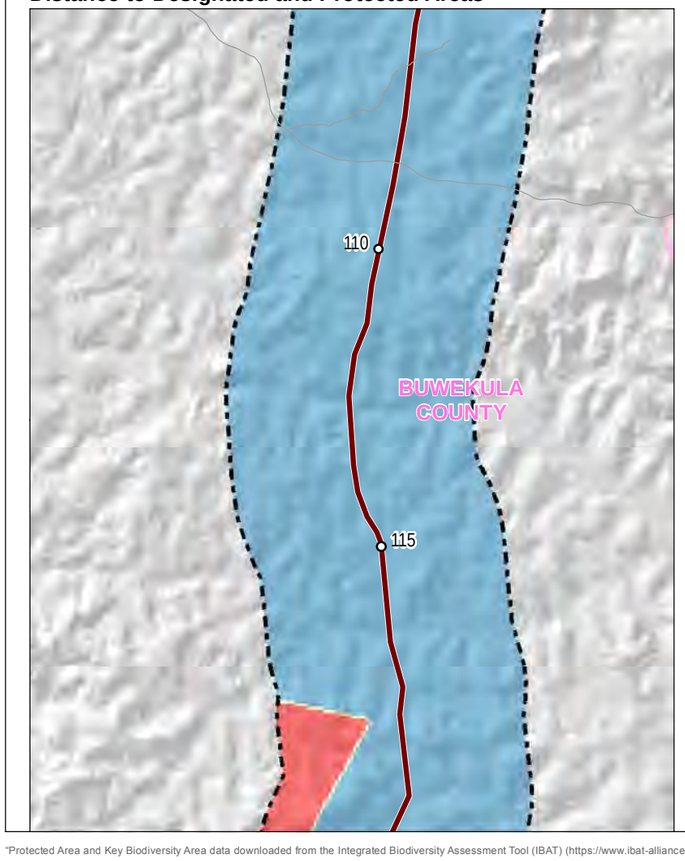

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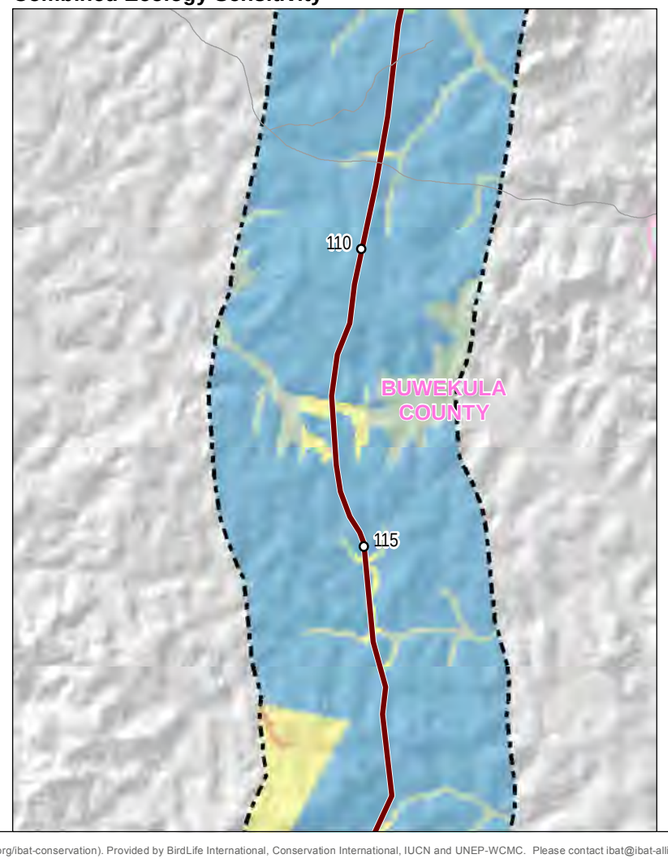

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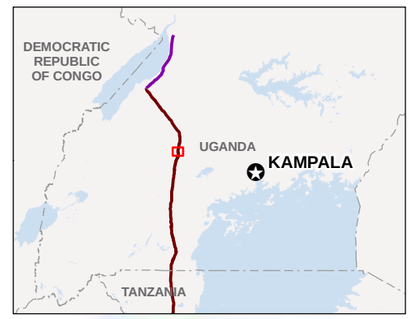

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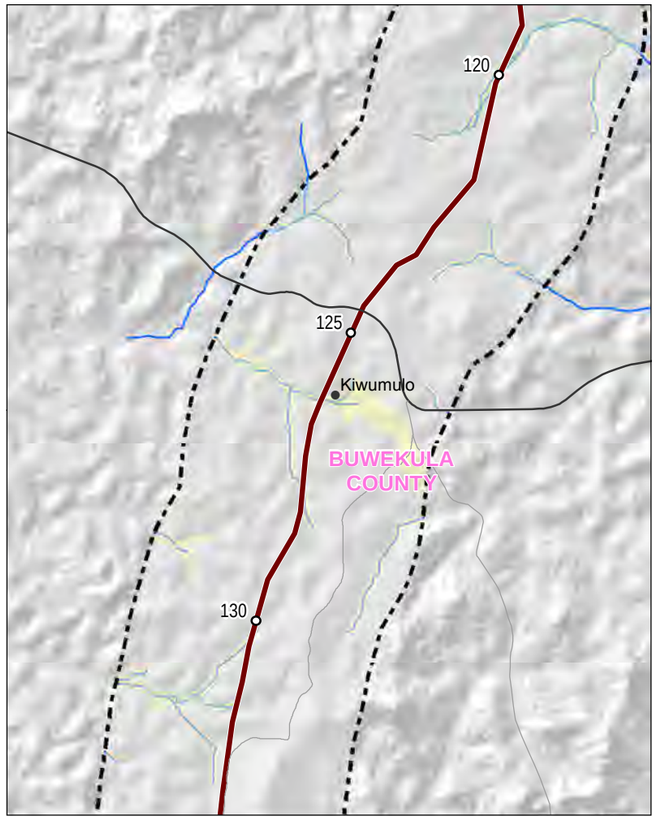

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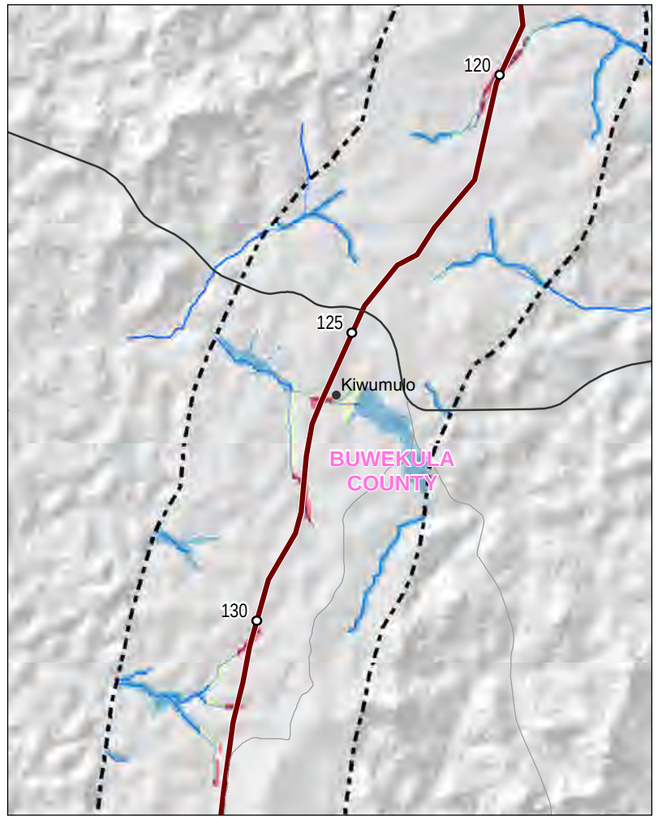

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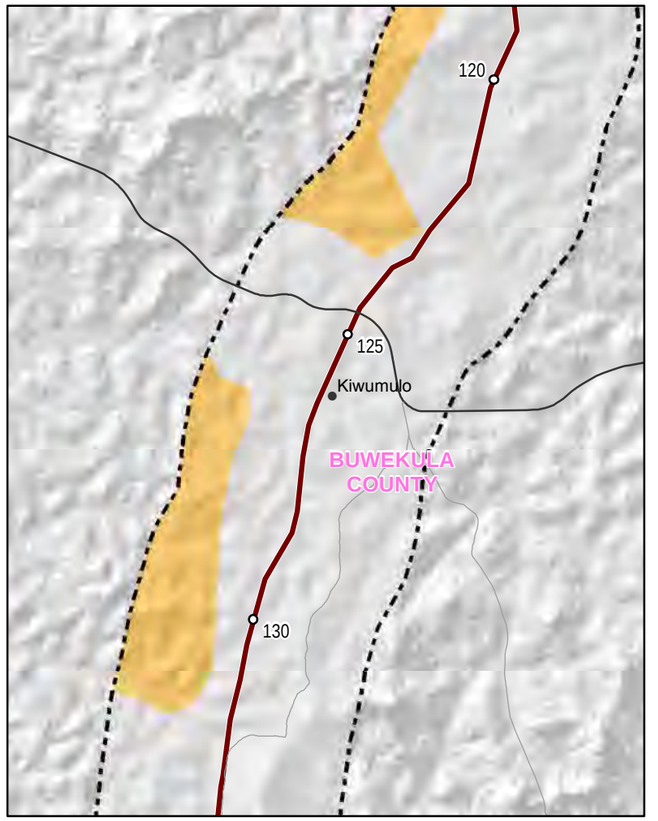

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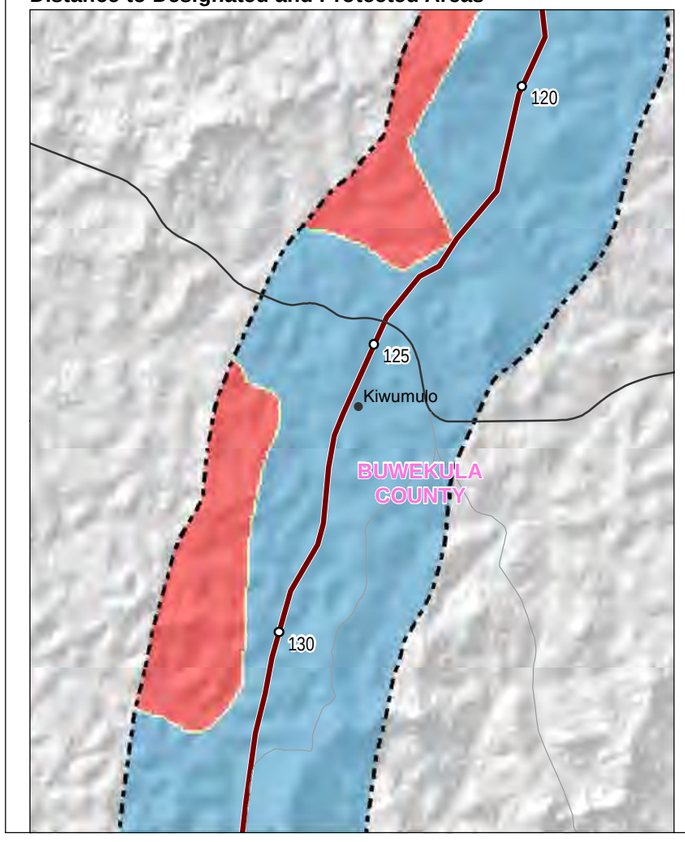

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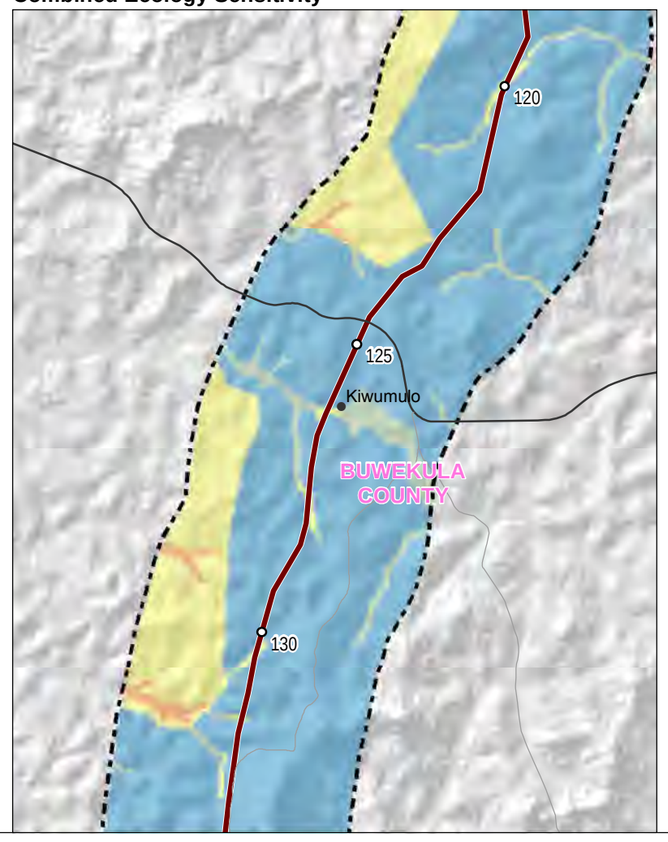

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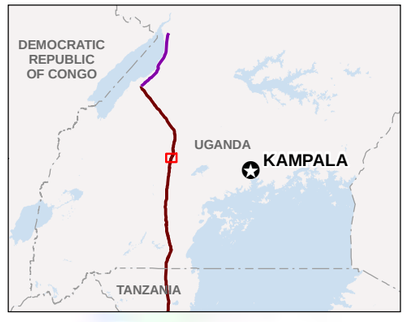

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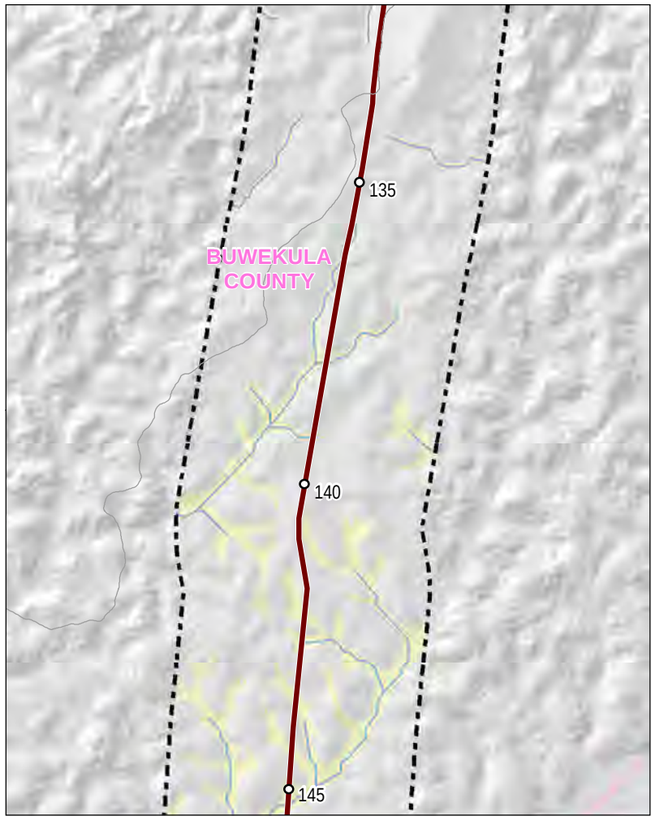

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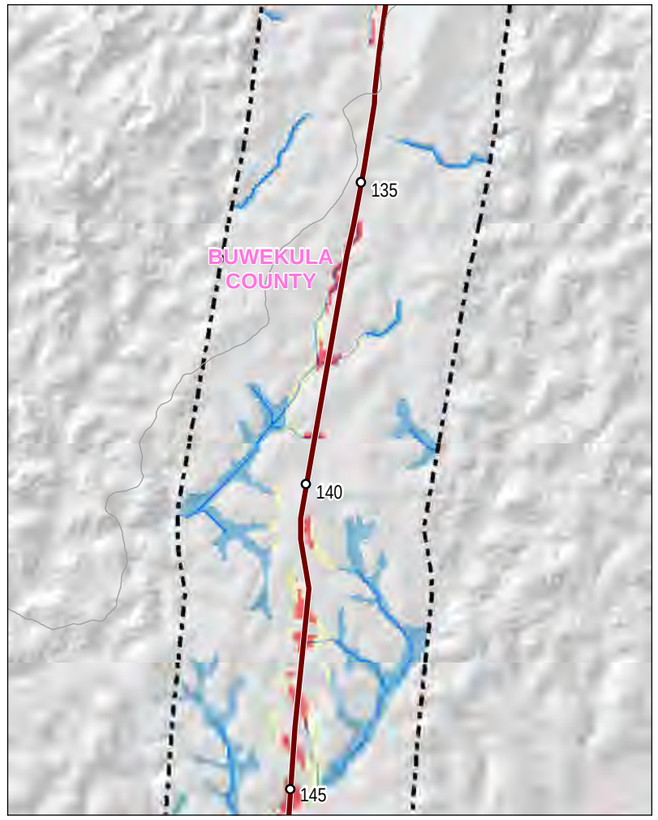

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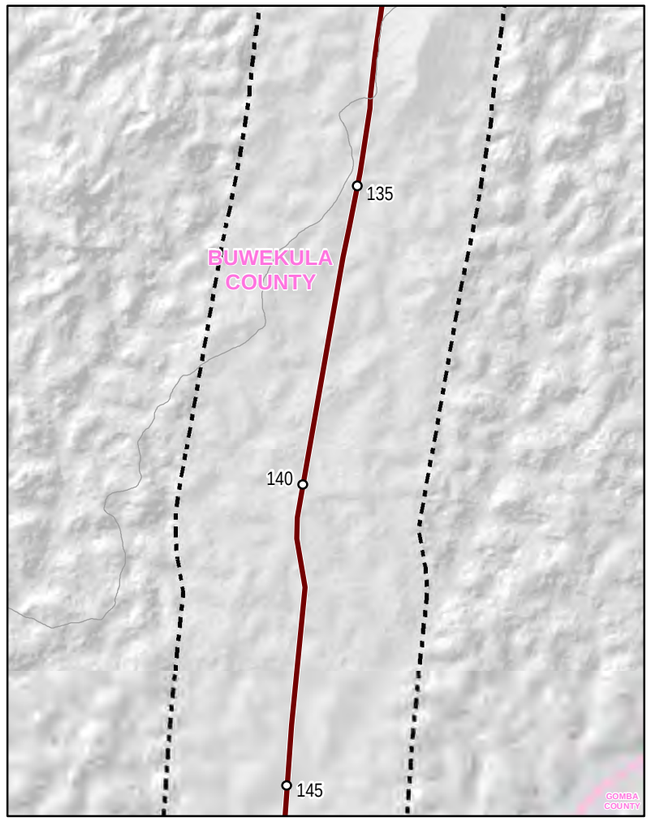

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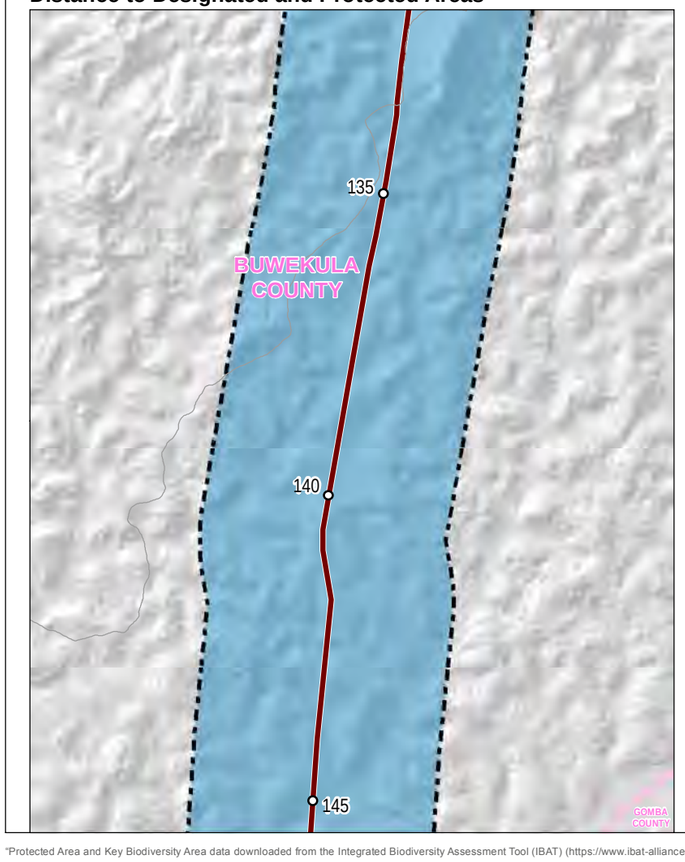

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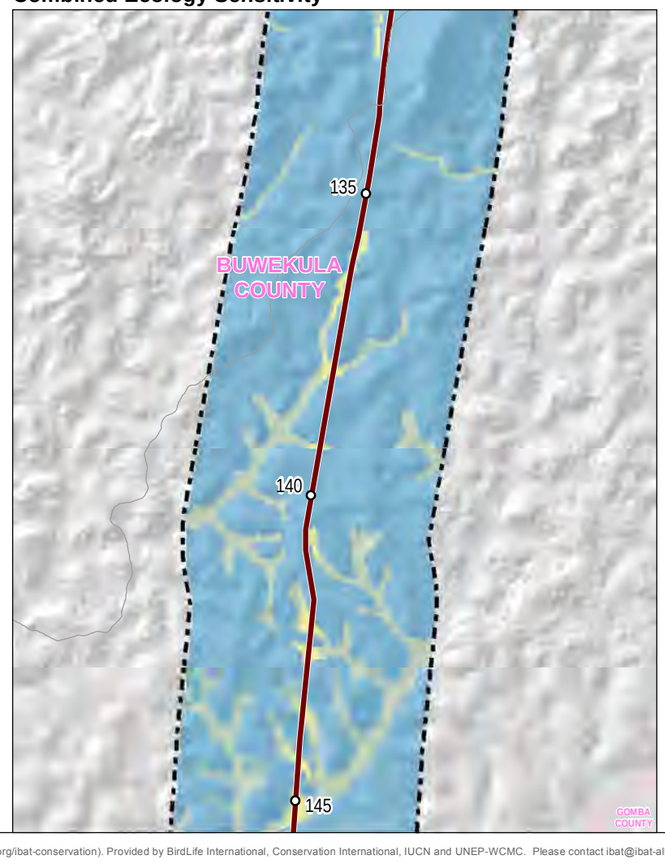

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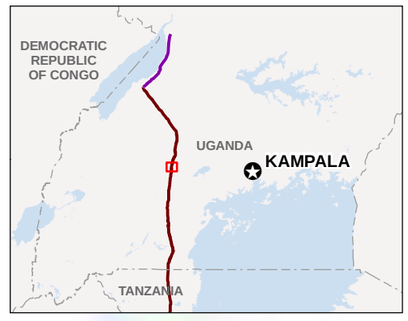

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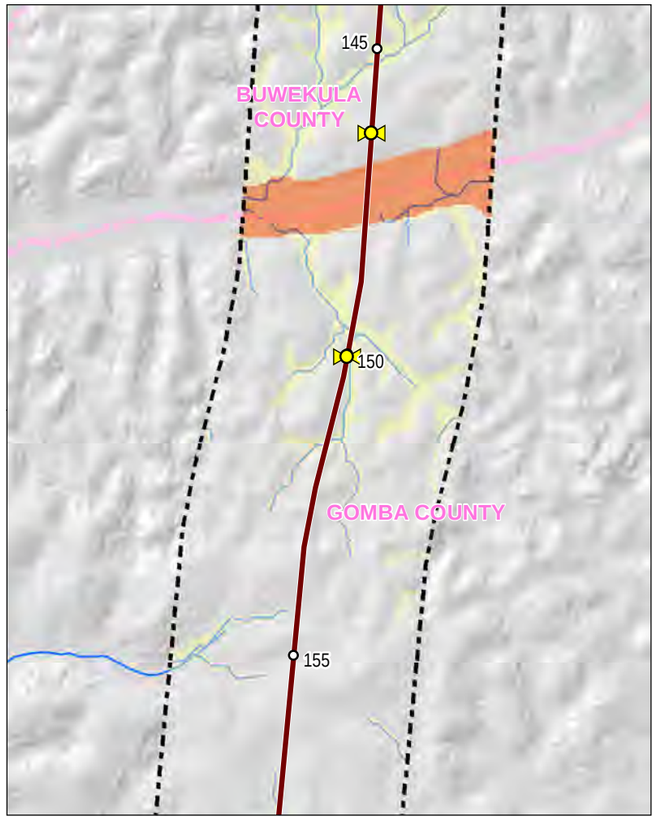

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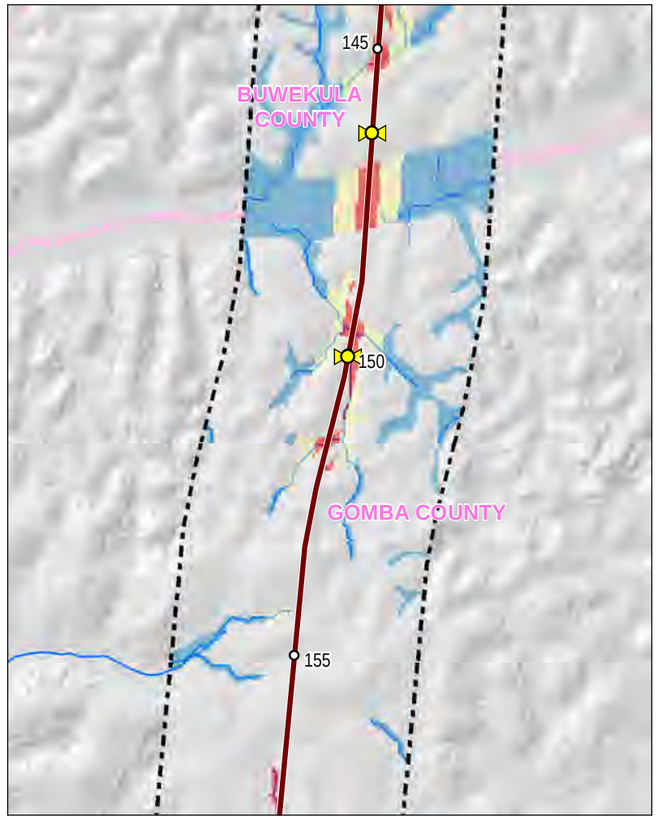

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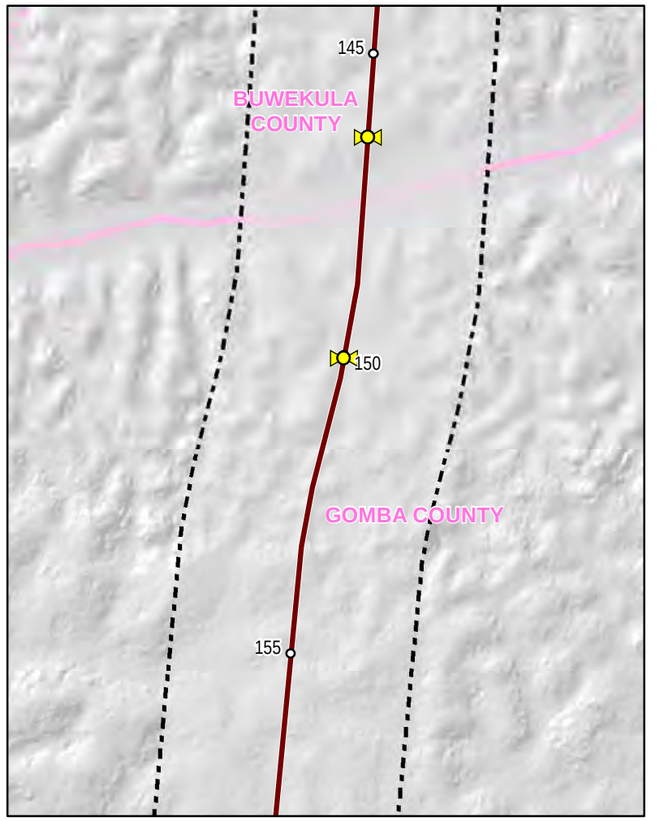

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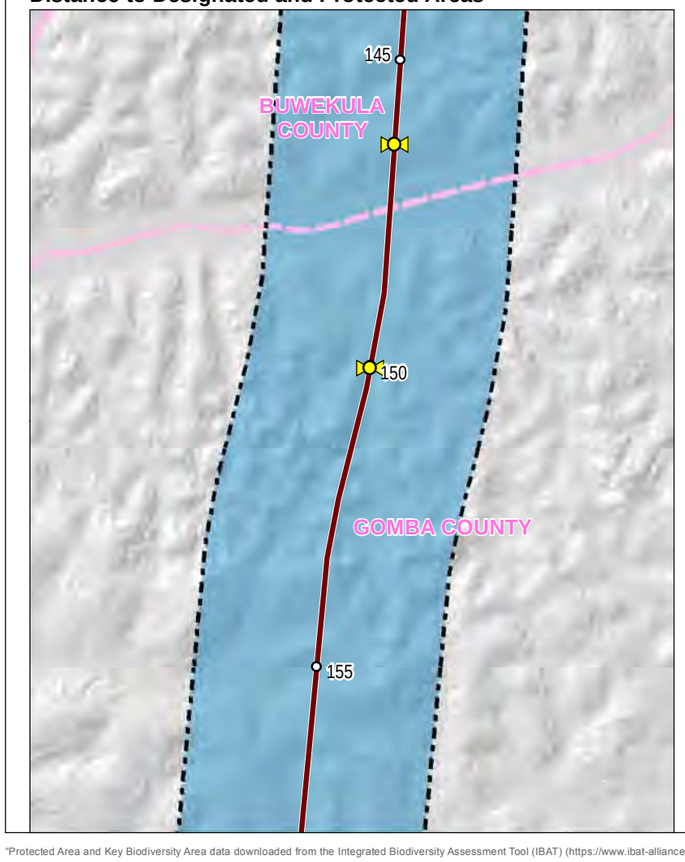

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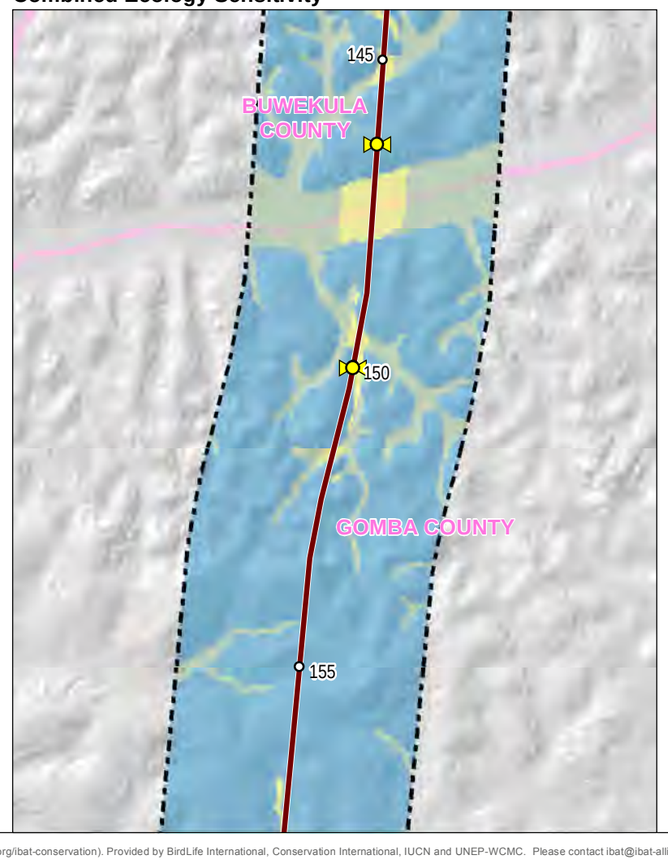

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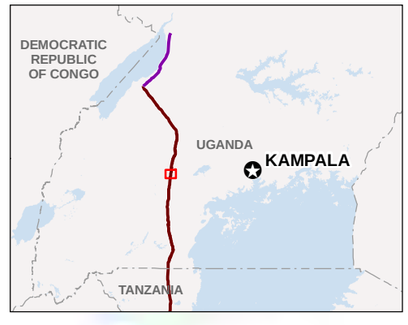

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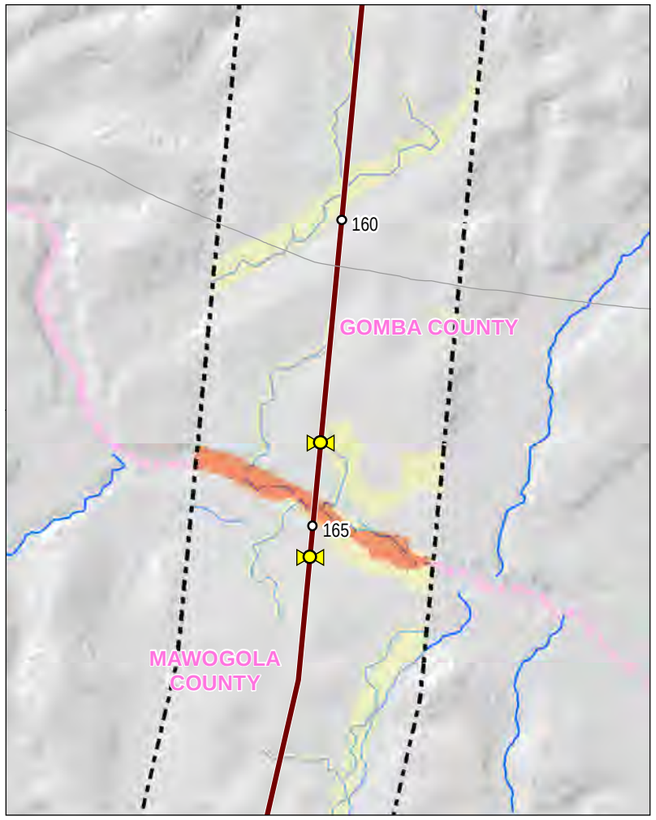

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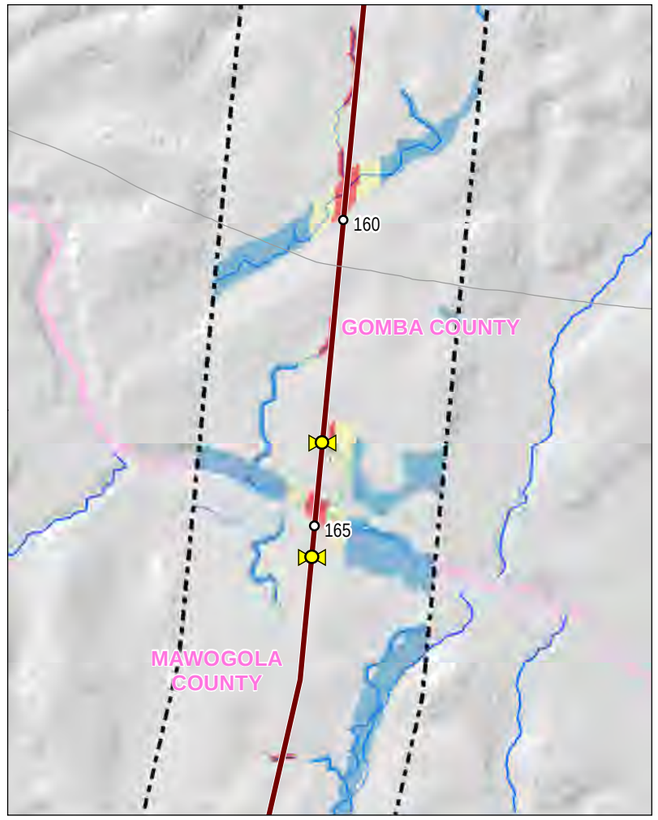

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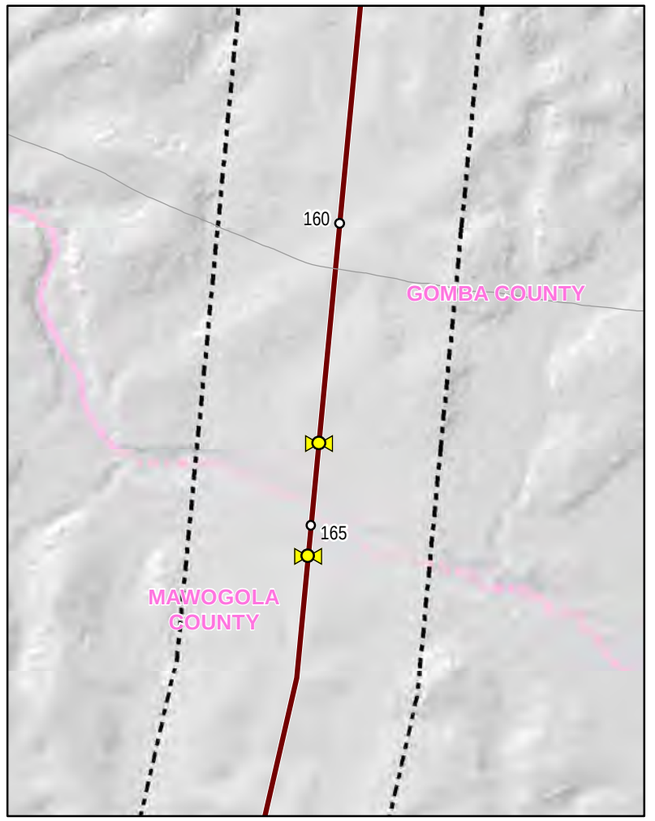
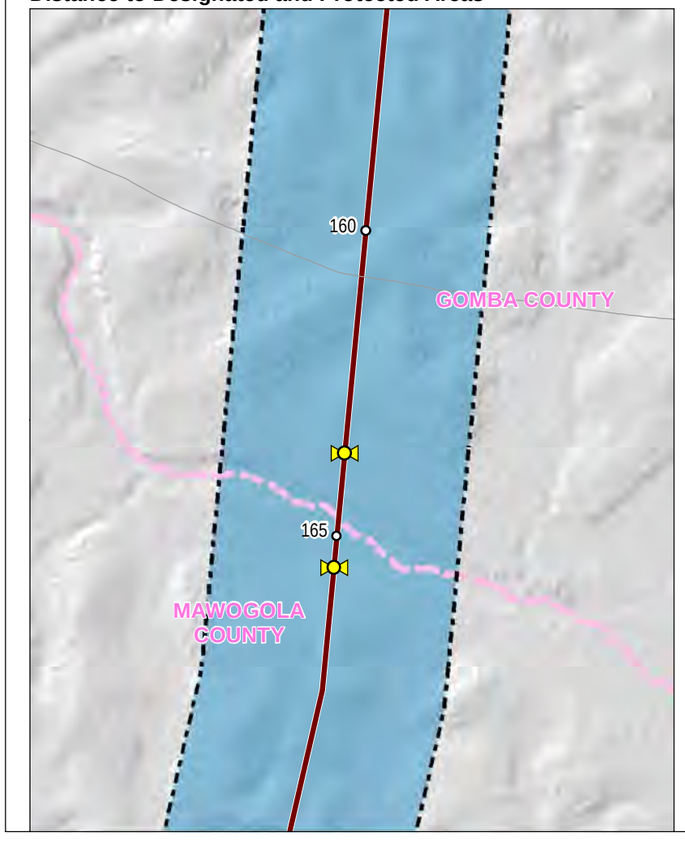
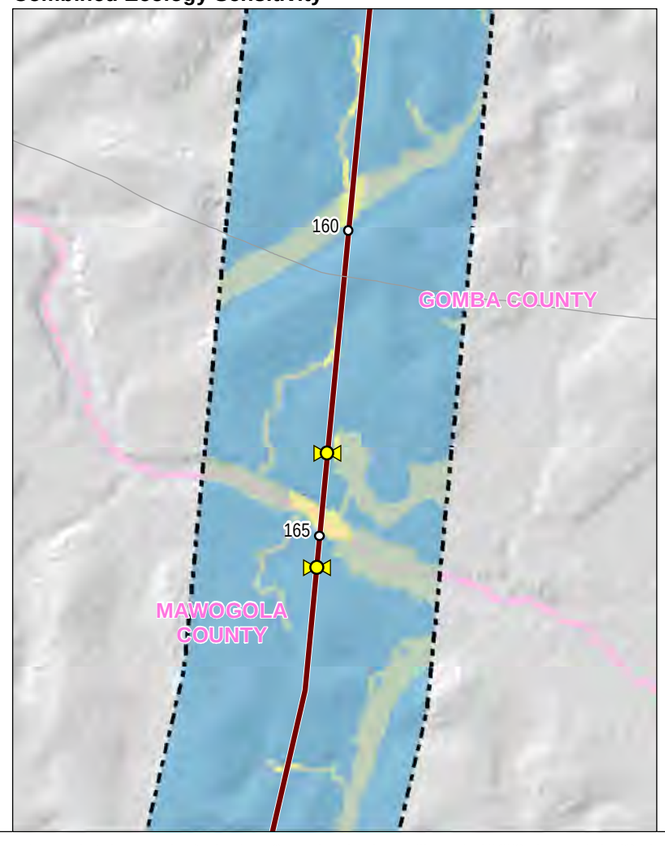


Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

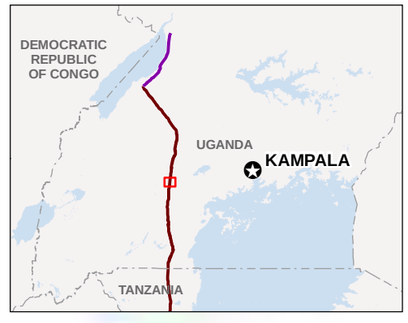
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

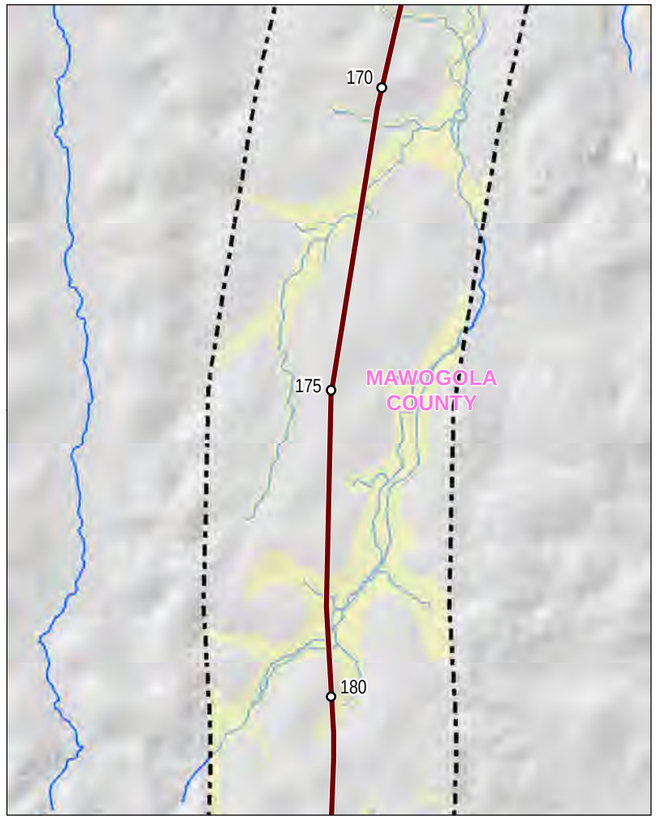
0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

N W E S

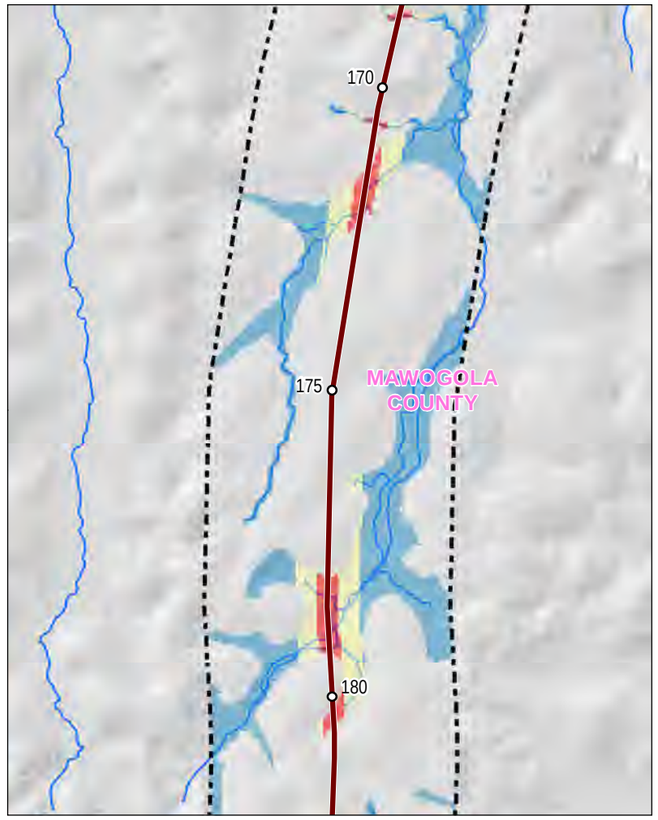
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-054[A].mxd

"Protected Area and Key Biodiversity Area data downloaded from the Integrated Biodiversity Assessment Tool (IBAT) (https://www.ibat-alliance.org/ibat-conservation). Provided by BirdLife International, Conservation International, IUCN and UNEP-WCMC. Please contact ibat@ibat-alliance.org for further information."

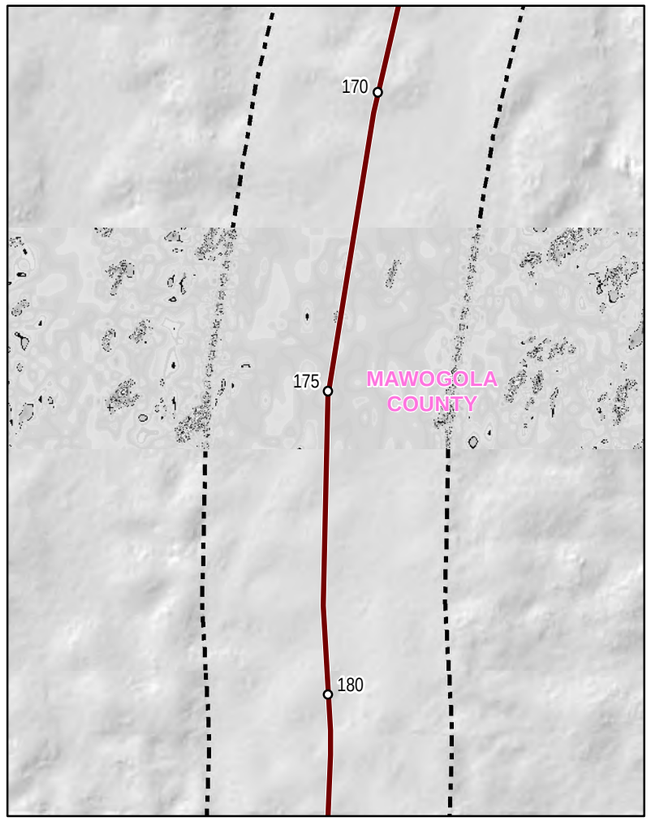
Aquatic Habitat



Distance to Aquatic Habitat



Designated and Protected Areas



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

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- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

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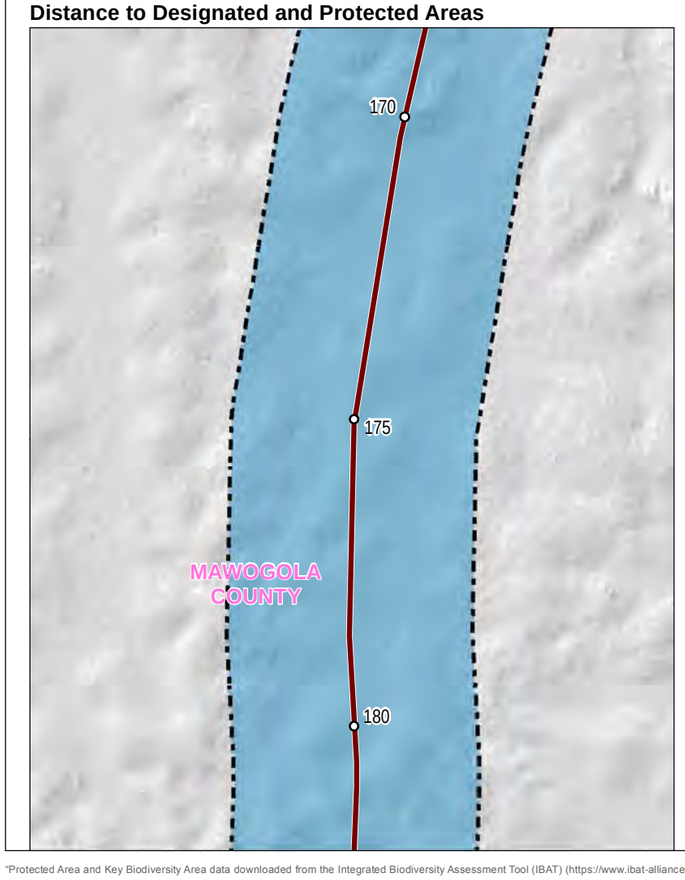
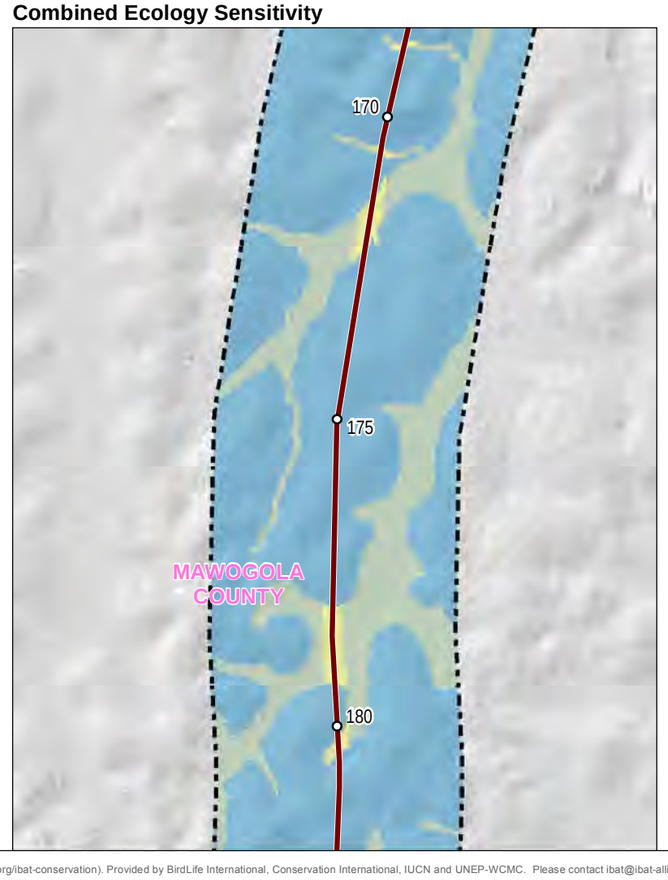
Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
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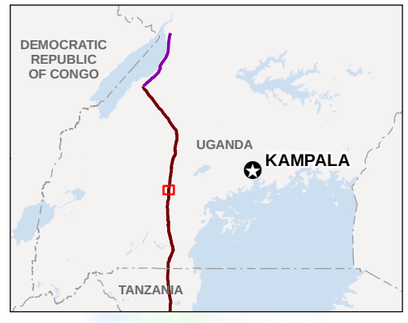
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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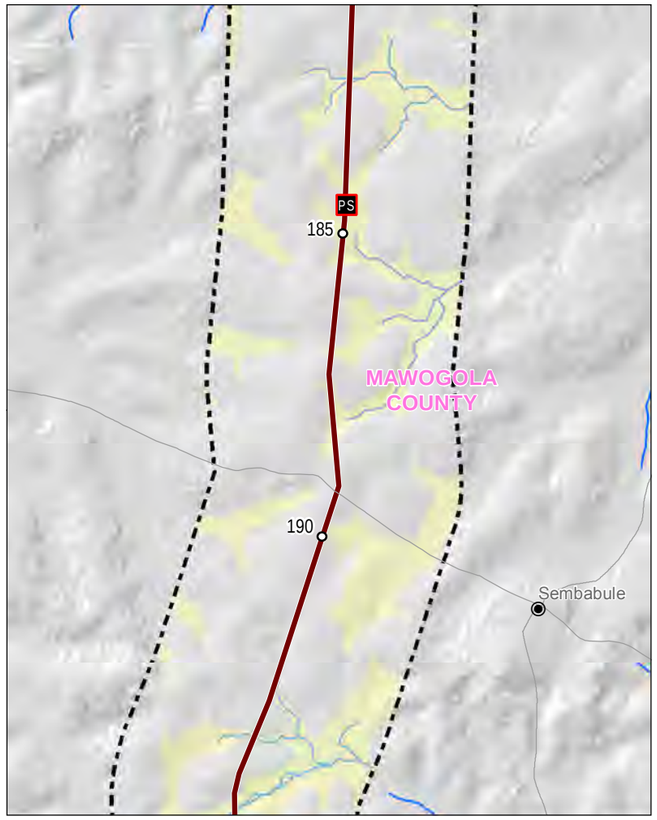
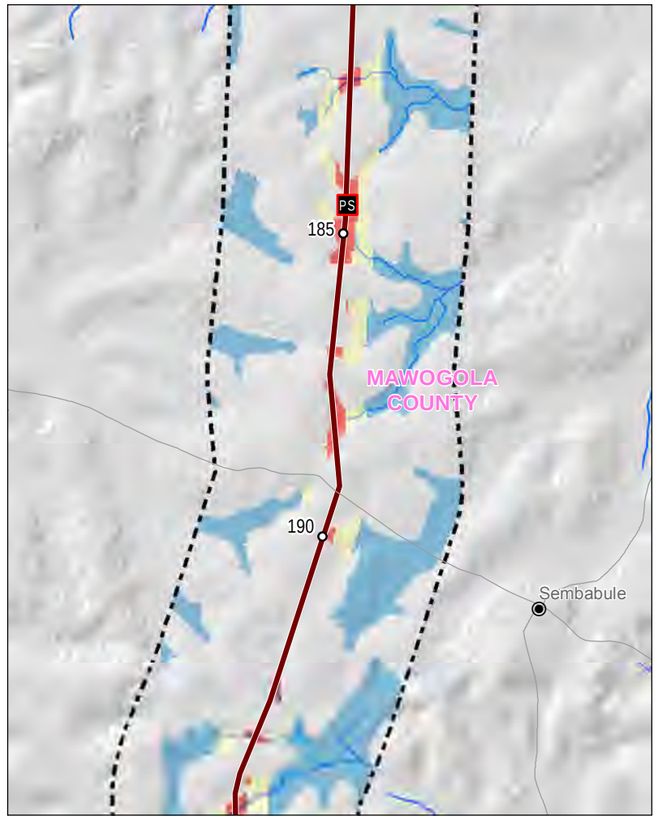
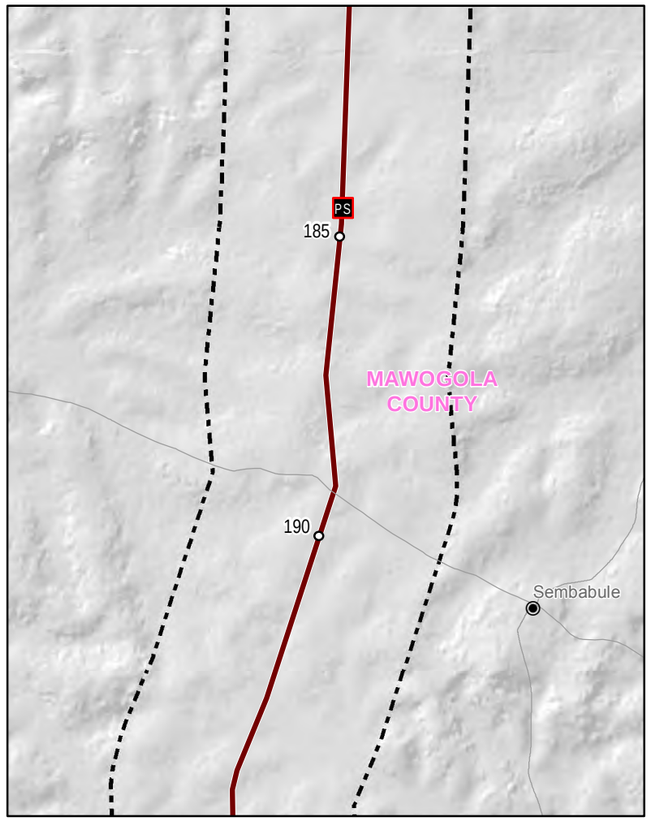


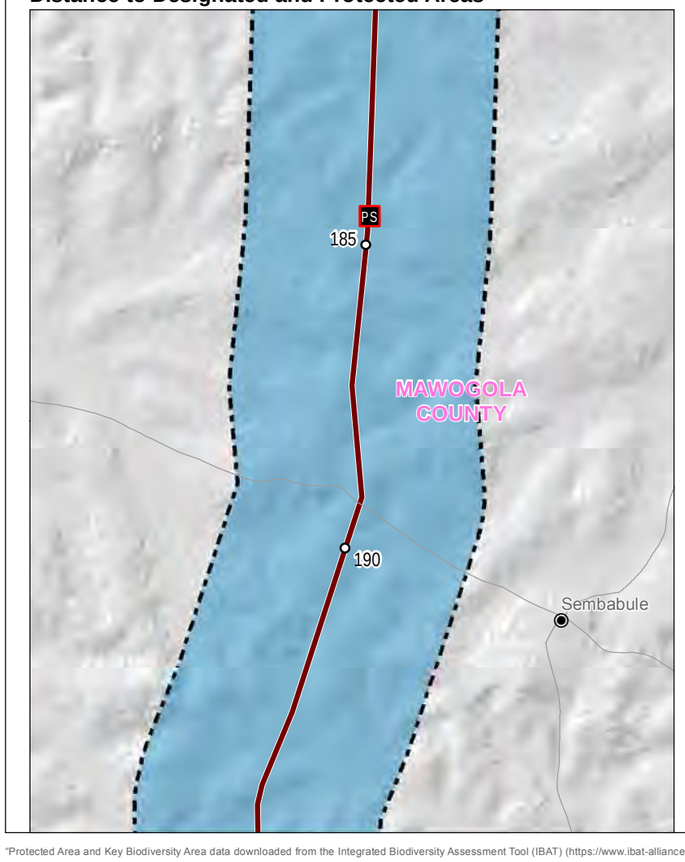
Distance to Aquatic Habitat



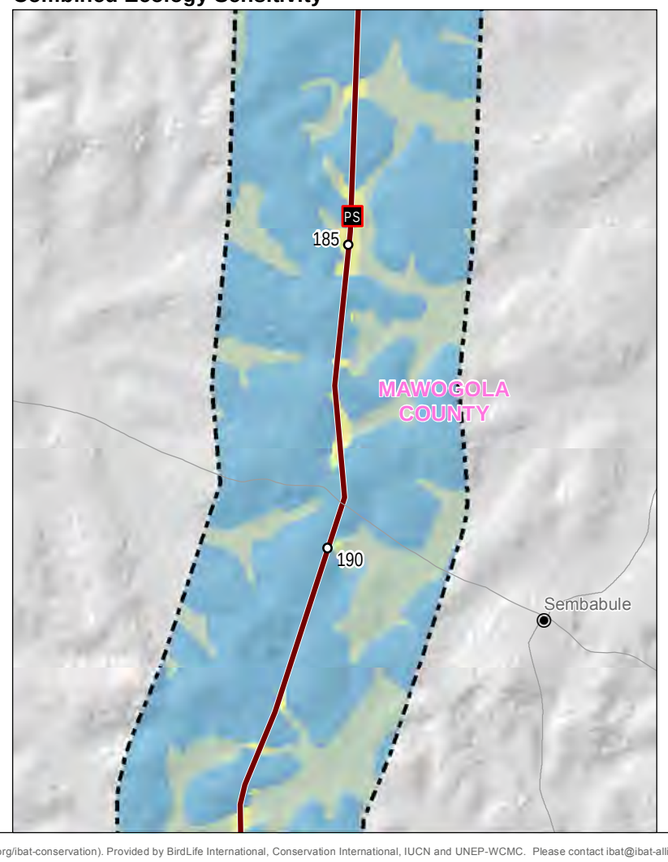
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- PS Pumping Station
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

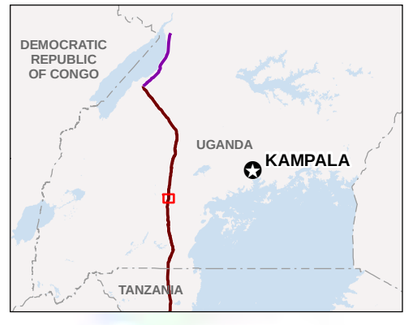
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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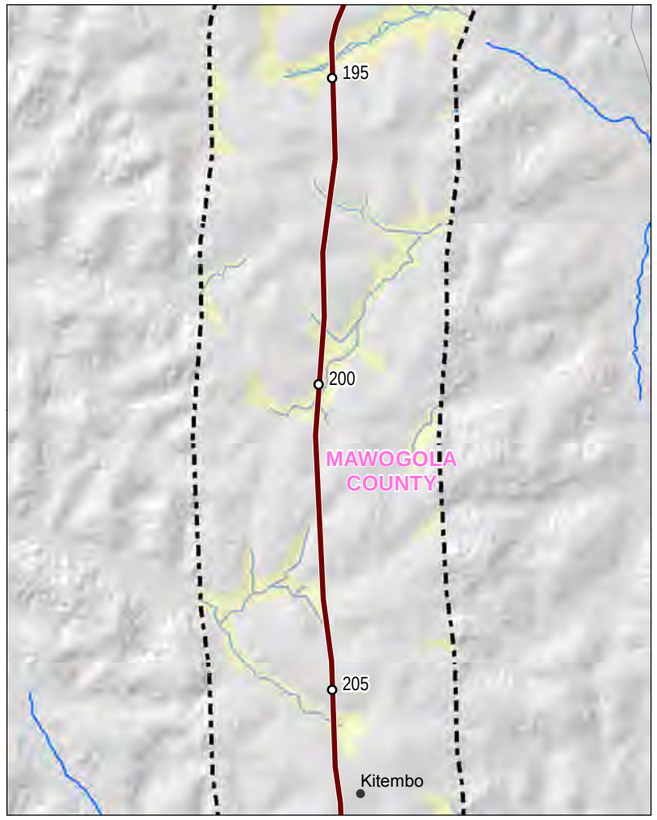
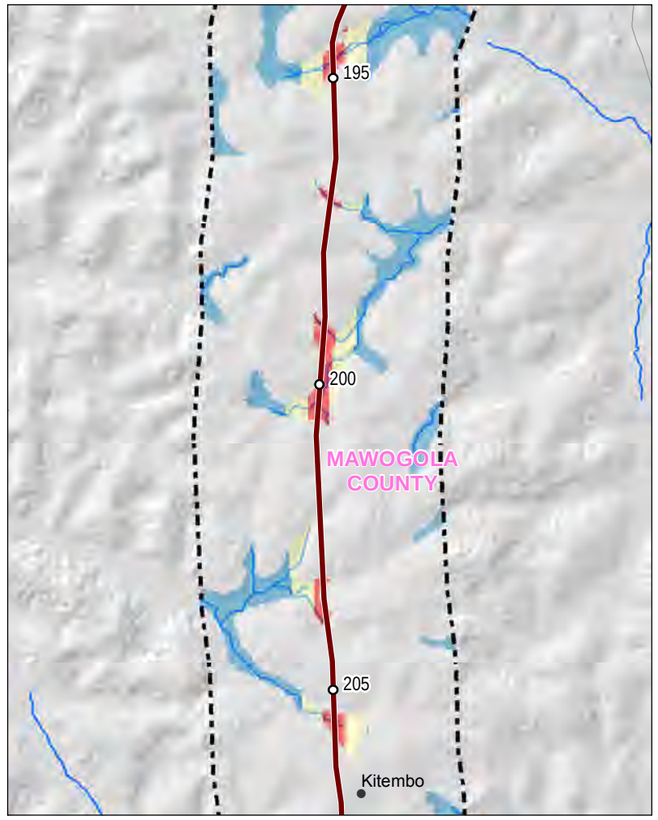
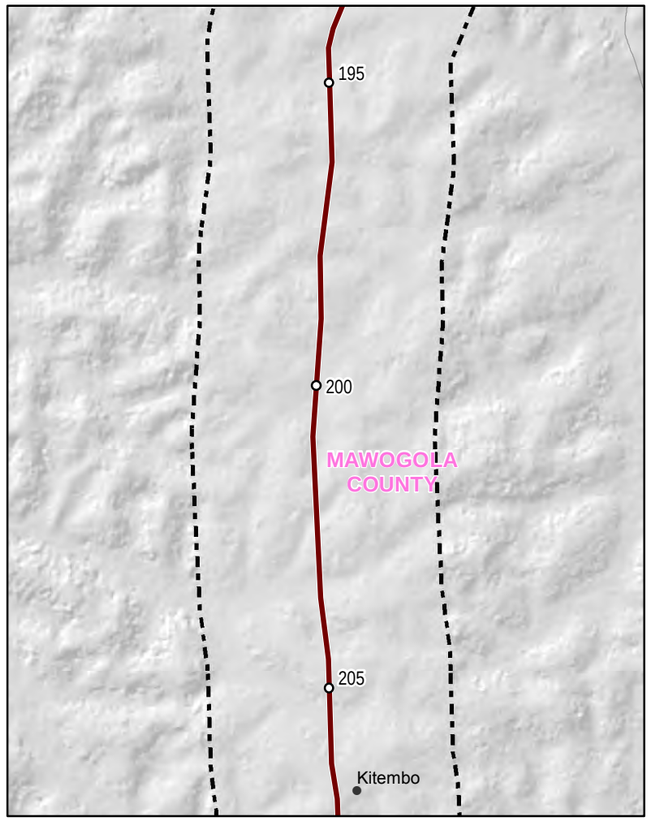


Distance to Aquatic Habitat



Designated and Protected Areas



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

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- Major Road

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Administrative Area:

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Environmental Sensitivity

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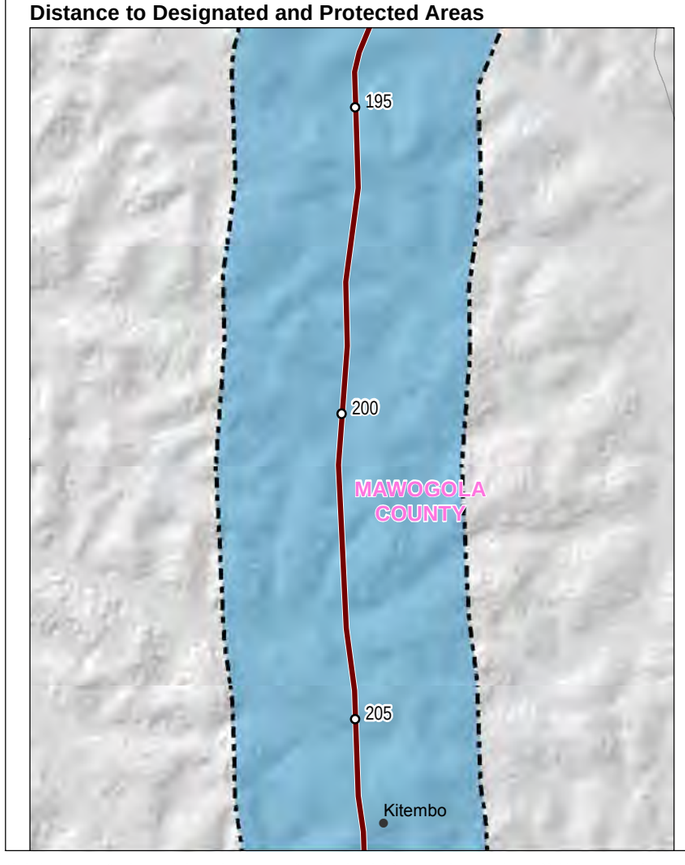
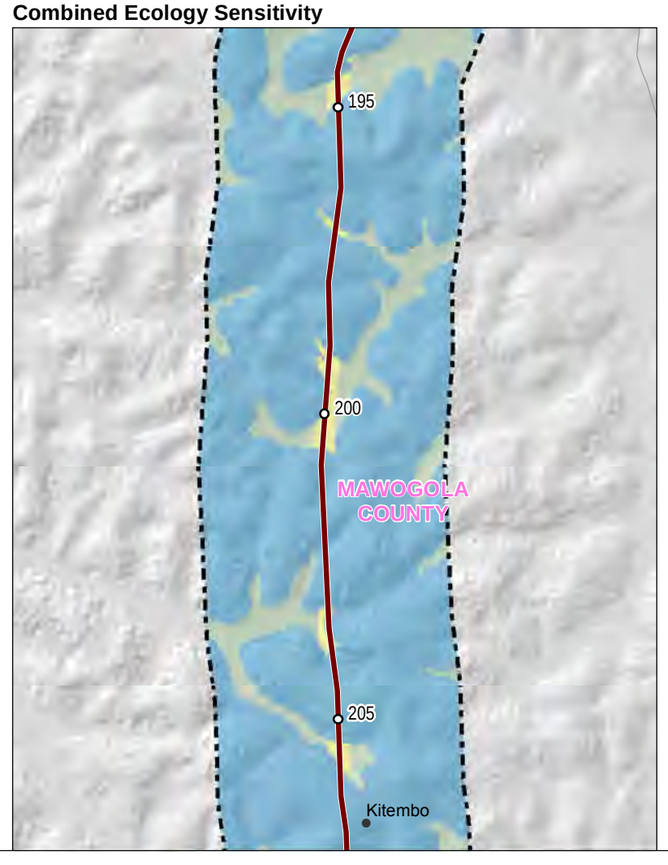
Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Coordinate System: WGS84 TM 35E S
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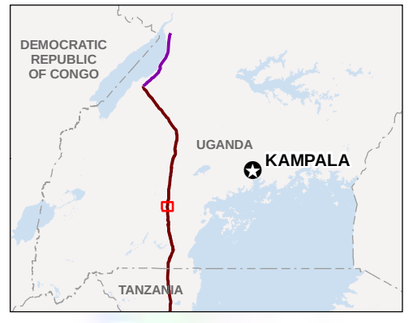
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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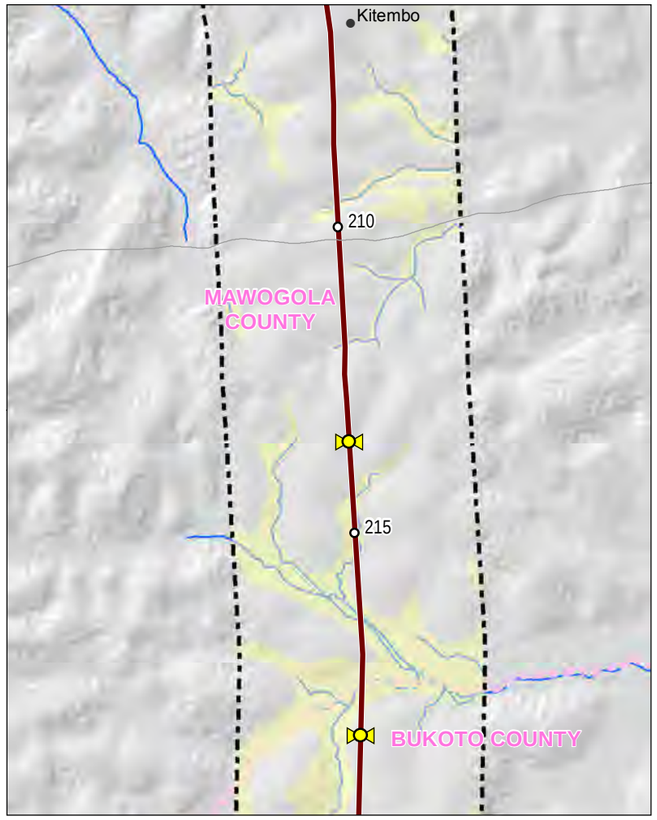
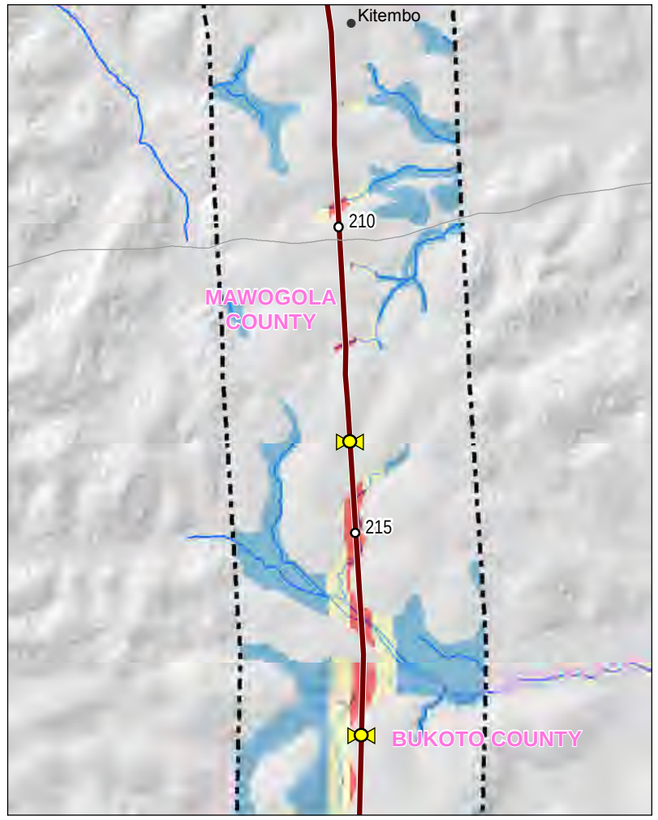
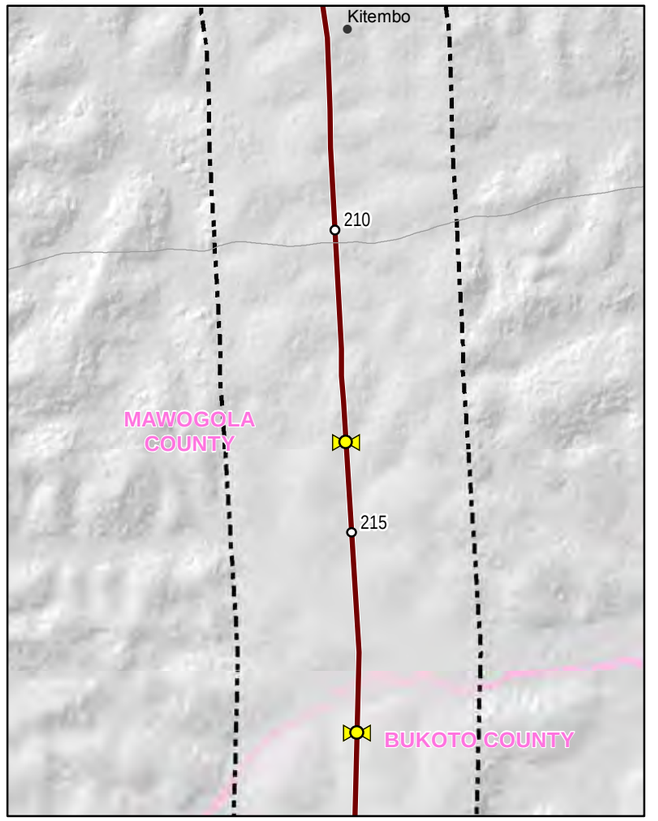
Aquatic Habitat



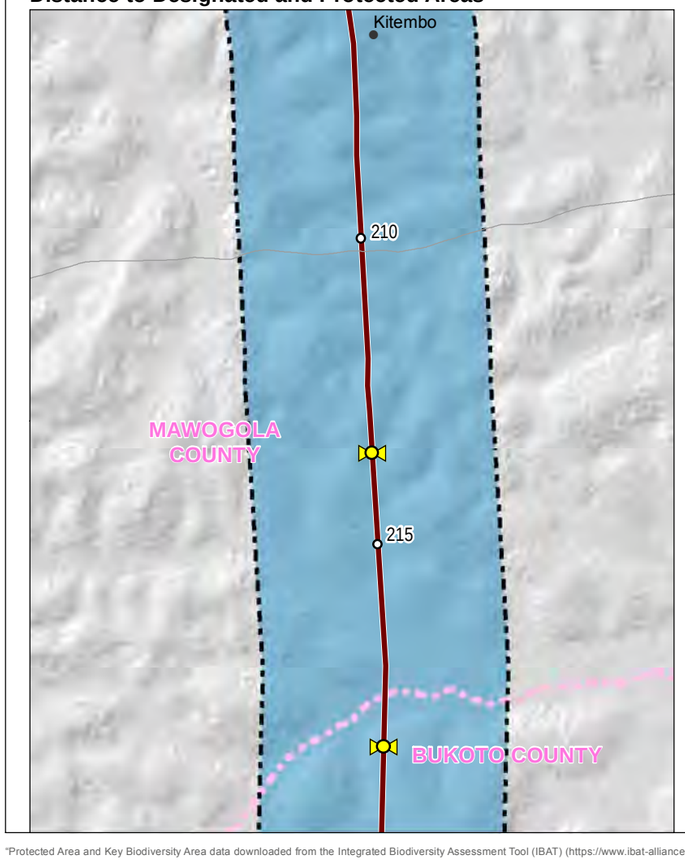
Distance to Aquatic Habitat



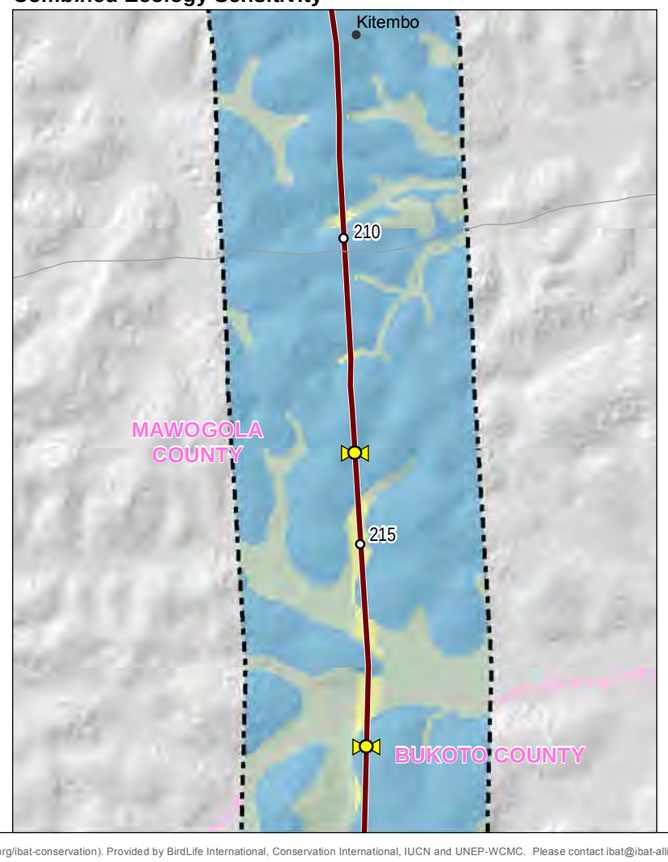
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
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- Medium
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Coordinate System: WGS84 TM 35E S
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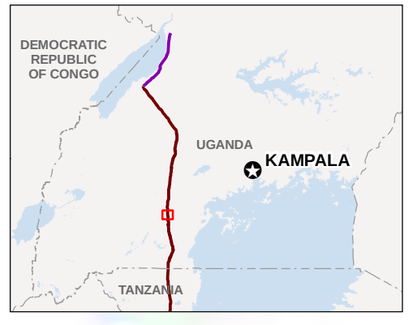

CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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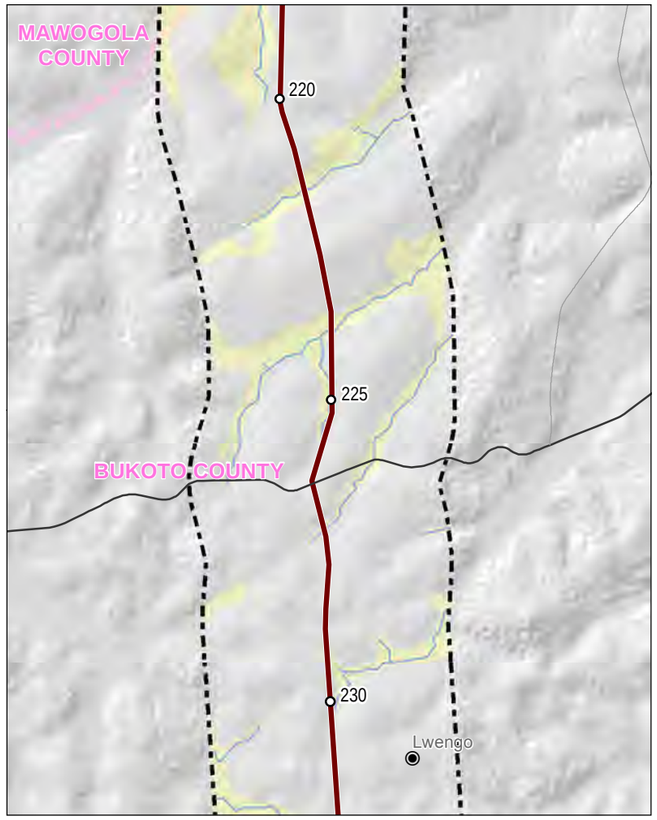
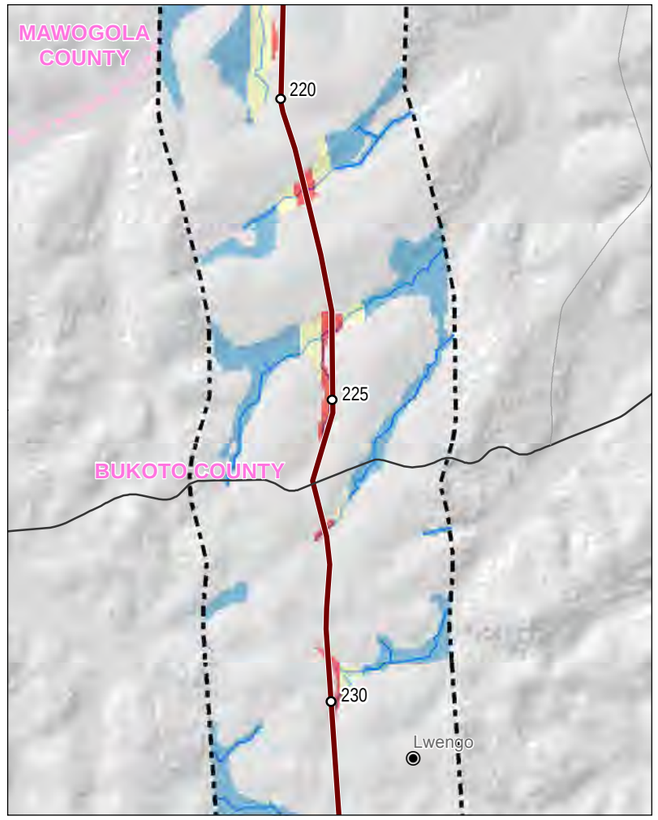
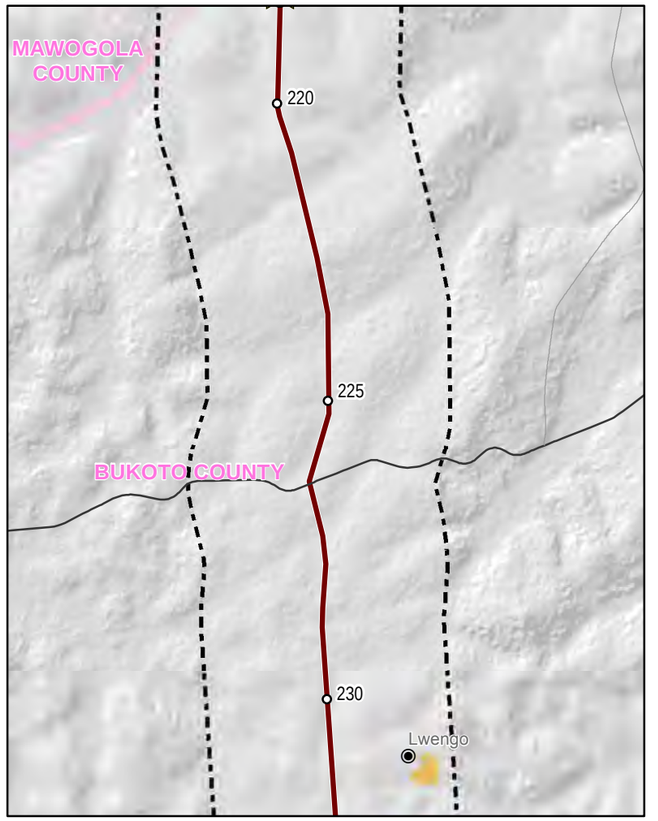


Distance to Aquatic Habitat



Designated and Protected Areas



Legend

- East African Crude Oil Pipeline
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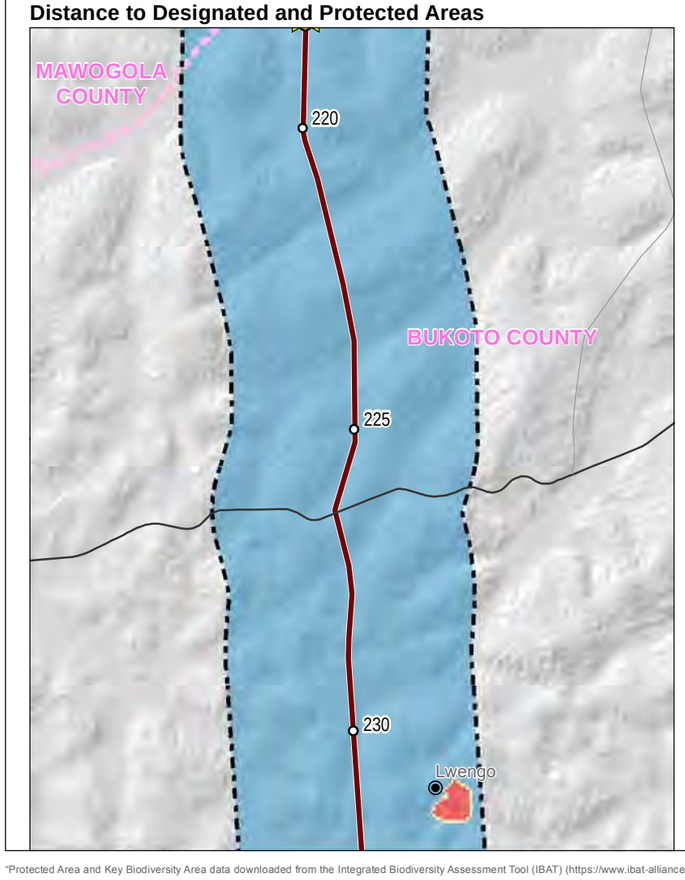
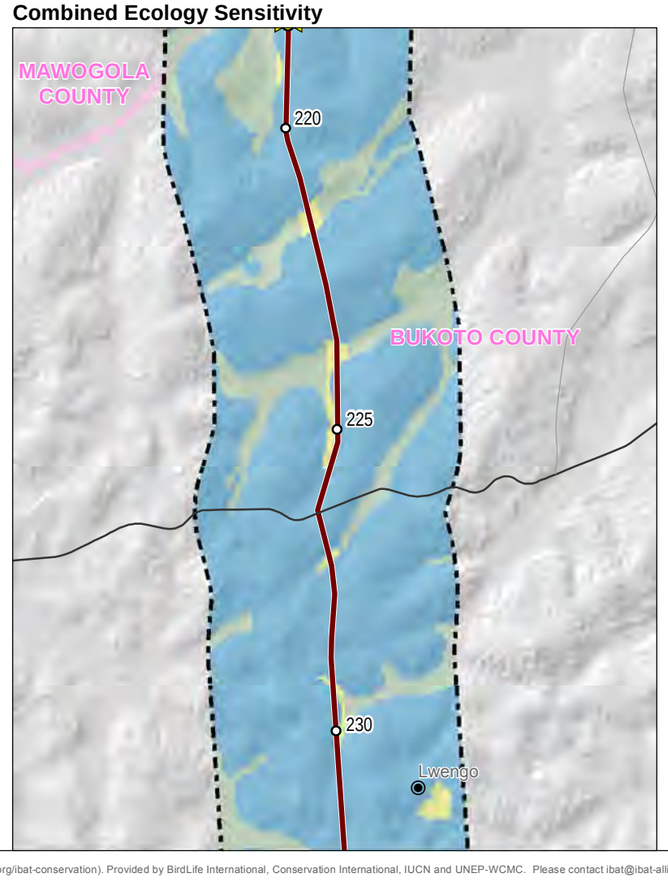
Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Coordinate System: WGS84 TM 35E S
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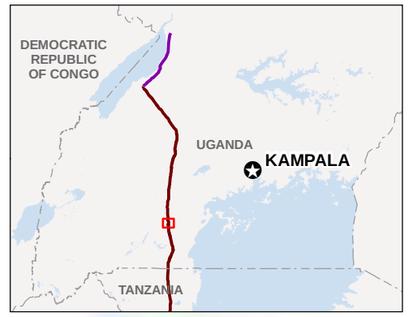

CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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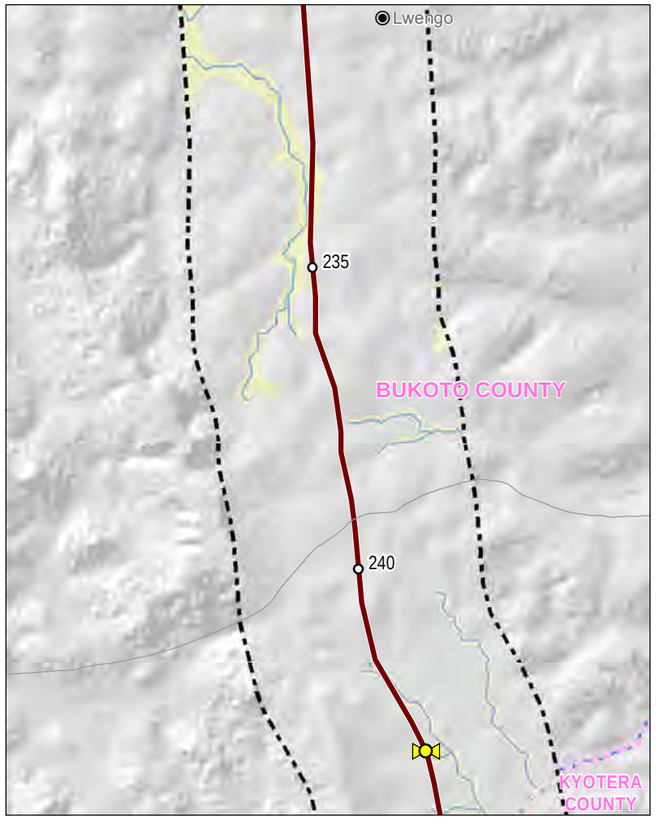
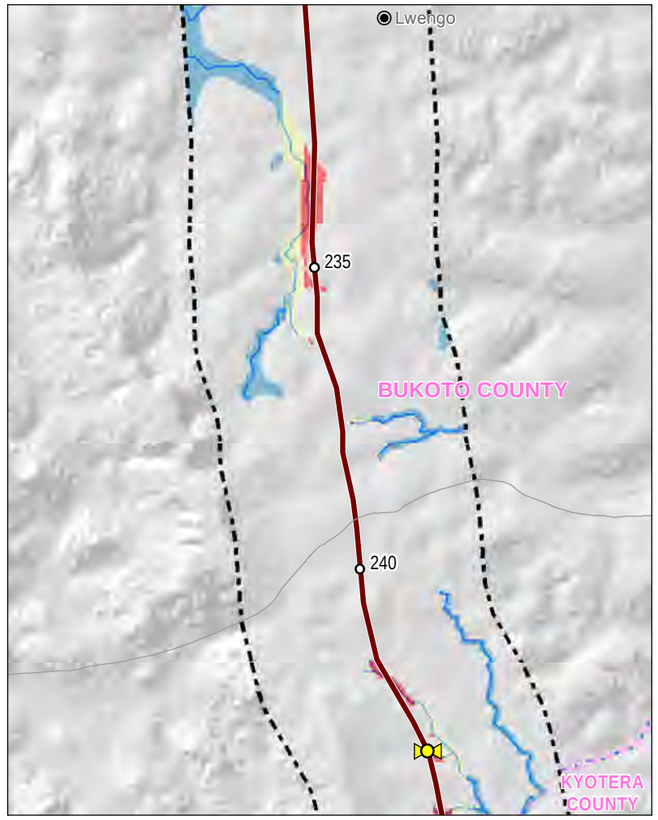
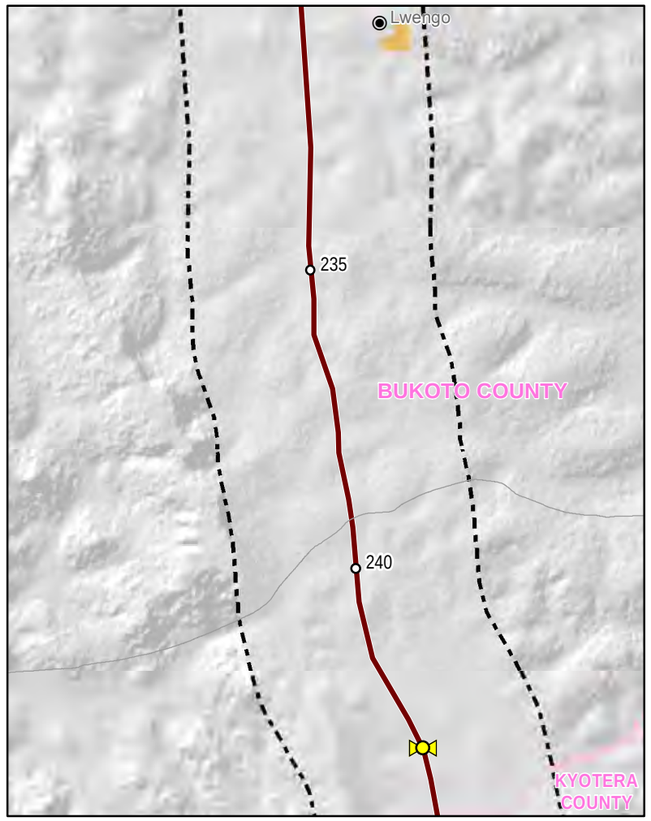


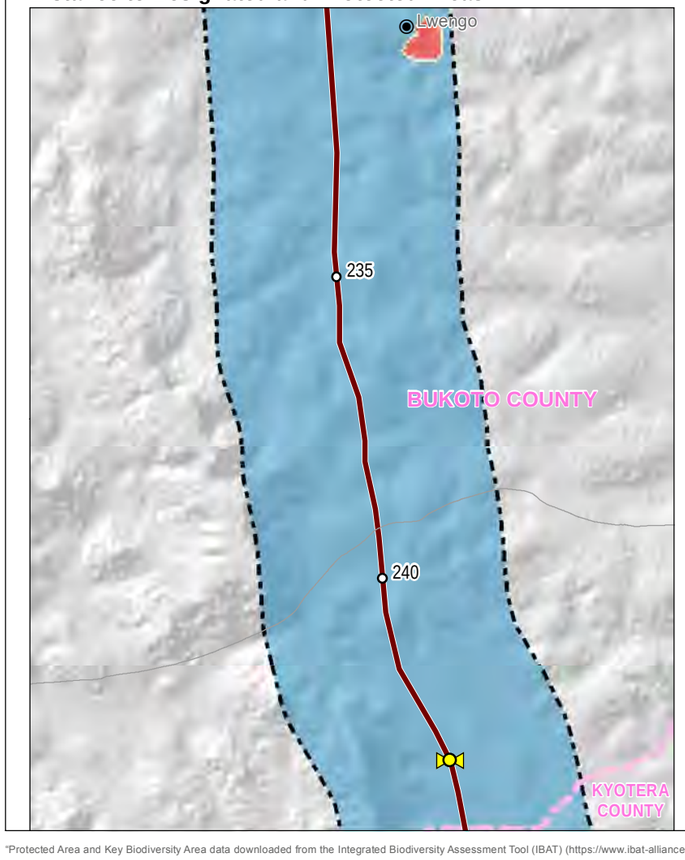
Distance to Aquatic Habitat



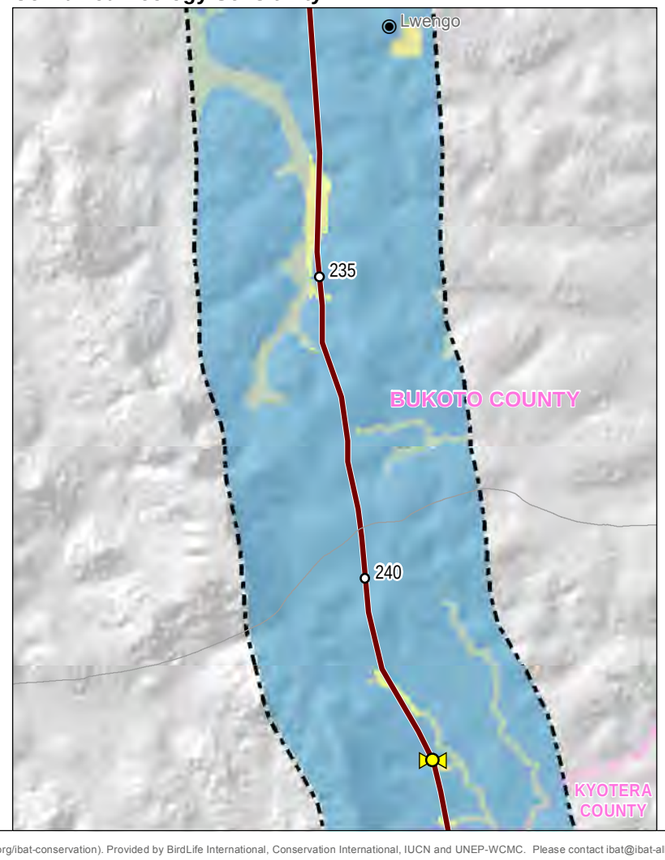
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

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- District Headquarters
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- Highway
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Coordinate System: WGS84 TM 35E S
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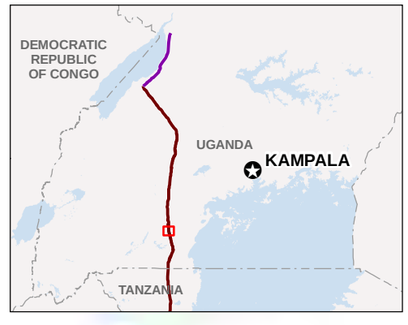

CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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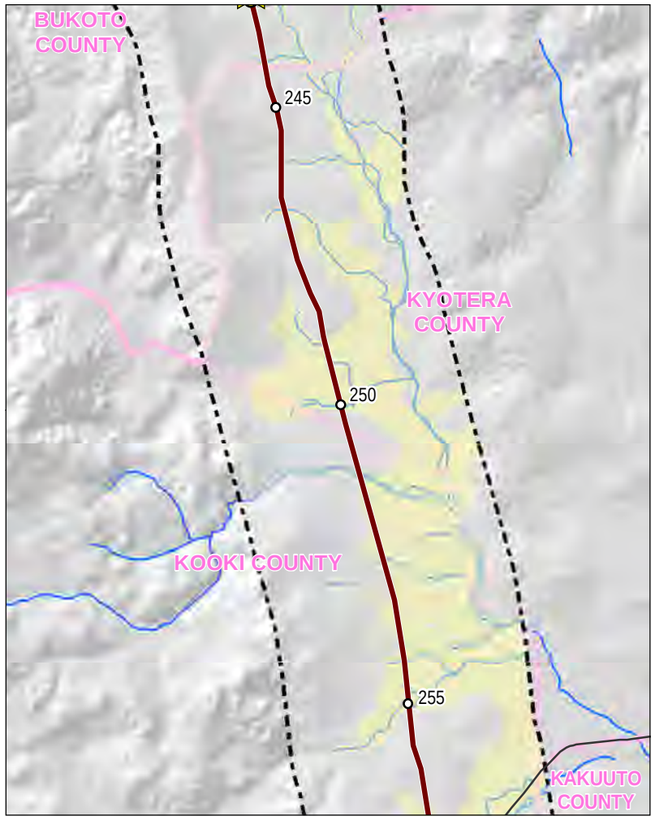
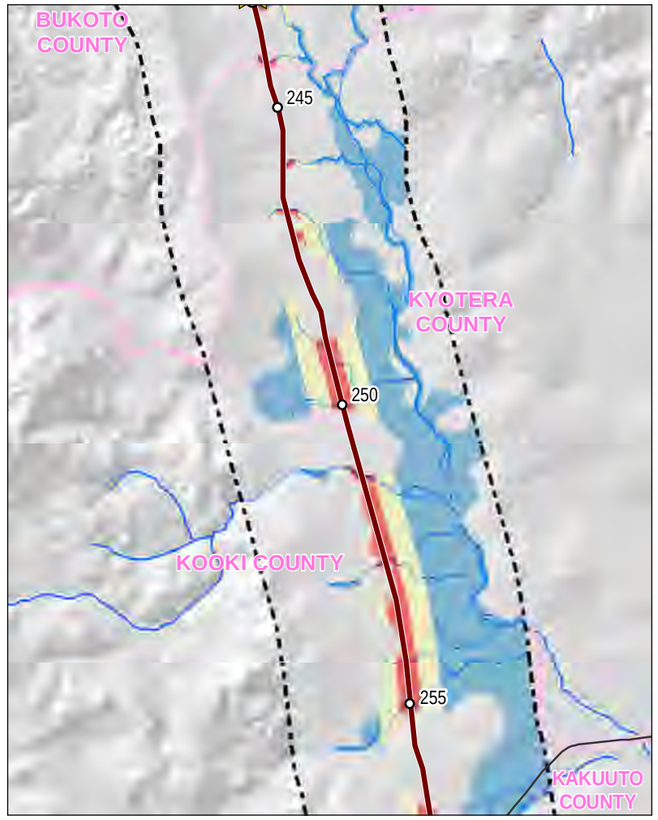
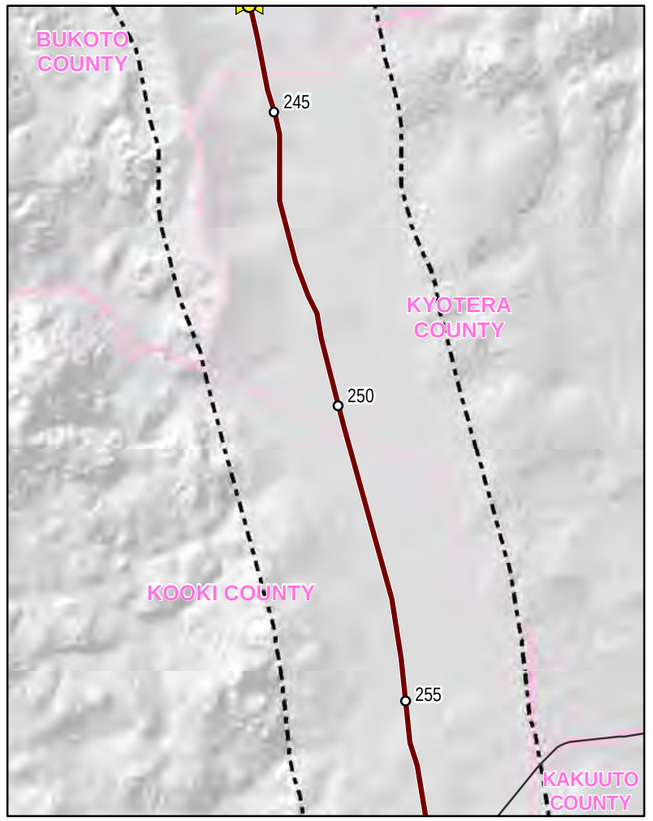
Aquatic Habitat



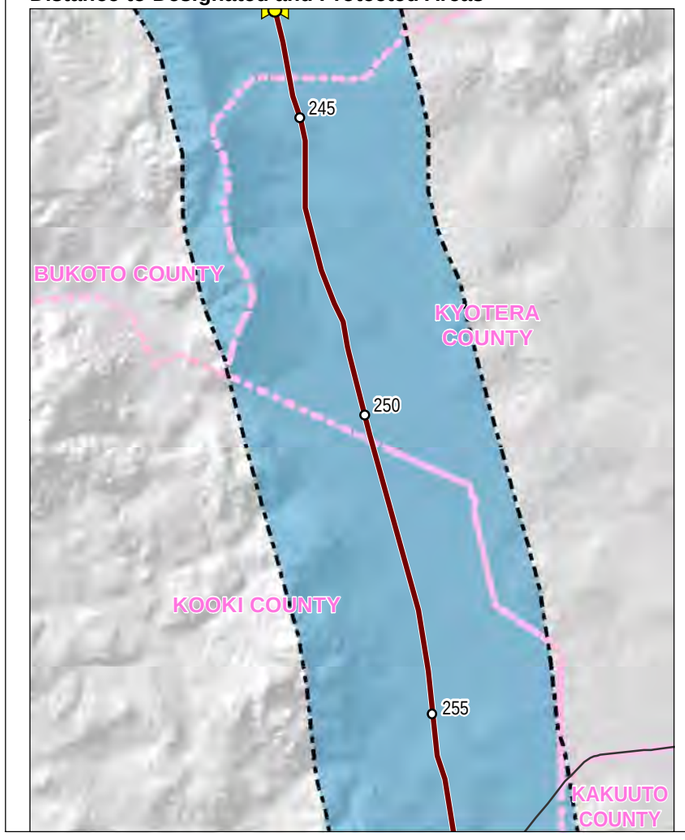
Distance to Aquatic Habitat



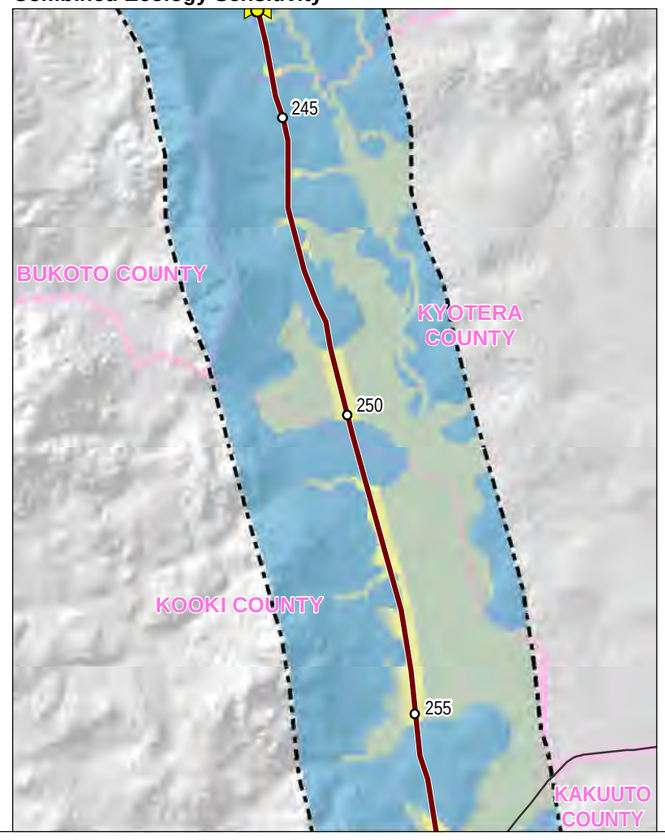
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

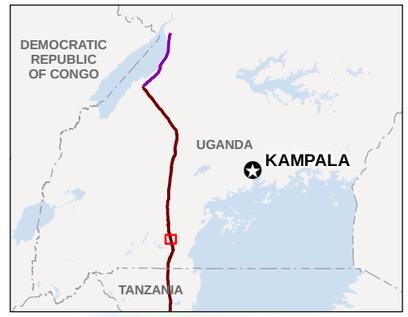
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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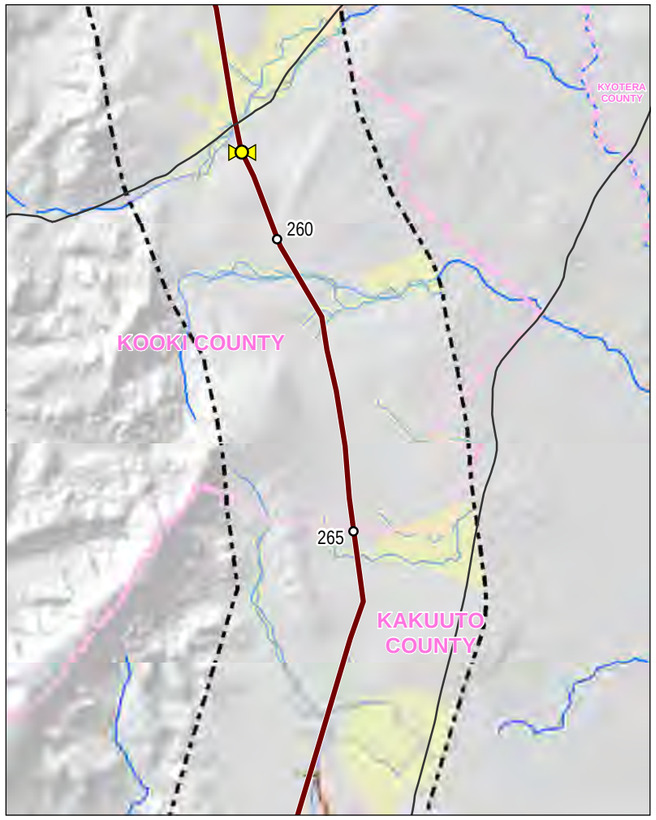
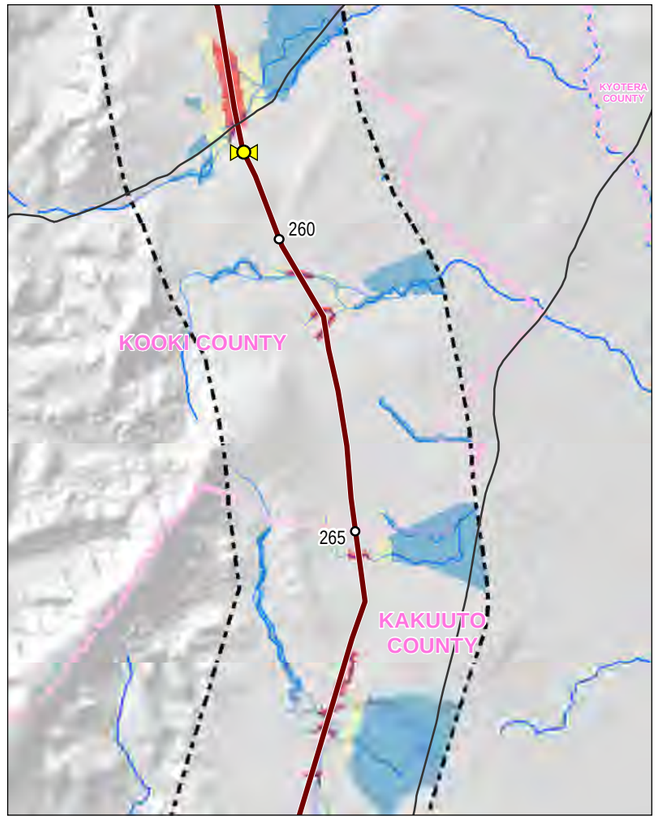
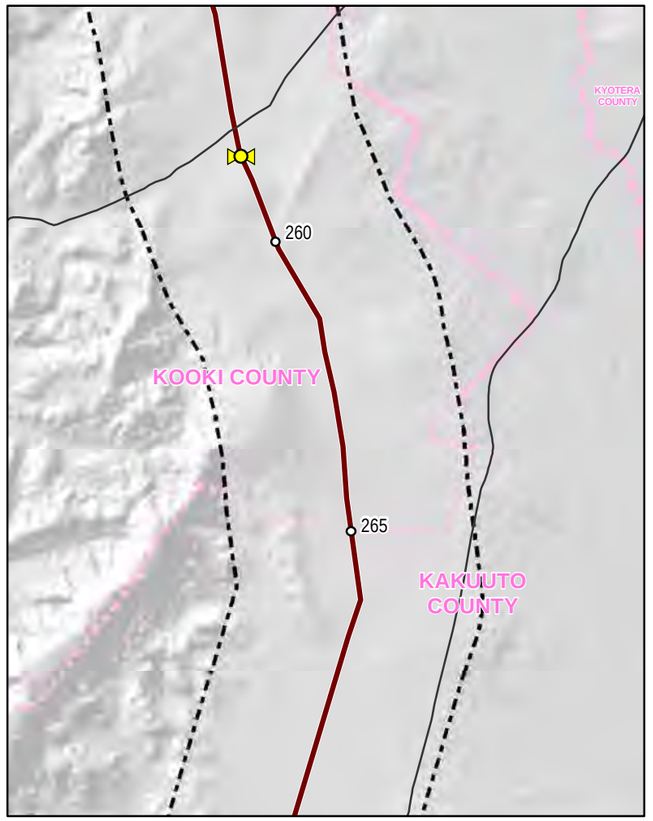
Aquatic Habitat



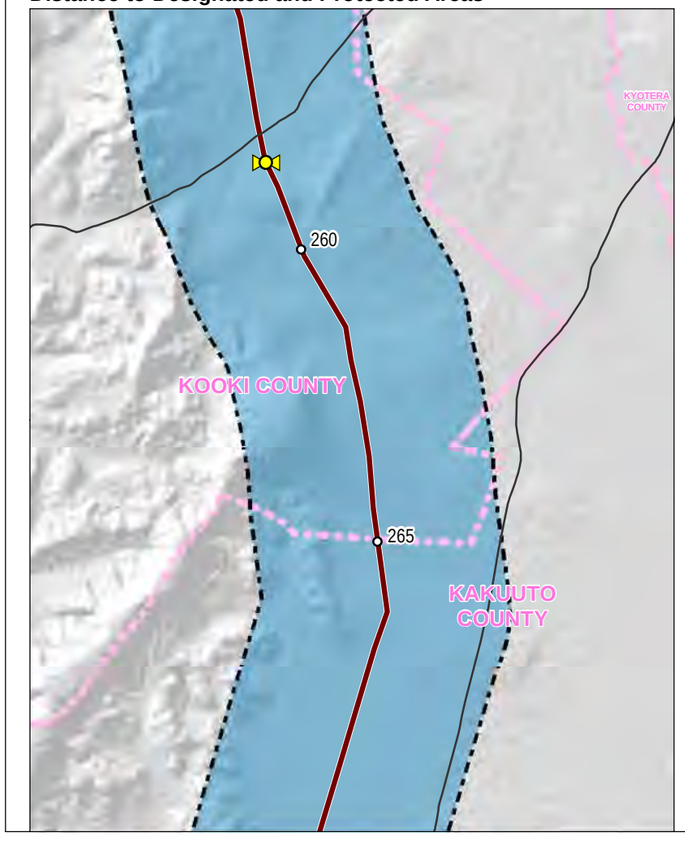
Distance to Aquatic Habitat



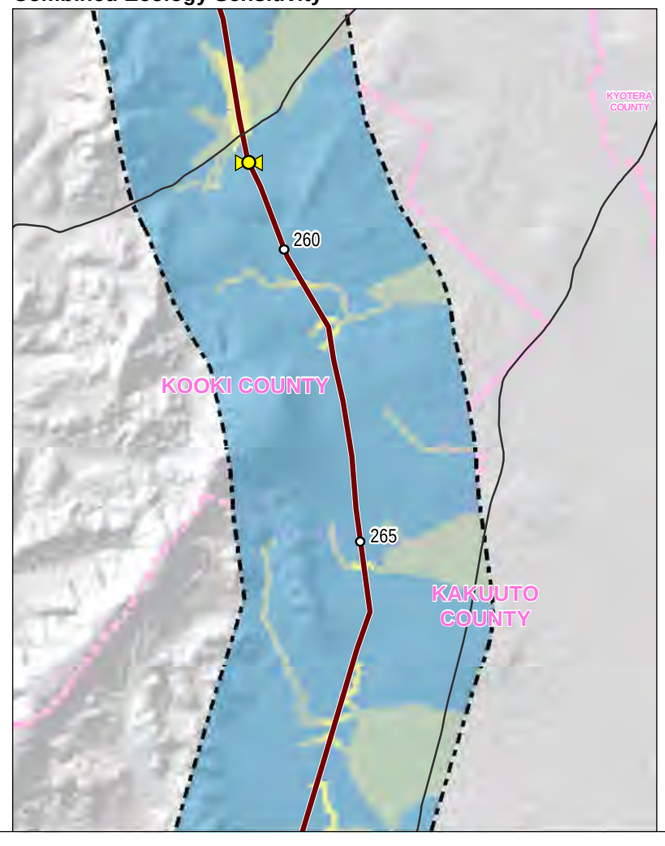
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

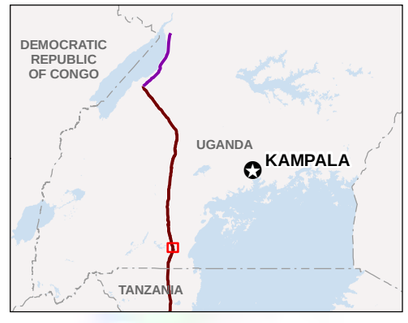
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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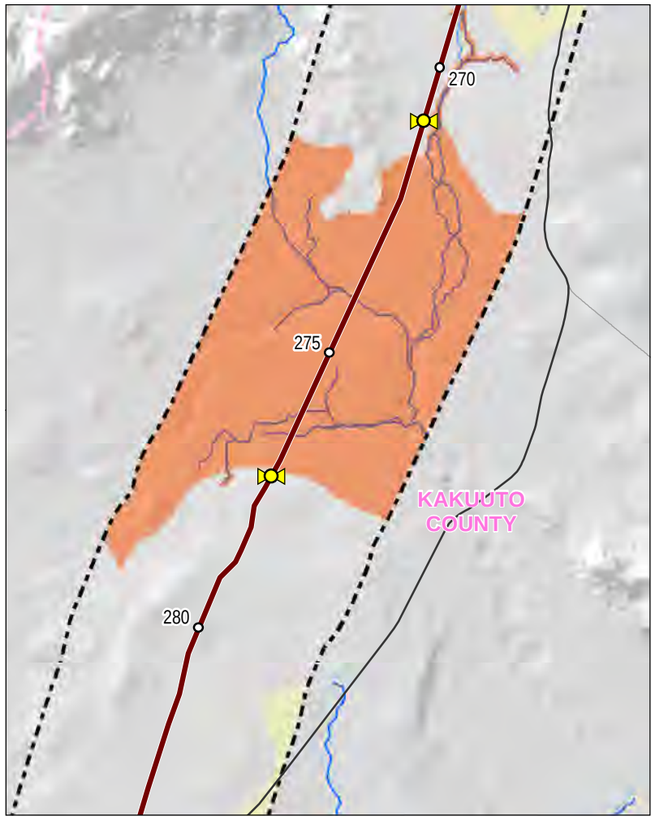
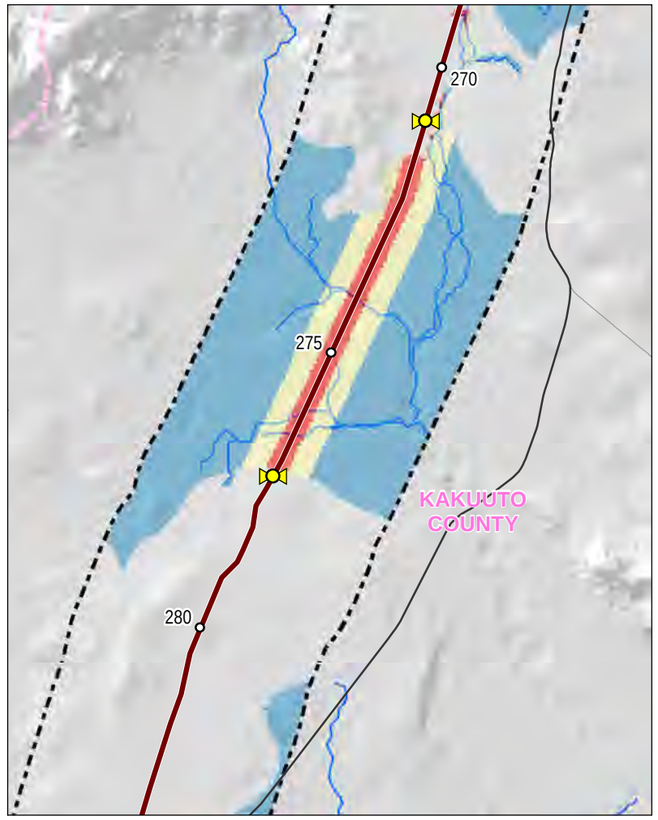
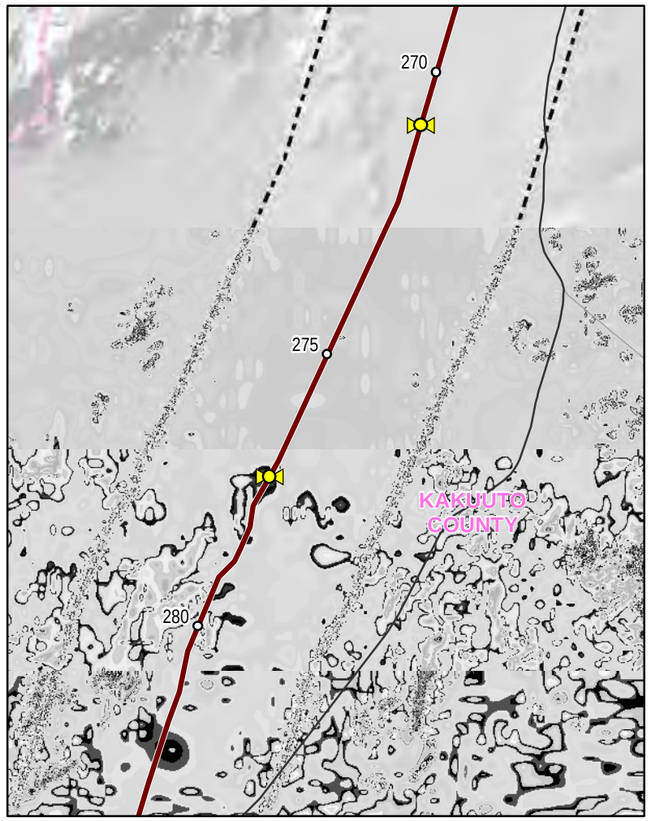
Aquatic Habitat



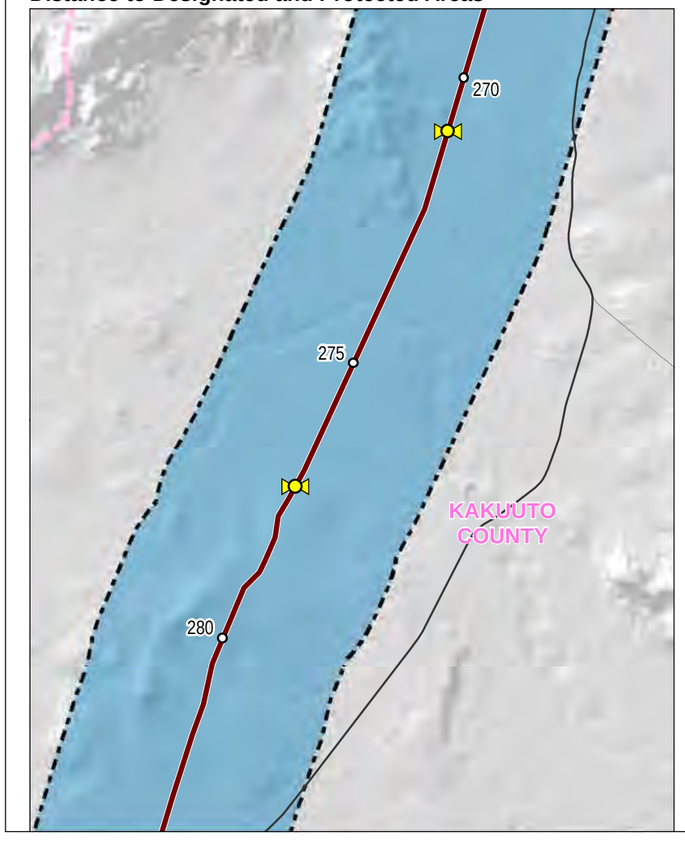
Distance to Aquatic Habitat



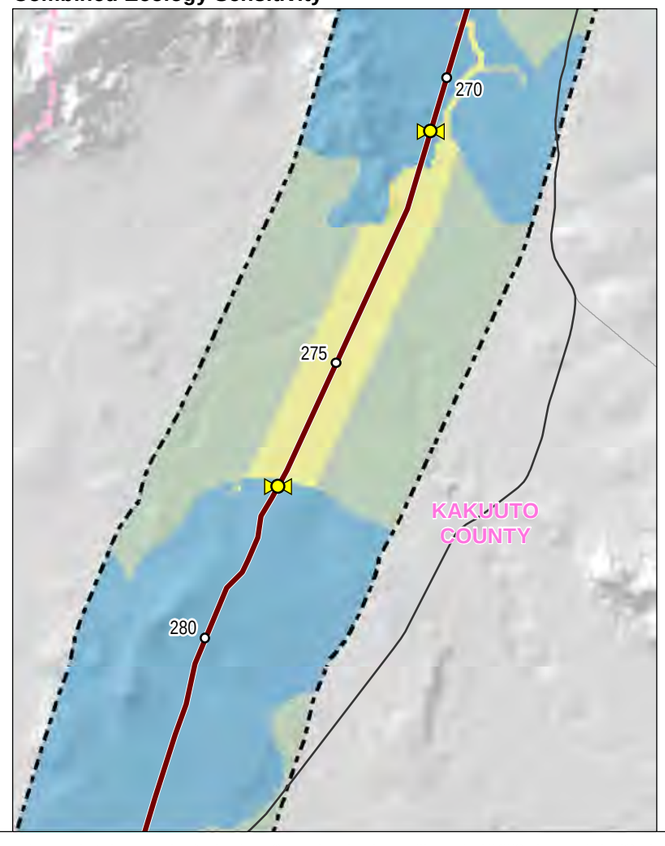
Designated and Protected Areas



Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

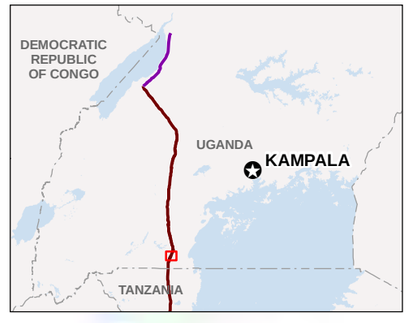
Administrative Area:

- County Boundary

Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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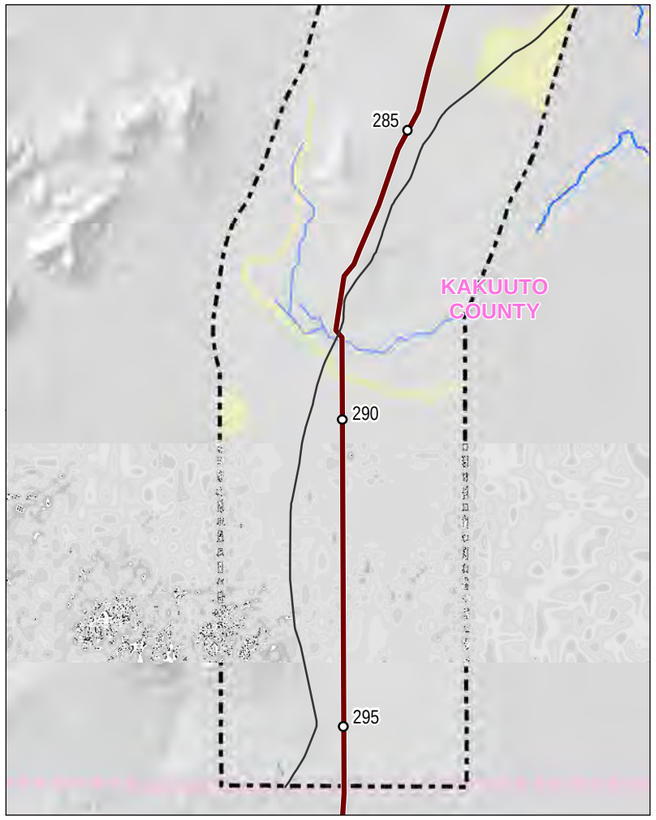
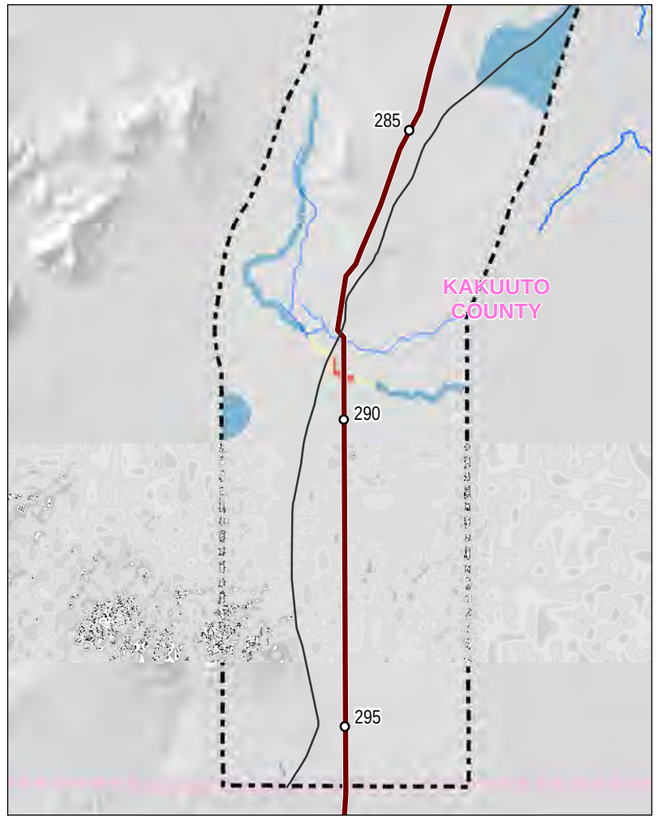
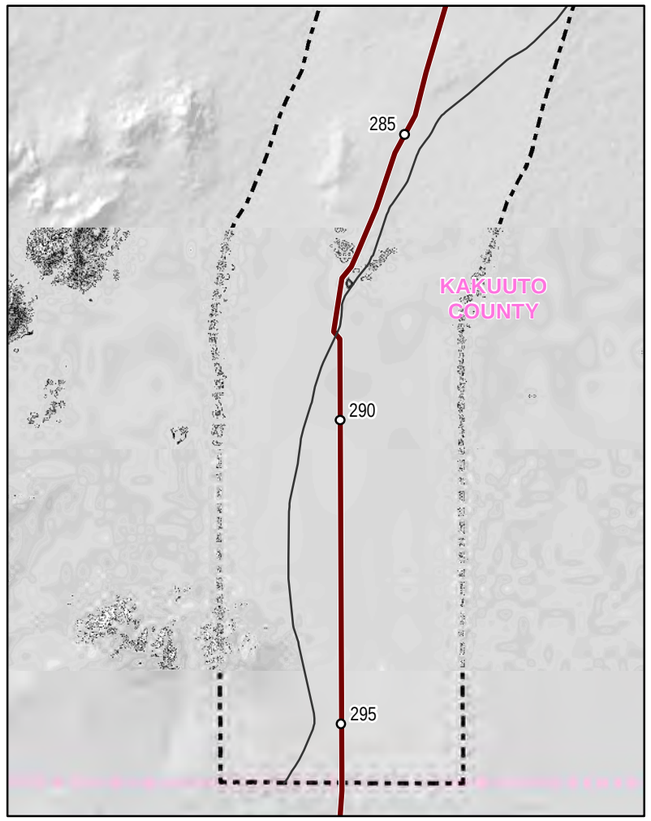
Aquatic Habitat



Distance to Aquatic Habitat



Designated and Protected Areas



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

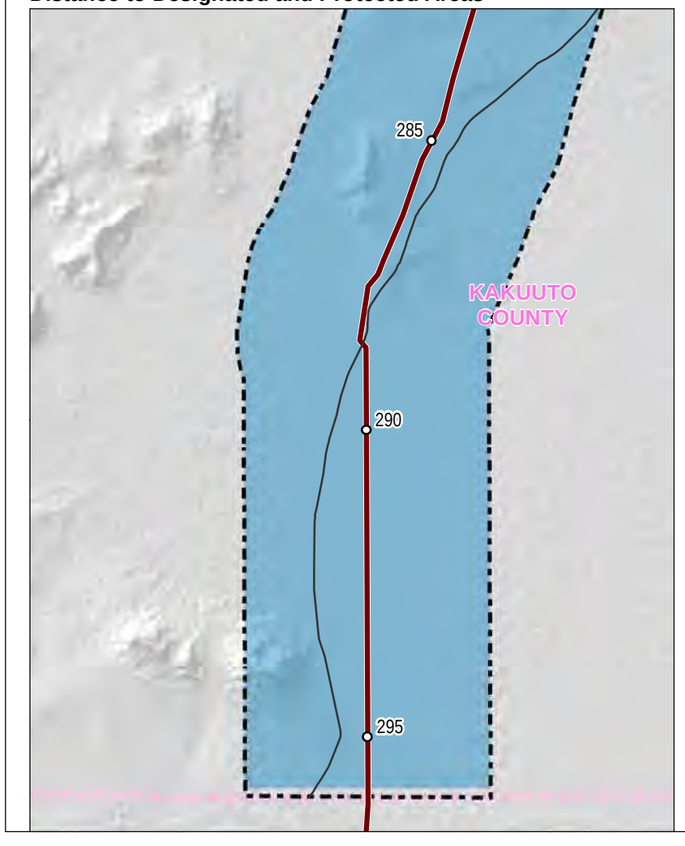
Administrative Area:

- County Boundary

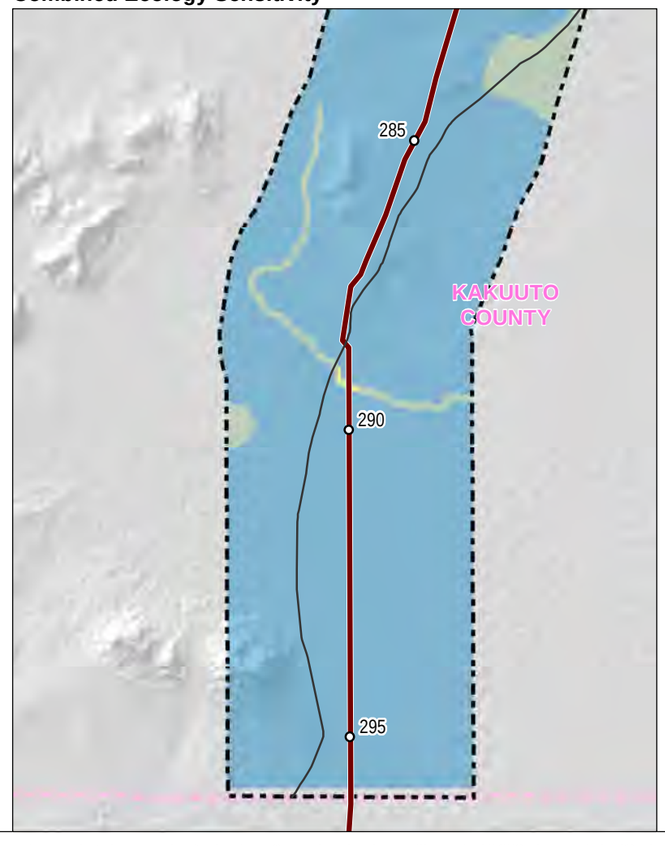
Environmental Sensitivity

- Very High
- High
- Medium
- Low
- Very Low

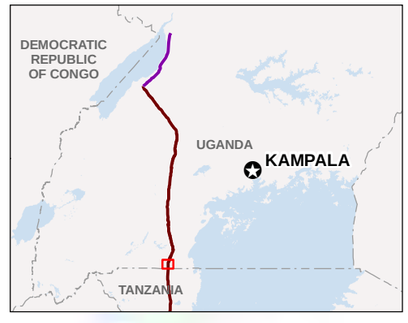
Distance to Designated and Protected Areas



Combined Ecology Sensitivity



Coordinate System: WGS84 TM 35E S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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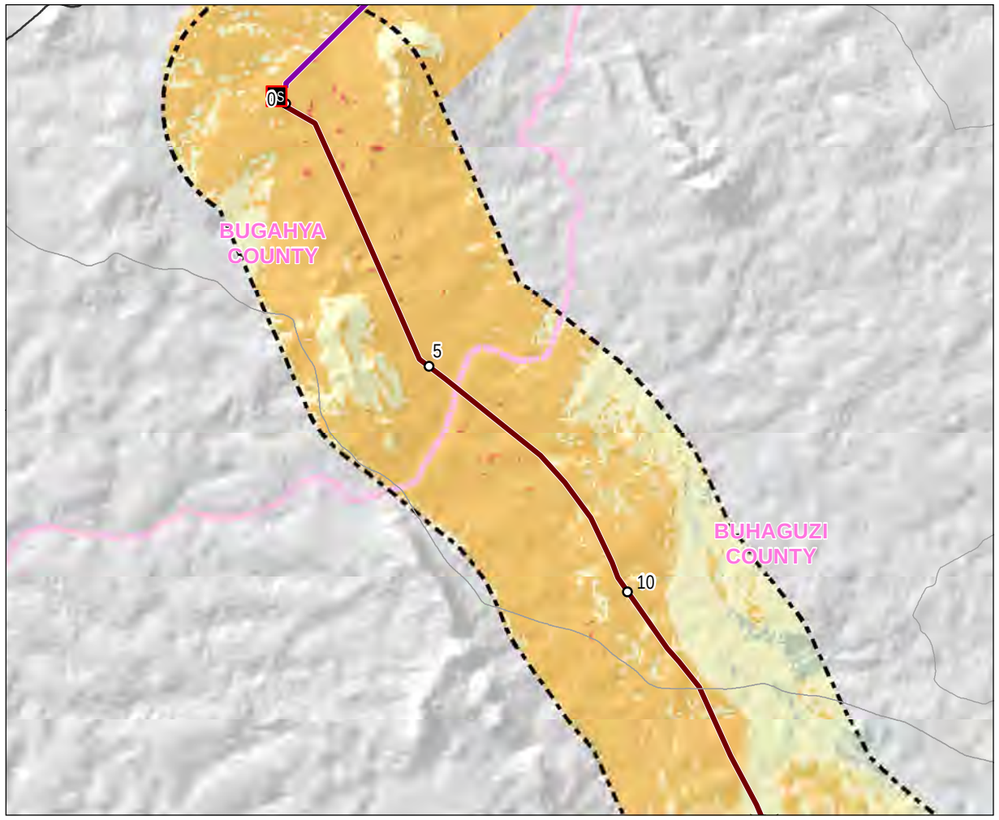
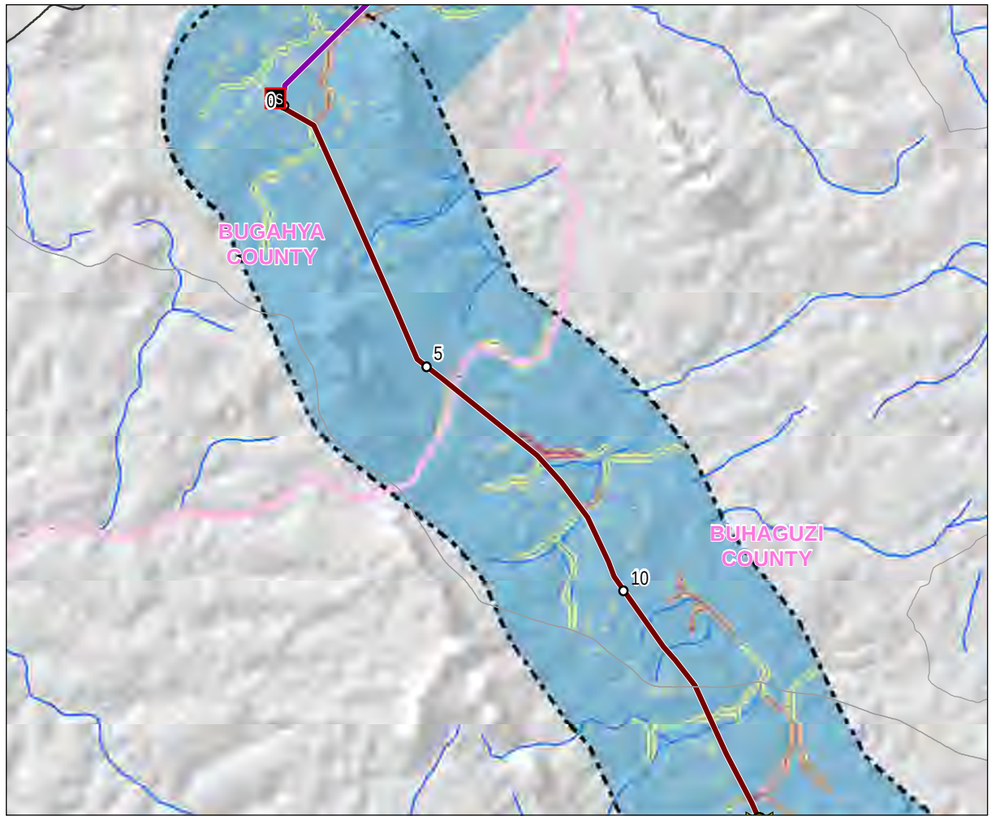
ATTACHMENT I1.5 COMBINED ENVIRONMENTAL SENSITIVITY SCREENING

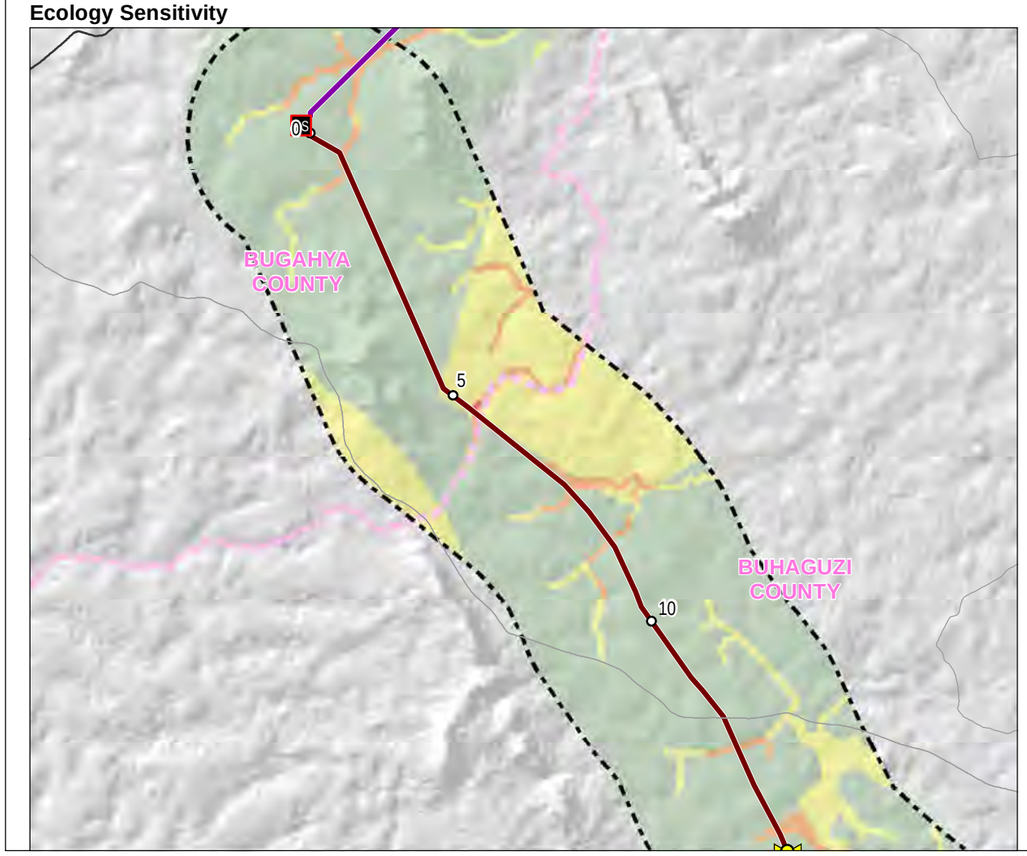
Groundwater Sensitivity



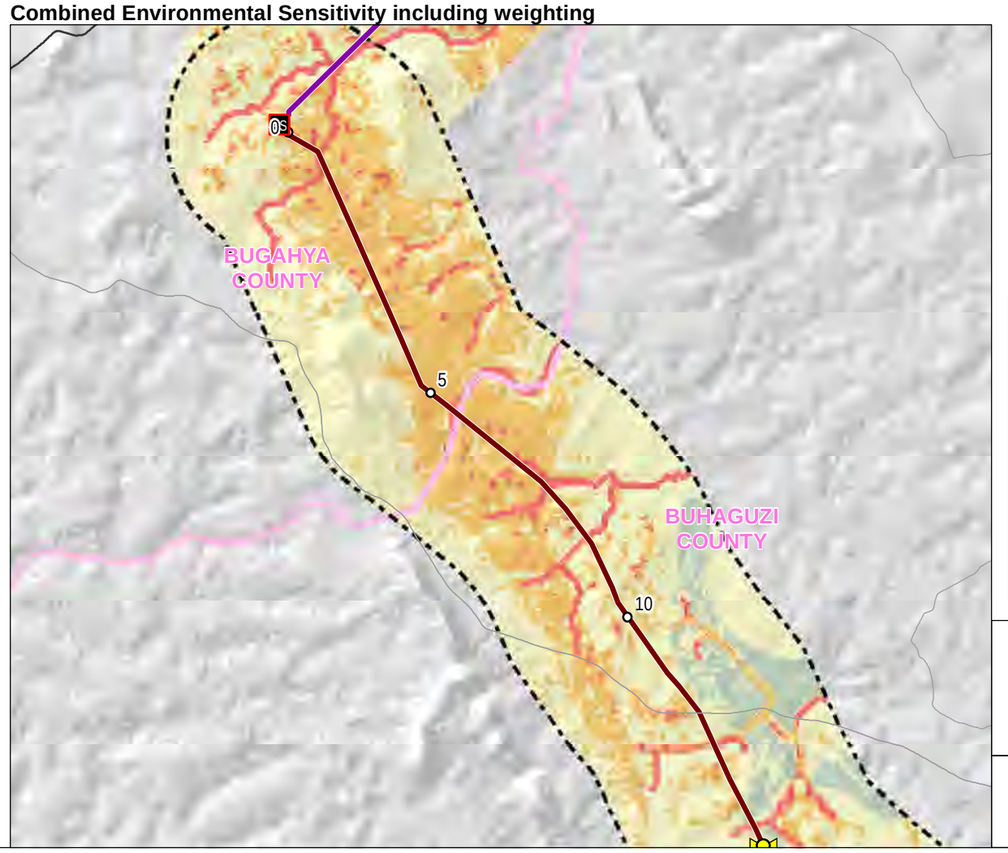
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Pumping Station
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

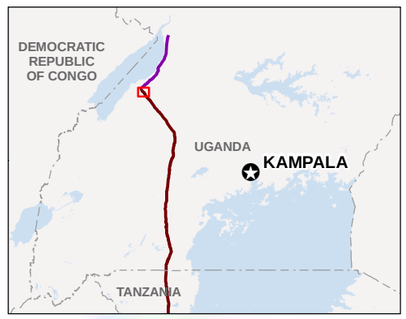
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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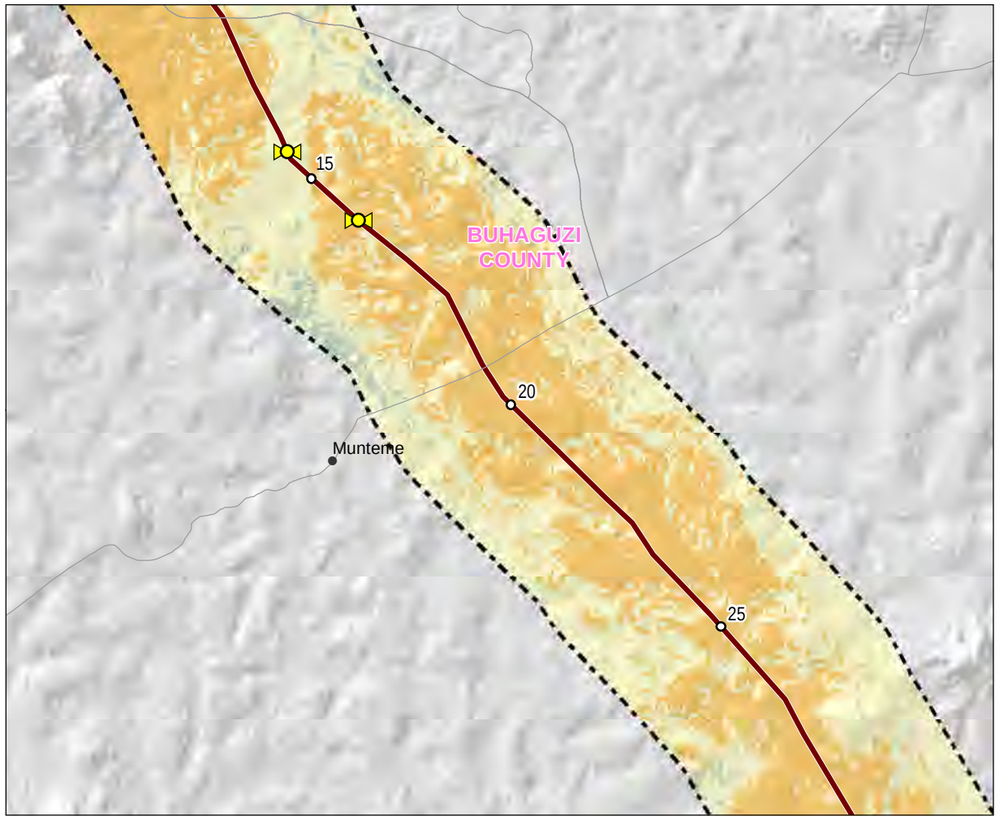
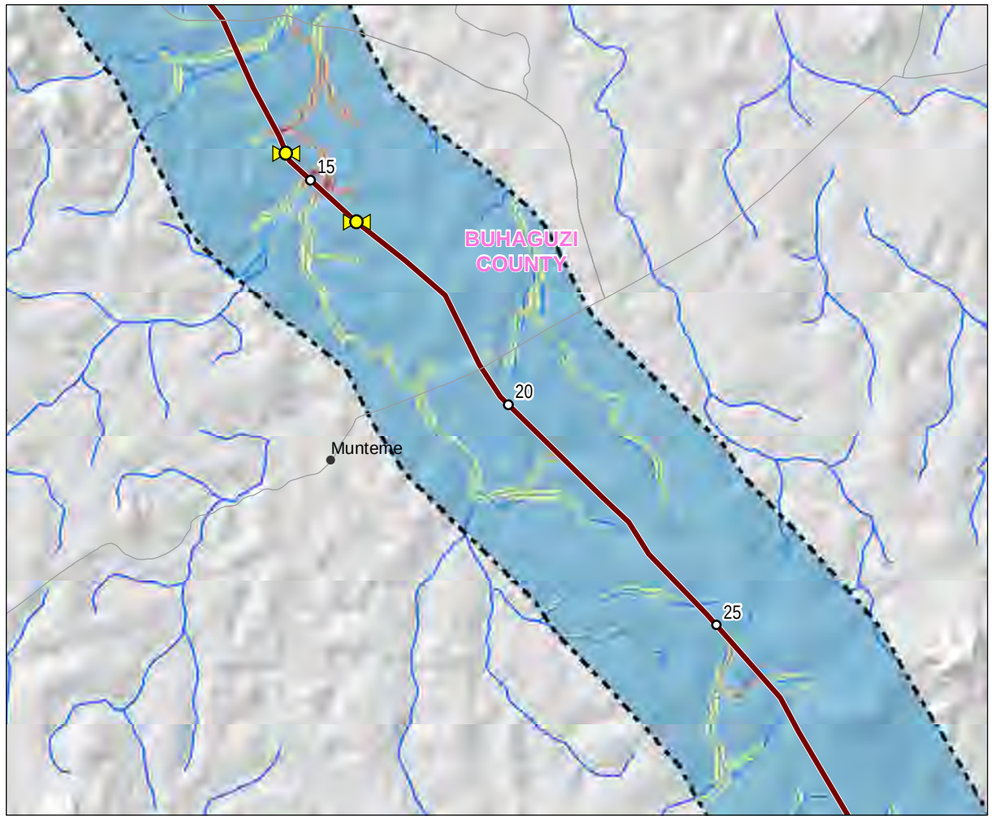
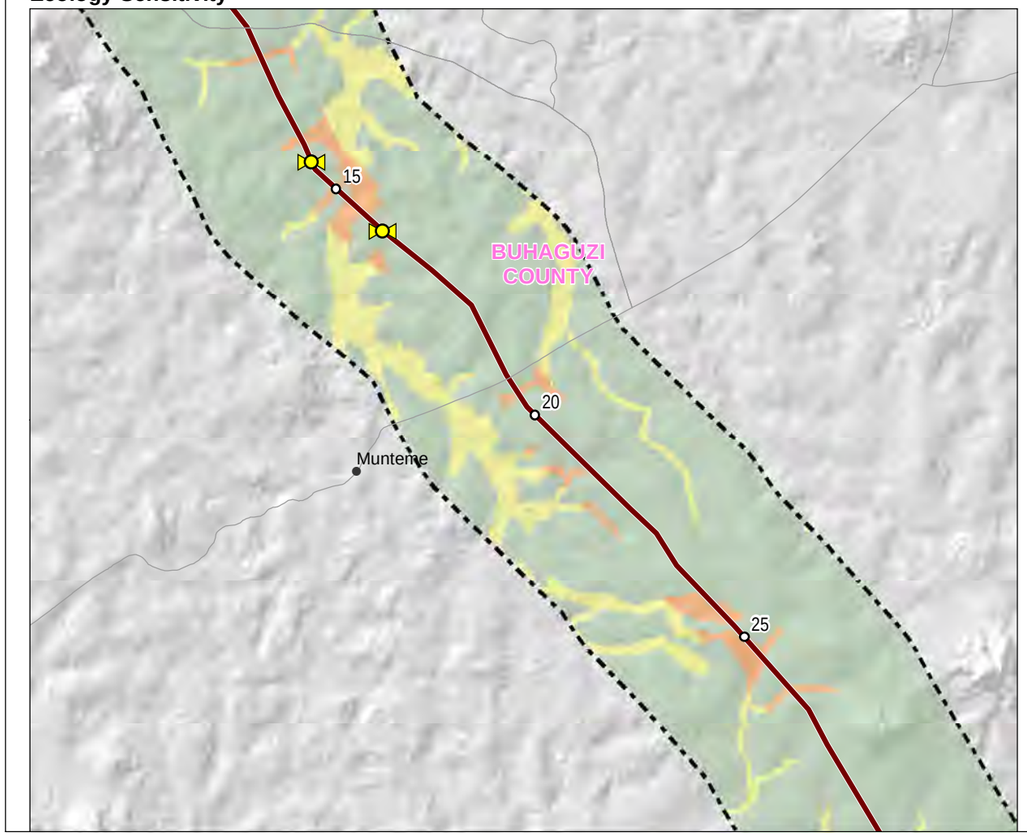
Groundwater Sensitivity



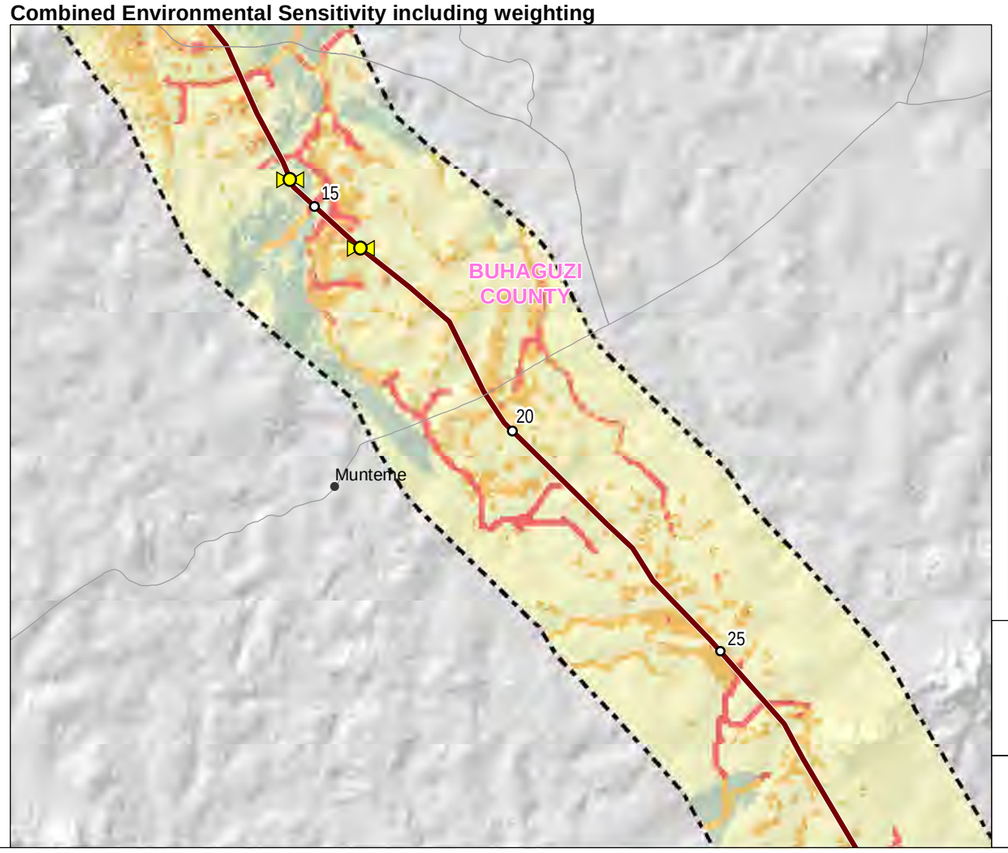
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

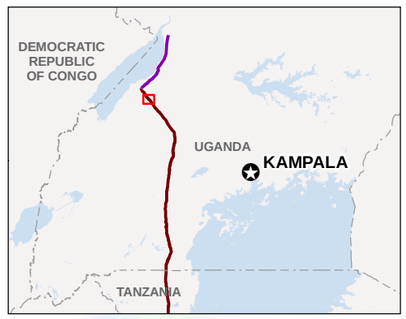
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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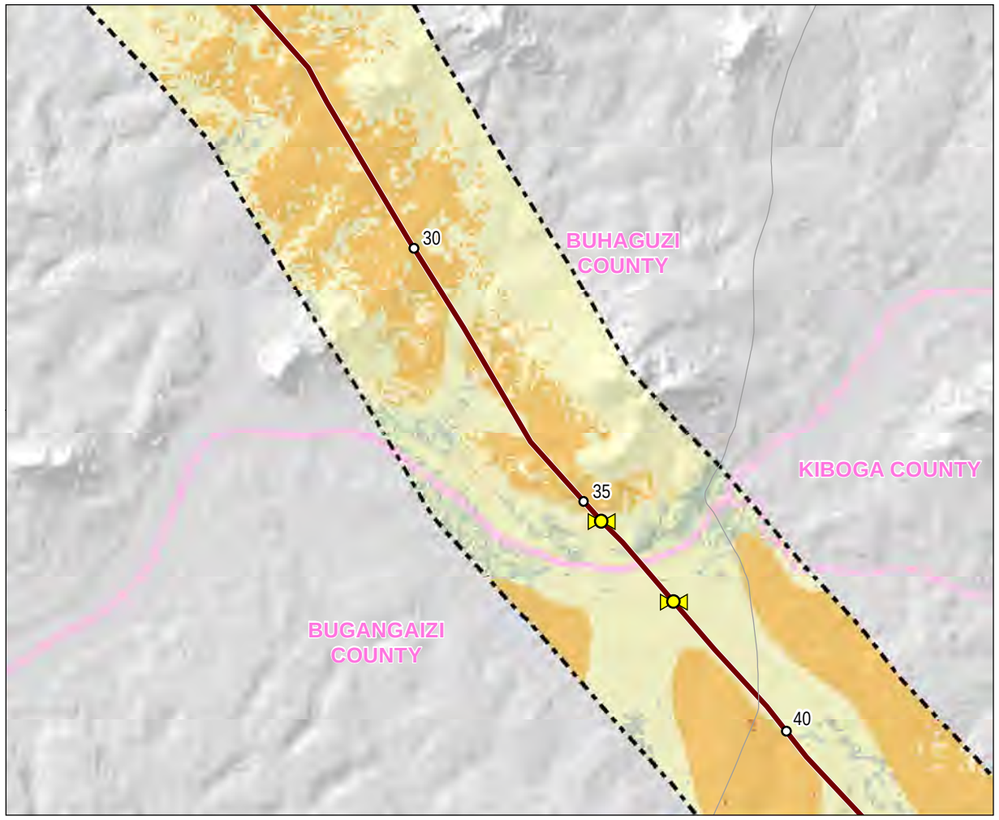
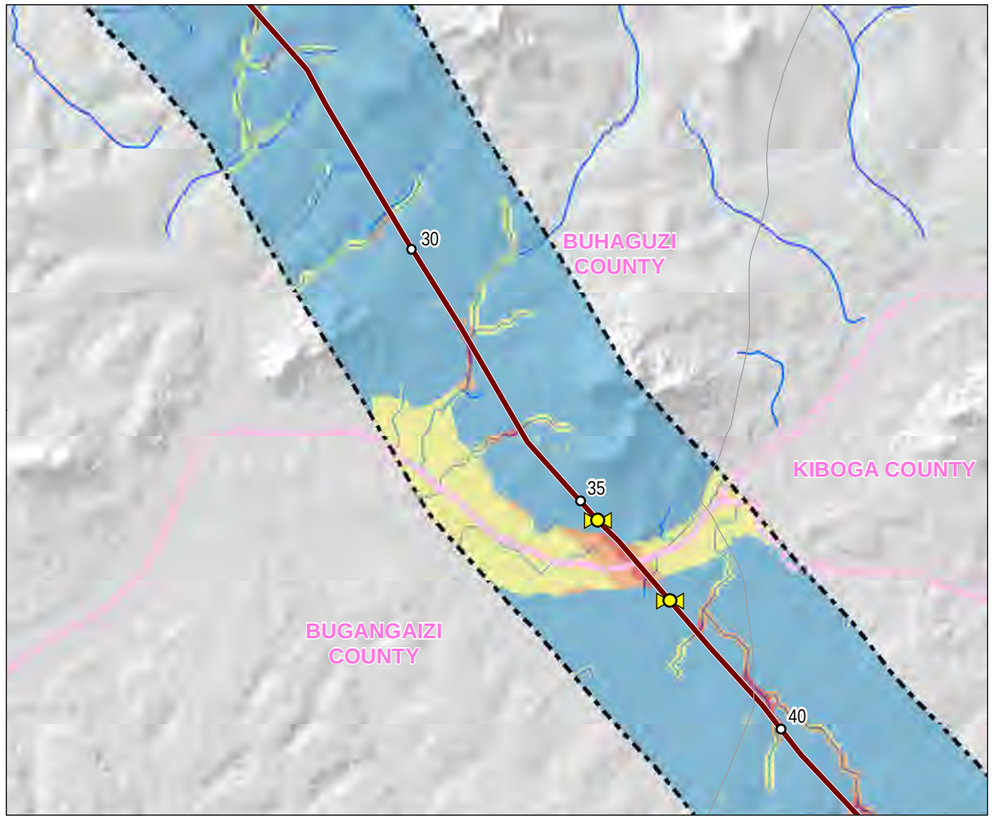
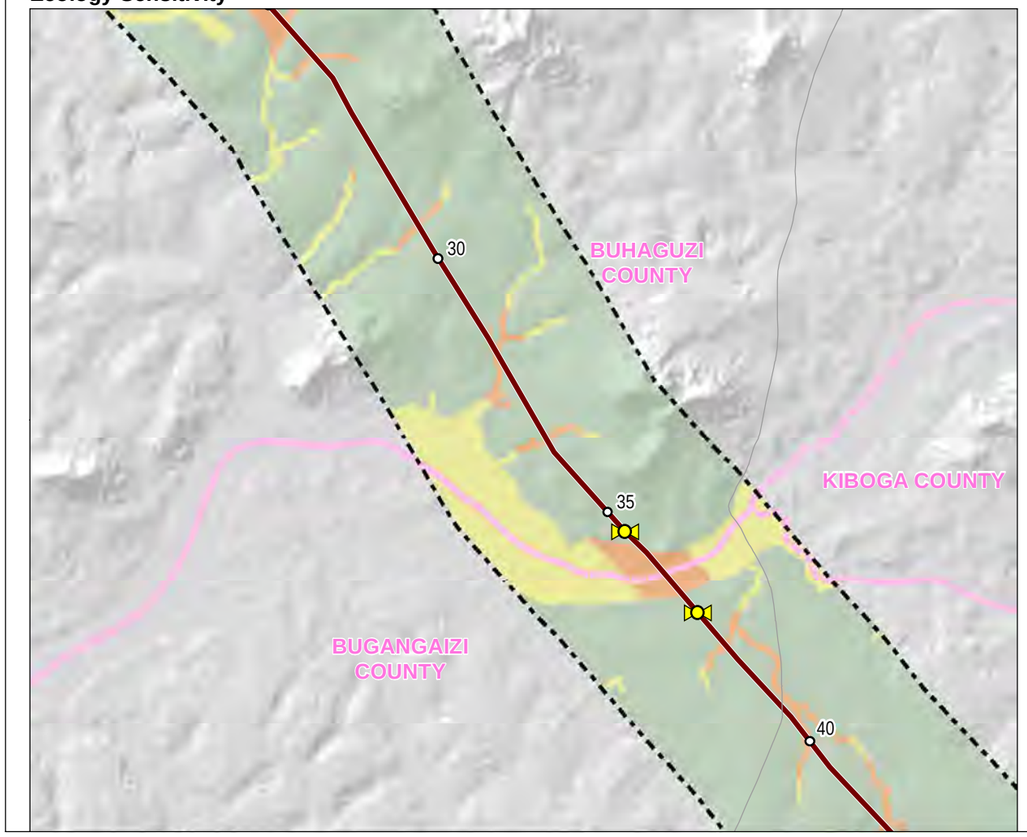
Groundwater Sensitivity



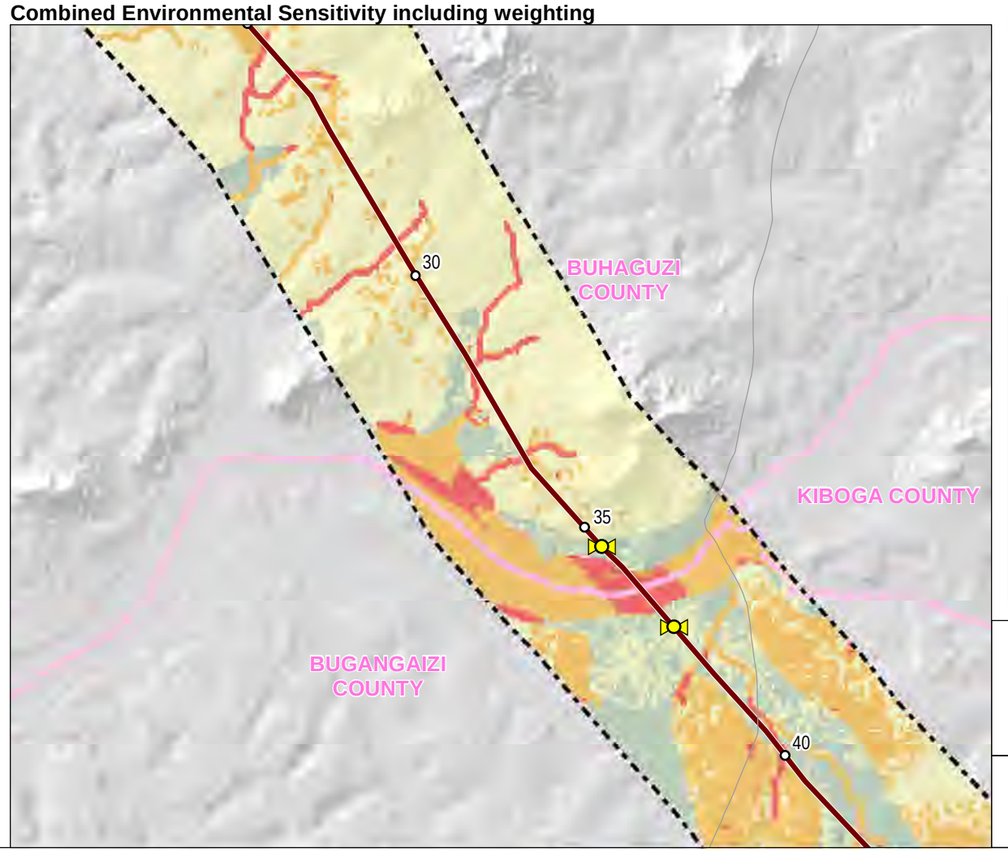
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

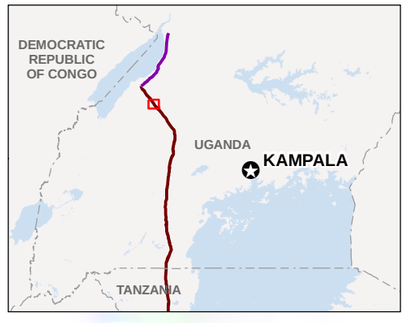
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

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Kilometres
SCALE: 1:100,000 @ A3

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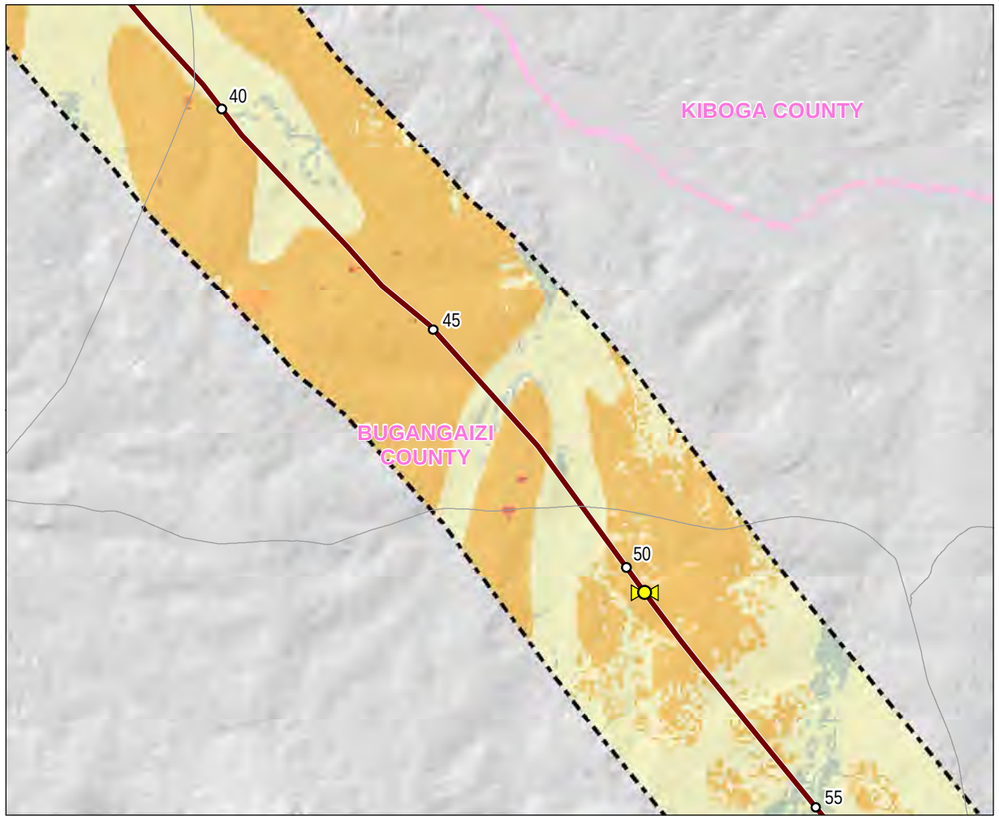
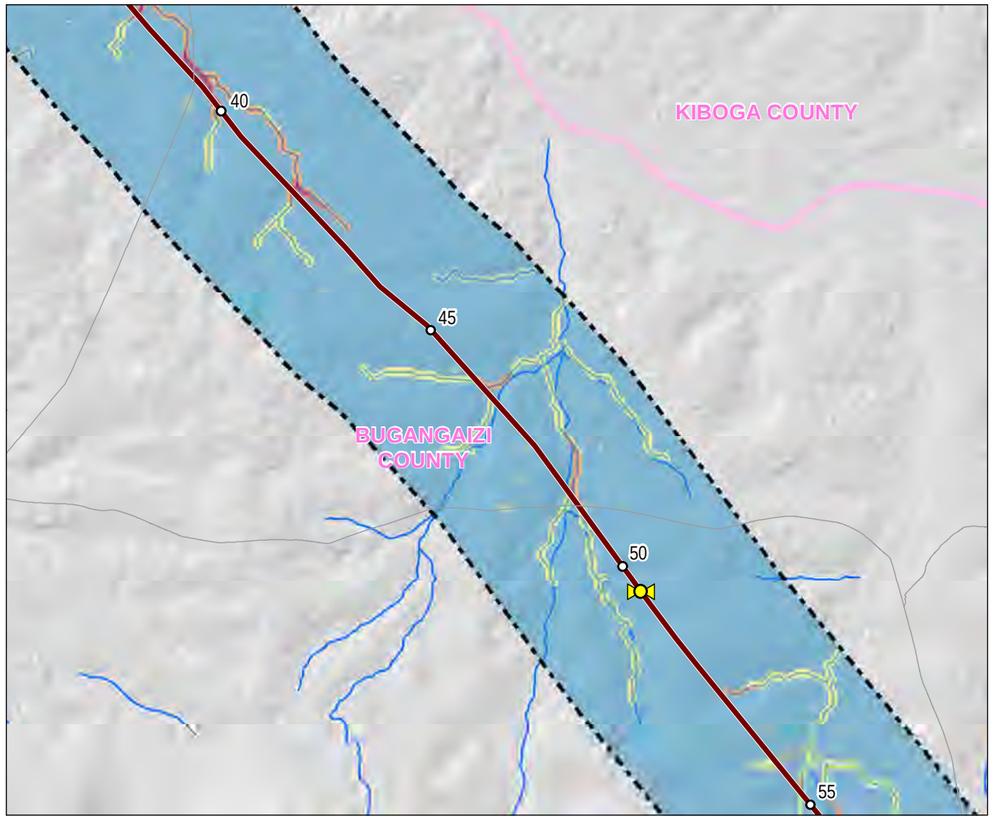
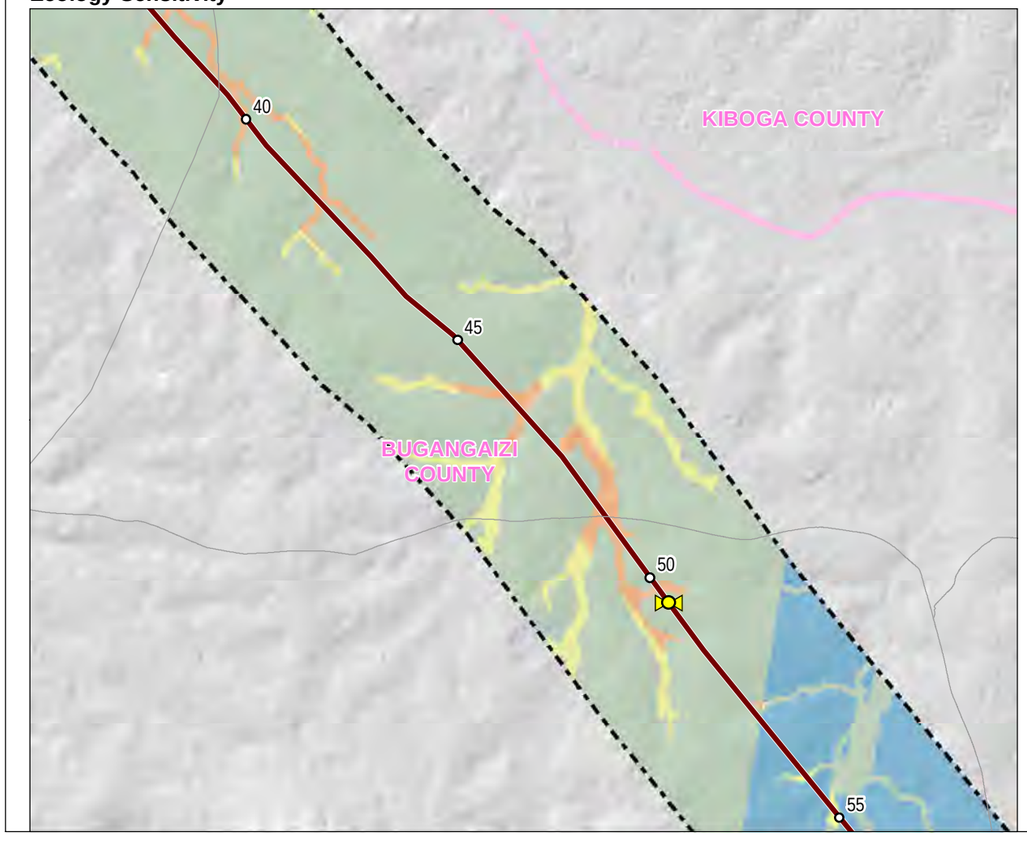
Groundwater Sensitivity



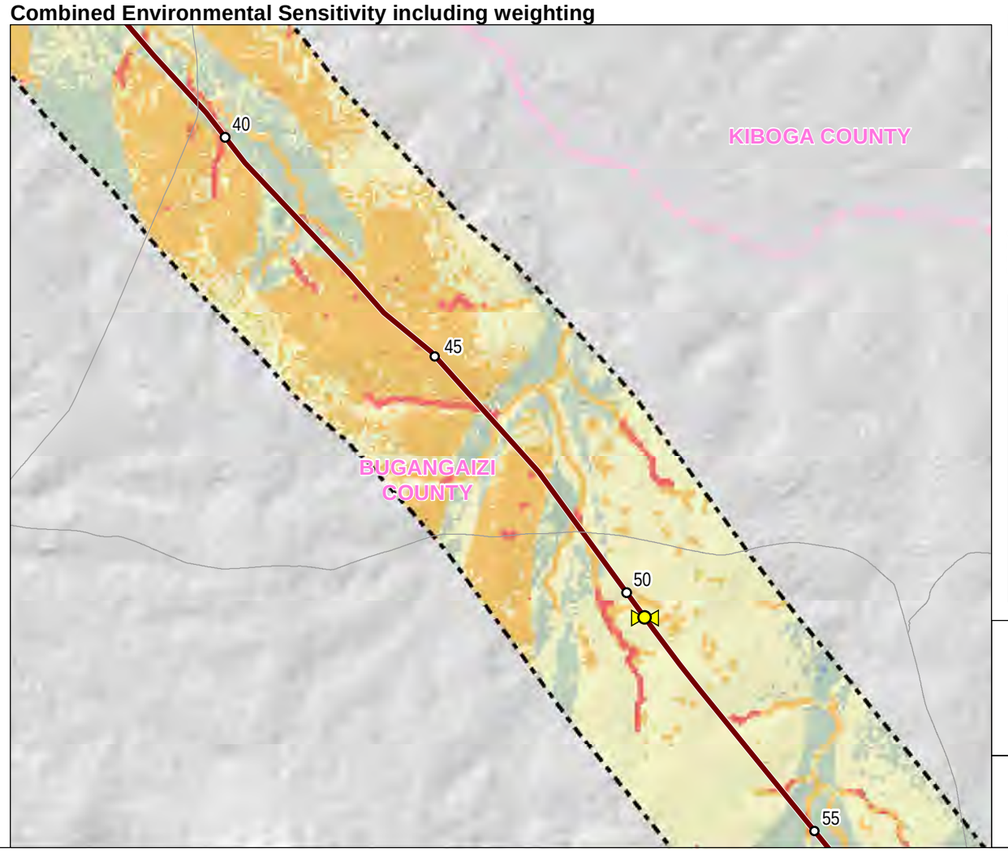
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

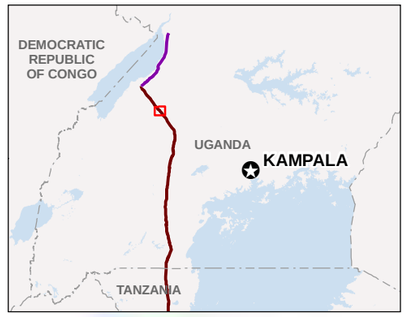
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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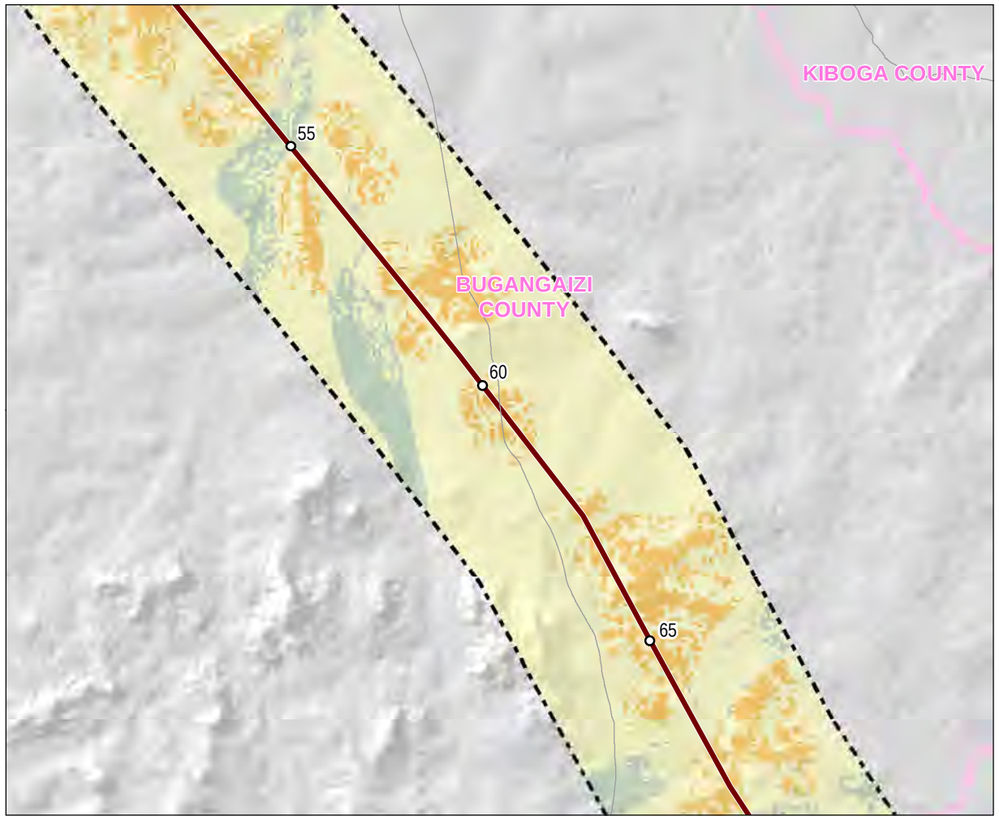
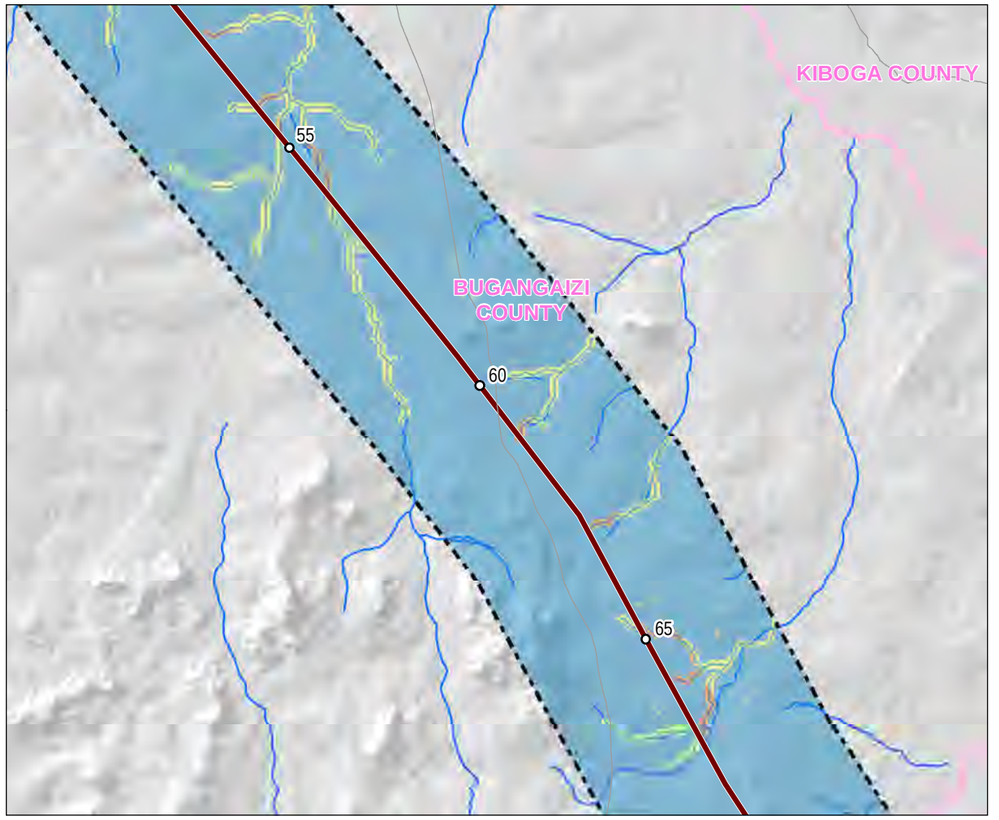
Groundwater Sensitivity



Surface Water Sensitivity



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

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Environmental Sensitivity

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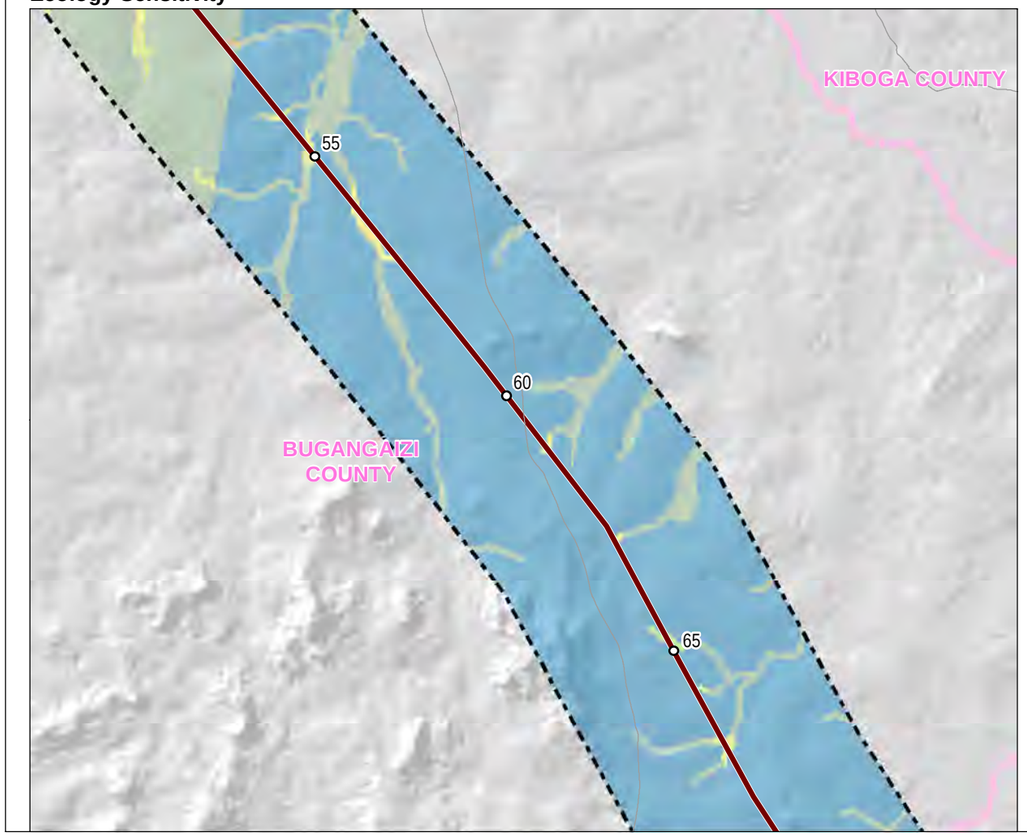
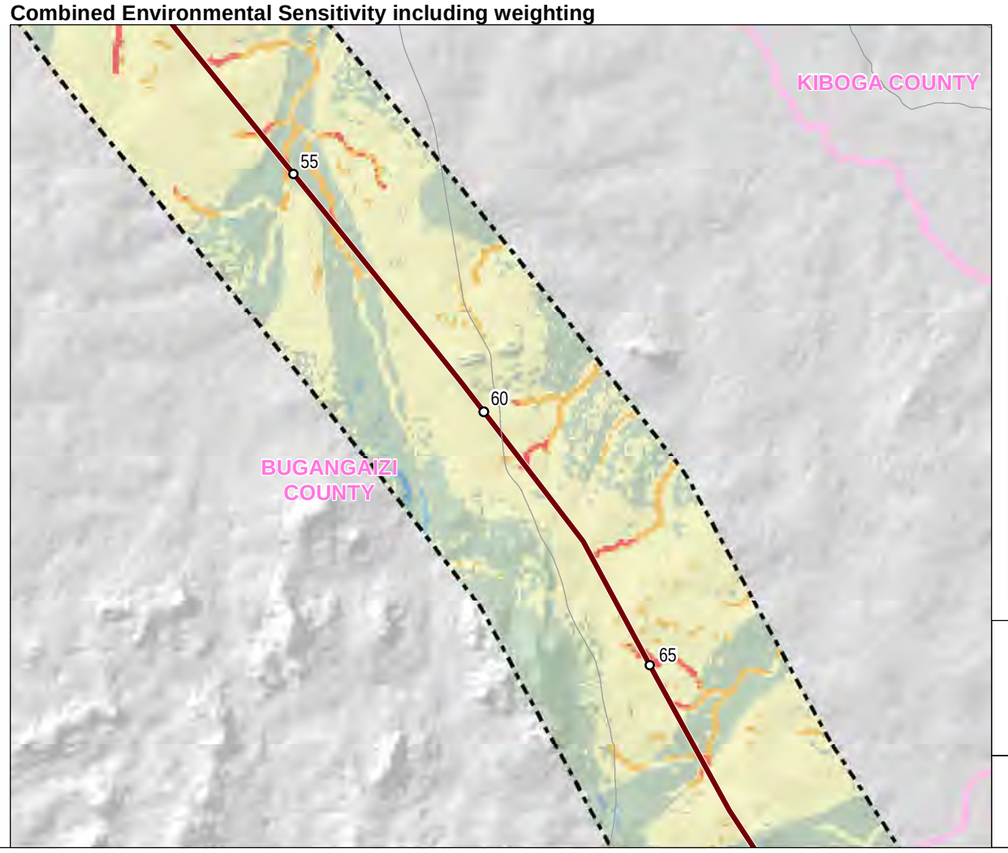
- **High**
- **Medium**
- **Low**
- **Very Low**

Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Weightings for combined sensitivity:
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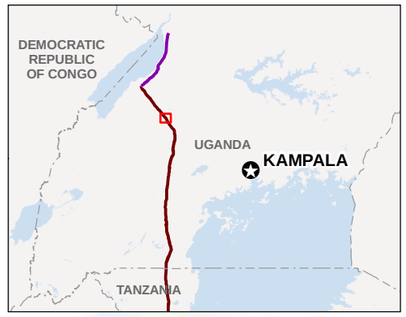
Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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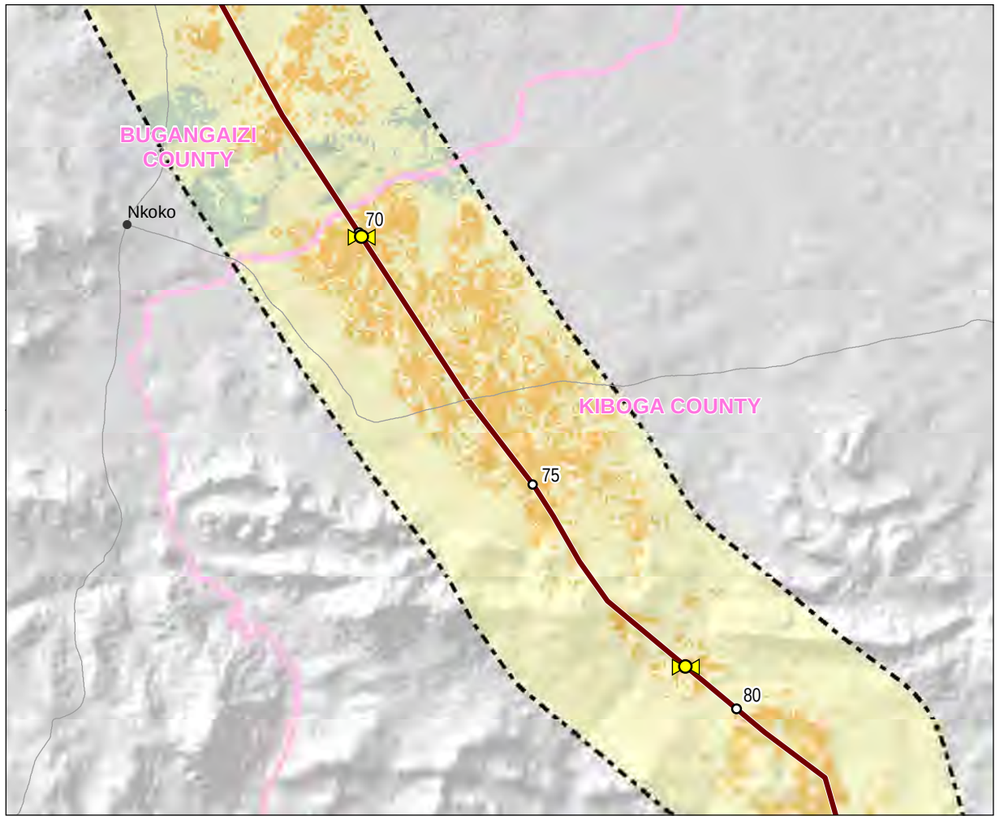
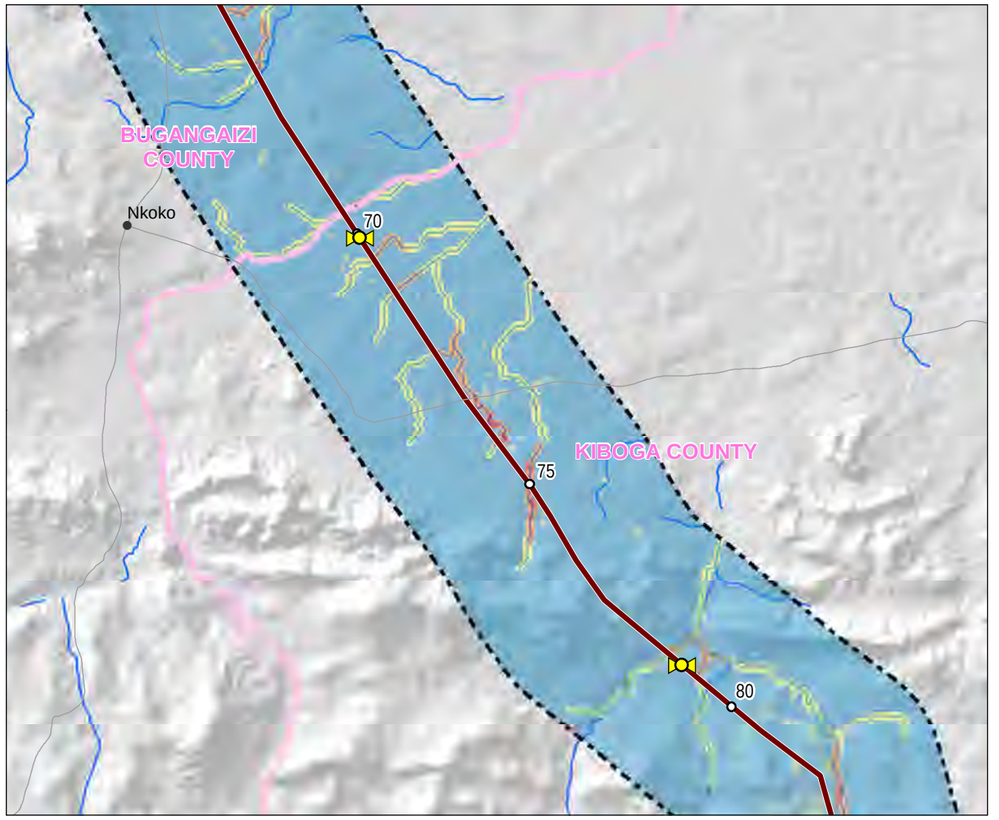
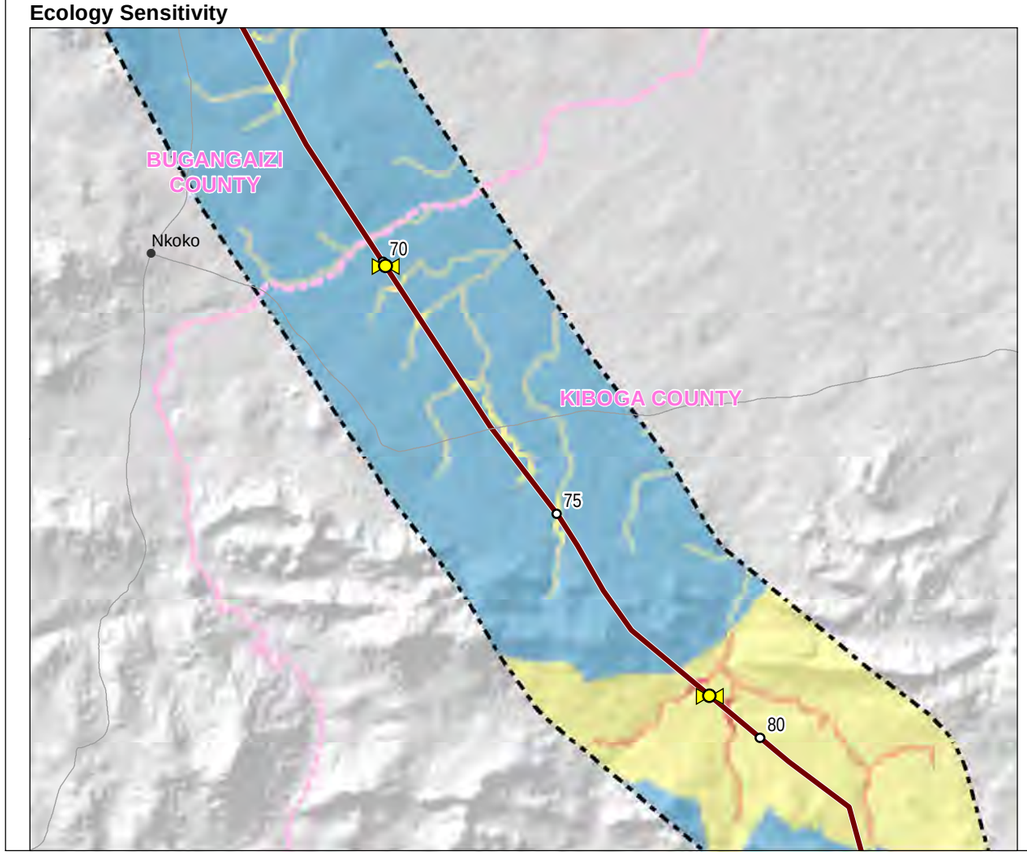
Groundwater Sensitivity



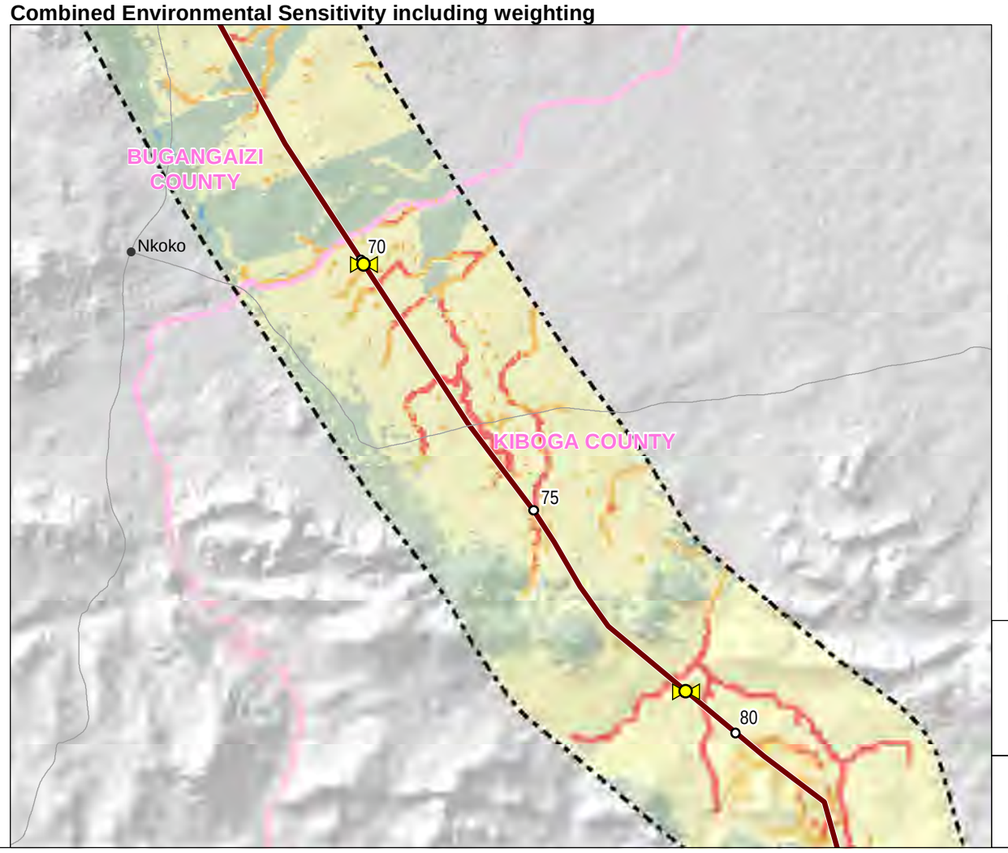
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

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- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

- County Boundary

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- **High**
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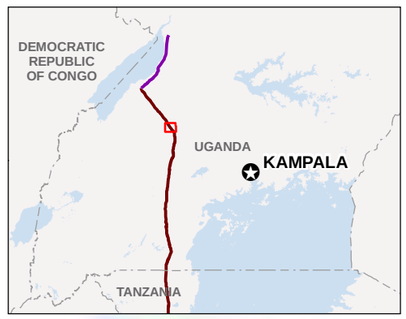
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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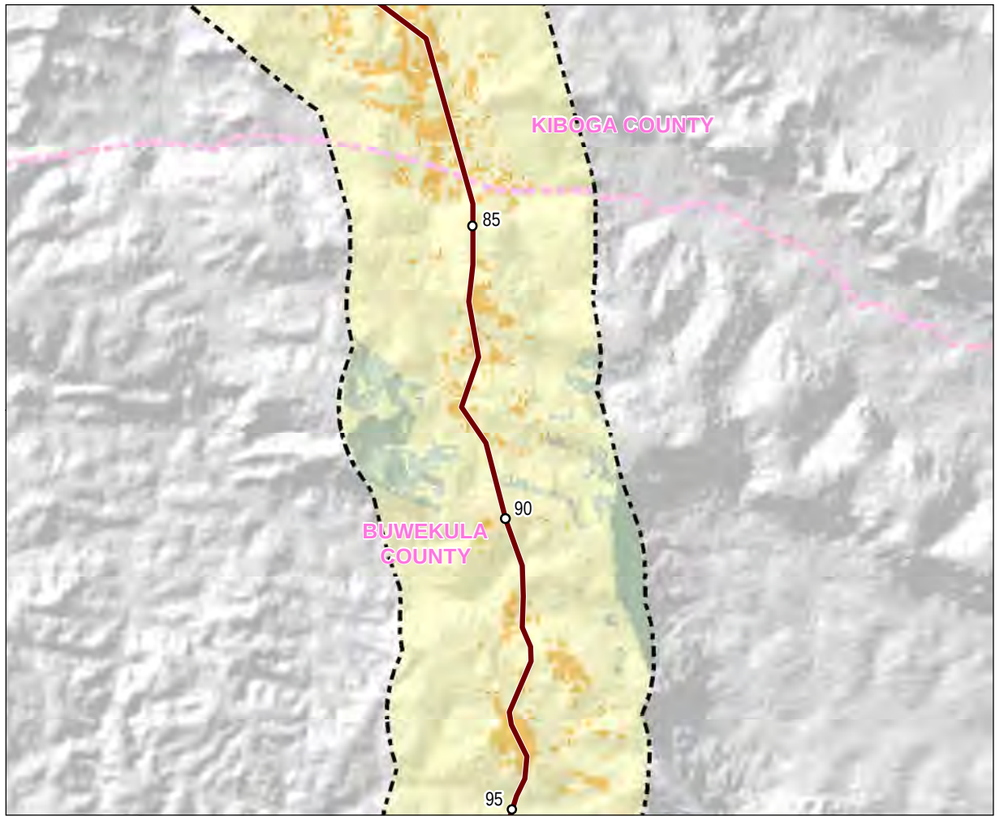
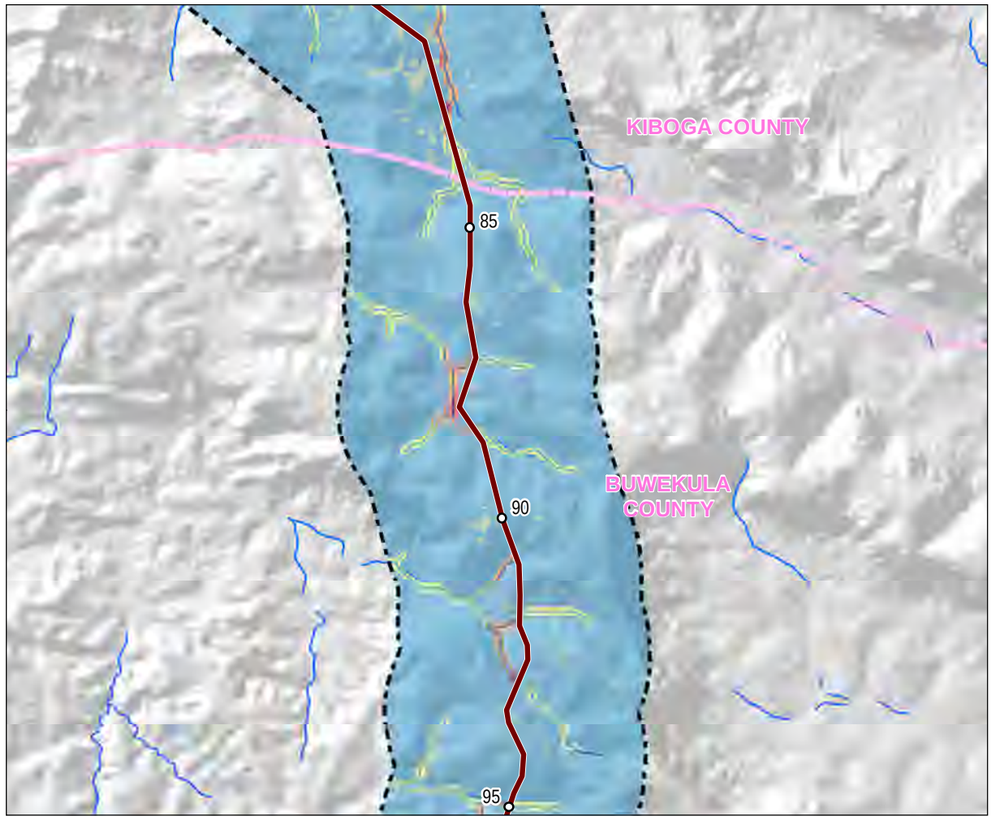
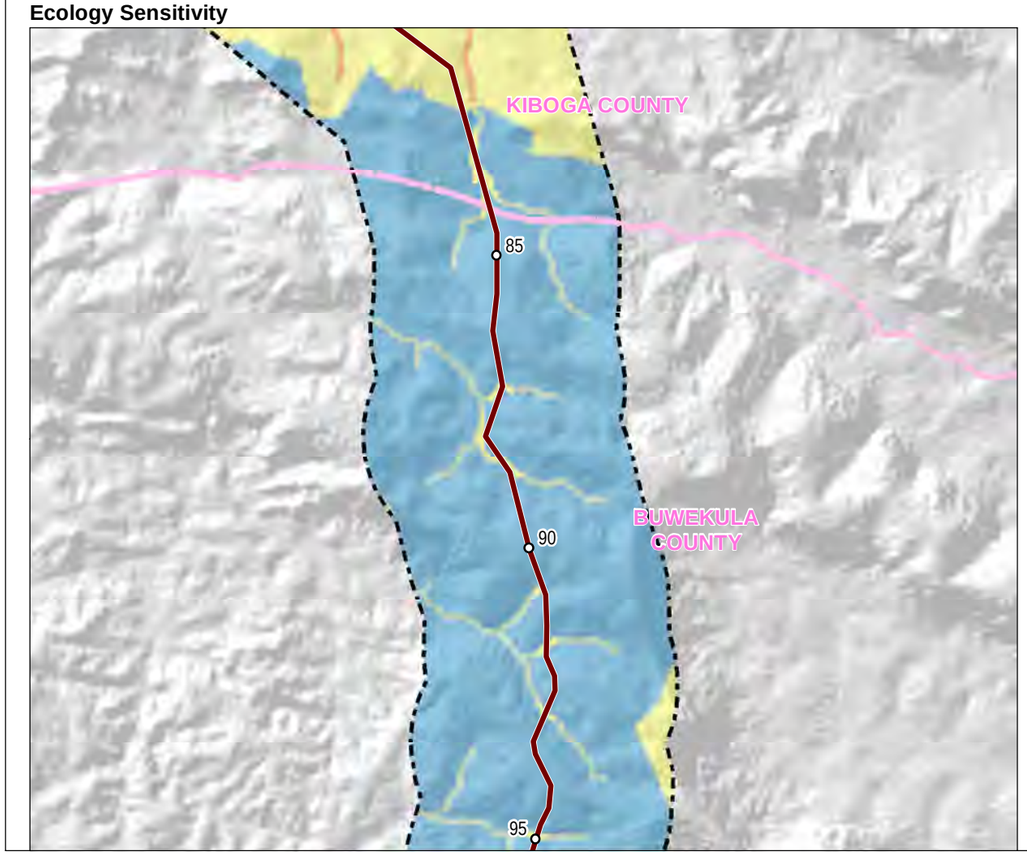
Groundwater Sensitivity



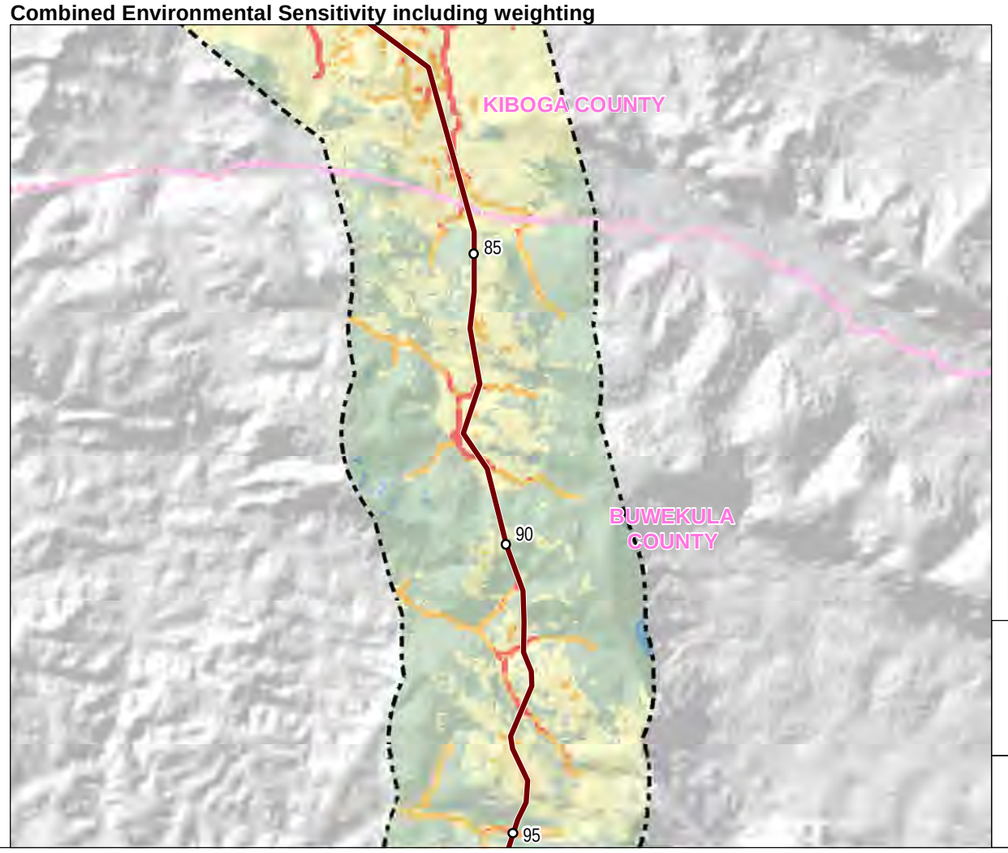
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
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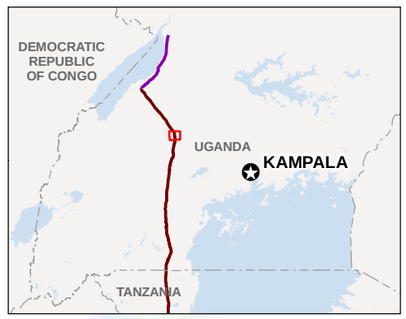
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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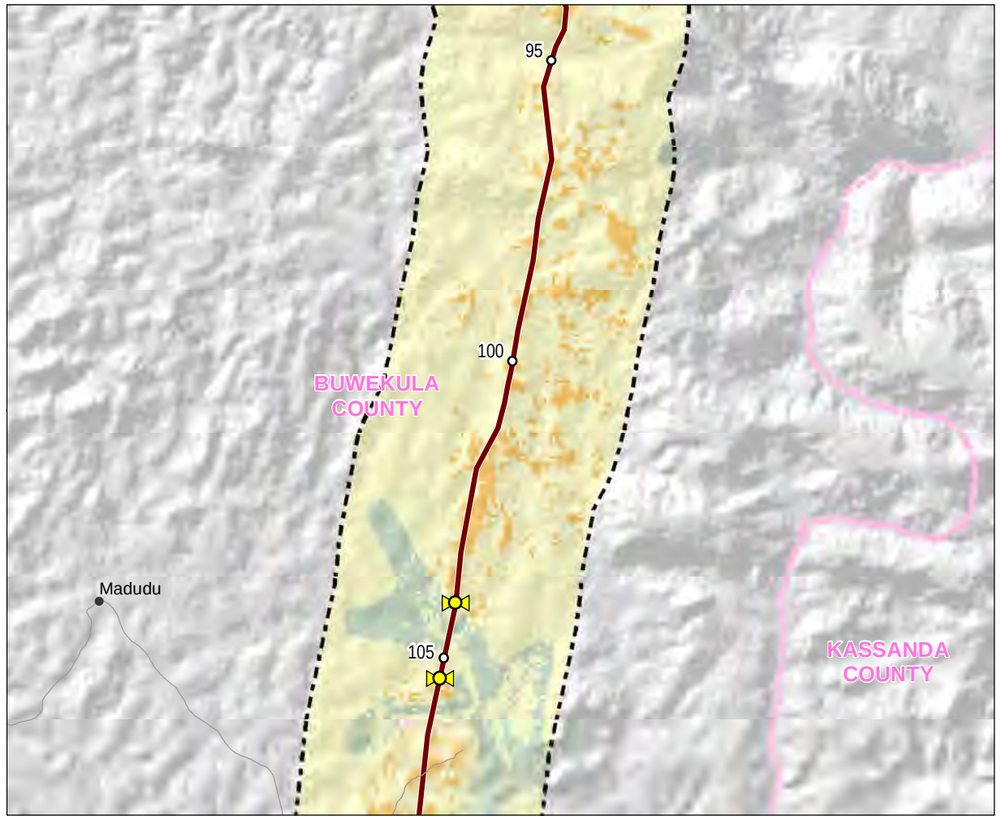
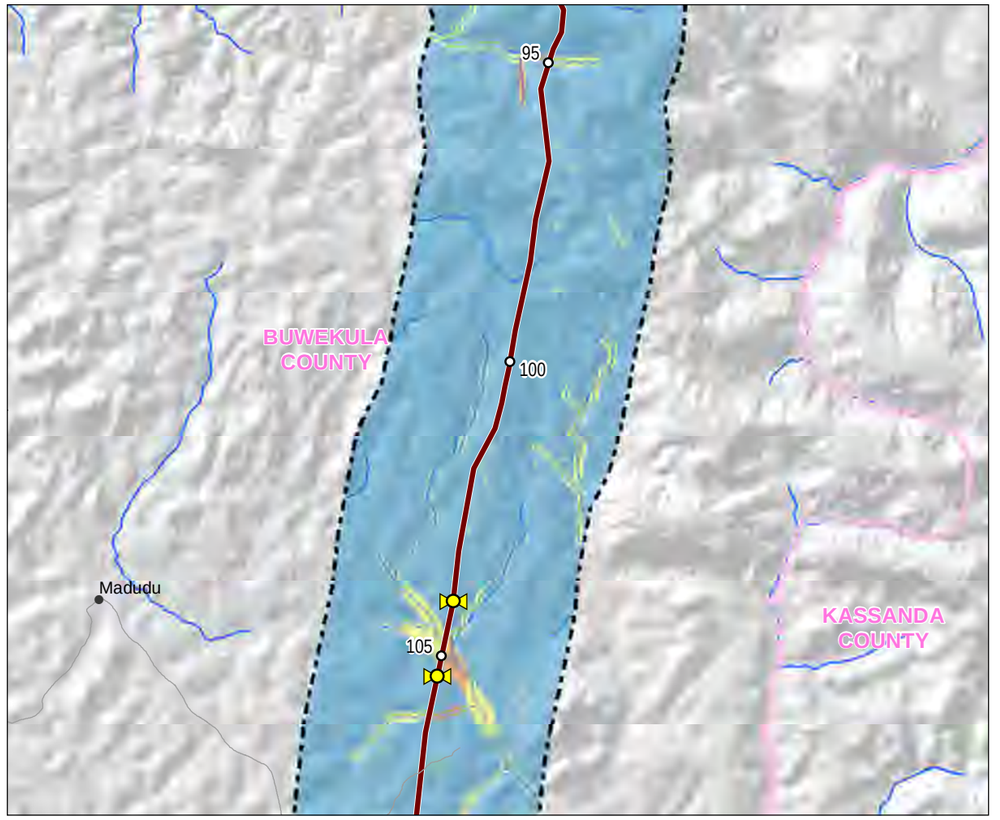
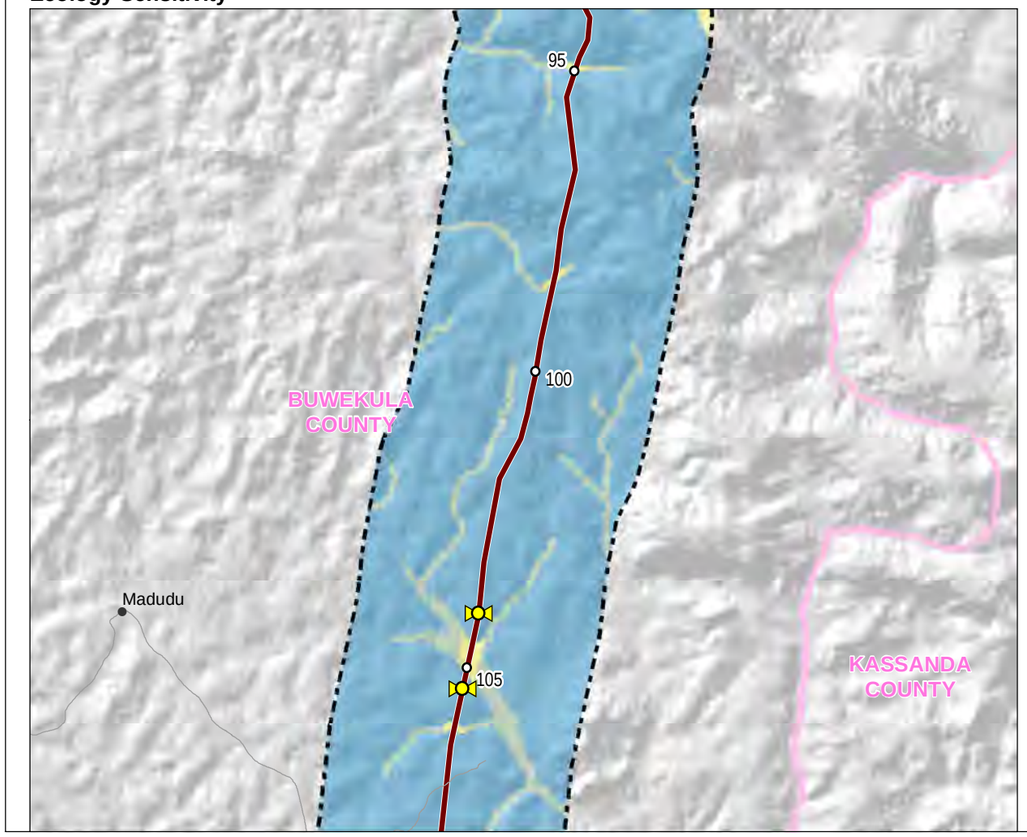
Groundwater Sensitivity



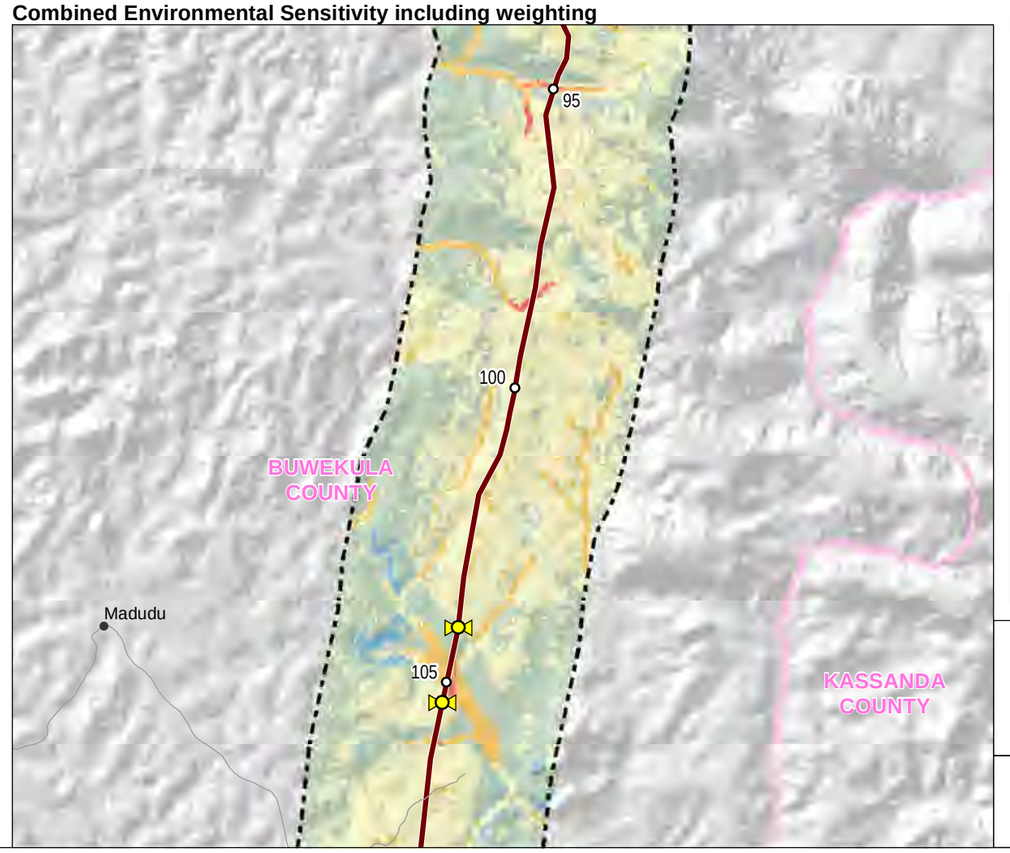
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

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Environmental Sensitivity

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- **High**
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Coordinate System: WGS 1984 UTM Zone 36S
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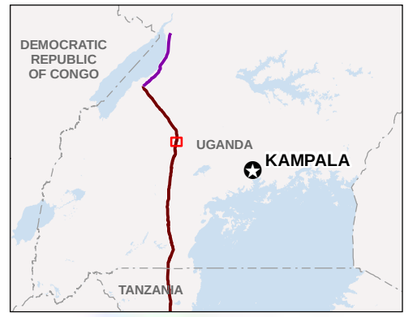
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

N W E S

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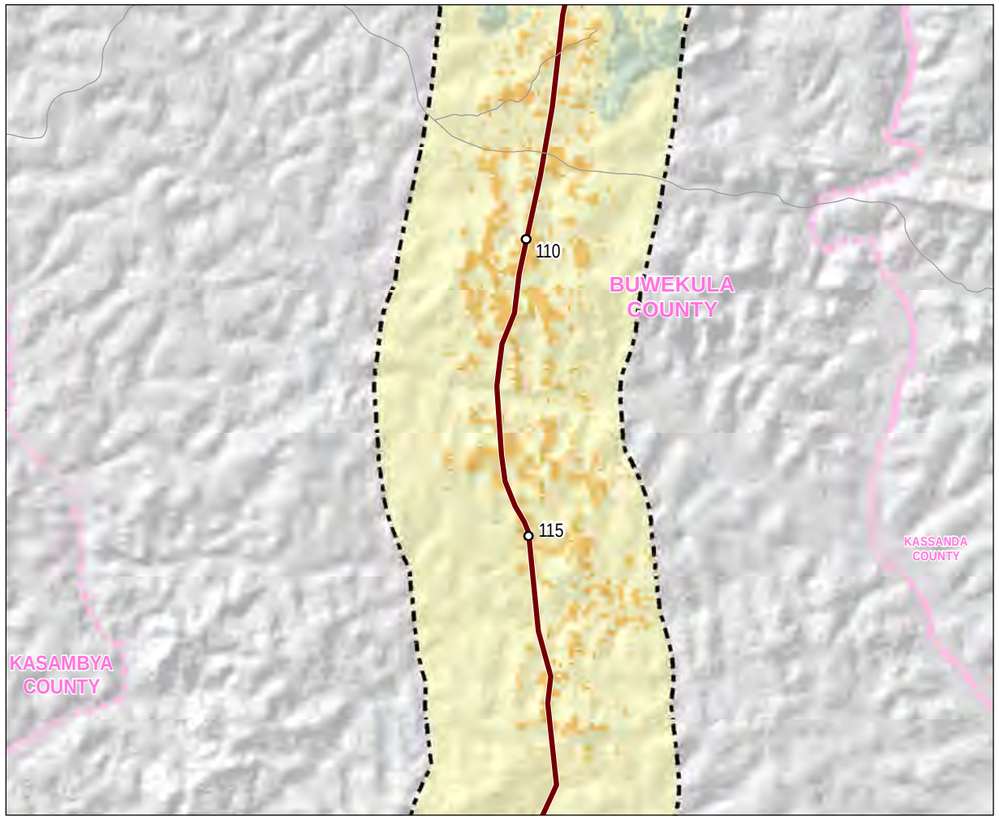
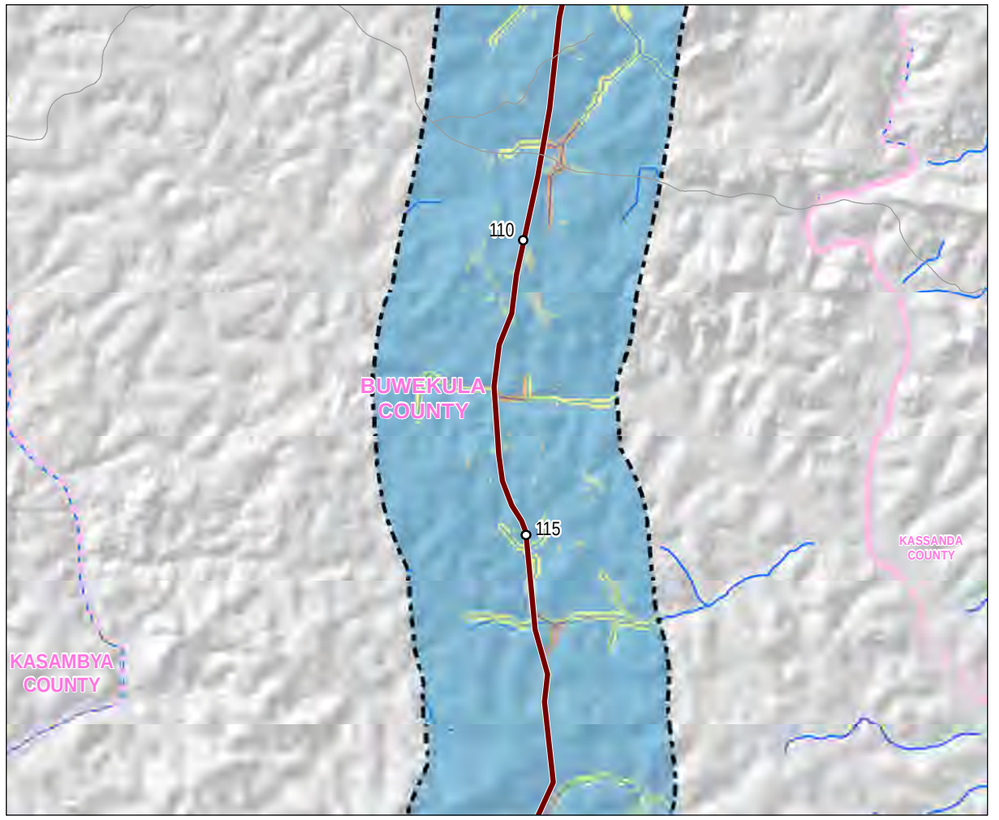
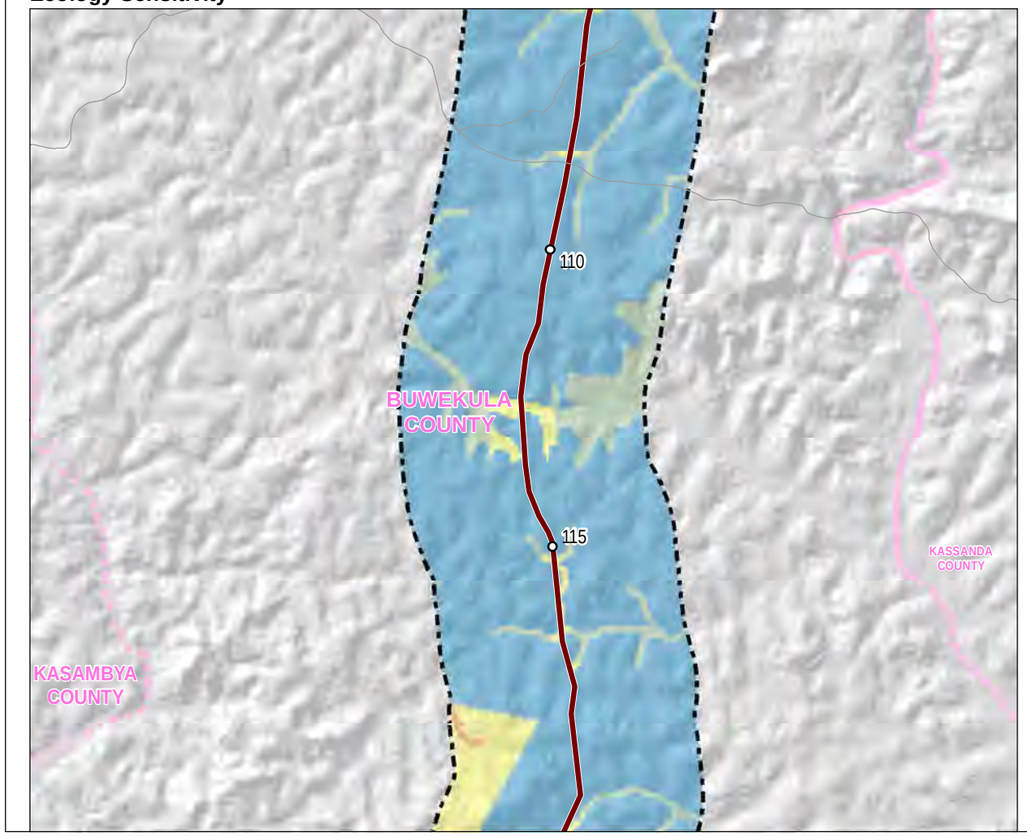
Groundwater Sensitivity



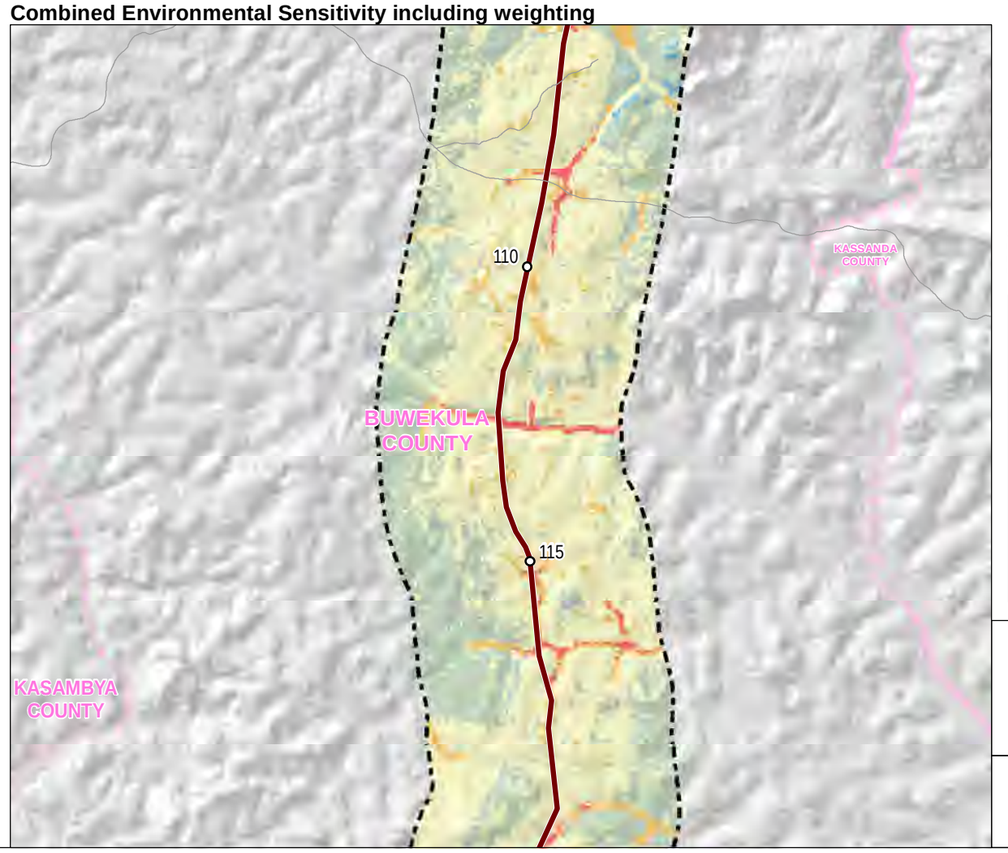
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

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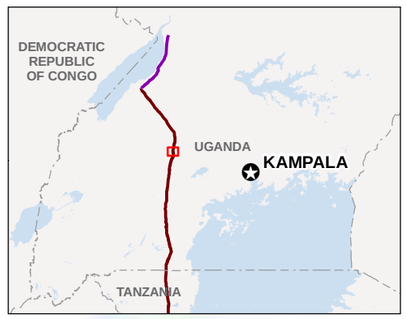
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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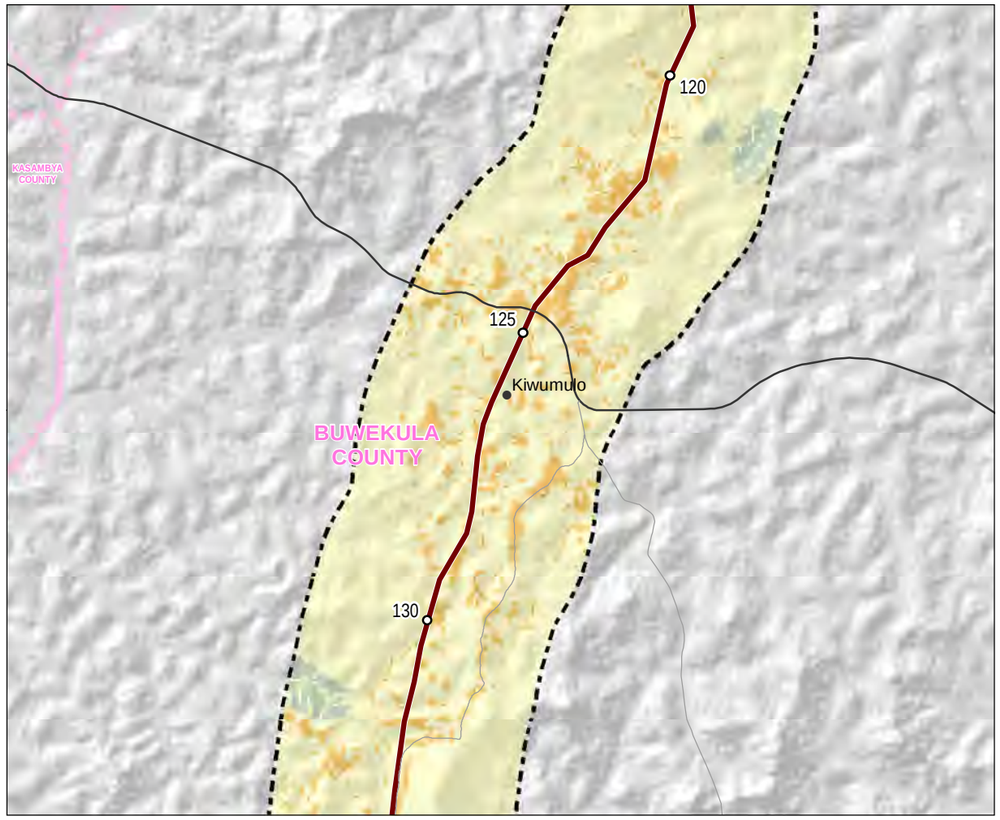
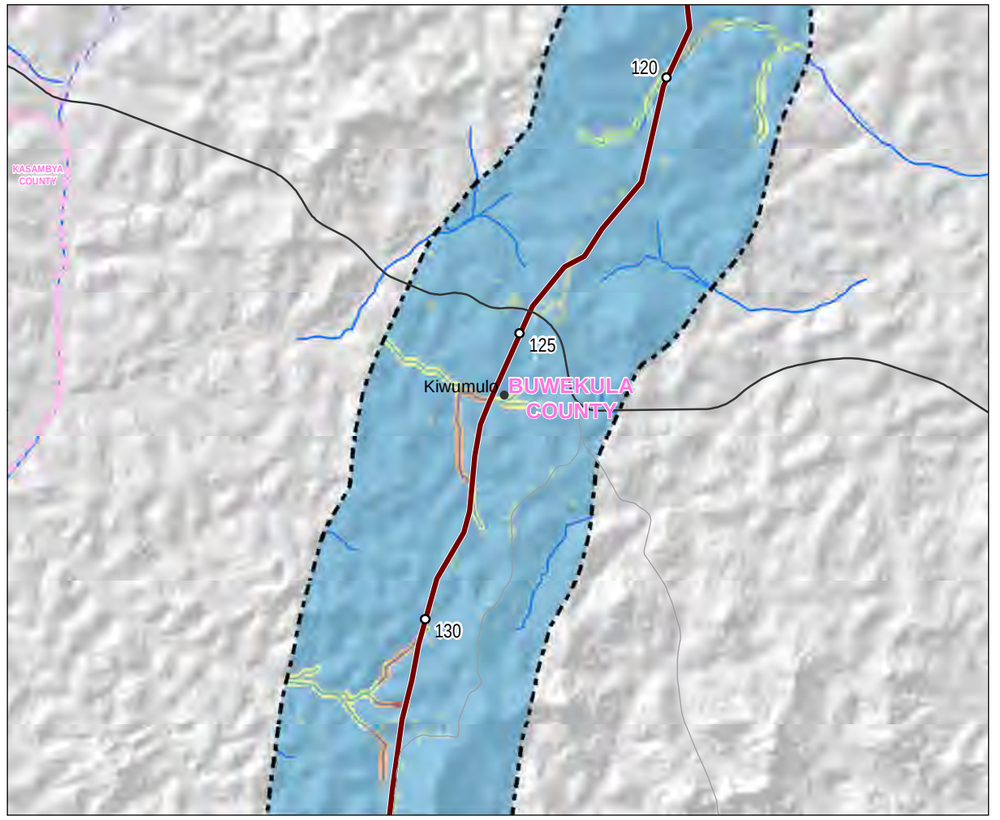
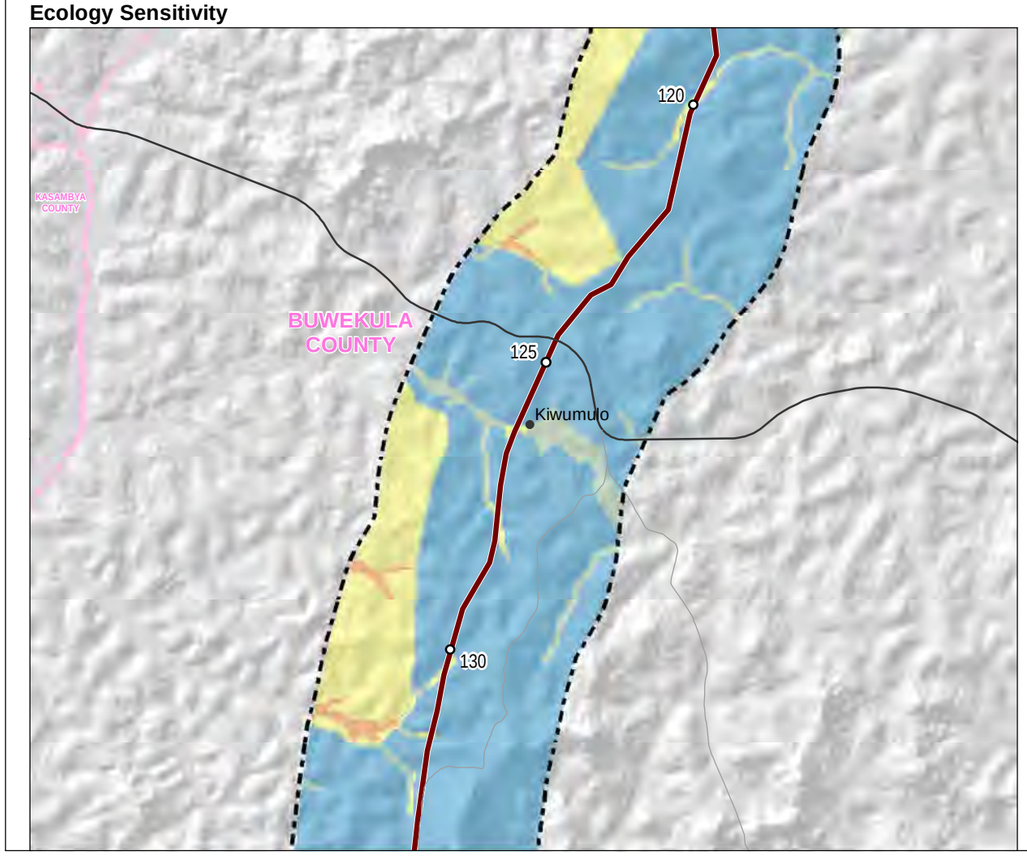
Groundwater Sensitivity



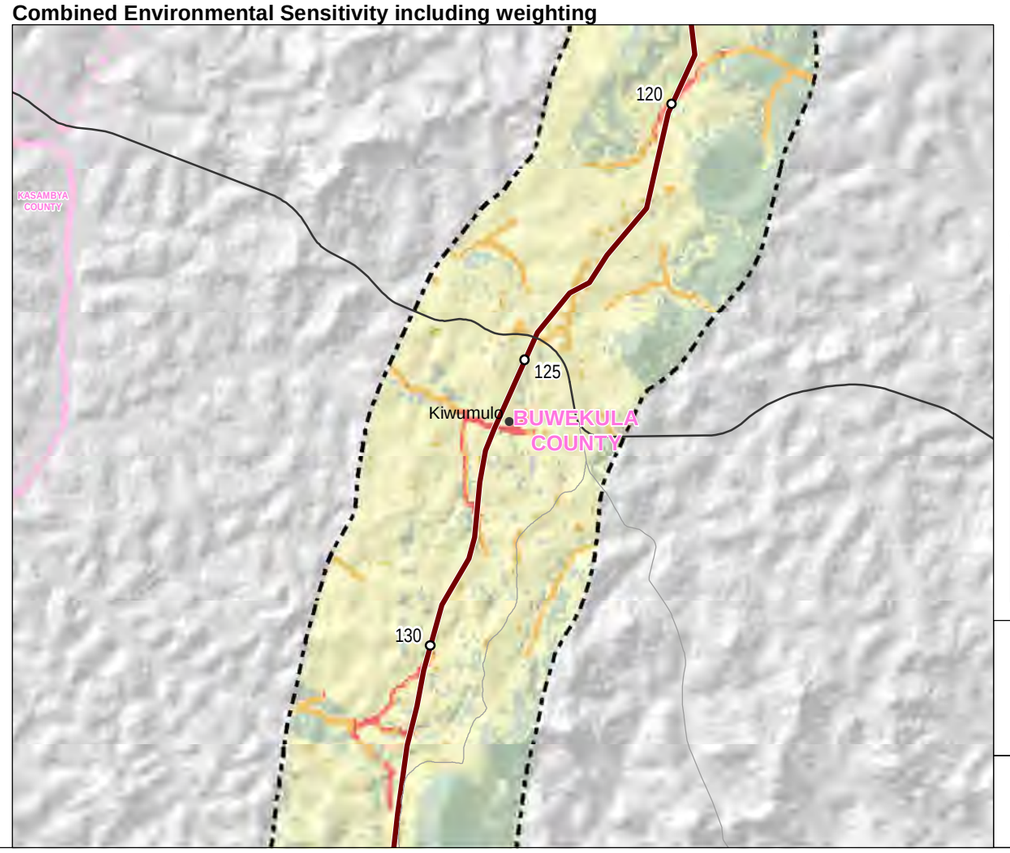
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

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- Tilenga Feeder Pipeline
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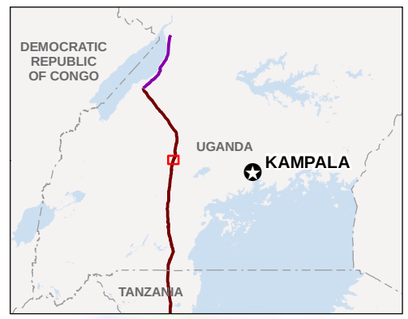
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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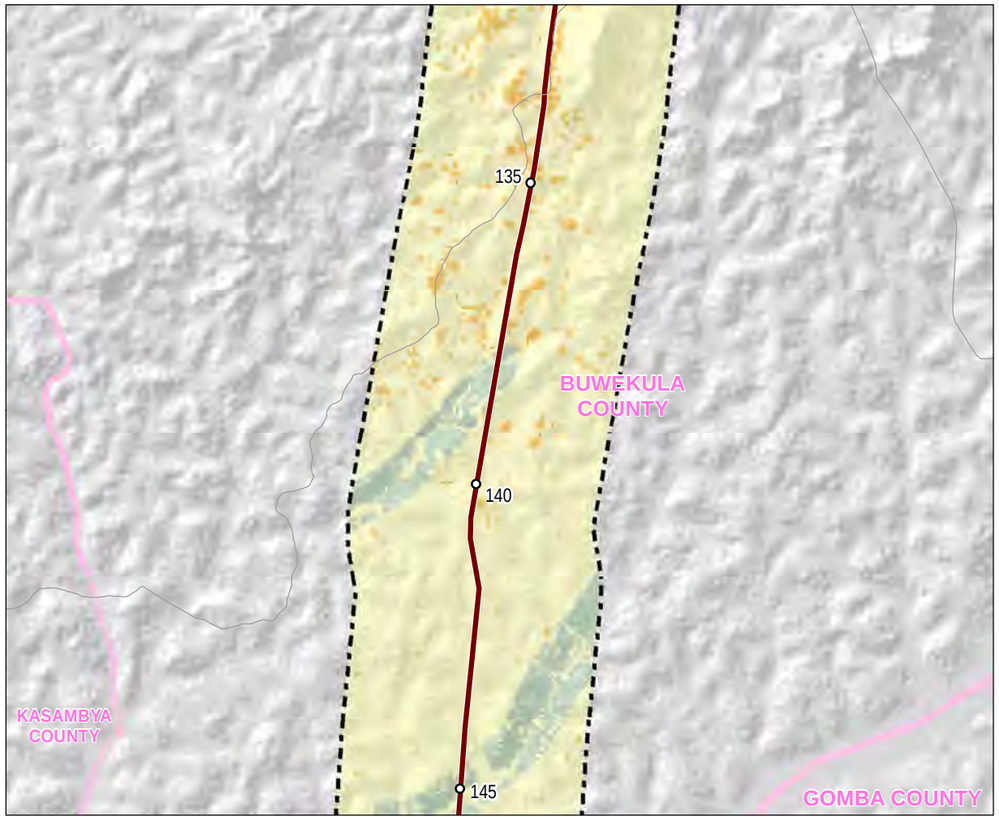
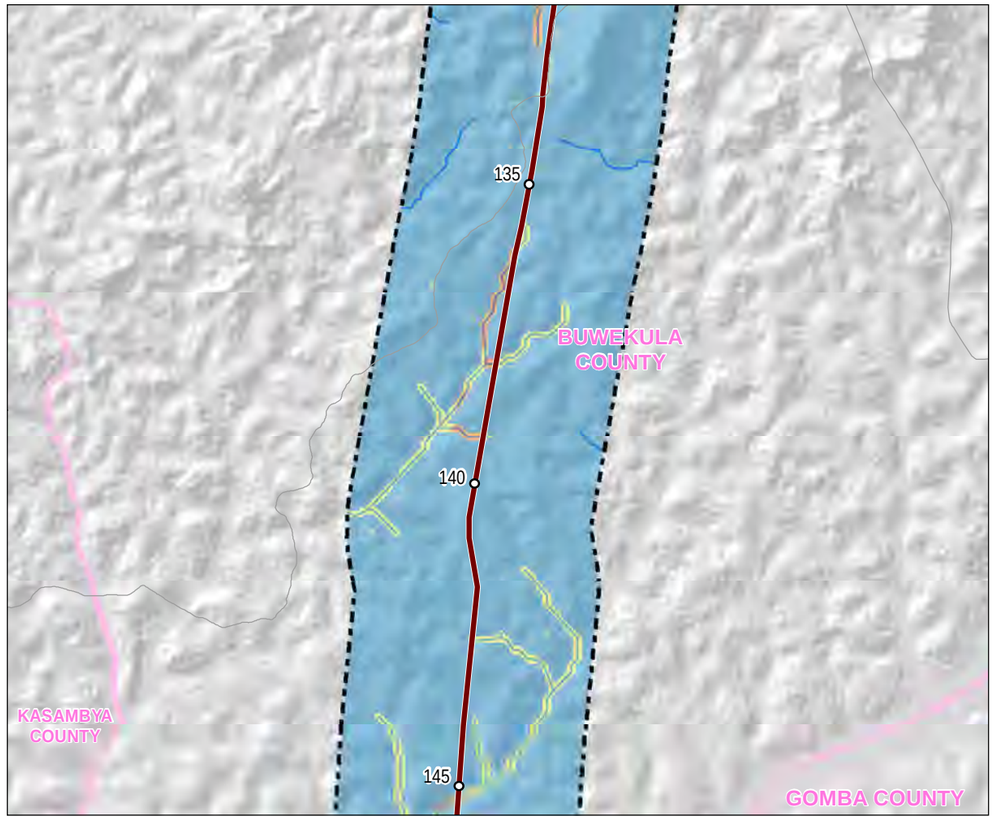
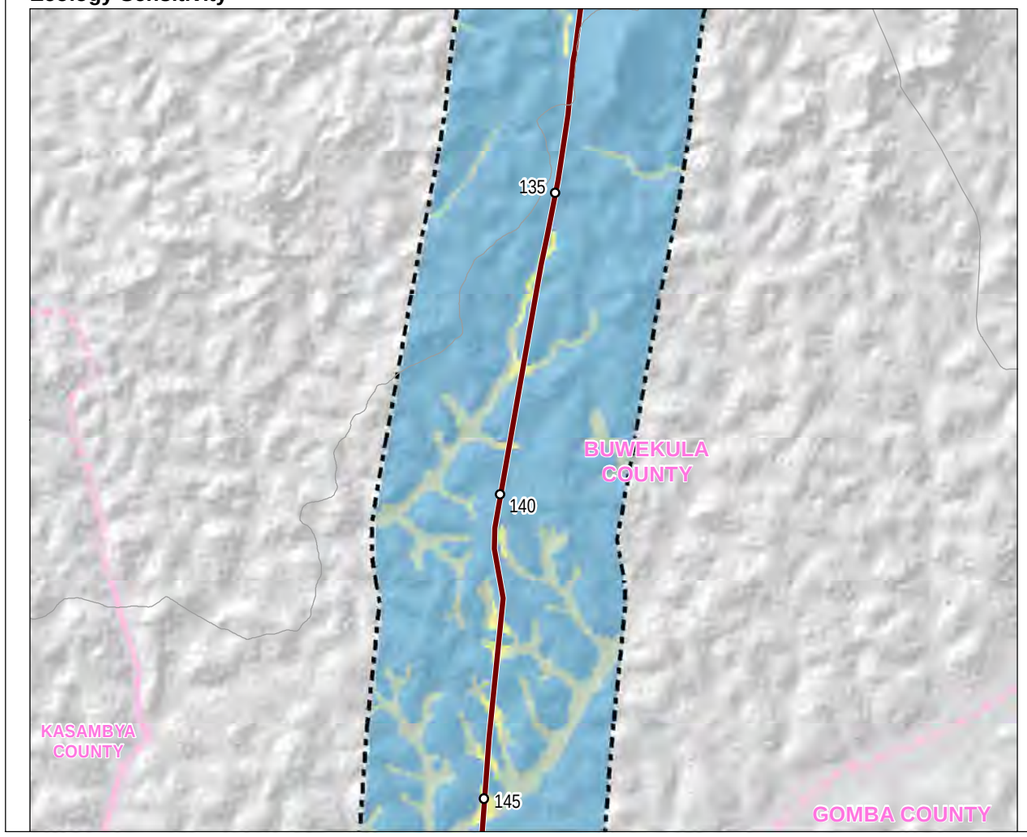
Groundwater Sensitivity



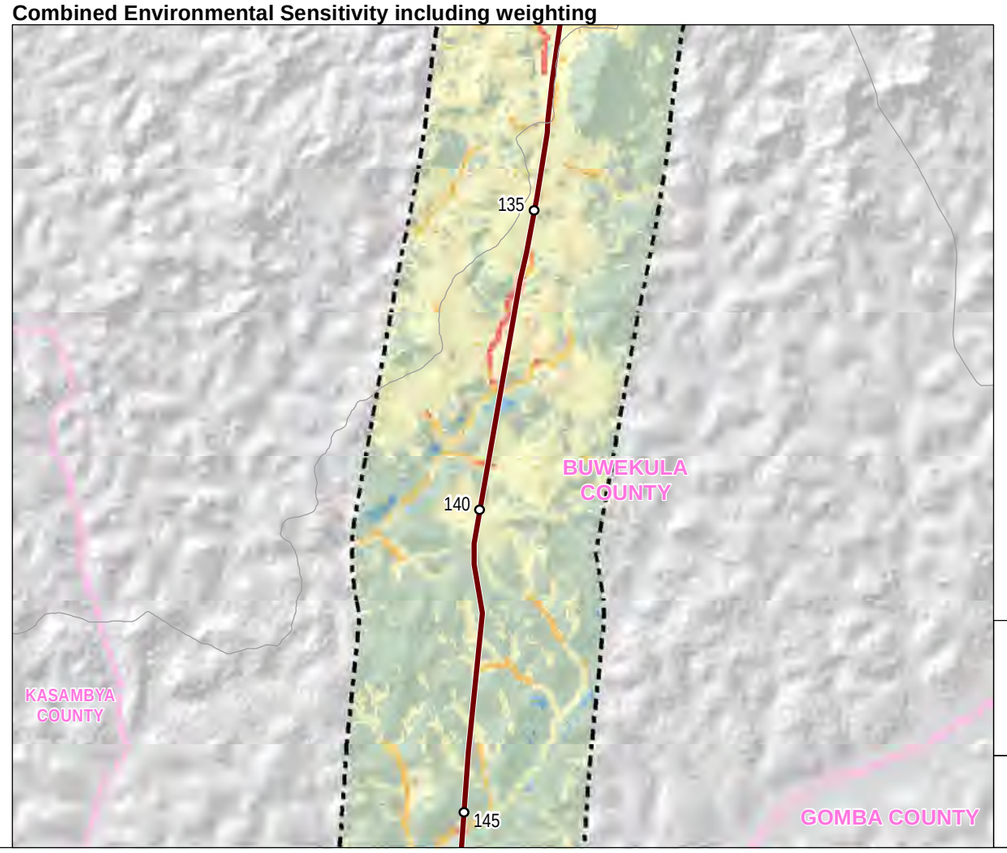
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

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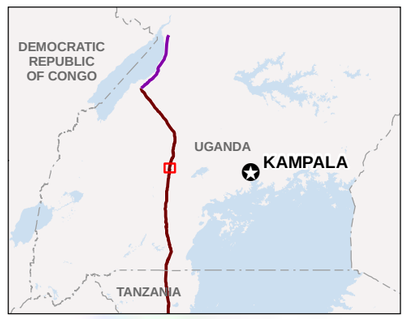
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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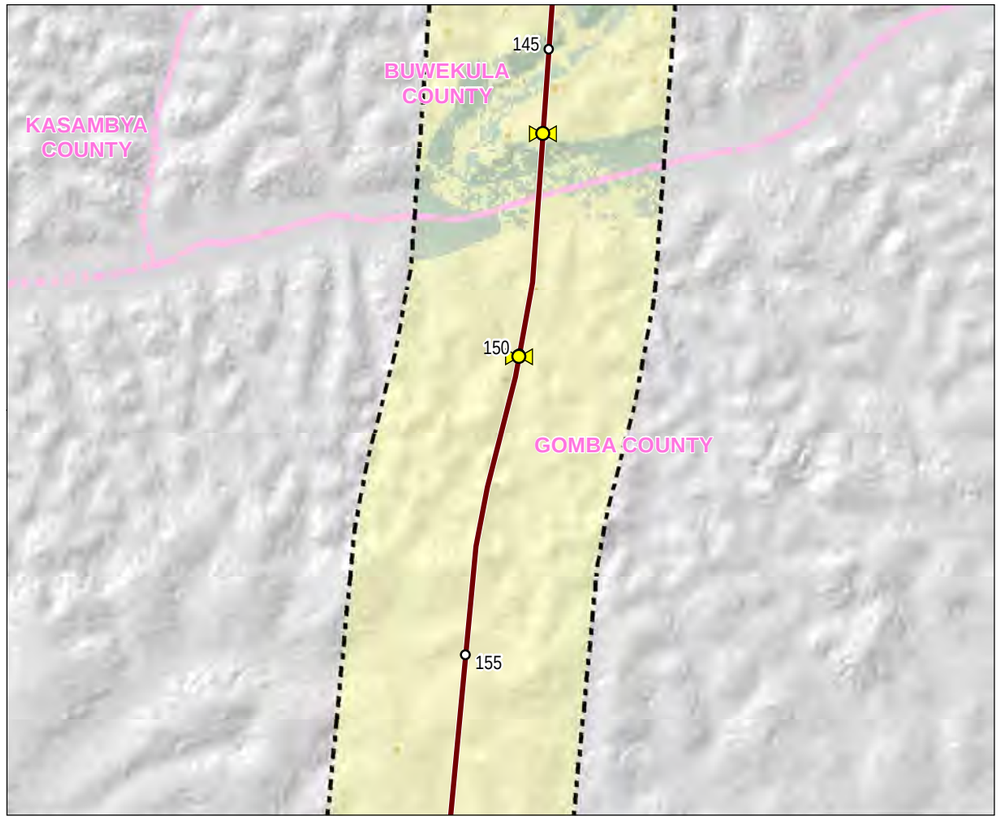
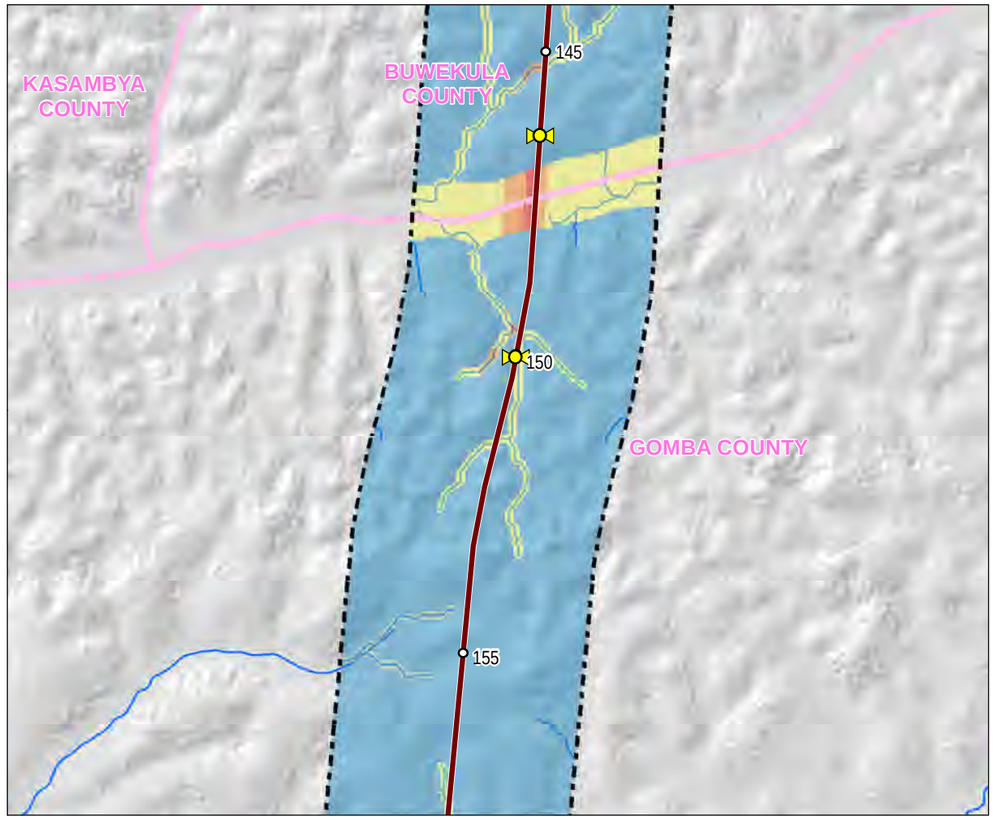
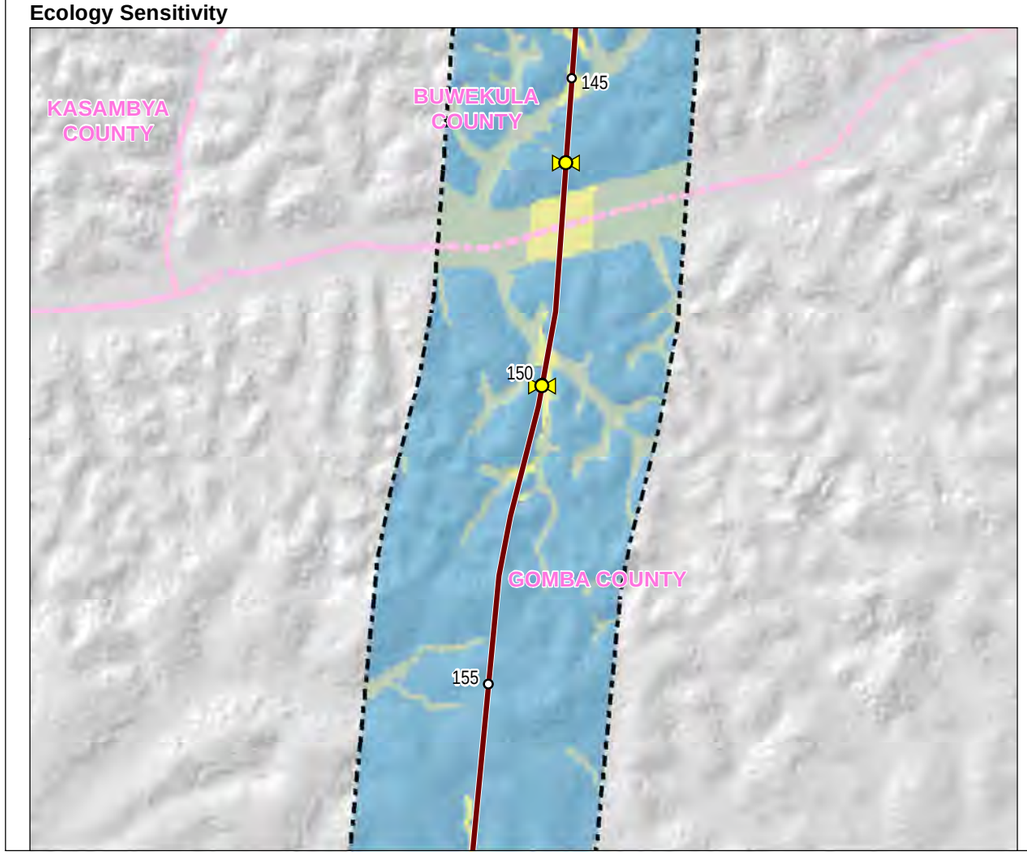
Groundwater Sensitivity



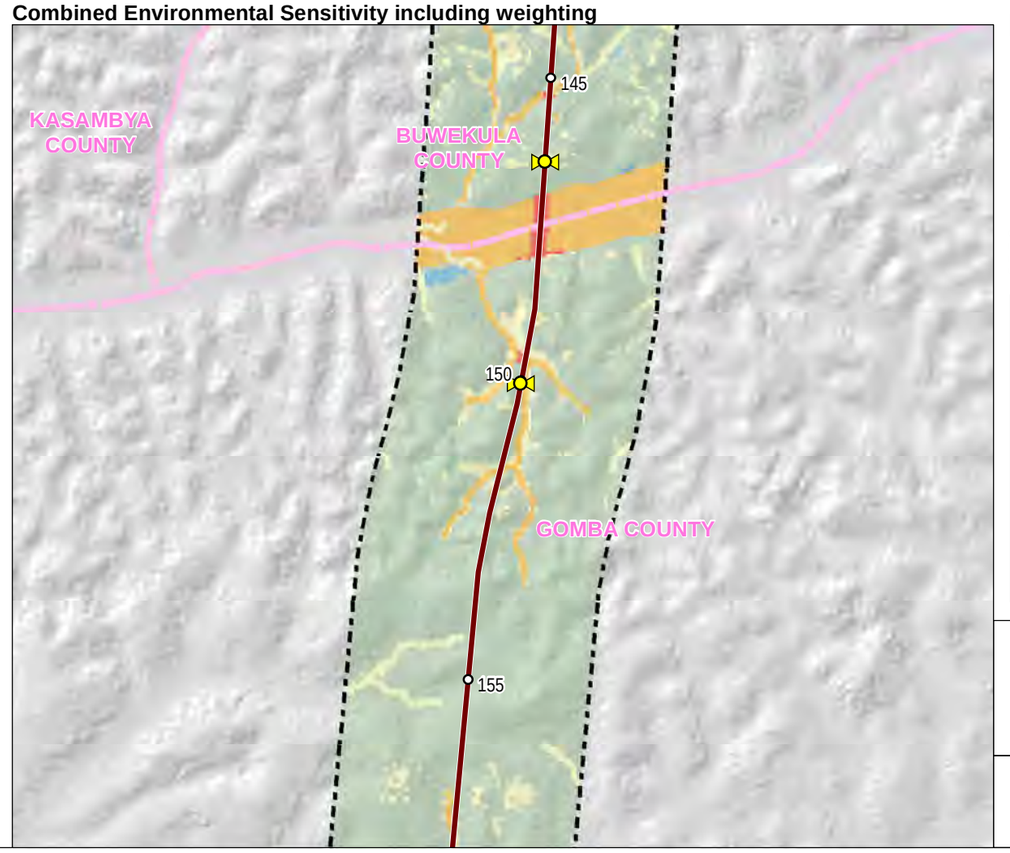
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

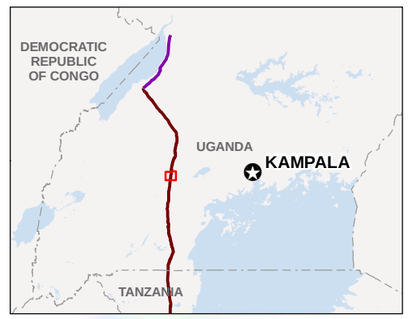
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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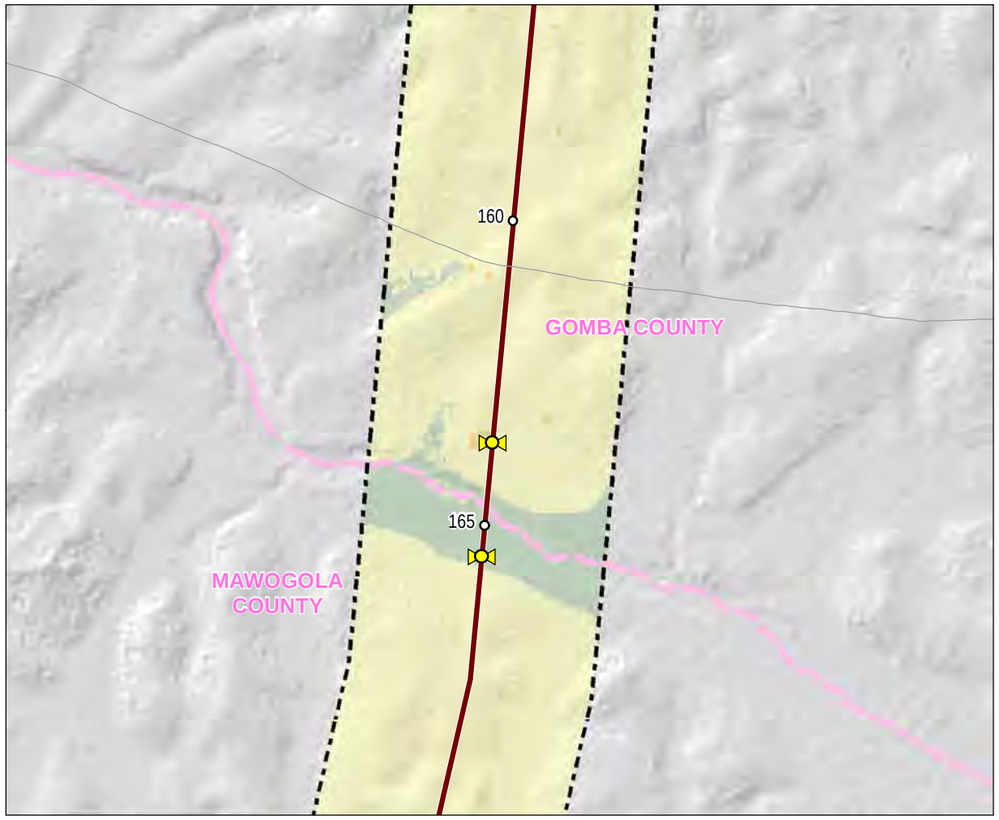
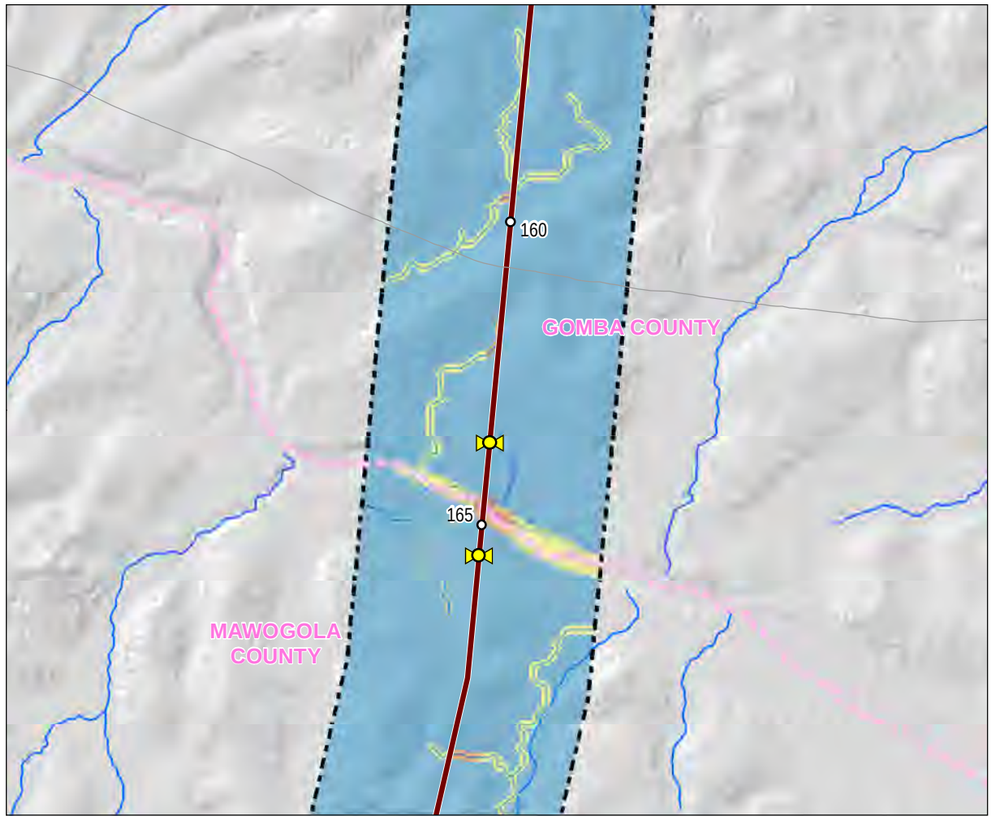
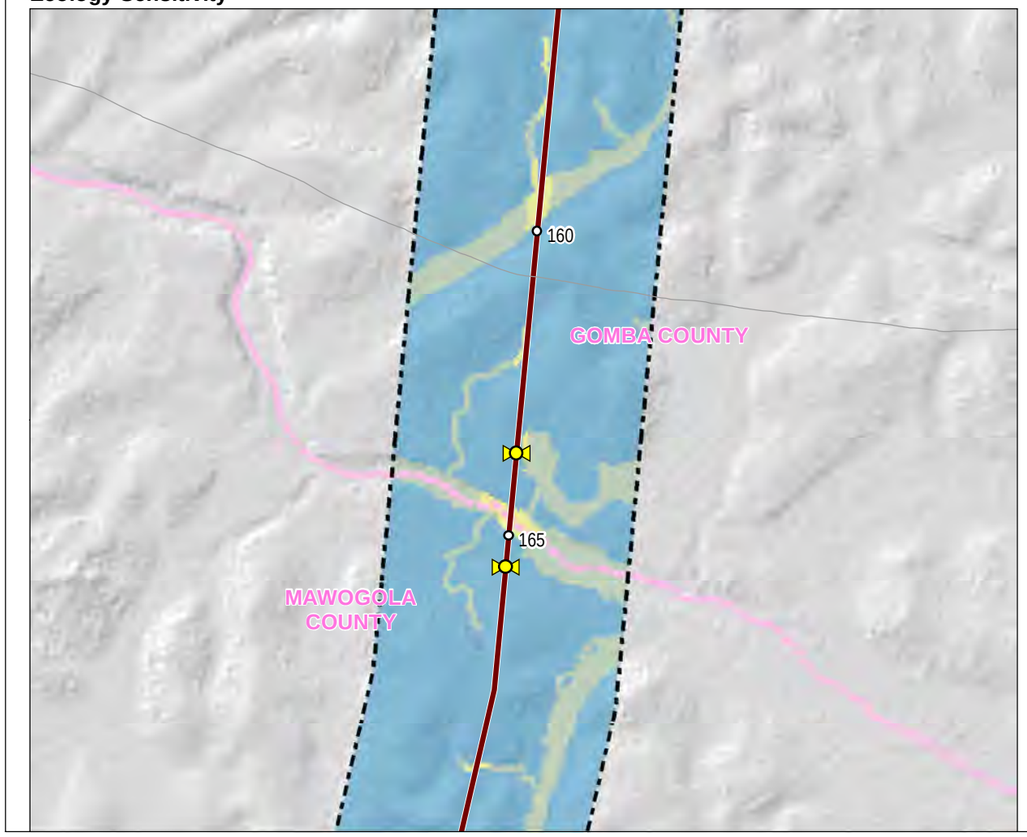
Groundwater Sensitivity



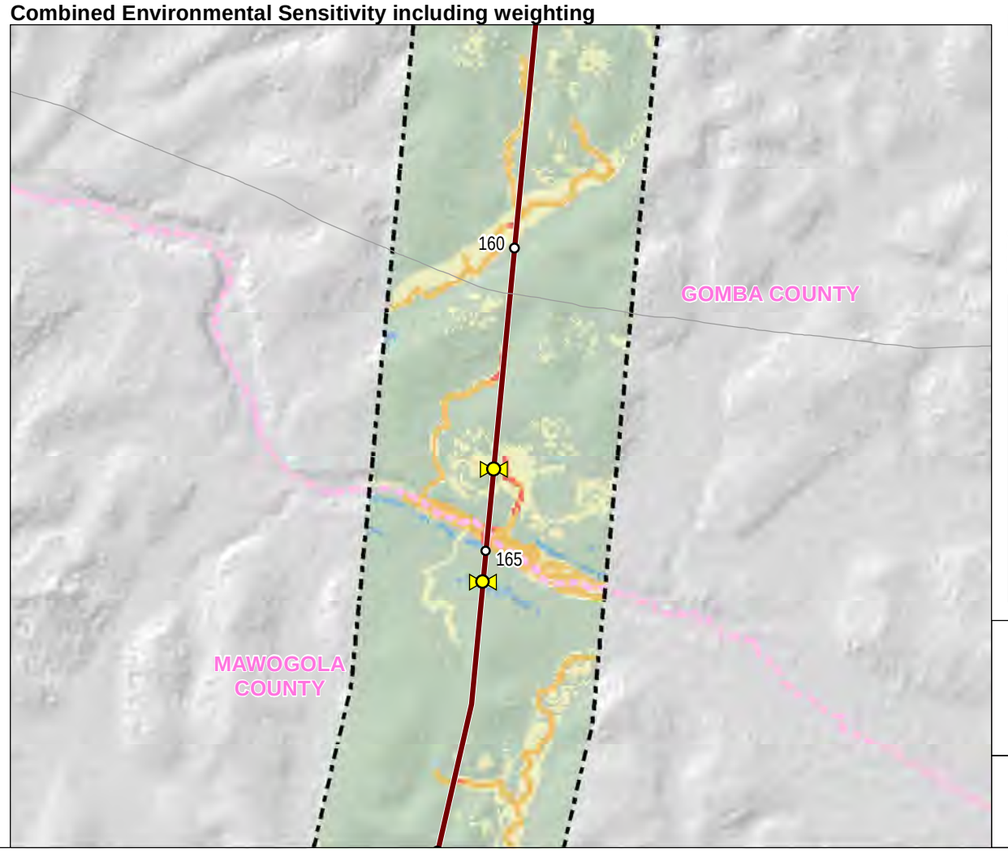
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

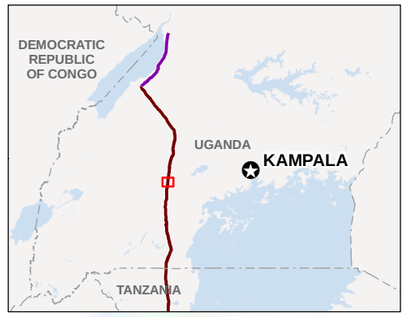
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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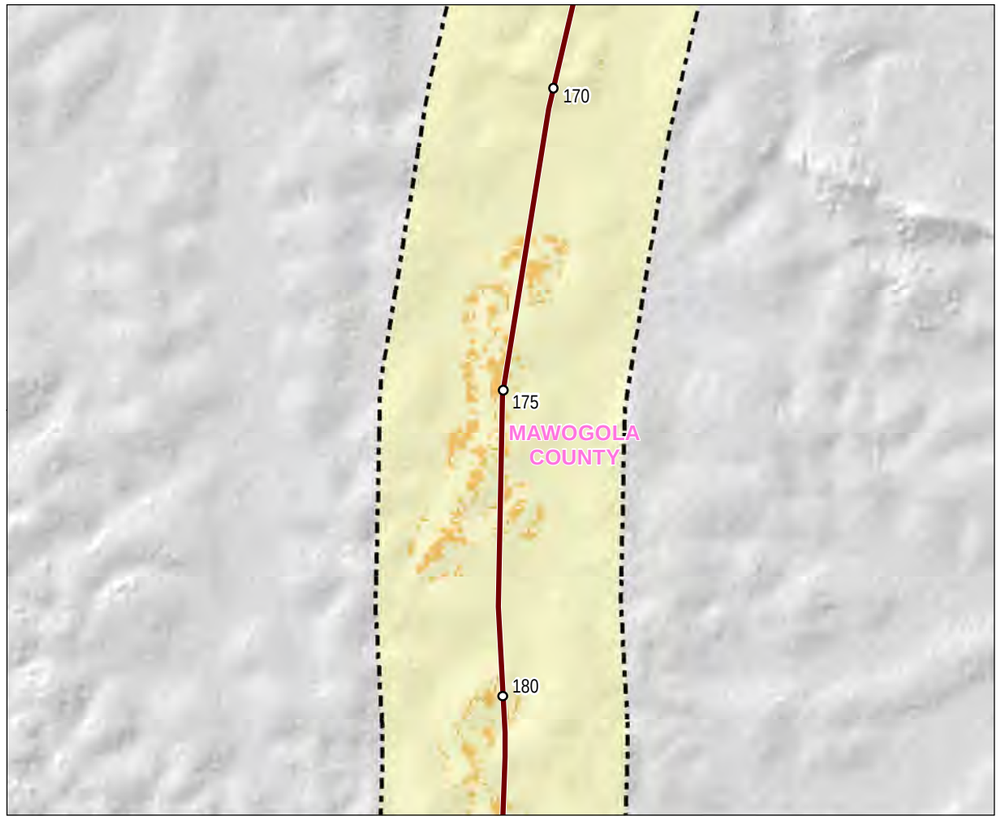
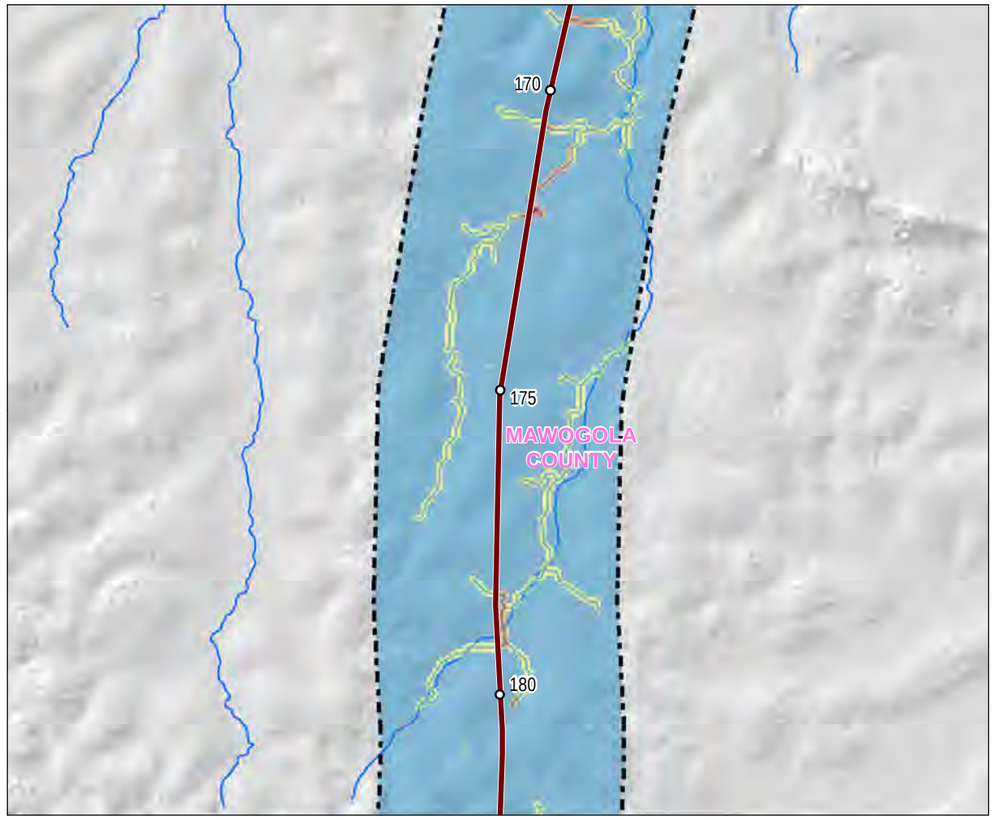
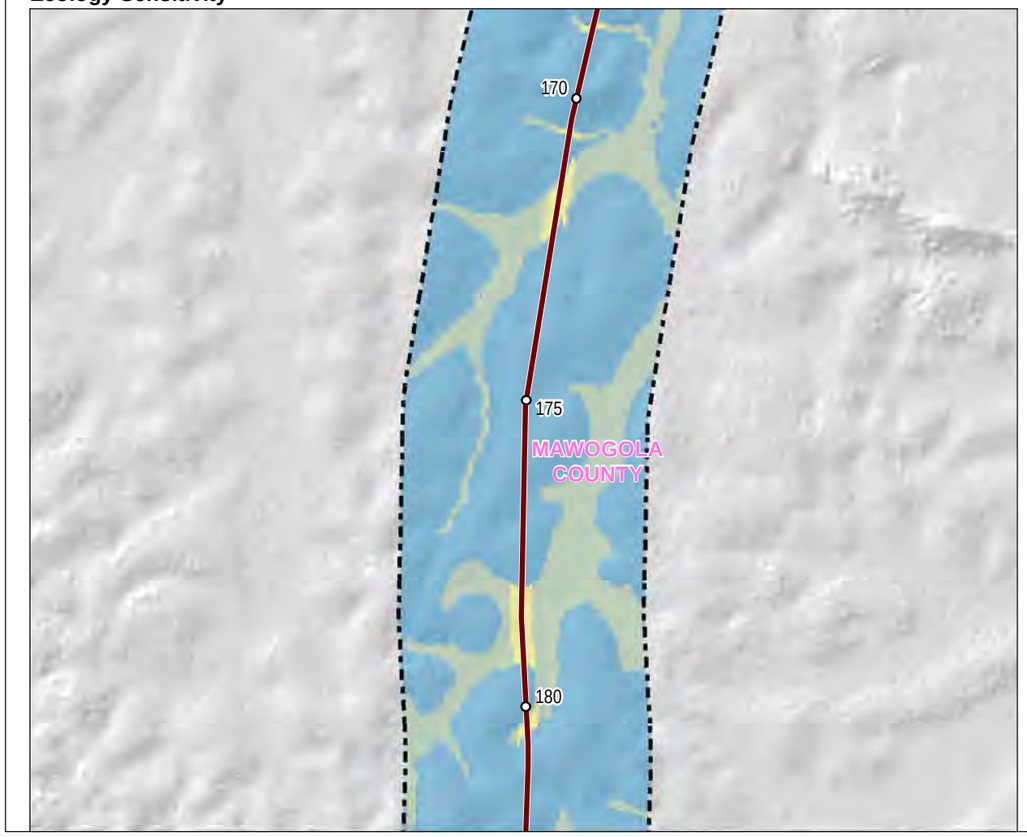
Groundwater Sensitivity



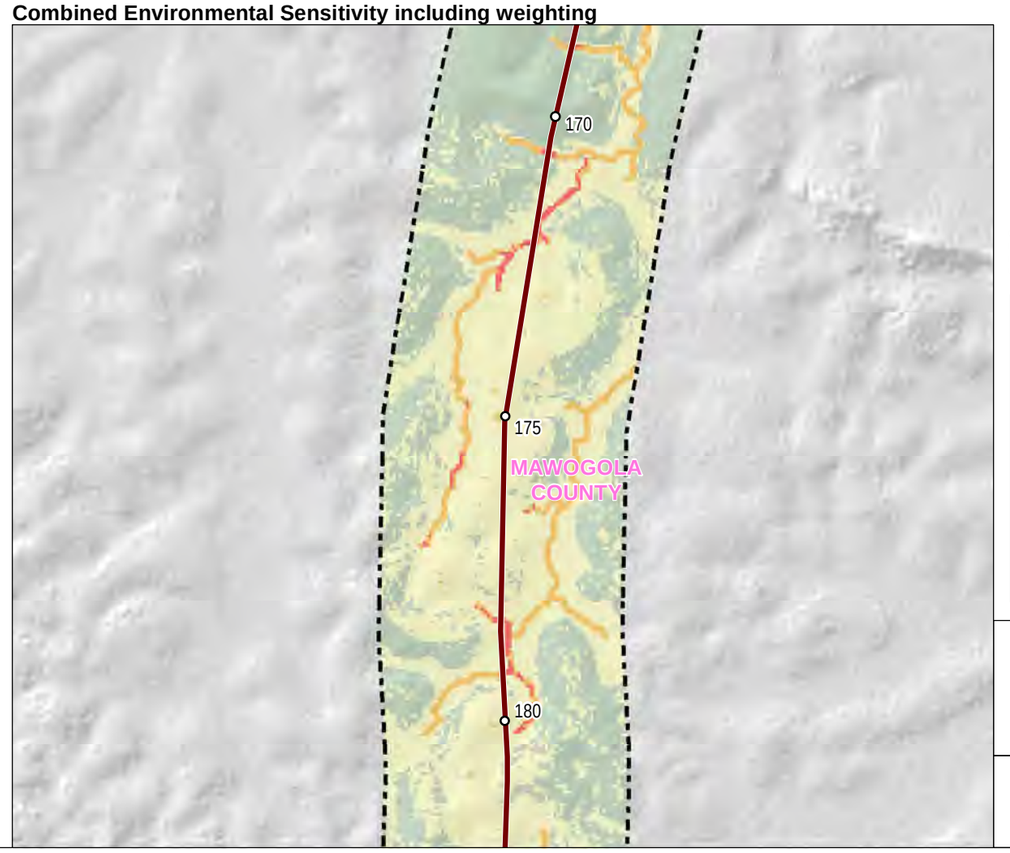
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

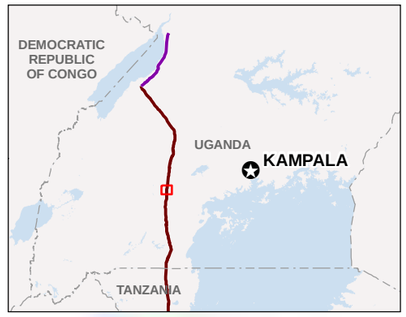
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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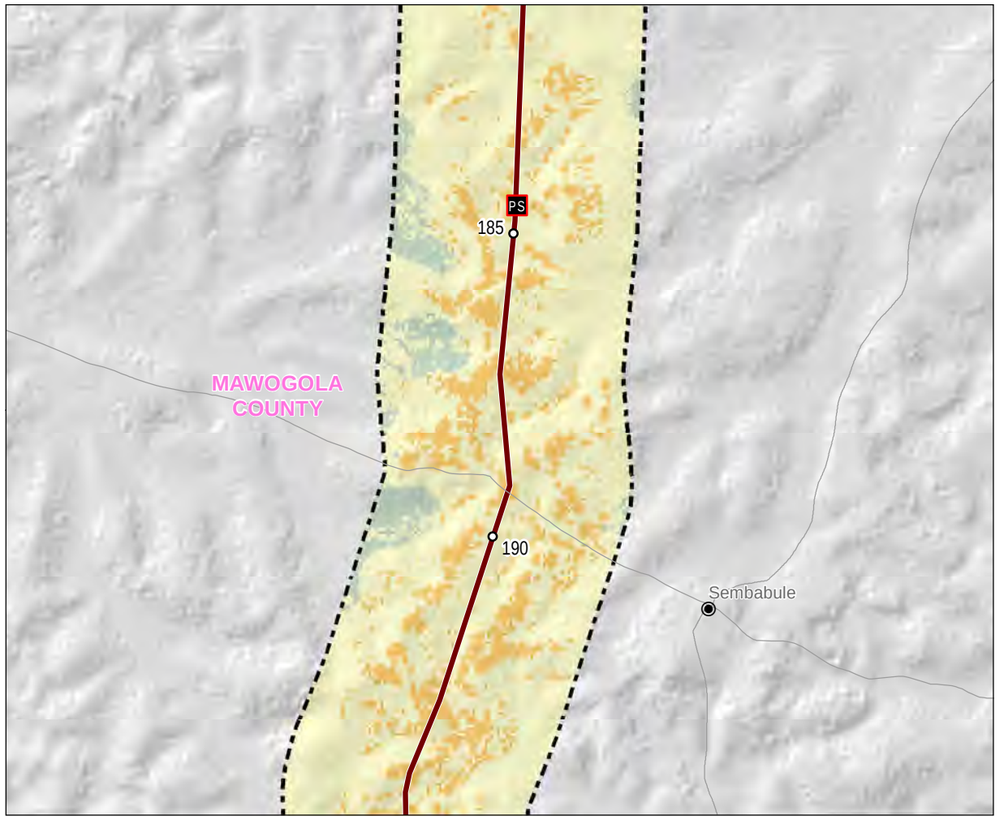
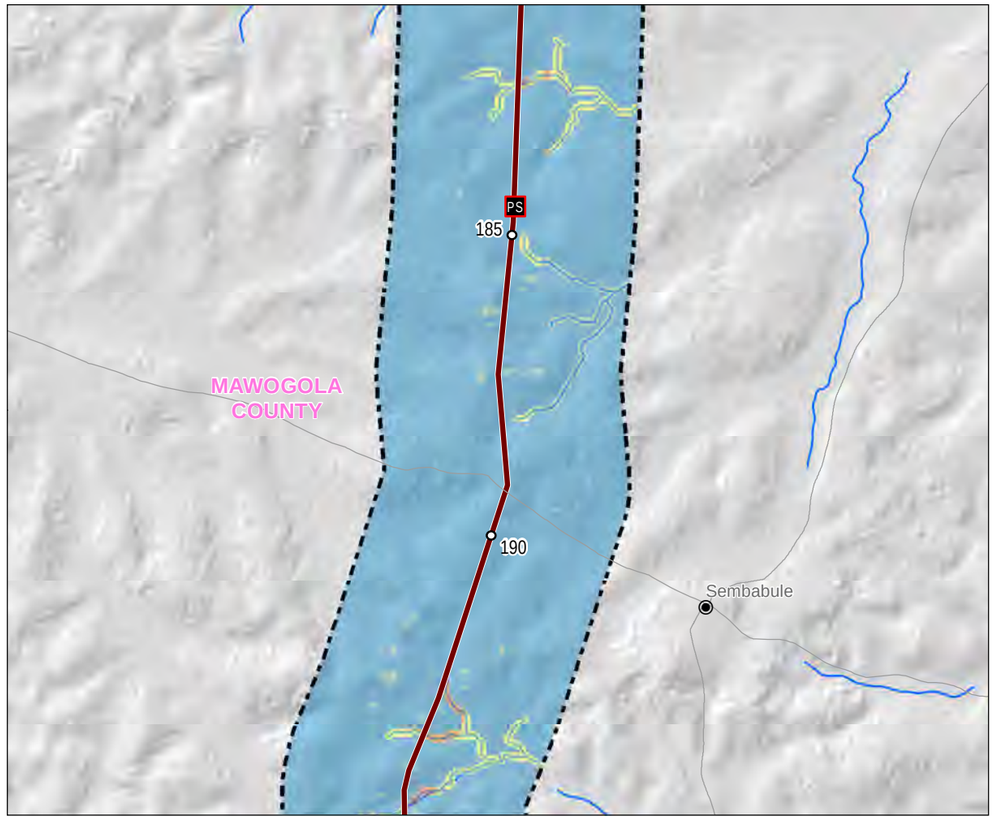
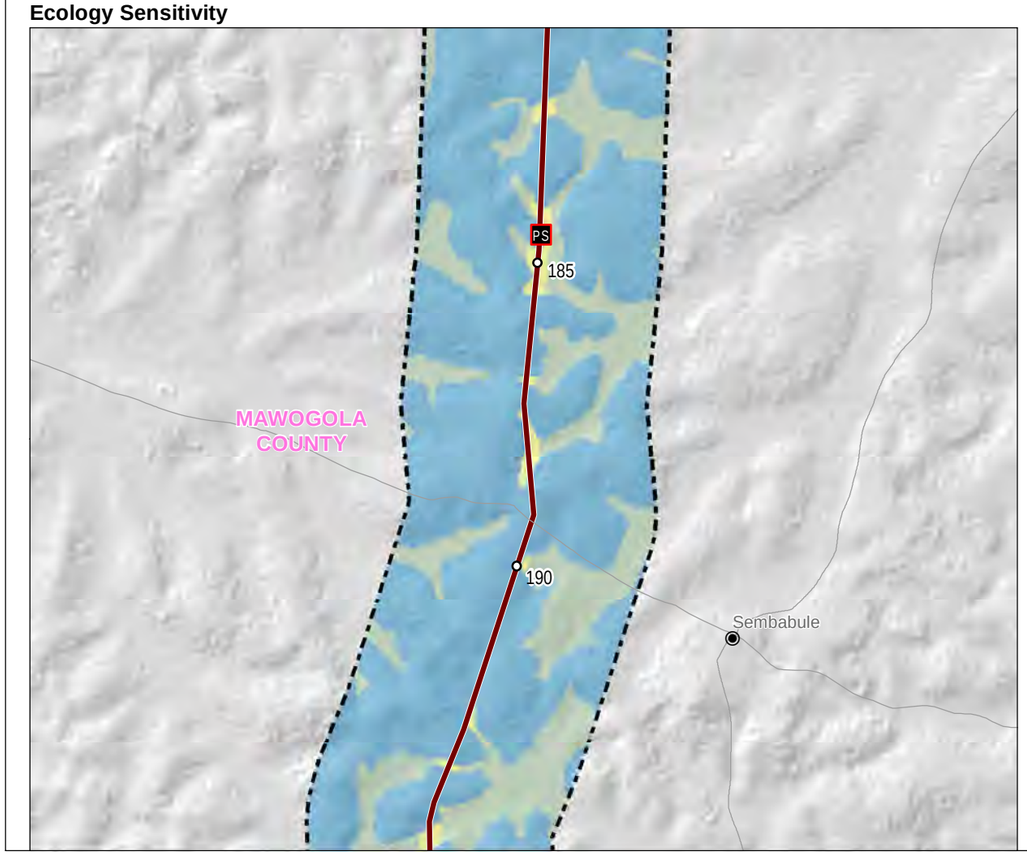
Groundwater Sensitivity



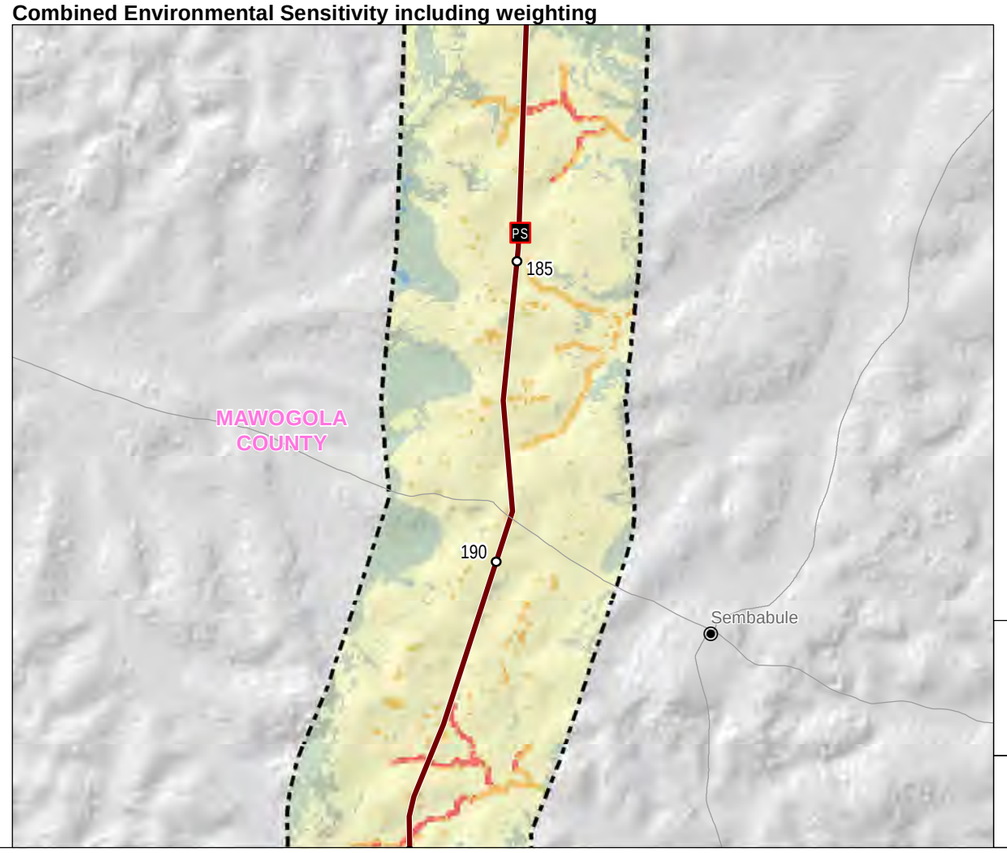
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- PS Pumping Station
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

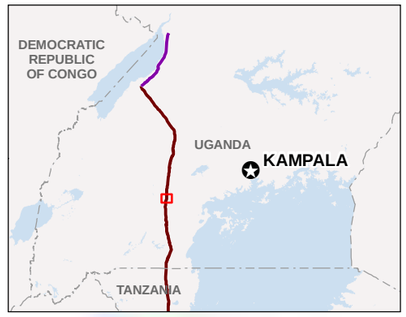
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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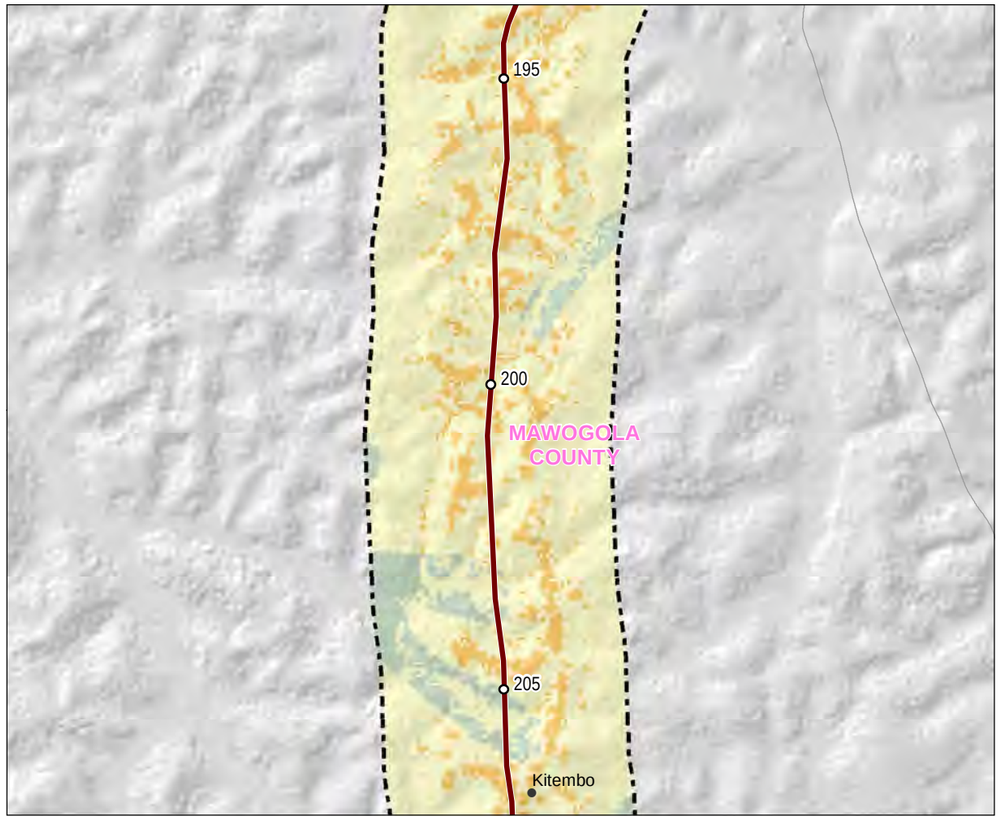
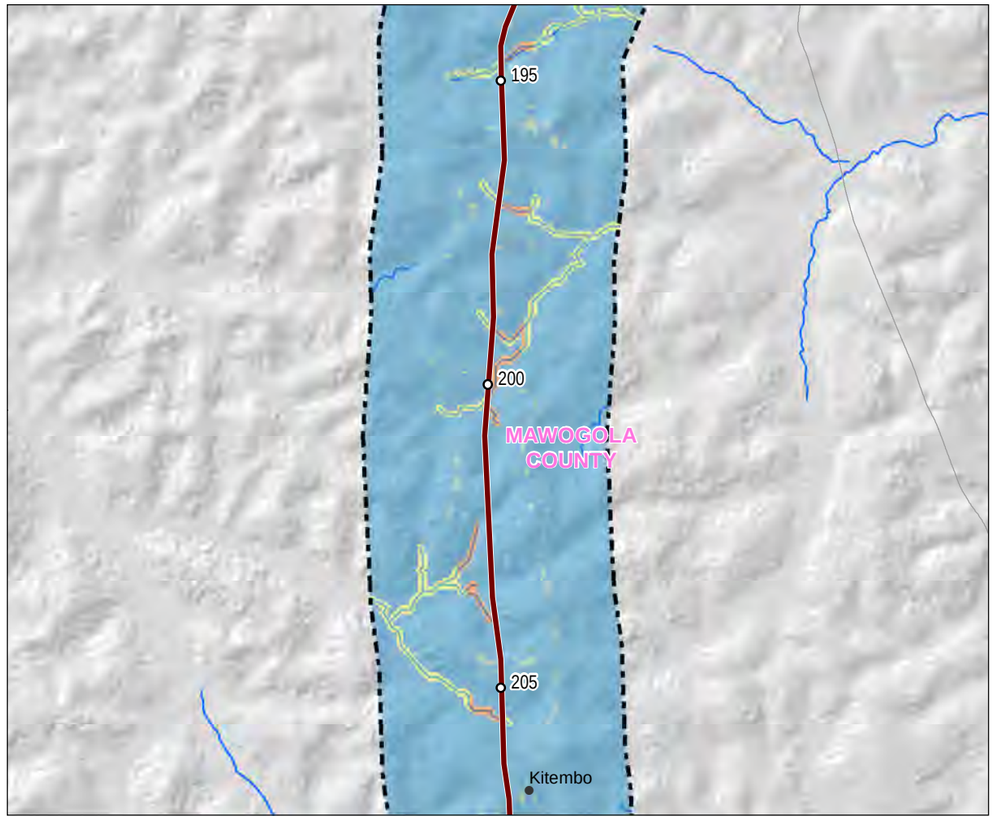
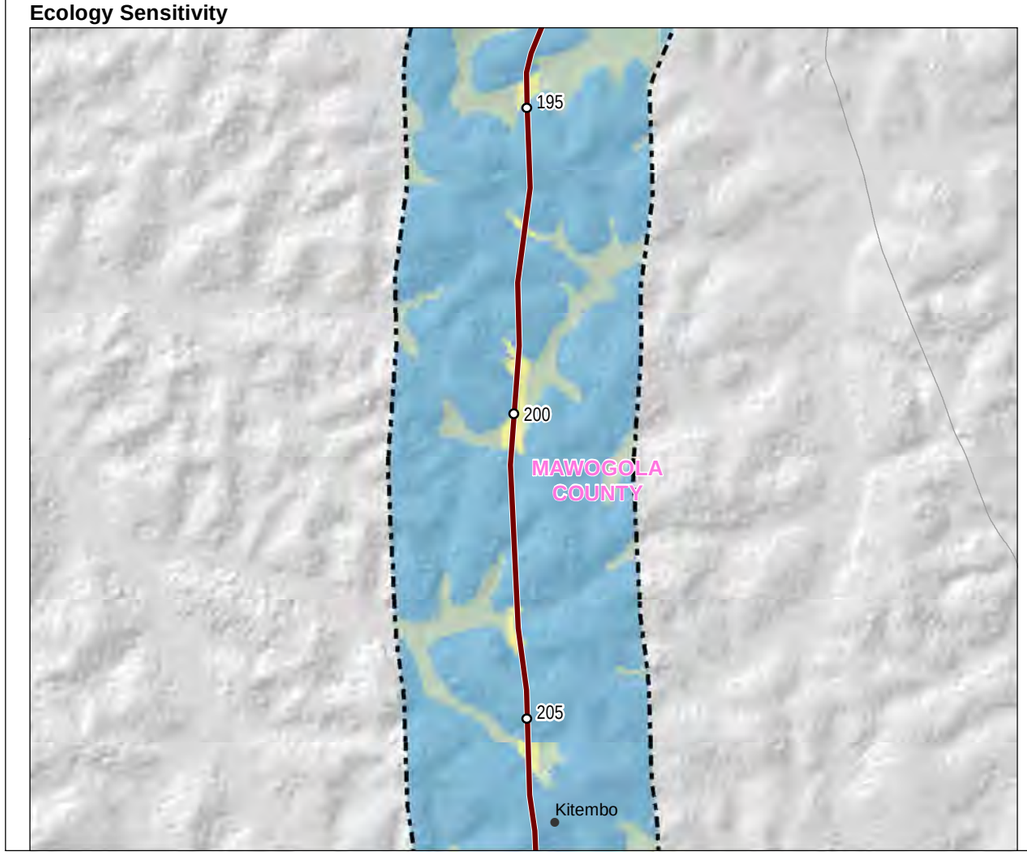
Groundwater Sensitivity



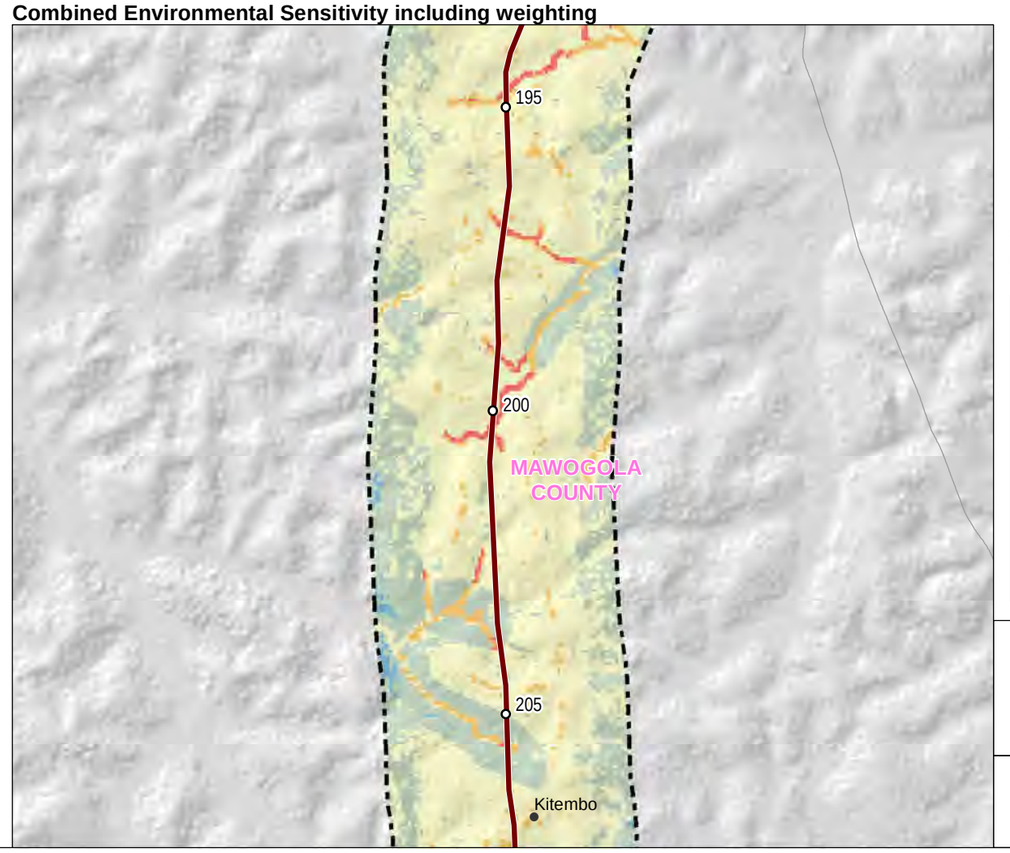
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

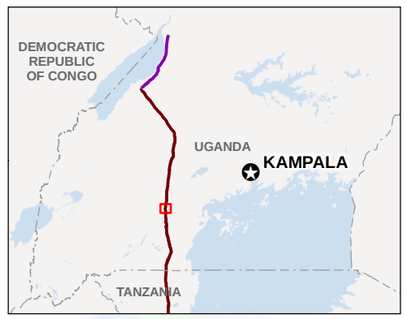
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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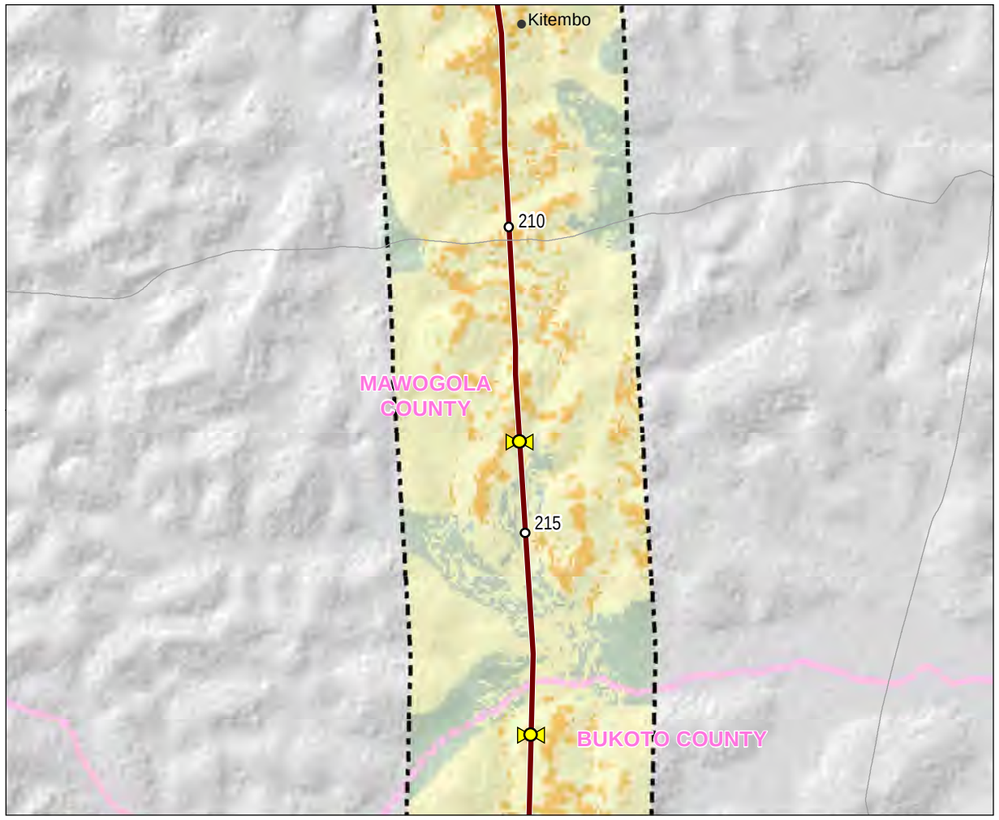
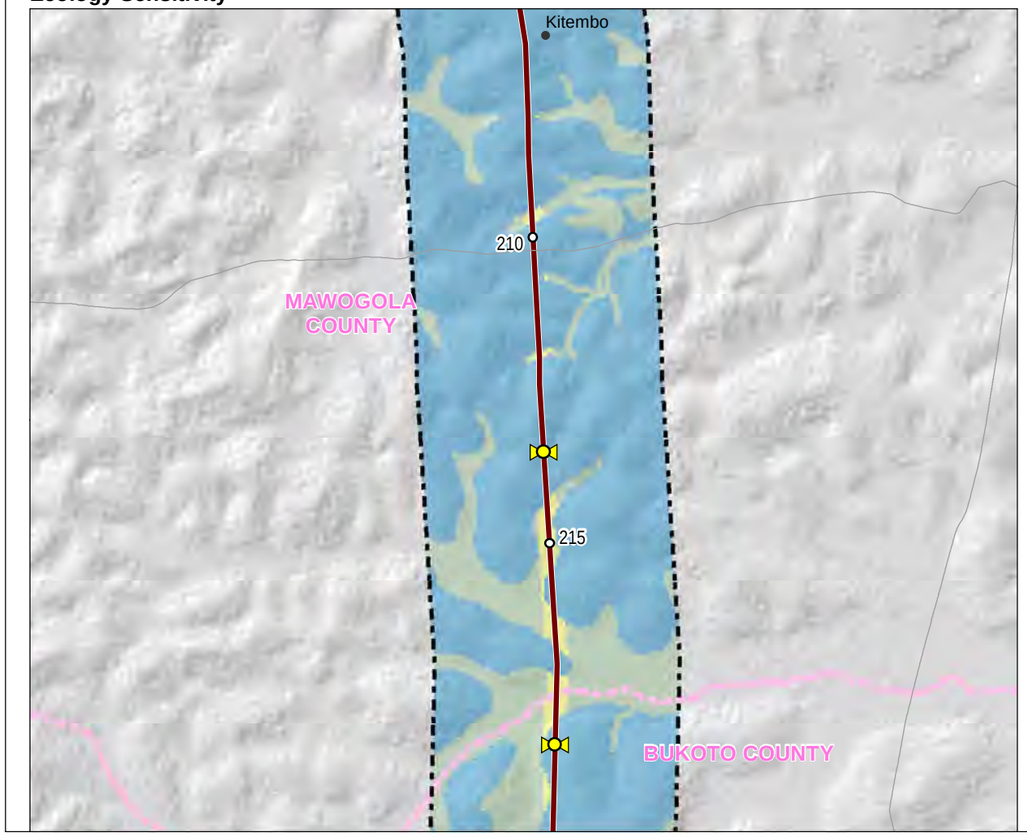
Groundwater Sensitivity

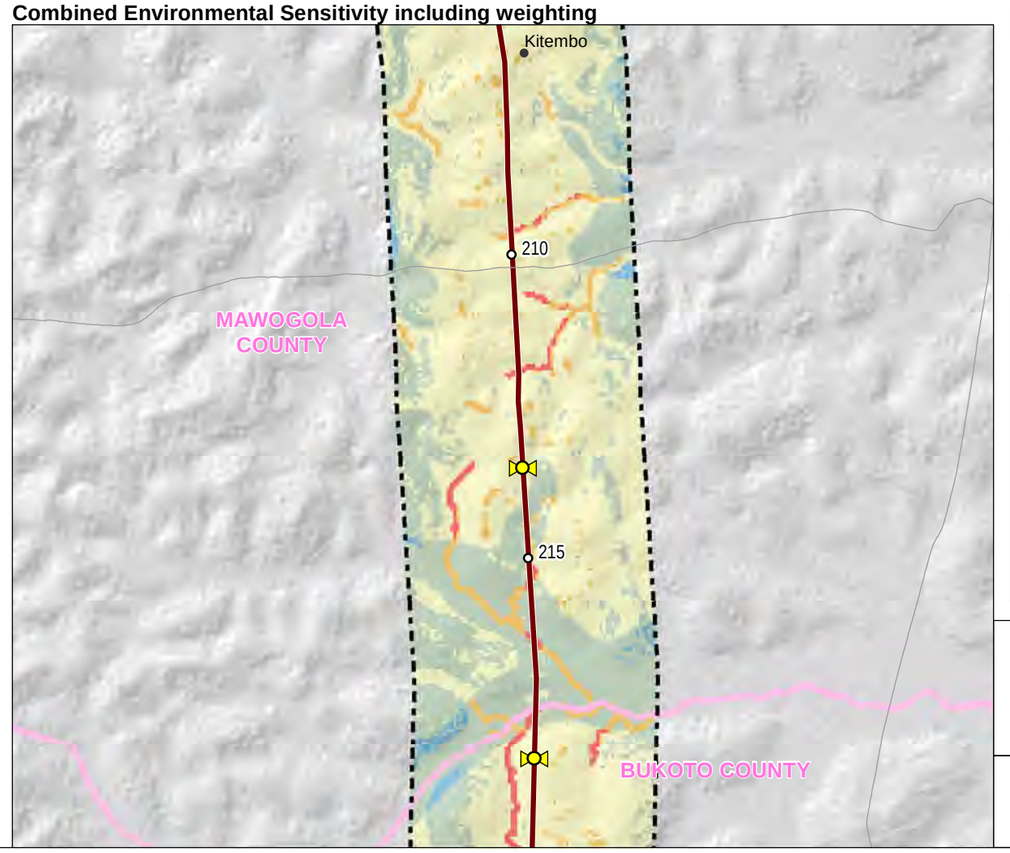


Surface Water Sensitivity

Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

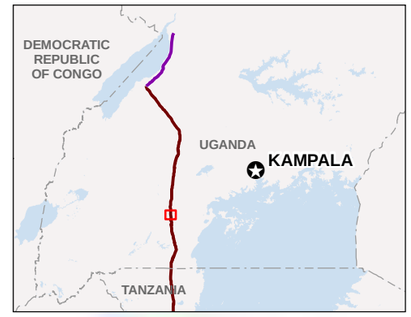
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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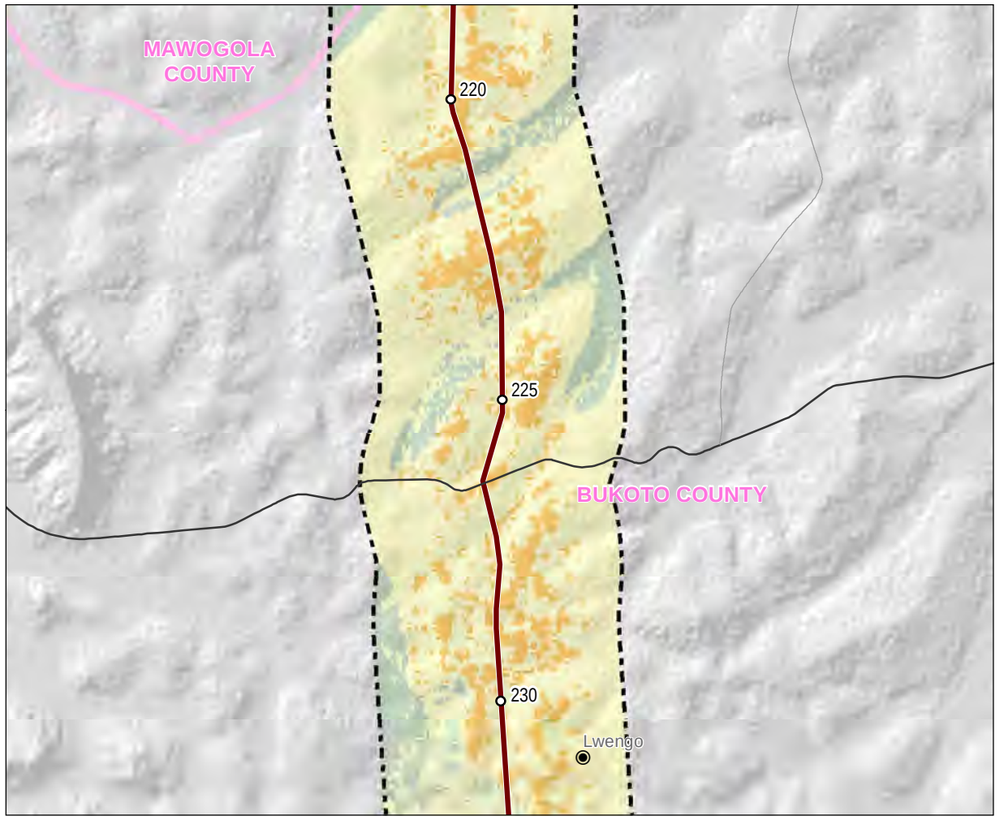
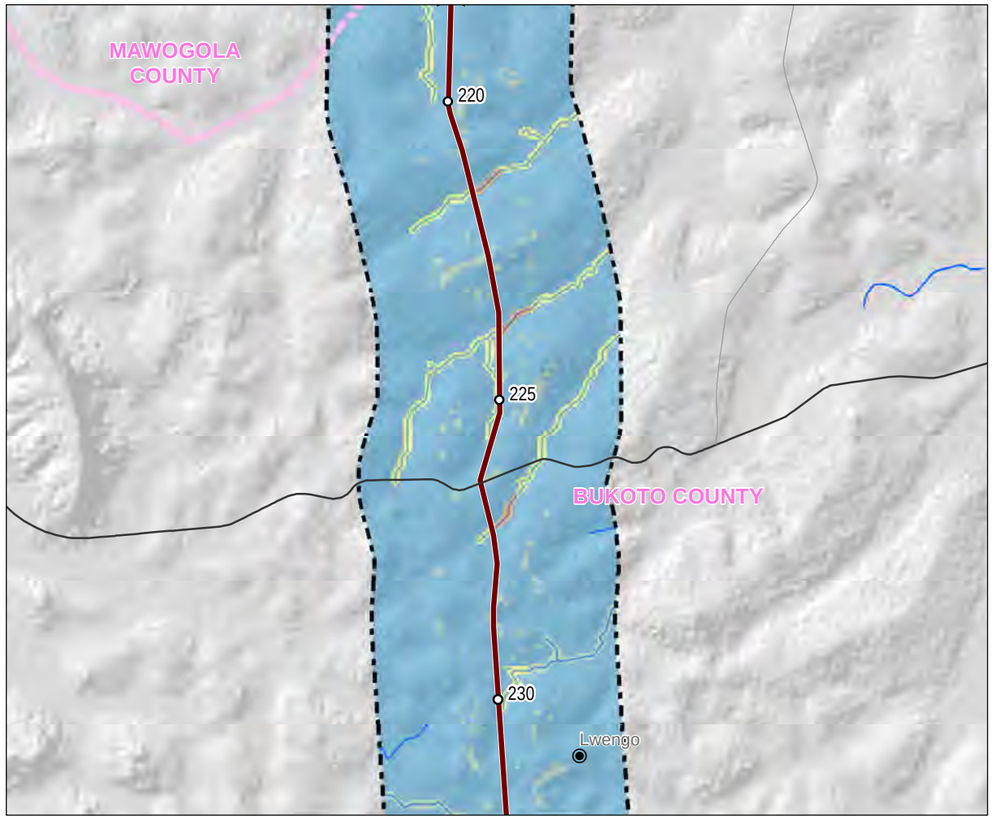
Document Path: P:\08-International\P80677 EACOP\CTR 10 - GIS\80712-057[A].mxd

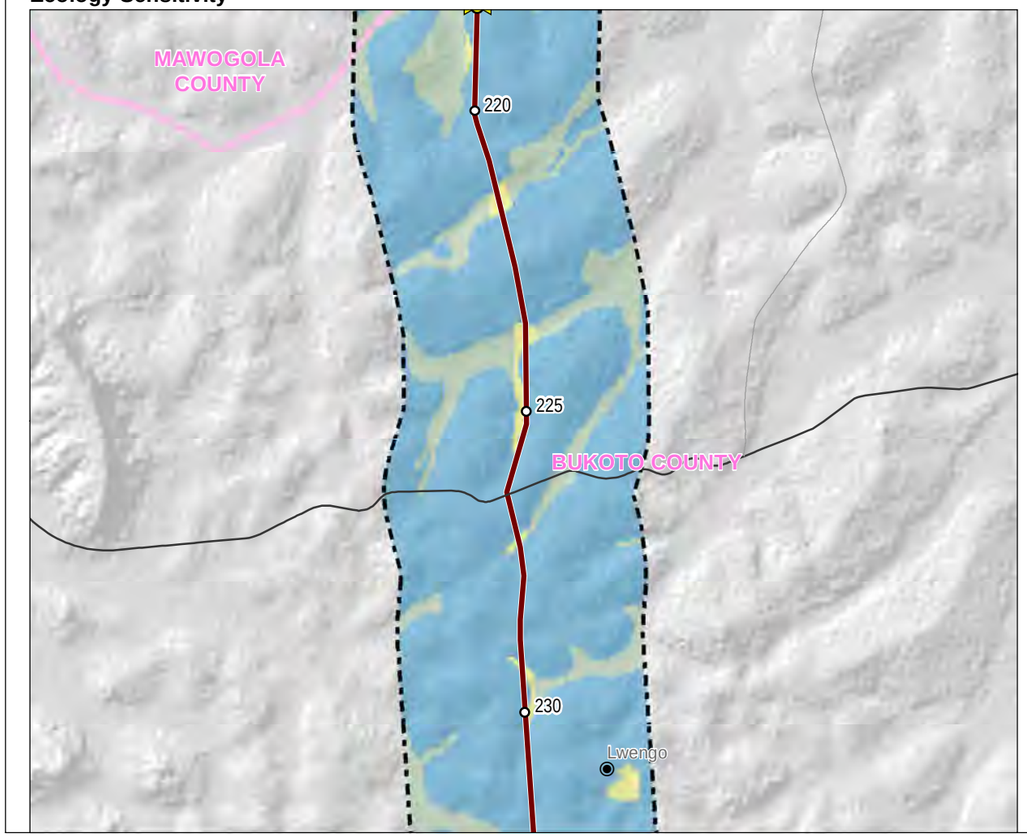
Groundwater Sensitivity



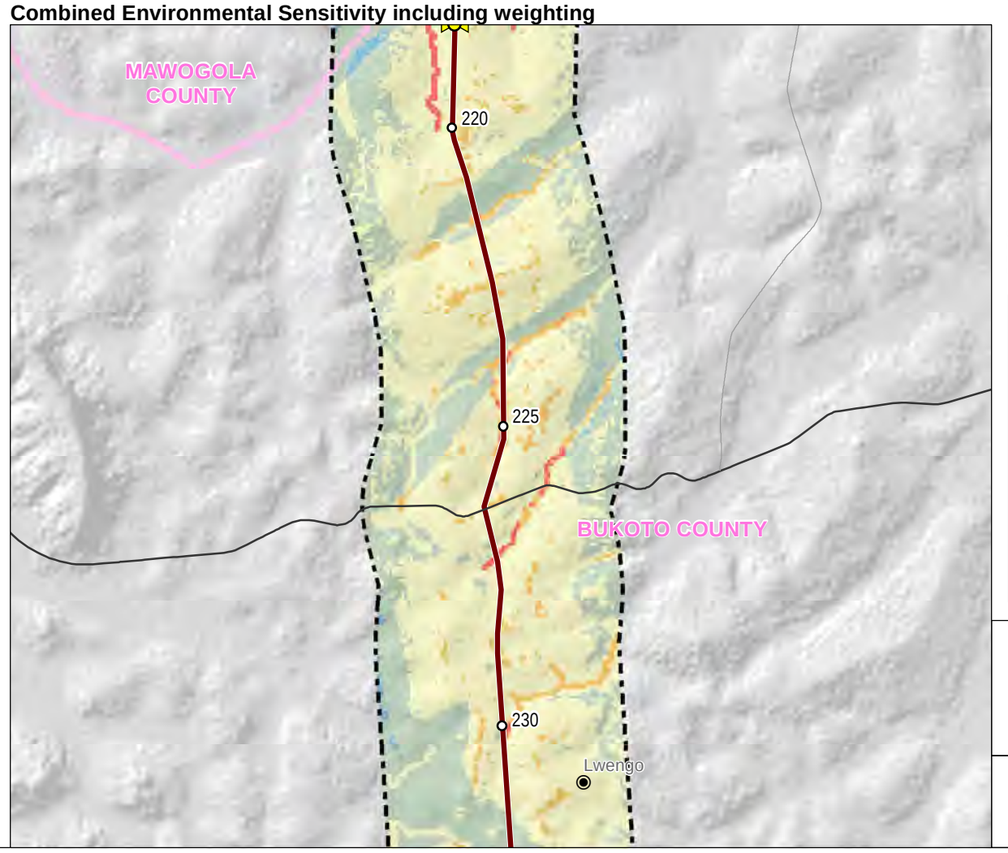
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

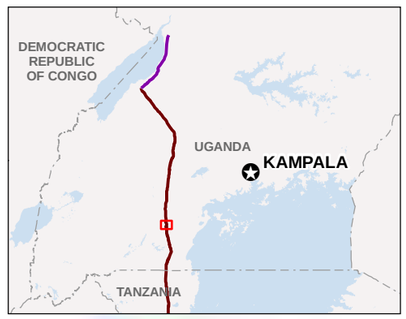
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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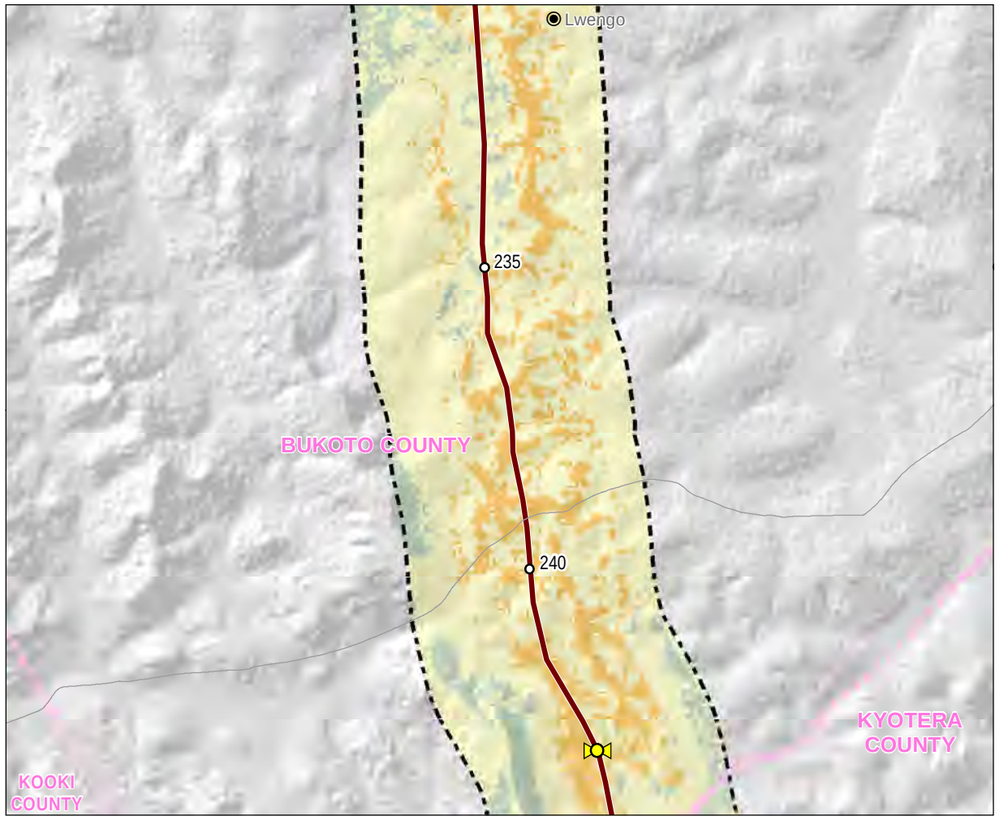
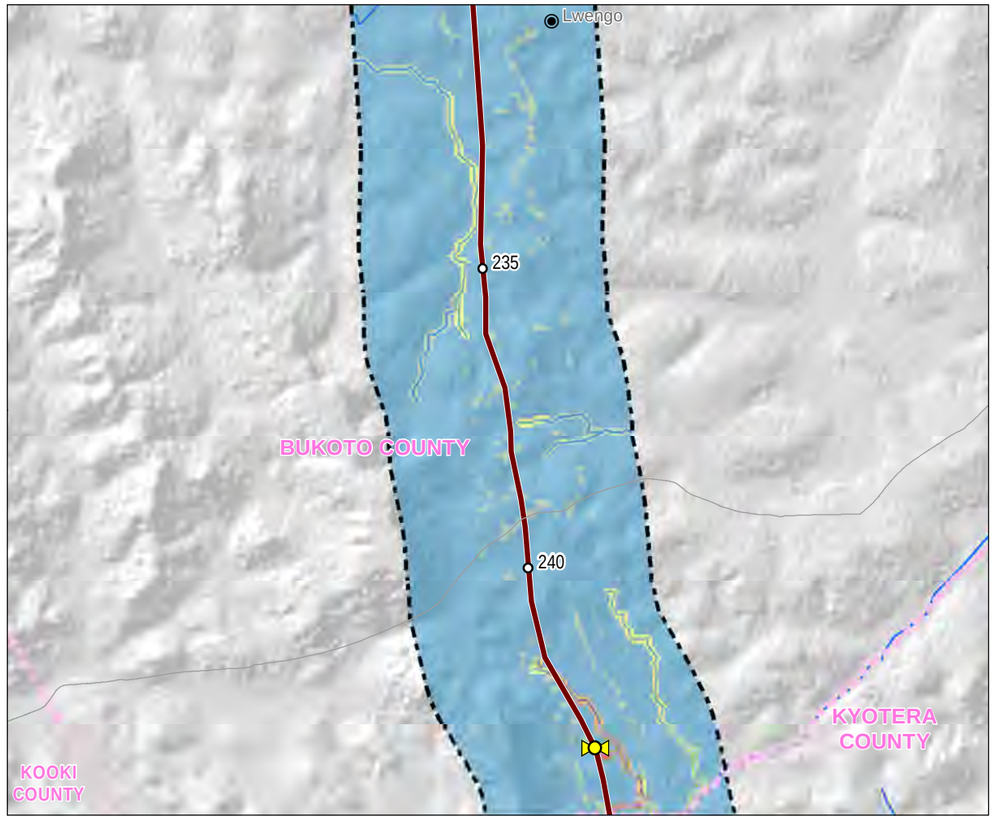
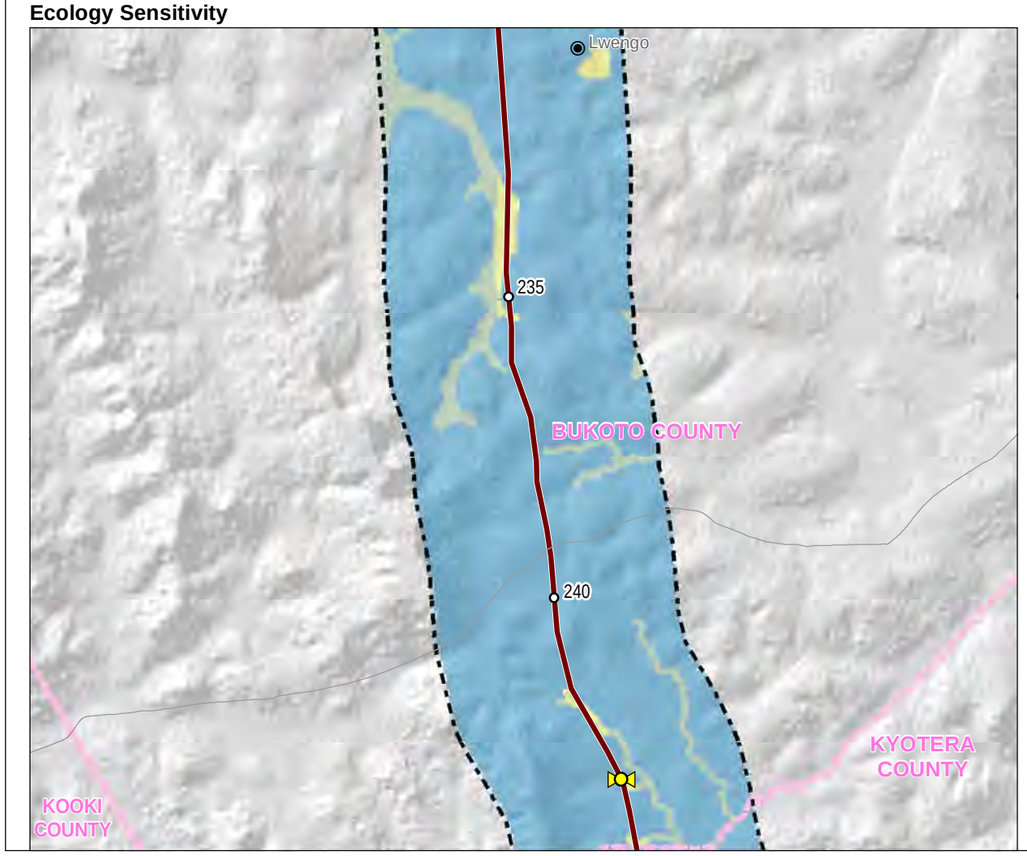
Groundwater Sensitivity



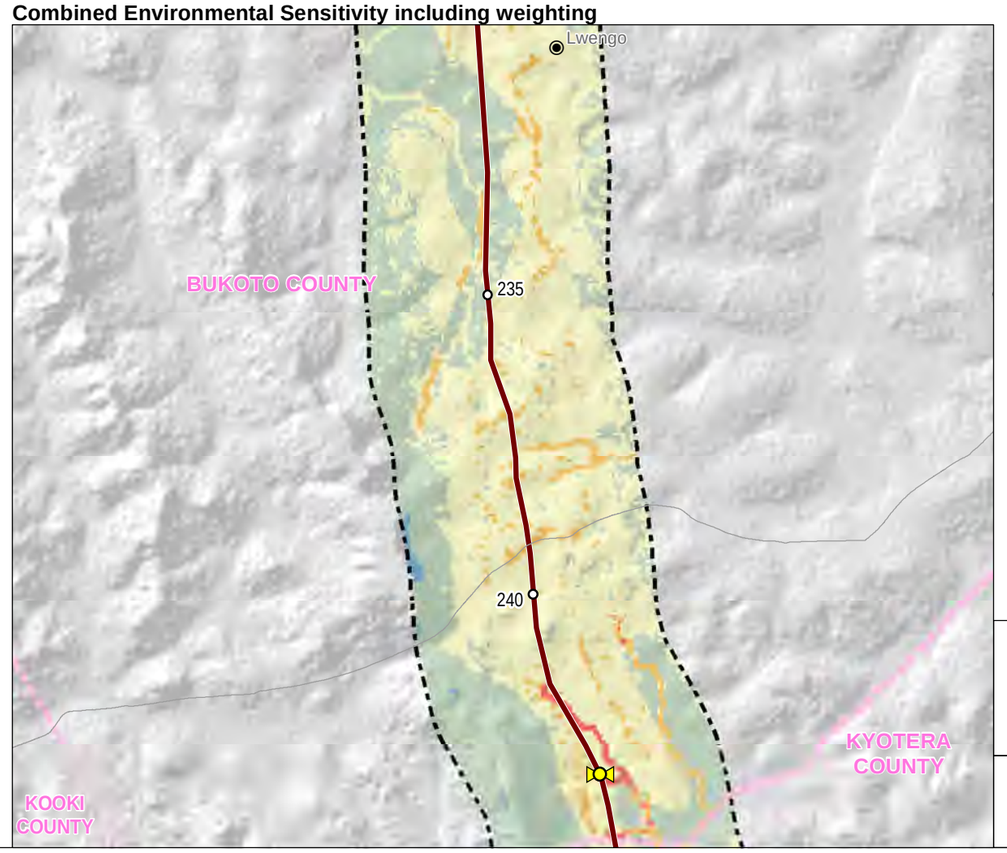
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

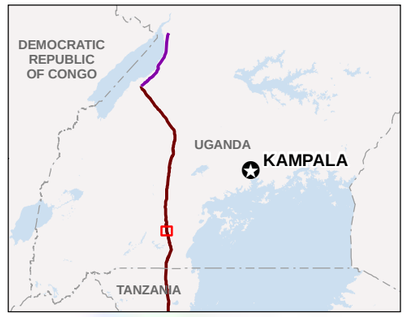
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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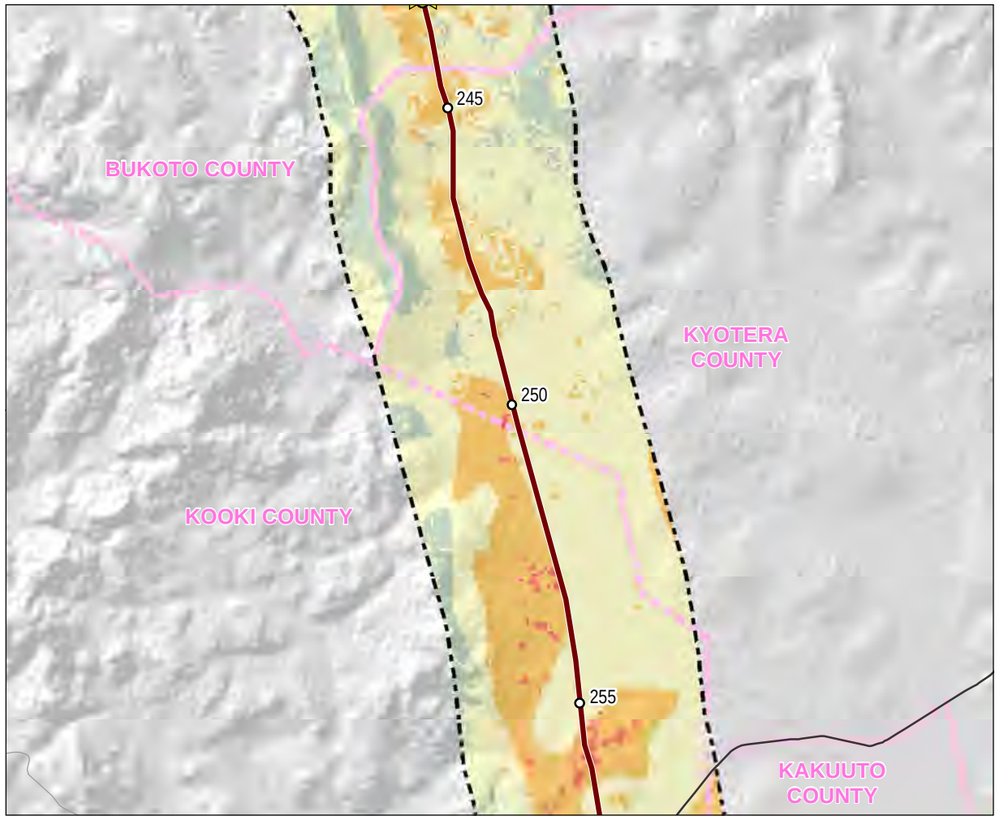
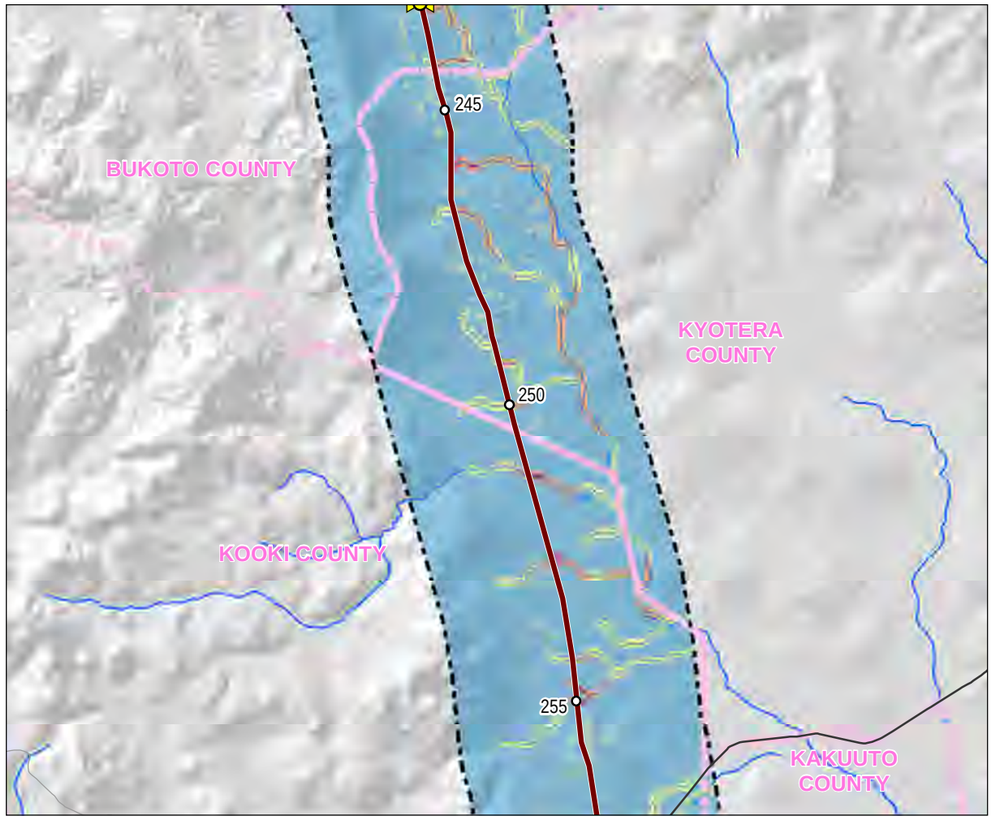
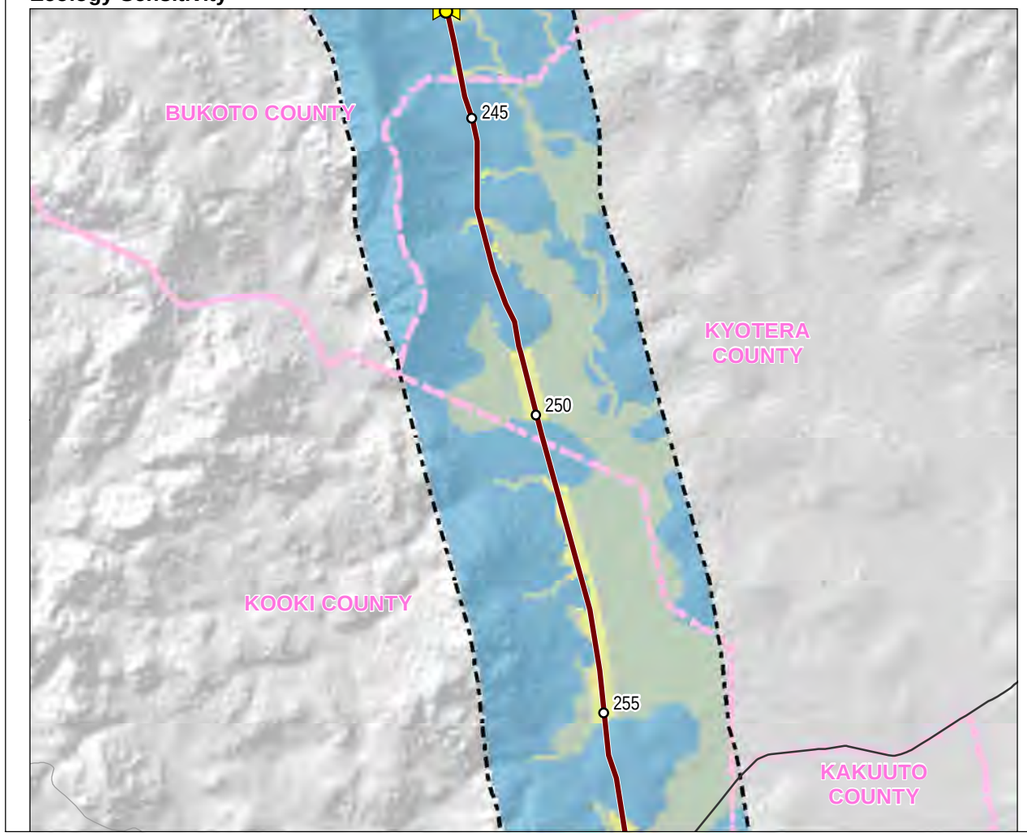
Groundwater Sensitivity



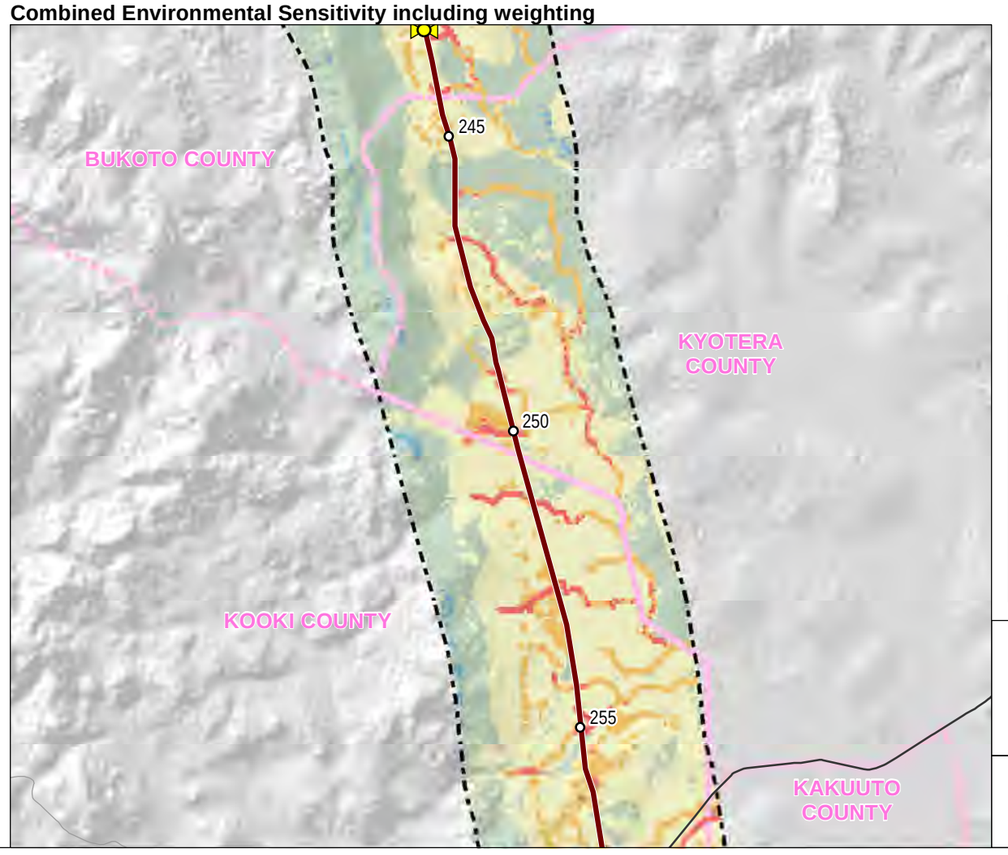
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

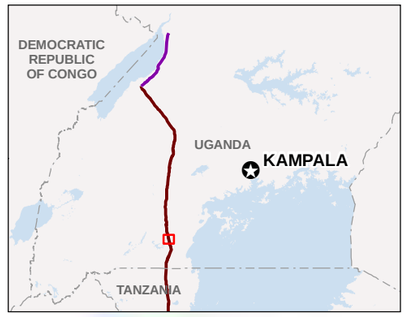
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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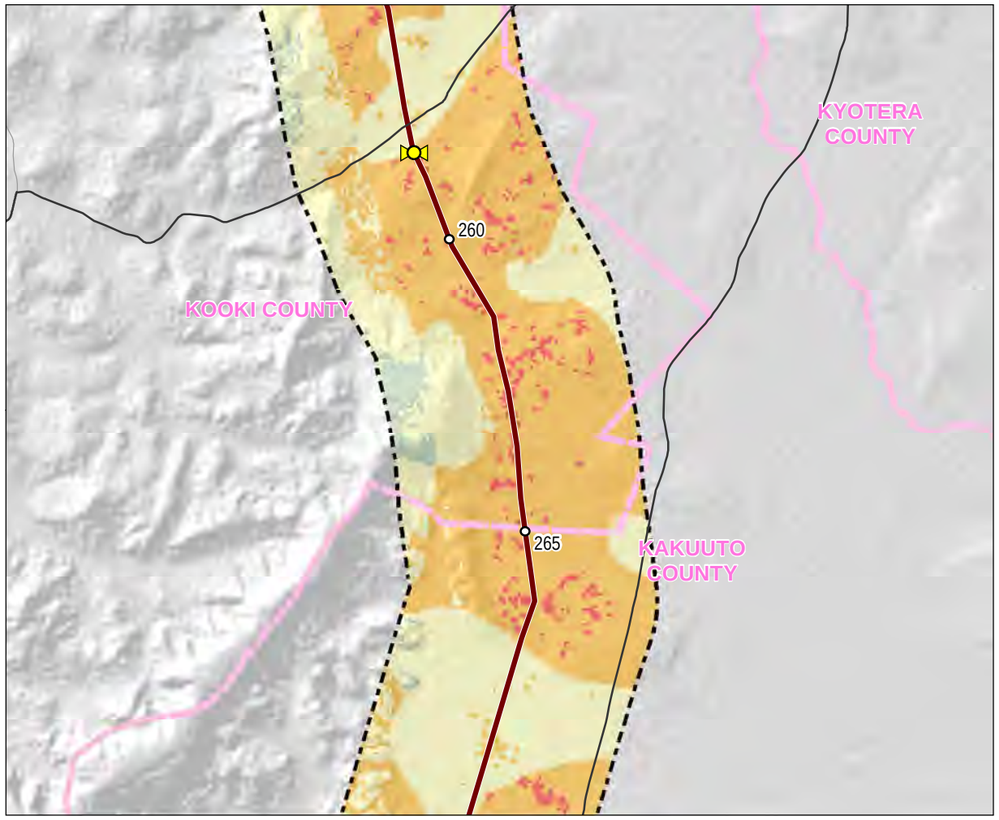
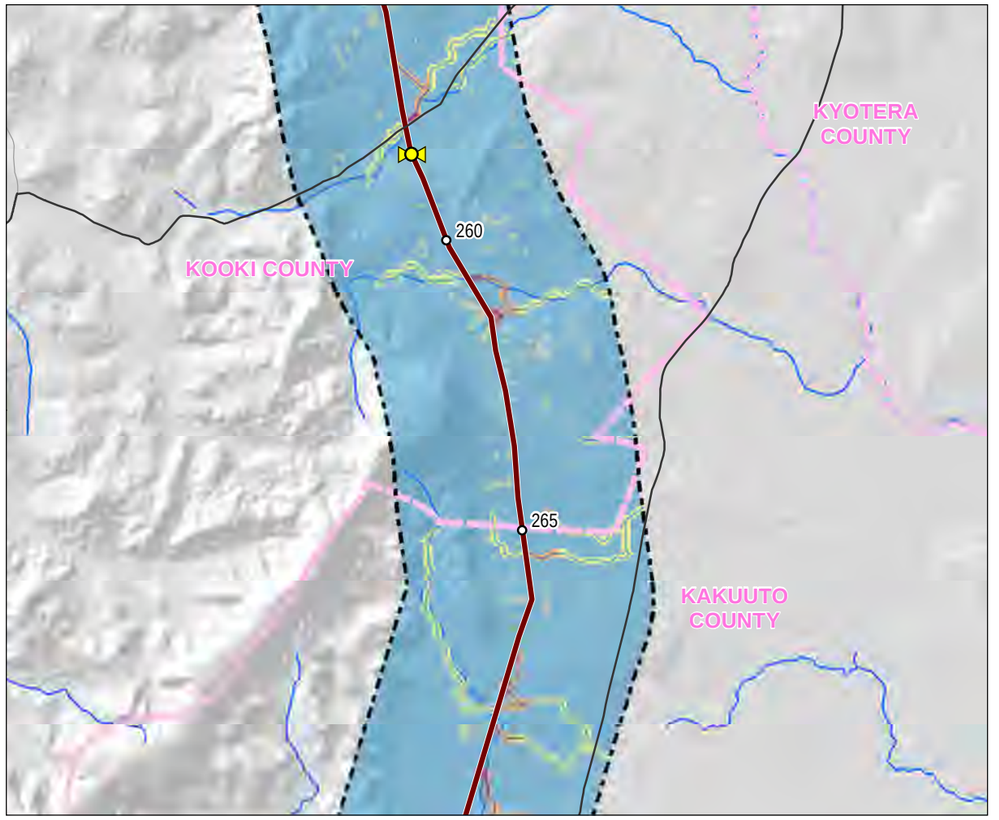
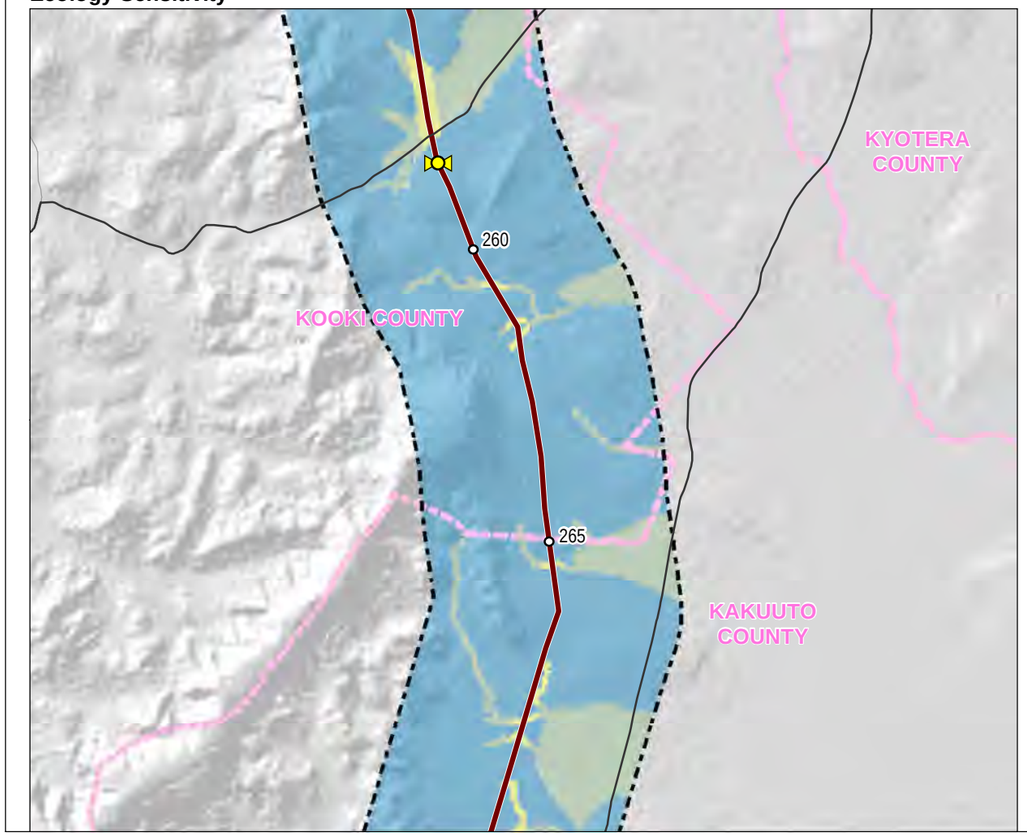
Groundwater Sensitivity



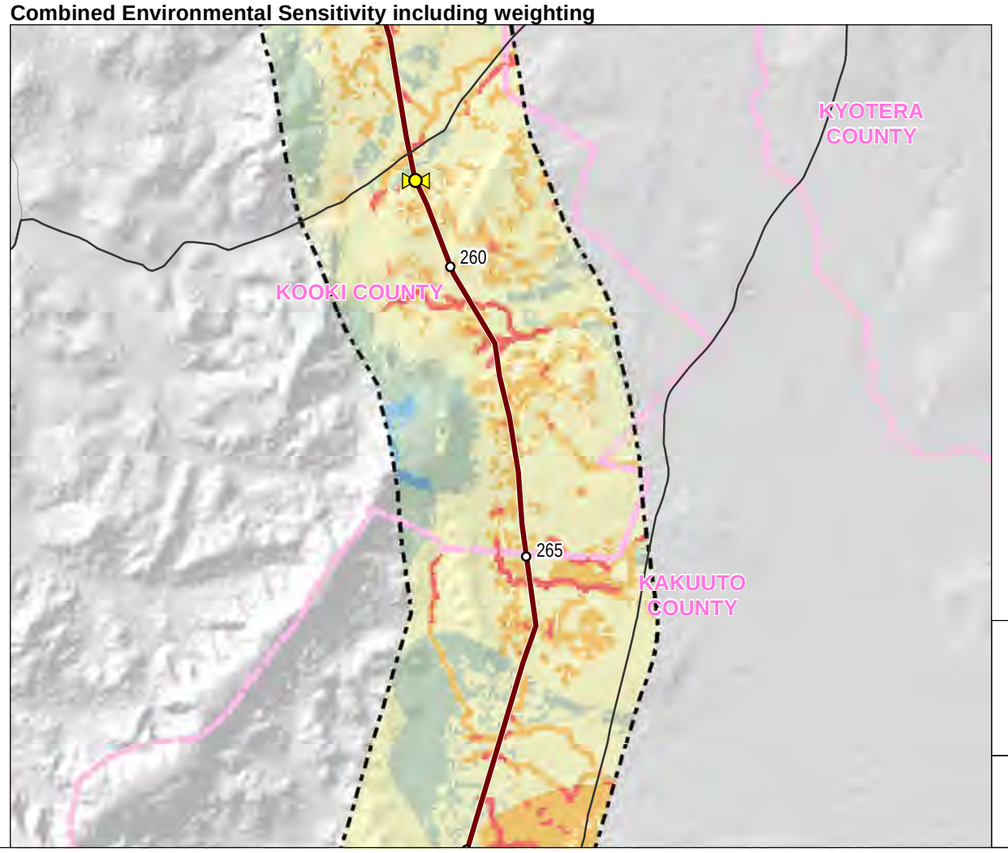
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

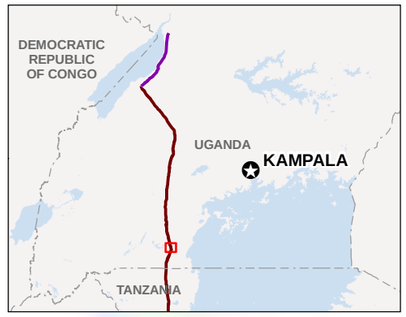
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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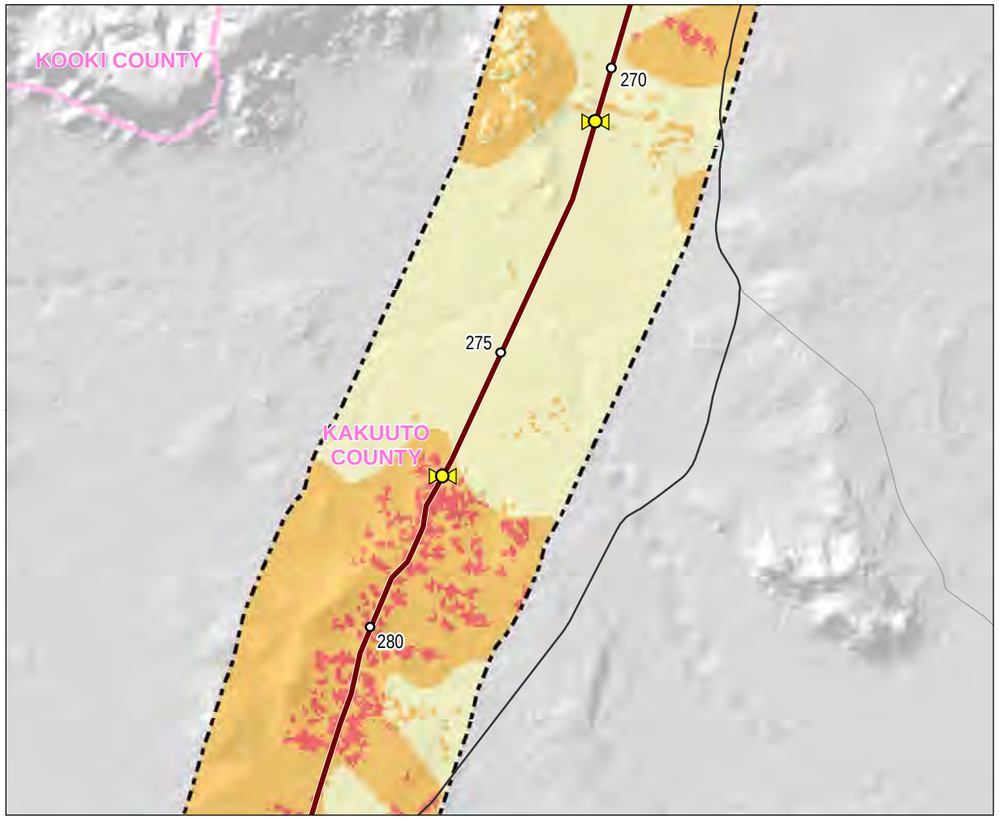
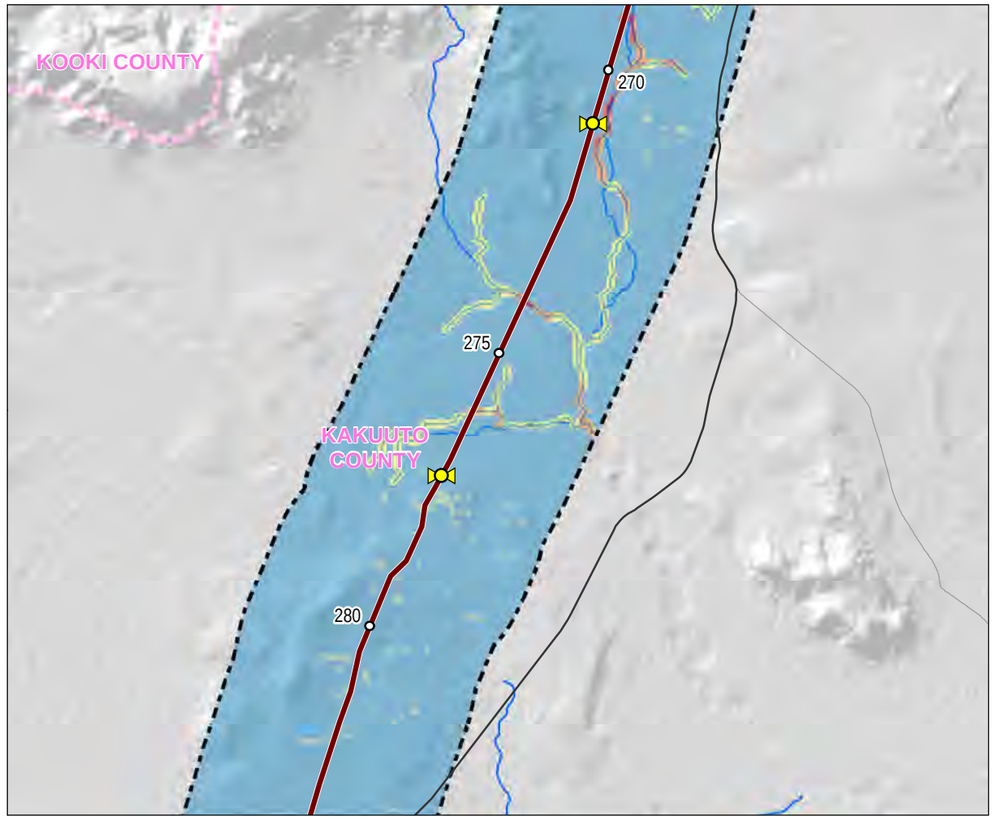
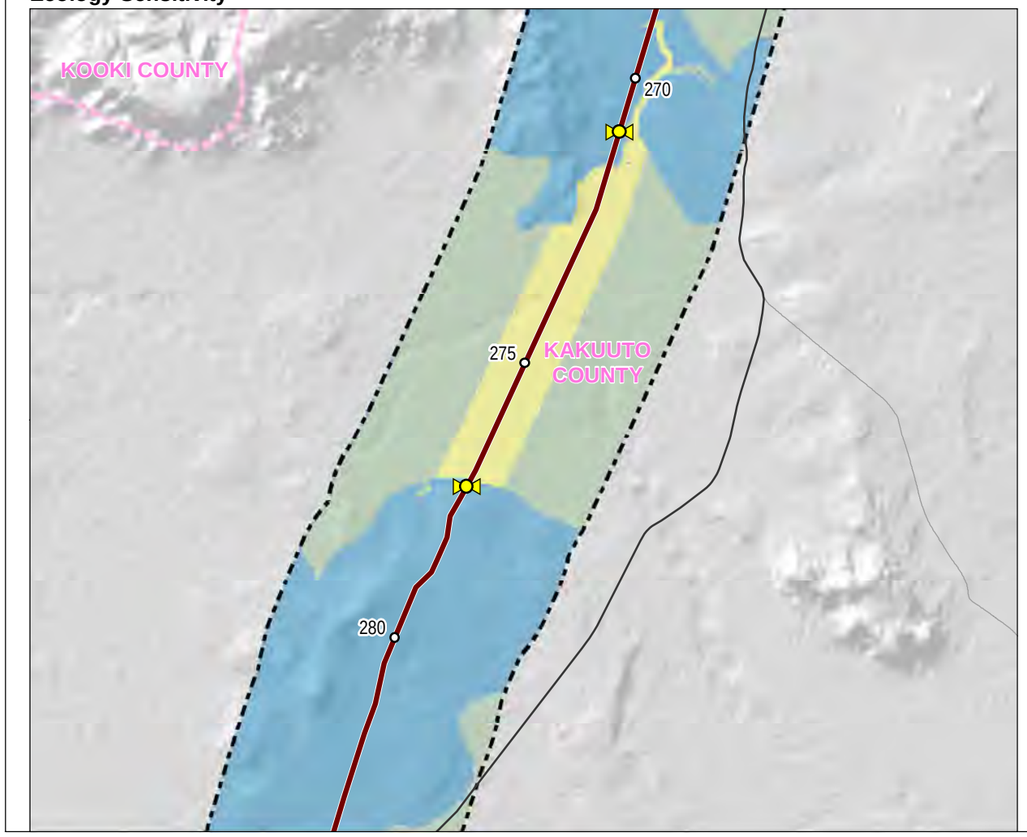
Groundwater Sensitivity



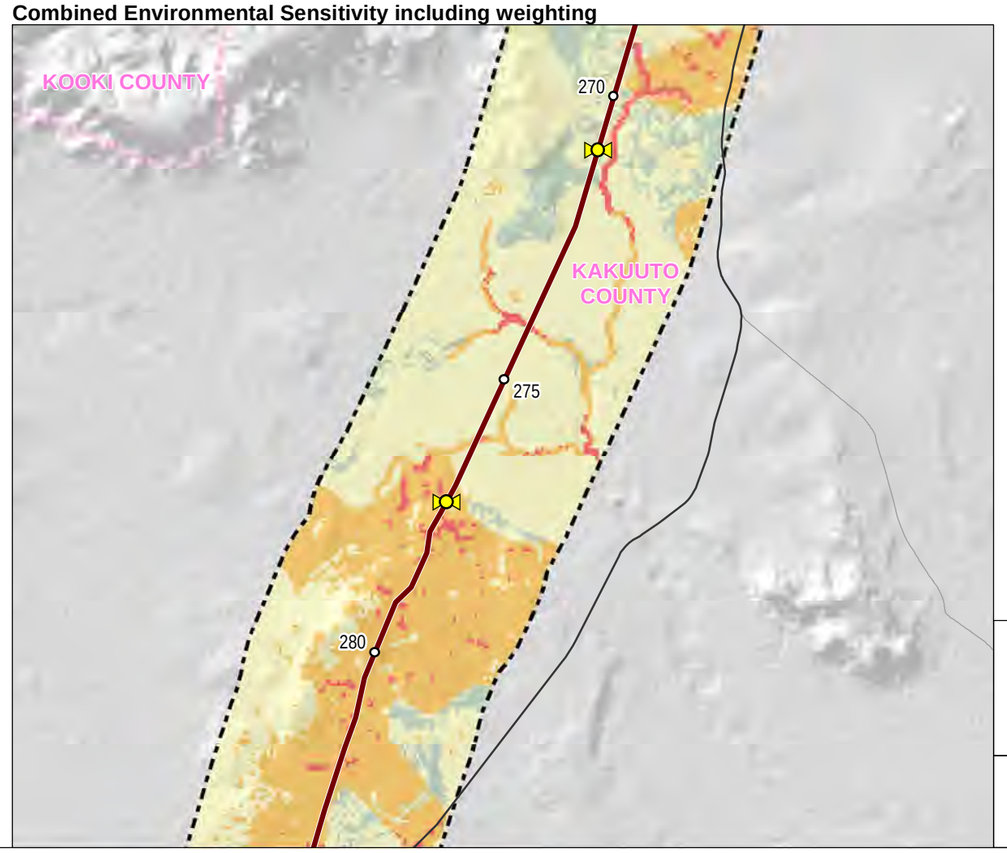
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Main Line Block Valve
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

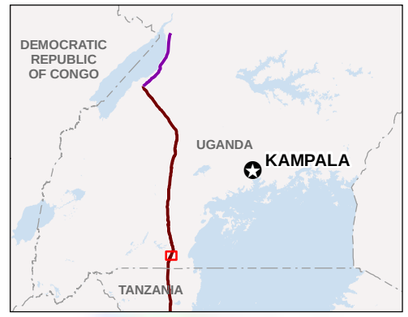
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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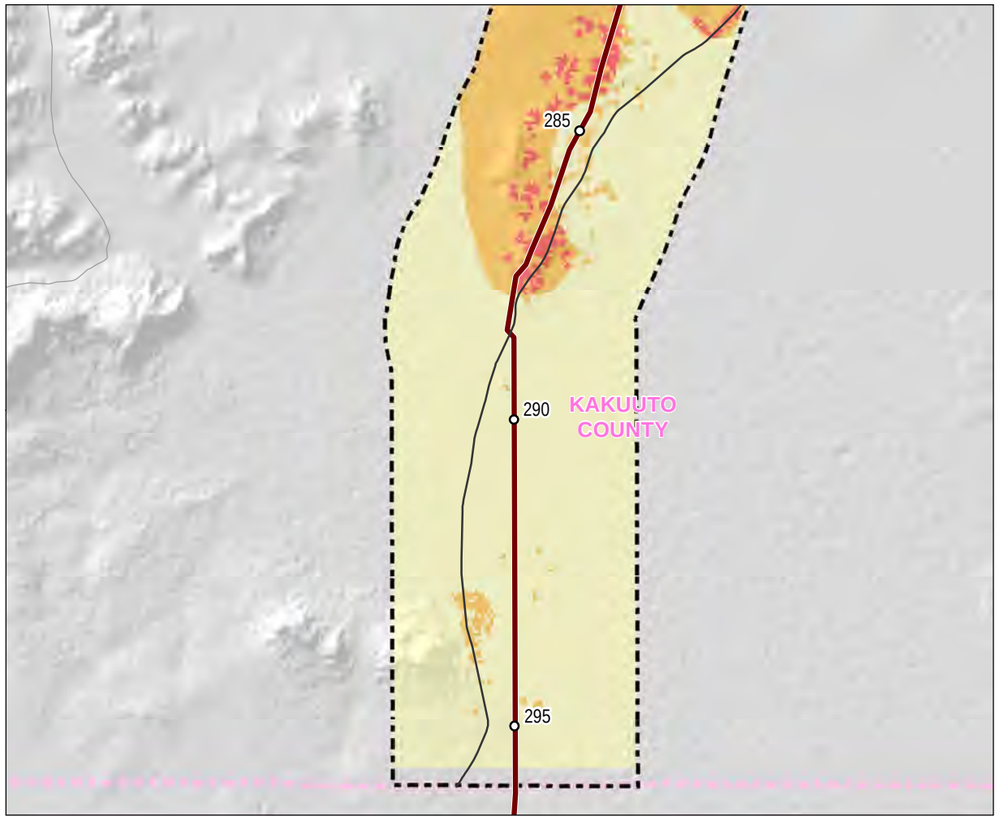
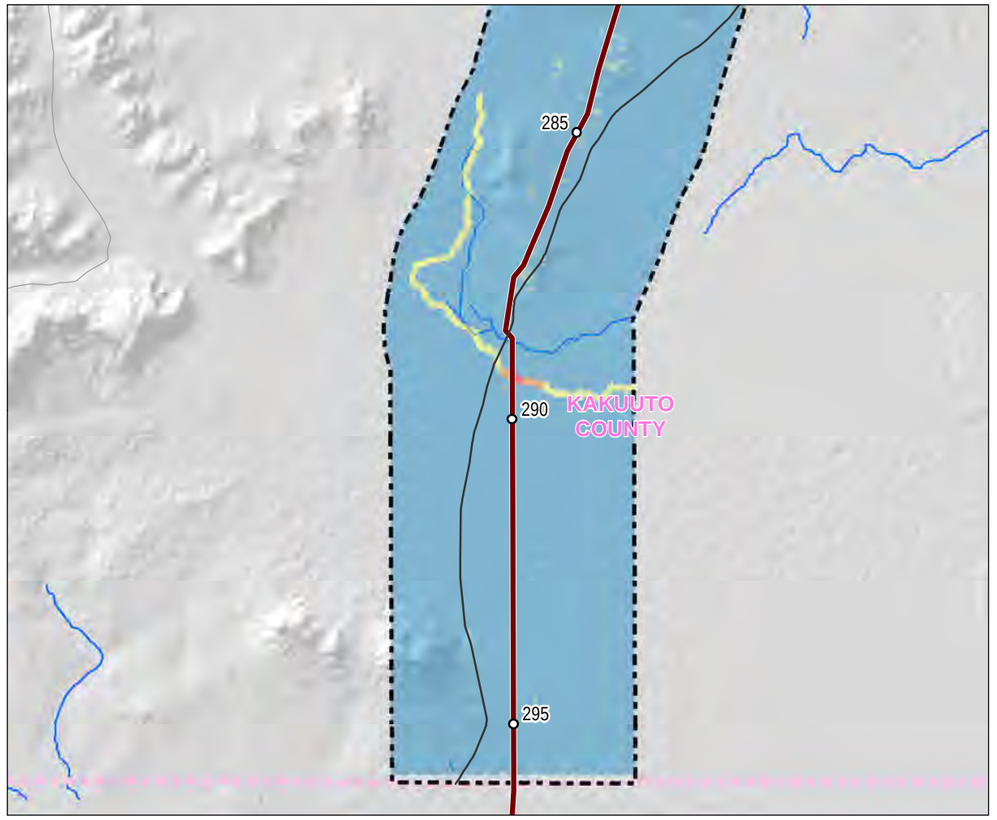
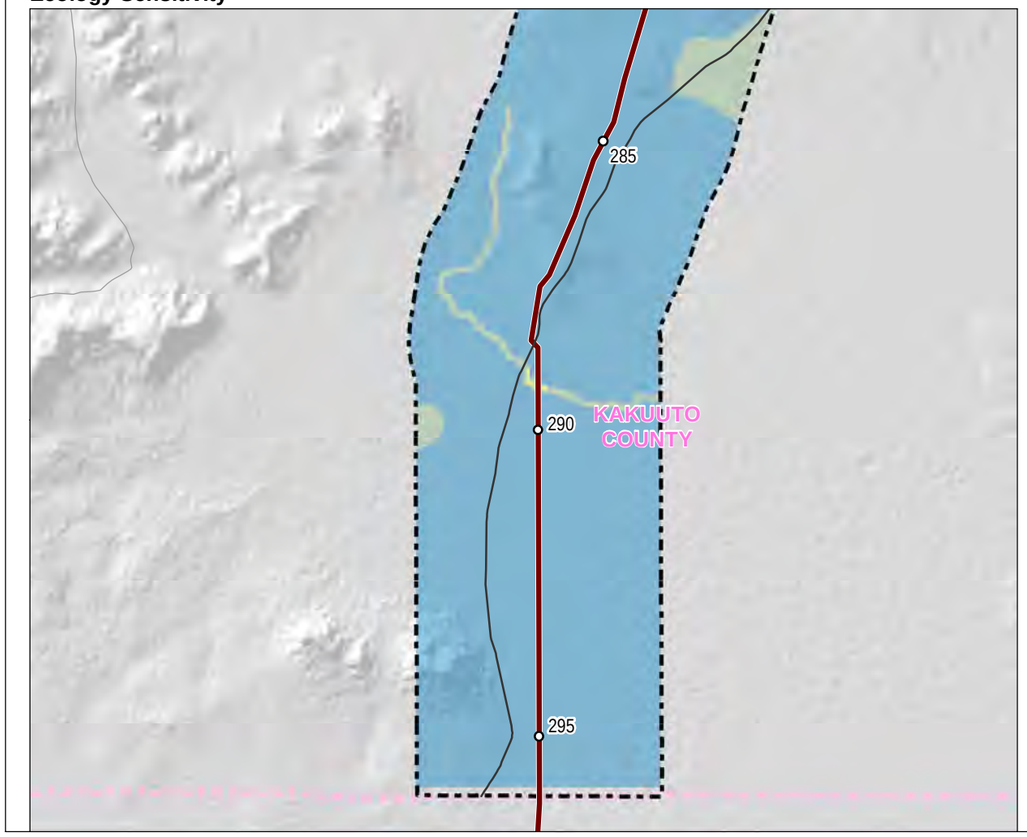
Groundwater Sensitivity



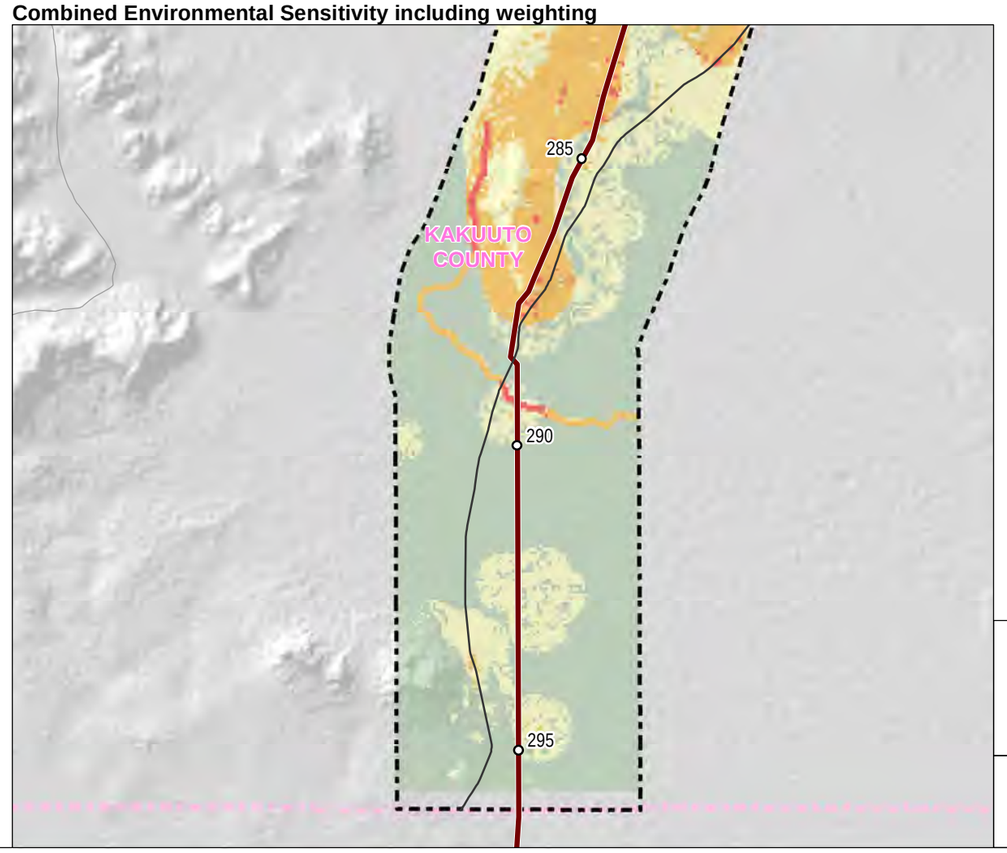
Surface Water Sensitivity



Ecology Sensitivity



Combined Environmental Sensitivity including weighting



Legend

- East African Crude Oil Pipeline
- Tilenga Feeder Pipeline
- Kilometre Point
- Area of Investigation

Settlements:

- National Capital
- District Headquarters
- Town/Settlement

Transportation Infrastructure:

- Highway
- Major Road

Hydrology:

- Watercourse
- Lake

Administrative Area:

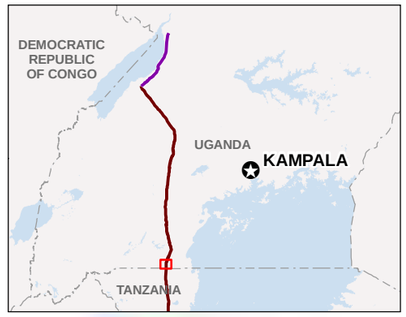
- County Boundary

Environmental Sensitivity

- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**

Weightings for combined sensitivity:
Groundwater Sensitivity 40%
Surface Water Sensitivity 40%
Ecology Sensitivity 20%

Coordinate System: WGS 1984 UTM Zone 36S
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter



CRUDE OIL PIPELINE

0 1 2 3 4 5
Kilometres
SCALE: 1:100,000 @ A3

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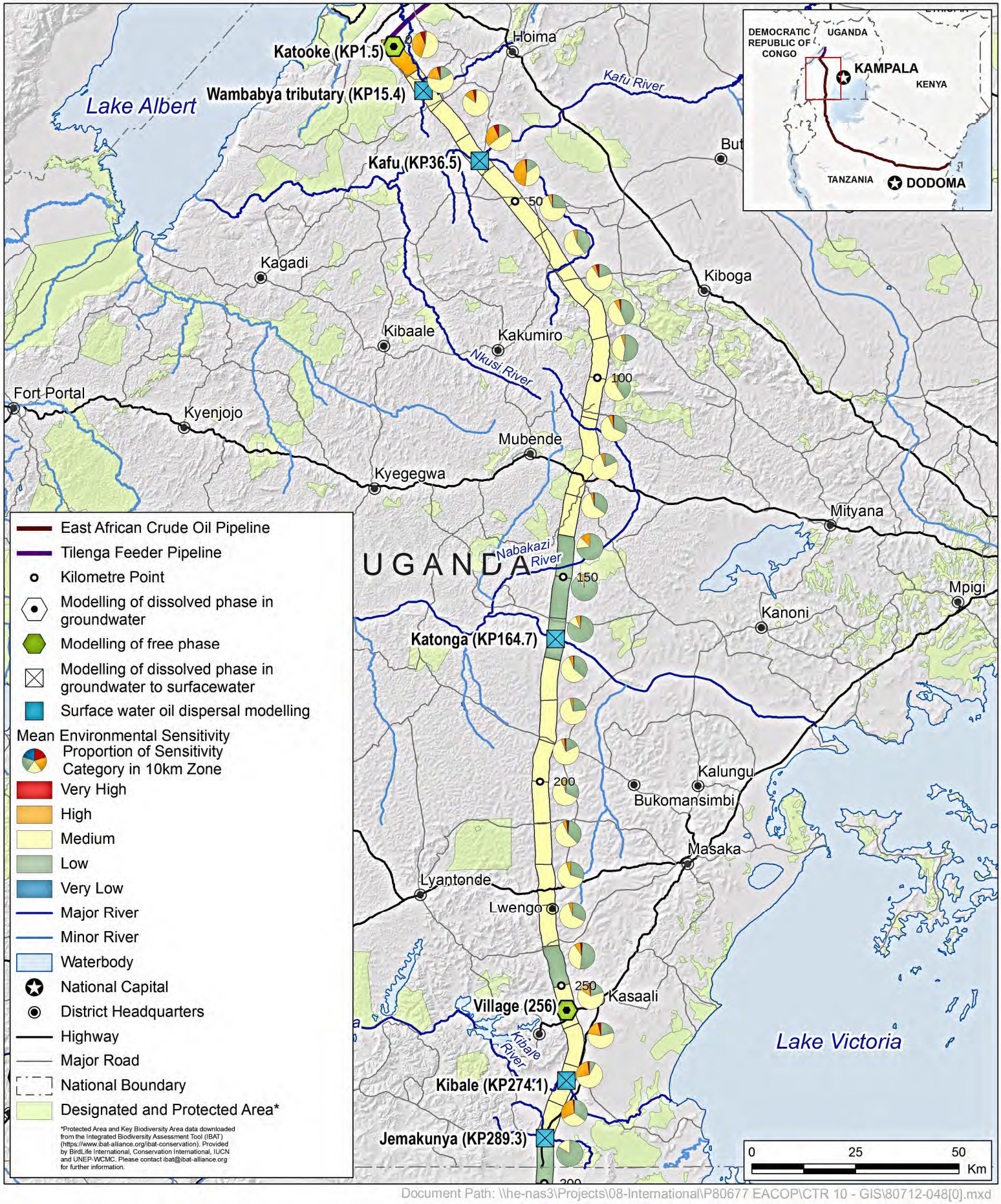
ATTACHMENT I1.6 ENVIRONMENTAL SENSITIVITY SUMMARY



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ATTACHMENT I1.7 DQRA – OIL RELEASE TO LAND – NAPL MODELLING – KP1.5 KATOOKE VILLAGE TRADE CENTRE

Figure AttI1.7-1 Conceptual Site Model

W

E

400m

800m

KP1.5
(1078m)

(single dwelling 65m
from pipeline)

Unnamed river
(1064m)

(Katooke village trade centre ~400m from pipeline) (1081m)

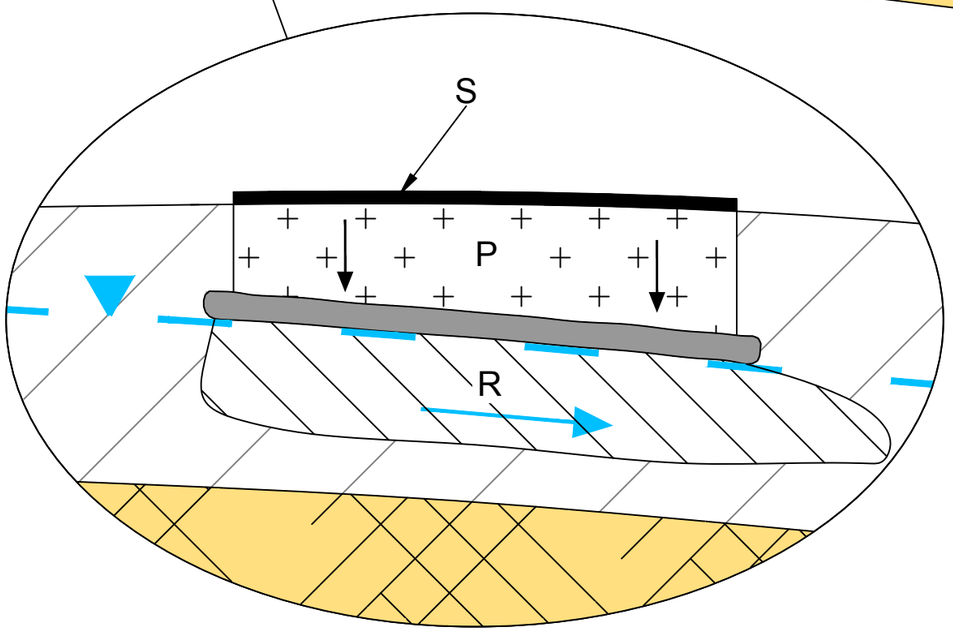
1mbgl

1430m^3 spill at surface

(crops and single dwelings
~590m from the pipeline)

?

?



S: Initial spill on ground surface

P: NAPL migrates vertically through the unsaturated zone leaving residual NAPL in the pores of the loam

R: Excess NAPL reaches water table, by this time the NAPL 'solidifies' as the water temperature is below the NAPL pour point. A dissolved phase plume migrates down hydraulic gradient N.B. the dissolved phase plume is assessed in the dissolved phase modelling

Legend:

- Superficia Deposits: Gritty c ay oam
- Fractured zone in parent rock
- Parent rock: Precambrian gneisses & granite
- Pipe ine
- Vegetation
- Groundwater f ow direction
- ? Potentia sha ow we s
- Water tab e
- (1000m) Groundwater
- Disso ved phase p ume
- so idified NAP be ow pour point temperture
- Residua NAP in pour space

Notes:

- Elevation data taken from Google Earth elevation profile
- Water table assumed at 1mbgl in rainy season in accordance with worst case conditions. In the dry season groundwater would be present in the fractured zone of the bedrock

Title:
Conceptua Site Mode NAP Migration KP1 5 | Katooke Vi age rade Centre

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Table AttI1.7-1 NAPL Model input Parameters for Site KP1.5

NAPL Model input parameters for site KP1.5

Parameter	Value		Source of parameter
Top soil	ACRIC FERRALSOILS Gritty clay loams 3m assumed		Uganda scoping report Section 6. Table 6.3.3. Quote from pg 12 of Hoima District Groundwater Report: *Depths range from 2.4 mbgl to 81 mbgl*
Bedrock and associated weathered material	Basement complex granites and gneisses and schists Depth 3m Thickness is unknown as not encountered		Uganda scoping report Section 6. Table 6.3.3. Page 12 Hoima District Groundwater report
Hydrogeology	General info:	Community well: 1 protected well and 3 shallow wells Community pumps: 1 borehole	UG8-3 Community Inventory Reporting Form Wambabya River and Odong Stream nearby
	Water level (mbgl):	1	No nearby boreholes reported in HYDROCENSUS DATA received 3 8 17 (2)_LA.xls 6-1-RepDist-W4- Hoima- jun12- final V5HS fig 9 has a regional range varying between: First water strike: 3-103.1 m Main water strike 8- 125.7 m Static water level: 15.01-57.28 m All water levels likely to be above bedrock. 6-1-RepDist-W4- Hoima- jun12- final V5HS (Figures 11b, 13b and 15b). Quote from pg 4 of Hoima District Groundwater Report: *Hydraulic conductivity tends to be high in the soil zone, but groundwater is generally not present outside the rainy season.* Table 3 has a minimum depth to static water level of 0m in the region. Used 1m as there are wells in the village nearby. Assume rainy season.
Residual NAPL saturation (-)	Top soil:	0.2	Cohen & Mercer (1993) for lube and heavy fuel oil in soil. Best fit for gritty clay loam soils
	clay layers within superficial deposits (weathered basement):	0.34	There is very limited published data and no data specific to crude oil for clay. Used approx mid range from Cohen & Mercer (1993) for crude oil; range 0.16 - 0.47 in sandstone, 0.26 -0.43 in sandstone, 0.25 - 0.5 in 'petroleum reservoirs' . This is within the range quoted in API Soil and Groundwater Research Bulletin No 9 (2000) for mineral oil in fine to medium

Parameter	Value		Source of parameter
			sand of 0.1 - 0.5
Aquifer porosity (-)	Top soil:	0.4	API Soil and Groundwater Research Bulletin No 9 (2000) value for lube and heavy oil fuel oil in soil. CLEA value for sandy clay loam water filled porosity is 0.37. The value of mid point between the arithmetic mean of a fine gravel (0.28) and clay (0.06) given in McWorter and Sunada (1977) is 0.17 and will be used as the lowest point in the sensitivity analysis.
	clay layers within superficial deposits (weathered basement):	0.47	CLEA clay total/air filled/ water filled 0.59/0.12/0.47 Total porosity fractured/dense crystalline and weathered; ConSim 0.1 – 0.57 Water filled value for clay used

Table AttI1.7-2 LNAPL Mobility Calculation Sheet - KP1.5 Katooke Village Trade Centre

LNAPL Mobility Calculation Sheet - KP1.5 Katooke Village Trade Centre

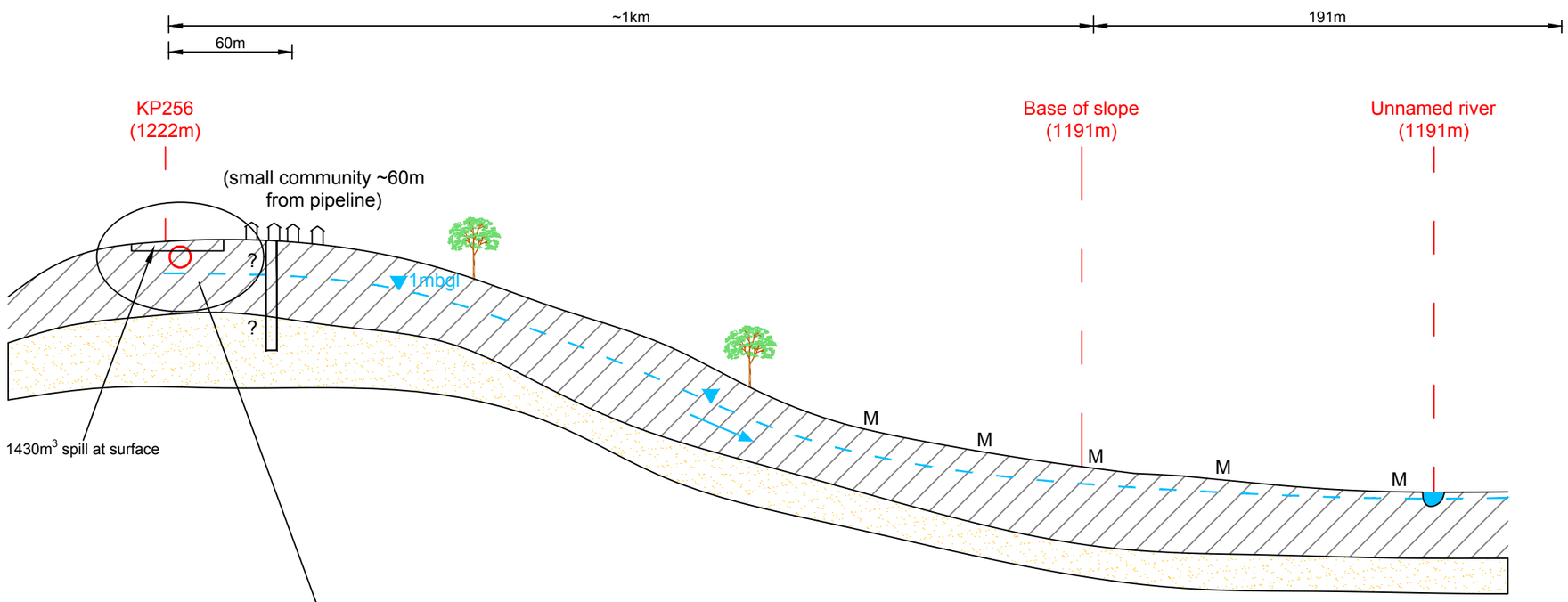
Parameter		Value	Unit	Justification/comment
Input				
source area	area	12658	m2	surface spill of diameter 125m
source thickness	source_thick	0.11	m	on top of ground
calc source volume	source_vol	1392.38	m3	1430m3 total
Depth to water table	wt	1	m bgl	
geology 1		top soil		
n geology 1	n1	0.4	(-)	
r geology 1	r1	0.2	(-)	
depth base geology 1	d1	3	m bgl	
geology 2		clay		
n geology 2	n2	0.47	(-)	
r geology 2	r2	0.34	(-)	
depth base geology 2	d2	60	mbgl	arbritary
geology 3				
n geology 3	n3		(-)	
r geology 3	r3		(-)	
depth base geology 3	d3		mbgl	
Results				
geology 1				
unsaturated thickness beneath spill (m)	unsat_t1	1	m	
max volume it can hold	vol1	1012.64	m3	
		1012640	l	
volume NAPL left at base of unsaturated geology 1	extra_vol1	379.74	m3	reaches watertable
depth extends if unsaturated geology 1		1.375	mbgl	reaches water table
geology 2				
total thickness		57	m	
unsaturated thickness	unsat_t2	0	m	
max unsaturated volume it could hold	vol2	0	m3	
volume NAPL left at unsaturated base	extra_vol2	n/a	m3	doesn't reach unsaturated base of geology 2
depth extends if unsaturated geology 2		0.187734668	m below top of lithology	
		3.187734668	mbgl	reaches water table
geology 3				
total thickness			m	
unsaturated thickness	unsat_t3	0	m	
max unsaturated volume it could hold	vol3	0	m3	
volume NAPL left at unsaturated base	extra_vol3	n/a	m3	doesn't reach unsaturated base of geology 3
depth extends if unsaturated geology 3		n/a	m below top of lithology	
		n/a	mbgl	doesn't reach water table

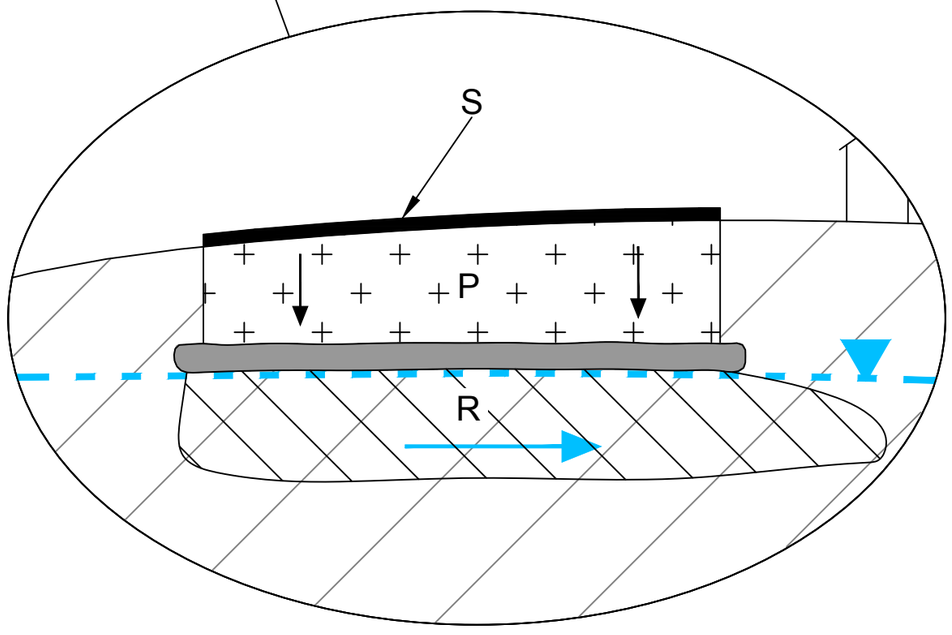
ATTACHMENT I1.8 DQRA – OIL RELEASE TO LAND – NAPL MODELLING – KP256 RAKAI DISTRICT

Figure AttI1.8-1 Conceptual Site Model

NWW

SEE





S: Initial spill on ground surface

P: NAPL migrates vertically through the unsaturated zone leaving residual NAPL in the pores of the loam

R: Excess NAPL reaches water table, by this time the NAPL 'solidifies' as the water temperature is below the NAPL pour point. A dissolved phase plume migrates down hydraulic gradient N.B. the dissolved phase plume is assessed in the dissolved phase modelling

Legend:

- Superficia Deposits: Sandy oams
- Superficia Deposits: Recent river a uvium
- Pipe ine
- Vegetation
- Groundwater f ow direction
- ? Potentia sha ow we
- Water tab e
- (1000m) Ground e evation
- M Marsh and dendritic river system
- Disso ved phase p ume
- so idified NAP be ow pour point temperture
- Residua NAP in pour space

Notes:

- Elevation data taken from Google Earth elevation profile
- Water table assumed at 1mbgl in rainy season in accordance with worst case conditions.

Title:
Conceptua Site Mode NAP Migration KP256 Rakai District

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Table AttI1.8-1 NAPL Model Input Parameters for Site KP256

NAPL Model input parameters for site KP256

Parameter	Value		Source of parameter
Top soil	GLEYSOILS Dark brown sandy loams over dark grey clays NB on edge of ACRIC FERALSOILS (reddish brown clay loams derived from Kargwe-Ankolean Phylites) Assume soils to 3m and clay to depth		Uganda scoping report Section 6. Table 6.3.3.
Bedrock and associated weathered material	Recent river alluvium NB on edge of ACRIC FERALSOILS (reddish brown clay loams derived from Kargwe-Ankolean Phylites)		Uganda scoping report Section 6. Table 6.3.3.
Hydrogeology	General info:	Near to a river/wetland at KP255	Google earth Quote from Rakai District Groundwater Report: *annual average precipitation of 1057mm is estimated for the District. Two rainy seasons, main season – March to May with peak in April and secondary season – September to December with a peak in October/November.* *The main dry season occurs from June to August, secondary dry season is January and February. Within the District, evaporation is greater than rainfall by a factor of ~ 6 during the dry months, June to August. During the main rainy season rainfall is greater or equal to evaporation (Hydroclimatic Report, DWRM 2007 – unpublished).*
	Water level (mbgl):	1	Assume shallow as near to a wetland/river Quote from Rakai District Groundwater Report： *The average First Water Strike is 42m, the strike varies between 3m to 120m ....* *The average main water strike is 44m, varying between 3m to 120m ....* *The average Static Water Level is 23.5m, with values ranging from 2m as the minimum recorded to 70m as the maximum recorded*
Residual NAPL saturation (-)	Top soil:	0.2	Cohen & Mercer (1993) for lube and heavy fuel oil in soil. Best fit for loam soils
	clay layers (river alluvium):	0.34	There is very limited published data and no data specific to crude oil for clay. Used approx mid range from Cohen & Mercer (1993) for crude oil; range 0.16 - 0.47 in sandstone, 0.26 -0.43 in sandstone, 0.25 - 0.5 in 'petroleum reservoirs' . This is within the range quoted in API Soil and Groundwater Research Bulletin No 9 (2000) for mineral oil in fine to medium sand of 0.1 - 0.5
Aquifer porosity	Top soil:	0.4	API Soil and Groundwater Research Bulletin No 9 (2000) value for lube and heavy oil fuel oil in soil. Literature value of mid point between the arithmetic mean of a coarse sand (0.30) and the arithmetic mean of a silt (0.20) from McWorter and Sunada (1977) is 0.25

Parameter	Value		Source of parameter
	clay layers (river alluvium):	0.47	CLEA clay total/air filled/ water filled 0.59/0.12/0.47 Total porosity fractured/dense crystalline and weathered; ConSim 0.1 – 0.57 Effective value for clay used

Table AttI1.8-2 LNAPL Mobility Calculation Sheet - KP256 Rakai District

LNAPL Mobility Calculation Sheet - KP256 Rakai District

Parameter		Value	Unit	Justification/comment
Input				
source area	area	12658	m2	surface spill of diameter 125m
source thickness	source_thick	0.11	m	on top of ground
calc source volume	source_vol	1392.38	m3	1430m3 total
Depth to water table	wt	1	m bgl	
geology 1		top soil		
n geology 1	n1	0.4	(-)	
r geology 1	r1	0.2	(-)	
depth base geology 1	d1	3	m bgl	
geology 2		clay		
n geology 2	n2	0.47	(-)	
r geology 2	r2	0.34	(-)	
depth base geology 2	d2	60	mbgl	arbritary
geology 3				
n geology 3	n3		(-)	
r geology 3	r3		(-)	
depth base geology 3	d3		mbgl	
Results				
geology 1				
unsaturated thickness beneath spill (m)	unsat_t1	1	m	
max volume it can hold	vol1	1012.64	m3	
		1012640	l	
volume NAPL left at base of unsaturated geology 1	extra_vol1	379.74	m3	reaches watertable
depth extends if unsaturated geology 1		1.375	mbgl	reaches water table
geology 2				
total thickness		57	m	
unsaturated thickness	unsat_t2	0	m	
max unsaturated volume it could hold	vol2	0	m3	
volume NAPL left at unsaturated base	extra_vol2	n/a	m3	doesn't reach unsaturated base of geology 2
depth extends if unsaturated geology 2		0.187734668	m below top of lithology	
		3.187734668	mbgl	reaches water table
geology 3				
total thickness			m	
unsaturated thickness	unsat_t3	0	m	
max unsaturated volume it could hold	vol3	0	m3	
volume NAPL left at unsaturated base	extra_vol3	n/a	m3	doesn't reach unsaturated base of geology 3
depth extends if unsaturated geology 3		n/a	m below top of lithology	
		n/a	mbgl	doesn't reach water table

ATTACHMENT I1.9 DQRA – OIL RELEASE TO LAND – GROUNDWATER VECS – KP1.5 KATOOKE VILLAGE TRADE CENTRE

Conceptual Site Model

W

E

400m

800m

KP1.5
(1078m)

(single dwelling 65m
from pipeline)

(Katooke village trade centre ~400m from pipeline) (1081m)

Unnamed river
(1064m)

1mbgl

?

?

Theoretical oil spill at surface due to pipeline rupture 1430m^3 with a pool distance of 127m (spill location generalised for modelling)

(crops and single dwelings
~590m from the pipeline)

Legend:

- Superficia Deposits: Gritty c ay oam
- Fractured zone in parent rock
- Parent Rock: Precambrian gneisses & granite
- Pipe ine
- Vegetation
- Groundwater f ow direction
- ? Potentia sha ow we s
- Water tab e
- (1000m) Ground e evation
- Vertica and atera migration to groundwater
- Oi spi due to pipe rupture

Notes:

- Elevation data taken from Google Earth elevation profile
- Water table assumed at 1mbgl in rainy season in accordance with worst case conditions. In the dry season groundwater would be present in the fractured zone of the bedrock

Title:
Conceptua Site Mode Groundwater Migration To Drinking Water Mode KP1 5 Katooke Vi age rade Centre

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Summary of Input Values Used in RBCA Fate and Transport Model

Summary of Input Values Used in RBCA Fate and Transport Model

Model Description:
Source media: Unsaturated zone soil (depleting source) and dissolved phase source originating from NAPL
Offsite exposure model: Leaching to groundwater and lateral migration to groundwater receptor (i.e. well) down hydraulic gradient from the site

Assumptions
The oil leak fully saturates the soil

		Assumed Representative Conditions Uganda Export Pipeline KP1.5 Hoima - Migration to drinking water source		
Unsaturated Zone Soil Source		**Value**	**Justification**	**Reference**
Depth to top of source	m	0.00	Assuming surface pooling of oil on the surface, with saturated soils present beneath the pool surface	*EACOP Studies*
Thickness of contamination	m	1.00	Thickness of contamination based on NAPL modelling at two locations along the Uganda Export pipeline. As a conservative estimate at KP1.5, the contamination thickness has been limited to the anticipated depth of groundwater (1m).	*Modelled values in OSM*
Length of source	m	127	Spill volume and spread data from worst case spill modelled in DRA, based on a 610mm diameter hole caused by erosion of the pipeline followed by 3rd party line strike. Pool length of 127m and a spill volume of 9000 bbl (1430m^3). Assumed circular pool.	*EACOP Studies*
Width of source	m	127		
Depth to groundwater	m	1.00	Conservative value selected based on static water levels recorded in the Hoima District in the basement complex geology, (static water levels reported to range between 0 m and 57m bgl)	*EACOP Studies*
Unsaturated Zone Properties				
Soil description	-	-	Soils described as gritty clay loam	*EACOP Studies*
Total Porosity in vadose zone	cm3/cm3	0.51	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8.*
Soil bulk density	g/cm3	1.4	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Infiltration rate	mm/yr	177.8	Average annual rainfall for the Hoima region of 1270mm and infiltration is estimated at 7 to 20% of rainfall in Uganda, therefore 14% of 1270mm used as infiltration rate	*Rainfall data and infiltration information from EACOP Studies*
Saturated conductivity	m/d	1.27008	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Aquifer Properties				
Aquifer description	-	-	Groundwater is assumed to be at a depth of 1 mbgl. Therefore, the groundwater is likely to be located within the superficial deposits of gritty clay loam soils. The aquifer properties have been assumed to be the same as those for the unsaturated zone.	*EACOP Studies*
Effective porosity	cm3/cm3	0.17	Literature value of mid point between the arithmetic mean of a fine gravel (0.28) and clay (0.06).	*McWorter and Sunada (1977).*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8.*
Hydraulic conductivity	m/d	1.3	Literature value for loam soils, selected to be consistent with unsaturated zone properties. This value also falls in between the ranges reported by Domenico and Schwartz for gravel and clay soils.	*Standard value included within RBCA default options - based on CLEA value for Loam & Domenico,P.A. and Schwartz,F.W. Physical and Chemical Hydrogeology, Wiley,1990.*
Hydraulic gradient	m/m	0.0175	Gradient based on Google Earth topographic slope from an elevation of 1078m at KP 1.5 along the pipeline route, to an elevation of 1064m at an unnamed river down gradient of KP 1.5 approximately 800m east i.e. 14 m change in elevation over 800m distance = 0.0175	*In the absence of groundwater level data along the pipeline, topographic slope has been used to give an estimate of likely hydraulic gradient*
Capillary Fringe				
Thickness of the capillary fringe	m	0.11	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Air content	-	0.051	Literature value for loam soils	
Water content	-	0.459	Literature value for loam soils	
Degradation - dissolved phase only				
Degradation half lives	-	-	Conservatively assumed anaerobic degradation in the dissolved phase only - Half life values selected based on mid-point of literature range for anaerobic degradation	*Half life values sourced from Howard et al. Handbook of Environmental Degradation Rates (1991). Half life values modified prior to entry into the model to account for no sorbed phase degradation. Modification via multiplication of half life values by contaminant specific calculated retardation factor.*

Half Life Calculation Sheet

Pipeline section	Uganda Export
KP	1.5
Model (GW-DW or GW-SW)	GW-DW
Description of aquifer material	Gritty Clay Loam
FOC data reference	Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value) - Lower end of literature range quoted for loam soil
Bulk density data reference	Standard value included within RBCA default options - based on CLEA value for loam soil
Effective porosity data reference	Literature value of mid point between the arithmetic mean of a fine gravel (0.28) and the arithmetic mean of a clay (0.06)from McWorter and Sunada (1977)

	Log Koc	foc	Kd	Bulk density	Effective porosity	Retardation factor	Anaerobic half life high (hours)	Anaerobic half life low (hours)	Literature t1/2 (Days) (ANAEROBIC)	Adjusted half lives for use in RBCA
Benzene	1.82	0.002	0.13	1.4	0.17	2.09E+00	17280	2688	416	8.69E+02
Toluene	2.15	0.002	0.28	1.4	0.17	3.33E+00	5040	1344	133	4.42E+02
Ethylbenzene	2.31	0.002	0.41	1.4	0.17	4.36E+00	5472	4224	202	8.81E+02
Xylenes	2.11	0.002	0.26	1.4	0.17	3.12E+00	8640	4320	270	8.43E+02
Aliphatics >EC5-EC6 (n-hexane)	2.9	0.002	1.59	1.4	0.17	1.41E+01	17280	2688	416	5.86E+03
Aliphatics >EC6-EC8 (n-heptane)	3.84	0.002	13.84	1.4	0.17	1.15E+02	5040	1344	133	1.53E+04
Aromatics >EC8-EC10 (1,2,4-trimethylbenzene)	2.97	0.002	1.87	1.4	0.17	1.64E+01	2688	672	70	1.15E+03
Aromatics >EC10-12 (naphthalene)	3.19	0.002	3.10	1.4	0.17	2.65E+01	6192	600	141.5	3.75E+03
Aromatics >EC12-16 (2-methynapthalene)	3.36	0.002	4.58	1.4	0.17	3.87E+01	5760	4080	205	7.94E+03

Fill-in yellow cells with literature data relevant to aquifer properties

Use adjusted site specific half lives in RBCA

RBCA Model Input Data Summary for NAPL to Groundwater

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)

Completed By: Cathy Cussell
Date Completed: 19.2.2018

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(m)
h_v	Vadose zone thickness	NA			(m)
ρ_s	Soil bulk density	NA			(g/cm^3)
f_{oc}	Fraction organic carbon	NA			(-)
θ_T	Soil total porosity	NA			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	NA	NA	NA	(-)
θ_a	Volumetric air content	NA	NA	NA	(-)
K_{vs}	Vertical hydraulic conductivity	NA			(m/d)
k_v	Vapor permeability	NA			(m^2)
L_{gw}	Depth to groundwater	NA			(m)
pH	Soil/groundwater pH	NA			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/s)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(m)
A_b	Foundation area	NA	NA	(m^2)
X_{crk}	Foundation perimeter	NA	NA	(m)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crk}	Foundation thickness	NA	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	NA	(m)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(m^3/s)
θ_{wcrack}	Volumetric water content of cracks	NA	NA	(-)
θ_{acrack}	Volumetric air content of cracks	NA	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(mm/yr)
U_{gw}	Groundwater Darcy velocity	***0.02275***	(m/d)
V_{gw}	Groundwater seepage velocity	***0.133823529***	(m/d)
K_s	Saturated hydraulic conductivity	***1.3***	(m/d)
i	Groundwater gradient	***0.0175***	(-)
S_w	Width of groundwater source zone	***127***	(m)
S_d	Depth of groundwater source zone	2	(m)
θ_{eff}	Effective porosity in water-bearing unit	***0.17***	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	***0.002***	(-)
pH_{sat}	Groundwater pH	***7***	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Groundwater to Indoor Air		
α_x	Longitudinal dispersivity	3.3E+0	8.3E+0	NA	NA	(m)
α_y	Transverse dispersivity	3.3E-1	8.3E-1	NA	NA	(m)
α_z	Vertical dispersivity	3.3E-2	8.3E-2	NA	NA	(m)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/s)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

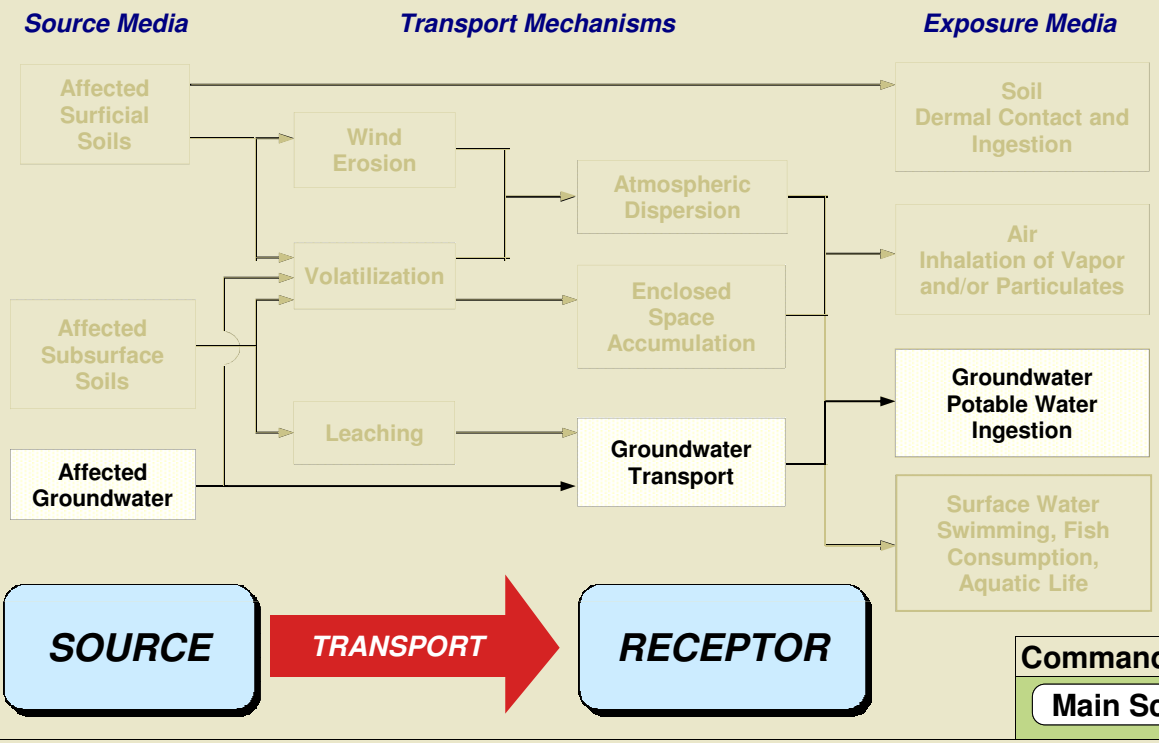
NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA Model Exposure Flowchart for NAPL to Groundwater

Exposure Pathway Flowchart

Site Name: EACOP Uganda Export Pipeline — Job ID: 325171
Location: KP1.5 (NAPL to GW) — Date: 19.2.2018
Compl. By: Cathy Cussell



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	None	None	None
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	None	None
Groundwater Potable Water Ingestion	*MCL*	*MCL*	*MCL*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

RBCA Model Results for NAPL to Groundwater

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 31-Aug-18
Job ID: 325171

Constiuent: Benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

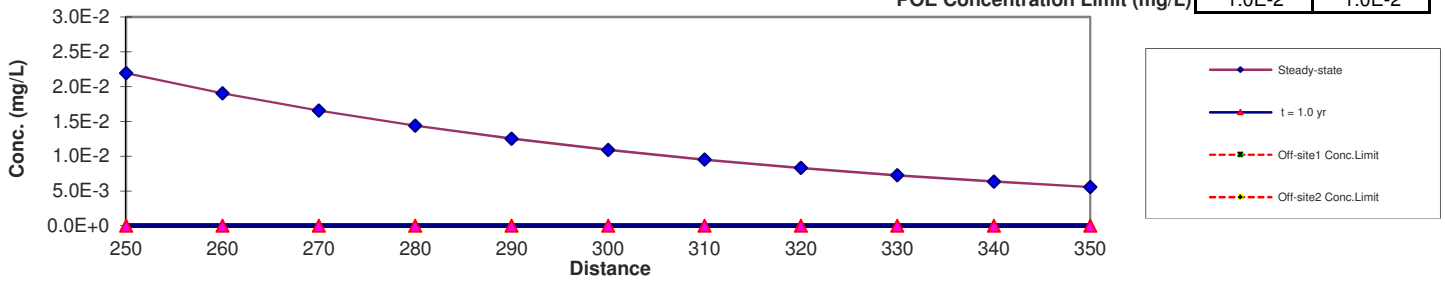
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		250	260	270	280	290	300	310	320	330	340	350
t = 1.0 yr	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state		2.2E-2	1.9E-2	1.7E-2	1.4E-2	1.3E-2	1.1E-2	9.5E-3	8.3E-3	7.2E-3	6.3E-3	5.5E-3

Off-site1	Off-site2
MCL	MCL
60	400
1.3E-3	0.0E+0
4.7E-1	2.9E-3
1.0E-2	1.0E-2

POE Concentration Limit (mg/L)



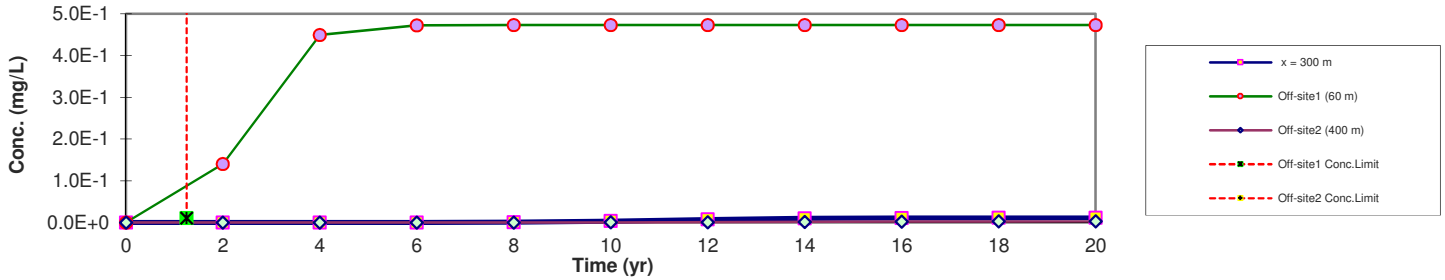
Concentration vs. Time (for given distance from source)

Distance (m) 300

Time (yr)		0	2	4	6	8	10	12	14	16	18	20
x = 300 m	Conc. (mg/L)	0.0E+0	0.0E+0	5.1E-10	9.7E-6	5.5E-4	3.3E-3	7.2E-3	9.6E-3	1.1E-2	1.1E-2	1.1E-2
Off-site1 (60 m)		0.0E+0	1.4E-1	4.5E-1	4.7E-1	4.7E-1	4.7E-1	4.7E-1	4.7E-1	4.7E-1	4.7E-1	4.7E-1
Off-site2 (400 m)		0.0E+0	0.0E+0	4.2E-16	2.2E-9	2.2E-6	7.5E-5	4.8E-4	1.3E-3	2.1E-3	2.5E-3	2.8E-3

Time to Reach Conc. Limit (yr)

Off-site1	1.3
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 31-Aug-18
Job ID: 325171

Constiuent: Toluene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

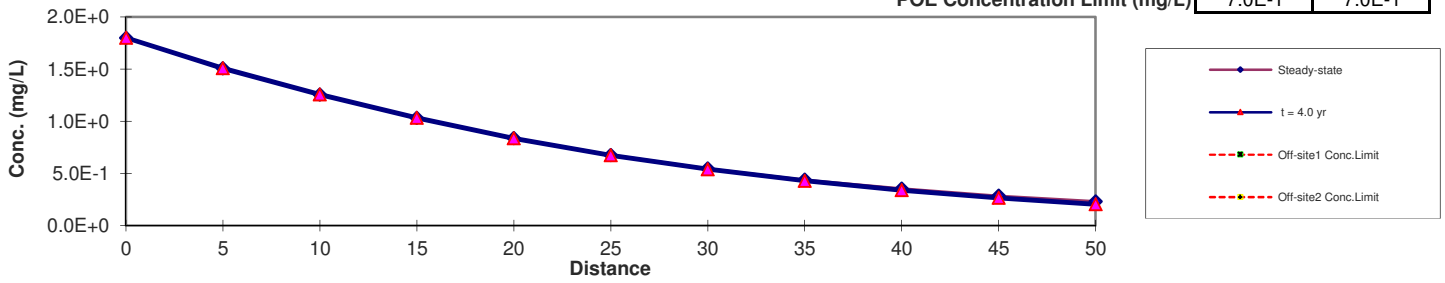
Concentration vs. Distance from Source (for given time)

Time (yr) 4.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 4.0 yr	Conc. (mg/L)	1.8E+0	1.5E+0	1.3E+0	1.0E+0	8.4E-1	6.7E-1	5.4E-1	4.3E-1	3.4E-1	2.6E-1	2.0E-1
Steady-state		1.8E+0	1.5E+0	1.3E+0	1.0E+0	8.4E-1	6.8E-1	5.5E-1	4.4E-1	3.6E-1	2.9E-1	2.3E-1

Off-site1	Off-site2
MCL	MCL
60	400
1.1E-1	0.0E+0
1.5E-1	1.5E-6
7.0E-1	7.0E-1

POE Concentration Limit (mg/L)



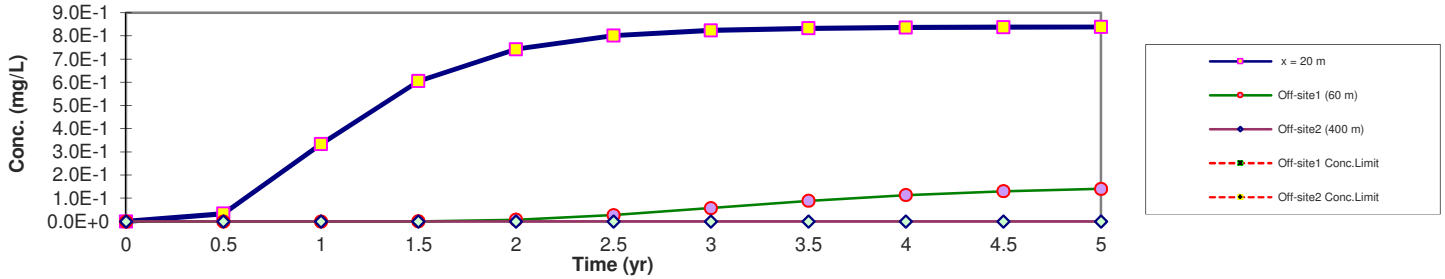
Concentration vs. Time (for given distance from source)

Distance (m) 20

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 20 m	Conc. (mg/L)	0.0E+0	3.3E-2	3.3E-1	6.0E-1	7.4E-1	8.0E-1	8.2E-1	8.3E-1	8.4E-1	8.4E-1	8.4E-1
Off-site1 (60 m)		0.0E+0	3.1E-14	1.9E-6	5.5E-4	7.1E-3	2.7E-2	5.8E-2	8.9E-2	1.1E-1	1.3E-1	1.4E-1
Off-site2 (400 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.7E-22

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.2018
Job ID: 325171

Constiuent: Ethyl benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

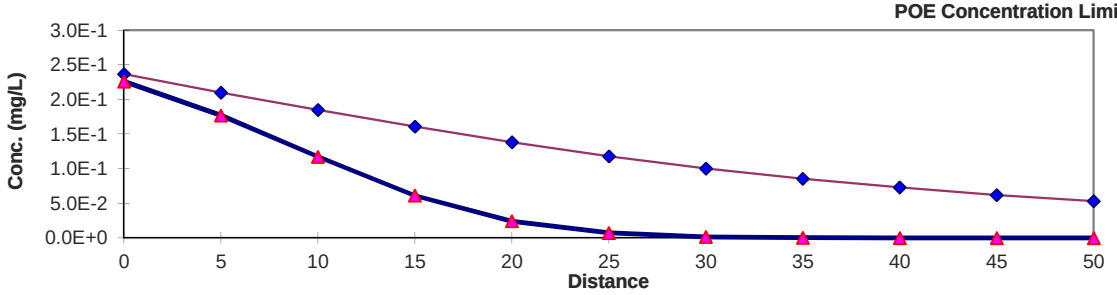
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 1.0 yr	Conc. (mg/L)	2.3E-1	1.8E-1	1.2E-1	6.1E-2	2.4E-2	7.2E-3	1.6E-3	2.8E-4	3.6E-5	3.7E-6	3.0E-7
Steady-state		2.4E-1	2.1E-1	1.8E-1	1.6E-1	1.4E-1	1.2E-1	1.0E-1	8.5E-2	7.3E-2	6.2E-2	5.3E-2

Off-site1	Off-site2
MCL	MCL
60	400
1.0E-9	0.0E+0
3.9E-2	7.7E-6
3.0E-1	3.0E-1

POE Concentration Limit (mg/L)



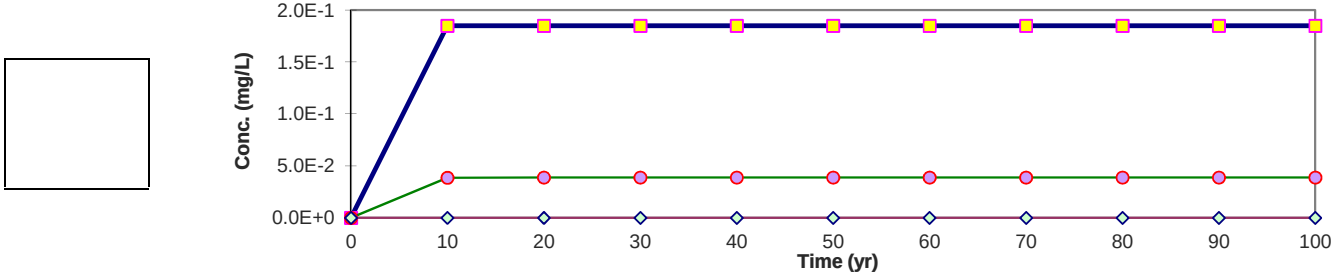
Concentration vs. Time (for given distance from source)

Distance (m) 10

Time (yr)		0	10	20	30	40	50	60	70	80	90	100
x = 10 m	Conc. (mg/L)	0.0E+0	1.8E-1	1.8E-1	1.8E-1	1.8E-1	1.8E-1	1.8E-1	1.8E-1	1.8E-1	1.8E-1	1.8E-1
Off-site1 (60 m)		0.0E+0	3.9E-2	3.9E-2	3.9E-2	3.9E-2	3.9E-2	3.9E-2	3.9E-2	3.9E-2	3.9E-2	3.9E-2
Off-site2 (400 m)		0.0E+0	4.2E-14	4.7E-7	6.0E-6	7.6E-6	7.7E-6	7.7E-6	7.7E-6	7.7E-6	7.7E-6	7.7E-6

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)

Completed By: Cathy Cussell
Date Completed: 31-Aug-18

Job ID: 325171

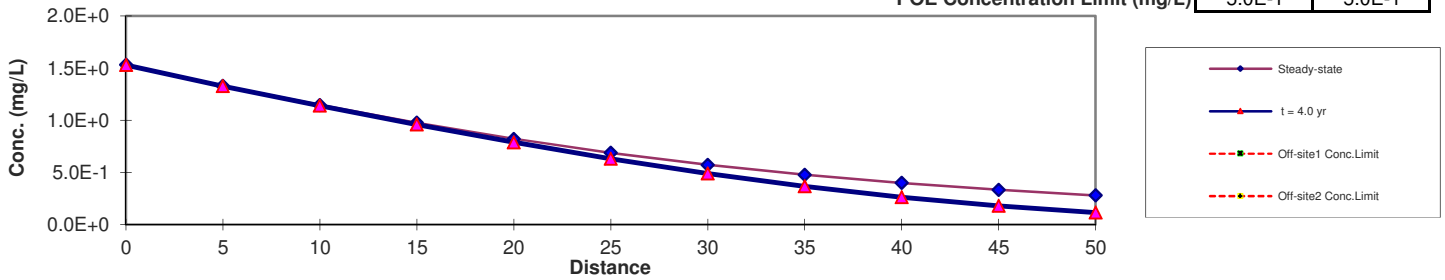
Constiuent: Xylenes (mixed isomers) *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 4.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 4.0 yr	Conc. (mg/L)	1.5E+0	1.3E+0	1.1E+0	9.6E-1	7.9E-1	6.3E-1	4.9E-1	3.7E-1	2.6E-1	1.8E-1	1.2E-1
Steady-state		1.5E+0	1.3E+0	1.1E+0	9.8E-1	8.2E-1	6.9E-1	5.7E-1	4.8E-1	4.0E-1	3.3E-1	2.8E-1

	Off-site1	Off-site2
	MCL	MCL
POE Concentration Limit (mg/L)	60	400
	4.1E-2	0.0E+0
	2.0E-1	1.2E-5
	5.0E-1	5.0E-1

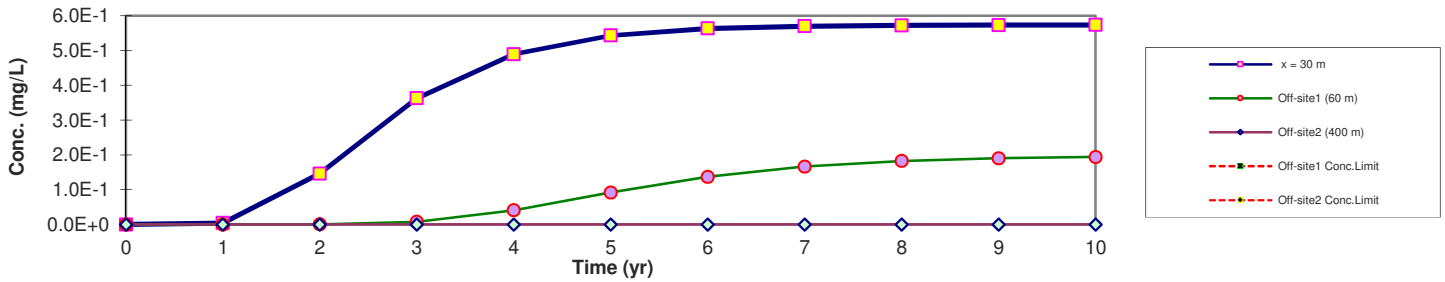


Concentration vs. Time (for given distance from source)

Distance (m) 30

Time (yr)		0	1	2	3	4	5	6	7	8	9	10
x = 30 m	Conc. (mg/L)	0.0E+0	4.0E-3	1.5E-1	3.6E-1	4.9E-1	5.4E-1	5.6E-1	5.7E-1	5.7E-1	5.7E-1	5.7E-1
Off-site1 (60 m)		0.0E+0	2.5E-10	1.4E-4	7.5E-3	4.1E-2	9.2E-2	1.4E-1	1.7E-1	1.8E-1	1.9E-1	1.9E-1
Off-site2 (400 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.4E-20	7.2E-18	9.6E-16

Time to Reach Conc. Limit (yr)	
Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.2018
Job ID: 325171

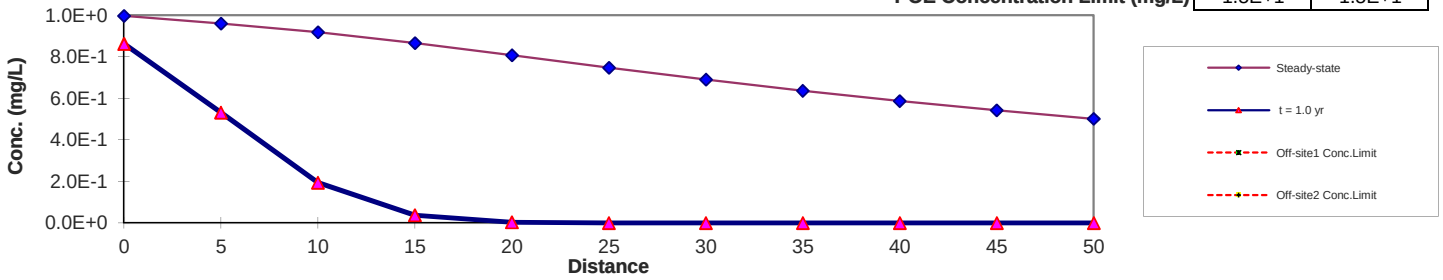
Constiuent: Hexane, n- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 1.0 yr	Conc. (mg/L)	8.6E-1	5.3E-1	1.9E-1	3.8E-2	3.8E-3	2.0E-4	5.8E-6	9.6E-8	9.2E-10	5.4E-12	2.0E-14
Steady-state		1.0E+0	9.6E-1	9.2E-1	8.7E-1	8.1E-1	7.5E-1	6.9E-1	6.4E-1	5.9E-1	5.4E-1	5.0E-1

	Off-site1	Off-site2
	MCL	MCL
POE Concentration Limit (mg/L)	60	400
	0.0E+0	0.0E+0
	4.3E-1	9.9E-3
	1.5E+1	1.5E+1

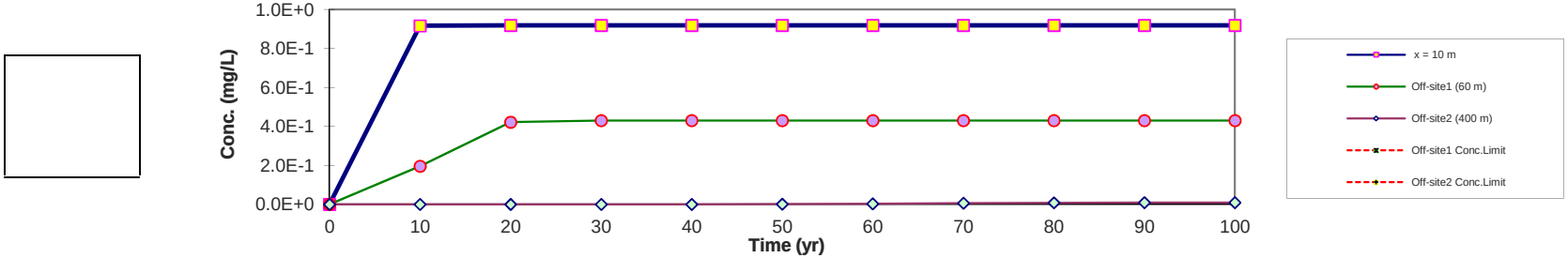


Concentration vs. Time (for given distance from source)

Distance (m) 10

Time (yr)		0	10	20	30	40	50	60	70	80	90	100
x = 10 m	Conc. (mg/L)	0.0E+0	9.2E-1	9.2E-1	9.2E-1	9.2E-1	9.2E-1	9.2E-1	9.2E-1	9.2E-1	9.2E-1	9.2E-1
Off-site1 (60 m)		0.0E+0	2.0E-1	4.2E-1	4.3E-1	4.3E-1	4.3E-1	4.3E-1	4.3E-1	4.3E-1	4.3E-1	4.3E-1
Off-site2 (400 m)		0.0E+0	0.0E+0	5.6E-13	2.2E-7	5.8E-5	8.9E-4	3.4E-3	6.5E-3	8.5E-3	9.4E-3	9.8E-3

Time to Reach Conc. Limit (yr)	
Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.2018
Job ID: 325171

Constiuent: Heptane, n- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

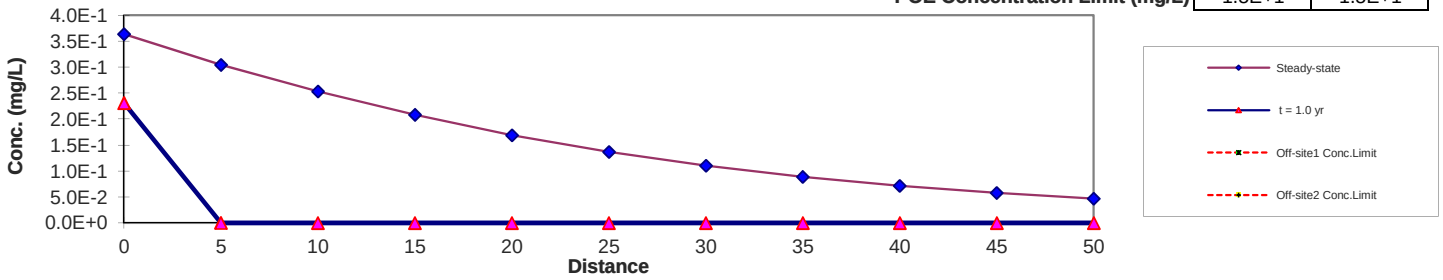
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 1.0 yr	Conc. (mg/L)	2.3E-1	3.3E-4	2.2E-11	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state		3.6E-1	3.0E-1	2.5E-1	2.1E-1	1.7E-1	1.4E-1	1.1E-1	8.9E-2	7.2E-2	5.8E-2	4.7E-2

Off-site1	Off-site2
MCL	MCL
60	400
0.0E+0	0.0E+0
3.1E-2	3.0E-7
1.5E+1	1.5E+1

POE Concentration Limit (mg/L)



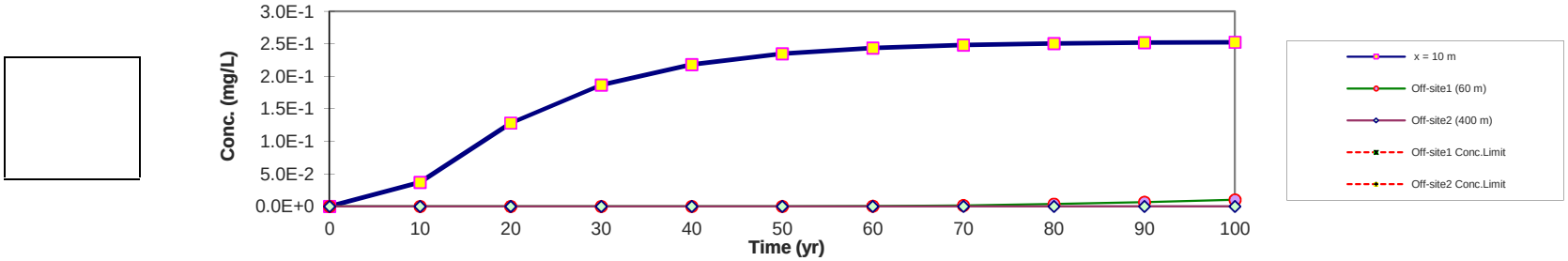
Concentration vs. Time (for given distance from source)

Distance (m) 10

Time (yr)		0	10	20	30	40	50	60	70	80	90	100
x = 10 m	Conc. (mg/L)	0.0E+0	3.7E-2	1.3E-1	1.9E-1	2.2E-1	2.3E-1	2.4E-1	2.5E-1	2.5E-1	2.5E-1	2.5E-1
Off-site1 (60 m)		0.0E+0	0.0E+0	8.0E-13	2.5E-8	3.9E-6	7.2E-5	4.5E-4	1.5E-3	3.6E-3	6.6E-3	1.0E-2
Off-site2 (400 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 31-Aug-18
Job ID: 325171

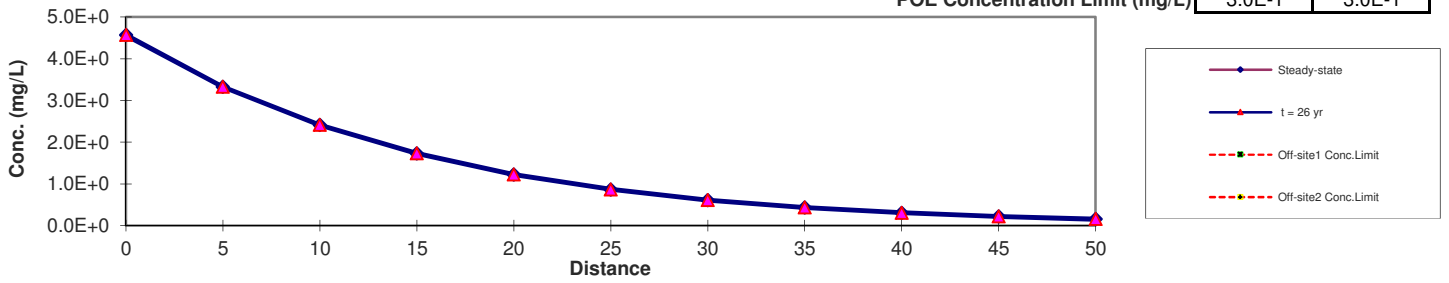
Constiuent: Trimethylbenzene, 1,2,4- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 26.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 26 yr	Conc. (mg/L)	4.6E+0	3.3E+0	2.4E+0	1.7E+0	1.2E+0	8.6E-1	6.1E-1	4.3E-1	3.1E-1	2.2E-1	1.5E-1
Steady-state		4.6E+0	3.3E+0	2.4E+0	1.7E+0	1.2E+0	8.6E-1	6.1E-1	4.3E-1	3.1E-1	2.2E-1	1.5E-1

	Off-site1	Off-site2
	MCL	MCL
	60	400
	7.8E-2	6.1E-22
	7.9E-2	9.6E-10
POE Concentration Limit (mg/L)	3.0E-1	3.0E-1



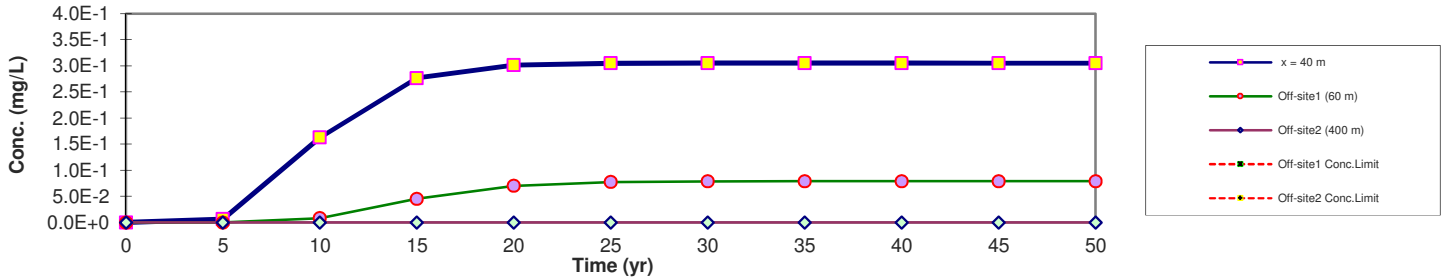
Concentration vs. Time (for given distance from source)

Distance (m) 40

Time (yr)		0	5	10	15	20	25	30	35	40	45	50
x = 40 m	Conc. (mg/L)	0.0E+0	6.3E-3	1.6E-1	2.8E-1	3.0E-1	3.0E-1	3.1E-1	3.1E-1	3.1E-1	3.1E-1	3.1E-1
Off-site1 (60 m)		0.0E+0	3.7E-6	8.0E-3	4.5E-2	7.0E-2	7.7E-2	7.9E-2	7.9E-2	7.9E-2	7.9E-2	7.9E-2
Off-site2 (400 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	6.8E-23	7.8E-19	4.2E-16	3.3E-14	7.4E-13	6.9E-12

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 31-Aug-18
Job ID: 325171

Constiuent: Naphthalene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

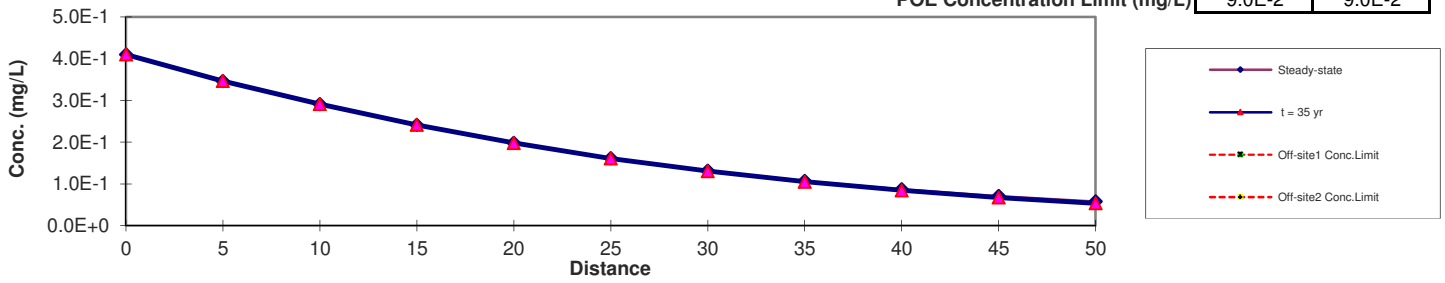
Concentration vs. Distance from Source (for given time)

Time (yr) 35.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 35 yr	Conc. (mg/L)	4.1E-1	3.5E-1	2.9E-1	2.4E-1	2.0E-1	1.6E-1	1.3E-1	1.1E-1	8.4E-2	6.7E-2	5.3E-2
Steady-state		4.1E-1	3.5E-1	2.9E-1	2.4E-1	2.0E-1	1.6E-1	1.3E-1	1.1E-1	8.7E-2	7.1E-2	5.8E-2

Off-site1	Off-site2
MCL	MCL
60	400
3.2E-2	0.0E+0
3.9E-2	6.1E-7
9.0E-2	9.0E-2

POE Concentration Limit (mg/L)



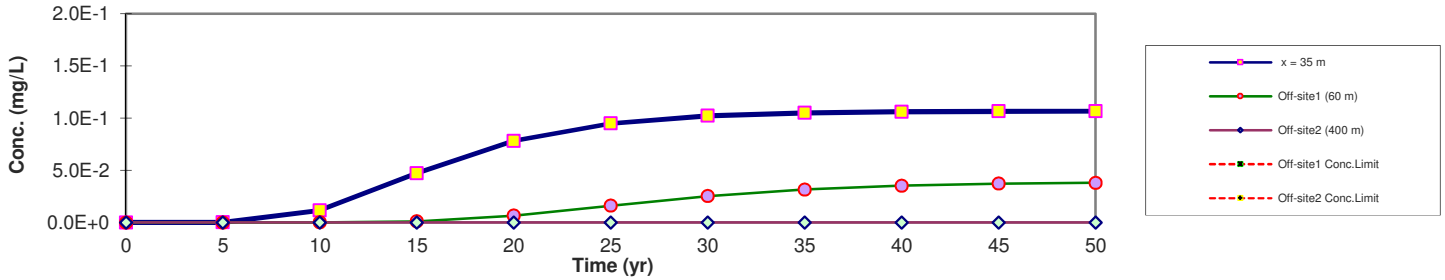
Concentration vs. Time (for given distance from source)

Distance (m) 35

Time (yr)		0	5	10	15	20	25	30	35	40	45	50
x = 35 m	Conc. (mg/L)	0.0E+0	6.3E-5	1.2E-2	4.7E-2	7.8E-2	9.5E-2	1.0E-1	1.1E-1	1.1E-1	1.1E-1	1.1E-1
Off-site1 (60 m)		0.0E+0	9.5E-12	1.4E-5	1.0E-3	6.5E-3	1.6E-2	2.5E-2	3.2E-2	3.5E-2	3.7E-2	3.8E-2
Off-site2 (400 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	3.4E-23	3.5E-20	6.7E-18

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP1.5 (NAPL to GW)

Completed By: Cathy Cussell
Date Completed: 31-Aug-18

Job ID: 325171

Constiuent: Methylnaphthalene, 2- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

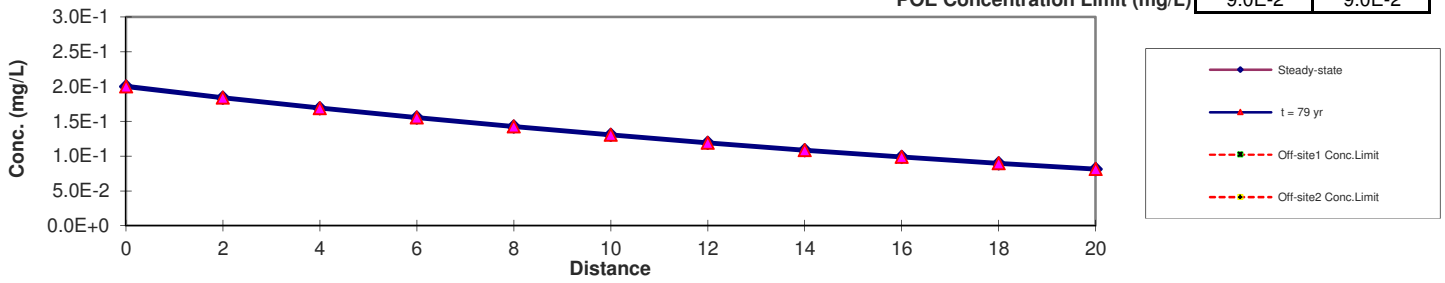
Concentration vs. Distance from Source (for given time)

Time (yr) 79.0

Distance (m)		0	2	4	6	8	10	12	14	16	18	20
t = 79 yr	Conc. (mg/L)	2.0E-1	1.8E-1	1.7E-1	1.6E-1	1.4E-1	1.3E-1	1.2E-1	1.1E-1	9.9E-2	8.9E-2	8.1E-2
Steady-state		2.0E-1	1.8E-1	1.7E-1	1.6E-1	1.4E-1	1.3E-1	1.2E-1	1.1E-1	9.9E-2	9.0E-2	8.1E-2

Off-site1	Off-site2
MCL	MCL
60	400
7.7E-3	0.0E+0
1.1E-2	2.0E-8
9.0E-2	9.0E-2

POE Concentration Limit (mg/L)



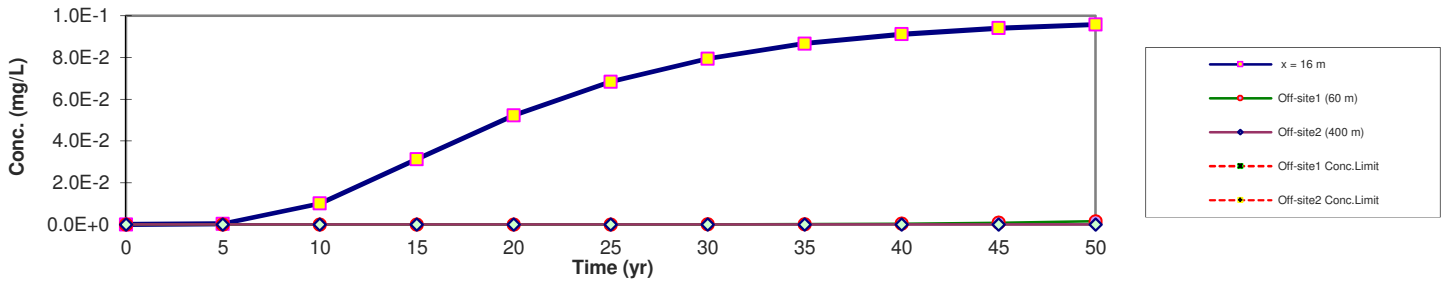
Concentration vs. Time (for given distance from source)

Distance (m) 16

Time (yr)		0	5	10	15	20	25	30	35	40	45	50
x = 16 m	Conc. (mg/L)	0.0E+0	2.7E-4	1.0E-2	3.1E-2	5.2E-2	6.8E-2	7.9E-2	8.7E-2	9.1E-2	9.4E-2	9.6E-2
Off-site1 (60 m)		0.0E+0	0.0E+0	1.2E-16	6.4E-11	4.0E-8	1.7E-6	2.0E-5	1.0E-4	3.4E-4	8.0E-4	1.5E-3
Off-site2 (400 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA

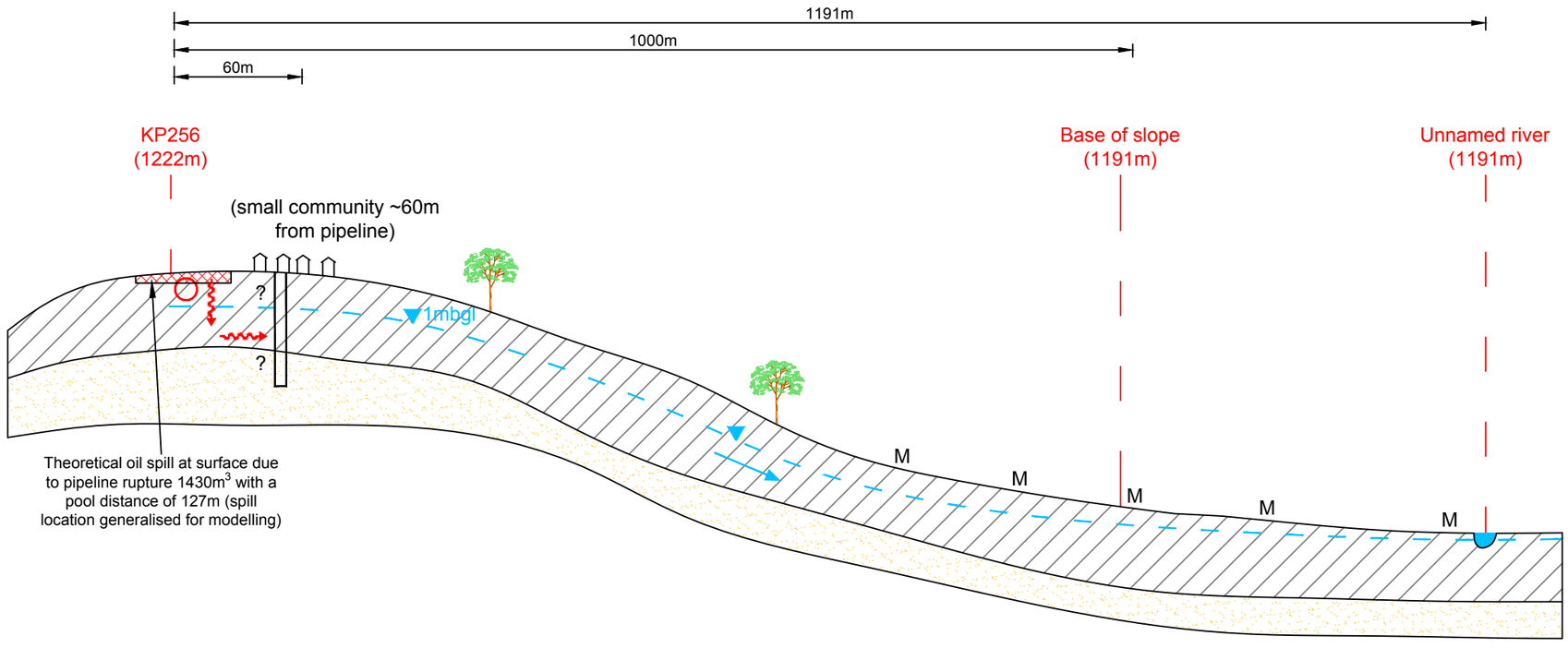


ATTACHMENT I1.10 DQRA – OIL RELEASE TO LAND – GROUNDWATER VECS – KP256 RAKAI DISTRICT

Conceptual Site Model

NWW

SEE



Legend:

- Superficia Deposits: Sandy oams
- Parent Rock: Recent river a uvium
- Pipe ine
- Vegetation
- Groundwater f ow direction
- ? Potentia sha ow we
- Water tab e
- (1000m) Ground e evation
- M Marsh and dendritic river system
- Oi spi due to pipe rupture
- Vertica and atera migration to groundwater

Notes:

- Elevation data taken from Google Earth elevation profile
- Water table assumed at 1mbgl in rainy season in accordance with worst case conditions.

Title:
Conceptua Site Mode Groundwater Migration
To Drinking Water Mode KP256 Rakai District

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Summary of Input Values Used in RBCA Fate and Transport Model

Summary of Input Values Used in RBCA Fate and Transport Model

Model Description:
Source media: Unsaturated zone soil (depleting source) and dissolved phase source originating from NAPL
Offsite exposure model: Leaching to groundwater and lateral migration to groundwater receptor (i.e. well) down hydraulic gradient from the site

Assumptions
The oil leak fully saturates the soil

		Assumed Representative Conditions Uganda Export Pipeline KP256 Rakai - Migration to drinking water source		
Unsaturated Zone Soil Source		**Value**	**Justification**	**Reference**
Depth to top of source	m	0.00	Assuming surface pooling of oil on the surface, with saturated soils present beneath the pool surface	*EACOP Studies*
Thickness of contamination	m	1.00	Thickness of contamination based on NAPL modelling at two locations along the Uganda Export pipeline. As a conservative estimate at KP256, the contamination thickness has been limited to the anticipated depth of groundwater (1m).	*Modelled values in OSM*
Length of source	m	127	Spill volume and spread data from worst case spill modelled in DRA, based on a 610mm diameter hole caused by erosion of the pipeline followed by 3rd party line strike. Pool length of 127m and a spill volume of 9000 bbl (1430m^3). Assumed circular pool.	*EACOP Studies*
Width of source	m	127		
Depth to groundwater	m	1.00	Conservative value selected based on static water levels recorded in the Rakai District, (static water levels reported to range between 1m and 96m bgl)	*EACOP Studies*
Unsaturated Zone Properties				
Soil description	-	-	Soils described as sandy loam	*EACOP Studies*
Total Porosity in vadose zone	cm3/cm3	0.51	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8.*
Soil bulk density	g/cm3	1.4	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Infiltration rate	mm/yr	128.10	Average annual rainfall for the Rakai region of 915mm and infiltration is estimated at 7 to 20% of rainfall in Uganda, therefore 14% of 915mm used as infiltration rate	*Rainfall data and infiltration information from EACOP Studies*
Saturated conductivity	m/d	1.27008	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Aquifer Properties				
Aquifer description	-	-	Groundwater is assumed to be at a depth of 1 mbgl. Therefore, the groundwater is likely to be located within the superficial deposits of sandy loam soils. The aquifer properties have been assumed to be the same as those for the unsaturated zone.	*EACOP Studies*
Effective porosity	cm3/cm3	0.25	Literature value of mid point between the arithmetic mean of a coarse sand (0.30) and the arithmetic mean of a silt (0.20)	*McWorter and Sunada (1977).*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Rifai, H.S. and Hopkins,L.P., 1996; Natural attenuation toolbox. Dept. Env. Sci. Eng.*
Hydraulic conductivity	m/d	1.27	Literature value for loam soils, selected to be consistent with unsaturated zone properties. This value also falls in the ranges reported by Domenico and Schwartz for sand and silt soils.	*Standard value included within RBCA default options - based on CLEA value for Loam & Domenico,P.A. and Schwartz,F.W. Physical and Chemical Hydrogeology, Wiley,1990.*
Hydraulic gradient	m/m	0.031	Gradient based on Google Earth topographic slope from an elevation of 1222m at KP 256 along the pipeline route, to an elevation of 1191m at the base of the slope down gradient of the site located approximately 1km south east, east, i.e. 31 m change in elevation over 1km distance = 0.031	*In the absence of groundwater level data along the pipeline, topographic slope has been used to give an estimate of likely hydraulic gradient*
Capillary Fringe				
Thickness of the capillary fringe	m	0.11	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Air content	-	0.051	Literature value for loam soils	
Water content	-	0.459	Literature value for loam soils	
Degradation - dissolved phase only				
Degradation half lives	-	-	Conservatively assumed anaerobic degradation in the dissolved phase only - Half life values selected based on mid-point of literature range for anaerobic degradation	*Half life values sourced from Howard et al. Handbook of Environmental Degradation Rates (1991). Half life values modified prior to entry into the model to account for no sorbed phase degradation. Modification via multiplication of half life values by contaminant specific calculated retardation factor.*

Half Life Calculation Sheet

Pipeline section	Uganda Export
KP	256
Model (GW-DW or GW-SW)	GW-DW
Description of aqiuifer material	Sandy Loam
FOC data reference	Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value) - Lower end of literature range quoted for loam soil
Bulk density data reference	Standard value included within RBCA default options - based on CLEA value for loam soil
Effective porosity data reference	Literature value of mid point between the arithmetic mean of a coarse sand (0.30) and the arithmetic mean of a silt (0.20)from McWorter and Sunada (1977)

	Log Koc	foc	Kd	Bulk density	Effective porosity	Retardation factor	Anaerobic half life high (hours)	Anaerobic half life low (hours)	Literature t1/2 (Days) (ANAEROBIC)	Adjusted half lives for use in RBCA
Benzene	1.82	0.002	0.13	1.4	0.25	1.74E+00	17280	2688	416	7.24E+02
Toluene	2.15	0.002	0.28	1.4	0.25	2.58E+00	5040	1344	133	3.43E+02
Ethylbenzene	2.31	0.002	0.41	1.4	0.25	3.29E+00	5472	4224	202	6.64E+02
Xylenes	2.11	0.002	0.26	1.4	0.25	2.44E+00	8640	4320	270	6.60E+02
Aliphatics >EC5-EC6 (n-hexane)	2.9	0.002	1.59	1.4	0.25	9.90E+00	17280	2688	416	4.12E+03
Aliphatics >EC6-EC8 (n-heptane)	3.84	0.002	13.84	1.4	0.25	7.85E+01	5040	1344	133	1.04E+04
Aromatics >EC8-EC10 (1,2,4-trimethylbenzene)	2.97	0.002	1.87	1.4	0.25	1.15E+01	2688	672	70	8.02E+02
Aromatics >EC10-12 (naphthalene)	3.19	0.002	3.10	1.4	0.25	1.83E+01	6192	600	141.5	2.60E+03
Aromatics >EC12-16 (2-methynapthalene)	3.36	0.002	4.58	1.4	0.25	2.67E+01	5760	4080	205	5.46E+03

Fill-in yellow cells with literature data relevant to aquifer properties

Use adjusted site specific half lives in RBCA

RBCA Model Input Data Summary for NAPL to Groundwater

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)

Completed By: Cathy Cussell
Date Completed: 19.2.18

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(m)
h_v	Vadose zone thickness	NA			(m)
ρ_s	Soil bulk density	NA			(g/cm^3)
f_{oc}	Fraction organic carbon	NA			(-)
θ_T	Soil total porosity	NA			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	NA	NA	NA	(-)
θ_a	Volumetric air content	NA	NA	NA	(-)
K_{vs}	Vertical hydraulic conductivity	NA			(m/d)
k_v	Vapor permeability	NA			(m^2)
L_{gw}	Depth to groundwater	NA			(m)
pH	Soil/groundwater pH	NA			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/s)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(m)
A_b	Foundation area	NA	NA	(m^2)
X_{crk}	Foundation perimeter	NA	NA	(m)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crk}	Foundation thickness	NA	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	NA	(m)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(m^3/s)
θ_{wcrack}	Volumetric water content of cracks	NA	NA	(-)
θ_{acrack}	Volumetric air content of cracks	NA	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(mm/yr)
U_{gw}	Groundwater Darcy velocity	***0.03937***	(m/d)
V_{gw}	Groundwater seepage velocity	***0.15748***	(m/d)
K_s	Saturated hydraulic conductivity	***1.27***	(m/d)
i	Groundwater gradient	***0.031***	(-)
S_w	Width of groundwater source zone	***127***	(m)
S_d	Depth of groundwater source zone	2	(m)
θ_{eff}	Effective porosity in water-bearing unit	***0.25***	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	***0.002***	(-)
pH_{sat}	Groundwater pH	***7***	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Groundwater to Indoor Air		
α_x	Longitudinal dispersivity	3.3E+0	9.1E+0	NA	NA	(m)
α_y	Transverse dispersivity	3.3E-1	9.1E-1	NA	NA	(m)
α_z	Vertical dispersivity	3.3E-2	9.1E-2	NA	NA	(m)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/s)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

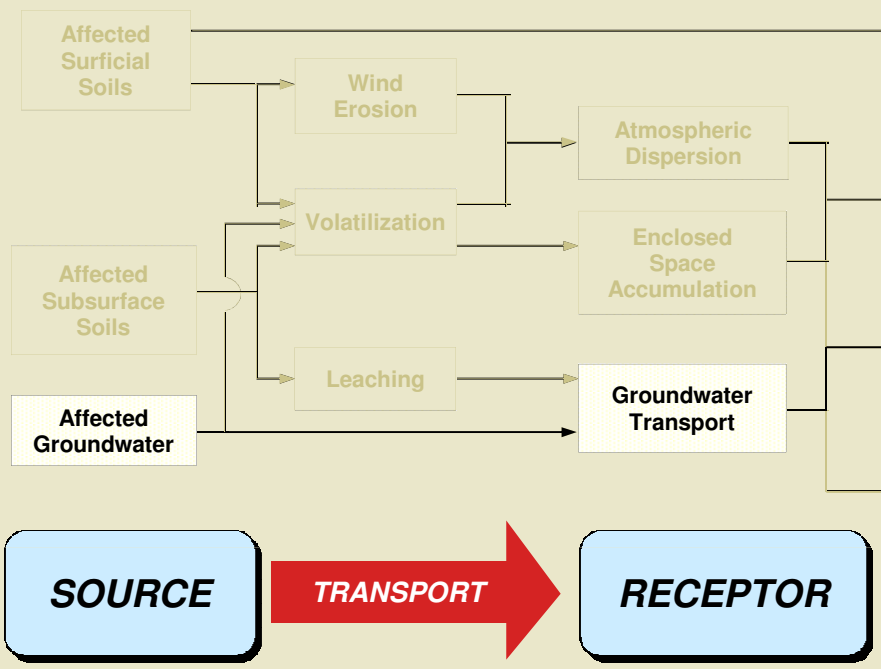
NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA Model Exposure Flowchart for NAPL to Groundwater

Exposure Pathway Flowchart

Site Name: EACOP Uganda Export Pipeline — Job ID: 325171
Location: KP256 - (NAPL to GW) — Date: 19.2.18
Compl. By: Cathy Cussell



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	None	None	None
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	None	None
Groundwater Potable Water Ingestion	*MCL*	*MCL*	*MCL*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

RBCA Model Results for NAPL to Groundwater

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)

Completed By: Cathy Cussell
Date Completed: 31-Aug-18

Job ID: 325171

Constiuent: Benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

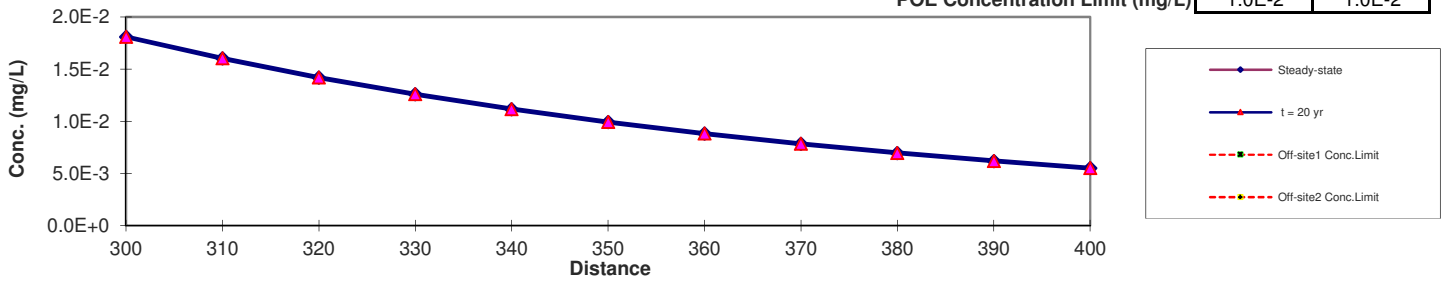
Concentration vs. Distance from Source (for given time)

Time (yr) 20.0

Distance (m)		300	310	320	330	340	350	360	370	380	390	400
t = 20 yr	Conc. (mg/L)	1.8E-2	1.6E-2	1.4E-2	1.3E-2	1.1E-2	9.9E-3	8.8E-3	7.8E-3	7.0E-3	6.2E-3	5.5E-3
Steady-state		1.8E-2	1.6E-2	1.4E-2	1.3E-2	1.1E-2	9.9E-3	8.8E-3	7.8E-3	7.0E-3	6.2E-3	5.5E-3

Off-site1	Off-site2
MCL	MCL
60	500
5.2E-1	1.8E-3
5.2E-1	1.8E-3
1.0E-2	1.0E-2

POE Concentration Limit (mg/L)



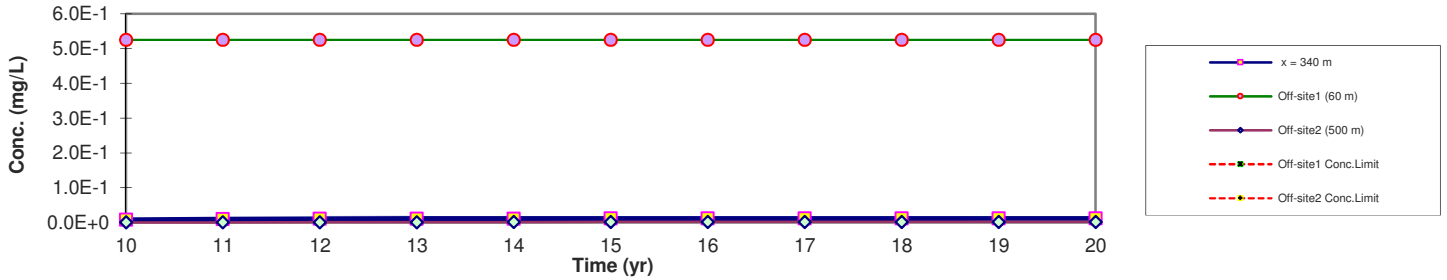
Concentration vs. Time (for given distance from source)

Distance (m) 340

Time (yr)		10	11	12	13	14	15	16	17	18	19	20
x = 340 m	Conc. (mg/L)	7.9E-3	9.5E-3	1.0E-2	1.1E-2	1.1E-2	1.1E-2	1.1E-2	1.1E-2	1.1E-2	1.1E-2	1.1E-2
Off-site1 (60 m)		5.2E-1	5.2E-1	5.2E-1	5.2E-1	5.2E-1	5.2E-1	5.2E-1	5.2E-1	5.2E-1	5.2E-1	5.2E-1
Off-site2 (500 m)		1.4E-4	3.3E-4	6.2E-4	9.3E-4	1.2E-3	1.4E-3	1.6E-3	1.7E-3	1.7E-3	1.7E-3	1.8E-3

Time to Reach Conc. Limit (yr)

Off-site1	0.9
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 31-Aug-18
Job ID: 325171

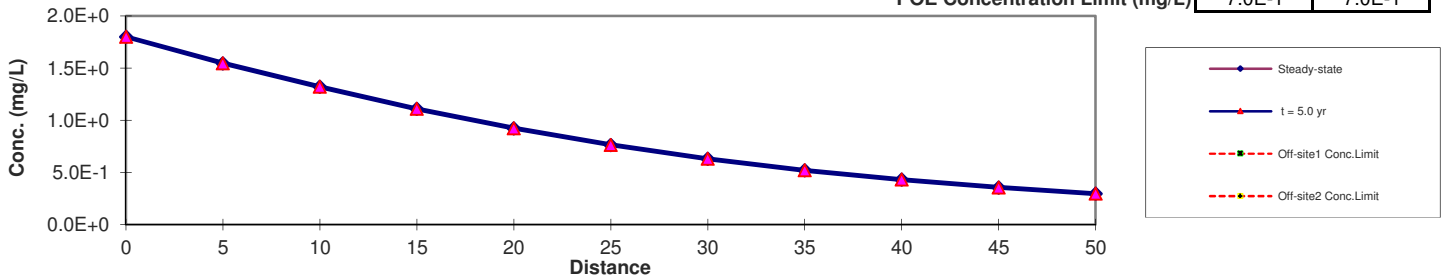
Constiuent: Toluene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 5.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 5.0 yr	Conc. (mg/L)	1.8E+0	1.5E+0	1.3E+0	1.1E+0	9.2E-1	7.6E-1	6.3E-1	5.2E-1	4.3E-1	3.6E-1	2.9E-1
Steady-state		1.8E+0	1.5E+0	1.3E+0	1.1E+0	9.2E-1	7.6E-1	6.3E-1	5.2E-1	4.3E-1	3.6E-1	2.9E-1

Off-site1	Off-site2
MCL	MCL
60	500
2.0E-1	3.8E-20
2.0E-1	5.0E-7
POE Concentration Limit (mg/L) 7.0E-1	7.0E-1



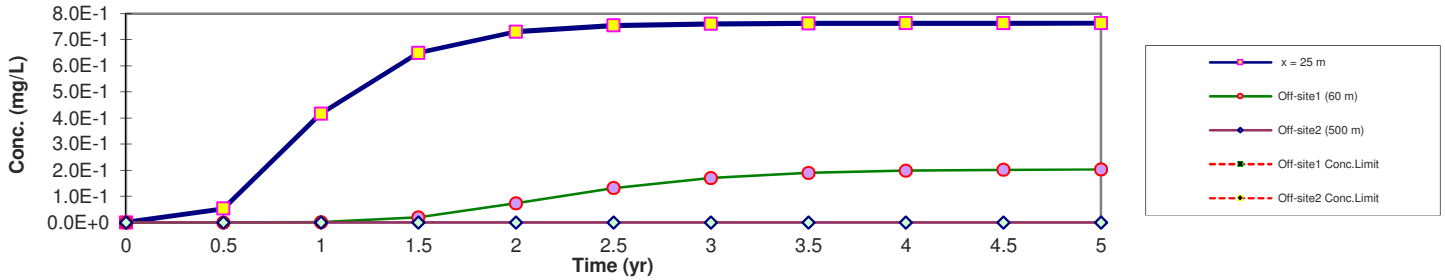
Concentration vs. Time (for given distance from source)

Distance (m) 25

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 25 m	Conc. (mg/L)	0.0E+0	5.3E-2	4.2E-1	6.5E-1	7.3E-1	7.5E-1	7.6E-1	7.6E-1	7.6E-1	7.6E-1	7.6E-1
Off-site1 (60 m)		0.0E+0	7.1E-9	6.8E-4	1.9E-2	7.3E-2	1.3E-1	1.7E-1	1.9E-1	2.0E-1	2.0E-1	2.0E-1
Off-site2 (500 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.3E-23	3.8E-20

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.18
Job ID: 325171

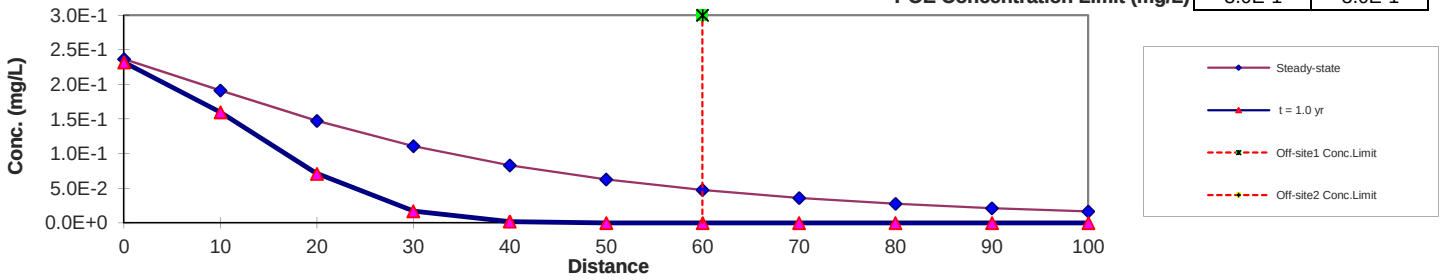
Constiuent: Ethyl benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.3E-1	1.6E-1	7.1E-2	1.7E-2	2.1E-3	1.4E-4	4.8E-6	1.0E-7	1.3E-9	1.0E-11	5.6E-14
Steady-state		2.4E-1	1.9E-1	1.5E-1	1.1E-1	8.3E-2	6.3E-2	4.8E-2	3.6E-2	2.8E-2	2.1E-2	1.7E-2

	Off-site1	Off-site2
	MCL	MCL
	60	500
	4.8E-6	0.0E+0
	4.8E-2	3.4E-6
POE Concentration Limit (mg/L)	3.0E-1	3.0E-1



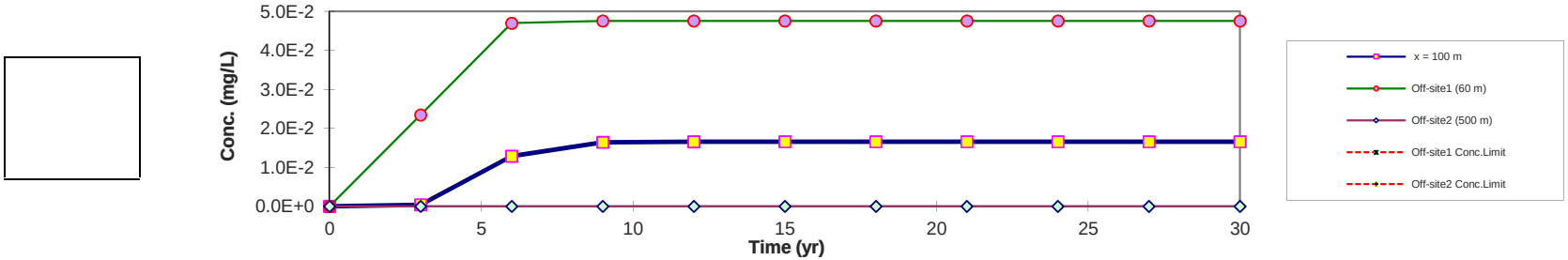
Concentration vs. Time (for given distance from source)

Distance (m) 100

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 m	Conc. (mg/L)	0.0E+0	4.2E-4	1.3E-2	1.6E-2	1.7E-2	1.7E-2	1.7E-2	1.7E-2	1.7E-2	1.7E-2	1.7E-2
Off-site1 (60 m)		0.0E+0	2.3E-2	4.7E-2	4.8E-2	4.8E-2	4.8E-2	4.8E-2	4.8E-2	4.8E-2	4.8E-2	4.8E-2
Off-site2 (500 m)		0.0E+0	0.0E+0	3.8E-22	1.2E-13	7.1E-10	5.6E-8	5.2E-7	1.6E-6	2.6E-6	3.2E-6	3.4E-6

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.18
Job ID: 325171

Constiuent: Xylenes (mixed isomers) *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

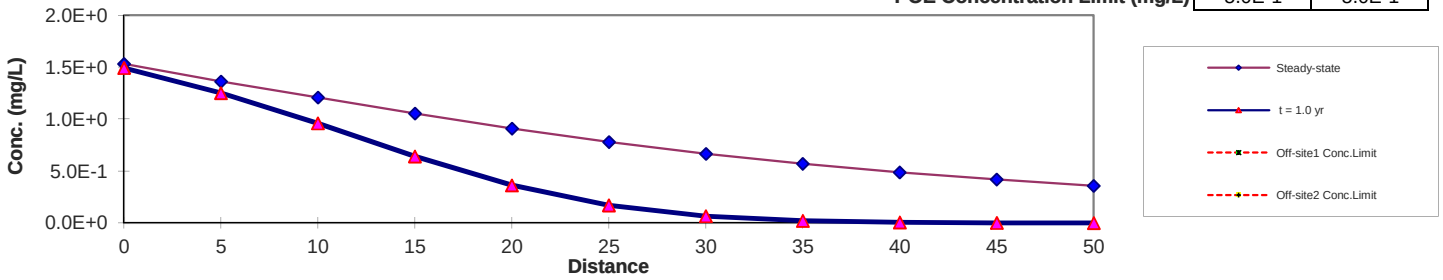
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 1.0 yr	Conc. (mg/L)	1.5E+0	1.2E+0	9.6E-1	6.4E-1	3.6E-1	1.7E-1	6.6E-2	2.1E-2	5.7E-3	1.3E-3	2.3E-4
Steady-state		1.5E+0	1.4E+0	1.2E+0	1.1E+0	9.1E-1	7.8E-1	6.7E-1	5.7E-1	4.9E-1	4.2E-1	3.6E-1

Off-site1	Off-site2
MCL	MCL
60	500
4.9E-6	0.0E+0
2.7E-1	7.9E-6
5.0E-1	5.0E-1

POE Concentration Limit (mg/L)



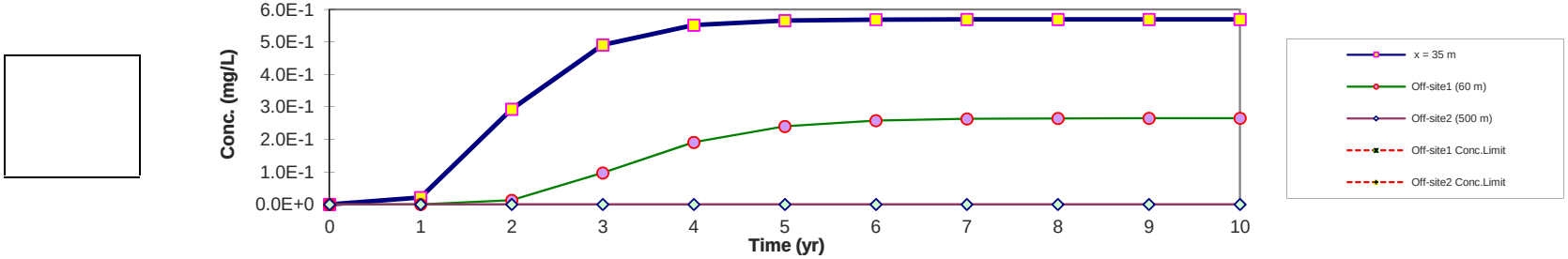
Concentration vs. Time (for given distance from source)

Distance (m) 35

Time (yr)		0	1	2	3	4	5	6	7	8	9	10
x = 35 m	Conc. (mg/L)	0.0E+0	2.1E-2	2.9E-1	4.9E-1	5.5E-1	5.7E-1	5.7E-1	5.7E-1	5.7E-1	5.7E-1	5.7E-1
Off-site1 (60 m)		0.0E+0	4.9E-6	1.3E-2	9.7E-2	1.9E-1	2.4E-1	2.6E-1	2.6E-1	2.6E-1	2.7E-1	2.7E-1
Off-site2 (500 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.8E-20	2.4E-17	5.3E-15	3.5E-13

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.18
Job ID: 325171

Constiuent: Hexane, n- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

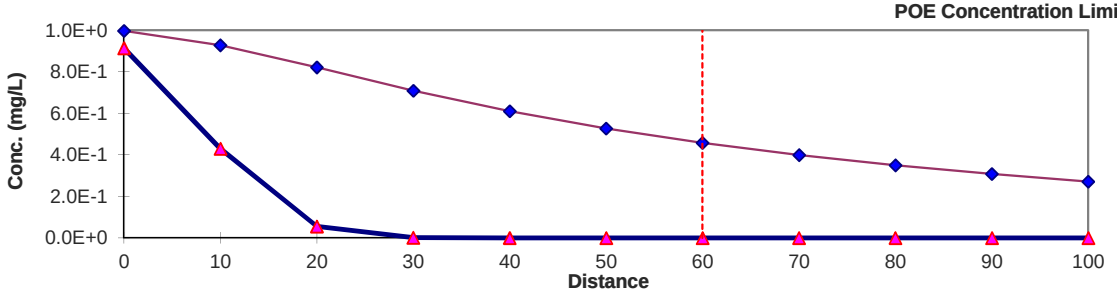
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	9.1E-1	4.3E-1	5.6E-2	1.7E-3	1.2E-5	2.5E-8	1.7E-11	4.0E-15	0.0E+0	0.0E+0	0.0E+0
Steady-state		1.0E+0	9.3E-1	8.2E-1	7.1E-1	6.1E-1	5.3E-1	4.6E-1	4.0E-1	3.5E-1	3.1E-1	2.7E-1

Off-site1	Off-site2
MCL	MCL
60	500
1.7E-11	0.0E+0
4.6E-1	6.4E-3
1.5E+1	1.5E+1

POE Concentration Limit (mg/L)



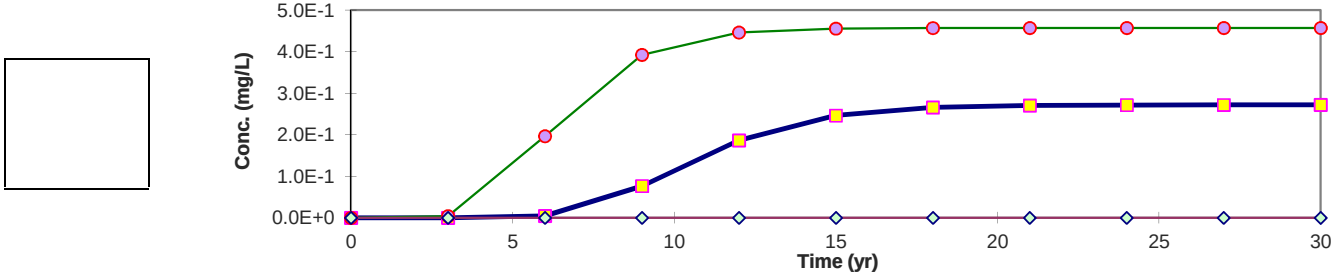
Concentration vs. Time (for given distance from source)

Distance (m) 100

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 m	Conc. (mg/L)	0.0E+0	1.1E-7	4.8E-3	7.7E-2	1.9E-1	2.5E-1	2.7E-1	2.7E-1	2.7E-1	2.7E-1	2.7E-1
Off-site1 (60 m)		0.0E+0	4.2E-3	2.0E-1	3.9E-1	4.5E-1	4.6E-1	4.6E-1	4.6E-1	4.6E-1	4.6E-1	4.6E-1
Off-site2 (500 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	7.9E-15	1.7E-11	3.2E-9	1.4E-7	2.1E-6	1.6E-5

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.18
Job ID: 325171

Constiuent: Heptane, n- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

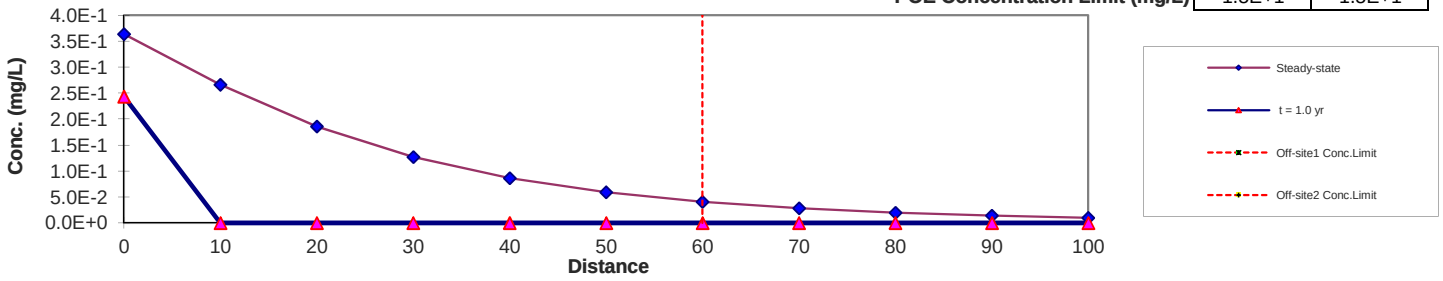
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	2.4E-1	5.3E-7	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state		3.6E-1	2.7E-1	1.9E-1	1.3E-1	8.6E-2	5.9E-2	4.1E-2	2.8E-2	2.0E-2	1.4E-2	9.8E-3

Off-site1	Off-site2
MCL	MCL
60	500
0.0E+0	0.0E+0
4.1E-2	9.5E-8
1.5E+1	1.5E+1

POE Concentration Limit (mg/L)



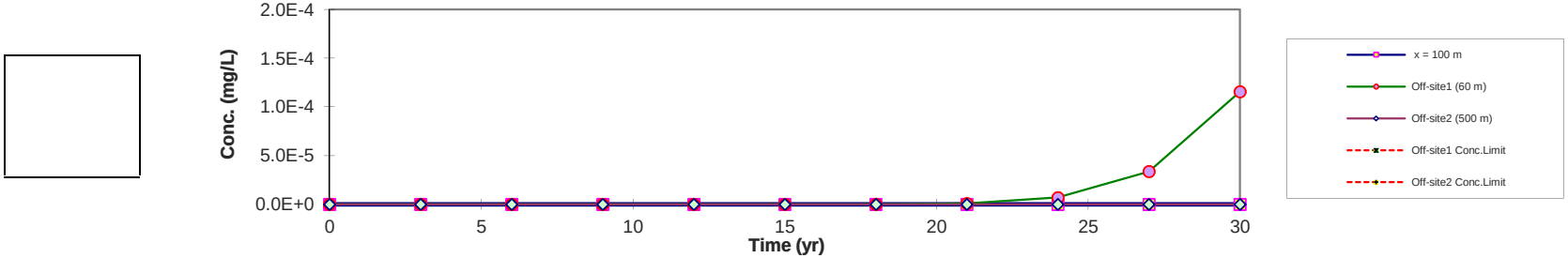
Concentration vs. Time (for given distance from source)

Distance (m) 100

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 m	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.5E-19	5.5E-16	9.4E-14	4.9E-12	1.1E-10
Off-site1 (60 m)		0.0E+0	0.0E+0	0.0E+0	9.1E-17	2.3E-12	9.9E-10	5.3E-8	8.8E-7	7.0E-6	3.4E-5	1.2E-4
Off-site2 (500 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.18
Job ID: 325171

Constiuent: Trimethylbenzene, 1,2,4- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

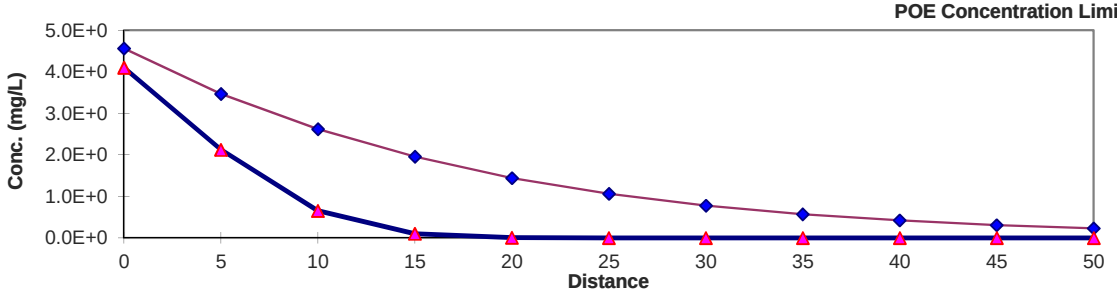
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 1.0 yr	Conc. (mg/L)	4.1E+0	2.1E+0	6.5E-1	1.0E-1	8.2E-3	3.2E-4	6.5E-6	7.0E-8	4.1E-10	1.4E-12	2.7E-15
Steady-state		4.6E+0	3.5E+0	2.6E+0	2.0E+0	1.4E+0	1.1E+0	7.8E-1	5.7E-1	4.2E-1	3.1E-1	2.3E-1

Off-site1	Off-site2
MCL	MCL
60	500
0.0E+0	0.0E+0
1.3E-1	1.5E-10
3.0E-1	3.0E-1

POE Concentration Limit (mg/L)



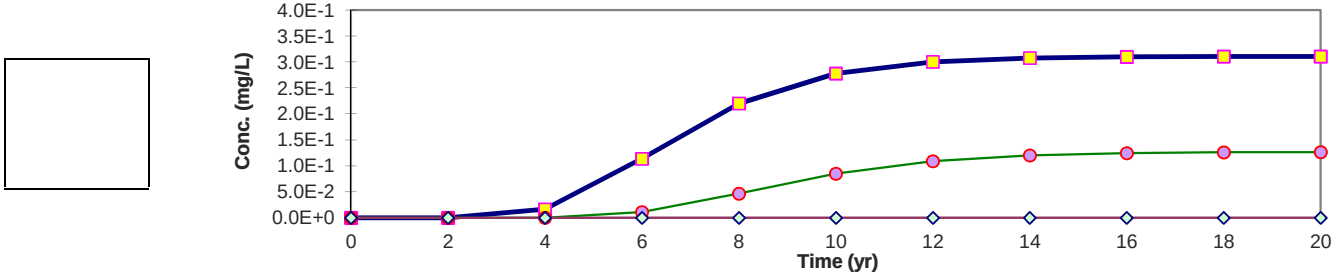
Concentration vs. Time (for given distance from source)

Distance (m) 45

Time (yr)		0	2	4	6	8	10	12	14	16	18	20
x = 45 m	Conc. (mg/L)	0.0E+0	1.1E-5	1.6E-2	1.1E-1	2.2E-1	2.8E-1	3.0E-1	3.1E-1	3.1E-1	3.1E-1	3.1E-1
Off-site1 (60 m)		0.0E+0	9.0E-10	2.9E-4	1.1E-2	4.7E-2	8.5E-2	1.1E-1	1.2E-1	1.2E-1	1.3E-1	1.3E-1
Off-site2 (500 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	8.1E-27	8.4E-24

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)
Completed By: Cathy Cussell
Date Completed: 19.2.18
Job ID: 325171

Constiuent: Naphthalene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

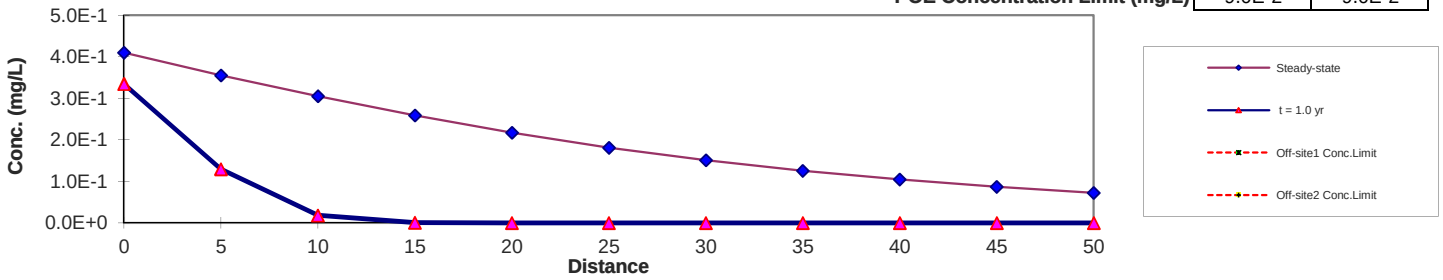
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 1.0 yr	Conc. (mg/L)	3.3E-1	1.3E-1	1.8E-2	7.9E-4	1.0E-5	4.4E-8	6.3E-11	3.2E-14	5.8E-18	0.0E+0	0.0E+0
Steady-state		4.1E-1	3.5E-1	3.1E-1	2.6E-1	2.2E-1	1.8E-1	1.5E-1	1.3E-1	1.0E-1	8.7E-2	7.3E-2

Off-site1	Off-site2
MCL	MCL
60	500
0.0E+0	0.0E+0
5.1E-2	2.2E-7
9.0E-2	9.0E-2

POE Concentration Limit (mg/L)



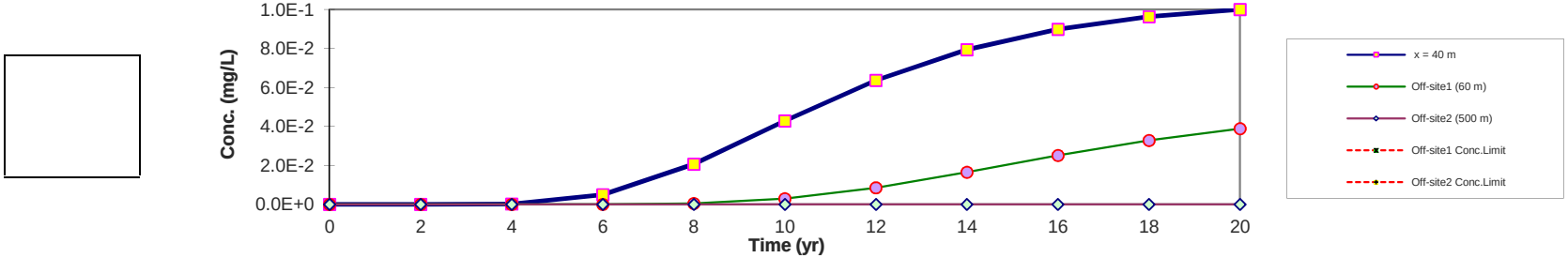
Concentration vs. Time (for given distance from source)

Distance (m) 40

Time (yr)		0	2	4	6	8	10	12	14	16	18	20
x = 40 m	Conc. (mg/L)	0.0E+0	7.5E-9	2.1E-4	5.0E-3	2.1E-2	4.3E-2	6.4E-2	7.9E-2	9.0E-2	9.6E-2	1.0E-1
Off-site1 (60 m)		0.0E+0	1.1E-17	2.1E-8	2.0E-5	5.0E-4	3.0E-3	8.5E-3	1.7E-2	2.5E-2	3.3E-2	3.9E-2
Off-site2 (500 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP256 - (NAPL to GW)

Completed By: Cathy Cussell
Date Completed: 19.2.18

Job ID: 325171

Constiuent: Methylnaphthalene, 2- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

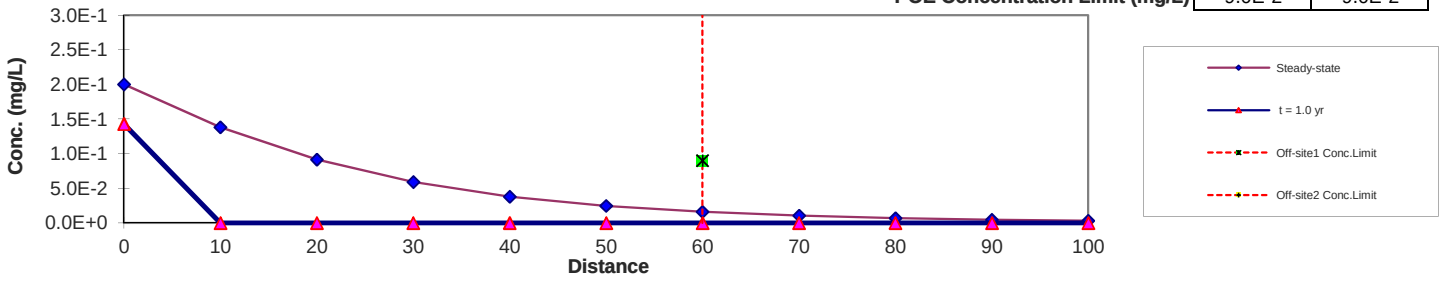
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 1.0 yr	Conc. (mg/L)	1.4E-1	3.9E-5	1.6E-14	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Steady-state		2.0E-1	1.4E-1	9.1E-2	5.9E-2	3.8E-2	2.5E-2	1.6E-2	1.1E-2	7.1E-3	4.7E-3	3.2E-3

Off-site1	Off-site2
MCL	MCL
60	500
0.0E+0	0.0E+0
1.6E-2	5.9E-9
9.0E-2	9.0E-2

POE Concentration Limit (mg/L)



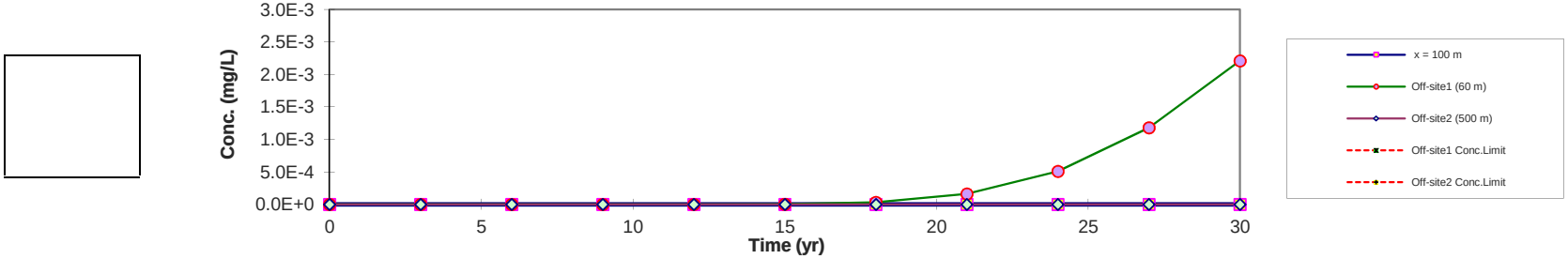
Concentration vs. Time (for given distance from source)

Distance (m) 100

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 100 m	Conc. (mg/L)	0.0E+0	0.0E+0	0.0E+0	0.0E+0	3.9E-18	3.4E-14	1.3E-11	8.5E-10	1.8E-8	1.9E-7	1.1E-6
Off-site1 (60 m)		0.0E+0	0.0E+0	4.4E-16	1.5E-10	7.9E-8	3.1E-6	3.2E-5	1.6E-4	5.1E-4	1.2E-3	2.2E-3
Off-site2 (500 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA

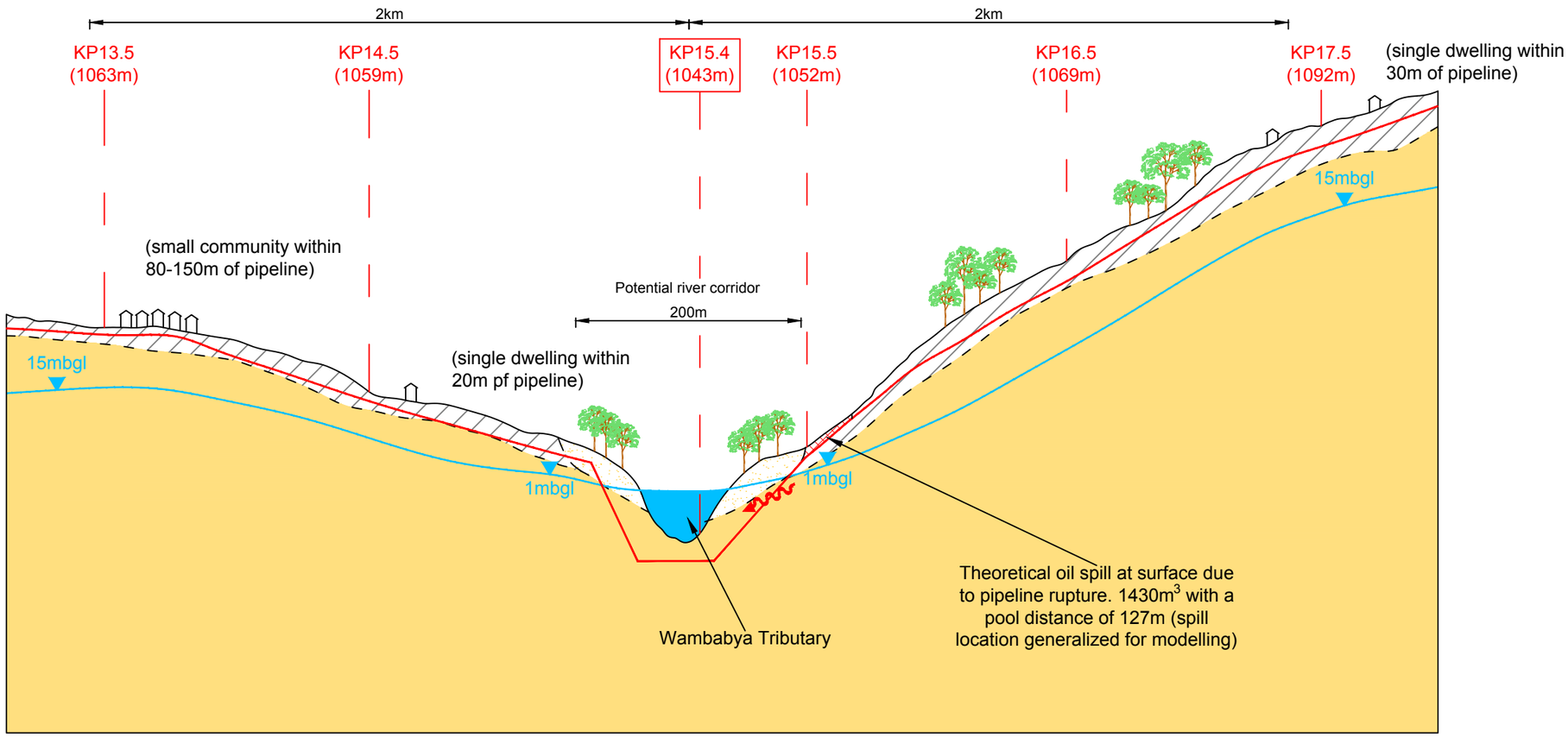


ATTACHMENT I1.11 DQRA – OIL RELEASE TO LAND – SURFACE WATER VECS – KP15.4 WAMBABYA TRIBUTARY

Conceptual Site Model

NW

SE



Legend:

- Superficia Deposits: Sandy oam
- Parent rock: Sha e, arkases and quartzites
- A uvium
- Pipe ine (approximate ocation)
- Vegetation
- Water tab e
- (1000m) Ground e evation
- Oi spi due to pipe ine rupture
- Vertica and atera migration in groundwater

Notes:

- Elevation data taken from Google Earth elevations profile

Title:
Conceptua Site Mode Groundwater Migration To Surface Water Mode KP15 4 Wambabya ributary

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Summary of Input Values Used in RBCA Fate and Transport Model

Summary of Input Values Used in RBCA Fate and Transport Model

Model Description:
Source media: Unsaturated zone soil (depleting source) and dissolved phase source originating from NAPL
Offsite exposure model: Leaching to groundwater and lateral migration to surface water receptor (i.e. water course) down hydraulic gradient from the site

Assumptions
The oil leak fully saturates the soil.

		Assumed Representative Conditions Uganda Export Pipeline KP15.4 Wambabya Tributary- Groundwater migration to surface water		
Unsaturated Zone Soil Source		**Value**	**Justification**	**Reference**
Depth to top of source	m	0.00	Assuming surface pooling of oil on the surface, with saturated soils present beneath the pool surface	*EACOP Studies*
Thickness of contamination	m	1.00	Assumed unsaturated thickness of source is 1m as a conservative estimate based on NAPL modelling	*Based on NAPL modelling in OSM*
Length of source	m	127	Spill volume and spread data from worst case spill modelled in DRA, based on a 610mm diameter hole caused by erosion of the pipeline followed by 3rd party line strike. Pool length of 127m and a spill volume of 9000 bbl (1430m^3). Assumed circular pool.	*EACOP Studies*
Width of source	m	127		
Depth to groundwater	m	1.00	Groundwater depth based on reported static water level ranging between 15-30m bgl in the regional DWRM report. This depth range has been assumed to be the case in the highlands. A more conservative, shallower value of 1m has been assumed for the lowland areas.	*EACOP Studies*
Unsaturated Zone Properties				
Soil description	-	-	Soils described as sandy loam	*EACOP Studies*
Total Porosity in vadose zone	cm3/cm3	0.51	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)*
Soil bulk density	g/cm3	1.4	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Infiltration rate	mm/yr	177.80	Average annual rainfall for the Hoima region of 1270mm and infiltration is estimated at 7 to 20% of rainfall in Uganda, therefore 14% of 1270mm used as infiltration rate	*Rainfall data and infiltration information from EACOP Studies*
Saturated conductivity	m/d	1.27008	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Aquifer Properties				
Aquifer description	-	-	Groundwater is assumed to be at a depth of 1m in lowland areas. It has therefore been assumed that the groundwater flow will likely be within either the superficial deposits (sandy loam) or upper weathered zone of the parent rock (shales, arkoses and quartzites)	*EACOP Studies*
Effective porosity	cm3/cm3	0.27	Arithmetic mean for a medium sandstone based on arkose sedimentary rocks	*McWorter and Sunada (1977)*
Fraction organic carbon	g oc/g soil	0.007	Lower end of literature range quoted for sandstone based on arkose sedimentary rocks	*Bourg ; A.C.M. et al, 1992; A review of the attenuation of TCE in soils and aquifers. Qtly. Jn. Eng. Geol.*
Hydraulic conductivity	m/d	0.518	Conservatively selected the upper end of the literature value for sandstone to represent the likely weathered nature of the bedrock.	*Values from Domenico,P.A. and Schwartz,F.W. Physical and Chemical Hydrogeology, Wiley,1990.*
Hydraulic gradient	m/m	0.0154	Gradient based on topographic slope from KP17.5 lying at an elevation of 1077m (inclusive of reduction of 15m to depth of groundwater) and the centre of the Wambabya River at KP15.5 at an elevation of 1043m (total length of 2.2km). There is an elevation change of 34m over 2206m distance = 0.0154.	*Data taken from EACOP Studies. Elevation data taken from Google Earth (2018)*
Capillary Fringe				
Thickness of the capillary fringe	m	0.11	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Air content	-	0.051	Literature value for loam soils	
Water content	-	0.459	Literature value for loam soils	
Degradation - dissolved phase only				
Degradation half lives	-	-	Conservatively assumed anaerobic degradation in the dissolved phase only - Half life values selected based on mid-point of literature range for anaerobic degradation	*Half life values sourced from Howard et al. Handbook of Environmental Degradation Rates (1991). Half life values modified prior to entry into the model to account for no sorbed phase degradation. Modification via multiplication of half life values by contaminant specific calculated retardation factor.*

Half Life Calculation Sheet

Retardation factors for Half Life Calculation Sheet

Pipeline section	Uganda Export
KP	15.4
Model (GW-DW or GW-SW)	GW-SW
Description of aqiuifer material	Sandy Loam over shales, arkoses and quartzites
FOC data reference	Lower end of literature range quoted for sandstone based on arkose sedimentary rocks. Bourg ; A.C.M. et al, 1992; A review of the attenuation of TCE in soils and aquifers. Qtly. Jn. Eng. Geol.
Bulk density data reference	Lower end of literature range for sandstone used based on arkose sedimentary rocks. Also within the range of a fine to coarse sand and clay to account for potential shales. Wiedemeier, T. et al., 1995; Tech. protocol for implementing Intrinsic remediation with long-term monitoring for at. attenuation of fuel contam'n. dissolved in g'water. Vol. 1. brooks AFB, Texas
Effective porosity data reference	Arithmetic mean for a medium sandstone based on arkose sedimentary rocks from McWorter and Sunada (1977)

	Log Koc	foc	Kd	Bulk density	Effective porosity	Retardation factor	Anaerobic half life high (hours)	Anaerobic half life low (hours)	Literature t1/2 (Days) (ANAEROBIC)	Adjusted half lives for use in RBCA
Benzene	1.82	0.007	0.46	2.1	0.27	4.60E+00	17280	2688	416	1.91E+03
Toluene	2.15	0.007	0.99	2.1	0.27	8.69E+00	5040	1344	133	1.16E+03
Ethylbenzene	2.31	0.007	1.43	2.1	0.27	1.21E+01	5472	4224	202	2.45E+03
Xylenes	2.11	0.007	0.90	2.1	0.27	8.01E+00	8640	4320	270	2.16E+03
Aliphatics >EC5-EC6 (hexane)	2.9	0.007	5.56	2.1	0.27	4.42E+01	17280	2688	416	1.84E+04
Aliphatics >EC6-EC8 (n-heptane)	3.84	0.007	48.43	2.1	0.27	3.78E+02	5040	1344	133	5.02E+04
Aromatics >EC8-EC10 (trimethylbenzene)	2.97	0.007	6.53	2.1	0.27	5.18E+01	2688	672	70	3.63E+03
Aromatics >EC10-12 (naphthalene)	3.19	0.007	10.84	2.1	0.27	8.53E+01	6192	600	141.5	1.21E+04
Aromatics >EC12-16 (2-methynapthalene	3.36	0.007	16.04	2.1	0.27	1.26E+02	5760	4080	205	2.58E+04

RBCA Model Input Data Summary for NAPL to Groundwater

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL to GW)

Completed By: E Hobbs
Date Completed: 27.02.2018

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(m)
h_v	Vadose zone thickness	NA			(m)
ρ_s	Soil bulk density	NA			(g/cm^3)
f_{oc}	Fraction organic carbon	NA			(-)
θ_T	Soil total porosity	NA			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	NA	NA	NA	(-)
θ_a	Volumetric air content	NA	NA	NA	(-)
K_{vs}	Vertical hydraulic conductivity	NA			(m/d)
k_v	Vapor permeability	NA			(m^2)
L_{gw}	Depth to groundwater	NA			(m)
pH	Soil/groundwater pH	NA			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/s)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(m)
A_b	Foundation area	NA	NA	(m^2)
X_{crk}	Foundation perimeter	NA	NA	(m)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crk}	Foundation thickness	NA	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	NA	(m)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(m^3/s)
θ_{wcrack}	Volumetric water content of cracks	NA	NA	(-)
θ_{acrack}	Volumetric air content of cracks	NA	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(mm/yr)
U_{gw}	Groundwater Darcy velocity	***0.0079772***	(m/d)
V_{gw}	Groundwater seepage velocity	***0.029545185***	(m/d)
K_s	Saturated hydraulic conductivity	***0.518***	(m/d)
i	Groundwater gradient	***0.0154***	(-)
S_w	Width of groundwater source zone	***127***	(m)
S_d	Depth of groundwater source zone	2	(m)
θ_{eff}	Effective porosity in water-bearing unit	***0.27***	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	***0.007***	(-)
pH_{sat}	Groundwater pH	***7***	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Groundwater to Indoor Air		
α_x	Longitudinal dispersivity	4.4E+0	6.9E+0	NA	NA	(m)
α_y	Transverse dispersivity	4.4E-1	6.9E-1	NA	NA	(m)
α_z	Vertical dispersivity	4.4E-2	6.9E-2	NA	NA	(m)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/s)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

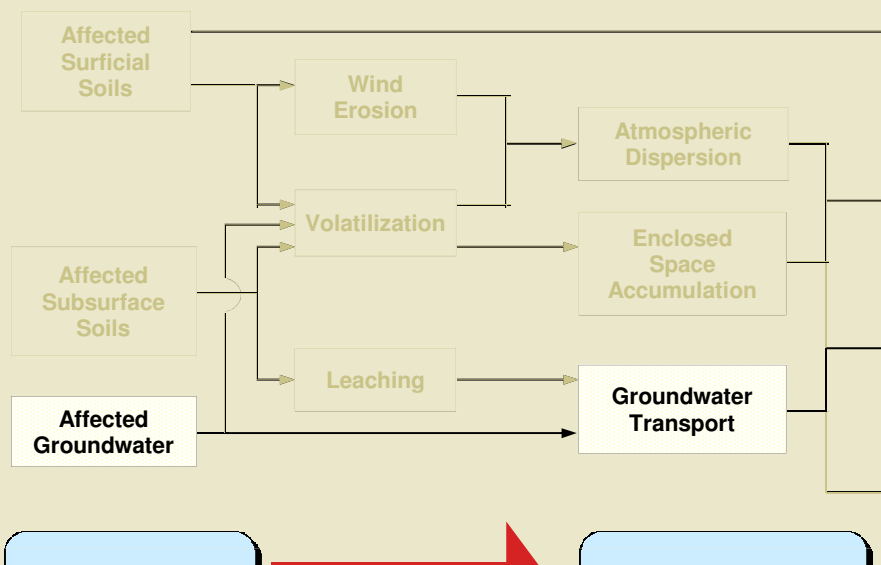
NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA Model Exposure Flowchart for NAPL to Groundwater

Exposure Pathway Flowchart

Site Name: EACOP Uganda Export Pipeline — Job ID: 325171
Location: KP15.4 Wambabya Trib (NAPL to GW) — Date: 27.02.2018
Compl. By: E Hobbs



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	None	None	None
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	None	None
Groundwater Potable Water Ingestion	*MCL*	*MCL*	*MCL*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

RBCA Model Results for NAPL to Groundwater

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 03.09.18
Job ID: 325171

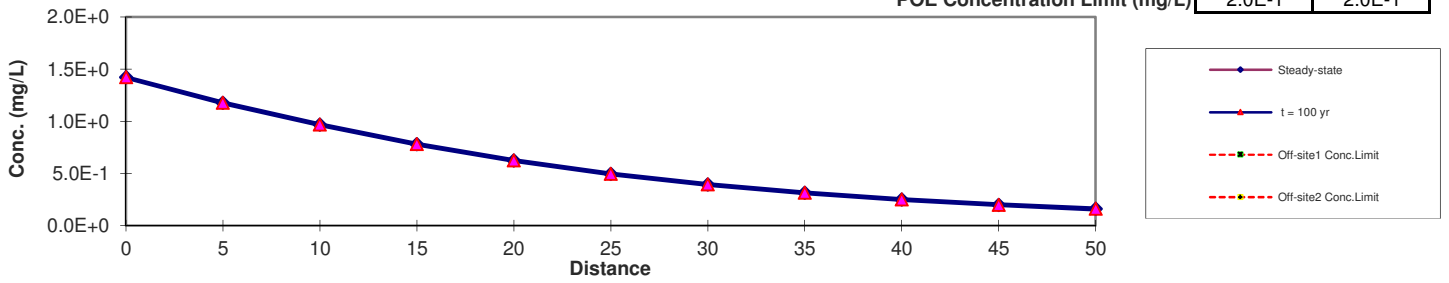
Constiuent: Benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 100.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 100 yr	Conc. (mg/L)	1.4E+0	1.2E+0	9.7E-1	7.8E-1	6.2E-1	5.0E-1	3.9E-1	3.1E-1	2.5E-1	2.0E-1	1.6E-1
Steady-state		1.4E+0	1.2E+0	9.7E-1	7.8E-1	6.2E-1	5.0E-1	3.9E-1	3.1E-1	2.5E-1	2.0E-1	1.6E-1

	Off-site1	Off-site2
	MCL	MCL
	100	250
	1.9E-2	8.0E-5
	1.9E-2	8.0E-5
POE Concentration Limit (mg/L)	2.0E-1	2.0E-1



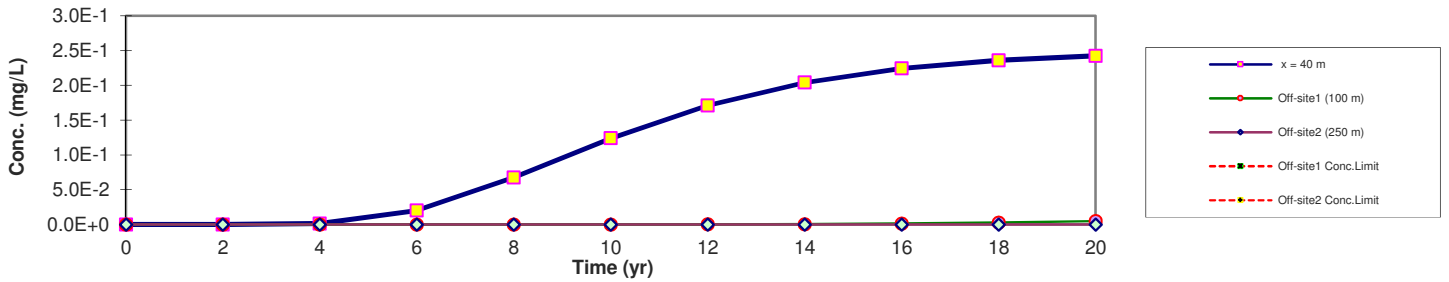
Concentration vs. Time (for given distance from source)

Distance (m) 40

Time (yr)		0	2	4	6	8	10	12	14	16	18	20
x = 40 m	Conc. (mg/L)	0.0E+0	1.6E-7	1.3E-3	2.0E-2	6.7E-2	1.2E-1	1.7E-1	2.0E-1	2.2E-1	2.4E-1	2.4E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	3.9E-17	7.8E-11	8.9E-8	5.1E-6	6.5E-5	3.6E-4	1.2E-3	2.7E-3	4.8E-3
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-18	1.1E-15	1.1E-13	4.1E-12

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 03.09.18
Job ID: 325171

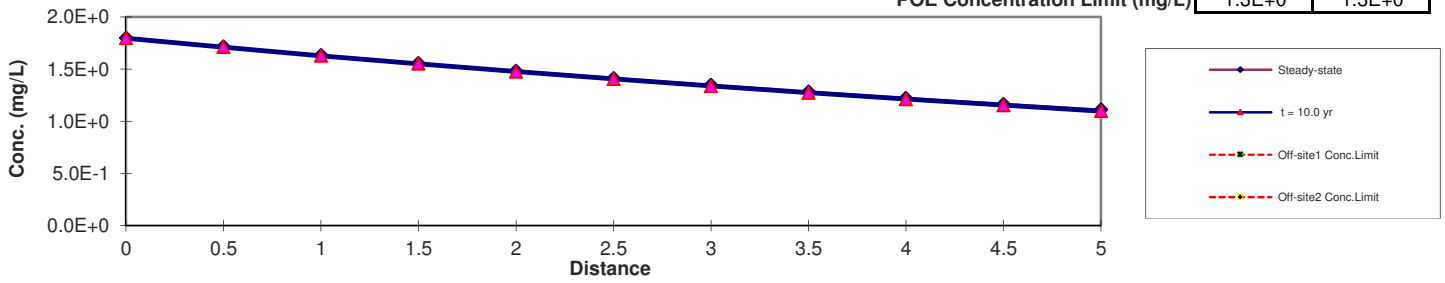
Constiuent: Toluene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
t = 10.0 yr	Conc. (mg/L)	1.8E+0	1.7E+0	1.6E+0	1.5E+0	1.5E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0	1.1E+0
Steady-state		1.8E+0	1.7E+0	1.6E+0	1.6E+0	1.5E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0	1.1E+0

	Off-site1	Off-site2
	MCL	MCL
POE Concentration Limit (mg/L)	100	250
	3.1E-12	0.0E+0
	1.3E-4	1.0E-9
	1.3E+0	1.3E+0



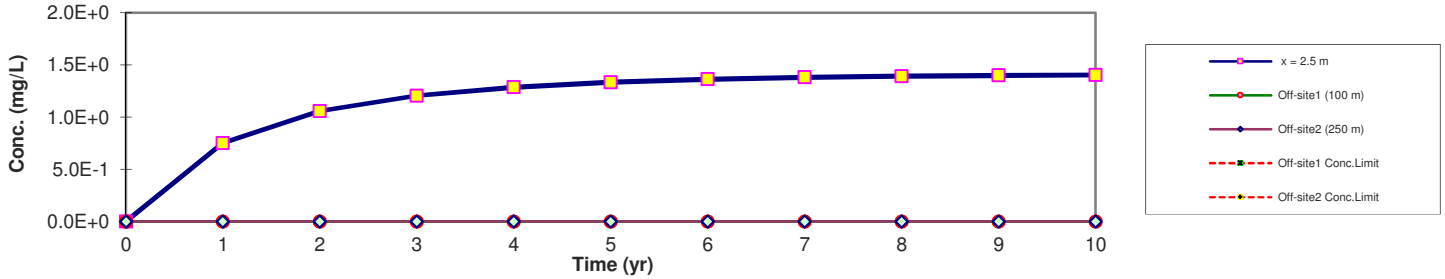
Concentration vs. Time (for given distance from source)

Distance (m) 2.5

Time (yr)		0	1	2	3	4	5	6	7	8	9	10
x = 2.5 m	Conc. (mg/L)	0.0E+0	7.5E-1	1.1E+0	1.2E+0	1.3E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	7.0E-21	7.1E-18	1.7E-15	1.1E-13	3.1E-12
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: Ethyl benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

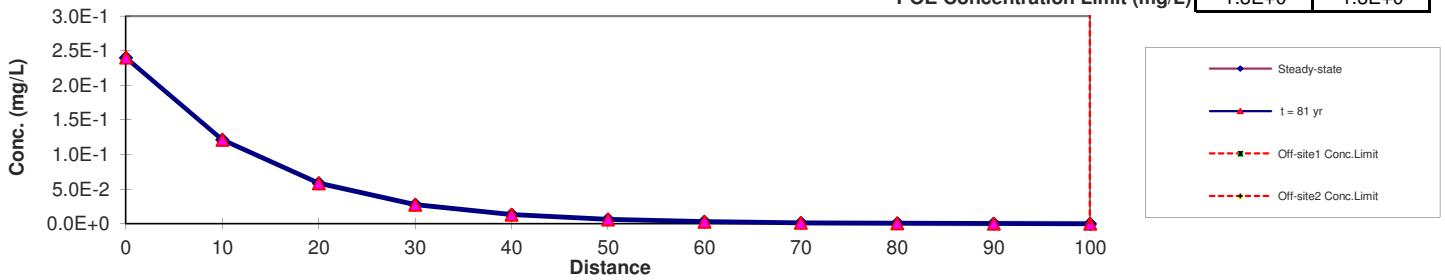
Concentration vs. Distance from Source (for given time)

Time (yr) 81.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 81 yr	Conc. (mg/L)	2.4E-1	1.2E-1	5.9E-2	2.8E-2	1.3E-2	6.5E-3	3.2E-3	1.6E-3	8.2E-4	4.2E-4	2.2E-4
Steady-state		2.4E-1	1.2E-1	5.9E-2	2.8E-2	1.3E-2	6.5E-3	3.2E-3	1.6E-3	8.2E-4	4.2E-4	2.2E-4

Off-site1	Off-site2
MCL	MCL
100	250
2.2E-4	1.6E-9
2.2E-4	3.5E-8
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



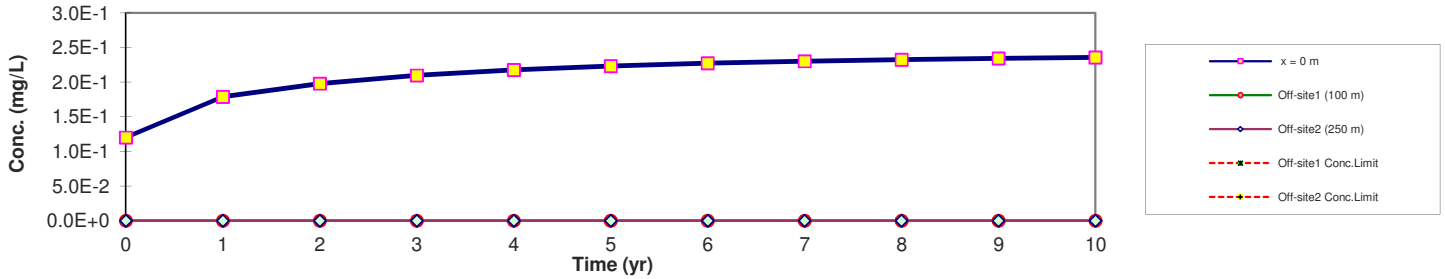
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	1	2	3	4	5	6	7	8	9	10
x = 0 m	Conc. (mg/L)	1.2E-1	1.8E-1	2.0E-1	2.1E-1	2.2E-1	2.2E-1	2.3E-1	2.3E-1	2.3E-1	2.3E-1	2.4E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	6.1E-20	6.7E-18
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 03.09.18
Job ID: 325171

Constiuent: Xylene, o- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

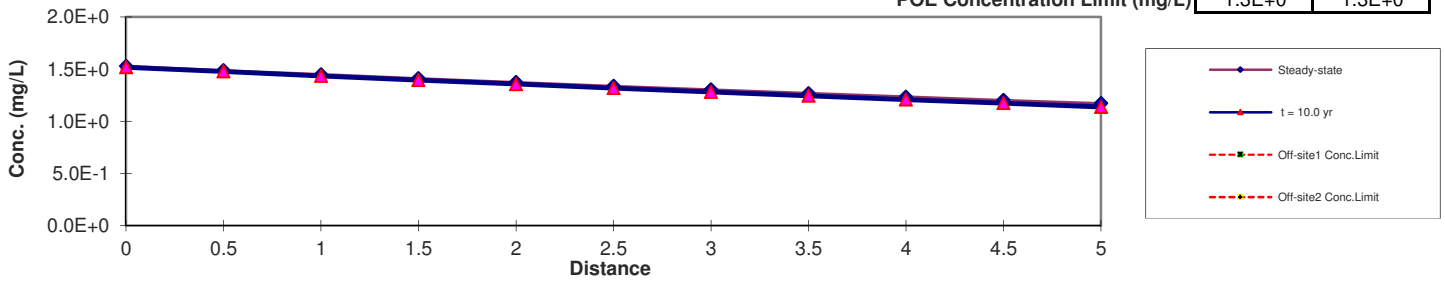
Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
t = 10.0 yr	Conc. (mg/L)	1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0	1.2E+0	1.1E+0
Steady-state		1.5E+0	1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0	1.2E+0

Off-site1	Off-site2
MCL	MCL
100	250
5.6E-11	0.0E+0
5.0E-3	3.5E-6
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



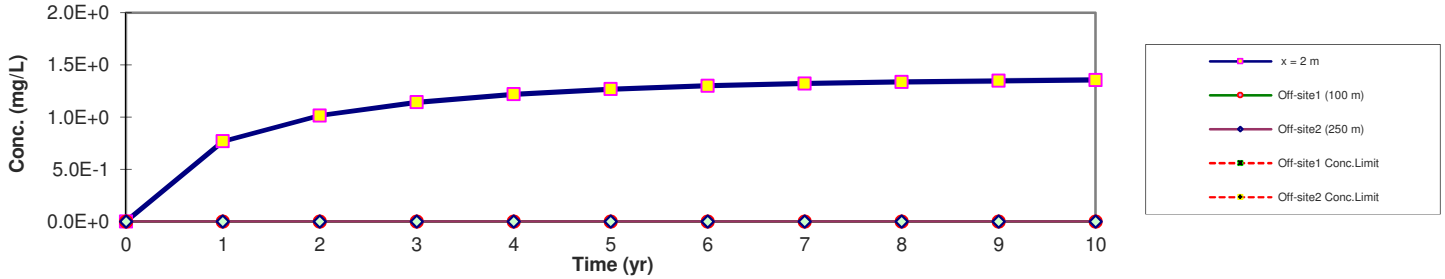
Concentration vs. Time (for given distance from source)

Distance (m) 2

Time (yr)		0	1	2	3	4	5	6	7	8	9	10
x = 2 m	Conc. (mg/L)	0.0E+0	7.7E-1	1.0E+0	1.1E+0	1.2E+0	1.3E+0	1.3E+0	1.3E+0	1.3E+0	1.3E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.8E-19	2.4E-16	4.4E-14	2.4E-12	5.6E-11
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: TPH - Aliph >C05-C06 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

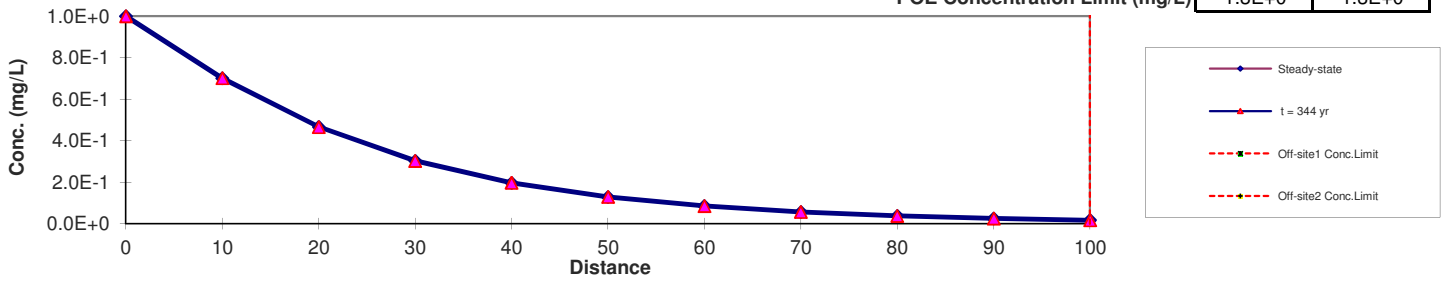
Concentration vs. Distance from Source (for given time)

Time (yr) 344.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 344 yr	Conc. (mg/L)	1.0E+0	7.0E-1	4.7E-1	3.0E-1	2.0E-1	1.3E-1	8.6E-2	5.8E-2	3.9E-2	2.6E-2	1.8E-2
Steady-state		1.0E+0	7.0E-1	4.7E-1	3.0E-1	2.0E-1	1.3E-1	8.6E-2	5.8E-2	3.9E-2	2.6E-2	1.8E-2

Off-site1	Off-site2
MCL	MCL
100	250
1.8E-2	4.3E-6
1.8E-2	1.1E-4
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



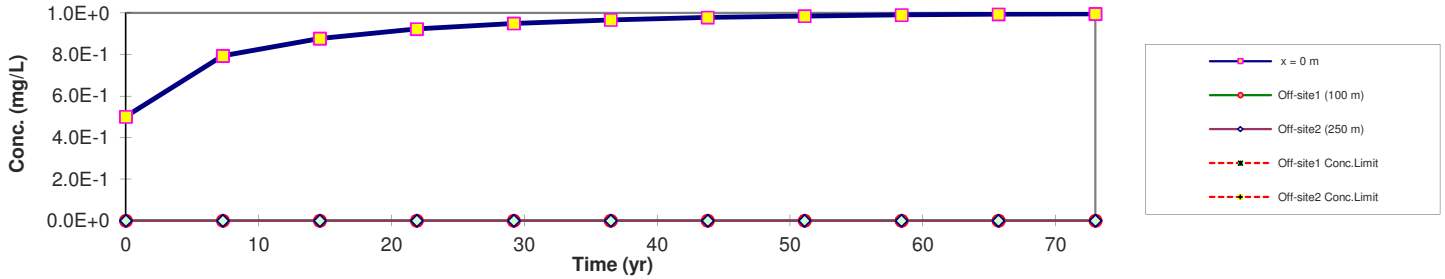
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	7.3	14.6	21.9	29.2	36.5	43.8	51.1	58.4	65.7	73
x = 0 m	Conc. (mg/L)	5.0E-1	7.9E-1	8.8E-1	9.2E-1	9.5E-1	9.7E-1	9.8E-1	9.8E-1	9.9E-1	9.9E-1	1.0E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.5E-16	1.7E-13	2.4E-11	9.6E-10	1.6E-8	1.5E-7
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: TPH - Aliph >C06-C08 (>53% n-hexane) *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

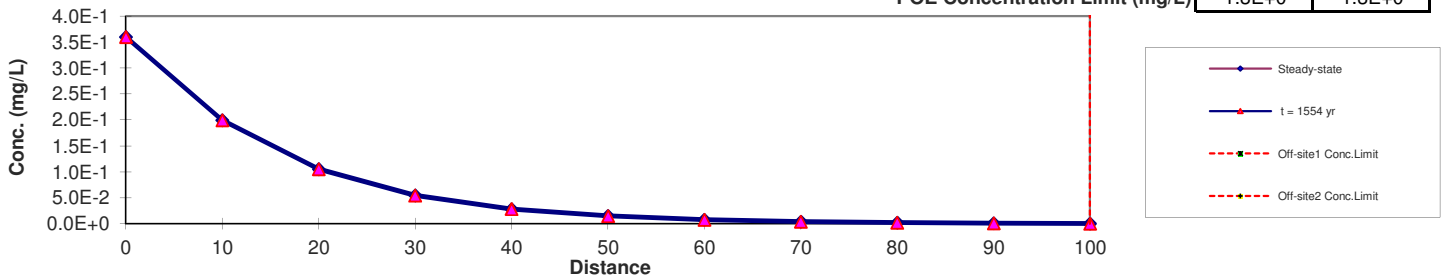
Concentration vs. Distance from Source (for given time)

Time (yr) 1554.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 1554 yr	Conc. (mg/L)	3.6E-1	2.0E-1	1.1E-1	5.5E-2	2.9E-2	1.5E-2	8.1E-3	4.4E-3	2.4E-3	1.3E-3	7.5E-4
Steady-state		3.6E-1	2.0E-1	1.1E-1	5.5E-2	2.9E-2	1.5E-2	8.1E-3	4.4E-3	2.4E-3	1.3E-3	7.5E-4

Off-site1	Off-site2
MCL	MCL
100	250
7.5E-4	2.6E-8
7.5E-4	3.2E-7
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



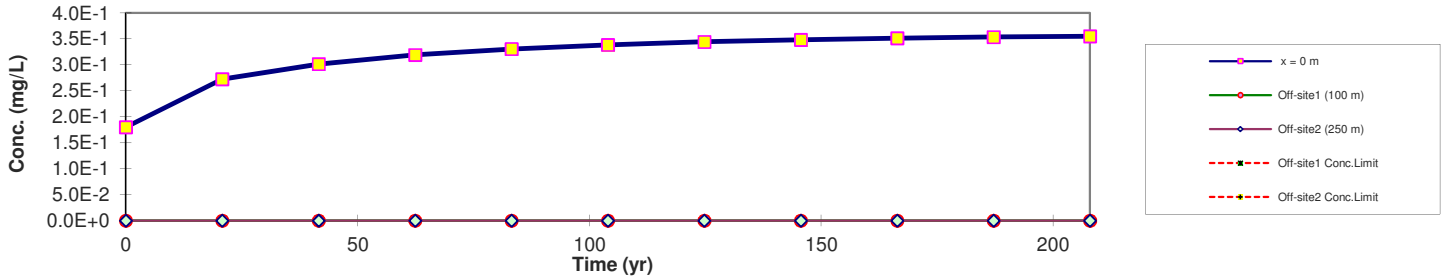
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	20.8	41.6	62.4	83.2	104	124.8	145.6	166.4	187.2	208
x = 0 m	Conc. (mg/L)	1.8E-1	2.7E-1	3.0E-1	3.2E-1	3.3E-1	3.4E-1	3.4E-1	3.5E-1	3.5E-1	3.5E-1	3.6E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.1E-18	3.0E-16	1.6E-14
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 03.09.18
Job ID: 325171

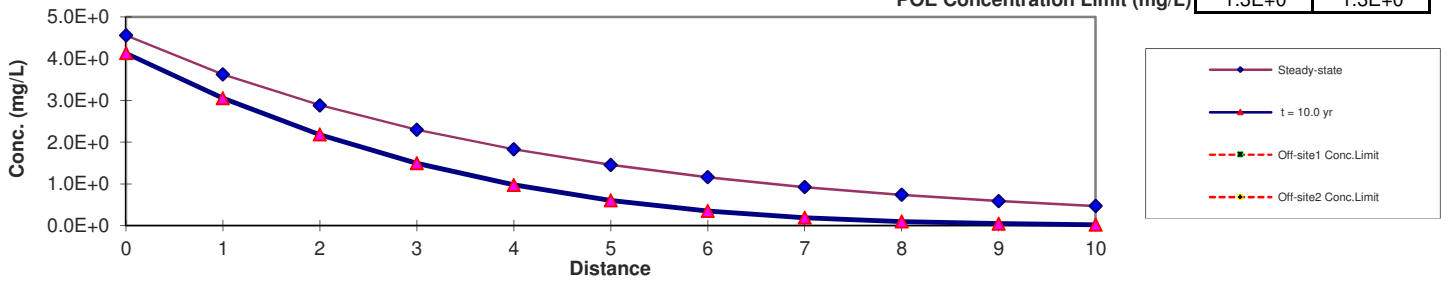
Constiuent: TPH - Arom >C08-C10 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 10.0 yr	Conc. (mg/L)	4.1E+0	3.1E+0	2.2E+0	1.5E+0	9.7E-1	6.0E-1	3.5E-1	1.9E-1	9.6E-2	4.6E-2	2.0E-2
Steady-state		4.6E+0	3.6E+0	2.9E+0	2.3E+0	1.8E+0	1.5E+0	1.2E+0	9.3E-1	7.4E-1	5.9E-1	4.7E-1

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
4.4E-9	1.9E-19
POE Concentration Limit (mg/L)	
1.3E+0	1.3E+0



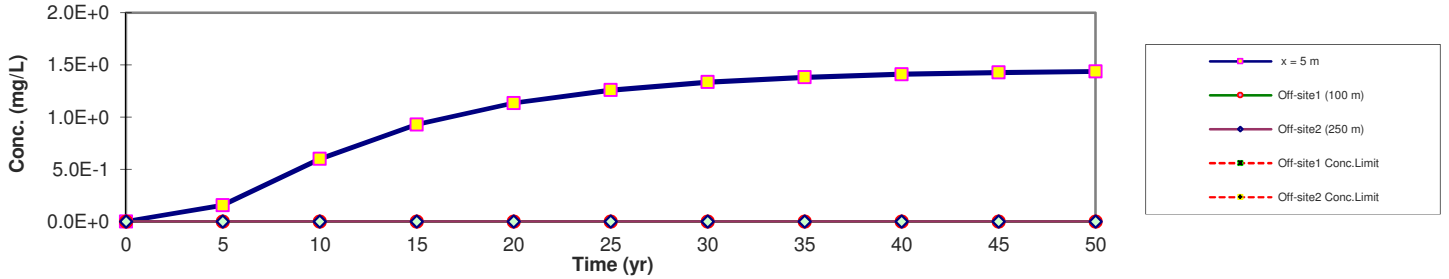
Concentration vs. Time (for given distance from source)

Distance (m) 5

Time (yr)		0	5	10	15	20	25	30	35	40	45	50
x = 5 m	Conc. (mg/L)	0.0E+0	1.6E-1	6.0E-1	9.3E-1	1.1E+0	1.3E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	4.9E-25
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: TPH - Arom >C10-C12 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

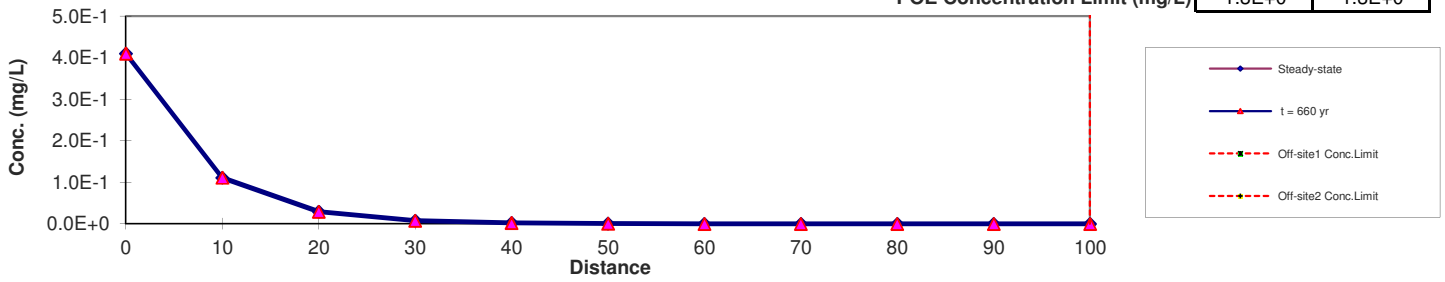
Concentration vs. Distance from Source (for given time)

Time (yr) 660.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 660 yr	Conc. (mg/L)	4.1E-1	1.1E-1	2.9E-2	7.8E-3	2.1E-3	6.0E-4	1.7E-4	5.1E-5	1.6E-5	4.9E-6	1.6E-6
Steady-state		4.1E-1	1.1E-1	2.9E-2	7.8E-3	2.1E-3	6.0E-4	1.7E-4	5.1E-5	1.6E-5	4.9E-6	1.6E-6

Off-site1	Off-site2
MCL	MCL
100	250
1.6E-6	1.4E-14
1.6E-6	5.1E-13
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



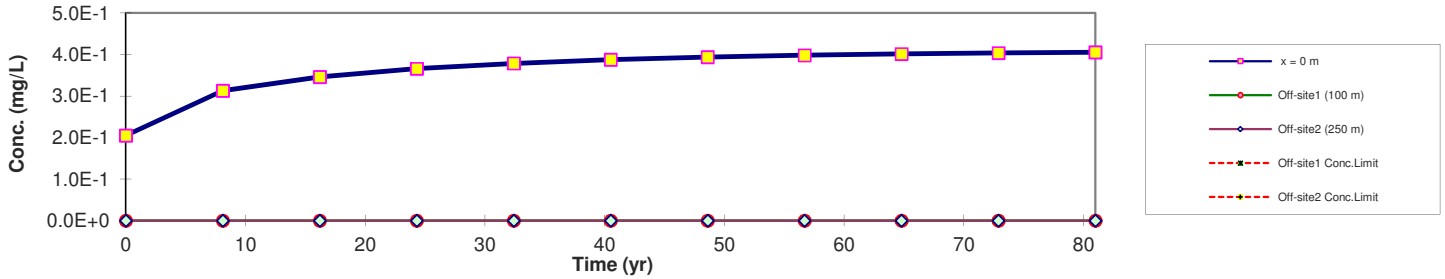
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	8.1	16.2	24.3	32.4	40.5	48.6	56.7	64.8	72.9	81
x = 0 m	Conc. (mg/L)	2.1E-1	3.1E-1	3.5E-1	3.7E-1	3.8E-1	3.9E-1	3.9E-1	4.0E-1	4.0E-1	4.0E-1	4.1E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP15.4 Wambabya Trib (NAPL on GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

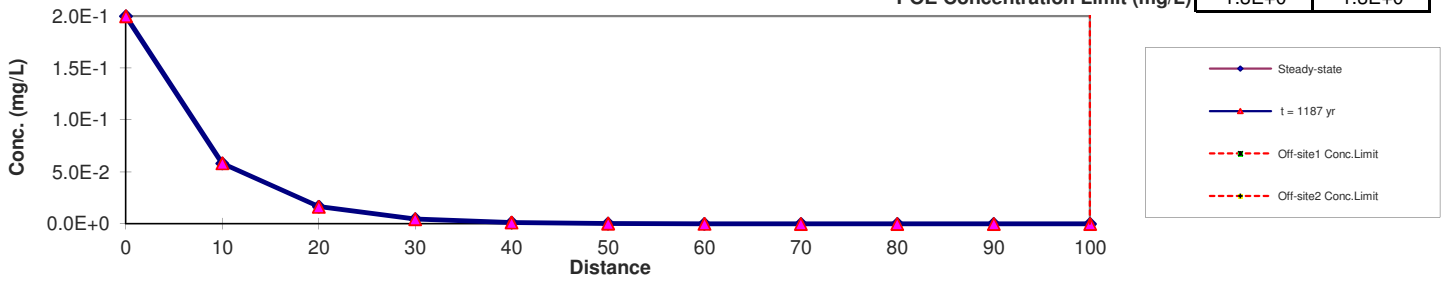
Constiuent: TPH - Arom >C12-C16 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 1187.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 1187 yr	Conc. (mg/L)	2.0E-1	5.8E-2	1.7E-2	4.7E-3	1.4E-3	4.1E-4	1.2E-4	3.9E-5	1.3E-5	4.1E-6	1.4E-6
Steady-state		2.0E-1	5.8E-2	1.7E-2	4.7E-3	1.4E-3	4.1E-4	1.3E-4	3.9E-5	1.3E-5	4.2E-6	1.4E-6

	Off-site1	Off-site2
	MCL	MCL
	100	250
t = 1187 yr	1.4E-6	2.9E-15
Steady-state	1.4E-6	9.2E-13
POE Concentration Limit (mg/L)	1.3E+0	1.3E+0



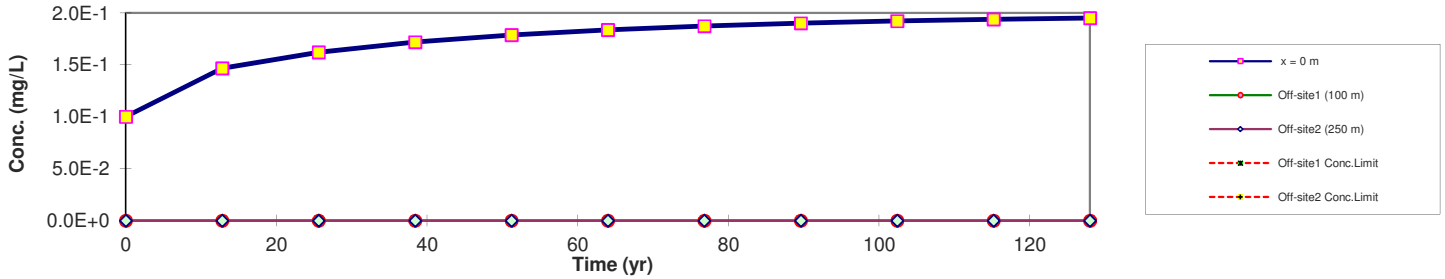
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	12.8	25.6	38.4	51.2	64	76.8	89.6	102.4	115.2	128
x = 0 m	Conc. (mg/L)	1.0E-1	1.5E-1	1.6E-1	1.7E-1	1.8E-1	1.8E-1	1.9E-1	1.9E-1	1.9E-1	1.9E-1	2.0E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA

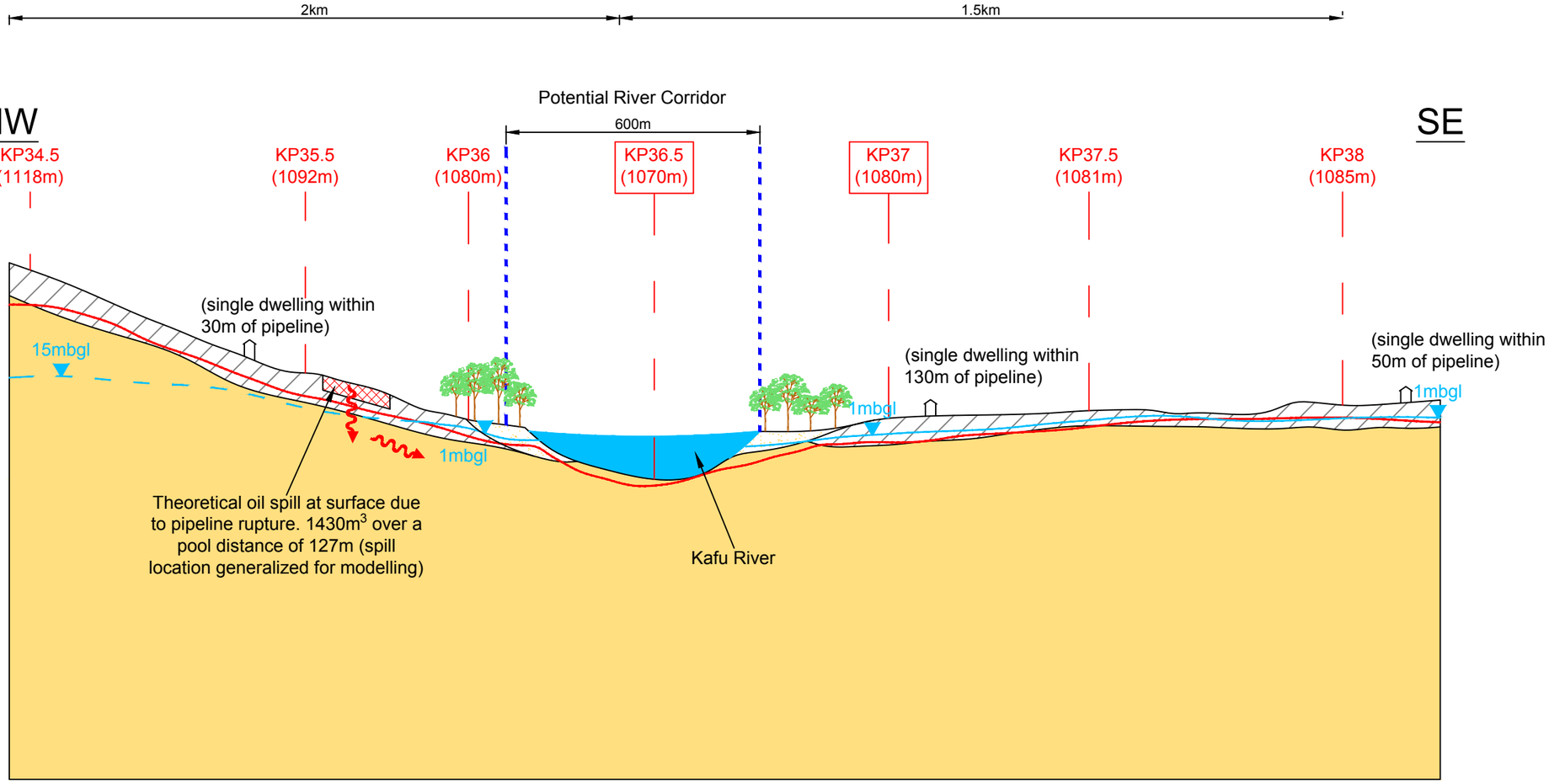


ATTACHMENT I.12 DQRA – OIL RELEASE TO LAND – SURFACE WATER VECS – KP36.5 KAFU RIVER

Conceptual Site Model

Legend:

- Superficia Deposits: Sandy oam
- A uvium
- Parent rock: Weather granite
- Pipe ine (approximate ocation)
- Vegetation
- Water tab e
- (1000m) Ground e evation
- Oi spi due to pipe ine rupture
- Vertica and atera migration in groundwater



Notes:

- Elevation data taken from Google Earth elevations profile

Title:
Conceptua Site Mode Groundwater Migration To Surface Water Mode KP36 5 Kafu River

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Summary of Input Values Used in RBCA Fate and Transport Model

Summary of Input Values Used in RBCA Fate and Transport Model

Model Description:
Source media: Unsaturated zone soil (depleting source) and dissolved phase source originating from NAPL
Offsite exposure model: Leaching to groundwater and lateral migration to surface water receptor (i.e. watercourse) down hydraulic gradient from the site

Assumptions
The oil leak fully saturates the soil.

		Assumed Representative Conditions Uganda Export Pipeline KP36.5 Kafu River- Groundwater migration to surface water		
Unsaturated Zone Soil Source		**Value**	**Justification**	**Reference**
Depth to top of source	m	0.00	Assuming surface pooling of oil on the surface, with saturated soils present beneath the pool surface	*EACOP Studies*
Thickness of contamination	m	1.00	Assumed unsaturated thickness of source is 1m as the lower end of the static water range reported in the DWRM report/	*Modelling in OSM*
Length of source	m	127	Spill volume and spread data from worst case spill modelled in DRA, based on a 610mm diameter hole caused by erosion of the pipeline followed by 3rd party line strike. Pool length of 127m and a spill volume of 9000 bbl (1430m^3). Assumed circular pool.	*EACOP Studies*
Width of source	m	127		
Depth to groundwater	m	1.00	Assumed 1m depth of groundwater in lowland areas close to river.	
Unsaturated Zone Properties				
Soil description	-	-	Soils described as sandy loam	*EACOP Studies*
Total Porosity in vadose zone	cm3/cm3	0.51	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)*
Soil bulk density	g/cm3	1.4	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Infiltration rate	mm/yr	177.80	Average annual rainfall for the Hoima region of 1270mm and infiltration is estimated at 7 to 20% of rainfall in Uganda, therefore 14% of 1270mm used as infiltration rate	*Rainfall data and infiltration information from EACOP Studies*
Saturated conductivity	m/d	1.27008	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Aquifer Properties				
Aquifer description	-	-	Groundwater is assumed to be at a depth of between 1m and 15 mbgl. Therefore, groundwater flow will be within both the weathered Granite and superficial deposits (sandy loam soils).	*EACOP Studies*
Effective porosity	cm3/cm3	0.3	Literature value of mid point between the arithmetic mean of a coarse sand (0.30) to represent weathered granite and sandy superficial deposits	*McWorter and Sunada (1977)*
Fraction organic carbon	g oc/g soil	0.0002	Lower end of literature range quoted for sandy soil. FOC within granite also likely to be low.	*Bourg ; A.C.M. et al, 1992; A review of the attenuation of TCE in soils and aquifers. Qtly. Jn. Eng. Geol.*
Hydraulic conductivity	m/d	1.79	Geometric mean of literature range for coarse sand (9E-7 to 6E-3 m/s or 0.78 to 518 m/d) - also within the range for weathered granite (3E-6 to 5E-5 m/s or 0.72 to 4.5 m/d)	*Values from Domenico,P.A. and Schwartz,F.W. Physical and Chemical Hydrogeology, Wiley,1990.*
Hydraulic gradient	m/m	0.018	Gradient based on topographic slope from KP34.5 lying at an elevation of 1103m (inclusive of reduction of 15m to depth of groundwater) and the Kafu River at KP36.5 at an elevation of 1071m. There is an elevation change of 32m over 1817m distance = 0.018.	*Groundwater data taken from EACOP Studies. Elevation data taken from Google Earth (2018).*
Capillary Fringe				
Thickness of the capillary fringe	m	0.11	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Air content	-	0.051	Literature value for loam soils	
Water content	-	0.459	Literature value for loam soils	
Degradation - dissolved phase only				
Degradation half lives	-	-	Conservatively assumed anaerobic degradation in the dissolved phase only - Half life values selected based on mid-point of literature range for anaerobic degradation	*Half life values sourced from Howard et al. Handbook of Environmental Degradation Rates (1991). Half life values modified prior to entry into the model to account for no sorbed phase degradation. Modification via multiplication of half life values by contaminant specific calculated retardation factor.*

Half Life Calculation Sheet

Retardation factors for Half Life calculation sheet

Pipeline section	Uganda Export
KP	36.5
Model (GW-DW or GW-SW)	GW-SW
Description of aqiuifer material	Sandy Loam over weathered granite
FOC data reference	Lower end of literature range quoted for sandy soil. FOC within granite also likely to be low. Bourg ; A.C.M. et al, 1992; A review of the attenuation of TCE in soils and aquifers. Qtly. Jn. Eng. Geol.
Bulk density data reference	Upper end of literature range for sand to represent sandy superficial deposits and weathered granite Wiedemeier, T. et al., 1995; Tech. protocol for implementing Intrinsic remediation with long-term monitoring for at. attenuation of fuel contam'n. dissolved in g'water. Vol. 1. brooks AFB, Texas
Effective porosity data reference	Literature value of mid point between the arithmetic mean of a coarse sand (0.30) to represent waethered granite and sandy superficial deposits from McWorter and Sunada (1977)

	Log Koc	foc	Kd	Bulk density	Effective porosity	Retardation factor	Anaerobic half life high (hours)	Anaerobic half life low (hours)	Literature t1/2 (Days) (ANAEROBIC)	Adjusted half lives for use in RBCA
Benzene	1.82	0.0002	0.01	1.8	0.3	1.08E+00	17280	2688	416	4.49E+02
Toluene	2.15	0.0002	0.03	1.8	0.3	1.17E+00	5040	1344	133	1.56E+02
Ethylbenzene	2.31	0.0002	0.04	1.8	0.3	1.25E+00	5472	4224	202	2.51E+02
Xylenes	2.11	0.0002	0.03	1.8	0.3	1.15E+00	8640	4320	270	3.12E+02
Aliphatics >EC5-EC6 (hexane)	2.9	0.0002	0.16	1.8	0.3	1.95E+00	17280	2688	416	8.13E+02
Aliphatics >EC6-EC8 (n-heptane)	3.84	0.0002	1.38	1.8	0.3	9.30E+00	5040	1344	133	1.24E+03
Aromatics >EC8-EC10 (trimethylbenzene)	2.97	0.0002	0.19	1.8	0.3	2.12E+00	2688	672	70	1.48E+02
Aromatics >EC10-12 (naphthalene)	3.19	0.0002	0.31	1.8	0.3	2.86E+00	6192	600	141.5	4.04E+02
Aromatics >EC12-16 (2-methynapthalene	3.36	0.0002	0.46	1.8	0.3	3.75E+00	5760	4080	205	7.69E+02

RBCA Model Input Data Summary for NAPL to Groundwater

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 14-Feb-18

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(m)
h_v	Vadose zone thickness	NA			(m)
ρ_s	Soil bulk density	NA			(g/cm^3)
f_{oc}	Fraction organic carbon	NA			(-)
θ_T	Soil total porosity	NA			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	NA	NA	NA	(-)
θ_a	Volumetric air content	NA	NA	NA	(-)
K_{vs}	Vertical hydraulic conductivity	NA			(m/d)
k_v	Vapor permeability	NA			(m^2)
L_{gw}	Depth to groundwater	NA			(m)
pH	Soil/groundwater pH	NA			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/s)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(m)
A_b	Foundation area	NA	NA	(m^2)
X_{crk}	Foundation perimeter	NA	NA	(m)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crk}	Foundation thickness	NA	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	NA	(m)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(m^3/s)
θ_{wcrack}	Volumetric water content of cracks	NA	NA	(-)
θ_{acrack}	Volumetric air content of cracks	NA	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(mm/yr)
U_{gw}	Groundwater Darcy velocity	***0.03222***	(m/d)
V_{gw}	Groundwater seepage velocity	***0.1074***	(m/d)
K_s	Saturated hydraulic conductivity	***1.79***	(m/d)
i	Groundwater gradient	***0.018***	(-)
S_w	Width of groundwater source zone	***127***	(m)
S_d	Depth of groundwater source zone	2	(m)
θ_{eff}	Effective porosity in water-bearing unit	***0.3***	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	***0.0002***	(-)
pH_{sat}	Groundwater pH	***7***	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Groundwater to Indoor Air		
α_x	Longitudinal dispersivity	4.4E+0	6.9E+0	NA	NA	(m)
α_y	Transverse dispersivity	4.4E-1	6.9E-1	NA	NA	(m)
α_z	Vertical dispersivity	4.4E-2	6.9E-2	NA	NA	(m)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/s)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

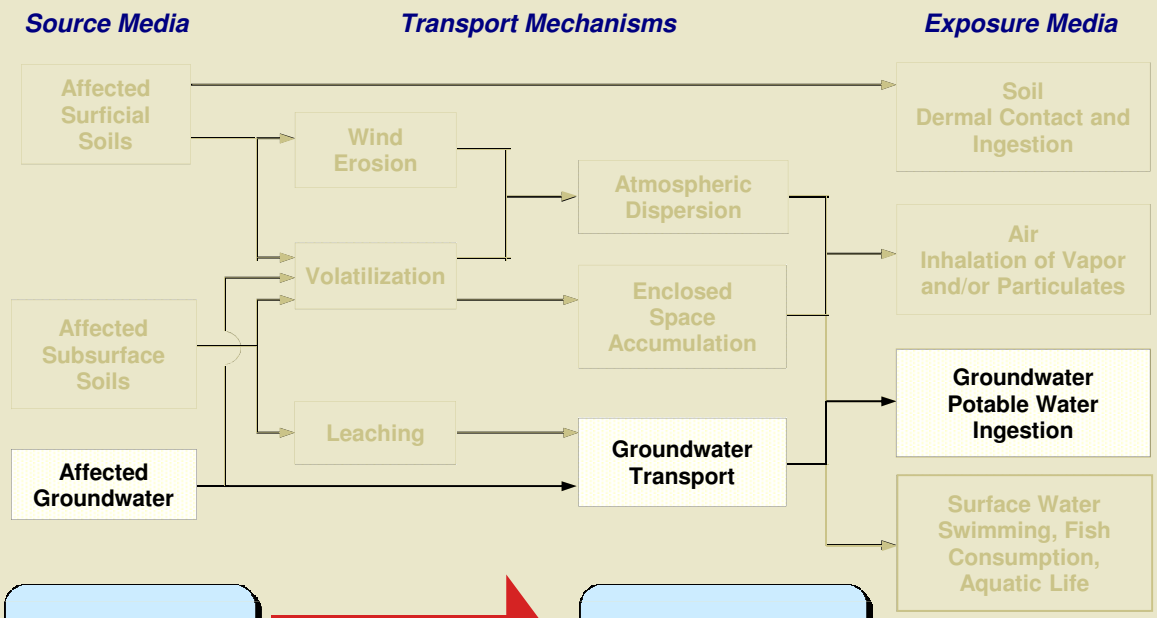
NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA Model Exposure Flowchart for NAPL to Groundwater

Exposure Pathway Flowchart

Site Name: EACOP Uganda Export Pipeline | Job ID: 325171
Location: KP36.5 Kafu River (NAPL to GW) | Date: 14-Feb-18
Compl. By: E Hobbs



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	None	None	None
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	None	None
Groundwater Potable Water Ingestion	*MCL*	*MCL*	*MCL*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

RBCA Model Results for NAPL to Groundwater

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 4-Sep-18
Job ID: 325171

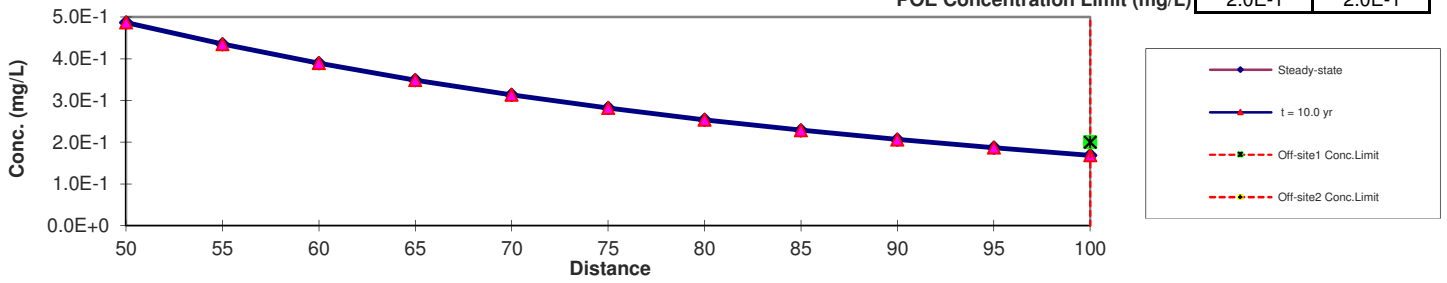
Constiuent: Benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		50	55	60	65	70	75	80	85	90	95	100
t = 10.0 yr	Conc. (mg/L)	4.9E-1	4.3E-1	3.9E-1	3.5E-1	3.1E-1	2.8E-1	2.5E-1	2.3E-1	2.1E-1	1.9E-1	1.7E-1
Steady-state		4.9E-1	4.3E-1	3.9E-1	3.5E-1	3.1E-1	2.8E-1	2.5E-1	2.3E-1	2.1E-1	1.9E-1	1.7E-1

	Off-site1	Off-site2
	MCL	MCL
POE Concentration Limit (mg/L)	100	250
	1.7E-1	1.2E-2
	1.7E-1	1.2E-2
	2.0E-1	2.0E-1



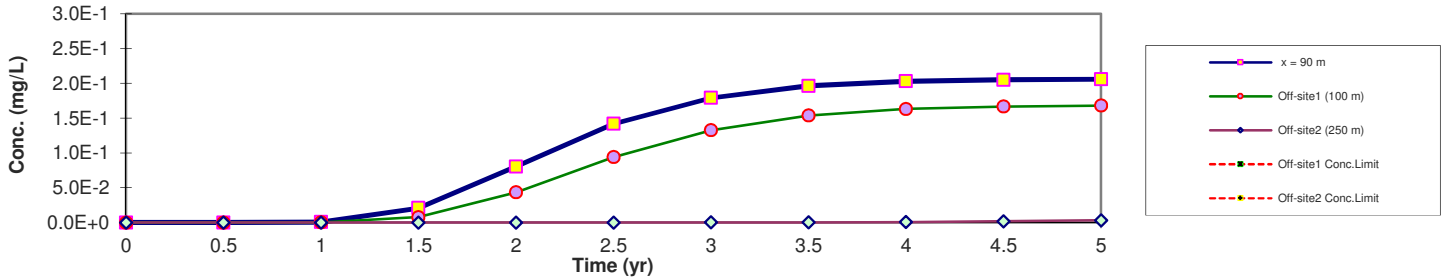
Concentration vs. Time (for given distance from source)

Distance (m) 90

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 90 m	Conc. (mg/L)	0.0E+0	3.5E-9	6.4E-4	2.1E-2	8.0E-2	1.4E-1	1.8E-1	2.0E-1	2.0E-1	2.1E-1	2.1E-1
Off-site1 (100 m)		0.0E+0	5.0E-11	1.1E-4	7.6E-3	4.3E-2	9.4E-2	1.3E-1	1.5E-1	1.6E-1	1.7E-1	1.7E-1
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	1.4E-13	2.1E-9	4.9E-7	1.4E-5	1.3E-4	5.8E-4	1.6E-3	3.2E-3

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 4-Sep-18
Job ID: 325171

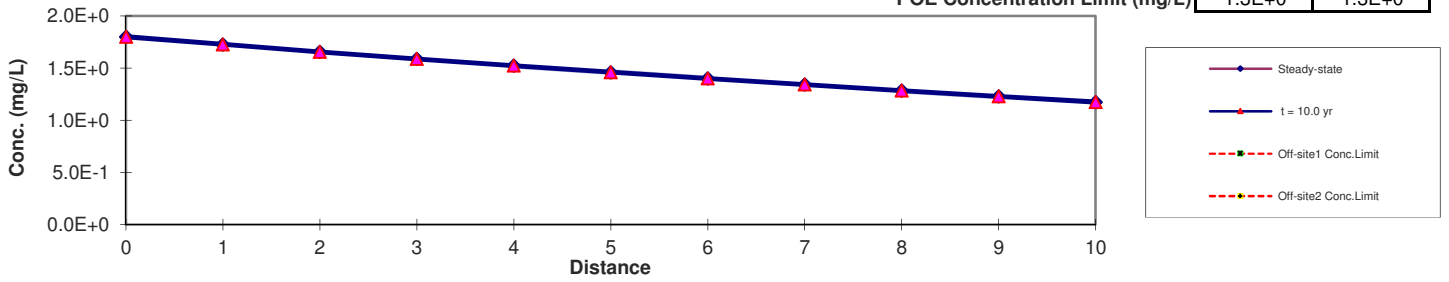
Constiuent: Toluene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 10.0 yr	Conc. (mg/L)	1.8E+0	1.7E+0	1.7E+0	1.6E+0	1.5E+0	1.5E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0
Steady-state		1.8E+0	1.7E+0	1.7E+0	1.6E+0	1.5E+0	1.5E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0

	Off-site1	Off-site2
	MCL	MCL
POE Concentration Limit (mg/L)	100	250
t = 10.0 yr	1.7E-2	4.2E-5
Steady-state	1.7E-2	4.2E-5
	1.3E+0	1.3E+0



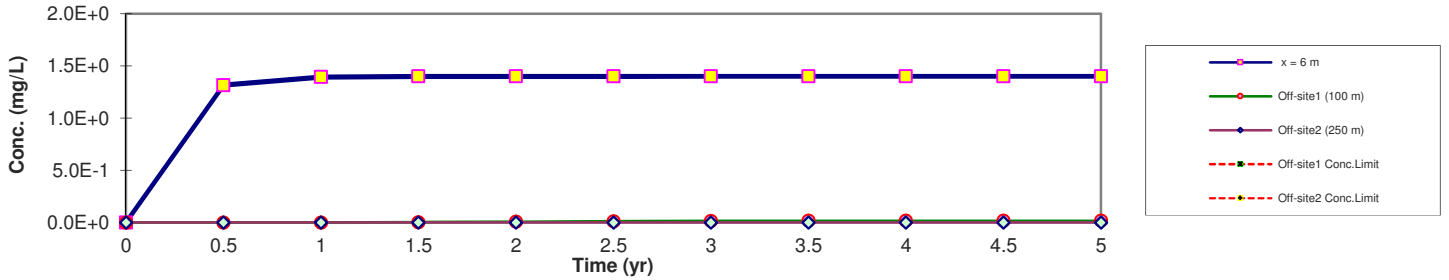
Concentration vs. Time (for given distance from source)

Distance (m) 6

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 6 m	Conc. (mg/L)	0.0E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	5.4E-12	2.0E-5	1.4E-3	6.7E-3	1.2E-2	1.5E-2	1.6E-2	1.7E-2	1.7E-2	1.7E-2
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	3.0E-15	5.4E-11	1.2E-8	3.0E-7	2.2E-6	7.6E-6	1.6E-5	2.5E-5

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 14-Feb-18

Job ID: 325171

Constiuent: Ethyl benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

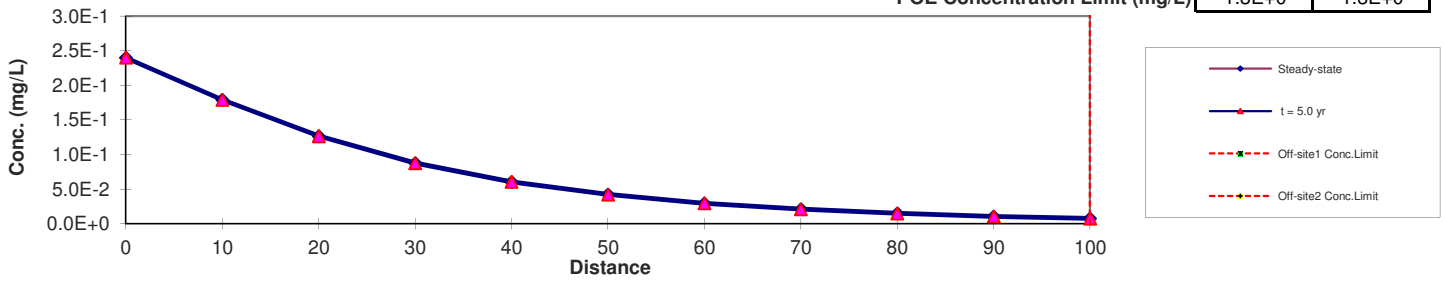
Concentration vs. Distance from Source (for given time)

Time (yr) 5.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 5.0 yr	Conc. (mg/L)	2.4E-1	1.8E-1	1.3E-1	8.8E-2	6.1E-2	4.2E-2	3.0E-2	2.1E-2	1.5E-2	1.1E-2	7.8E-3
Steady-state		2.4E-1	1.8E-1	1.3E-1	8.8E-2	6.1E-2	4.2E-2	3.0E-2	2.1E-2	1.5E-2	1.1E-2	7.8E-3

Off-site1	Off-site2
MCL	MCL
100	250
7.8E-3	2.8E-5
7.8E-3	9.8E-5
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



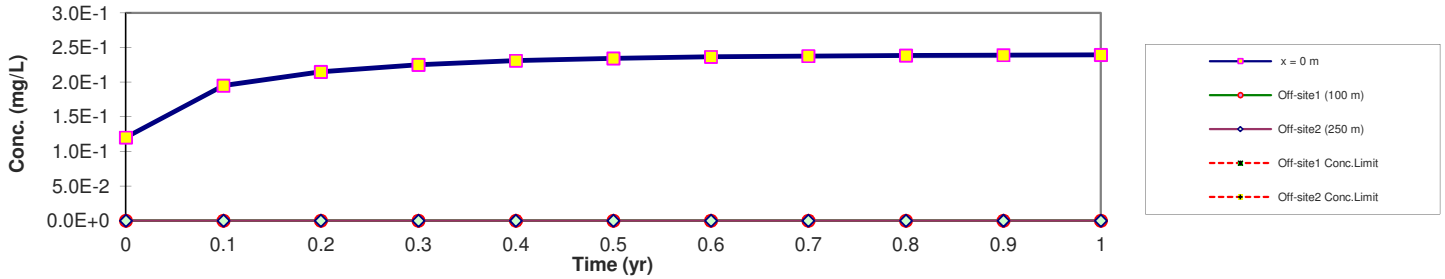
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
x = 0 m	Conc. (mg/L)	1.2E-1	2.0E-1	2.1E-1	2.3E-1	2.3E-1	2.3E-1	2.4E-1	2.4E-1	2.4E-1	2.4E-1	2.4E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	3.7E-17	1.7E-13	4.5E-11	2.3E-9	4.1E-8	3.8E-7	2.1E-6
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 4-Sep-18
Job ID: 325171

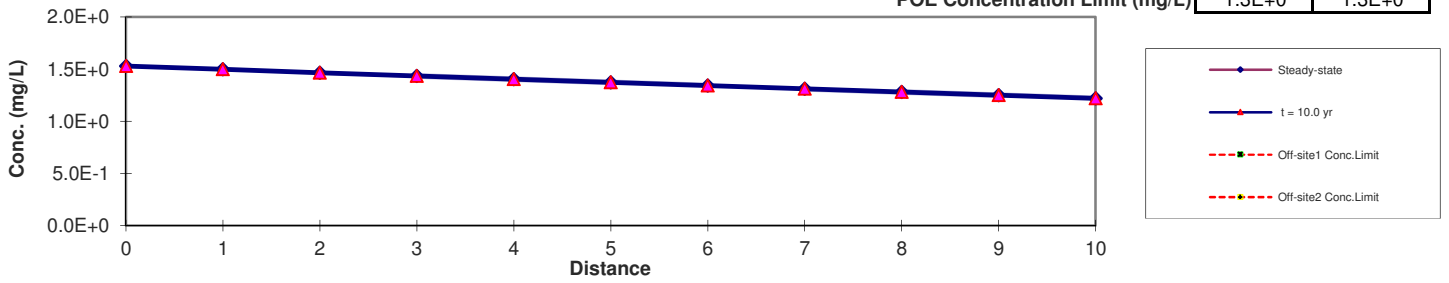
Constiuent: Xylene, o- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 10.0 yr	Conc. (mg/L)	1.5E+0	1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0
Steady-state		1.5E+0	1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0

	Off-site1	Off-site2
	MCL	MCL
POE Concentration Limit (mg/L)	100	250
	9.2E-2	2.5E-3
	9.2E-2	2.5E-3
	1.3E+0	1.3E+0

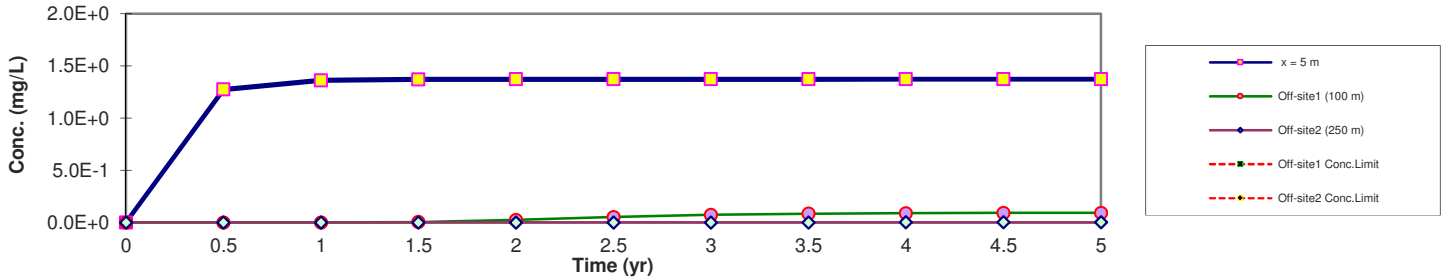


Concentration vs. Time (for given distance from source)

Distance (m) 5

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 5 m	Conc. (mg/L)	0.0E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	9.0E-12	4.1E-5	3.7E-3	2.3E-2	5.1E-2	7.2E-2	8.4E-2	8.9E-2	9.1E-2	9.1E-2
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	1.2E-14	2.8E-10	8.5E-8	2.9E-6	2.9E-5	1.3E-4	3.7E-4	7.5E-4

Time to Reach Conc. Limit (yr)	
Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 14-Feb-18

Job ID: 325171

Constiuent: TPH - Aliph >C05-C06 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

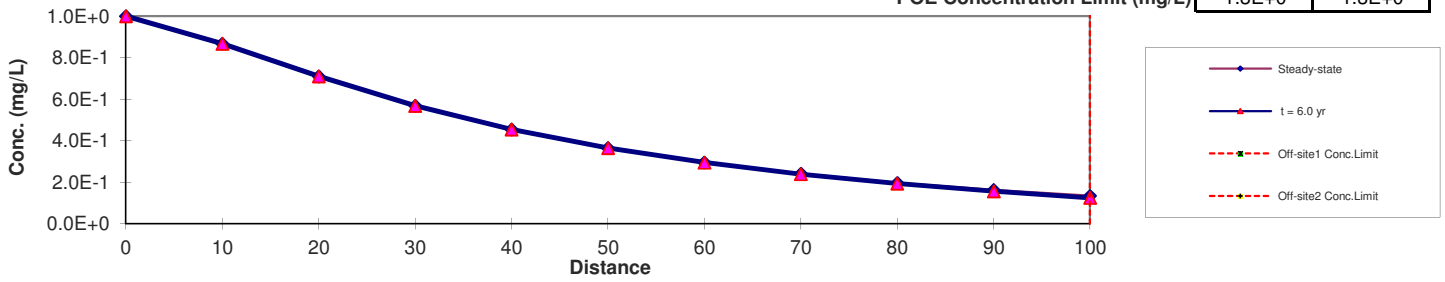
Concentration vs. Distance from Source (for given time)

Time (yr) 6.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 6.0 yr	Conc. (mg/L)	1.0E+0	8.7E-1	7.1E-1	5.7E-1	4.5E-1	3.7E-1	3.0E-1	2.4E-1	1.9E-1	1.6E-1	1.3E-1
Steady-state		1.0E+0	8.7E-1	7.1E-1	5.7E-1	4.5E-1	3.7E-1	3.0E-1	2.4E-1	2.0E-1	1.6E-1	1.3E-1

Off-site1	Off-site2
MCL	MCL
100	250
1.3E-1	1.9E-4
1.3E-1	1.1E-2
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



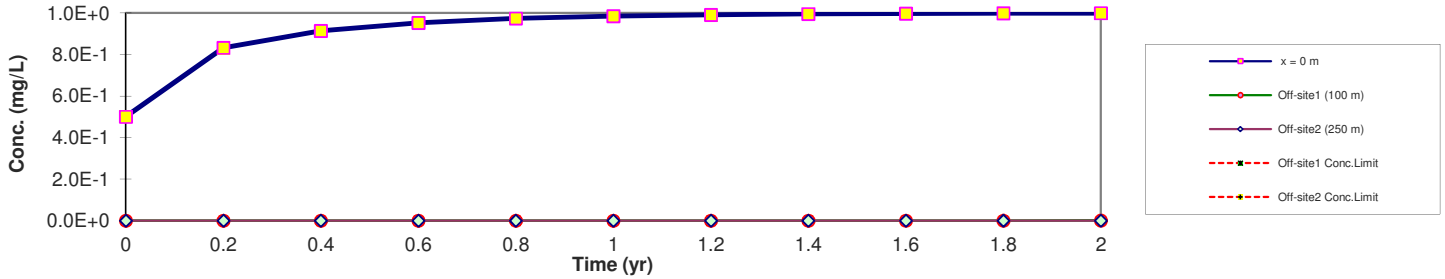
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2
x = 0 m	Conc. (mg/L)	5.0E-1	8.3E-1	9.1E-1	9.5E-1	9.7E-1	9.8E-1	9.9E-1	9.9E-1	1.0E+0	1.0E+0	1.0E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	5.5E-16	1.7E-11	7.7E-9	4.2E-7	7.0E-6	5.5E-5	2.6E-4	8.6E-4
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.2E-17

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 14-Feb-18
Job ID: 325171

Constiuent: TPH - Aliph >C06-C08 (>53% n-hexane) *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

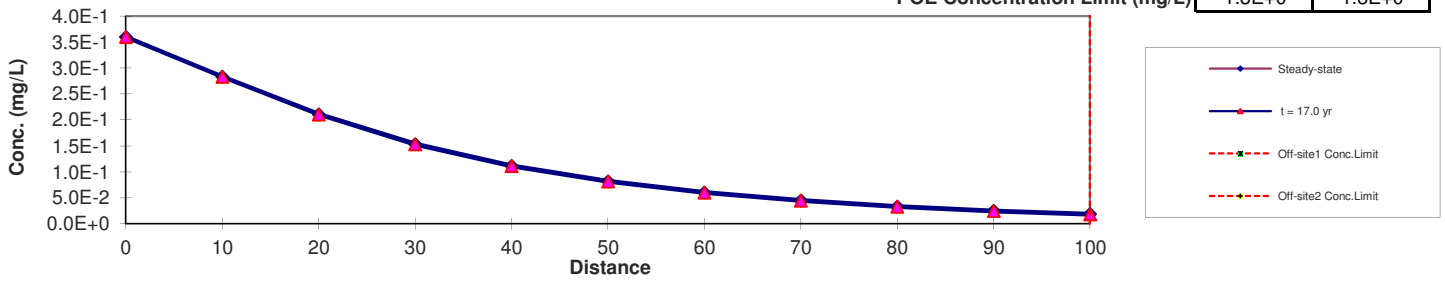
Concentration vs. Distance from Source (for given time)

Time (yr) 17.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 17.0 yr	Conc. (mg/L)	3.6E-1	2.8E-1	2.1E-1	1.5E-1	1.1E-1	8.2E-2	6.0E-2	4.5E-2	3.3E-2	2.5E-2	1.9E-2
Steady-state		3.6E-1	2.8E-1	2.1E-1	1.5E-1	1.1E-1	8.2E-2	6.0E-2	4.5E-2	3.4E-2	2.5E-2	1.9E-2

Off-site1	Off-site2
MCL	MCL
100	250
1.9E-2	2.9E-5
1.9E-2	4.5E-4
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



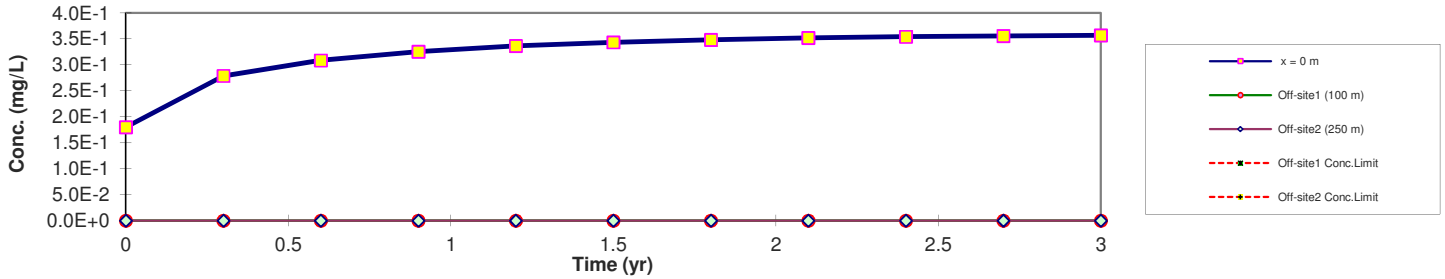
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3
x = 0 m	Conc. (mg/L)	1.8E-1	2.8E-1	3.1E-1	3.3E-1	3.4E-1	3.4E-1	3.5E-1	3.5E-1	3.5E-1	3.6E-1	3.6E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.3E-18	9.6E-15	1.9E-12	9.9E-11	2.1E-9	2.3E-8
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 4-Sep-18
Job ID: 325171

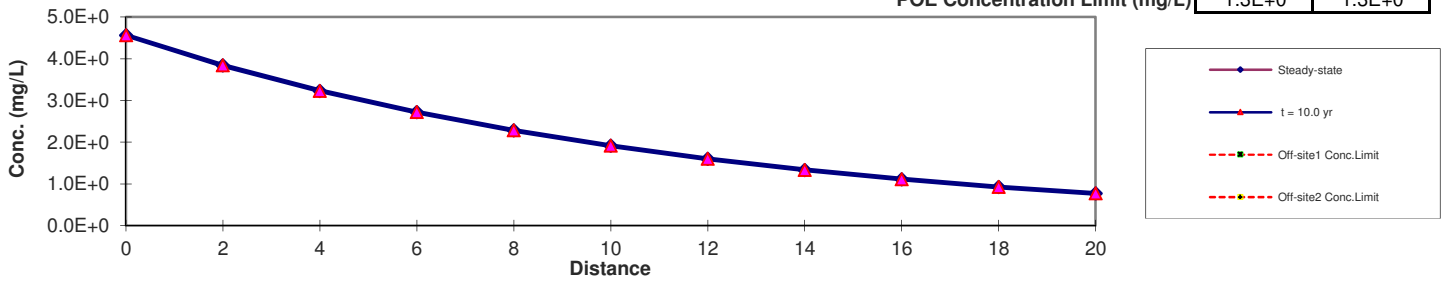
Constiuent: TPH - Arom >C08-C10 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	2	4	6	8	10	12	14	16	18	20
t = 10.0 yr	Conc. (mg/L)	4.6E+0	3.8E+0	3.2E+0	2.7E+0	2.3E+0	1.9E+0	1.6E+0	1.3E+0	1.1E+0	9.2E-1	7.7E-1
Steady-state		4.6E+0	3.8E+0	3.2E+0	2.7E+0	2.3E+0	1.9E+0	1.6E+0	1.3E+0	1.1E+0	9.2E-1	7.7E-1

	Off-site1	Off-site2
	MCL	MCL
POE Concentration Limit (mg/L)	100	250
	7.8E-4	1.6E-8
	7.8E-4	1.8E-8
	1.3E+0	1.3E+0



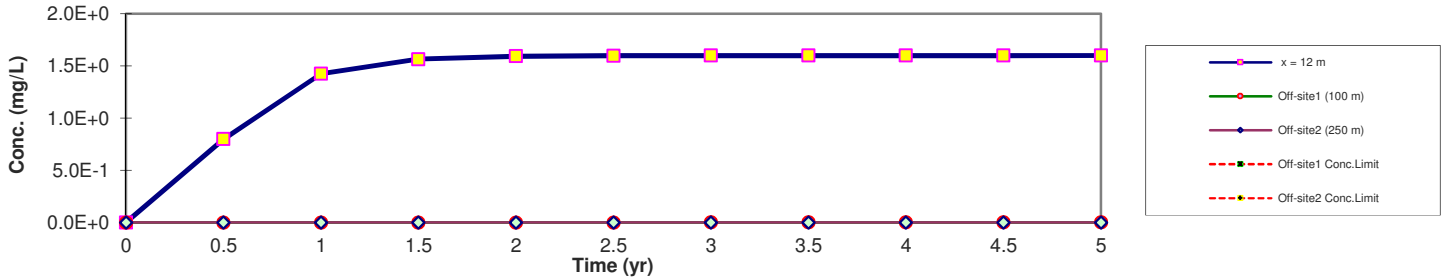
Concentration vs. Time (for given distance from source)

Distance (m) 12

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 12 m	Conc. (mg/L)	0.0E+0	8.0E-1	1.4E+0	1.6E+0	1.6E+0	1.6E+0	1.6E+0	1.6E+0	1.6E+0	1.6E+0	1.6E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	2.7E-13	1.6E-8	2.3E-6	3.2E-5	1.4E-4	3.1E-4	5.0E-4	6.3E-4	7.1E-4
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.7E-21	9.6E-18	3.5E-15	2.3E-13	4.7E-12	4.4E-11

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 14-Feb-18
Job ID: 325171

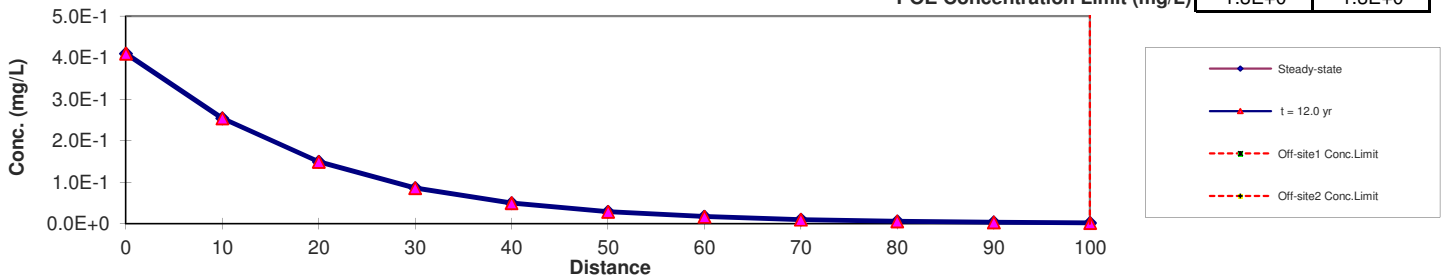
Constiuent: TPH - Arom >C10-C12 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 12.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 12.0 yr	Conc. (mg/L)	4.1E-1	2.5E-1	1.5E-1	8.6E-2	5.0E-2	2.9E-2	1.7E-2	1.0E-2	6.3E-3	3.8E-3	2.4E-3
Steady-state		4.1E-1	2.5E-1	1.5E-1	8.6E-2	5.0E-2	2.9E-2	1.7E-2	1.0E-2	6.3E-3	3.9E-3	2.4E-3

Off-site1	Off-site2
MCL	MCL
100	250
2.4E-3	8.6E-7
2.4E-3	3.4E-6
POE Concentration Limit (mg/L) 1.3E+0	1.3E+0



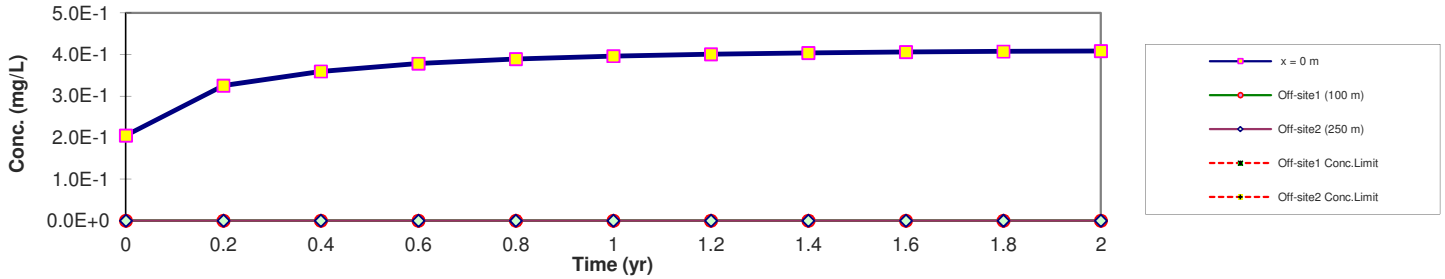
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2
x = 0 m	Conc. (mg/L)	2.1E-1	3.3E-1	3.6E-1	3.8E-1	3.9E-1	4.0E-1	4.0E-1	4.0E-1	4.1E-1	4.1E-1	4.1E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.6E-19	7.0E-16	1.9E-13	1.2E-11	2.9E-10	3.6E-9
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP36.5 Kafu River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 14-Feb-18

Job ID: 325171

Constiuent: TPH - Arom >C12-C16 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

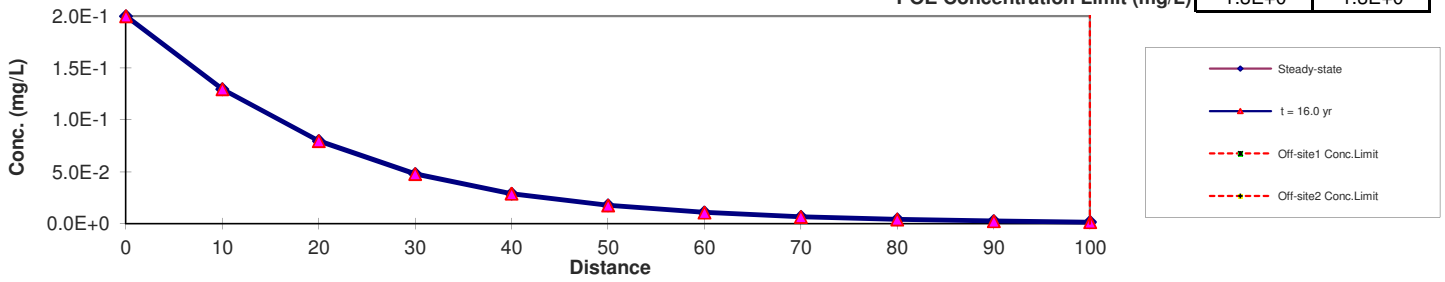
Concentration vs. Distance from Source (for given time)

Time (yr) 16.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 16.0 yr	Conc. (mg/L)	2.0E-1	1.3E-1	8.0E-2	4.8E-2	2.9E-2	1.8E-2	1.1E-2	6.8E-3	4.3E-3	2.7E-3	1.7E-3
Steady-state		2.0E-1	1.3E-1	8.0E-2	4.8E-2	2.9E-2	1.8E-2	1.1E-2	6.8E-3	4.3E-3	2.7E-3	1.7E-3

Off-site1	Off-site2
MCL	MCL
100	250
1.7E-3	7.3E-8
1.7E-3	4.1E-6
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



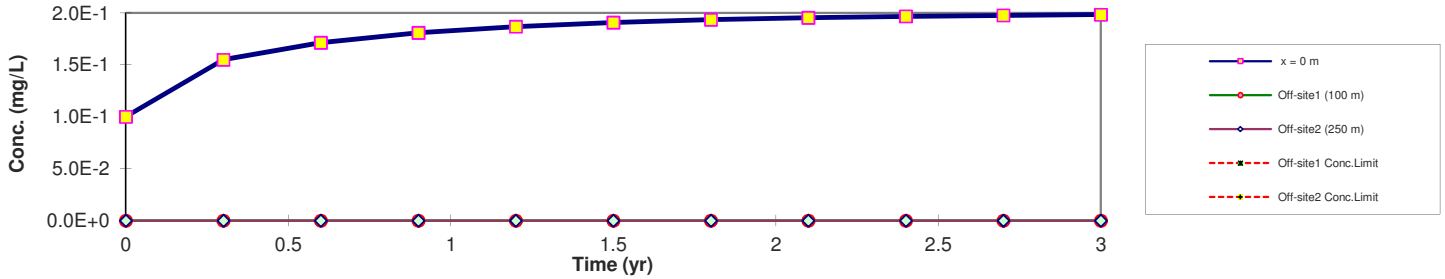
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3
x = 0 m	Conc. (mg/L)	1.0E-1	1.5E-1	1.7E-1	1.8E-1	1.9E-1	1.9E-1	1.9E-1	2.0E-1	2.0E-1	2.0E-1	2.0E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.0E-18	1.2E-15	1.4E-13	5.4E-12	9.8E-11
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

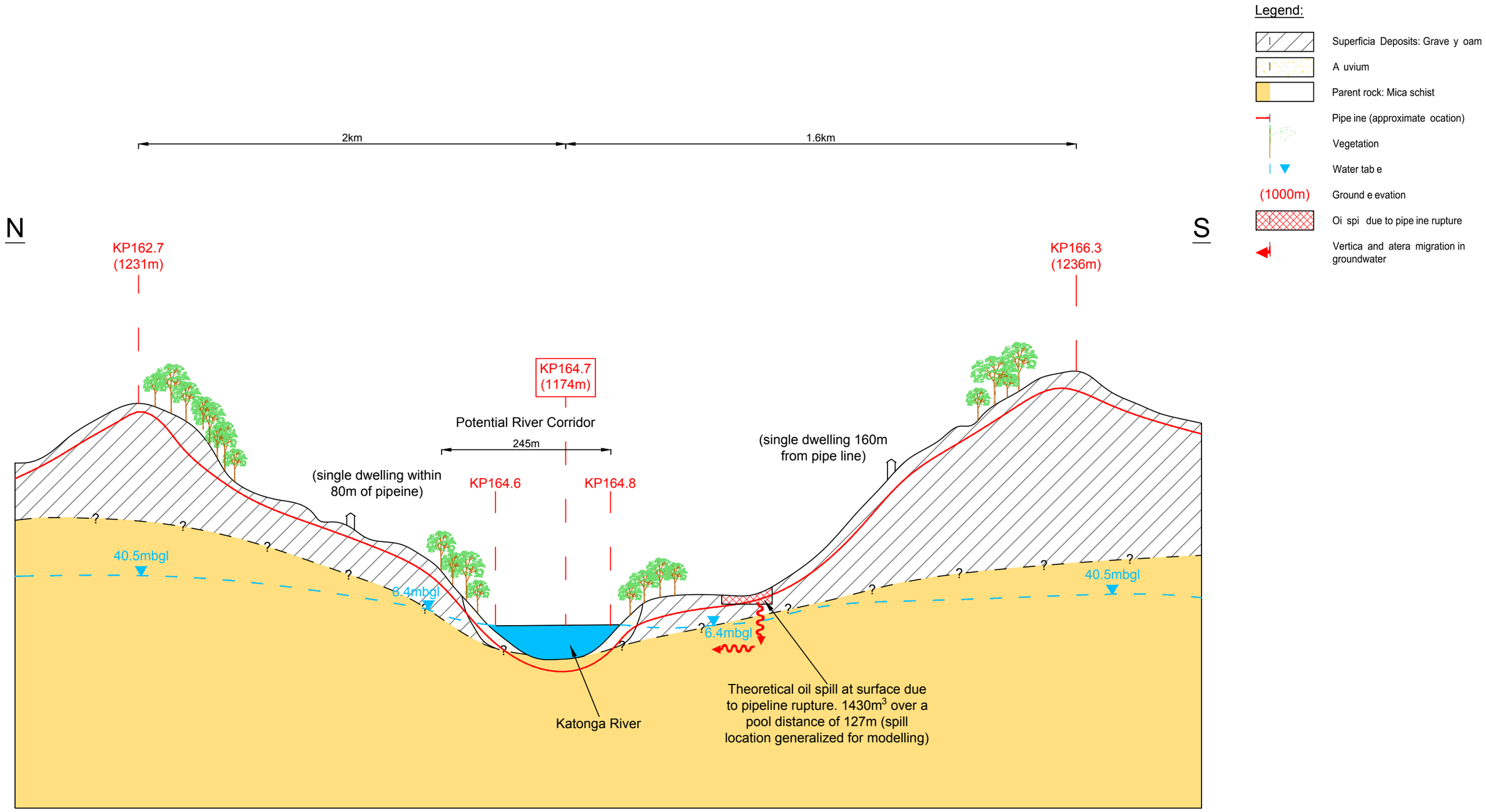
Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



ATTACHMENT I1.13 DQRA – OIL RELEASE TO LAND – SURFACE WATER VECS – KP164.7 KATONGA RIVER

Conceptual Site Model



Legend:

- Superficia Deposits: Grave y oam
- A uvium
- Parent rock: Mica schist
- Pipe ine (approximate ocation)
- Vegetation
- Water tab e
- (1000m) Ground e evation
- Oi spi due to pipe ine rupture
- Vertica and atera migration in groundwater

Notes:

- Elevation data taken from Google Earth elevations profile

Title:
Conceptua Site Mode Groundwater Migration
To Surface Water Mode KP164 7 Katonga River

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Summary of Input Values Used in RBCA Fate and Transport Model

Summary of Input Values Used in RBCA Fate and Transport Model

Model Description:
Source media: Unsaturated zone soil (depleting source) and dissolved phase source originating from NAPL
Offsite exposure model: Leaching to groundwater and lateral migration to surface water receptor (i.e. watercourse) down hydraulic gradient from the site

Assumptions
The oil leak fully saturates the soil.

		Assumed Representative Conditions Uganda Export Pipeline KP164.7 Katonga River- Groundwater migration to surface water		
Unsaturated Zone Soil Source		**Value**	**Justification**	**Reference**
Depth to top of source	m	0.00	Assuming surface pooling of oil on the surface, with saturated soils present beneath the pool surface	*EACOP Studies*
Thickness of contamination	m	1.50	Conservative estimate based on NAPL modelling	*Modelling in OSM*
Length of source	m	127	Spill volume and spread data from worst case spill modelled in DRA, based on a 610mm diameter hole caused by erosion of the pipeline followed by 3rd party line strike. Pool length of 127m and a spill volume of 9000 bbl (1430m^3). Assumed circular pool.	*EACOP Studies*
Width of source	m	127		
Depth to groundwater	m	6.40	Used lower end of static groundwater depth range reported in DWRM report. The range is reported to be between 6.4m and 76.3m bgl with an average of 40.5m bgl. It has been assumed that groundwater lies at 6.4m in the lowlands by the river (due to the steepness of the riverbank) and 40.5m bgl in the highlands.	*EACOP Studies*
Unsaturated Zone Properties				
Soil description	-	-	Soils described as gravelly loam	*EACOP Studies*
Total Porosity in vadose zone	cm3/cm3	0.51	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)*
Soil bulk density	g/cm3	1.4	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Infiltration rate	mm/yr	142.94	Rainfall data for the Gomba District (located to north of river) and Sembabule District (located to south of river) does not exist. In absence of this data, rainfall data for Mubende (nearest region with data, located to the north of Sembabule) has been used. Average annual rainfall for the Mubende region of 1021mm and infiltration is estimated at 7 to 20% of rainfall in Uganda, therefore 14% of 1021mm used as infiltration rate	*Rainfall data and infiltration information from EACOP Studies*
Saturated conductivity	m/d	1.27008	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Aquifer Properties				
Aquifer description	-	-	Groundwater is assumed to be at a depth of between 6.4m and 76.3mbgl with an average of 40.5m bgl. Therefore, groundwater flow will likely be within the parent rock (mica schist)	*EACOP Studies*
Effective porosity	cm3/cm3	0.26	Arithmetic mean for a metamorphic schist	*McWorter and Sunada (1977)*
Fraction organic carbon	g oc/g soil	0.0002	Lower end of literature range quoted for sandy soil but low value likely to be representative of a weathered crystalline bedrock	*Bourg ; A.C.M. et al, 1992; A review of the attenuation of TCE in soils and aquifers. Qtly. Jn. Eng. Geol.*
Hydraulic conductivity	m/d	0.20	Value used for weathered Gabbro to be representative of weathered upper zone of schist in a coarse grained rock	*Values from Todd, D.K., 1980. Groundwater Hydrology. Second Edn. Wiley & Sons, 1980.*
Hydraulic gradient	m/m	0.0135	Gradient based on topographic slope from KP166.3 lying at an elevation of 1193.5m (inclusive of reduction of 40.5m to depth of groundwater) and the southern bank of the Katonga River at KP164.9 at an elevation of 1174.6m (inclusive of reduction of 6.4m to depth of groundwater). There is an elevation change of 18.9m over 1400m distance = 0.0135.	*Groundwater data taken from EACOP Studies. Elevation data taken from Google Earth (2018).*
Capillary Fringe				
Thickness of the capillary fringe	m	0.11	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Air content	-	0.051	Literature value for loam soils	
Water content	-	0.459	Literature value for loam soils	
Degradation - dissolved phase only				
Degradation half lives	-	-	Conservatively assumed anaerobic degradation in the dissolved phase only - Half life values selected based on mid-point of literature range for anaerobic degradation	*Half life values sourced from Howard et al. Handbook of Environmental Degradation Rates (1991). Half life values modified prior to entry into the model to account for no sorbed phase degradation. Modification via multiplication of half life values by contaminant specific calculated retardation factor.*

Half Life Calculation Sheet

Retardation factors for half life calculation sheet

Pipeline section	Uganda Export
KP	164.7
Model (GW-DW or GW-SW)	GW-SW
Description of aquifer material	Gravelly loam over mica schist
FOC data reference	Lower end of literature range quoted for sandy soil but low value likely to be representative of a weathered crystalline bedrock. Bourg ; A.C.M. et al, 1992; A review of the attenuation of TCE in soils and aquifers. Qtly. Jn. Eng. Geol.
Bulk density data reference	Value of 2.64 reported for Tasmania Schist. Reduced to 2.2 to allow for weathered/fractured nature of upper zone of schist. Manger, G. E. 1963; Porosity and bulk density of sedimentary rocks: Contributions to Geochemistry. Geological Survey Bulletin 1144-E, Washington.
Effective porosity data reference	Arithmetic mean for a metamorphic schist from McWorter and Sunada (1977)

	Log Koc	foc	Kd	Bulk density	Effective porosity	Retardation factor	Anaerobic half life high (hours)	Anaerobic half life low (hours)	Literature t1/2 (Days) (ANAEROBIC)	Adjusted half lives for use in RBCA
Benzene	1.82	0.0002	0.01	2.2	0.26	1.11E+00	17280	2688	416	4.63E+02
Toluene	2.15	0.0002	0.03	2.2	0.26	1.24E+00	5040	1344	133	1.65E+02
Ethylbenzene	2.31	0.0002	0.04	2.2	0.26	1.35E+00	5472	4224	202	2.72E+02
Xylenes	2.11	0.0002	0.03	2.2	0.26	1.22E+00	8640	4320	270	3.29E+02
Aliphatics >EC5-EC6 (hexane)	2.9	0.0002	0.16	2.2	0.26	2.34E+00	17280	2688	416	9.75E+02
Aliphatics >EC6-EC8 (n-heptane)	3.84	0.0002	1.38	2.2	0.26	1.27E+01	5040	1344	133	1.69E+03
Aromatics >EC8-EC10 (trimethylbenzene)	2.97	0.0002	0.19	2.2	0.26	2.58E+00	2688	672	70	1.81E+02
Aromatics >EC10-12 (naphthalene)	3.19	0.0002	0.31	2.2	0.26	3.62E+00	6192	600	141.5	5.12E+02
Aromatics >EC12-16 (2-methynapthalene	3.36	0.0002	0.46	2.2	0.26	4.88E+00	5760	4080	205	1.00E+03

RBCA Model Input Data Summary for Soil to Groundwater

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: EACOP Uganda Export Pipeline
Site Location: KP164.7 Katonga River (Soil to GW)

Completed By: E Hobbs
Date Completed: 27.02.2018

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(m)
h_v	Vadose zone thickness	NA			(m)
ρ_s	Soil bulk density	***1.4***			(g/cm^3)
f_{oc}	Fraction organic carbon	***0.002***			(-)
θ_T	Soil total porosity	***0.51***			(-)
		capillary	**vadose**	**foundation**	
θ_w	Volumetric water content	***0.459***	***0.36***	0.12	(-)
θ_a	Volumetric air content	***0.051***	***0.15***	0.26	(-)
K_{vs}	Vertical hydraulic conductivity	***1.27008***			(m/d)
k_v	Vapor permeability	***1.32E-12***			(m^2)
L_{gw}	Depth to groundwater	***6.4***			(m)
pH	Soil/groundwater pH	***7***			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	***127***			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	0			(m)
L_{base}	Depth to base of affected soils	***1.5***			(m)
L_{subs}	Thickness of affected soils	***1.5***			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/s)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(m)
A_b	Foundation area	NA	NA	(m^2)
X_{crk}	Foundation perimeter	NA	NA	(m)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crk}	Foundation thickness	NA	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	NA	(m)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(m^3/s)
θ_{wcrack}	Volumetric water content of cracks	NA	NA	(-)
θ_{acrack}	Volumetric air content of cracks	NA	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	2	(m)
I_f	Net groundwater infiltration rate	***142.94***	(mm/yr)
U_{gw}	Groundwater Darcy velocity	***0.0027***	(m/d)
V_{gw}	Groundwater seepage velocity	***0.010384615***	(m/d)
K_s	Saturated hydraulic conductivity	***0.2***	(m/d)
i	Groundwater gradient	***0.0135***	(-)
S_w	Width of groundwater source zone	***127***	(m)
S_d	Depth of groundwater source zone	2	(m)
θ_{eff}	Effective porosity in water-bearing unit	***0.26***	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	***0.0002***	(-)
pH_{sat}	Groundwater pH	***7***	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		**Groundwater Ingestion**		**Groundwater to Indoor Air**		
α_x	Longitudinal dispersivity	4.4E+0	6.9E+0	NA	NA	(m)
α_y	Transverse dispersivity	4.4E-1	6.9E-1	NA	NA	(m)
α_z	Vertical dispersivity	4.4E-2	6.9E-2	NA	NA	(m)
Lateral Outdoor Air Transport		**Soil to Outdoor Air Inhal.**		**GW to Outdoor Air Inhal.**		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/s)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

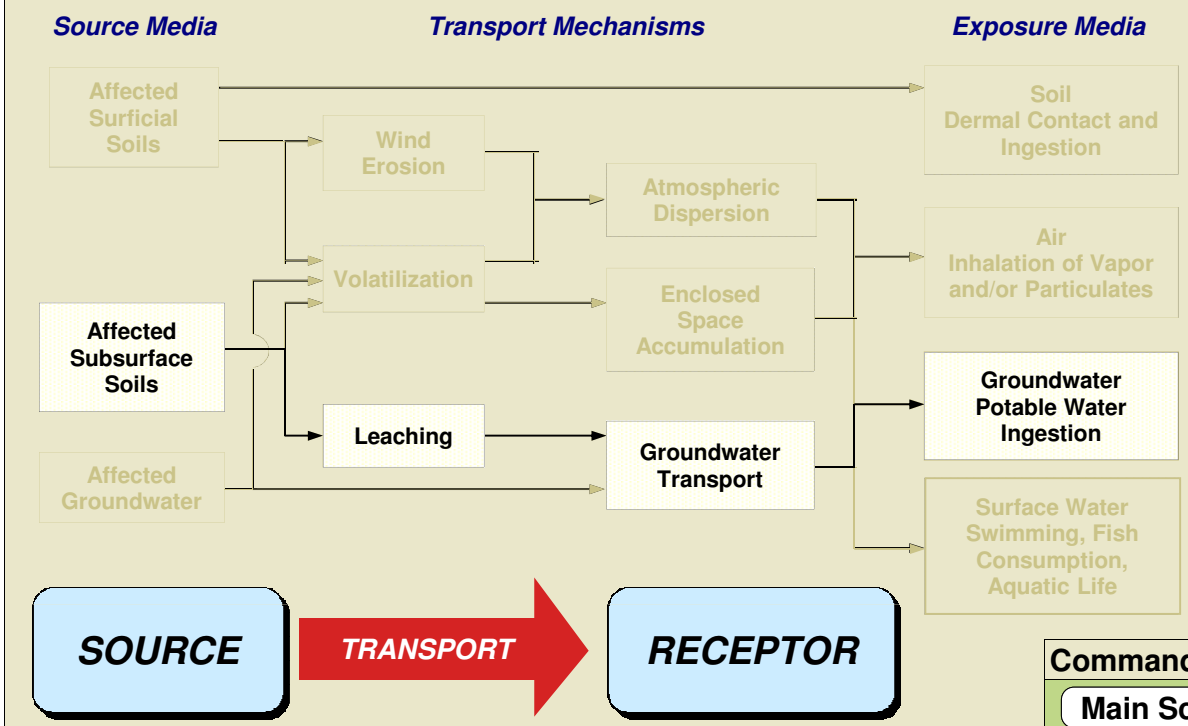
NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA Model Exposure Flowchart for NAPL to Groundwater

Exposure Pathway Flowchart

Site Name: EACOP Uganda Export Pipeline — Job ID: 325171
Location: KP164.7 Katonga River (Soil to GW) — Date: 27.02.2018
Compl. By: E Hobbs



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	None	None	None
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	None	None
Groundwater Potable Water Ingestion	*MCL*	*MCL*	*MCL*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

RBCA Model Results for Soil to Groundwater

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP164.7 Katonga River (Soil to GW)
Completed By: E Hobbs
Date Completed: 11.10.2018
Job ID: 325171

Constiuent: Benzene *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

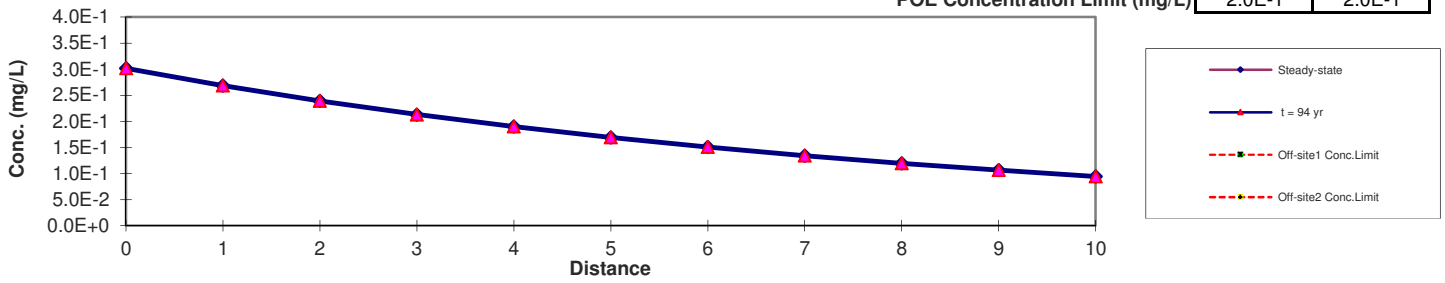
Concentration vs. Distance from Source (for given time)

Time (yr) 94.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 94 yr	Conc. (mg/L)	3.0E-1	2.7E-1	2.4E-1	2.1E-1	1.9E-1	1.7E-1	1.5E-1	1.3E-1	1.2E-1	1.1E-1	9.4E-2
Steady-state		3.0E-1	2.7E-1	2.4E-1	2.1E-1	1.9E-1	1.7E-1	1.5E-1	1.3E-1	1.2E-1	1.1E-1	9.4E-2

Off-site1	Off-site2
MCL	MCL
100	250
4.0E-6	5.0E-12
4.0E-6	5.0E-12
2.0E-1	2.0E-1

POE Concentration Limit (mg/L)



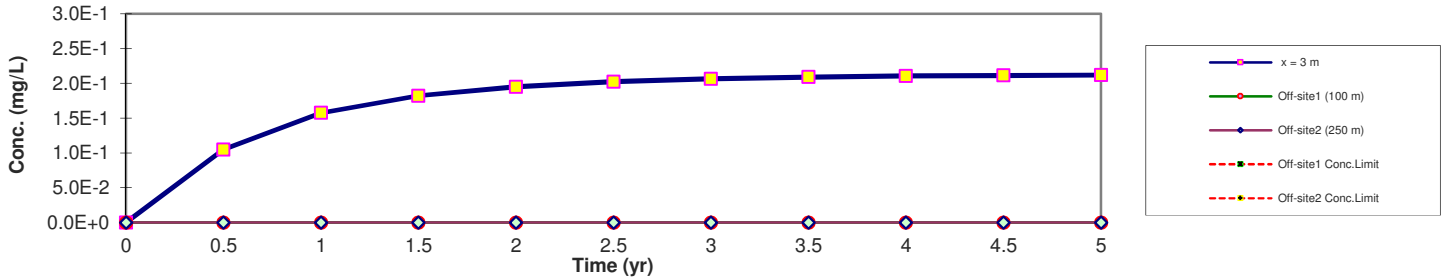
Concentration vs. Time (for given distance from source)

Distance (m) 3

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 3 m	Conc. (mg/L)	0.0E+0	1.0E-1	1.6E-1	1.8E-1	2.0E-1	2.0E-1	2.1E-1	2.1E-1	2.1E-1	2.1E-1	2.1E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	4.4E-22	7.5E-19	1.7E-16	1.1E-14	2.9E-13
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline | Completed By: E Hobbs | Job ID: 325171

Site Location: KP164.7 Katonga River (Soil to GW) | Date Completed: 11.10.2018 | *2 of 9*

Constiuent: Toluene *

Source Medium: Affected Soils Leaching to Groundwater

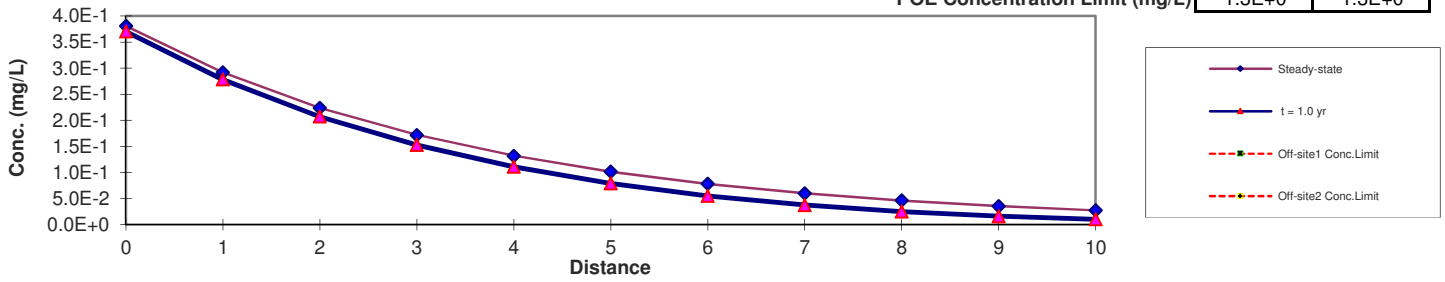
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	3.7E-1	2.8E-1	2.1E-1	1.5E-1	1.1E-1	7.9E-2	5.5E-2	3.7E-2	2.5E-2	1.6E-2	9.9E-3
Steady-state		3.8E-1	2.9E-1	2.2E-1	1.7E-1	1.3E-1	1.0E-1	7.8E-2	6.0E-2	4.6E-2	3.6E-2	2.7E-2

	Off-site1	Off-site2
	MCL	MCL
	100	250
	0.0E+0	0.0E+0
	1.8E-11	3.4E-23
POE Concentration Limit (mg/L)	1.3E+0	1.3E+0



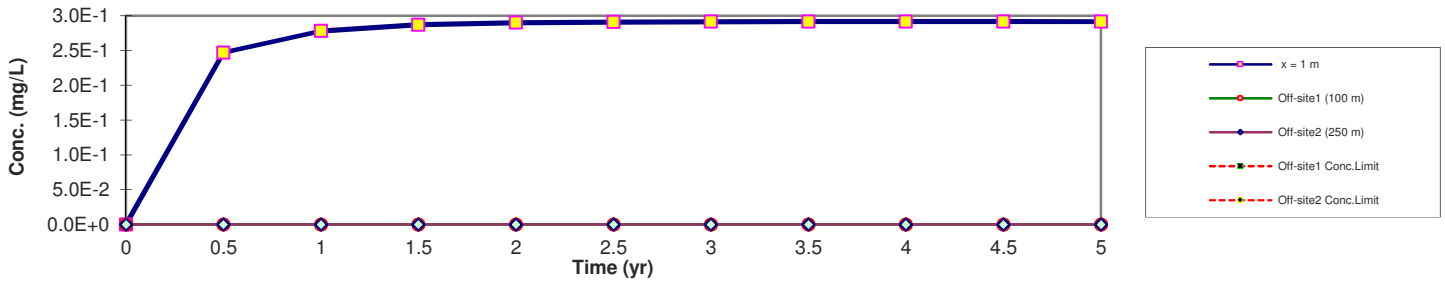
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	2.5E-1	2.8E-1	2.9E-1	2.9E-1	2.9E-1	2.9E-1	2.9E-1	2.9E-1	2.9E-1	2.9E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	6.9E-25	1.2E-21	2.6E-19	1.5E-17	3.3E-16
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline | Completed By: E Hobbs | Job ID: 325171

Site Location: KP164.7 Katonga River (Soil to GW) | Date Completed: 11.10.2018 | *3 of 9*

Constiuent: Ethyl benzene *

Source Medium: Affected Soils Leaching to Groundwater

Biodegredation: 1st Order

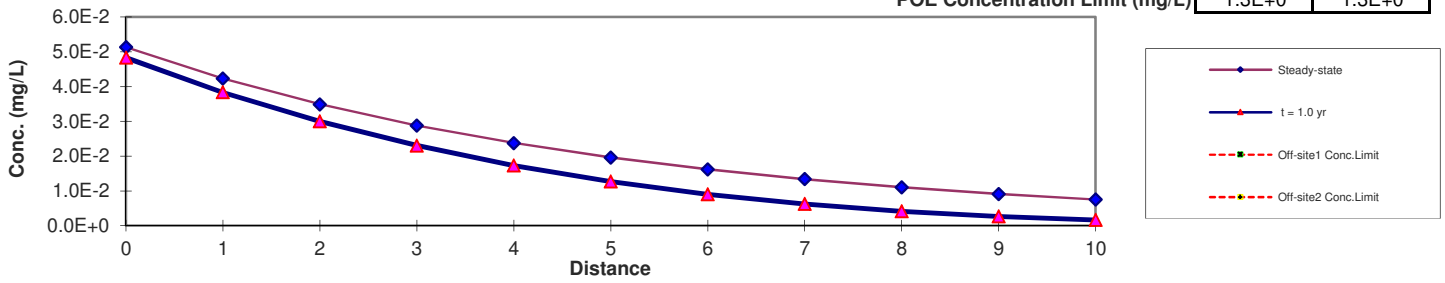
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	4.8E-2	3.8E-2	3.0E-2	2.3E-2	1.7E-2	1.3E-2	9.0E-3	6.2E-3	4.1E-3	2.6E-3	1.6E-3
Steady-state		5.1E-2	4.2E-2	3.5E-2	2.9E-2	2.4E-2	2.0E-2	1.6E-2	1.3E-2	1.1E-2	9.1E-3	7.5E-3

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
9.9E-10	1.0E-18
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



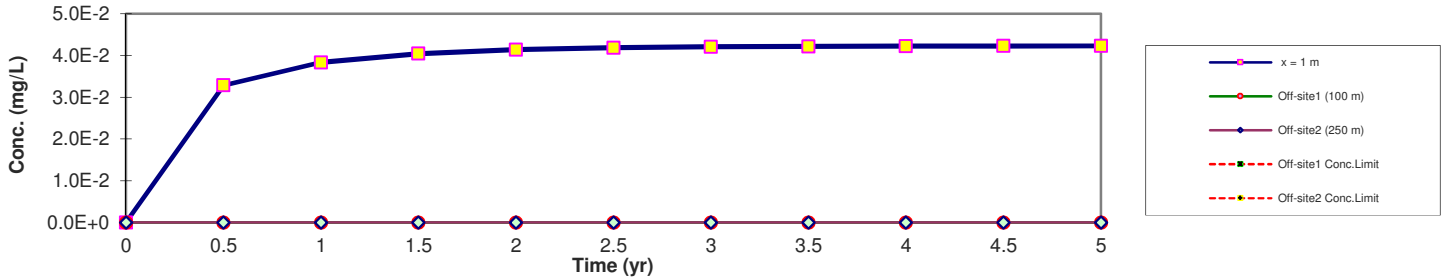
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	3.3E-2	3.8E-2	4.0E-2	4.1E-2	4.2E-2	4.2E-2	4.2E-2	4.2E-2	4.2E-2	4.2E-2
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	6.4E-23	2.7E-20	2.7E-18	9.9E-17
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP164.7 Katonga River (Soil to GW)
Completed By: E Hobbs
Date Completed: 11.10.2018
Job ID: 325171

Constiuent: Xylene, o- *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

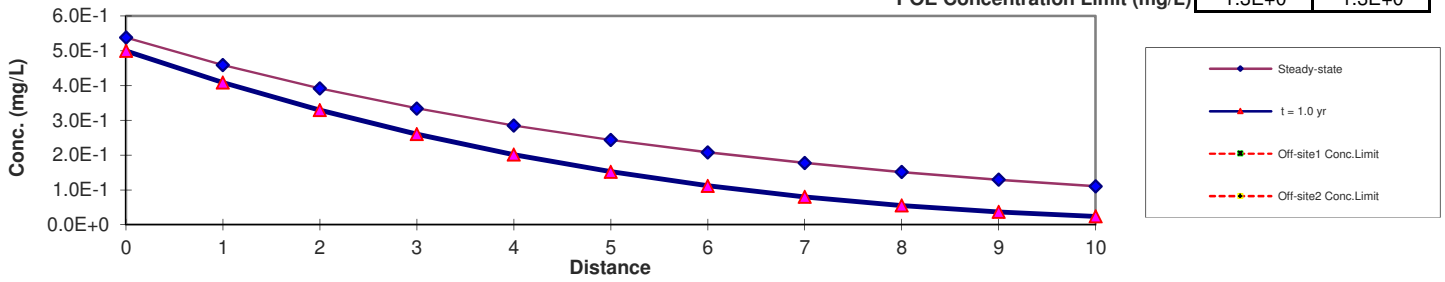
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	5.0E-1	4.1E-1	3.3E-1	2.6E-1	2.0E-1	1.5E-1	1.1E-1	7.9E-2	5.5E-2	3.6E-2	2.3E-2
Steady-state		5.4E-1	4.6E-1	3.9E-1	3.3E-1	2.8E-1	2.4E-1	2.1E-1	1.8E-1	1.5E-1	1.3E-1	1.1E-1

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
1.8E-7	4.2E-15
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



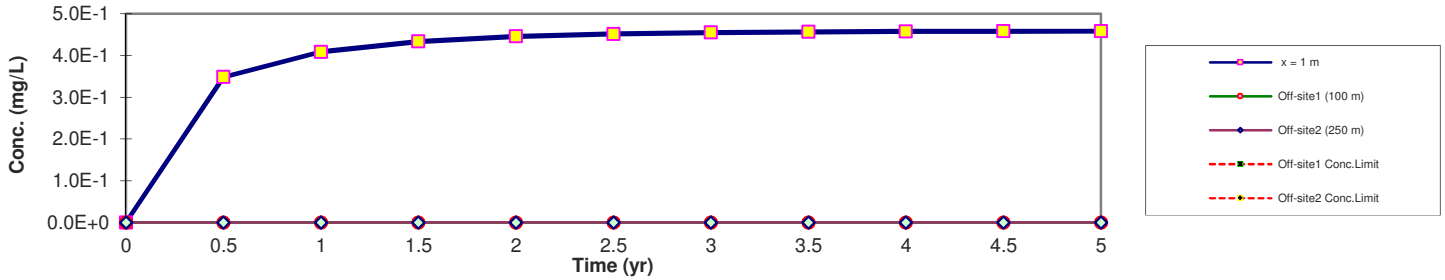
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	3.5E-1	4.1E-1	4.3E-1	4.5E-1	4.5E-1	4.5E-1	4.6E-1	4.6E-1	4.6E-1	4.6E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	2.0E-23	3.6E-20	1.1E-17	8.3E-16	2.5E-14
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP164.7 Katonga River (Soil to GW)
Completed By: E Hobbs
Date Completed: 11.10.2018
Job ID: 325171

Constiuent: TPH - Aliph >C05-C06 *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

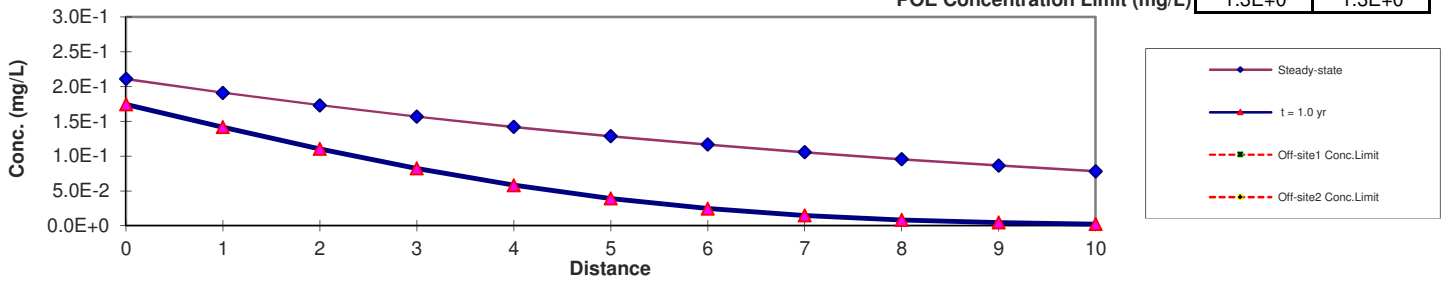
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	1.7E-1	1.4E-1	1.1E-1	8.2E-2	5.8E-2	3.9E-2	2.4E-2	1.4E-2	8.0E-3	4.2E-3	2.0E-3
Steady-state		2.1E-1	1.9E-1	1.7E-1	1.6E-1	1.4E-1	1.3E-1	1.2E-1	1.1E-1	9.6E-2	8.6E-2	7.8E-2

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
1.2E-5	8.0E-11
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



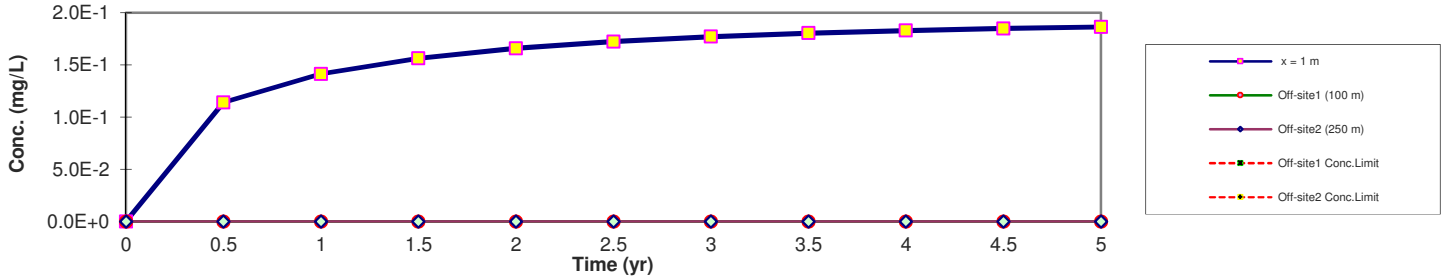
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	1.1E-1	1.4E-1	1.6E-1	1.7E-1	1.7E-1	1.8E-1	1.8E-1	1.8E-1	1.8E-1	1.9E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline | Completed By: E Hobbs | Job ID: 325171

Site Location: KP164.7 Katonga River (Soil to GW) | Date Completed: 11.10.2018 |

Constiuent: TPH - Aliph >C06-C08 (>53% n-hexane) *

Source Medium: Affected Soils Leaching to Groundwater

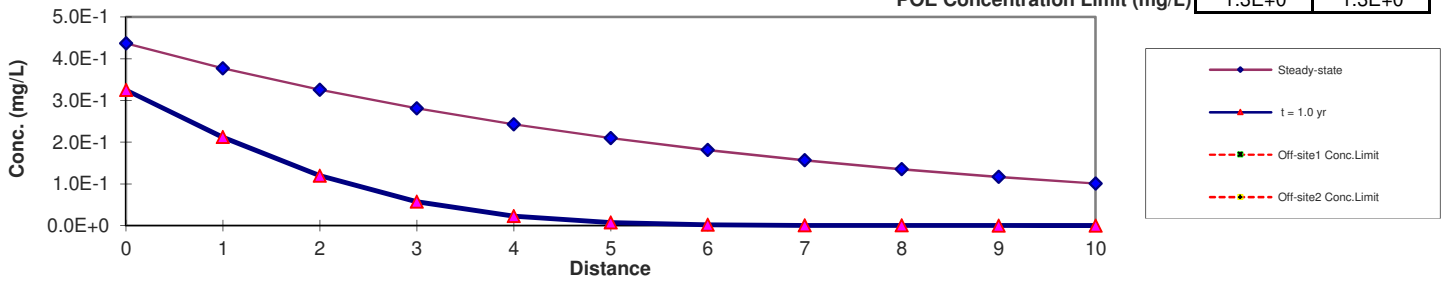
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	3.2E-1	2.1E-1	1.2E-1	5.7E-2	2.3E-2	7.4E-3	2.0E-3	4.4E-4	7.8E-5	1.1E-5	1.3E-6
Steady-state		4.4E-1	3.8E-1	3.3E-1	2.8E-1	2.4E-1	2.1E-1	1.8E-1	1.6E-1	1.4E-1	1.2E-1	1.0E-1

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
4.1E-7	2.8E-14
POE Concentration Limit (mg/L)	
1.3E+0	1.3E+0



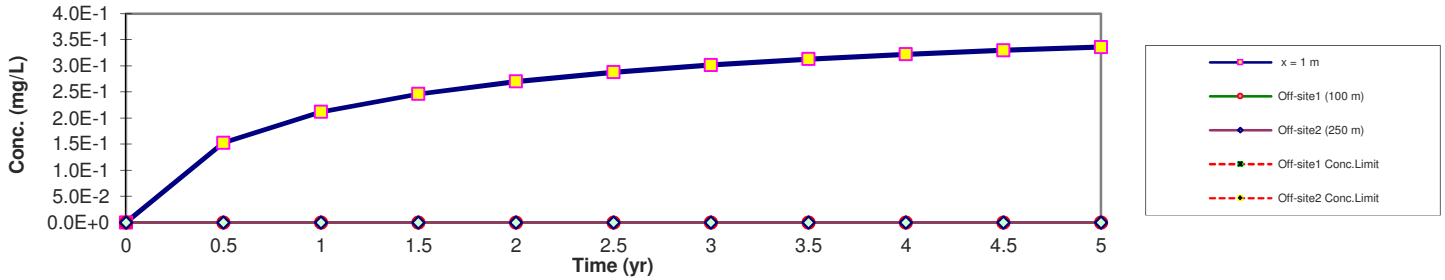
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	1.5E-1	2.1E-1	2.5E-1	2.7E-1	2.9E-1	3.0E-1	3.1E-1	3.2E-1	3.3E-1	3.4E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP164.7 Katonga River (Soil to GW)
Completed By: E Hobbs
Date Completed: 11.10.2018
Job ID: 325171

Constiuent: TPH - Arom >C08-C10 *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

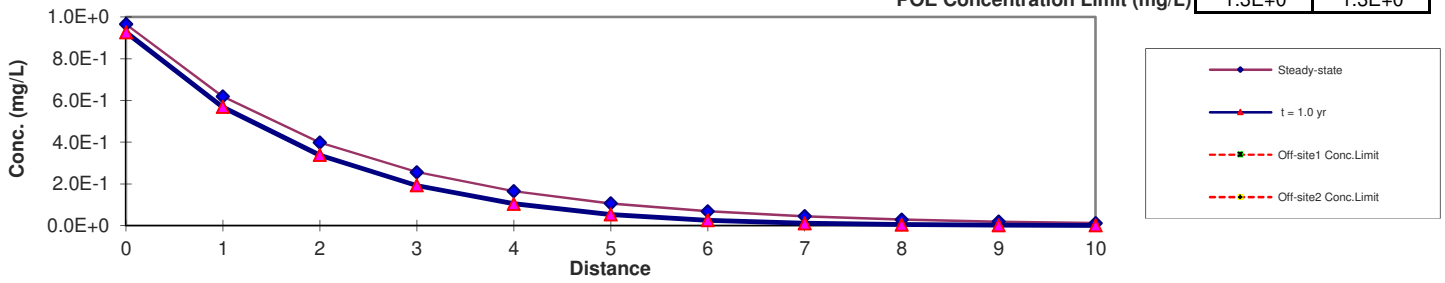
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	9.3E-1	5.7E-1	3.4E-1	1.9E-1	1.0E-1	5.3E-2	2.5E-2	1.1E-2	4.3E-3	1.6E-3	5.1E-4
Steady-state		9.6E-1	6.2E-1	4.0E-1	2.6E-1	1.6E-1	1.1E-1	6.9E-2	4.5E-2	2.9E-2	1.9E-2	1.2E-2

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
2.3E-17	1.3E-35
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



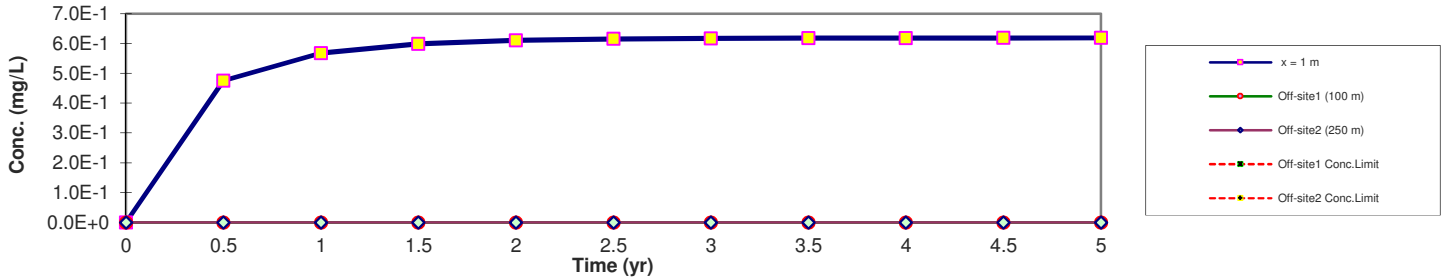
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	4.8E-1	5.7E-1	6.0E-1	6.1E-1	6.2E-1	6.2E-1	6.2E-1	6.2E-1	6.2E-1	6.2E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP164.7 Katonga River (Soil to GW)
Completed By: E Hobbs
Date Completed: 11.10.2018
Job ID: 325171

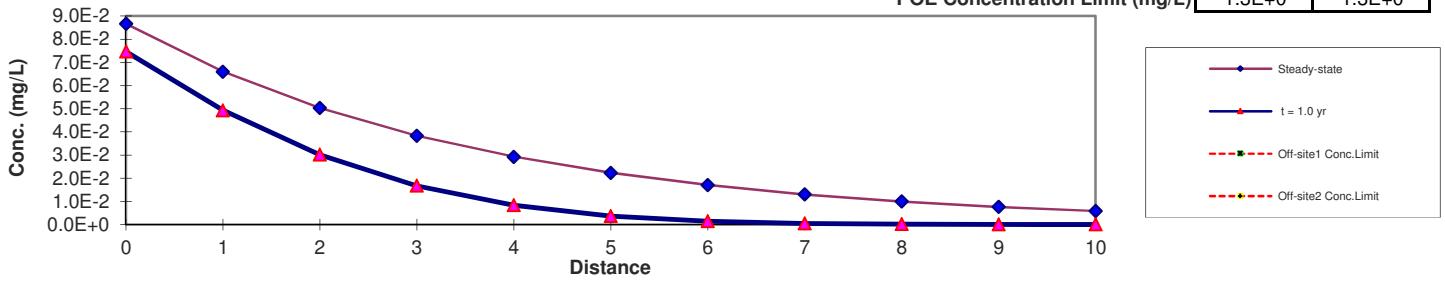
Constiuent: TPH - Arom >C10-C12 *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	7.5E-2	4.9E-2	3.0E-2	1.7E-2	8.3E-3	3.7E-3	1.4E-3	4.8E-4	1.4E-4	3.7E-5	8.4E-6
Steady-state		8.7E-2	6.6E-2	5.0E-2	3.8E-2	2.9E-2	2.2E-2	1.7E-2	1.3E-2	1.0E-2	7.6E-3	5.8E-3

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
2.4E-12	2.5E-24
POE Concentration Limit (mg/L)	
1.3E+0	1.3E+0



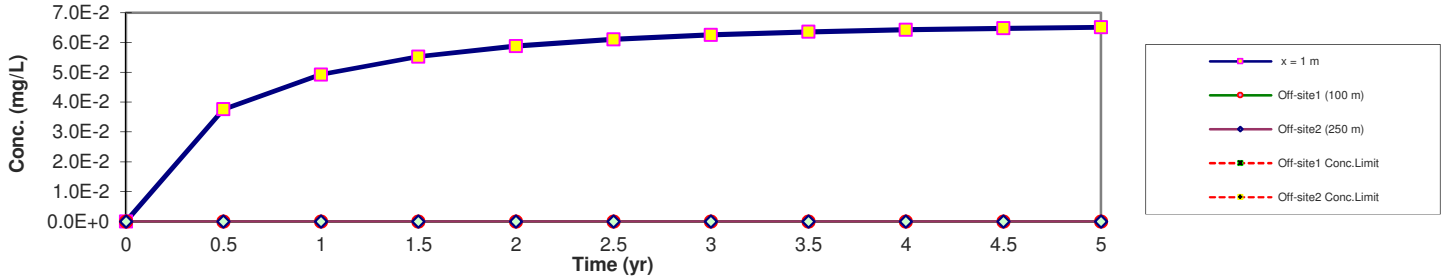
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	3.8E-2	4.9E-2	5.5E-2	5.9E-2	6.1E-2	6.3E-2	6.4E-2	6.4E-2	6.5E-2	6.5E-2
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP164.7 Katonga River (Soil to GW)
Completed By: E Hobbs
Date Completed: 11.10.2018
Job ID: 325171

Constiuent: TPH - Arom >C12-C16 *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

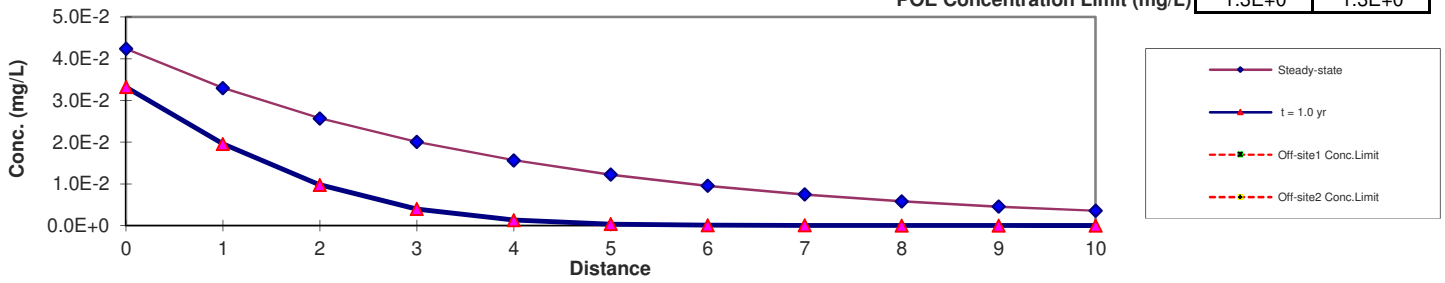
Concentration vs. Distance from Source (for given time)

Time (yr) 1.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 1.0 yr	Conc. (mg/L)	3.3E-2	2.0E-2	9.7E-3	4.0E-3	1.3E-3	3.3E-4	6.7E-5	1.1E-5	1.3E-6	1.2E-7	9.3E-9
Steady-state		4.2E-2	3.3E-2	2.6E-2	2.0E-2	1.6E-2	1.2E-2	9.5E-3	7.5E-3	5.8E-3	4.6E-3	3.6E-3

Off-site1	Off-site2
MCL	MCL
100	250
0.0E+0	0.0E+0
7.5E-12	5.5E-23
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



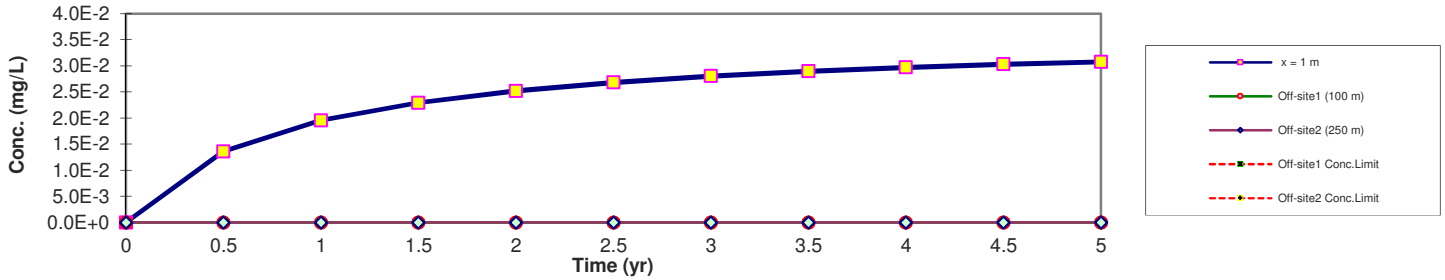
Concentration vs. Time (for given distance from source)

Distance (m) 1

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1 m	Conc. (mg/L)	0.0E+0	1.4E-2	2.0E-2	2.3E-2	2.5E-2	2.7E-2	2.8E-2	2.9E-2	3.0E-2	3.0E-2	3.1E-2
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA

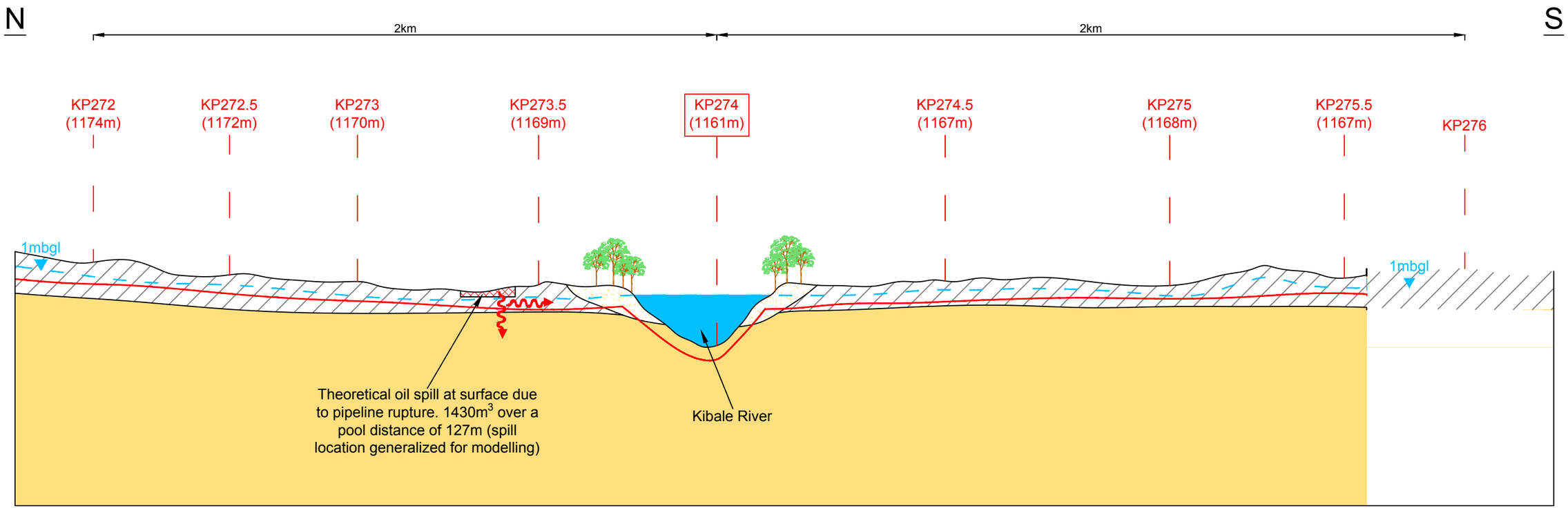


ATTACHMENT I1.14 DQRA – OIL RELEASE TO LAND – SURFACE WATER VECS – KP274 KIBALE RIVER

Conceptual Site Model

Legend:

- Superficia Deposits: Sandy oam
- A uvium
- Parent rock: Quartzite and Mica Schists
- Pipe ine (approximate ocation)
- Vegetation
- Water tab e
- (1000m) Ground e evation
- Oi spi due to pipe ine rupture
- Vertica and atera migration in groundwater



Notes:

- Elevation data taken from Google Earth elevations profile

Title:
Conceptua Site Mode Groundwater Migration To Surface Water Mode KP274 Kiba e River

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Summary of Input Values Used in RBCA Fate and Transport Model

Summary of Input Values Used in RBCA Fate and Transport Model

Model Description:
Source media: Unsaturated zone soil (depleting source) and dissolved phase source originating from NAPL
Offsite exposure model: Leaching to groundwater and lateral migration to surface water receptor (i.e. watercourse) down hydraulic gradient from the site

Assumptions
The oil leak fully saturates the soil.

		Assumed Representative Conditions Uganda Export Pipeline KP274 Kibale River - Groundwater migration to surface water		
Unsaturated Zone Soil Source		**Value**	**Justification**	**Reference**
Depth to top of source	m	0.00	Assuming surface pooling of oil on the surface, with saturated soils present beneath the pool surface	*EACOP Studies*
Thickness of contamination	m	1.00	Assumed unsaturated thickness of source is 1m as the lower end of the static water range reported in the DWRM report	*Modelling in OSM*
Length of source	m	127	Spill volume and spread data from worst case spill modelled in DRA, based on a 610mm diameter hole caused by erosion of the pipeline followed by 3rd party line strike. Pool length of 127m and a spill volume of 9000 bbl (1430m^3). Assumed circular pool.	*EACOP Studies*
Width of source	m	127		
Depth to groundwater	m	1.00	Assumed depth of groundwater based on flat topography to the northeast and southwest of the river.	
Unsaturated Zone Properties				
Soil description	-	-	Soils described as sandy loam	*EACOP Studies*
Total Porosity in vadose zone	cm3/cm3	0.51	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)*
Soil bulk density	g/cm3	1.4	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Infiltration rate	mm/yr	128.10	Average annual rainfall for the Rakai region of 915mm and infiltration is estimated at 7 to 20% of rainfall in Uganda, therefore 14% of 915mm used as infiltration rate	*Rainfall data and infiltration information from EACOP Studies*
Saturated conductivity	m/d	1.27008	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Aquifer Properties				
Aquifer description	-	-	Groundwater is assumed to be at a depth of 1 mbgl. Therefore, Therefore, groundwater flow will be within the superficial deposits (sandy loam soils).	
Effective porosity	cm3/cm3	0.25	Literature value of mid point between the arithmetic mean of a coarse sand (0.30) and the arithmetic mean of a silt (0.20)	*McWorter and Sunada (1977)*
Fraction organic carbon	g oc/g soil	0.002	Lower end of literature range quoted for loam soil	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)*
Hydraulic conductivity	m/d	1.27	Literature value for loam soils, selected to be consistent with unsaturated zone properties. This value also falls in the ranges reported by Domenico and Schwartz for sand and silt soils.	*Standard value included within RBCA default options - based on CLEA value for Loam*
Hydraulic gradient	m/m	0.006	Gradient based on topographic slope from KP272.5 lying at an elevation of 1171m (inclusive of reduction of 1m to depth of groundwater) and the Kibale River at KP274 at an elevation of 1161m. There is an elevation change of 10m over 1692m distance = 0.006.	*Groundwater level assumed to be 1m due to flat topography. This has been taken into account when calculating hydraulic gradient. Elevation data taken from Google Earth (2018)*
Capillary Fringe				
Thickness of the capillary fringe	m	0.11	Literature value for loam soils	*Standard value included within RBCA default options - based on CLEA value for Loam*
Air content	-	0.051	Literature value for loam soils	
Water content	-	0.459	Literature value for loam soils	
Degradation - dissolved phase only				
Degradation half lives	-	-	Conservatively assumed anaerobic degradation in the dissolved phase only - Half life values selected based on mid-point of literature range for anaerobic degradation	*Half life values sourced from Howard et al. Handbook of Environmental Degradation Rates (1991). Half life values modified prior to entry into the model to account for no sorbed phase degradation. Modification via multiplication of half life values by contaminant specific calculated retardation factor.*

Half Life Calculation Sheet

Retardation factors for half life calculation sheet

Pipeline section	Uganda Export
KP	274
Model (GW-DW or GW-SW)	GW-SW
Description of aqiuifer material	Sandy Loam
FOC data reference	Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value) - Lower end of literature range quoted for loam soil
Bulk density data reference	Standard value included within RBCA default options - based on CLEA value for loam soil
Effective porosity data reference	Literature value of mid point between the arithmetic mean of a coarse sand (0.30) and the arithmetic mean of a silt (0.20)from McWorter and Sunada (1977)

	Log Koc	foc	Kd	Bulk density	Effective porosity	Retardation factor	Anaerobic half life high (hours)	Anaerobic half life low (hours)	Literature t1/2 (Days) (ANAEROBIC)	Adjusted half lives for use in RBCA
Benzene	1.82	0.002	0.13	1.4	0.25	1.74E+00	17280	2688	416	7.24E+02
Toluene	2.15	0.002	0.28	1.4	0.25	2.58E+00	5040	1344	133	3.43E+02
Ethylbenzene	2.31	0.002	0.41	1.4	0.25	3.29E+00	5472	4224	202	6.64E+02
Xylenes	2.11	0.002	0.26	1.4	0.25	2.44E+00	8640	4320	270	6.60E+02
Aliphatics >EC5-EC6 (hexane)	2.9	0.002	1.59	1.4	0.25	9.90E+00	17280	2688	416	4.12E+03
Aliphatics >EC6-EC8 (n-heptane)	3.84	0.002	13.84	1.4	0.25	7.85E+01	5040	1344	133	1.04E+04
Aromatics >EC8-EC10 (trimethylbenzene)	2.97	0.002	1.87	1.4	0.25	1.15E+01	2688	672	70	8.02E+02
Aromatics >EC10-12 (naphthalene)	3.19	0.002	3.10	1.4	0.25	1.83E+01	6192	600	141.5	2.60E+03
Aromatics >EC12-16 (2-methynapthalene	3.36	0.002	4.58	1.4	0.25	2.67E+01	5760	4080	205	5.46E+03

RBCA Model Input Data Summary for NAPL to Groundwater

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 15-Feb-18

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(m)
h_v	Vadose zone thickness	NA			(m)
ρ_s	Soil bulk density	NA			(g/cm^3)
f_{oc}	Fraction organic carbon	NA			(-)
θ_T	Soil total porosity	NA			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	NA	NA	NA	(-)
θ_a	Volumetric air content	NA	NA	NA	(-)
K_{vs}	Vertical hydraulic conductivity	NA			(m/d)
k_v	Vapor permeability	NA			(m^2)
L_{gw}	Depth to groundwater	NA			(m)
pH	Soil/groundwater pH	NA			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/s)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(m)
A_b	Foundation area	NA	NA	(m^2)
X_{crk}	Foundation perimeter	NA	NA	(m)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crk}	Foundation thickness	NA	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	NA	(m)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(m^3/s)
θ_{wcrack}	Volumetric water content of cracks	NA	NA	(-)
θ_{acrack}	Volumetric air content of cracks	NA	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(mm/yr)
U_{gw}	Groundwater Darcy velocity	***0.00762***	(m/d)
V_{gw}	Groundwater seepage velocity	***0.03048***	(m/d)
K_s	Saturated hydraulic conductivity	***1.27***	(m/d)
i	Groundwater gradient	***0.006***	(-)
S_w	Width of groundwater source zone	***127***	(m)
S_d	Depth of groundwater source zone	2	(m)
θ_{eff}	Effective porosity in water-bearing unit	***0.25***	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	***0.002***	(-)
pH_{sat}	Groundwater pH	***7***	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Groundwater to Indoor Air		
α_x	Longitudinal dispersivity	4.4E+0	6.9E+0	NA	NA	(m)
α_y	Transverse dispersivity	4.4E-1	6.9E-1	NA	NA	(m)
α_z	Vertical dispersivity	4.4E-2	6.9E-2	NA	NA	(m)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/s)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

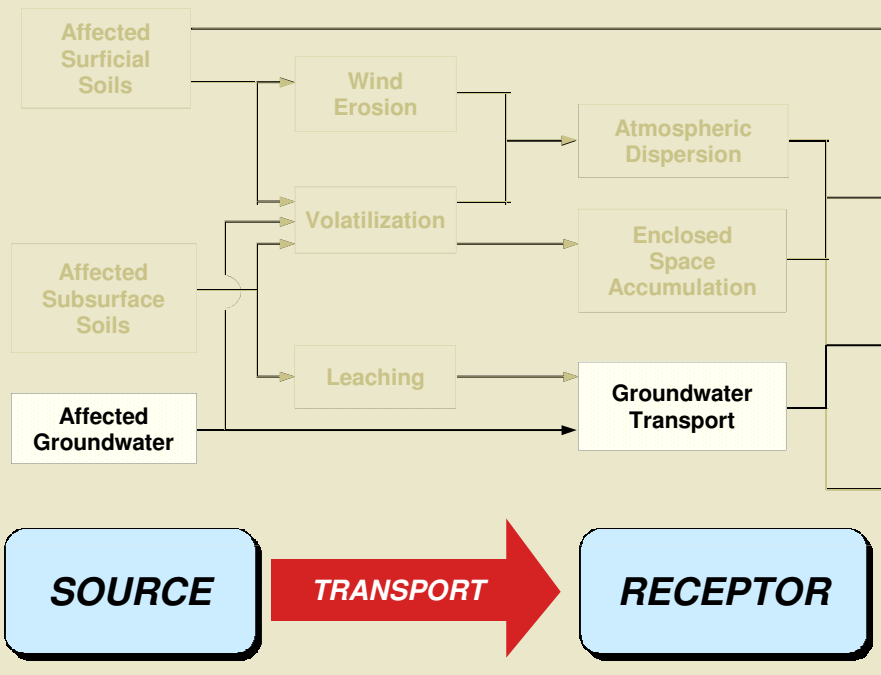
NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA Model Exposure Flowchart for NAPL to Groundwater

Exposure Pathway Flowchart

Site Name: EACOP Uganda Export Pipeline | Job ID: 325171
Location: KP274 Kibale River (NAPL to GW) | Date: 15-Feb-18
Compl. By: E Hobbs



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	None	None	None
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	None	None
Groundwater Potable Water Ingestion	*MCL*	*MCL*	*MCL*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

RBCA Model Results for NAPL to Groundwater

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 04.09.18
Job ID: 325171

Constiuent: Benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

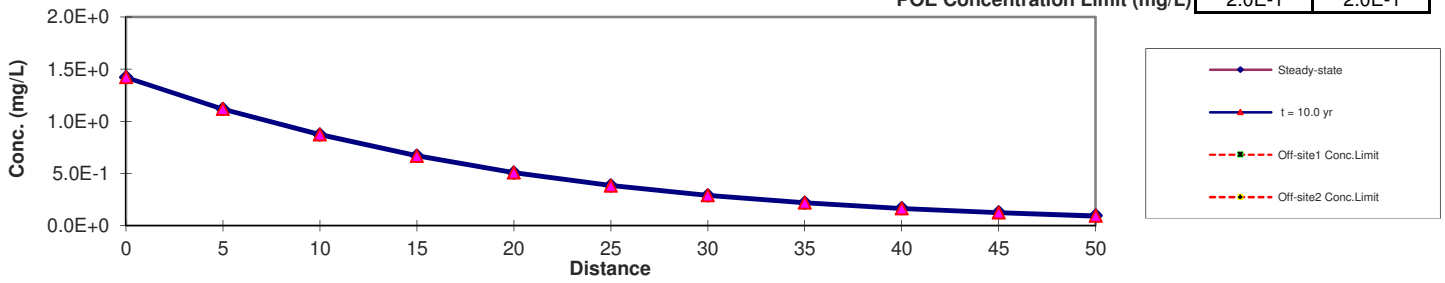
Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 10.0 yr	Conc. (mg/L)	1.4E+0	1.1E+0	8.7E-1	6.7E-1	5.1E-1	3.8E-1	2.9E-1	2.2E-1	1.6E-1	1.2E-1	9.2E-2
Steady-state		1.4E+0	1.1E+0	8.7E-1	6.7E-1	5.1E-1	3.8E-1	2.9E-1	2.2E-1	1.7E-1	1.3E-1	9.7E-2

Off-site1	Off-site2
MCL	MCL
100	250
2.5E-3	2.4E-12
7.5E-3	9.5E-6
2.0E-1	2.0E-1

POE Concentration Limit (mg/L)



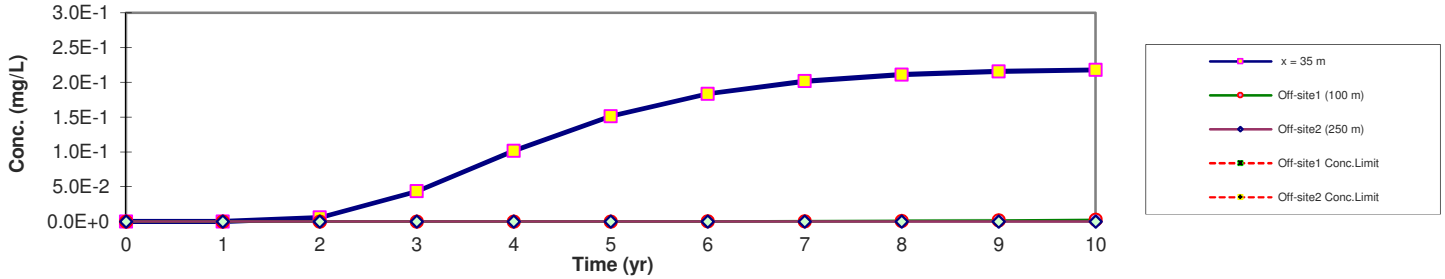
Concentration vs. Time (for given distance from source)

Distance (m) 35

Time (yr)		0	1	2	3	4	5	6	7	8	9	10
x = 35 m	Conc. (mg/L)	0.0E+0	5.7E-6	5.6E-3	4.3E-2	1.0E-1	1.5E-1	1.8E-1	2.0E-1	2.1E-1	2.2E-1	2.2E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	4.6E-17	7.7E-11	7.6E-8	3.9E-6	4.6E-5	2.3E-4	6.9E-4	1.5E-3	2.5E-3
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.3E-22	2.3E-18	8.3E-16	7.3E-14	2.4E-12

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 04.09.18
Job ID: 325171

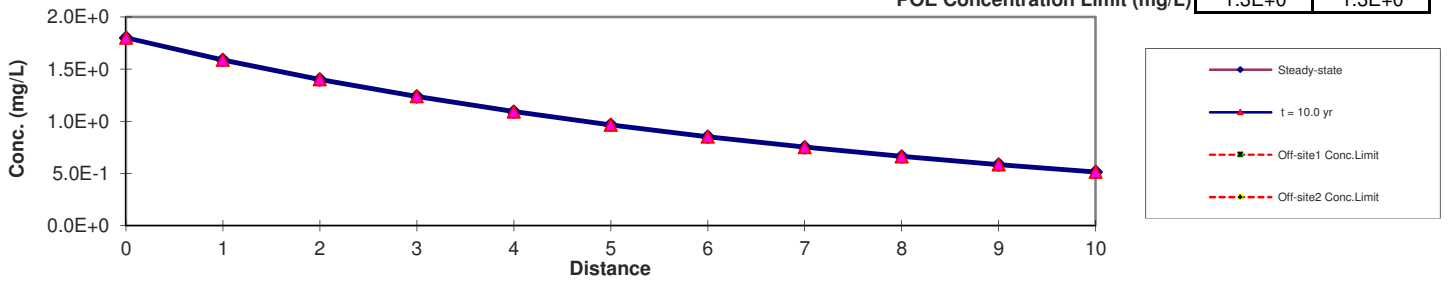
Constiuent: Toluene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 10.0 yr	Conc. (mg/L)	1.8E+0	1.6E+0	1.4E+0	1.2E+0	1.1E+0	9.6E-1	8.5E-1	7.5E-1	6.6E-1	5.8E-1	5.1E-1
Steady-state		1.8E+0	1.6E+0	1.4E+0	1.2E+0	1.1E+0	9.6E-1	8.5E-1	7.5E-1	6.6E-1	5.8E-1	5.1E-1

Off-site1	Off-site2
MCL	MCL
100	250
2.7E-6	4.9E-21
1.1E-5	5.7E-12
POE Concentration Limit (mg/L)	
1.3E+0	1.3E+0

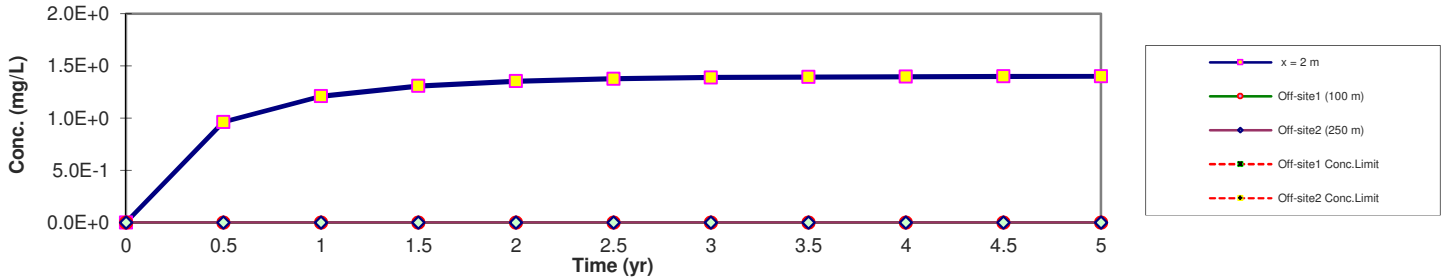


Concentration vs. Time (for given distance from source)

Distance (m) 2

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 2 m	Conc. (mg/L)	0.0E+0	9.6E-1	1.2E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	7.2E-21	2.9E-17	1.0E-14	7.3E-13	1.9E-11	2.4E-10
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)	
Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 15-Feb-18

Job ID: 325171

Constiuent: Ethyl benzene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

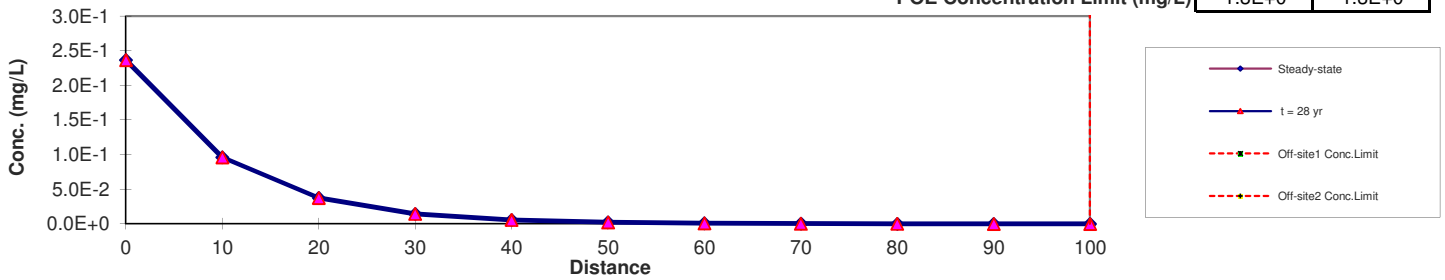
Concentration vs. Distance from Source (for given time)

Time (yr) 28.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 28 yr	Conc. (mg/L)	2.4E-1	9.6E-2	3.8E-2	1.5E-2	5.7E-3	2.3E-3	9.3E-4	3.9E-4	1.6E-4	7.0E-5	3.1E-5
Steady-state		2.4E-1	9.6E-2	3.8E-2	1.5E-2	5.7E-3	2.3E-3	9.3E-4	3.9E-4	1.6E-4	7.1E-5	3.1E-5

Off-site1	Off-site2
MCL	MCL
100	250
3.1E-5	2.8E-11
3.1E-5	5.2E-10
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



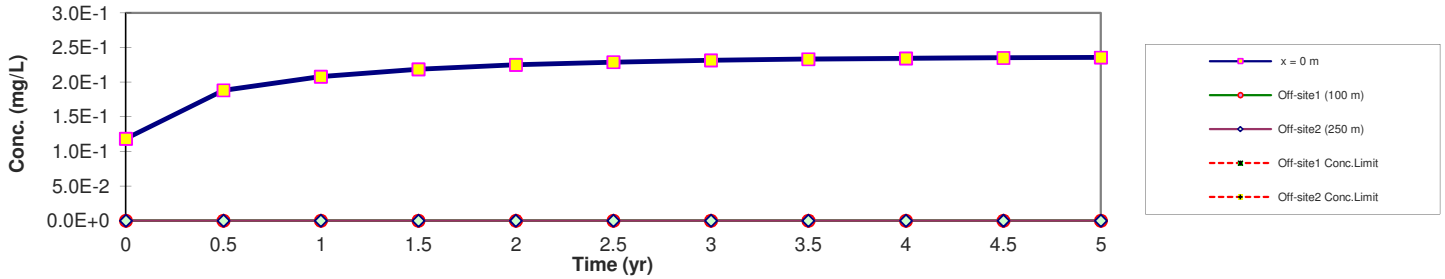
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 0 m	Conc. (mg/L)	1.2E-1	1.9E-1	2.1E-1	2.2E-1	2.2E-1	2.3E-1	2.3E-1	2.3E-1	2.3E-1	2.4E-1	2.4E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.3E-19	4.2E-17	3.6E-15	1.2E-13
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 04.09.18
Job ID: 325171

Constiuent: Xylene, o- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

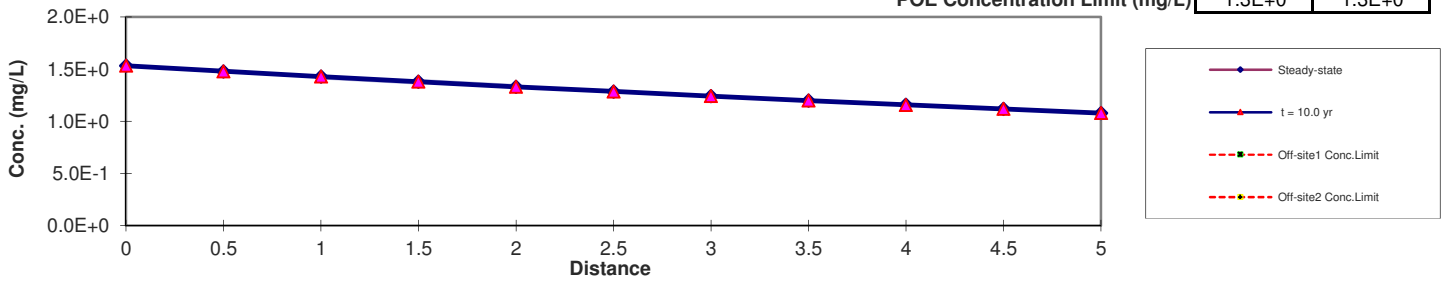
Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
t = 10.0 yr	Conc. (mg/L)	1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0	1.2E+0	1.1E+0	1.1E+0
Steady-state		1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0	1.2E+0	1.1E+0	1.1E+0

Off-site1	Off-site2
MCL	MCL
100	250
9.0E-5	1.5E-18
1.1E-3	1.3E-7
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



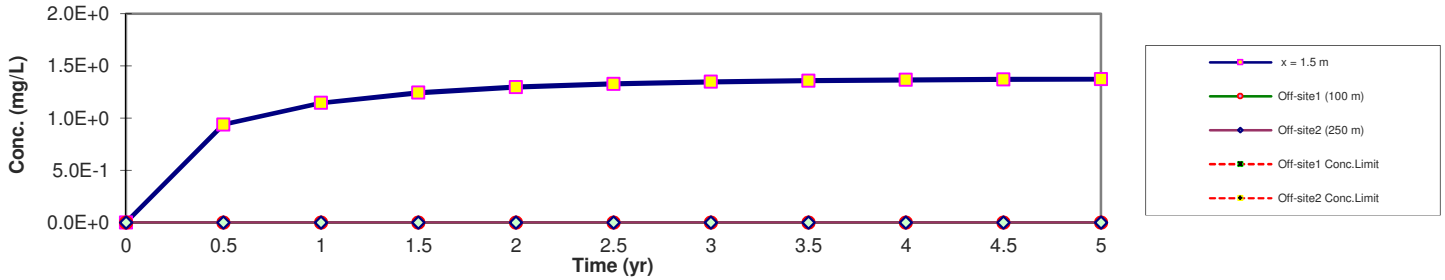
Concentration vs. Time (for given distance from source)

Distance (m) 1.5

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 1.5 m	Conc. (mg/L)	0.0E+0	9.4E-1	1.1E+0	1.2E+0	1.3E+0	1.3E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.8E-19	5.5E-16	1.7E-13	1.1E-11	2.8E-10	3.6E-9
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 15-Feb-18

Job ID: 325171

Constiuent: TPH - Aliph >C05-C06 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

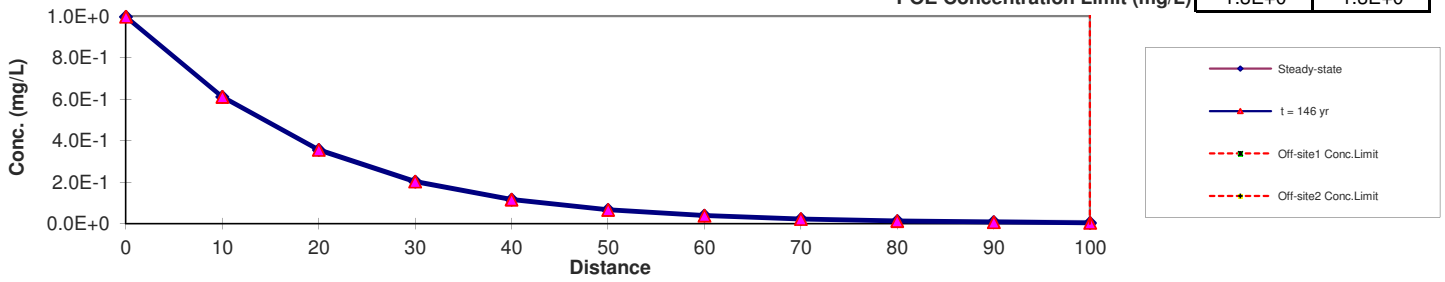
Concentration vs. Distance from Source (for given time)

Time (yr) 146.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 146 yr	Conc. (mg/L)	1.0E+0	6.1E-1	3.6E-1	2.0E-1	1.2E-1	6.8E-2	4.0E-2	2.4E-2	1.4E-2	8.6E-3	5.3E-3
Steady-state		1.0E+0	6.1E-1	3.6E-1	2.0E-1	1.2E-1	6.8E-2	4.0E-2	2.4E-2	1.4E-2	8.6E-3	5.3E-3

Off-site1	Off-site2
MCL	MCL
100	250
5.3E-3	3.9E-6
5.3E-3	6.7E-6
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



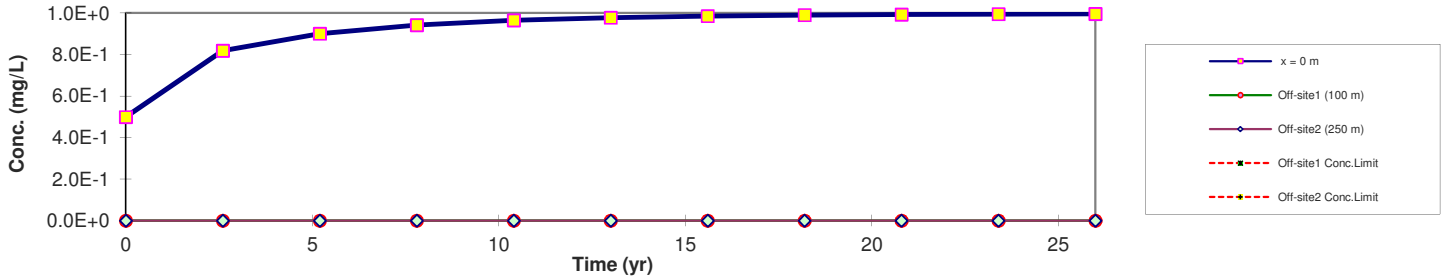
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	2.6	5.2	7.8	10.4	13	15.6	18.2	20.8	23.4	26
x = 0 m	Conc. (mg/L)	5.0E-1	8.2E-1	9.0E-1	9.4E-1	9.6E-1	9.8E-1	9.8E-1	9.9E-1	9.9E-1	9.9E-1	1.0E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.8E-19	7.3E-15	3.8E-12	3.1E-10	7.9E-9	9.4E-8	6.5E-7
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 15-Feb-18
Job ID: 325171

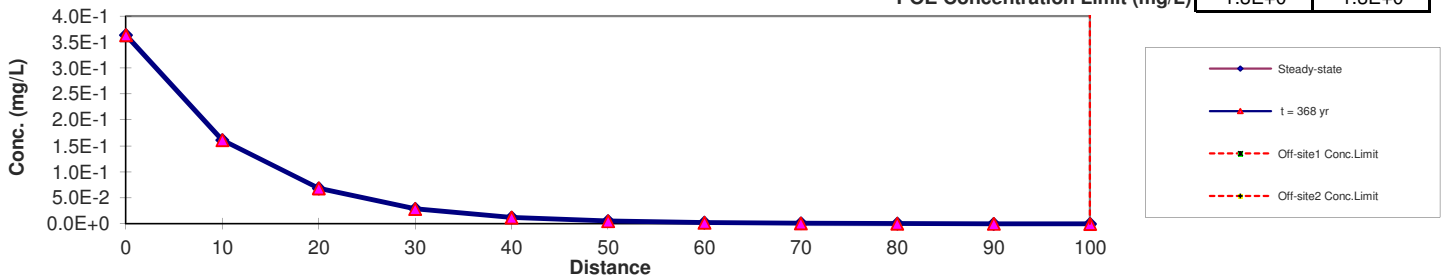
Constiuent: TPH - Aliph >C06-C08 (>53% n-hexane) *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 368.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 368 yr	Conc. (mg/L)	3.6E-1	1.6E-1	6.9E-2	2.9E-2	1.2E-2	5.3E-3	2.3E-3	1.0E-3	4.7E-4	2.2E-4	1.0E-4
Steady-state		3.6E-1	1.6E-1	6.9E-2	2.9E-2	1.2E-2	5.3E-3	2.3E-3	1.1E-3	4.8E-4	2.2E-4	1.0E-4

	Off-site1	Off-site2
	MCL	MCL
	100	250
	1.0E-4	6.1E-11
	1.0E-4	4.2E-9
POE Concentration Limit (mg/L)	1.3E+0	1.3E+0



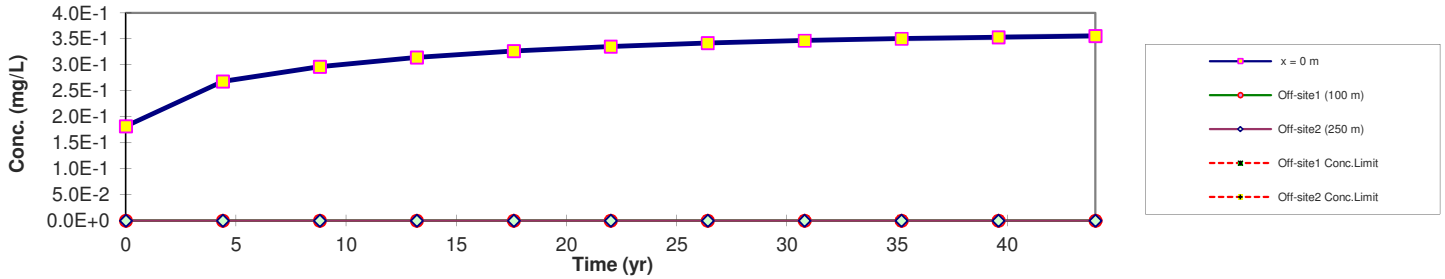
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	4.4	8.8	13.2	17.6	22	26.4	30.8	35.2	39.6	44
x = 0 m	Conc. (mg/L)	1.8E-1	2.7E-1	3.0E-1	3.1E-1	3.3E-1	3.4E-1	3.4E-1	3.5E-1	3.5E-1	3.5E-1	3.6E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 04.09.18
Job ID: 325171

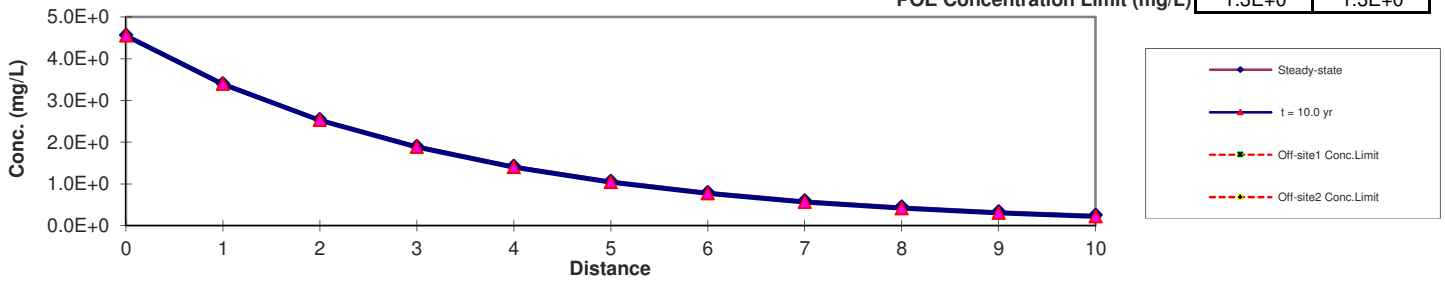
Constiuent: TPH - Arom >C08-C10 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 10.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 10.0 yr	Conc. (mg/L)	4.5E+0	3.4E+0	2.5E+0	1.9E+0	1.4E+0	1.0E+0	7.7E-1	5.6E-1	4.1E-1	3.0E-1	2.2E-1
Steady-state		4.6E+0	3.4E+0	2.5E+0	1.9E+0	1.4E+0	1.1E+0	8.0E-1	6.0E-1	4.5E-1	3.4E-1	2.6E-1

	Off-site1	Off-site2
	MCL	MCL
	100	250
	0.0E+0	0.0E+0
	2.7E-11	5.5E-24
POE Concentration Limit (mg/L)	1.3E+0	1.3E+0



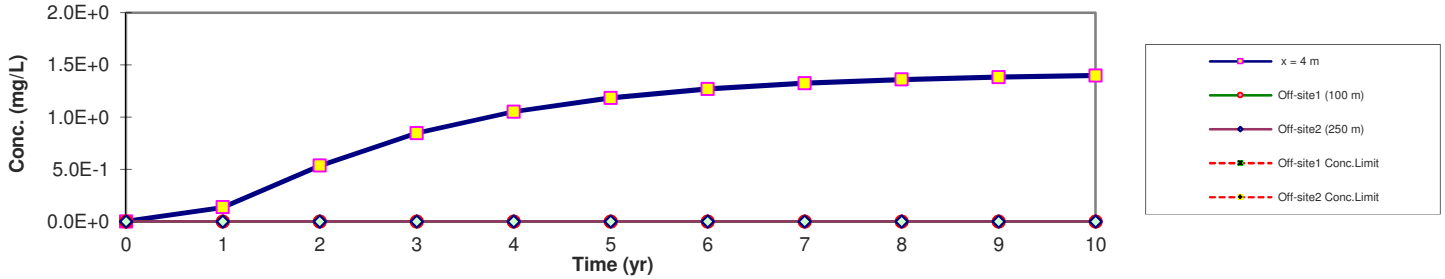
Concentration vs. Time (for given distance from source)

Distance (m) 4

Time (yr)		0	1	2	3	4	5	6	7	8	9	10
x = 4 m	Conc. (mg/L)	0.0E+0	1.4E-1	5.3E-1	8.5E-1	1.1E+0	1.2E+0	1.3E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 15-Feb-18

Job ID: 325171

Constiuent: TPH - Arom >C10-C12 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

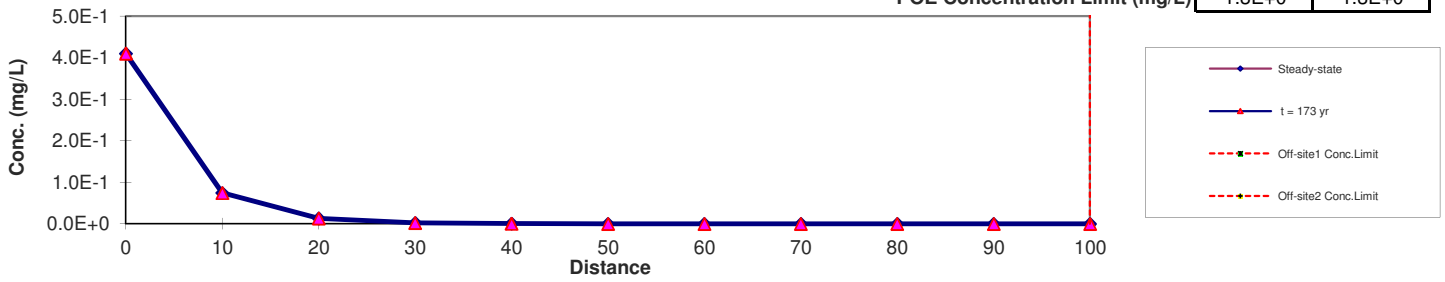
Concentration vs. Distance from Source (for given time)

Time (yr) 173.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 173 yr	Conc. (mg/L)	4.1E-1	7.4E-2	1.3E-2	2.4E-3	4.6E-4	9.1E-5	1.9E-5	4.0E-6	9.0E-7	2.1E-7	4.9E-8
Steady-state		4.1E-1	7.4E-2	1.3E-2	2.4E-3	4.6E-4	9.1E-5	1.9E-5	4.0E-6	9.0E-7	2.1E-7	4.9E-8

Off-site1	Off-site2
MCL	MCL
100	250
4.9E-8	6.6E-18
4.9E-8	3.7E-16
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



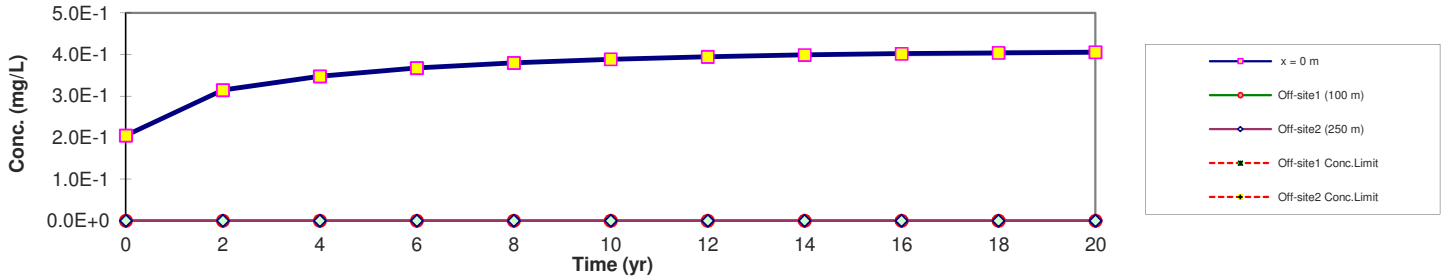
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	2	4	6	8	10	12	14	16	18	20
x = 0 m	Conc. (mg/L)	2.1E-1	3.1E-1	3.5E-1	3.7E-1	3.8E-1	3.9E-1	3.9E-1	4.0E-1	4.0E-1	4.0E-1	4.1E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP274 Kibale River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 15-Feb-18

Job ID: 325171

Constiuent: TPH - Arom >C12-C16 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

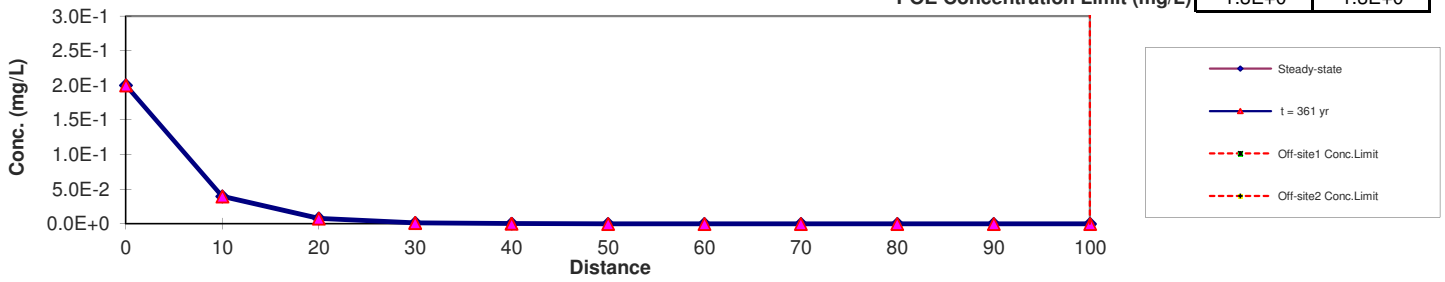
Concentration vs. Distance from Source (for given time)

Time (yr) 361.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 361 yr	Conc. (mg/L)	2.0E-1	4.0E-2	7.7E-3	1.5E-3	3.1E-4	6.7E-5	1.5E-5	3.4E-6	8.2E-7	2.0E-7	5.1E-8
Steady-state		2.0E-1	4.0E-2	7.7E-3	1.5E-3	3.1E-4	6.7E-5	1.5E-5	3.4E-6	8.2E-7	2.0E-7	5.1E-8

Off-site1	Off-site2
MCL	MCL
100	250
5.1E-8	2.8E-17
5.1E-8	8.5E-16
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



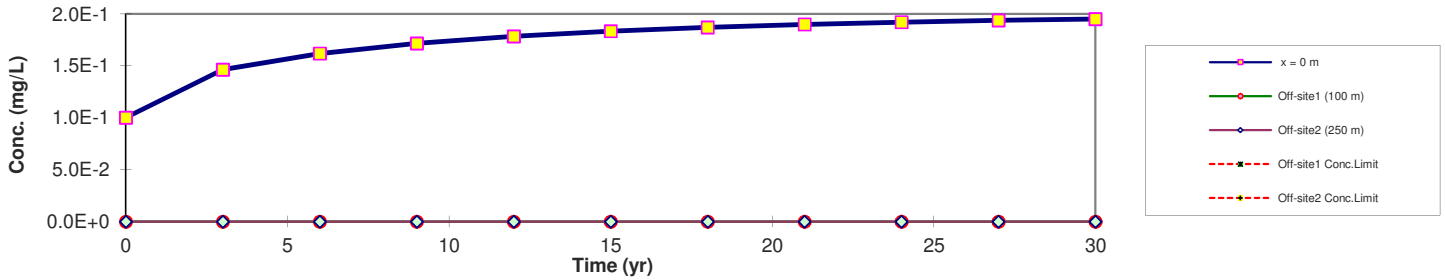
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	3	6	9	12	15	18	21	24	27	30
x = 0 m	Conc. (mg/L)	1.0E-1	1.5E-1	1.6E-1	1.7E-1	1.8E-1	1.8E-1	1.9E-1	1.9E-1	1.9E-1	1.9E-1	2.0E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA

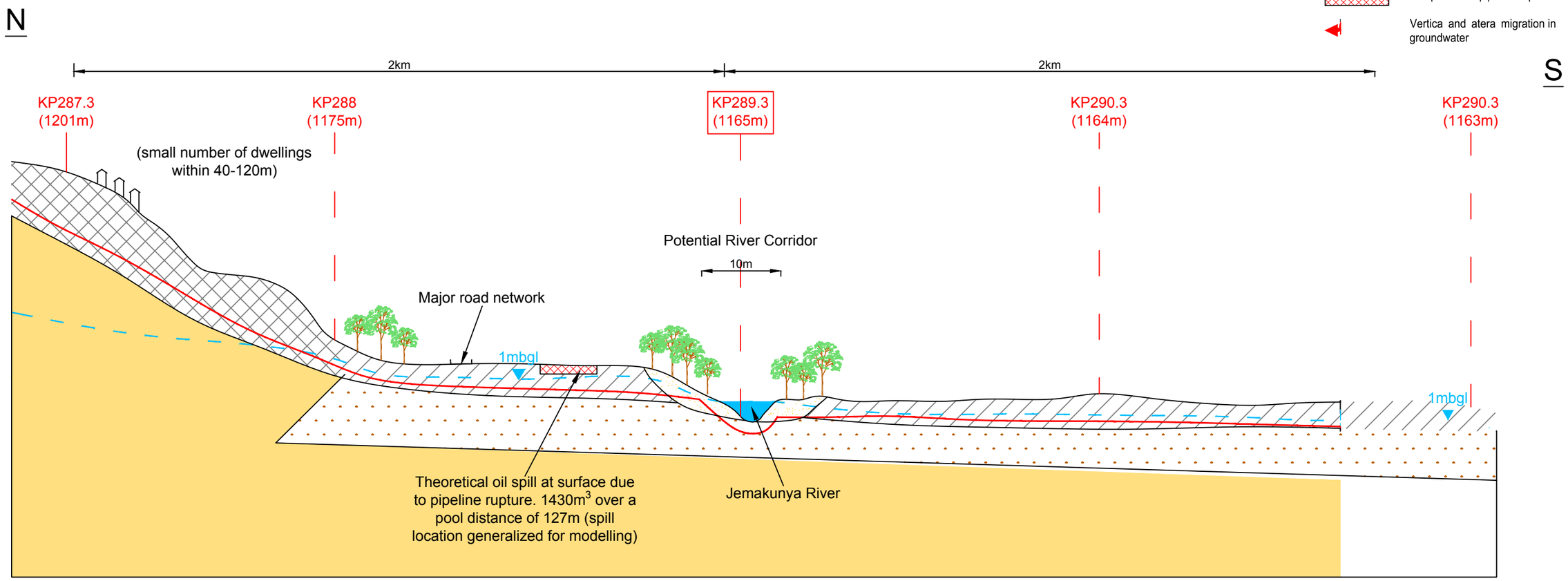


ATTACHMENT I.15 DQRA – OIL RELEASE TO LAND – SURFACE WATER VECS – KP289.3 JEMAKUNYA RIVER

Conceptual Site Model

Legend:

- Superficia Deposits: Grey coarse sand
- A uvium
- ake deposits (parent rock)
- Superficia Deposits: Sandy oams
- Parent rock: Sandstone
- Pipe ine (approximate ocation)
- Vegetation
- Water tab e
- (1000m) Ground e evation
- Oi spi due to pipe ine rupture
- Vertica and atera migration in groundwater



Notes:

- Elevation data taken from Google Earth elevations profile

Title:
Conceptua Site Mode Groundwater Migration To Surface Water Mode KP289 3 Jemakunya River

Report :
Uganda Export

EAST AFRICAN CRUDE OIL PIPELINE

Summary of Input Values Used in RBCA Fate and Transport Model

Summary of Input Values Used in RBCA Fate and Transport Model

Model Description:
Source media: Unsaturated zone soil (depleting source) and dissolved phase source originating from NAPL
Offsite exposure model: Leaching to groundwater and lateral migration to surface water receptor (i.e. watercourse) down hydraulic gradient from the site

Assumptions
The oil leak fully saturates the soil.

		Assumed Representative Conditions Uganda Export Pipeline KP289.3 Jamakunya River - Groundwater migration to surface water		
Unsaturated Zone Soil Source		**Value**	**Justification**	**Reference**
Depth to top of source	m	0.00	Assuming surface pooling of oil on the surface, with saturated soils present beneath the pool surface	*EACOP Studies*
Thickness of contamination	m	1.00	Assumed unsaturated thickness of source is 1m as a conservative estimate based on NAPL modelling	*Modelling in OSM*
Length of source	m	127	Spill volume and spread data from worst case spill modelled in DRA, based on a 610mm diameter hole caused by erosion of the pipeline followed by 3rd party line strike. Pool length of 127m and a spill volume of 9000 bbl (1430m^3). Assumed circular pool.	*EACOP Studies*
Width of source	m	127		
Depth to groundwater	m	1.00	Assumed depth of groundwater based on flat topography to the north and south of the river.	
Unsaturated Zone Properties				
Soil description	-	-	Soils described as coarse sand	*EACOP Studies*
Total Porosity in vadose zone	cm3/cm3	0.41	Literature value for SW/SP sand soils (US soil) classification	*Standard value included within RBCA default options for sand*
Fraction organic carbon	g oc/g soil	0.0001	Lower end of literature range quoted for coarse sand	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)*
Soil bulk density	g/cm3	1.7	Literature value for SW/SP sand soils (US soil) classification	*Standard value included within RBCA default options for sand*
Infiltration rate	mm/yr	128.10	Average annual rainfall for the Rakai region of 915mm and infiltration is estimated at 7 to 20% of rainfall in Uganda, therefore 14% of 915mm used as infiltration rate	*Rainfall data and infiltration information from EACOP Studies*
Saturated conductivity	m/d	8.64	Literature value for SW/SP sand soils (US soil) classification	*Standard value included within RBCA default options for sand*
Aquifer Properties				
Aquifer description	-	-	Groundwater is assumed to be at a depth of 1 mbgl. Therefore, groundwater flow will be within the superficial deposits (coarse grey sands).	
Effective porosity	cm3/cm3	0.3	Literature value of the arithmetic mean of a coarse sand	*McWorter and Sunada (1977)*
Fraction organic carbon	g oc/g soil	0.0001	Lower end of literature range quoted for coarse sand	*Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)*
Hydraulic conductivity	m/d	6.349	Geometric midpoint of the literature range for sand (9E-7m/s to 6E-3m/s)	*Values from Domenico,P.A. and Schwartz,F.W. Physical and Chemical Hydrogeology, Wiley,1990.*
Hydraulic gradient	m/m	0.005	Gradient based on topographic slope from KP288 lying at an elevation of 1174m (inclusive of reduction of 1m to depth of groundwater) and the Jamakunya River at KP289.3 at an elevation of 1165m. There is an elevation change of 7m over 1300m distance = 0.005.	*Groundwater is assumed to lie at 1m bgl given the flat topography close to the river. Elevation data is taken from Google Earth (2018)*
Capillary Fringe				
Thickness of the capillary fringe	m	0.05	Literature value for sand soils	*Standard value included within RBCA default options for sand. Different values for this site due to this site being described as a coarse sand not a loam.*
Air content	-	0.041	Literature value for sand soils	
Water content	-	0.369	Literature value for sand soils	
Degradation - dissolved phase only				
Degradation half lives	-	-	Conservatively assumed anaerobic degradation in the dissolved phase only - Half life values selected based on mid-point of literature range for anaerobic degradation	*Half life values sourced from Howard et al. Handbook of Environmental Degradation Rates (1991). Half life values modified prior to entry into the model to account for no sorbed phase degradation. Modification via multiplication of half life values by contaminant specific calculated retardation factor.*

Half Life Calculation Sheet

Retardation factors for half life calculation sheet

Pipeline section	Uganda Export
KP	289.3
Model (GW-DW or GW-SW)	GW-SW
Description of aquifer material	Coarse grey sands
FOC data reference	Lower end of literature range quoted for coarse sand. Soil Characteristics. 1995; Env. Sci. and Tech. Vol. 29, No. 8. (ConSIM value)
Bulk density data reference	Literature value for sand soils. Standard value included within RBCA default options for sand
Effective porosity data reference	Literature value of the arithmetic mean of a coarse sand from McWorter and Sunada (1977)

	Log Koc	foc	Kd	Bulk density	Effective porosity	Retardation factor	Anaerobic half life high (hours)	Anaerobic half life low (hours)	Literature t1/2 (Days) (ANAEROBIC)	Adjusted half lives for use in RBCA
Benzene	1.82	0.0001	0.01	1.7	0.3	1.04E+00	17280	2688	416	4.32E+02
Toluene	2.15	0.0001	0.01	1.7	0.3	1.08E+00	5040	1344	133	1.44E+02
Ethylbenzene	2.31	0.0001	0.02	1.7	0.3	1.12E+00	5472	4224	202	2.25E+02
Xylenes	2.11	0.0001	0.01	1.7	0.3	1.07E+00	8640	4320	270	2.90E+02
Aliphatics >EC5-EC6 (hexane)	2.9	0.0001	0.08	1.7	0.3	1.45E+00	17280	2688	416	6.03E+02
Aliphatics >EC6-EC8 (n-heptane)	3.84	0.0001	0.69	1.7	0.3	4.92E+00	5040	1344	133	6.54E+02
Aromatics >EC8-EC10 (trimethylbenzene)	2.97	0.0001	0.09	1.7	0.3	1.53E+00	2688	672	70	1.07E+02
Aromatics >EC10-12 (naphthalene)	3.19	0.0001	0.15	1.7	0.3	1.88E+00	6192	600	141.5	2.66E+02
Aromatics >EC12-16 (2-methynapthalene	3.36	0.0001	0.23	1.7	0.3	2.30E+00	5760	4080	205	4.71E+02

RBCA Model Input Data Summary for NAPL to Groundwater

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (NAPL to GW)

Completed By: E Hobbs
Date Completed: 01.03.2018

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	NA			(m)
h_v	Vadose zone thickness	NA			(m)
ρ_s	Soil bulk density	NA			(g/cm^3)
f_{oc}	Fraction organic carbon	NA			(-)
θ_T	Soil total porosity	NA			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	NA	NA	NA	(-)
θ_a	Volumetric air content	NA	NA	NA	(-)
K_{vs}	Vertical hydraulic conductivity	NA			(m/d)
k_v	Vapor permeability	NA			(m^2)
L_{gw}	Depth to groundwater	NA			(m)
pH	Soil/groundwater pH	NA			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/s)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(m)
A_b	Foundation area	NA	NA	(m^2)
X_{crk}	Foundation perimeter	NA	NA	(m)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crk}	Foundation thickness	NA	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	NA	(m)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(m^3/s)
θ_{wcrack}	Volumetric water content of cracks	NA	NA	(-)
θ_{acrack}	Volumetric air content of cracks	NA	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(mm/yr)
U_{gw}	Groundwater Darcy velocity	***0.031745***	(m/d)
V_{gw}	Groundwater seepage velocity	***0.105816667***	(m/d)
K_s	Saturated hydraulic conductivity	***6.349***	(m/d)
i	Groundwater gradient	***0.005***	(-)
S_w	Width of groundwater source zone	***127***	(m)
S_d	Depth of groundwater source zone	2	(m)
θ_{eff}	Effective porosity in water-bearing unit	***0.3***	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	***0.0001***	(-)
pH_{sat}	Groundwater pH	***7***	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Groundwater to Indoor Air		
α_x	Longitudinal dispersivity	4.4E+0	6.9E+0	NA	NA	(m)
α_y	Transverse dispersivity	4.4E-1	6.9E-1	NA	NA	(m)
α_z	Vertical dispersivity	4.4E-2	6.9E-2	NA	NA	(m)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/s)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

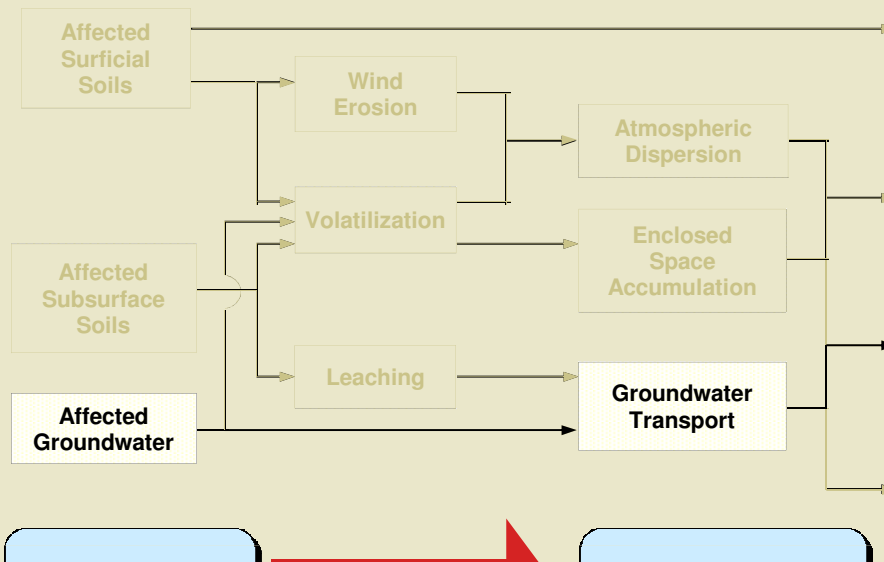
NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA Model Exposure Flowchart for NAPL to Groundwater

Exposure Pathway Flowchart

Site Name: EACOP Uganda Export Pipeline — Job ID: 325171
Location: KP289.3 Jamakunya River (NAPL to GW) — Date: 01.03.2018
Compl. By: E Hobbs



Receptors	On-site	Off-site1	Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air:	None	None	None
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	None	None
Groundwater Potable Water Ingestion	*MCL*	*MCL*	*MCL*
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

RBCA Model Results for NAPL to Groundwater

RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline | Completed By: E Hobbs | Job ID: 325171

Site Location: KP289.3 Jamakunya River (NAPL to GW) | Date Completed: 04.09.18

Constiuent: Benzene *

Source Medium: Affected Groundwater

Biodegredation: 1st Order

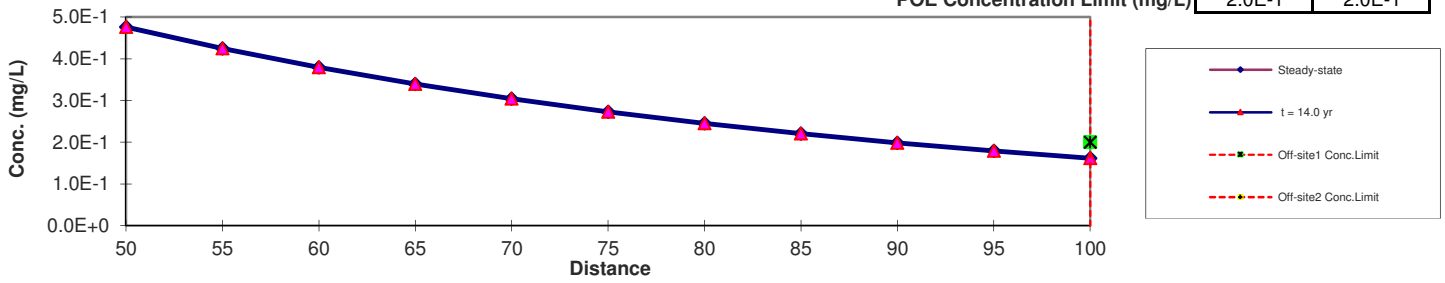
Concentration vs. Distance from Source (for given time)

Time (yr) 14.0

Distance (m)		50	55	60	65	70	75	80	85	90	95	100
t = 14.0 yr	Conc. (mg/L)	4.8E-1	4.2E-1	3.8E-1	3.4E-1	3.0E-1	2.7E-1	2.4E-1	2.2E-1	2.0E-1	1.8E-1	1.6E-1
Steady-state		4.8E-1	4.2E-1	3.8E-1	3.4E-1	3.0E-1	2.7E-1	2.4E-1	2.2E-1	2.0E-1	1.8E-1	1.6E-1

Off-site1	Off-site2
MCL	MCL
100	250
1.6E-1	1.1E-2
1.6E-1	1.1E-2
2.0E-1	2.0E-1

POE Concentration Limit (mg/L)



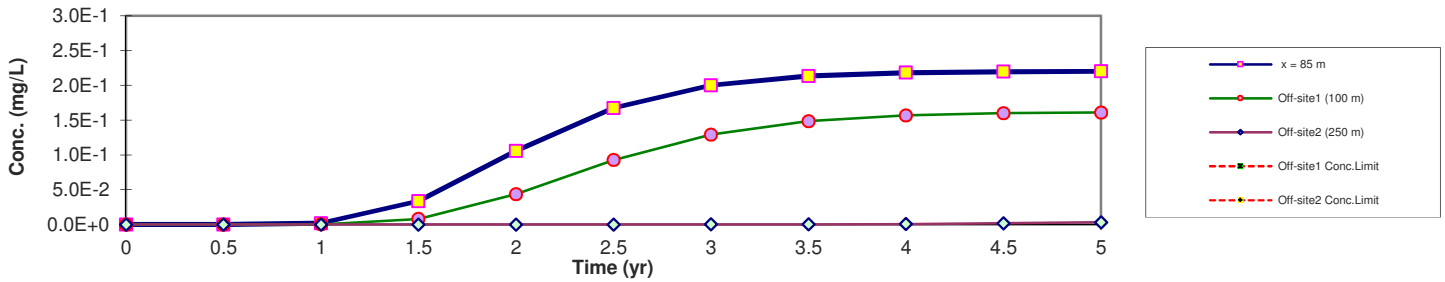
Concentration vs. Time (for given distance from source)

Distance (m) 85

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 85 m	Conc. (mg/L)	0.0E+0	3.1E-8	1.6E-3	3.4E-2	1.1E-1	1.7E-1	2.0E-1	2.1E-1	2.2E-1	2.2E-1	2.2E-1
Off-site1 (100 m)		0.0E+0	6.3E-11	1.2E-4	7.9E-3	4.4E-2	9.3E-2	1.3E-1	1.5E-1	1.6E-1	1.6E-1	1.6E-1
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	1.9E-13	2.5E-9	5.6E-7	1.6E-5	1.4E-4	5.9E-4	1.6E-3	3.1E-3

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 04.09.18
Job ID: 325171

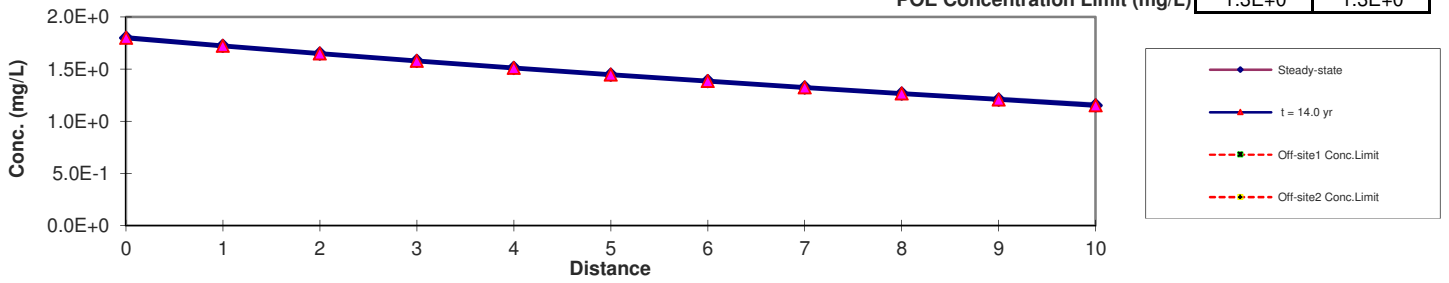
Constiuent: Toluene *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

Concentration vs. Distance from Source (for given time)

Time (yr) 14.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 14.0 yr	Conc. (mg/L)	1.8E+0	1.7E+0	1.6E+0	1.6E+0	1.5E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0
Steady-state		1.8E+0	1.7E+0	1.6E+0	1.6E+0	1.5E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0

	Off-site1	Off-site2
	MCL	MCL
	100	250
	1.4E-2	2.9E-5
	1.4E-2	2.9E-5
POE Concentration Limit (mg/L)	1.3E+0	1.3E+0



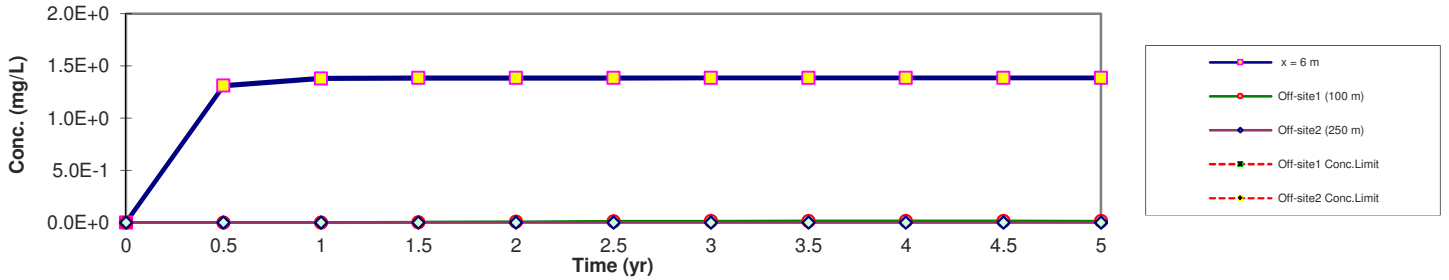
Concentration vs. Time (for given distance from source)

Distance (m) 6

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 6 m	Conc. (mg/L)	0.0E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	1.4E-11	2.9E-5	1.6E-3	6.6E-3	1.1E-2	1.3E-2	1.4E-2	1.4E-2	1.4E-2	1.4E-2
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	9.4E-15	1.1E-10	1.9E-8	3.8E-7	2.4E-6	7.1E-6	1.4E-5	2.0E-5

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (Soil to GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: Ethyl benzene *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

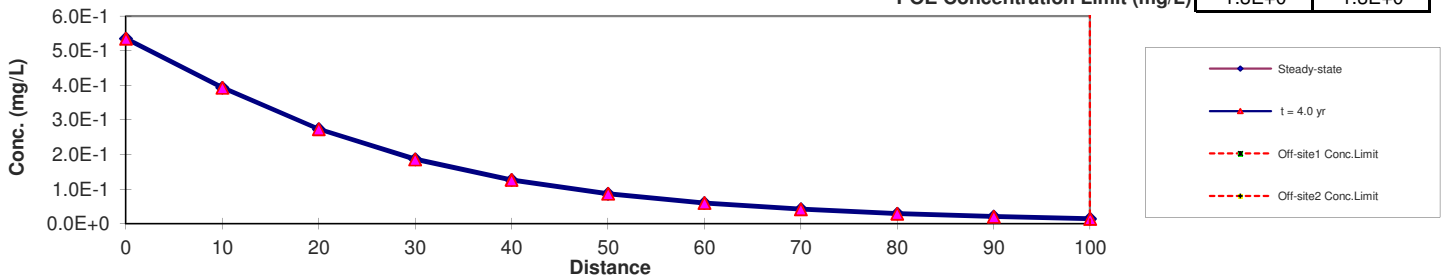
Concentration vs. Distance from Source (for given time)

Time (yr) 4.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 4.0 yr	Conc. (mg/L)	5.3E-1	3.9E-1	2.7E-1	1.9E-1	1.3E-1	8.7E-2	6.0E-2	4.2E-2	3.0E-2	2.1E-2	1.5E-2
Steady-state		5.3E-1	3.9E-1	2.7E-1	1.9E-1	1.3E-1	8.7E-2	6.1E-2	4.2E-2	3.0E-2	2.1E-2	1.5E-2

Off-site1	Off-site2
MCL	MCL
100	250
1.5E-2	1.3E-5
1.5E-2	1.5E-4
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



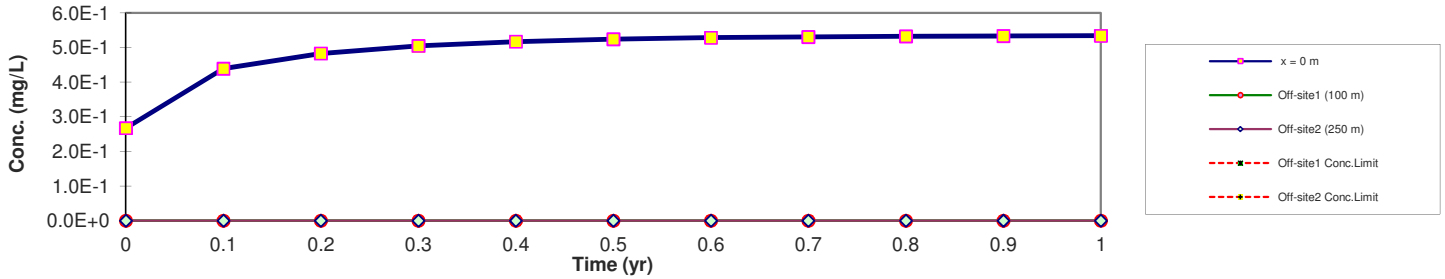
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
x = 0 m	Conc. (mg/L)	2.7E-1	4.4E-1	4.8E-1	5.0E-1	5.2E-1	5.2E-1	5.3E-1	5.3E-1	5.3E-1	5.3E-1	5.3E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	6.4E-16	1.9E-12	3.8E-10	1.5E-8	2.3E-7	1.9E-6	9.3E-6
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 04.09.18
Job ID: 325171

Constiuent: Xylene, o- *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

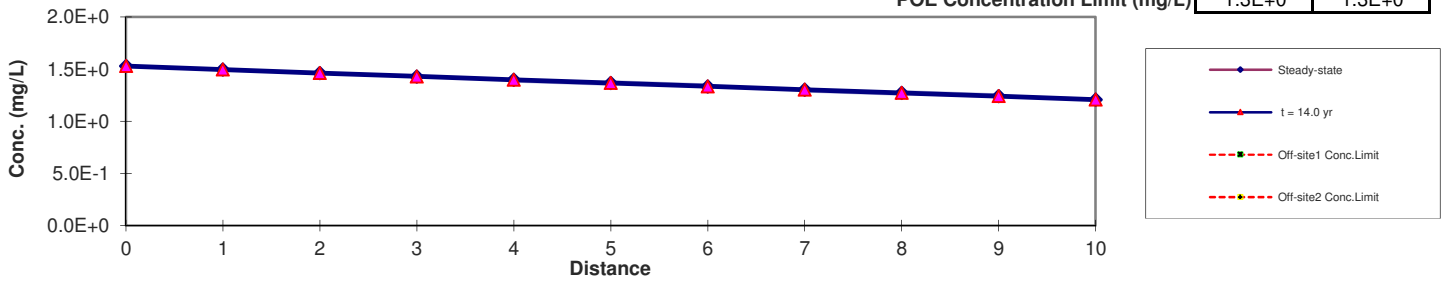
Concentration vs. Distance from Source (for given time)

Time (yr) 14.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 14.0 yr	Conc. (mg/L)	1.5E+0	1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0
Steady-state		1.5E+0	1.5E+0	1.5E+0	1.4E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.3E+0	1.2E+0	1.2E+0

Off-site1	Off-site2
MCL	MCL
100	250
8.4E-2	2.0E-3
8.4E-2	2.0E-3
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



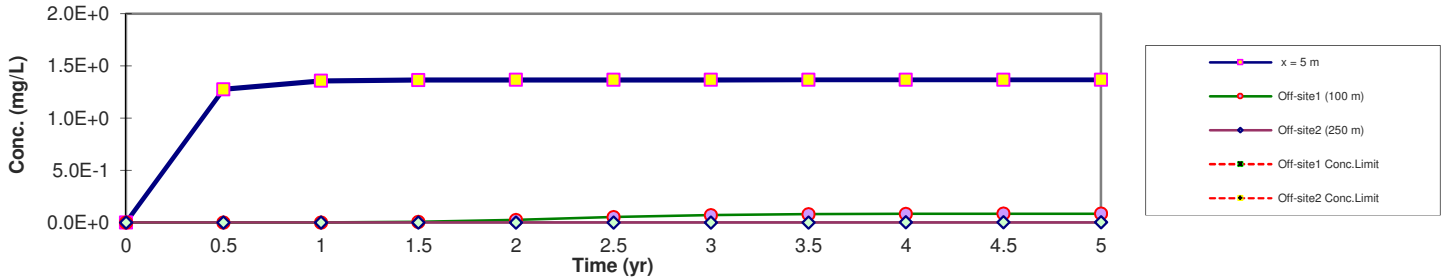
Concentration vs. Time (for given distance from source)

Distance (m) 5

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 5 m	Conc. (mg/L)	0.0E+0	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	2.1E-11	6.0E-5	4.4E-3	2.4E-2	5.1E-2	6.9E-2	7.8E-2	8.2E-2	8.3E-2	8.4E-2
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	3.6E-14	6.0E-10	1.4E-7	4.2E-6	3.7E-5	1.5E-4	4.0E-4	7.4E-4

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (Soil to GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: TPH - Aliph >C05-C06 *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

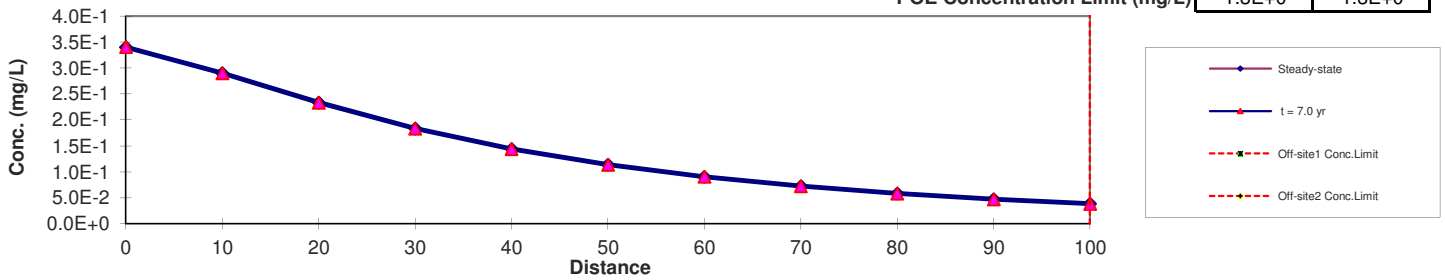
Concentration vs. Distance from Source (for given time)

Time (yr) 7.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 7.0 yr	Conc. (mg/L)	3.4E-1	2.9E-1	2.3E-1	1.8E-1	1.4E-1	1.1E-1	9.1E-2	7.3E-2	5.9E-2	4.7E-2	3.9E-2
Steady-state		3.4E-1	2.9E-1	2.3E-1	1.8E-1	1.4E-1	1.1E-1	9.1E-2	7.3E-2	5.9E-2	4.8E-2	3.9E-2

Off-site1	Off-site2
MCL	MCL
100	250
3.9E-2	7.5E-4
3.9E-2	2.5E-3
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



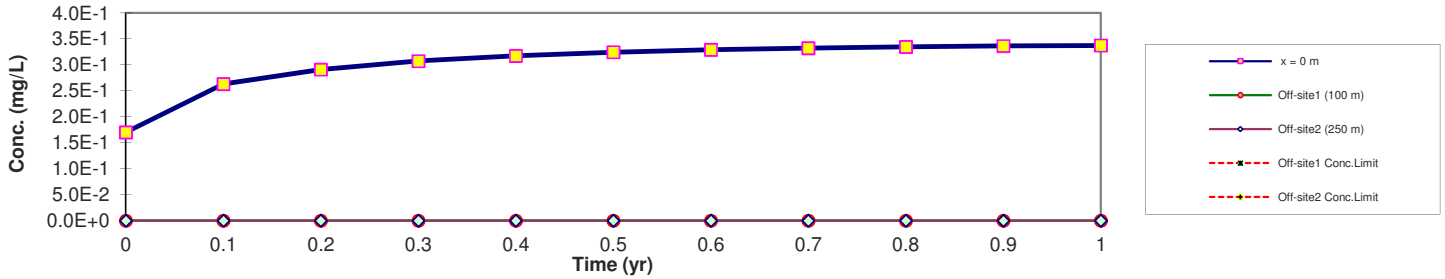
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
x = 0 m	Conc. (mg/L)	1.7E-1	2.6E-1	2.9E-1	3.1E-1	3.2E-1	3.2E-1	3.3E-1	3.3E-1	3.3E-1	3.4E-1	3.4E-1
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.0E-16	1.1E-13	1.6E-11	6.4E-10	1.1E-8	1.0E-7
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (Soil to GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: TPH - Aliph >C06-C08 (>53% n-hexane) *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

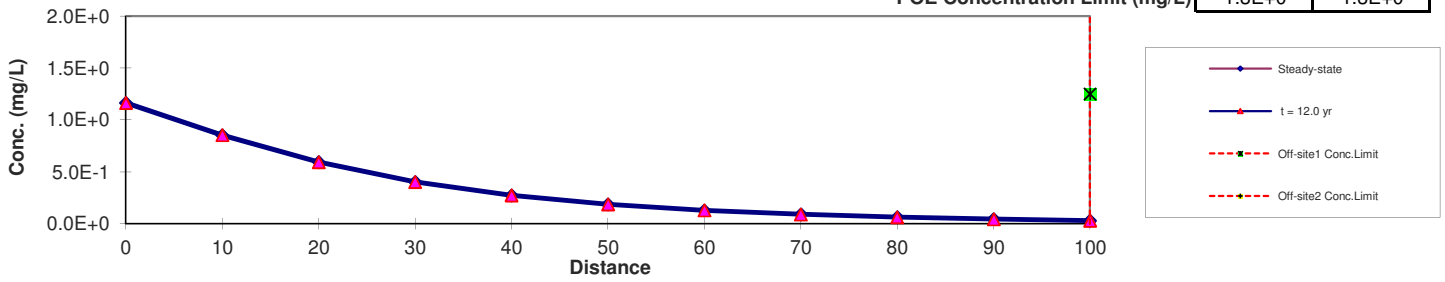
Concentration vs. Distance from Source (for given time)

Time (yr) 12.0

Distance (m)		0	10	20	30	40	50	60	70	80	90	100
t = 12.0 yr	Conc. (mg/L)	1.2E+0	8.5E-1	5.9E-1	4.0E-1	2.8E-1	1.9E-1	1.3E-1	9.1E-2	6.4E-2	4.5E-2	3.2E-2
Steady-state		1.2E+0	8.5E-1	5.9E-1	4.0E-1	2.8E-1	1.9E-1	1.3E-1	9.1E-2	6.4E-2	4.5E-2	3.2E-2

Off-site1	Off-site2
MCL	MCL
100	250
3.2E-2	3.6E-5
3.2E-2	3.3E-4
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



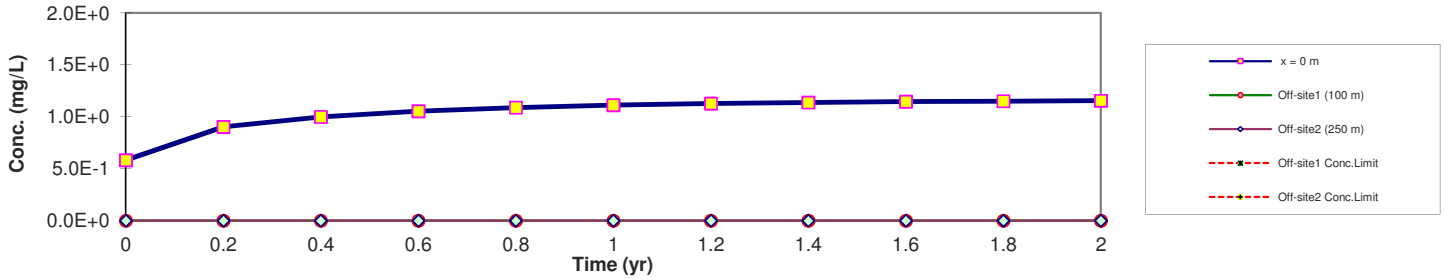
Concentration vs. Time (for given distance from source)

Distance (m) 0

Time (yr)		0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2
x = 0 m	Conc. (mg/L)	5.8E-1	9.0E-1	1.0E+0	1.1E+0	1.1E+0	1.1E+0	1.1E+0	1.1E+0	1.1E+0	1.2E+0	1.2E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	1.8E-18	4.2E-15	1.1E-12	6.8E-11	1.7E-9	2.1E-8
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (NAPL to GW)
Completed By: E Hobbs
Date Completed: 04.09.18
Job ID: 325171

Constiuent: TPH - Arom >C08-C10 *
Source Medium: Affected Groundwater
Biodegredation: 1st Order

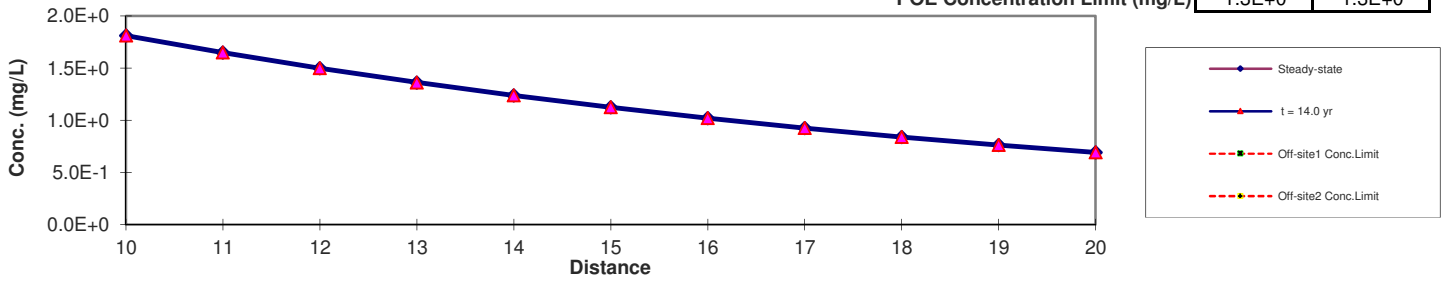
Concentration vs. Distance from Source (for given time)

Time (yr) 14.0

Distance (m)		10	11	12	13	14	15	16	17	18	19	20
t = 14.0 yr	Conc. (mg/L)	1.8E+0	1.6E+0	1.5E+0	1.4E+0	1.2E+0	1.1E+0	1.0E+0	9.2E-1	8.4E-1	7.6E-1	6.9E-1
Steady-state		1.8E+0	1.6E+0	1.5E+0	1.4E+0	1.2E+0	1.1E+0	1.0E+0	9.2E-1	8.4E-1	7.6E-1	6.9E-1

Off-site1	Off-site2
MCL	MCL
100	250
4.8E-4	6.4E-9
4.8E-4	6.4E-9
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



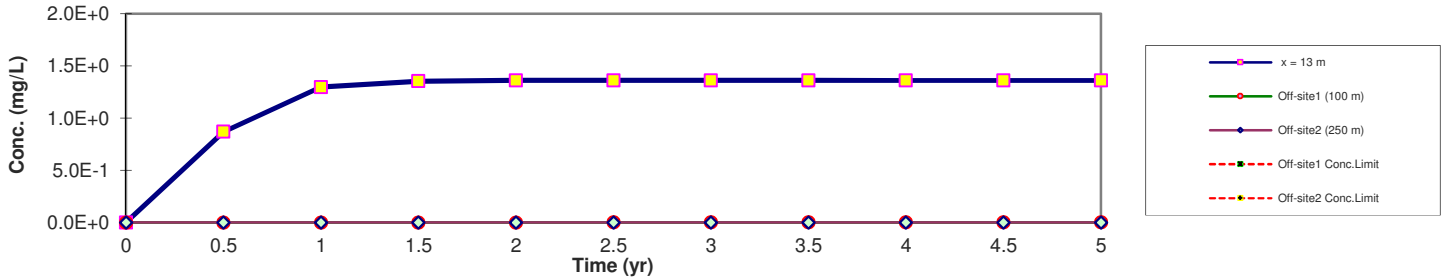
Concentration vs. Time (for given distance from source)

Distance (m) 13

Time (yr)		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
x = 13 m	Conc. (mg/L)	0.0E+0	8.7E-1	1.3E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	3.9E-10	1.1E-6	3.1E-5	1.5E-4	3.0E-4	4.0E-4	4.6E-4	4.8E-4	4.8E-4
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	5.5E-21	1.1E-16	5.0E-14	2.7E-12	4.0E-11	2.5E-10	8.4E-10

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (Soil to GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: TPH - Arom >C10-C12 *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

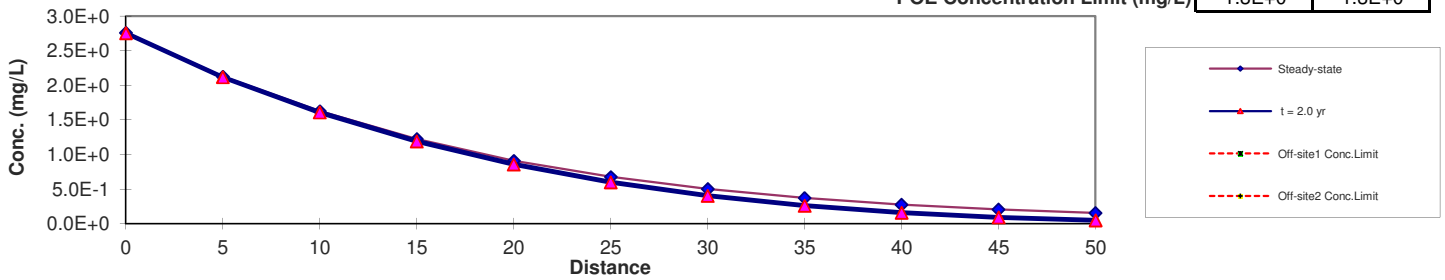
Concentration vs. Distance from Source (for given time)

Time (yr) 2.0

Distance (m)		0	5	10	15	20	25	30	35	40	45	50
t = 2.0 yr	Conc. (mg/L)	2.8E+0	2.1E+0	1.6E+0	1.2E+0	8.6E-1	6.0E-1	4.1E-1	2.6E-1	1.6E-1	9.5E-2	5.2E-2
Steady-state		2.8E+0	2.1E+0	1.6E+0	1.2E+0	9.1E-1	6.8E-1	5.0E-1	3.7E-1	2.8E-1	2.1E-1	1.6E-1

Off-site1	Off-site2
MCL	MCL
100	250
6.3E-6	0.0E+0
1.0E-2	8.4E-6
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



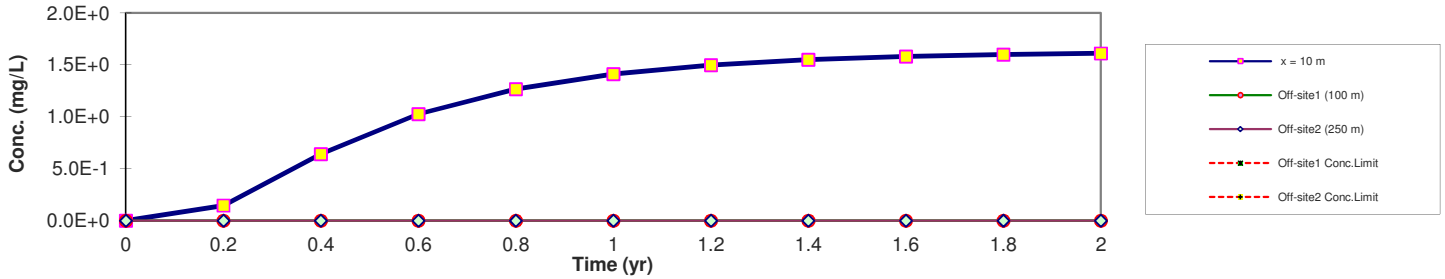
Concentration vs. Time (for given distance from source)

Distance (m) 10

Time (yr)		0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2
x = 10 m	Conc. (mg/L)	0.0E+0	1.5E-1	6.4E-1	1.0E+0	1.3E+0	1.4E+0	1.5E+0	1.5E+0	1.6E+0	1.6E+0	1.6E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	7.5E-17	4.3E-13	1.3E-10	6.7E-9	1.2E-7	1.1E-6	6.3E-6
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



RBCA SITE ASSESSMENT

TIER 2 TRANSIENT DOMENICO ANALYSIS

Site Name: EACOP Uganda Export Pipeline
Site Location: KP289.3 Jamakunya River (Soil to GW)
Completed By: E Hobbs
Date Completed: 27.02.2018
Job ID: 325171

Constiuent: TPH - Arom >C12-C16 *
Source Medium: Affected Soils Leaching to Groundwater
Biodegredation: 1st Order

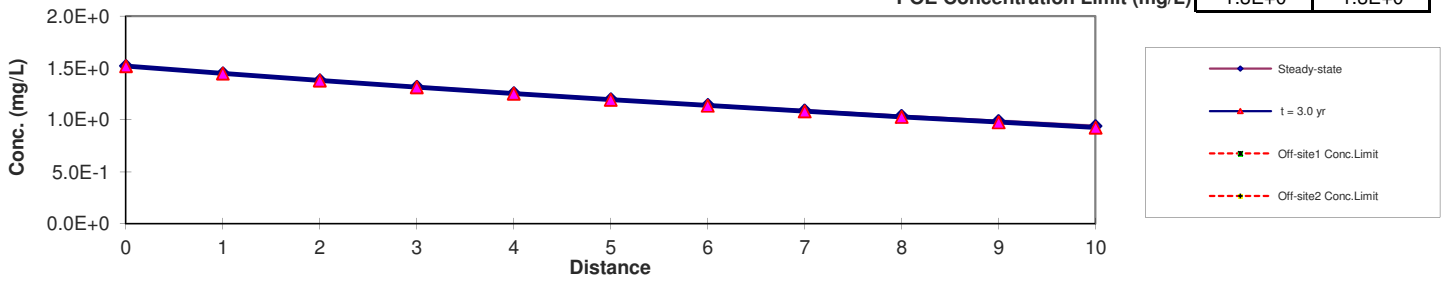
Concentration vs. Distance from Source (for given time)

Time (yr) 3.0

Distance (m)		0	1	2	3	4	5	6	7	8	9	10
t = 3.0 yr	Conc. (mg/L)	1.5E+0	1.4E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.1E+0	1.1E+0	1.0E+0	9.8E-1	9.3E-1
Steady-state		1.5E+0	1.5E+0	1.4E+0	1.3E+0	1.3E+0	1.2E+0	1.1E+0	1.1E+0	1.0E+0	9.9E-1	9.4E-1

Off-site1	Off-site2
MCL	MCL
100	250
1.7E-6	0.0E+0
8.8E-3	1.3E-5
1.3E+0	1.3E+0

POE Concentration Limit (mg/L)



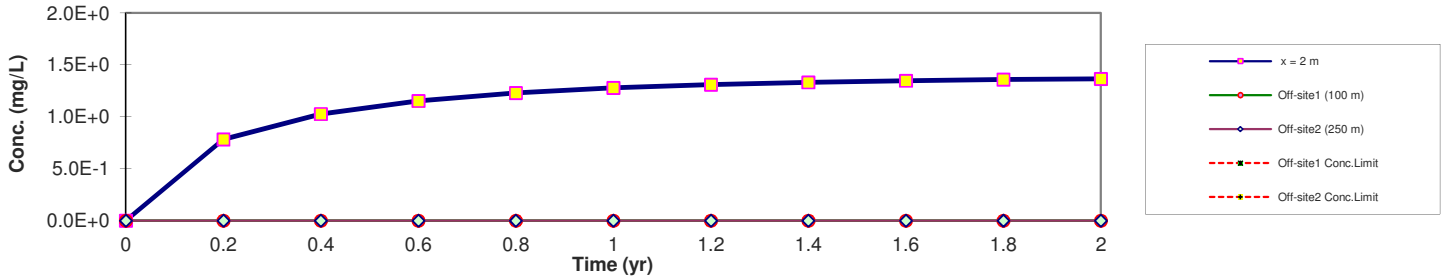
Concentration vs. Time (for given distance from source)

Distance (m) 2

Time (yr)		0	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2
x = 2 m	Conc. (mg/L)	0.0E+0	7.8E-1	1.0E+0	1.2E+0	1.2E+0	1.3E+0	1.3E+0	1.3E+0	1.3E+0	1.4E+0	1.4E+0
Off-site1 (100 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	3.9E-18	2.7E-15	3.6E-13	1.6E-11	3.1E-10
Off-site2 (250 m)		0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Time to Reach Conc. Limit (yr)

Off-site1	NA
Off-site2	NA



ATTACHMENT I1.16 DQRA – OIL RELEASE TO LAND – SURFACE WATER

NOVEMBER 2018
RSK

UGANDA EXPORT PIPELINE, OIL SPILL MODELLING

FINAL REPORT

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NOVEMBER 2018
RSK

UGANDA EXPORT PIPELINE, OIL SPILL MODELLING

FINAL REPORT

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1 Objective and introduction

The present Final report provides the results of the oil spill modelling of 5 watercourses in Uganda at the crossings of the Uganda Export Pipeline.

The objective of the present report was to describe the effect of potential oil spill in 5 selected watercourses, crossed by the Uganda Export Oil Pipeline. The Uganda Export Pipeline forms part of a larger pipeline system, connecting the oil field at Lake Albert with the Indian Ocean. The pipeline will go through Uganda and Tanzania, see Figure 1-2.

Figure 1-1 Overview map with project site

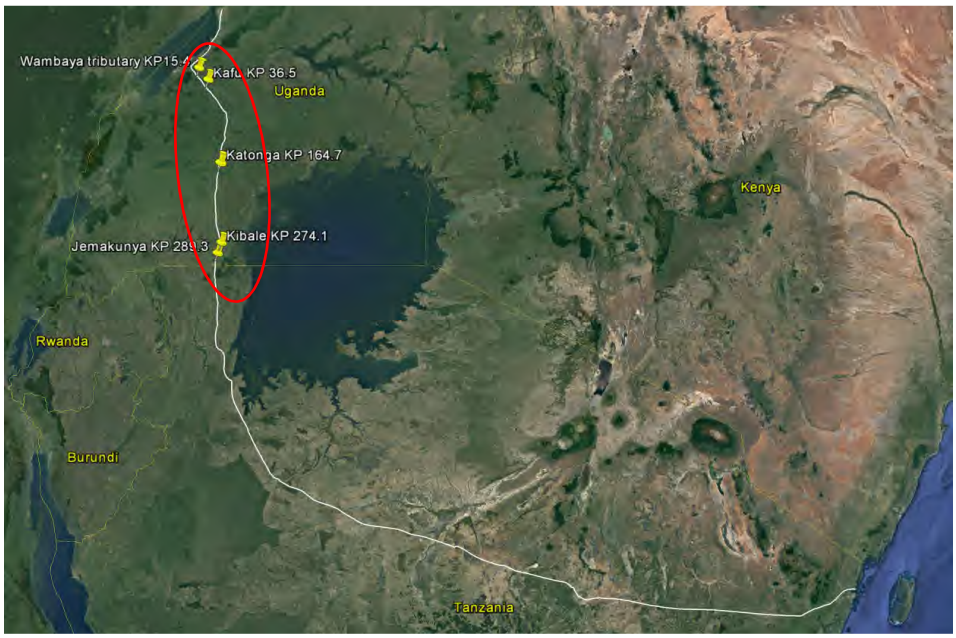

Figure 1-2 Entire Pipeline reach from Lake Albert to the Indian Ocean. The area of the considered crossings of the Uganda Export Pipeline is marked with red ellipse. The white path indicates the pipeline route.

In the event of an oil spill from the pipeline at the river crossings, the spilled oil may flow into the watercourses and represent a potential risk to river water, with subsequent risks to human health, as well as risks to the environment. The description of the oil spill shall feed into the environmental impact assessment of the project.

The watercourses described in this report are selected by RSK, and the description of the oil as well as the likely volume of spilled oil were determined by RSK, as described in EACOP 2018 APP I.

2 Method

2.1 Model

The applied mathematical model MIKE21 is a comprehensive modeling system for 2-dimensional, free surface flows. It has been continuously improved and tuned through the experience gained from thousands of applications world-wide during the last 30 years. The model solves the governing equations for conservation of momentum and mass integrated over the vertical. The model requires a model bathymetry and it is forced by input time series of e.g. water level, wind and discharge. The model bathymetry is described by a flexible mesh (FM). The output of the model is basically a time series of selected parameters, which again can be processed to maps of e.g. iso-lines, velocity vectors, exceedance probabilities, etc.

The applied MIKE21 set-up consists of the following modules:

- Hydrodynamic (HD): This module describes water level and velocities.
- Advection and Dispersion (AD): Description of advection (transport) and dispersion (spreading) of matter in the water column. The matter is modeled as being conservative, i.e. it is not changed due to decay, chemical or biological processes. This assumption is also valid for non-conservative parameters if rough order of magnitude considerations have to be performed, or in case that the parameters are not limiting for the biological processes in the specific situation.
- Particle (PT): Particle tracking module for description of oil spill, drift, spreading, weathering and decay.
- Oil spill (OS) module (see Appendix B).

The MIKE21 model is 2 dimensional, i.e. it integrates all state variables over the depth. This means that flow features connected to stratification are not included.

2.2 Uganda Export Pipeline bathymetry

The basic geographical descriptions of the river crossing points are outlined below in Figure 2-1. Table 2-1 shows the geographical positions of the crossings.

Table 2-1 River crossing coordinates for Uganda Export pipeline (KP: Kilometre Point from start of Export Pipeline, Northing and Easting in degrees, minutes and decimal seconds)

River Crossing	KP	Northing	Easting
Wambabya Tributary	15.4	1°20'49.12''	31°09'49.57''
Kafu	36.5	1°11'54.02''	31°16'47.88''
Katonga	164.7	0°9'16.69''	31°26'54.88''
Kibale	274	0°48'44.98"	31°28'15.60"
Jemakunya	289.3	0°56'24.85"	31°25'30.25"

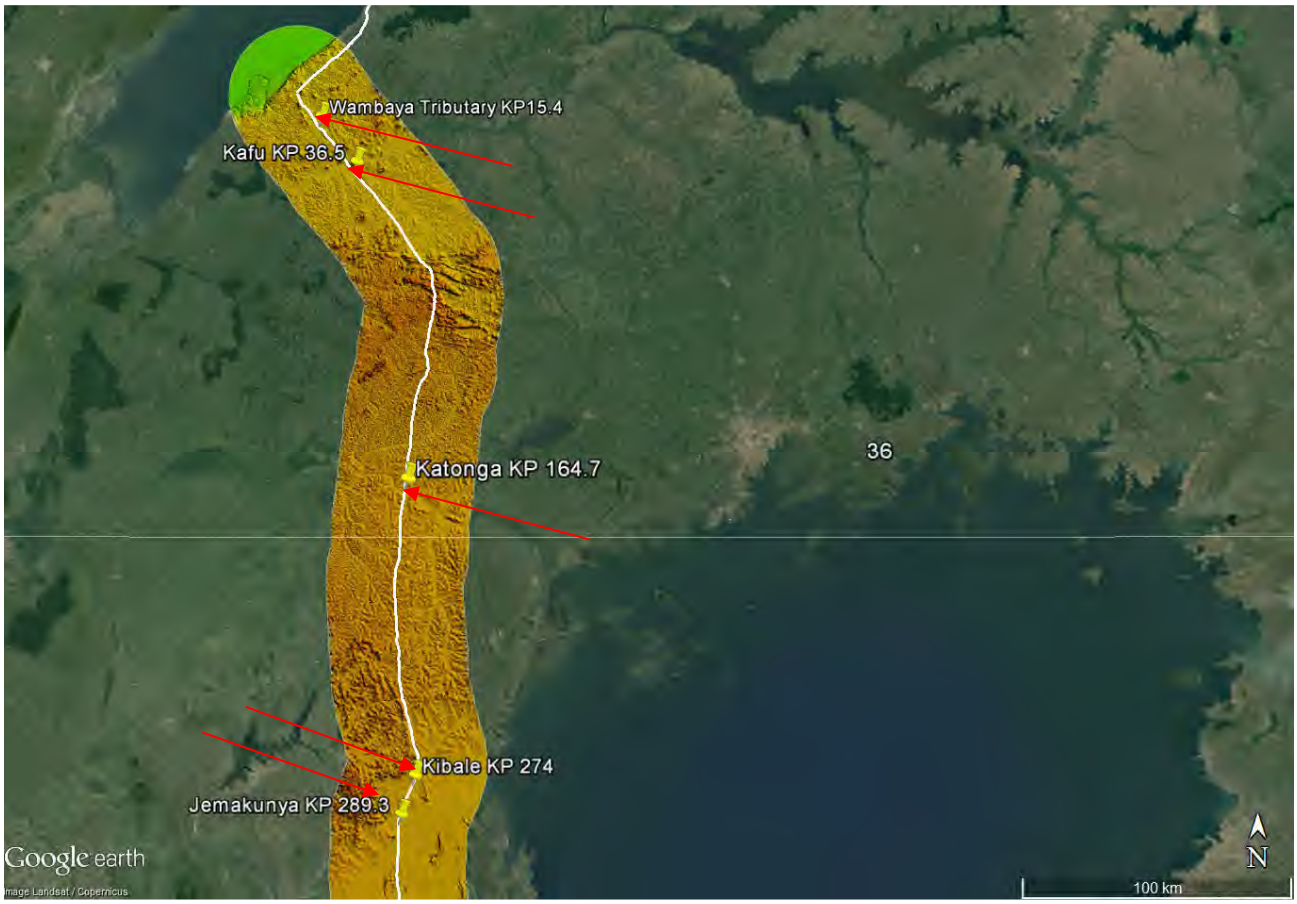

Figure 2-1 Uganda Export Pipeline with its five selected crossings marked. The corridor indicates the 50 km wide coarse survey area. The white path indicates the pipeline route.

A geographical description of the corridor for the pipeline and the locations of 2 river crossings is given in Figure 2-2.

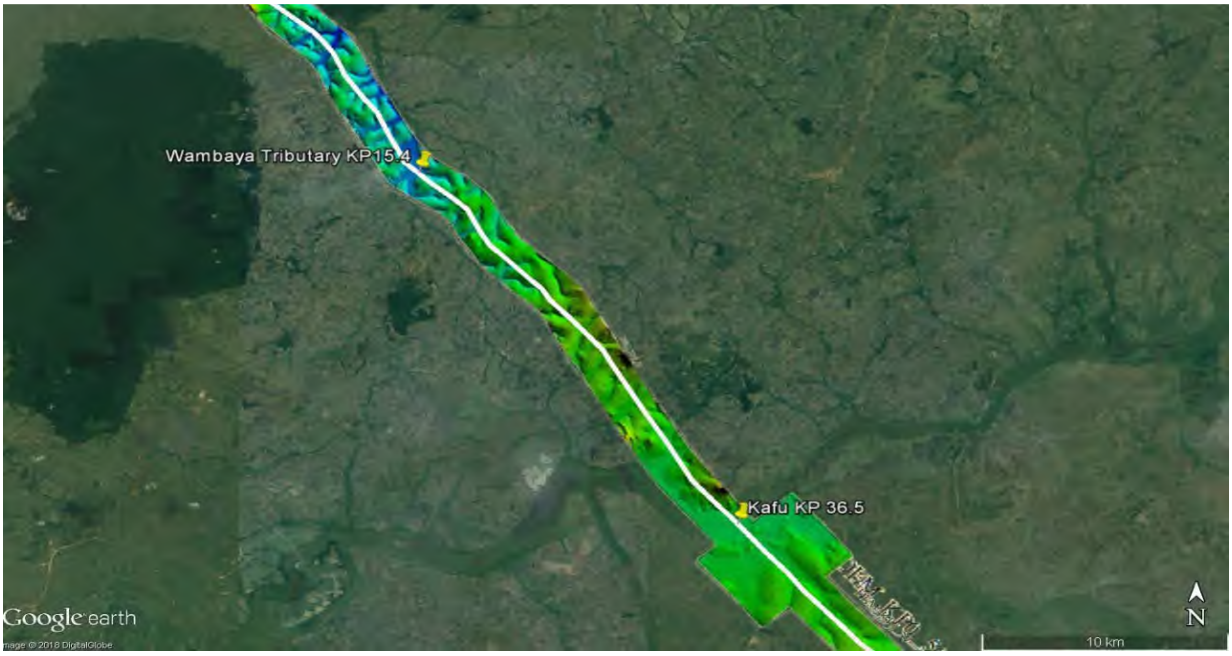

Figure 2-2 Northern section of Uganda Export Pipeline. The two selected crossings Wambaya Tributary and Kafu are marked. The corridor indicates the 2 km wide fine grid survey area (topographic data).

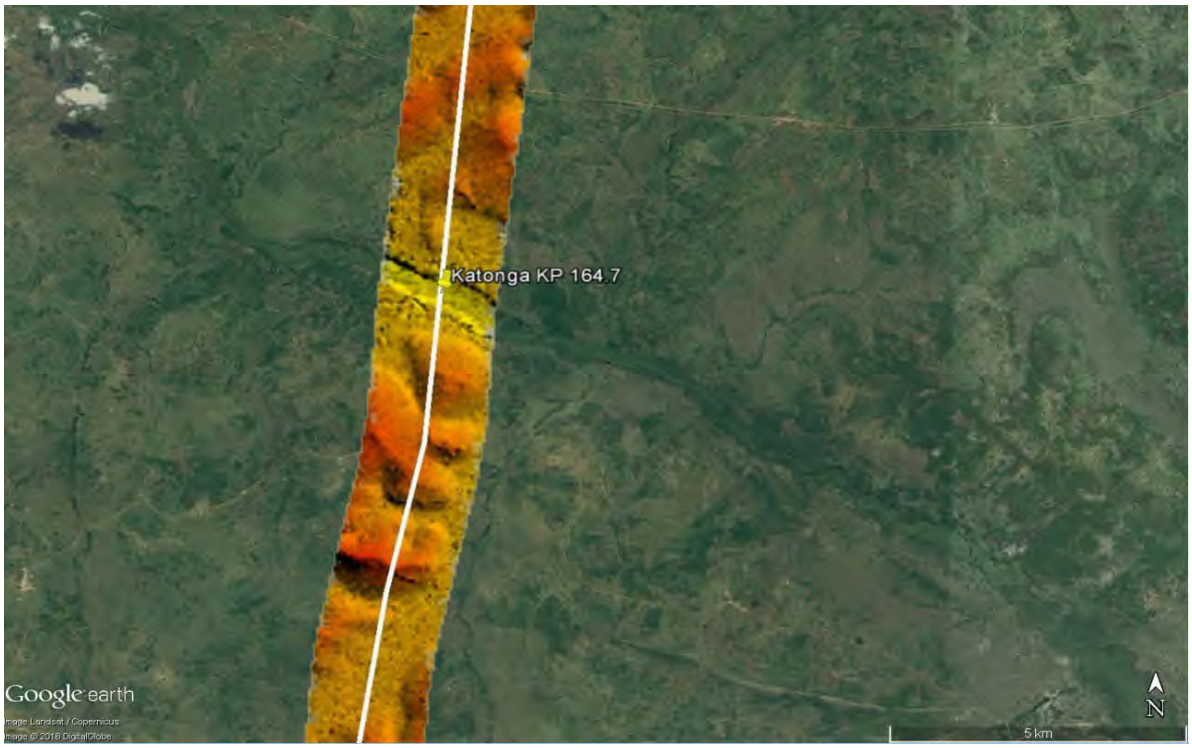

Figure 2-3 Central section of Uganda Export Pipeline. The selected crossing Katonga is marked. The corridor indicates the 2 km wide fine grid survey area (topographic data).

Figure 2-4 Southern section of Uganda Export Pipeline. The selected crossings Kibale and Jemakunya are marked. The corridor indicates the 2 km wide fine grid survey area (topographic data).

Detailed maps are prepared and presented in the following chapters in map projection UTM 36 and 37 WGS84.

Generally, the bathymetric depths at the crossings are unknown. Due to the uncertainty of the vertical accuracy and the fact that the LIDAR radar reflects the top side of the vegetation (papyrus, riparian woodland, etc.), the river bed elevation varies many times more than the expected water depth. The variation of the LIDAR data of the riverbed is several metres or tens of metres and the water depth is generally less than 1m. therefore, a modification of the river bed elevation had to be introduced. A satisfactory estimate is found by considering the overall slope (=energy gradient) and the given discharge, (EACOP, 2017). Furthermore, the "Natural Depth" is determined based on the Manning equation. The Manning equation can be used for open channel flow with uniform flow conditions. Hence, similar cross sectional area of wet area is assumed throughout the channel. This is an approximation, which makes a basis for the bathymetry of the crossings and reads:

$$Q = A \cdot V = A \cdot M \cdot R^{\frac{2}{3}} \cdot I_0^{\frac{1}{2}}$$

Where *A* is the wetted cross sectional area, *M* is the Manning number, *R* is the hydraulic radius, equal to half the water depth *y* for very wide channels of triangular cross section and I is the energy gradient based on the slope of the flood plain. The width of the river bed is taken as the width of the flood plain as it is identified from Google Earth. The shape of the river planform with all its variations, bends and curves, was also taken from Google Earth. This way, the shape of the river bed, as well as its depth, was determined in a hydraulically consistent way.

Table 2-2 summarises the bathymetric basis parameters.

Table 2-2 Bathymetric basis parameters

Crossing	Discharge [m³/s]	Manning Number [s/m$^{1/3}$]	Energy gradient [‰]	Channel width estimate [m]	Natural depth [m]
Wambaya Tributary	0.85	5	1.8	160	0.22
Kafu	3.81	5	0.5	70	1.30
Katonga	5.86	5	0.7	130	1.10
Kibale	2.64	5	1.5	50	0.90
Jemakunya	0.04	5	0.4	15	0.23

The applied manning number is based on available river characteristics. From available Google Earth photos and river descriptions provided by RSK a roughness applied in the model is assessed. Because of coarse descriptions of river roughness, a highly vegetated/rough river is given a high friction, corresponding to a low Manning number Mmanning of 5 s/m$^{1/3}$. A free and open water surface of a river is given a standard friction, corresponding to a standard low Manning number of 30 s/m$^{1/3}$. For the rivers of the Tilenga Feeder Pipeline a manning of 5 s/m$^{1/3}$ is assumed, as all rivers are highly vegetated (Papyrus wetlands), with riparian woodland along the river banks.

The modelled bathymetry is shown in Appendix C.

2.3 River discharges

Documentation for discharge analysis is provided by RSK.

The discharge statistics for the watercourses at the 5 selected river crossings of the pipeline are given below, see Figure 2-5 and Table 2-3.

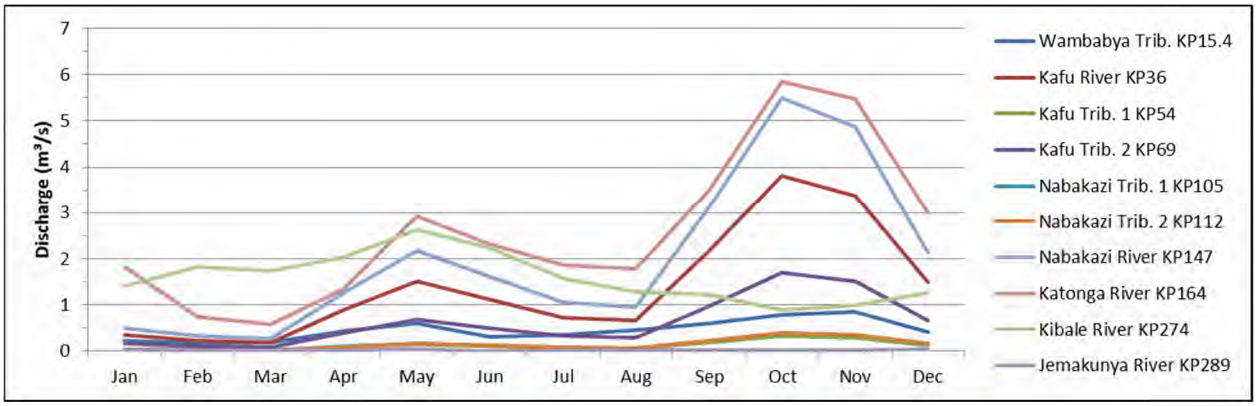

Figure 2-5 Illustrative flow statistics (m³/s) (RSK, 2017)

Table 2-3 Tabular estimated median monthly flow statistics (m³/s) for main watercourse crossings (RSK, 2017)

KP	River Crossing	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
15.4	Wambabya Trib.	0.23	0.15	0.19	0.42	0.6	0.31	0.35	0.46	0.59	0.78	**0.85**	0.4	0.41
KP36.5	Kafu River	0.35	0.23	0.18	0.88	1.52	1.12	0.73	0.66	2.17	**3.81**	3.38	1.48	1.00
KP164.7	Katonga	1.83	0.74	0.56	1.35	2.91	2.32	1.87	1.77	3.49	**5.86**	5.48	3.01	2.09
KP274	Kibale	1.4	1.81	1.735	2.02	**2.64**	2.24	1.58	1.275	1.225	0.895	0.98	1.27	1.49
KP289.3	Jemakunya	0.04	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.02	0.02	**0.04**	0.01

Based on the above listed flow statistics the discharges applied for the models were extracted. The median value of the month with the highest median discharge was chosen as a typical high flow scenario that is realistic without being extreme. Applying the median value instead of the average omits the assumption that the discharge events are distributed according to a normal distribution.

A single event of a dry or flood season would influence the result of an average calculation. The median calculation, however, will not be influenced by extreme events throughout the given time period. No assumption on the distribution of the events was taken. Hence, the maximum median flow discharge is used for the modelling.

The selected design discharge Q_{median} is listed in Table 2-4 below.

Table 2-4 Design discharge Q_{median} for each crossing

Crossing	Wambabya	Kafu	Katonga	Kibale	Jemakunya
Q_{median} (m³/s)	0.85	3.81	5.86	2.64	0.04

2.4 Sediment characteristics

The sediments of the Uganda Export Pipeline consist of sand in the upper reaches to clay in the lower reaches. Sediment was characterised by visual inspection during site visits, see Appendix A. Many flood plains were characterised as papyrus wetlands and riparian woodland, with a very high oil retention capacity. Other rivers were narrow with many bends and curves, that increases the contact between the river banks and oil and hence also add to quick retention of spilt oil. These two factors may add to the high retention and indicate that the length of impact was expected to be shorter than e.g. at marine oil spills.

2.5 Oil spill

Oil blends E1, E2, E3 and E4 (see table below) were considered for the Uganda Export pipeline. The most conservative oil type was considered, i.e. the one with the lowest viscosity that will tend to spread further.

In terms of the spill volume and duration, a spill of 9000 bbl (equivalent to 1,275 tonnes) over a period of 60 minutes were considered. This corresponds to a discharge rate of approx. 0.4 m³/s over a duration of 1 hour. It is assumed that the spill occurs in the middle of the river crossing.

In Table 2-5, densities (EACOP, 2017) and viscosities are listed for the different oil blends. The viscosities were taken as readings at 50 °C and from Figure 2-6.

Table 2-5 Density and Viscosity

Blend name	Density (kg/m³)	Viscosity (T=50 °C) (mPas.s)
E1	908	43
E2	935	61
E3	912	50
E4	**892**	**20**

Since blend E4 has the lowest viscosity, it was expected that this oil blend will have the tendency for spreading further and was hence selected as the critical oil blend for spill from the Uganda Export Pipeline.

Table 2-6 Pour point temperature (PP) and wax appearance temperature (WAT) for different blends. From (EACOP, 2017)

Blend name	Pour Point (°C)	WAT(°C)
E1	34	49
E2	31	45
E3	33	48
E4	**40**	**57**

The pour point for E4 was given as 40 °C (EACOP, 2017).

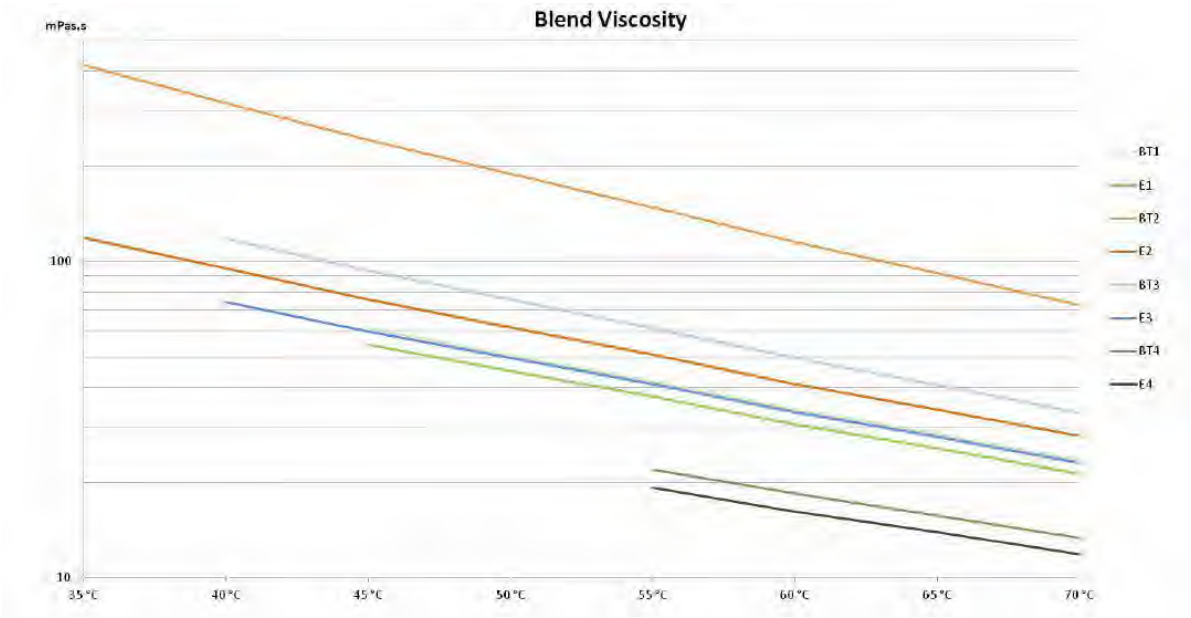

Figure 2-6 Blend viscosities for temperatures above WAT, (EACOP, 2017).

In (EACOP, 2017) it was stated that the export temperature is specified as 50 °C minimum. In the Uganda Export Pipeline, the oil will be in a state between PP and WAT.

2.6 Wind

Oil spill was modelled for 5 days after spill. Wind condition is 3 m/s from South, see wind rose for Kampala airport (Windfinder, 2018) below.

Figure 2-7 Wind rose for Kampala airport (Windfinder, 2018)

2.7 Model calibration

Calibration of hydrodynamic parameters cannot be carried out due to lack of measurements. The model was run with standard (default) model parameters.

2.8 Model assumptions

In each case, the dispersal of oil following a spill has been modelled. The model is allowed to run until a point in time at which dispersal produced by the model reaches an equilibrium state at which point no further substantial oil migration is observed. The length of affected river is then estimated using the model output.

The length of affected river can be understood as a maximum extent in which substantial impact of oil is expected from an oil spill. The extent of substantial impact can be further defined as the area where the majority of the oil will stay, e.g. 90-95%, and the river would be affected from bank to bank with a coating of oil. A smaller amount of oil can however be expected to drift down the river as small patches or tar balls (see further discussion in Sections 3 and 4, below) A proportion of the spill is also expected to be transported upstream of the spill point. This upstream transport is due to gravity adjustments and dispersive processes of the oil spill.

Further information on the calculations performed by the model software with respect transport and dispersion of oil in an aquatic environment are discussed in more detail below.

2.8.1 Oil transport modelling

The MIKE 21 model includes three process to describe the transport and dispersion of oi on the water surface:

- Gravity adjustment
- Dispersion
- Advection

The **gravity adjustment** concerns the first period of the spill where the oil flattens out due to gravity and where the viscosity and friction against the support, usually the sea, here it is the river, the swamp or even the river bank (land). In confined river valleys, the resulting flow will be in only two directions: downstream and upstream. Taking the small inclination of the river bed into account and the sudden spill of high viscous oil, it is most likely that this initial flow will be almost symmetrical in upstream and downstream direction.

The **dispersive** transport of oil particles illustrates that oil will split into several minor portions/ patches, which will spread and move slightly different from each other. In the present case this process illustrates the feature that some of the oil will detach from the main spill and move further on as separate patches. This process is governed by a dispersion factor (describing the strength of the dispersive process) and by the concentration gradient of oil. There is no calibration basis for determining the dispersion factor, and therefore the standard factor from marine spills is applied. This implies that the dispersion is high, due to the high concentration gradients in the confined rivers, which will result in a conservative (long) impact length. Since the dispersive process acts almost symmetrical to the spill point, this process will result in downstream as well as upstream transport of oil. The effect that some of the affected length in the model is found to be upstream of the spill point is a consequence of including as much dispersed oil particles in the affected length as reasonable possible. The main purpose of this study is to determine a realistic length of affected river and not to describe the exact location of spilled oil. A detailed oil spill model describing the exact location of oil impact requires more information on the bathymetry and on flow conditions, including calibration data.

Advection describes the transport of oil that passively flows with the current. It is a direct consequence of the current speed and direction. For small and confined creeks and for wetlands (papyrus swamps) with low current speed, this effect is secondary. In the open sea, however, this process is dominant.

The oil spill modelling which is described by the OS module considers the likelihood of an oil particle getting absorbed at the river bank. As the river flood banks are characterised by vegetation, the retention capacity is considered high. Hence, the probability of a particle getting absorbed is set to the default value of 1 (100 %), indicating that oil sticks once it touches the land. The only process that can move the oil away again is dispersion, which, however, is a weaker process. As a result of this the model output shows the oil adhering to the riverbanks and accumulating at distinct points.

The affected length is to be understood as a maximum extent where significant impact of oil is expected from an oil spill at the respective section of the pipeline. The extent of significant impact is defined as the area where the majority of the oil will stay, e.g. 90-95%. A smaller amount of oil can be expected to drift down the river as small patches or tar balls. A proportion of the affected length is expected to be upstream of the spill point. This upstream effect is a consequence of modelling gravity adjustments and dispersive processes of the oil spill.

The rivers studied are small and narrow, thus the oil will come into contact to the riverbanks quickly. The sudden spill of more than 1,000 m^3 over 1 hour of highly viscous oil, will cause a rapid build up oil in the river and its valley.

3 Results

The detailed outputs from the MIKE21 modelling are presented in Appendix C, including images of river hydraulics and oil distribution.

A summary of the results is shown in Table 3-1 and in Figure 3-1. More detailed discussions of the results at each location are included in the following sub-sections.

In the initial phase of the spill, gravity and viscosity as well as dispersion govern the transport and spreading of oil within the specific local geometry. The gravitational flow is hence governed by the riverbed topography and bathymetry and differs upstream and downstream from the oil spill crossing point and this effect is different between rivers. The changes in the cross-sectional area of each river influences the flow of water and this in turn leads to different oil flow patterns being expressed in the model outputs.

The model output is expressed as a length of river predicted to experience substantial impact in the event of a spill is shown in the table and chart below. As described in Section 2, the area of substantial impact is that length of river which the model predicts would experience approximately 90-95% of the oil as a coating of oil from bank to bank.

More detailed discussion of the results at each location are presented in Appendix C. Further discussion on the safety factor considerations, uncertainty inherent in the modelling process and the variables that have been considered in determining an additional 'low risk zone' is provided in Section 4.

Table 3-1 Results summary of oil spilling in river crossings of the Uganda Export Pipeline.

River crossing	Wambabya Tributary	Kafu River	Katonga River	Kibale River	Jemakunya River
KP	15.4	36.5	164.7	274	289.3
Length of river affected – model* (km)	0.6	2.0	3.0	3.0	0.1**
River discharge (m^3/s)	0.85	3.81	5.86	2.64	0.04
*Not including 'low risk zone' (see Section 4) ** Oil not mobilised due to very limited wet area. Affected length based on oil pool diameter.					

The results are depicted in Figure 3-1.

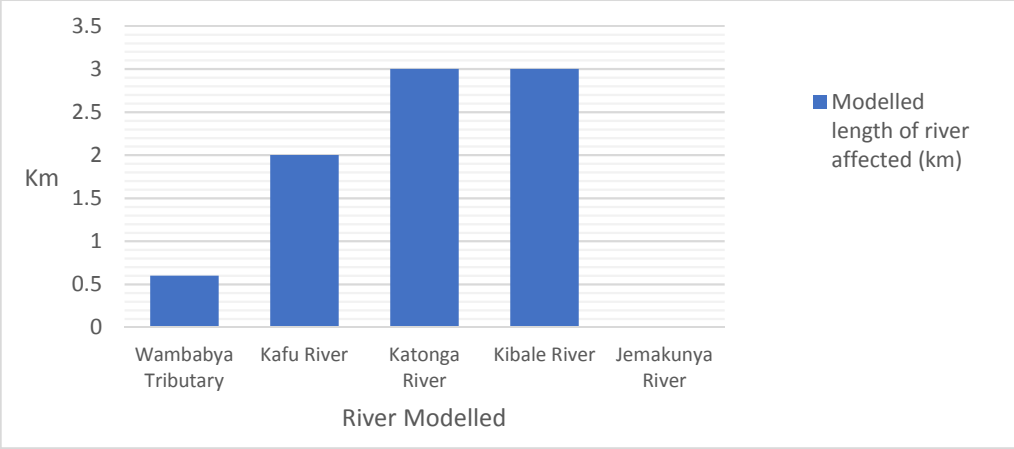

Figure 3-1 Length of river affected by oil spill at the Uganda Export Pipeline based on figures from Table 3-1.

It can be seen that at four of the five crossing locations, the modelled length of river affected ranges between 0.6 km and 3.0km. The main reason for the relative short transport is the high viscosity of the oil and the small magnitude of most of the rivers. The rivers are so narrow that the oil spill covers the entire river surface.

The oil spill in the Jemakunya River is limited due to very low flow rate which limits the wet area, for which the oil can flow. The natural water depth in the Jemakunya River is 23 cm and the river width is very narrow. The oil can only flow in this narrow corridor, furthermore the hydraulic features of the river limits the oil spill to around 100 m.

The high pour point temperature of 40°C lets the oil solidify in the water, and hence minimises the spreading as oil. The oil quickly will become extremely sticky and will hence – in solid form – either stick to the riverbanks or to the vegetation (papyrus). In solid state, the oil will quickly introduce a "barrage effect" that will further reduce drift and spreading, particularly in narrow areas of the rivers. The narrowness and the curvature of the rivers and the small discharge compared to the large oil spill contribute to the high retention of oil in the vicinity of the spill.

Detailed results and interpretation can be found in Appendix C.

4 Discussion

Uncertainty

The objective of the oil spill modelling was to assess a river length, where substantial oil impact could be expected in case of rupture of the pipeline.

The uncertainty and the quality of the data available must be taken into account in interpreting the affected river lengths produced by the model.

In order to represent input uncertainties, an estimated 'low risk zone' for impact on human health and environment should be considered in addition to the modelled affected length. The designation of a low risk zone is aligned with the concept of a "safety factor". Safety factors are often applied in situations where there is uncertainty in an assessment of risk and the potential scale of an impact to human health and the environment.

The effect of applying a safety factor creates a zone, in which impact to the river environment as which presents a risk to human health or the environment cannot be entirely discounted. This would include, for example dissolved phase hydrocarbons originating from the oil, minor isolated patches of oil or tar balls transported further downstream than the modelled length.

The magnitude of the low risk zone is derived by multiplying the modelled affected length by a factor of 5. For example, a modelled affected length of 1km should be considered to be associated with an additional 4km low risk zone. This factor has been determined based on professional judgement and in consideration of the cumulative uncertainties of key input parameters which are described below. Clearly, improvements in model input data quality would be expected to result in a smaller safety factor.

1 Bathymetry:
Water depth, width of river bed and shape of transects, curvature of the river bed as well as the energy gradient are all parameters that should be determined indirectly, giving rise to considerable uncertainty. These parameters are assumed to provide the largest contribution to the uncertainty of the model results.

2 Oil type:
Composition of oil (waxes, asphaltenes, heavy and volatiles) as well as viscosity were chosen as central estimates. The effect of applying the oil type with the highest and the lowest viscosity indicated no effect on affected length. Applying high and low water temperature indicated approx. 20% difference, see Appendix A.

3 Friction:
Bed friction varies significantly in the different river beds. Most rivers had significant vegetation, giving rise to extreme friction.

4 Spill scenario:

The given design spill volume, location, duration etc, is a central estimate of likely spills. High variability on the range of likely spills is expected.

5 River discharge:
The river discharges are based on statistical analyses that include significant uncertainties due to the lack of reliable measurements at the river locations studied.

5 References

EACOP, 2017: EACOP Studies

DHI OS, 2018: "DHI Oil Spill Model, Oil Spill Template, Scientific Description, 2017"

DHI HD, 2018: "MIKE 21 & MIKE 3 Flow Model FM, Hydrodynamic and Transport Module, Scientific Documentation, 2017".

Windfinder, 2018: https://www.windfinder.com/windstatistics/kampala

6 Appendix

Appendix A Sediment observations

The following observations are made by RSK in the close vicinity of the different crossings:

River crossing	River bed sediment texture observation	Sediment colour	Odour	Presence of biota	Presence of detritus
Wambabya tributary (KP15.4)	No data				
Kafu (KP36.5)	Murram, soil mixed with small aggregates	Brown	soil smell	Not visible	plant matter present
Katonga (KP164.7)	Coarse sand	Greyish brown	smell of oil (oil)	Not visible	plant roots
Kibale (KP274)	Fine, slippery, sticky, clayey sediment	Light brown	smell of soil	Not visible	No data
Jemakunya (KP289.3)	Clay with some loam soil, slippery with clods	Light brown	smell of soil	Not visible	plant matter present

Appendix B Oil spill Module, MIKE 21 & Mike 3 Flow Model FM

Application areas

The oil spill module can be applied in open sea, coastal areas, estuaries, rivers and lakes. It can be applied in two or three dimensions. However, when considering dissolved oil three dimensions are recommended.

The Oil Spill Module can be applied in studies of e.g.

- Environmental impact assessment
- Single spill impacts
- Clean up operations
- Emergency response systems
- Assessments of required amounts of dispersants.

Oil characterisation

The different types of oil are characterised through a number of key parameters including e.g. density, viscosity, pour point and maximum water content. Additionally, the oil is divided into the following five fractions:

- Heavy fraction
- Semi volatile fraction
- Volatile fraction
- Wax
- Asphaltene

Each of these are described through a number of key parameters and weathering constants.

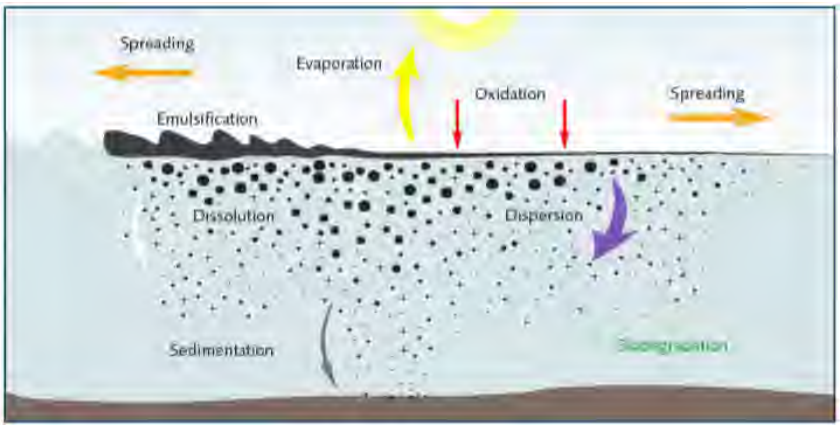

Figure 6-1 Weathering processes (ITOPF, 2002)

Weathering Processes

The following weathering processes are included in the Oil Spill Module:

- Spreading (viscous, gravity based)
- Evaporation
- Emulsification
- Vertical dispersion (by waves)
- Dissolution
- Biodegradation
- Photo-oxidation

All of these processes and the other features in the Oil Spill Module are handled by a MIKE ECO Lab template. This means that all processes/features may be inspected (and updated) using the MIKE ECO Lab editor (a MIKE ECO Lab license is required to use the MIKE ECO Lab editor). An illustration of the weathering processes and their time scales is shown above and below.

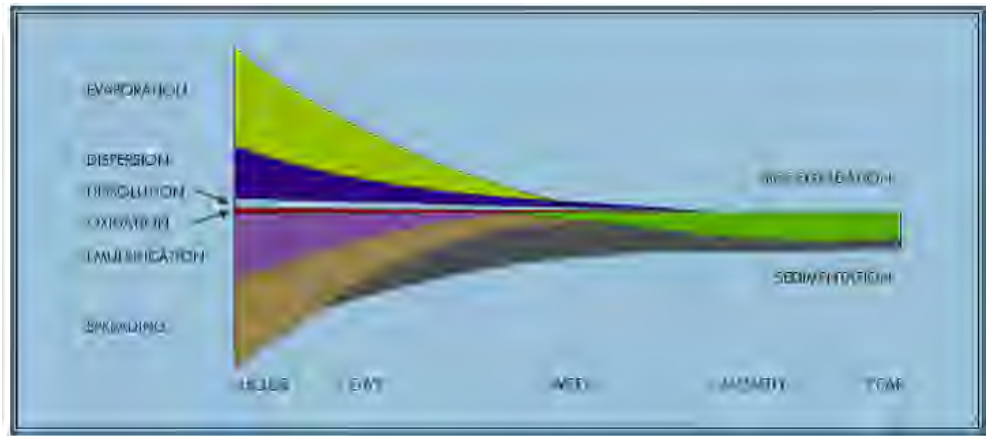

Figure 6-2 Time scales for weathering processes (ITOPF, 2002)

Environmental data requirements

The following environmental data are required for an oil spill simulation:

- Current data in 2D or 3D. These will normally come from a coupled or de-coupled MIKE21 or MIKE3 FM simulation.
- Wind data. These are used for calculation of the surface layer drift. The wind data are also applied in e.g. the evaporation process.
- Wave data. These are used for the vertical dispersion of oil. Note that when oil particles are dispersed into the water column no evaporation will take place. This may have an important effect on the amount of oil hitting e.g. a coast.
- Ice data (optional). Oil drift in ice-infested waters will follow the ice. Also, the weathering processes will be adjusted.

Solution technique

The oil spill simulation is executed using the MIKE ECO Lab engine and a MIKE ECO Lab oil spill template. The execution comprises both Lagrangian particle tracking (including weathering processes) and Eulerian advective-dispersive computations of dissolved oil (optional).

An oil spill simulation may either be run as a coupled model together with MIKE21 or MIKE3 Flow Model FM or in the de-coupled mode. In order to save time the de-coupled mode, where flow data from previous MIKE21 or MIKE3 FM simulation are re-used, is normally used.

The spreading of an oil spill is calculated by dividing the oil spill into discrete parcels, termed particles.

The movements of these particles are given as a sum of a displacement determined by the hydrodynamic flow field (and optionally the wind) and a dispersive component as a result of random process (e.g. turbulence in the water).

The movement of dissolved oil is calculated using the advective-dispersion formulation in the transport solver in MIKE21 & MIKE3 FM.

The above is quoted from (DHI, 2018).

References

ITOP, 2002: Fate of marine oil spills, Page 8, Technical Reports, The international tanker Owner Pollutions Federation Limited (ITOPF), London

DHI, 2018:" MIKE21 & MIKE3 Flow Model FM, Oil spill Module, short description". file:///C:/Users/crj/Downloads/MIKE213_OS_FM_Short_Description.pdf

Appendix C Oil spill modelling results

C.1 Wambabya Tributary KP 15.4

The bathymetry based on received topographic data is shown in Figure 6-3.

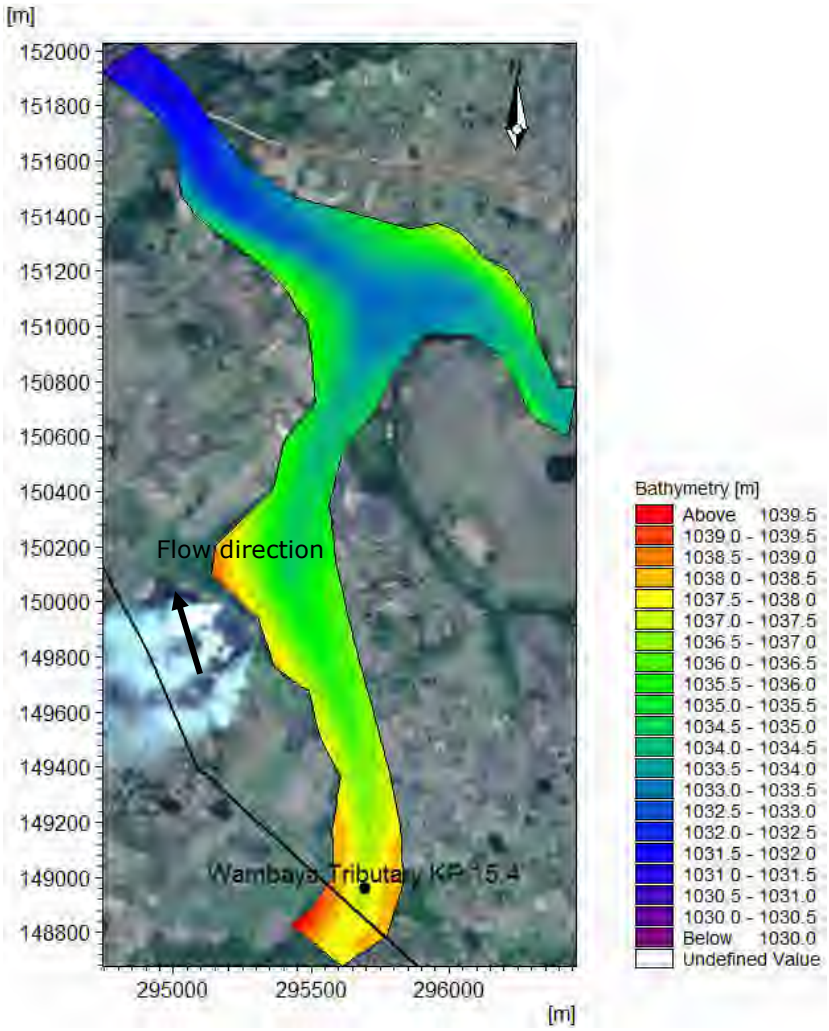

Figure 6-3 Modelled bathymetry at Wambabya Tributary crossing at KP 15.4. The model was generated based on topographic data. Bathymetric data in flood plain was based on natural depth calculations, see Table 2-2. Pipeline route shown with black line.

The resulting hydraulic features of the river are shown in Figure 6-4 and Figure 6-5.

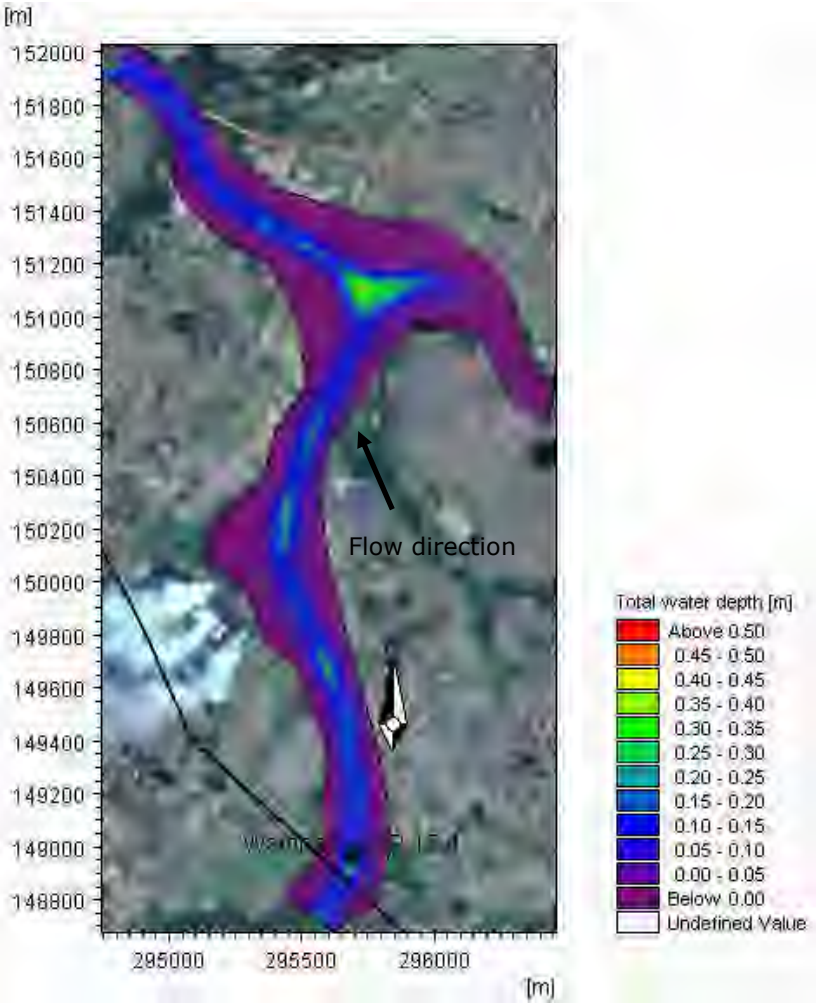

Figure 6-4 Wambabya Tributary: Total water depth (m). Pipeline route shown with black line.

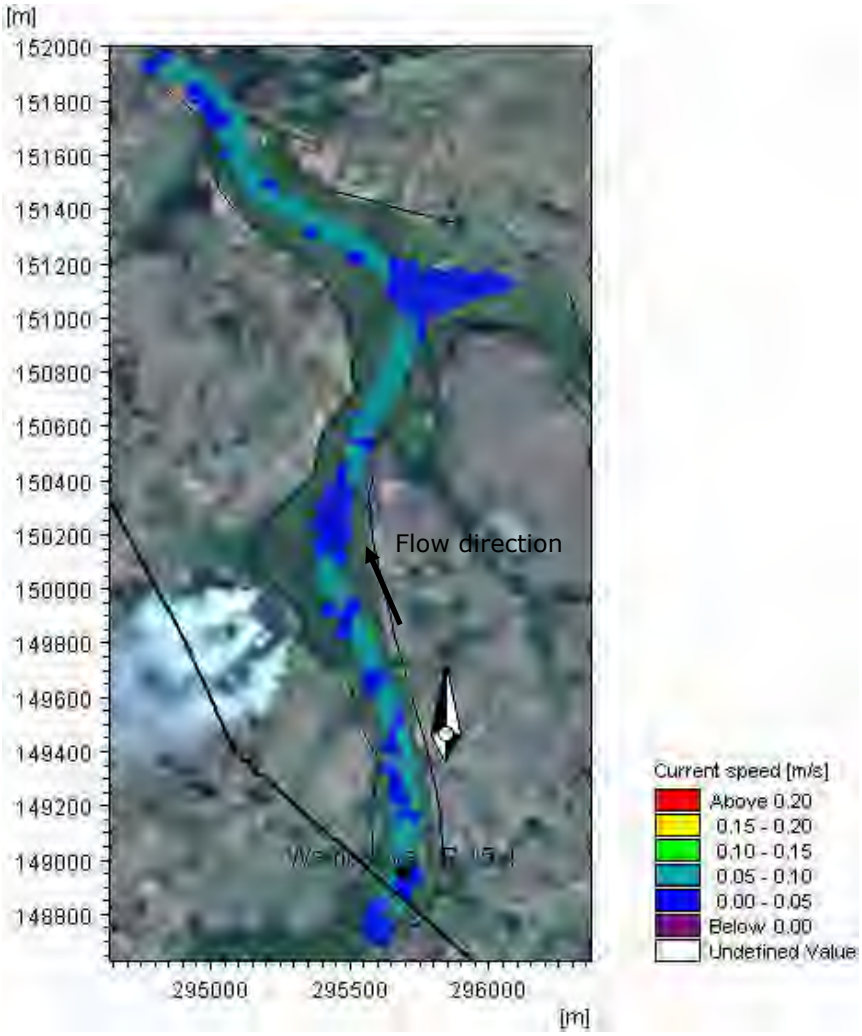

Figure 6-5 Wambabya Tributary: Current Speed (m/s). Pipeline route shown with black line.

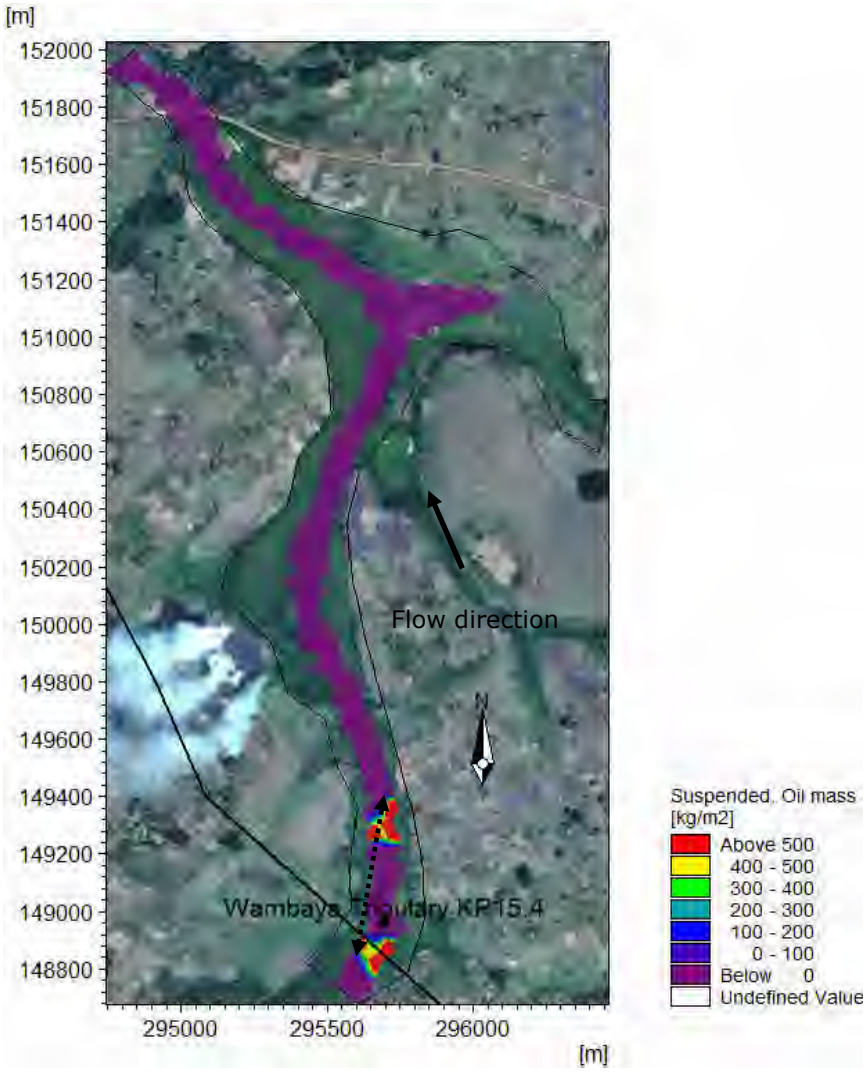

Figure 6-6 Final distribution of total oil mass in kg/m². Length of river affected marked with dashed line.

The results of the oil spill modelling at the Wambabya Tributary crossing are summarised in Table 6-1.

Table 6-1 Wambabya Tributary: Impact length

Modelled length of river with substantial impact (km)	Travel time (days) For modelled impact	Low risk zone factor	Possible length of affected river (km) (including Low risk zone)
0.6	<1	5	3.0

It is seen that the oil stays in the vicinity of the spill location due to the narrowness of the river and the low pour point temperature, that makes the oil stick to the river banks and vegetation. The oil assembles in two large pools rather quickly throughout the simulation and sticks at that position. The time for full spreading along the modelled length of river affected and the point at which equilibrium is considered to have been reached was less than 1 day. The travel time can not be assessed for the length of affected river including the low risk zone, as the time variation does not vary linearly with the safety factor.

Of course, it should be noted that the extent of significant impact is defined as the area where the majority of the oil will stay, e.g. 90-95%. A smaller amount of oil can also be expected to drift down the river as small patches or tar balls.

C.2 Kafu River KP 36.5

The bathymetry based on received topographic data is shown in Figure 6-7.

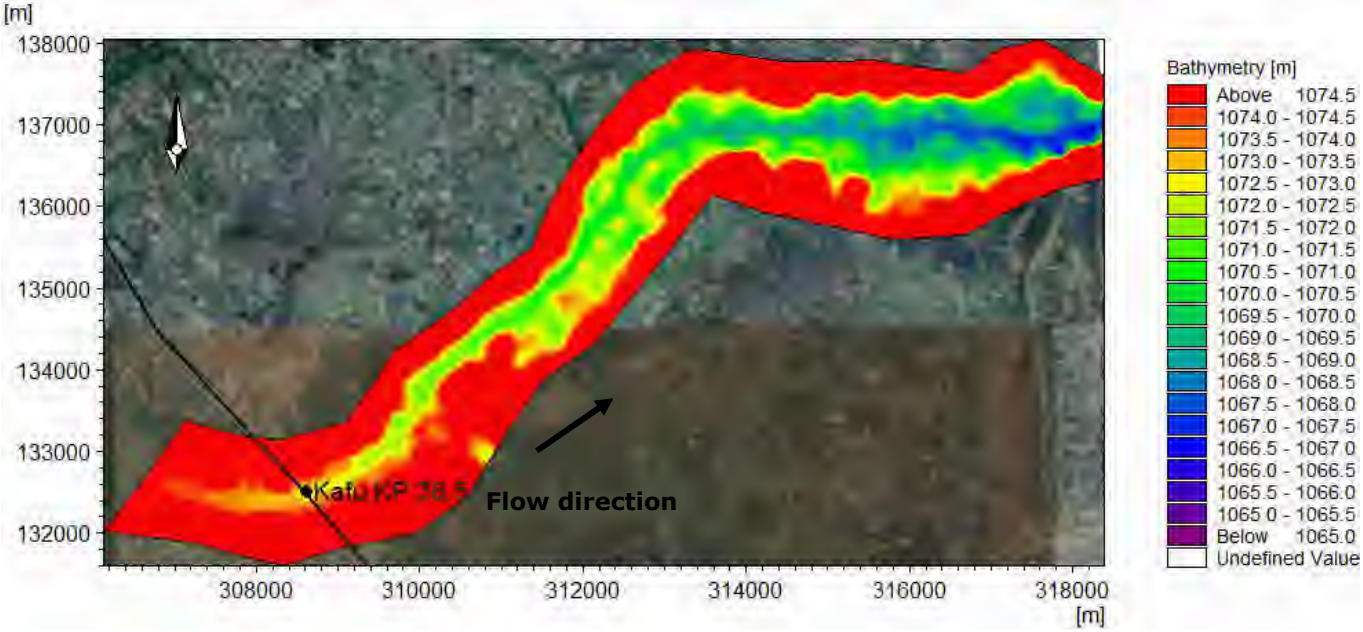

Figure 6-7 Modelled bathymetry at Kafu river crossing at KP 36.5. The model was generated based on topographic data. Bathymetric data in flood plain was based on natural depth calculations, see Table 2-2. Pipeline route shown with black line.

The resulting hydraulic features of the river crossing are shown in Figure 6-8.

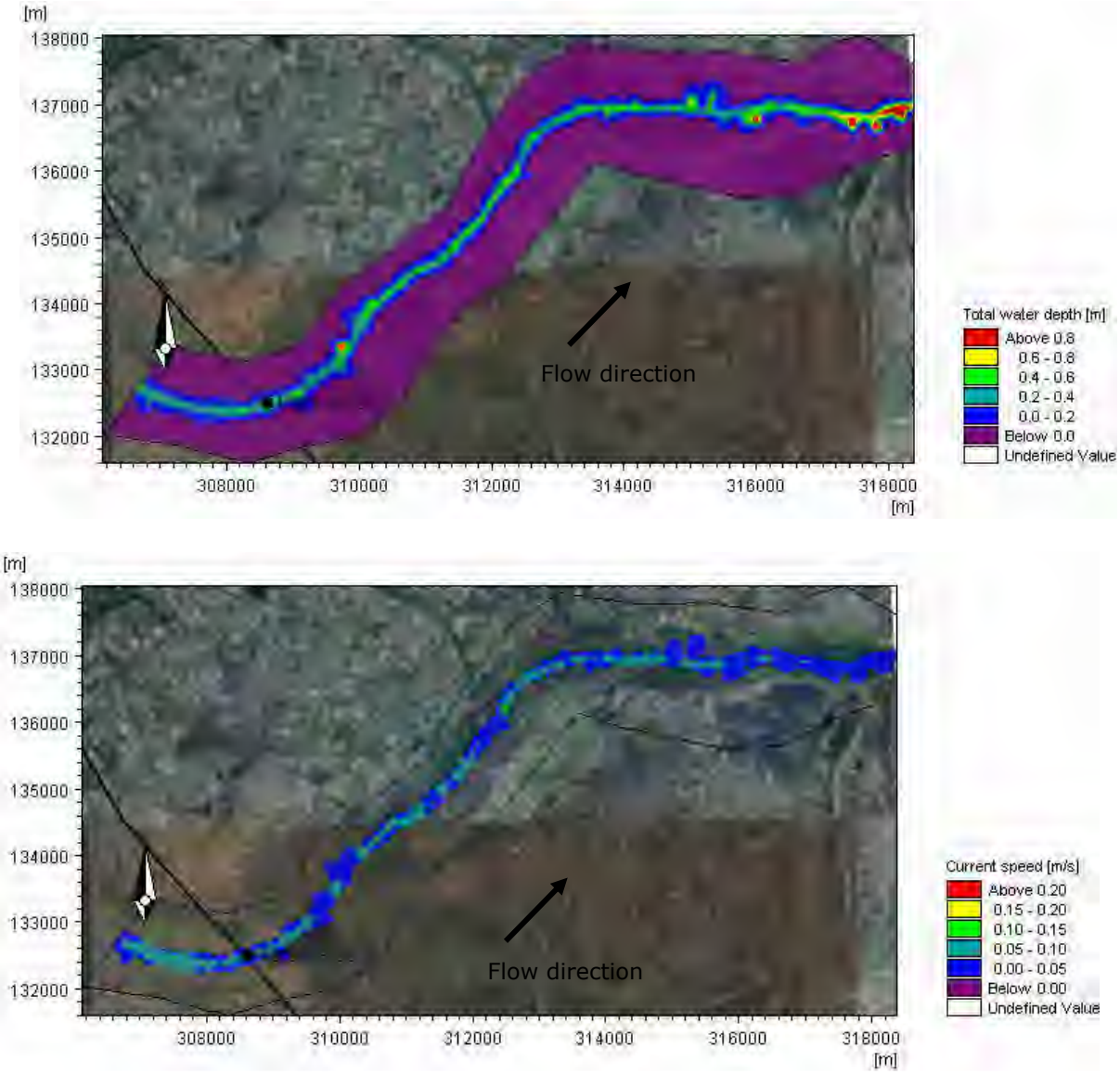

Figure 6-8 Kafu River Crossing KP 36.5: top: Total water depth (m), bottom: current speed (m/s). Pipeline route shown with black line.

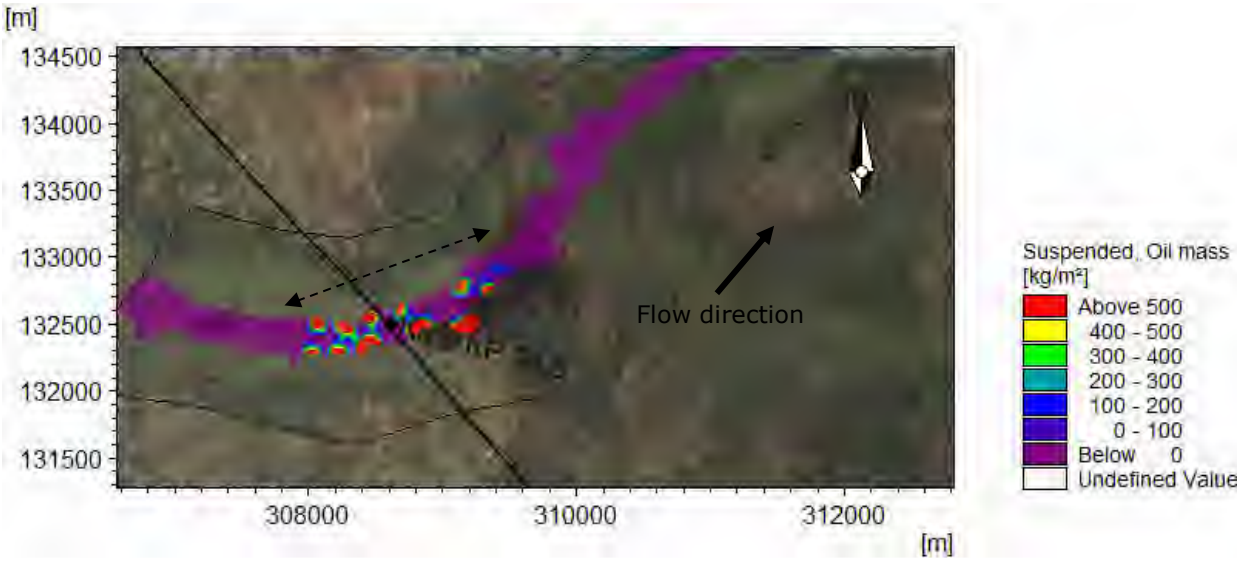

Figure 6-9 Final distribution of total oil mass in kg/m². Length of river affected marked with dashed line.

The results of the oil spill modelling at the Kafu River crossing are summarised in Table 6-2.

Table 6-2 Kafu River: Impact length

Modelled length of river with substantial impact (km)	Travel time (days) For modelled impact	Low risk zone factor	Possible length of affected river (km) (including Low risk zone)
2.0	<1	5	10

It is seen that most of the oil stays within 2 km of the spill location due to low pour point temperature, that make the oil stick to the river banks and vegetation. The oil drifted upstream and downstream, but drifted mostly downstream. See further explanation on upstream drift in Section 2. A large amount of the oil assembled at the spill point and stayed in the vicinity. The time for full spreading along the modelled length of river affected and the point at which equilibrium is considered to have been reached is less than 1 day. The travel time can not be assessed for the length of affected river including the low risk zone, as the time variation does not vary linearly with the safety factor.

Of course, it should be noted that the extent of significant impact is defined as the area where the majority of the oil will stay, e.g. 90-95%. A smaller amount of oil can also be expected to drift down the river as small patches or tar balls.

C.3 Katonga River KP 164.7

The bathymetry based on received topographic data is shown in Figure 6-10.

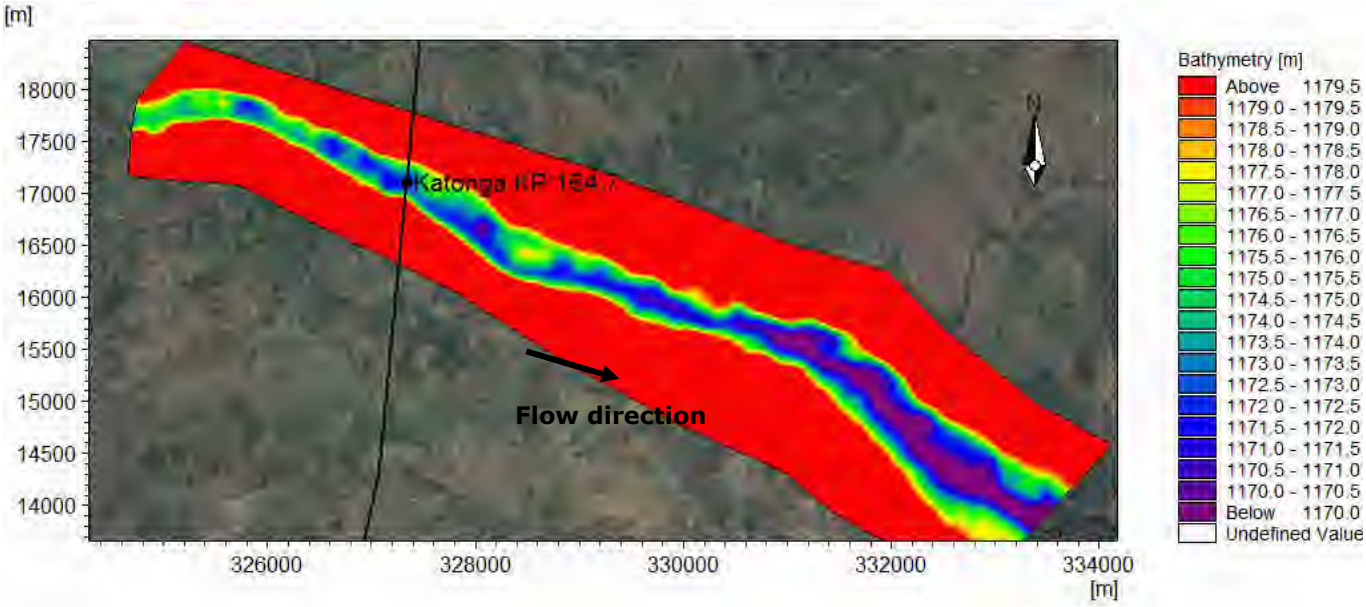

Figure 6-10 Modelled bathymetry at Katonga river crossing at KP 164.7. The model was generated based on topographic data. Bathymetric data in flood plain was based on natural depth calculations, see Table 2-2. Pipeline route shown with black line.

The resulting hydraulic features of the river crossing are shown in Figures 6-11 to 6-13.

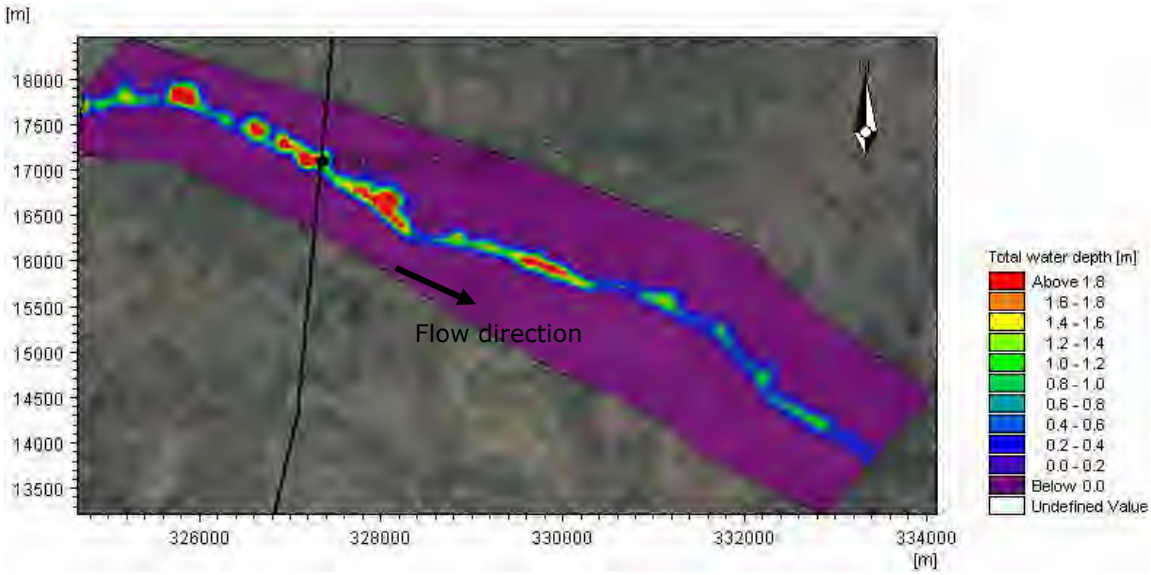

Figure 6-11 Katonga KP 164.7: Total water depth (m). Pipeline route shown with black line.

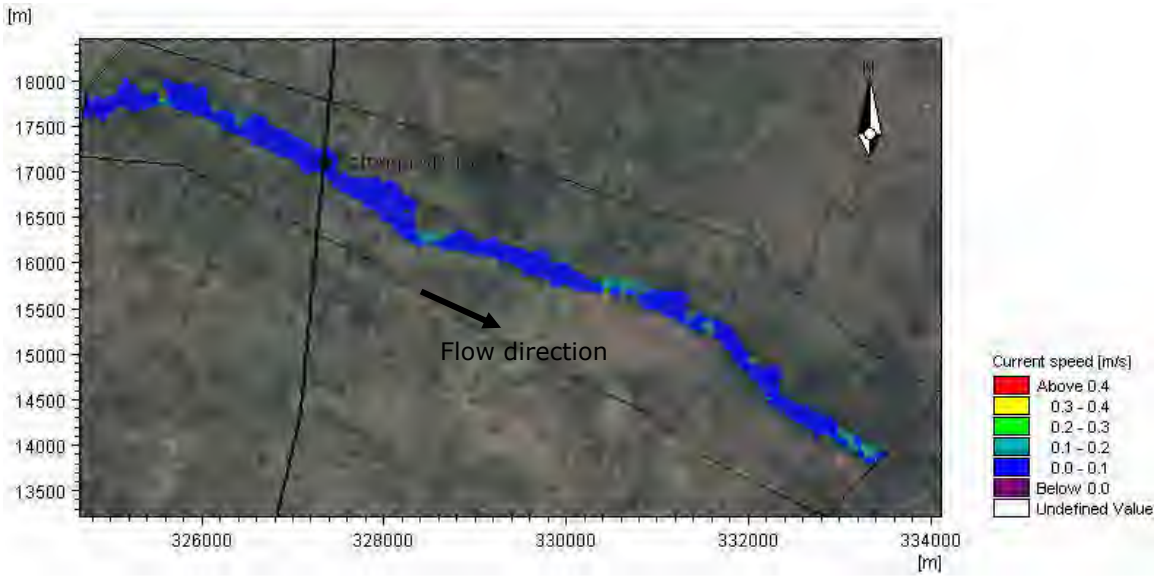

Figure 6-12 Katonga River Crossing KP 164.7: Total water depth (m). Pipeline route shown with black line.

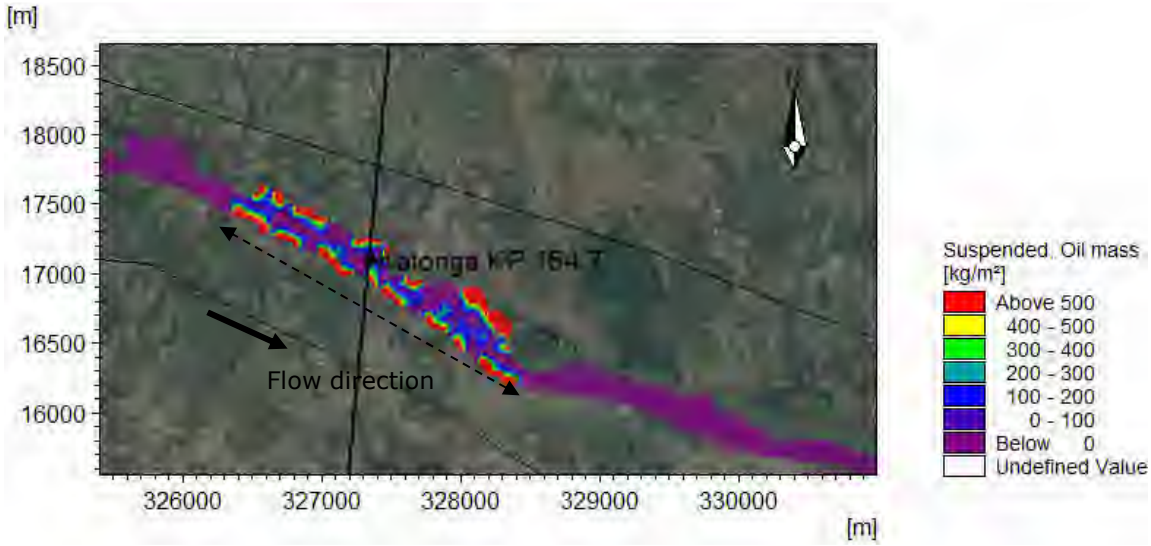

Figure 6-13 Final distribution of total oil mass in kg/m². Length of river affected marked with dashed line.

The results of the oil spill modelling at the Katonga River crossing are summarised in Table 6.3.

Table 6-3 Katonga River: Impact length

Modelled length of river with substantial impact (km)	Travel time (days) For modelled impact	Low risk zone factor	Possible length of affected river (km) (including Low risk zone)
3.0	<1	5	15

It is seen that the oil stays within 3 km of the spill location due to the narrowness of the river and the low pour point temperature, that makes the oil stick to the river banks and vegetation. Downstream from the spill point the river width narrows and stops the oil from further downstream drifting. Hence, the oil spill in the Katonga river assembles in a uniform distribution over the length. The time for full spreading along the modelled length of river affected and the point at which equilibrium is considered to have been reached is less than 1 day. The travel time can not be assessed for the length of affected river including the low risk zone, as the time variation does not vary linearly with the safety factor.

Of course, it should be noted that the extent of significant impact is defined as the area where the majority of the oil will stay, e.g. 90-95%. A smaller amount of oil can also be expected to drift down the river as small patches or tar balls.

C.4 Kibale River KP 274

The bathymetry based on received topographic data is shown in Figure 6-14.

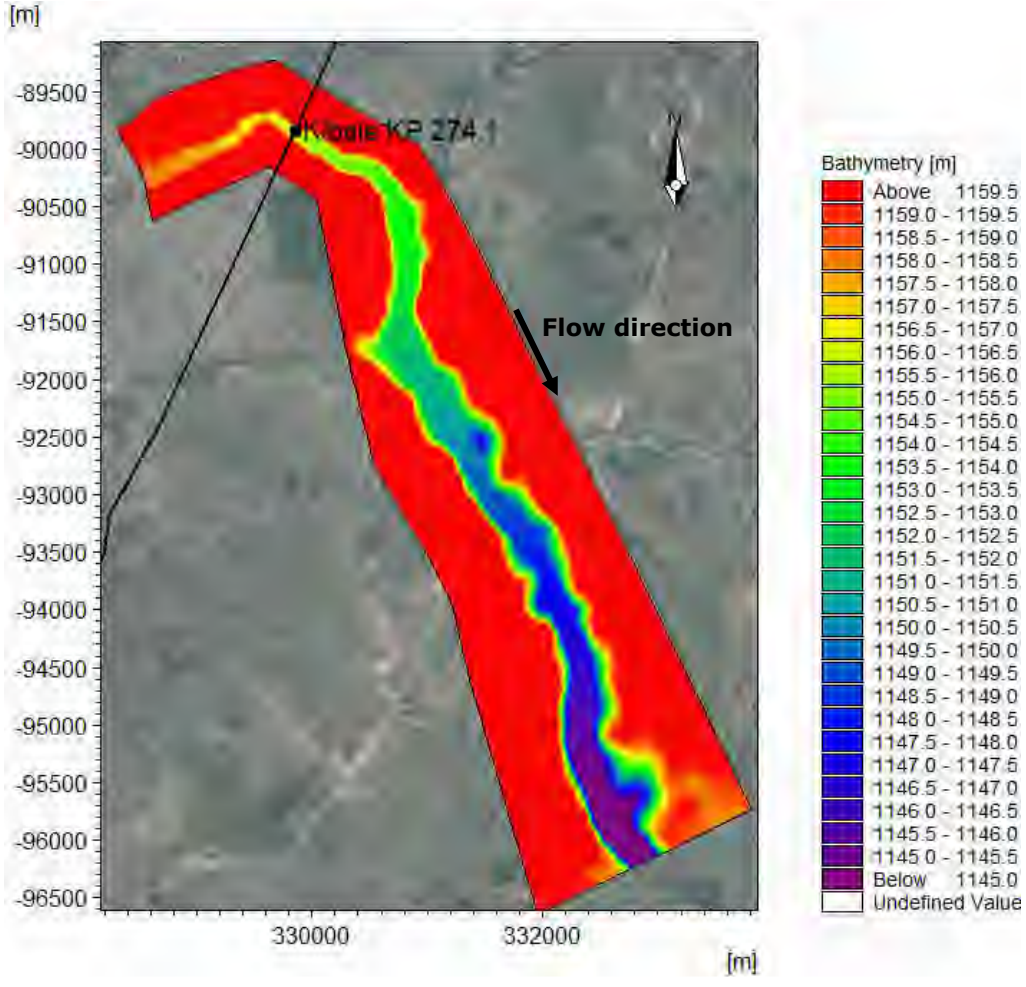

Figure 6-14 Modelled bathymetry at Kibale river crossing at KP 274. The model was generated based on topographic data. Bathymetric data in flood plain was based on natural depth calculations, see Table 2-2. Pipeline route shown with black line.

The resulting hydraulic features of the river crossing are shown in Figure 6-15.

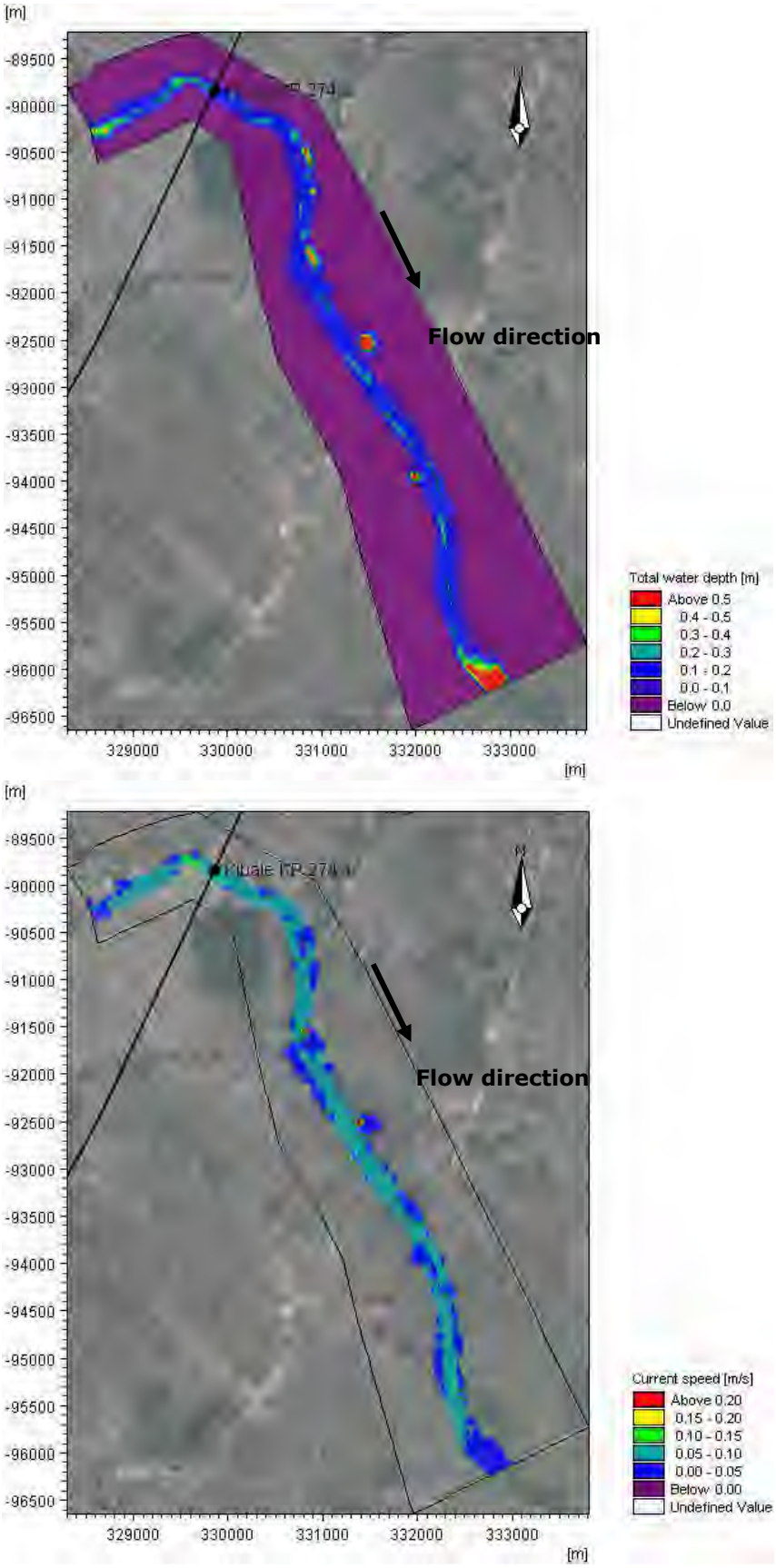

Figure 6-15 Kibale River Crossing KP 274: top: Total water depth (m), bottom: current speed (m/s). Pipeline route shown with black line.

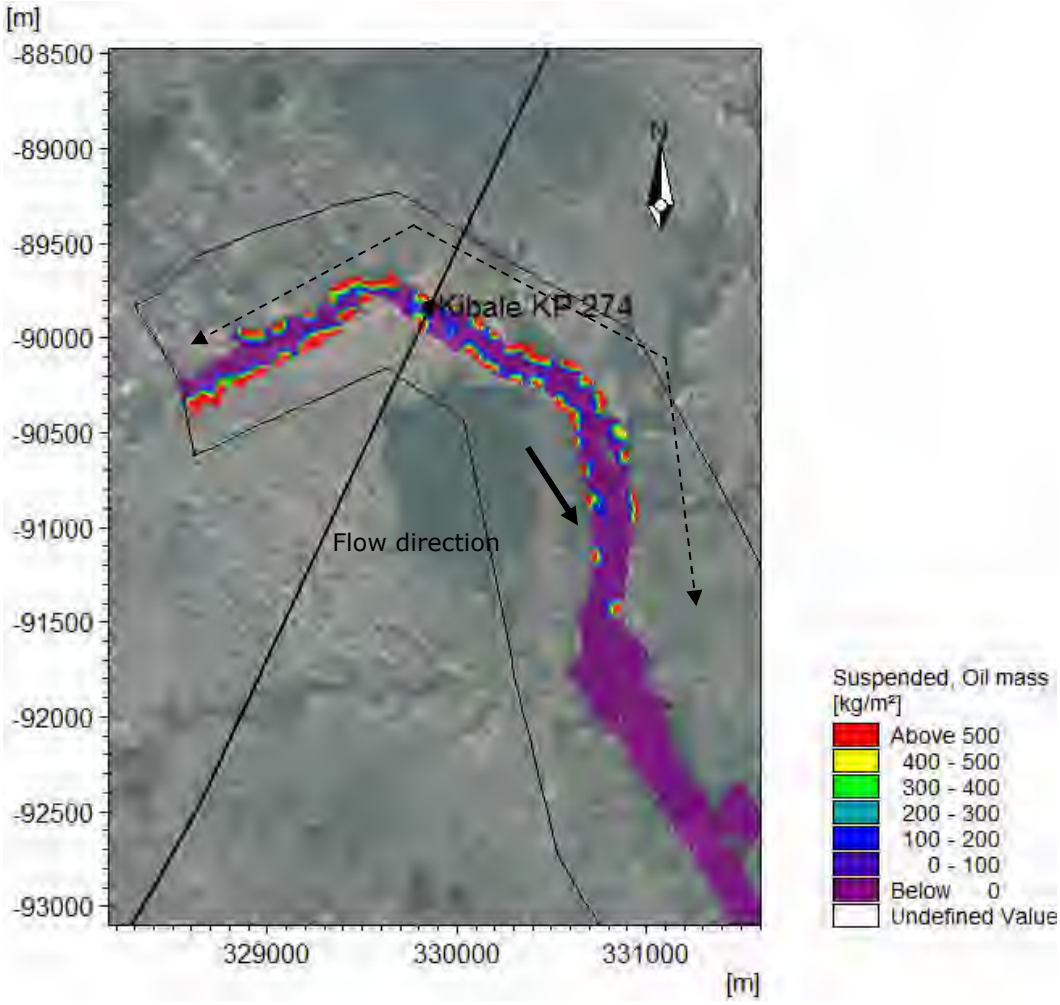

Figure 6-16 Final distribution of total oil mass in kg/m². Length of river affected marked with dashed line.

The results of the oil spill modelling at the Kibale River crossing are summarised in Table 6-4.

Table 6-4 Kibale River: Impact length

Modelled length of river with substantial impact (km)	Travel time (days) For modelled impact	Low risk zone factor	Possible length of affected river (km) (including Low risk zone)
3.0	<1	5	15

It is seen that the oil stays within 3 km of the spill location due to the bend of the river and the low pour point temperature, that makes the oil stick to the river banks and vegetation. The oil drift both upstream and downstream, distributed 2/3 downstream and 1/3 upstream. The oil is appears uniformly across the affected river length. See further explanation on upstream oil drift in Section 2. The time for full spreading along the modelled length of river affected and the point at which equilibrium is considered to have been reached is less than 1 day. The travel time can not be assessed for the length of affected river including the low risk zone, as the time variation does not vary linearly with the safety factor.

Of course, it should be noted that the extent of significant impact is defined as the area where the majority of the oil will stay, e.g. 90-95%. A smaller amount of oil can also be expected to drift down the river as small patches or tar balls.

C.5 Jemakunya River KP 289.3

The bathymetry based on received topographic data is shown inFigure 6-17.

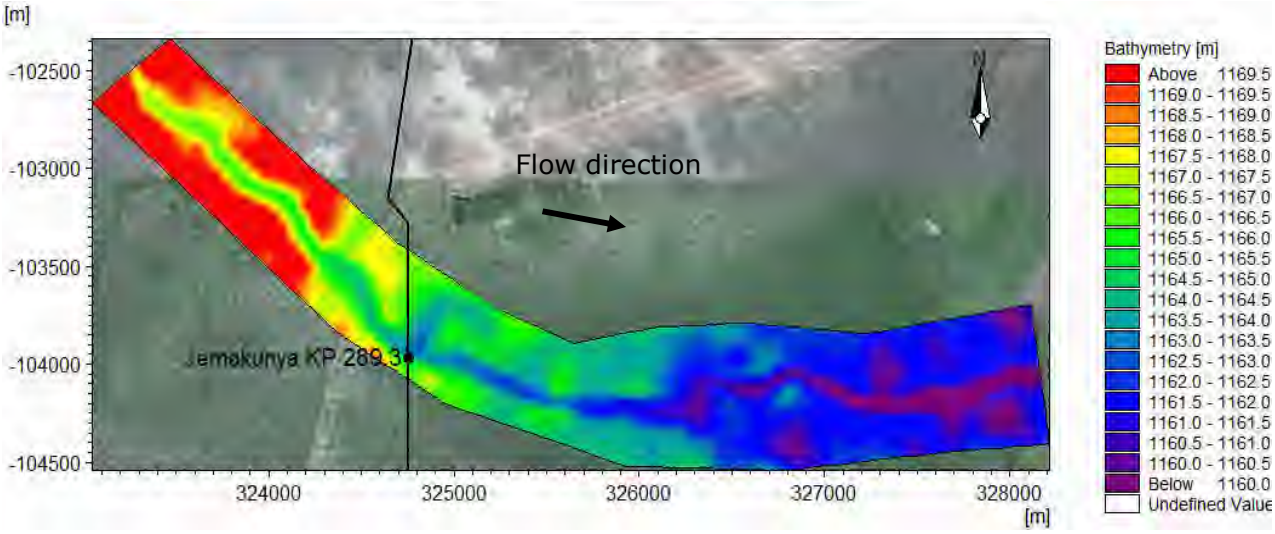

Figure 6-17 Modelled bathymetry at Jemakunya river crossing at KP 289.3. The model was generated based on topographic data. Bathymetric data in flood plain was based on natural depth calculations, see Table 2-2. Pipeline route shown with black line.

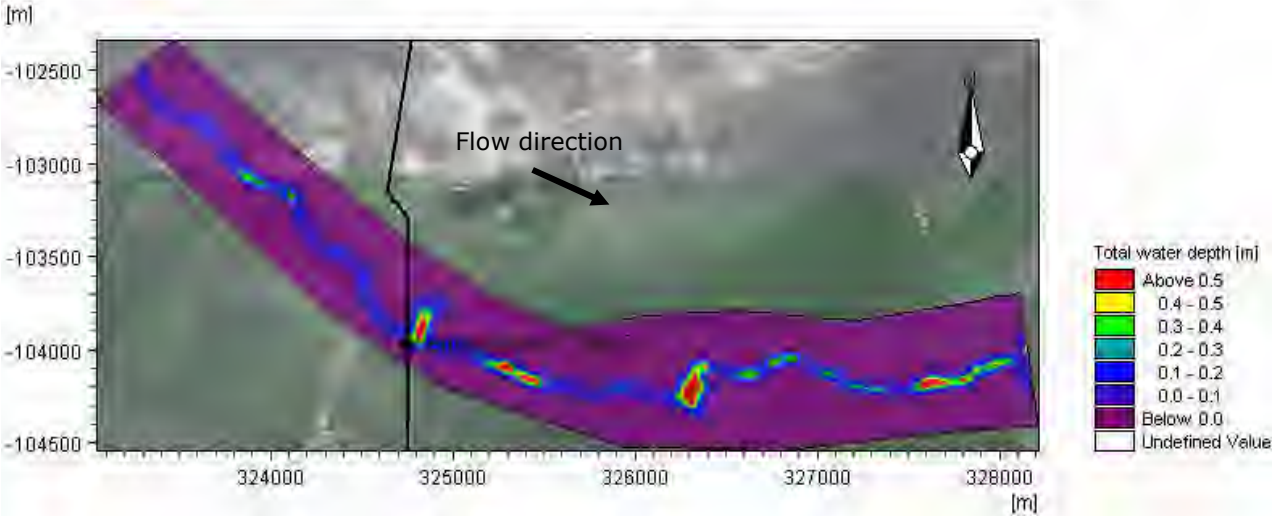

Figure 6-18 Jemakunya River Crossing KP 289.3: Total water depth (m). Pipeline route shown with black line.

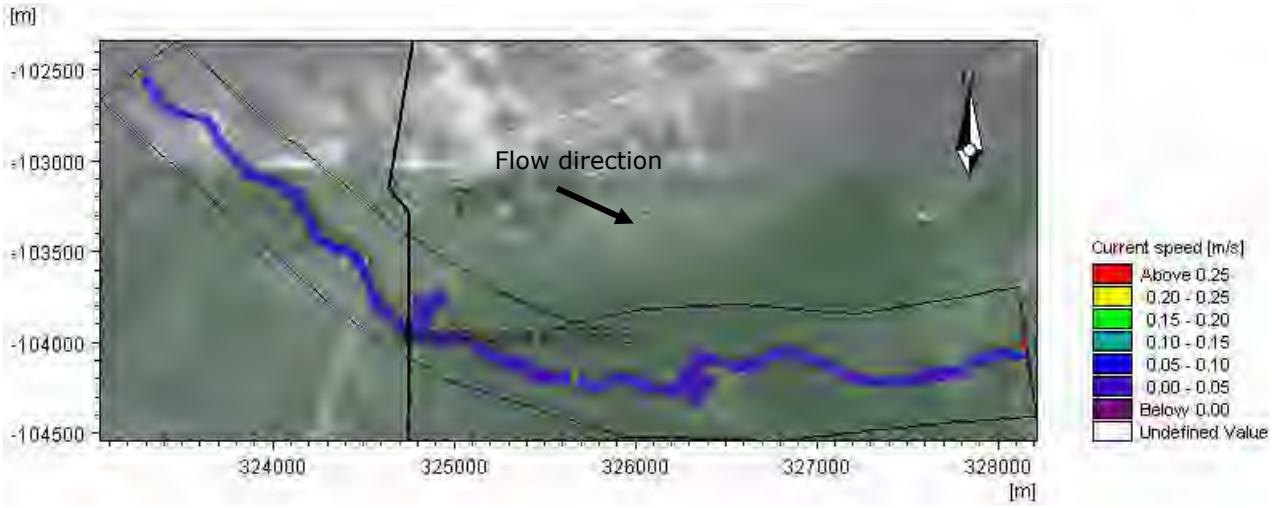

Figure 6-19 Jemakunya River Crossing KP 289.3: current speed (m/s). Pipeline route shown with black line.

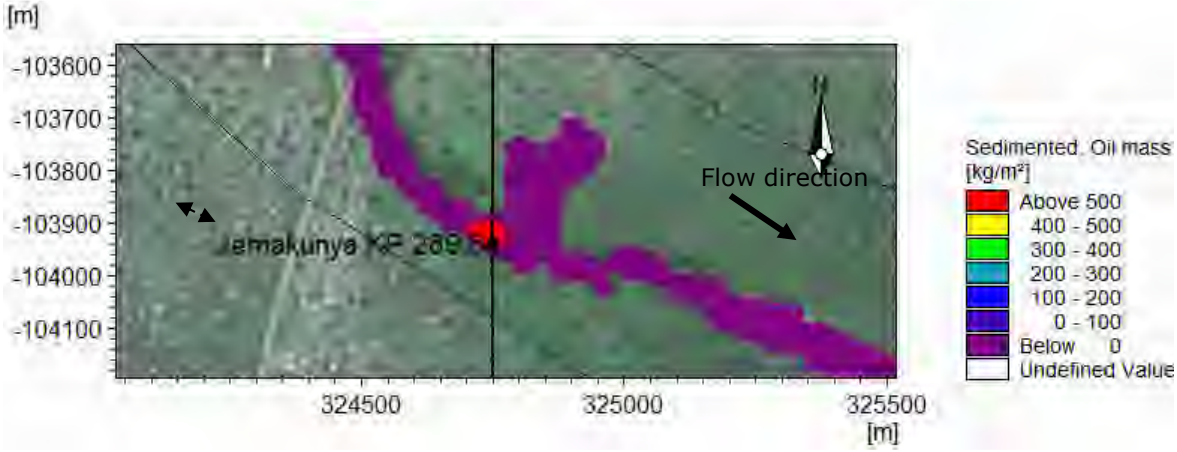

Figure 6-20 Final distribution of total oil mass in kg/m². Length of river affected marked with dashed line.

The results of the oil spill modelling at the Jemakunya River crossing are summarised in Table 6-5.

Table 6-5 Jemakunya: Impact length

Modelled length of river with substantial impact (km)	Travel time (days) For modelled impact	Low risk zone factor	Possible length of affected river (km) (including Low risk zone)
0.1	<1	5	0.5

For Jemakunya River, the river characteristics limit the oil spreading and the oil stays in the spill location and does not disperse. The river flow of 0.04 m³/s results in a current speed lower than 0.05 m/s, which is not able to mobilize the oil. After oil is released it assembles in a big pool and stays there throughout the simulation. The travel time can not be assessed for the length of affected river, as the time variation does not vary linearly with the safety factor. It should be noted that if flows within the river were to increase above that modelled, potentially due to a prolonged period of rain, then mobilisation of the oil could occur if a spill occurred during this time. However migration is expected to be limited.

Appendix J: Environmental and Social Management Plan

February 2020

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J1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

A generic impact is an impact that potentially occurs at multiple locations across the project AOI where the VEC and or impact characteristics are similar across those multiple locations. A location-specific impact is a potential impact that may occur at a specific location or, where the sensitivity of a VEC at a particular location warrants generic mitigation as well as additional, location-specific mitigation.

Proposed mitigation has been designed to ameliorate generic type impacts and location-specific type impacts to a level that is considered to be not significant.

Section J1.1 presents the ESMP that has been prepared to address generic impacts and identifies respective mitigation together with proposed monitoring parameters, performance indicators, targets and acceptance criteria as applicable and, monitoring frequency.

Section J1.2 presents the location-specific ESMP. For each unique location-and-impact-mitigation combination a separate line item is presented, together with proposed monitoring parameters, performance indicators, targets and acceptance criteria as applicable and, monitoring frequency.

Monitoring parameters and performance indicators have been identified that are consistent with the SMART principle where applicable, namely: specific, measurable, achievable, realistic and time-bound.

The specific costs of mitigations will be provided under separate cover.

J1.1 Generic ESMP Matrix

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Soil compaction	Habitats of conservation importance	Impaired re-establishment of vegetation after construction	Soil Management Plan. Reinstatement Plan. Community Health, Safety and Security Plan.	Load-bearing/ ground protection materials, such as bog mats and geotextile membranes under temporary haul roads, will be used to support heavy loads in areas of soft ground, including wetland areas. Local communities will be discouraged from using the right-of-way as an access road during construction through signage, awareness raising and the use of communication materials. If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme • compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Soil compaction. Adherence to the soil management plan in terms of topsoil storage and control of erosion and compaction. Compliance with reinstatement plan in terms of drainage, contouring and revegetation.	Zero noncompliance with the soil management plan and the reinstatement Plan.	Weekly during construction and reinstatement.	Project and project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers, DWRM, WMD, NFA, UWA
Soil erosion	Habitats of conservation importance	Loss of topsoil through erosion by wind or water causing impaired reinstatement	Soil management plan. Reinstatement plan.	Procedures will be developed, incorporating plans for erosion and sediment control and reinstatement. These will be produced before work begins at areas of fragile, sensitive or thin topsoil, side slopes or narrow ridges and at watercourse crossings. Sediment interception measures will be installed, inspected and maintained to prevent sediment runoff from the right-of-way or construction sites affecting watercourses, wetlands, waterbodies or environmentally sensitive areas. Procedures will include additional precautions to be taken and increased monitoring (minimum twice per week), with the aim of preserving the topsoil for subsequent replacement.	Rills or gullies on topsoil stacks and or reinstated areas	No visible signs of erosion	Bi-Weekly until vegetation is established in reinstated areas	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, DWRM, MEMD, PAU, District Environment Officers
Soil erosion	Habitats of conservation importance	Reduced primary productivity in watercourses, smothering of	Soil Management Plan.	Procedures will be developed, incorporating plans for erosion and sediment control and reinstatement. These will be produced before work begins at areas of fragile, sensitive or thin topsoil, side slopes or narrow ridges and at watercourse crossings. Sediment interception measures will	Installation of erosion and sediment controls. Separate storage of	Zero incidence of sedimentation above background levels greater than	Daily - during watercourse construction activities.	Project and Project contractors;

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	Reinstatement Plan.	be installed, inspected and maintained to prevent sediment runoff from the right-of-way or construction sites affecting watercourses, wetlands, waterbodies or environmentally sensitive areas. Procedures will include additional precautions to be taken and increased monitoring (minimum twice per week), with the aim of preserving the topsoil for subsequent replacement. Surface water that could be affected by runoff from the pipeline route or worksites will be visually inspected on a regular basis and remedial measures implemented if sediment or contamination arising from project activities are visible. During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made, and the area reinstated as quickly as possible.	bank and bed material during crossings. River crossing method statements developed for wet crossings. Compliance with permit-to-pump.	50 m up- or downstream of crossings during construction. Zero incidence of collapsed banks after reinstatement Zero incidence of sediment loaded surface water run-off entering water-courses (causing sediment load above background levels) from the RoW. Zero noncompliance with permit-to-pump.	Daily during rain seasons. Weekly after reinstatement until vegetation is re-established. Daily when pumping trench and or spread water.	Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, DWRM, MEMD, PAU, District Environment Officers, MAAIF, NFA UWA, WMD
Loss of soil structure, fertility and seed bank	Habitats of conservation importance	Poor recolonization due to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds	Soil management plan.	If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme • compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site.	Compliance with soil management plan. Topsoil storage longer than 6 months; corrective measures implemented.	Zero noncompliance with the soil management plan.	Weekly during period between stripping and reinstatement.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, DWRM, MEMD, PAU, District Environment Officers
Impeded flow of river or channel	Habitats of conservation importance	Loss of aquatic and water-margin habitats	Natural Resource Management Plan.	Where water is abstracted from a surface waterbody, the flow, water level or water volume in the waterbody will be assessed before and during abstraction. Abstraction rates and the frequency of assessment of the water flow, level or volume will be monitored based on permit conditions. During abstraction from surface waters, inlet hoses will be fitted with suitably sized fish screens.	Bank stability is maintained before and after crossings. Bank and bed material is stored separately away from water flow. Crossing method	Zero noncompliance with crossing method statement, soil management plan and reinstatement plan. Approved method	Weekly for bank stability and material storage. Once for method statement prior to crossing.	Project and Project contractors; Relevant Government bodies who may conduct

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					statement developed for all wet crossings.	statement prior to crossing.		independent monitoring or review the data include: NEMA, UWA, DWRM, District Environment Officers, PAU, MAAIF, WMD
Loss of habitat	Habitats of conservation importance	Permanent loss of habitat from AGIs and operational RoW.	Biodiversity management plan.	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way.	Area of habitat loss. Documentation (reports, checklists, etc) demonstrating that supplementary preclearance surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans	Minimum of 7 days before soil stripping commences for preclearance surveys.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, NFA, WMD
Loss of habitat	Habitats of conservation importance	Temporary loss of habitat from construction activities (RoW, other temporary	Biodiversity management plan.	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will	Vegetation composition before removal	Comprehensive data records from supplementary preconstruction surveys	Minimum of 7 days before soil stripping commences for preclearance	Project and Project contractors; Relevant

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		worksites main camps and pipe yards MCPYs)		identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Re-establishment of vegetation following reinstatement Documentation (reports, checklists, etc) demonstrating that supplementary preclearance surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary	Compliance with site-specific management plans Performance indicators may include cover-abundance of species (using Dominance or similar scale)	surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU; WMD, NFA
Loss of habitat	Habitats of conservation importance	Modified habitat structure following habitat reinstatement after construction	Biodiversity management plan.	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as:	Vegetation composition before removal Re-establishment of vegetation following reinstatement Documentation (reports, checklists, etc) demonstrating that supplementary preclearance surveys have been completed and site-specific biodiversity management plans	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans Performance indicators may include cover-abundance of species (using Domin or similar scale)	Minimum of 7 days before soil stripping commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD UWA, DWRM,

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				• directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	have been drafted and implemented where necessary		sites are fully restored.	District Environment Officers, PAU, NFA, WMD
Loss of habitat	Habitats of conservation importance	Loss of wetland and riparian habitat through open cut crossing during construction of the RoW	Biodiversity management plan.	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern	Vegetation composition before removal Re-establishment of vegetation following reinstatement Documentation (reports, checklists, etc) demonstrating that supplementary preclearance surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans Performance indicators may include cover-abundance of species (using Dominance or similar scale)	Minimum of 7 days before soil stripping commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, WMD, NFA

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				• a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Introduction of competitive species or plants/animal diseases	Habitats of conservation importance	Poor re-colonisation by local flora through competition by non-natives following reinstatement	Biodiversity management plan.	Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive species on the RoW, work sites and camp facilities. The biosecurity measures will also outline specifics to protect the aquatic environment from alien invasive species.	Evidence of alien invasive species, for example: • Changes in the extent and density of previously existing alien/invasive species populations; • Occurrence of alien/invasive species attributed to the project; • Occurrences of newly introduced alien/invasive species Documentation supporting that the biosecurity measures are implemented.	Zero noncompliance with the Biodiversity Management Plan.	Weekly.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU; NFA
Disturbance or harm to wildlife	Habitats of conservation importance	Interaction between construction workers and habitats of conservation importance,	Biodiversity Management Plan. Project-induced in-migration plan. Community	Hunting, fishing, unauthorised gathering of products (including plants and firewood) and deliberate disturbance or harassment of fauna will be prohibited for project personnel. The Project will restrict the purchase of wildlife related products and crafts by project workers. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage	Training records that specifically target hunting and gathering; Number of incidents and grievances (received /	Total coverage of all personnel living in camps	Monthly	Project and Project contractors; Relevant Government bodies who may

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		especially relating to food and fuel	health, safety and security plan Occupational health, safety and security plan	transgressions within the project disciplinary procedures and structures. Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.	addressed) related to poaching, harm to wildlife.			conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, MAAIF.
Disturbance or harm to wildlife	Habitats of conservation importance	PIIM to areas around camps causing increased pressure on natural resources (farming, deforestation for fuel)	Project-induced in-migration (PIIM) plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Settlements developing around or near camps and AGIs.	Zero unplanned settlements.	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, NFA, MGLSD
Treatment and disposal of known/unknown contamination	Flora and fauna species of conservation importance (terrestrial and aquatic)	Injury or mortality of flora and fauna due to mobilisation of soil contaminants	Pollution prevention plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. Areas of surface contamination identified prior to construction within the	Waste disposal and handling methods on project sites; Site verification and records demonstrating that hazardous materials are handled, managed and stored according to the pollution prevention plan and waste management plan.	Zero noncompliance with pollution prevention plan and waste management plan.	Site verification daily when contaminated soils are discovered. Quarterly to review documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, WMD

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				project footprint will be remediated before or during project construction. Where clean-up of pre-existing contaminated land is required, a remediation proposal will be implemented including but not limited to: • remediation techniques • the clean-up standard to be achieved • monitoring and analysis of remediated land to be undertaken • all regulatory and project documentation requirements • appropriate environmental and occupational health and safety protection measures to be adopted. All clean-up and remediation activities will be adequately documented. Contaminated material storage areas will be provided with containment measures (e.g., bunds, ditches, impermeable base membranes and covers) to prevent runoff and airborne losses.				
Disposal of solid and liquid waste	Flora and fauna species of conservation importance (terrestrial and aquatic)	Mortality of flora and fauna through contamination of food and water supply	Pollution prevention plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. Areas of surface contamination identified prior to construction within the project footprint will be remediated before or during project construction. Where clean-up of pre-existing contaminated land is required, a remediation proposal will be implemented including but not limited to: • remediation techniques • the clean-up standard to be achieved • monitoring and analysis of remediated land to be undertaken • all regulatory and project documentation requirements • appropriate environmental and occupational health and safety protection measures to be adopted. All clean-up and remediation activities will be adequately documented. Contaminated material storage areas will be provided with containment measures (e.g., bunds, ditches, impermeable base membranes and covers) to prevent runoff and airborne losses.	Littering of solid waste. Spillage of liquid waste. Site verification and records demonstrating that hazardous materials are handled, managed and stored according to the pollution prevention plan and waste management plan.	Zero noncompliance with pollution prevention plan and waste management plan.	Daily during wet river crossings. Twice weekly for all other work areas.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, MAAIF,
Disposal of solid and liquid waste	Flora and fauna species of	Increase in vermin around waste dumps and	Occupational health, safety and security plan	Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.	Waste disposal and handling methods on project sites;	Zero noncompliance with the pollution	Weekly	Project and Project contractors;

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
	conservation importance (terrestrial and aquatic)	consequent increase in prey availability for carnivorous birds and mammals	(OHSSP). Pollution prevention plan. Waste management plan.	As part of the OHSSP, a pest control plan will be developed for implementation on construction camps.	Documentation demonstrating that project activities are in compliance with the waste management plan and pollution prevention plan Site verification	prevention plan and waste management plan.		Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, MAAIF
Disposal of solid and liquid waste	Flora and fauna species of conservation importance (terrestrial and aquatic)	Stress or mortality to flora and fauna from spills of waste	Pollution prevention plan. Waste management plan.	A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater.	Waste disposal and handling methods on project sites; Effectiveness of oil spill equipment; Documentation demonstrating that project activities are in compliance with the waste management plan and pollution prevention plan Site verification	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, OPM (Disaster Preparedness)
Disposal of surplus water from working	Flora and fauna species of conservation	Reduced primary productivity in watercourses, smothering of	Pollution prevention plan (PPP). Waste	As a requirement of the PPP, locations for discharging excavated pipeline trench water will be identified as part of a 'Permit to Pump Procedure' which will be implemented during the construction phase. Appropriate sediment control measures in line with recognised industry best practices	Quality of discharge water; Documentation demonstrating that	Zero noncompliance with the pollution prevention plan	Weekly	Project; Relevant

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
areas and hydrotest water	importance (terrestrial and aquatic)	invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	management plan.	will be implemented at each location. Surface water run-off from construction areas and AGIs will be discharged in accordance with project environmental standards. All licences and consents for hydrostatic test water discharge will be obtained following preparation of a hydrostatic test effluent disposal risk assessment. This will undergo internal technical evaluation before submitting the permit application to the appropriate water resources regulatory authority.	project activities are in compliance with the waste management plan and pollution prevention plan Site verification	waste management plan, and wastewater discharge permit requirements.		Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, MAAIF, WMD
Impeded flow of river or channel	Flora and fauna species of conservation importance (terrestrial and aquatic)	Restriction of fish (ranging from general fish species (nonmigratory) to potamodromous fish) movement and reduced reproductive success, impaired movement and reduced habitat suitability of other aquatic organisms	Biodiversity management plan. Natural resource management plan.	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. If temporary damming of a watercourse is required, a preconstruction engineering, social and environmental evaluation will be undertaken to plan the work and so the duration of the flow interruption is limited and to determine the need for pump around to maintain flows.	Natural drainage patterns, particularly streams and rivers; Documentation identifying that a Watercourse Crossing Plan has been approved (for crossings when water-courses are flowing) Compliance with Watercourse Crossing Plan	Zero noncompliance with Watercourse Crossing Plan	Daily during watercourse crossing and reinstatement construction activities	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, DWRM, WMD, District Environment Officers, MAAIF
Abstraction of water from river or channel	Flora and fauna species of conservation importance (terrestrial and aquatic)	Decreased water level due to water abstraction for project use leading to loss of aquatic and water-margin habitats causing reduced spawning activity	Biodiversity management plan. Natural resource management plan.	Where water is abstracted from a surface waterbody, the flow, water level or water volume in the waterbody will be assessed before and during abstraction. Abstraction rates and the frequency of assessment of the water flow, level or volume will be monitored based on permit conditions. During abstraction from surface waters, inlet hoses will be fitted with suitably sized fish screens.	Volumes of water abstracted; Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, DWRM, WMD, District Environment Officers, MAAIF

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Abstraction of water from river or channel	Flora and fauna species of conservation importance (terrestrial and aquatic)	Mortality to aquatic organisms from the river through direct abstraction	Natural resource management plan.	If dams and pumps are used to maintain water flow during the construction of watercourse crossings or abstraction of water from watercourses is required, fish screens will be used on the end of the pump inlet hose. Any fish caught within dammed areas either side of the crossing will be transferred up or downstream as appropriate by suitably experienced personnel. Where water is abstracted from a surface waterbody, the flow, water level or water volume in the waterbody will be assessed before and during abstraction. Abstraction rates and the frequency of assessment of the water flow, level or volume will be monitored based on permit conditions. During abstraction from surface waters, inlet hoses will be fitted with suitably sized fish screens.	Use of meshes, screens or fish guards during water abstraction	Zero incidence of abstraction without suitably sized fish guards.	Weekly during water abstraction activities.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD, District Environment Officers, MAAIF
Management of black and grey water	Flora and fauna species of conservation importance (terrestrial and aquatic)	Injury or mortality of flora and fauna due to surface water contamination	Natural Resource Management Plan, Waste management plan.	The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An environmental and social evaluation of potential treated wastewater discharge locations will be undertaken as the basis for the development of measures to mitigate impacts from discharges on surface water ecology, downstream water users or terrestrial ecology. The evaluations will take into account the compliance with project environmental standards and will support applications for discharge permits. All licences and consents will be obtained before planned liquid discharges. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.	Disposal locations of treated effluent; Effectiveness of wastewater treatment plant/process; Quality of discharge effluent before disposal on land; Documentation to support treated wastewater (to be disposed of) meets the relevant waste water discharge standards.	Zero noncompliance with statutory limits.	Monthly or As per permit conditions	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD, District Environment Officers,
Abstraction of groundwater	Flora and fauna species of conservation importance (terrestrial and aquatic)	Decreased water level due to water abstraction for project use leading to loss of habitat for stygofauna	Natural Resource Management Plan	Where water is abstracted from a surface waterbody, the flow, water level or water volume in the waterbody will be assessed before and during abstraction. Abstraction rates and the frequency of assessment of the water flow, level or volume will be monitored based on permit conditions. During abstraction from surface waters, inlet hoses will be fitted with suitably sized fish screens.	Water abstraction is as per the permit conditions and Natural Resource Management Plan.	Zero noncompliance with the Natural Resource Management Plan and abstraction permit requirements.	Monthly - site verification of Natural Resource Management Plan; Water abstraction monitoring as per permit requirement	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

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								include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers,
Loss of habitat for species of conservation importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Permanent loss of breeding and foraging habitat for fauna through site clearance before construction	Biodiversity management plan.	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Conducting of pre-clearance surveys; Extent of site clearance for construction ROW; Change in extent and state of the habitats; Documentation (reports, checklists, etc) demonstrating that supplementary preclearance surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary;	Comprehensive data records from supplementary preconstruction surveys; Compliance with site-specific management plans	Minimum of 7 days before soil stripping commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers, MAAIF

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Loss of habitat for species of conservation importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Temporary loss of breeding and foraging habitat for fauna through site clearance before construction	Biodiversity management plan.	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Extent of site clearance for construction ROW; Documentation (reports, checklists, etc) demonstrating that supplementary preclearance surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans	Minimum of 7 days before soil stripping commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers, MAAIF
Loss of habitat for species of conservation importance	Flora and fauna species of conservation importance (terrestrial and aquatic)	Temporary habitat fragmentation causing disrupted species movement during construction of RoW	Biodiversity management plan.	The total duration of construction disturbance (i.e. the time between initial site clearing and final reinstatement/biorestoration) will be minimised.	Adherence to work schedule, particularly in sensitive locations; Documentation demonstrating that the duration of disturbance is minimised.	Disturbance limited to a single growing season.	Quarterly.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

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								include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers, MAAIF,
Introduction of competitive species or plants/animal diseases	Flora and fauna species of conservation importance (terrestrial and aquatic)	Modified habitats due to non-native species establishment leading to increased competition and loss of habitat for breeding and foraging	Biodiversity management plan.	Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive species on the RoW, work sites and camp facilities. The biosecurity measures will also outline specifics to protect the aquatic environment from alien invasive species.	Visual inspection for incidence of alien invasive species including; Changes in the extent and density of previously existing alien/invasive species populations; Occurrence of alien/invasive species attributed to the Project; Occurrences of newly introduced alien/invasive species. Documentation supporting that the biosecurity measures are implemented.	Zero noncompliance with the Biodiversity Management Plan.	Weekly.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers,
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Increased predation from predator species due to removal of habitat used to shelter and forage	Biodiversity management plan.	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing.	Adherence to work schedule, particularly in sensitive locations; Conducting of pre-clearance surveys; Extent of site clearance for construction ROW; Documentation (reports, checklists, etc) demonstrating that supplementary preclearance surveys have been completed; and site-specific biodiversity management plans have been drafted	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans	Minimum of 7 days before soil stripping commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers, MAAIF

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Where a section of the right-of-way is through habitats with high biodiversity value (as identified in the baseline appendices of the environmental and social impact assessment), the area will be reviewed to determine if the working width can be reduced to limit impacts as much as possible. A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction.	and implemented where necessary			
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Mortality of fauna species of conservation importance due to movement of vehicles and presence of construction plants and structures	Biodiversity management plan.	A strict project maximum speed limit will be enforced for project vehicles. Only trained, certified and physically fit drivers will drive vehicles. Night-time driving will be by exception only. The CHSSP will describe requirements to be implemented for vehicles passing through areas where animal disease control measures are in place. Project approved vehicles will be provided to transport camp residents to worksites. Other than when required for crossings excavations, construction equipment and traffic will normally not enter watercourses. Vehicles and equipment will cross watercourses via appropriately sized temporary culverts and bridging arrangements. Bathing or washing clothes, vehicles and equipment by project employees will be prohibited in watercourses.	Journey management with regard to defined routes. Speed infringements and effective corrective action. Vehicles and machinery entering water courses.	Zero noncompliance with journey management; field verification. Decreasing trend of speed infringements. Zero incidence of vehicles and machinery in water-courses other than during crossings.	Monthly for journey management records; daily during intense transport activities (pipe), weekly for people movement. Monthly for speed infringements. Weekly spot checks of watercourses along defined travel routes.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers, MAAIF
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps, from improved access along new or upgraded project	Project Induced In-Migration Management Plan	Hunting, fishing, unauthorised gathering of products (including plants and firewood) and deliberate disturbance or harassment of fauna will be prohibited for project personnel. The Project will restrict the purchase of wildlife related products and crafts by project workers. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited	Local recruitment process; Project supply chain; Training records that specifically target hunting and gathering. Settlements developing around or near camps and AGIs. Effective messaging	Total coverage of all personnel living in camps. Zero unplanned settlements	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD,

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		access roads and access provided by RoW during construction and reinstatement.		to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary through targeted meetings scheduled at times and locations that may increase women's participation A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. Local communities will be discouraged from using the right-of-way as an access road during construction through signage, awareness raising and the use of communication materials.	to PACs (stakeholder engagement records).			UWA, DWRM, WMD District Environment Officers, MAAIF, NFA,
Open excavations	Flora and fauna species of conservation importance (terrestrial and aquatic)	Injury or fatality of fauna from falling into excavations if they cannot escape or where they are at increased risk of predation	Biodiversity management plan.	Appropriate measures will be implemented to prevent fauna or people from entering welded pipe sections or open excavations; there will be fauna ladders placed at suitable intervals in all open excavations. Animals will be removed safely and released into suitable habitat away from the working area. The maximum length of open trench at any one time (per spread) will be defined based on: • the habitats present and potential ecological sensitivities (e.g., terrestrial commuting routes for large mammals) • community safety. Gaps will also be left in soil stacks and pipe strings at strategic locations to allow passage of animals where it is considered safe to do so.	Location and length of open excavations. Location and number of faunal ladders. Incidents of fauna trapped in excavations; Documentation (reports, checklists, etc) demonstrating that appropriate risk assessment has been implemented.	Zero injury or death of animals in excavations.	Daily	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers,
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and behaviour of animals	Pollution prevention plan. Biodiversity management plan Community health, safety and security plan Occupational health, safety and security plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Potential noise and vibration impacts will be assessed where piling is to be undertaken close to sensitive receptors. Where possible, alternative techniques or materials will be used to reduce potential impacts, e.g. restrictions on times and duration in any given day that piling activities are undertaken. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books	Noise levels at sensitive receptors; field verification. Maintenance records of vehicles and equipment. Documentation demonstrating that the duration of disturbance is minimised. Journey	Zero exceedance of project environmental standards. Disturbance limited to a single growing season. Zero noncompliance with journey management. Decreasing trend	Weekly for noise level monitoring at sensitive receptors. Monthly for maintenance records. Quarterly for documentation. Monthly for journey management	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
			Project Induced In-Migration Management Plan Road traffic management plan	• be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. The total duration of construction disturbance (i.e. the time between initial site clearing and final reinstatement/biorestoration) will be minimised. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures	management with regard to defined routes. Speed infringements and effective corrective action.	of speed infringements.	records; daily during intense transport activities (pipe), weekly for people movement. Monthly for speed infringements.	include: NEMA, MEMD, UWA, DWRM, WMD District Environment Officers, MAAIF
Use of raw materials and natural resources	Soil	Depletion of natural resources, for example, aggregate	Waste management plan. Natural resource management plan.	All excavated materials will be screened and reused where possible to reduce the need for newly quarried aggregates. Any new aggregate extraction sites and batching plants sites, including 3rd party sites, will undergo environmental and social evaluation prior to use; and, where possible, new sites will be located as close as possible to the existing road network to reduce the requirement for new access roads.	Reuse of aggregate. Environmental and social evaluation for new aggregate extraction sites.	Zero aggregate not reused. Approved environmental and social evaluation of all new aggregate extraction sites.	Monthly for reuse of aggregate. 30 days prior to the opening of new aggregate extraction sites for evaluations.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers
Soil compaction	Soil	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development. Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and	Soil management plan. Community health, safety and security plan.	Load-bearing/ ground protection materials, such as bog mats and geotextile membranes under temporary haul roads, will be used to support heavy loads in areas of soft ground, including wetland areas. Local communities will be discouraged from using the right-of-way as an access road during construction through signage, awareness raising and the use of communication materials. Topsoil and subsoil stockpiles will be stored in accordance with the Soil Management Plan, be free draining and include gaps left in strategic locations to allow potential floodwater through. If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme	Compressed soil; driving, parking and or storage of machinery, equipment or materials on reinstated RoW.	Zero noncompliance with the Soil Management Plan	Weekly after reinstatement until vegetation is re-established	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, WMD, District

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		decreased productivity.		• compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site.				Environment Officers
Soil erosion	Soil	Loss of topsoil causing reduced fertility and impaired reinstatement	Soil management plan. Community health, safety and security plan.	Load-bearing/ ground protection materials, such as bog mats and geotextile membranes under temporary haul roads, will be used to support heavy loads in areas of soft ground, including wetland areas. Local communities will be discouraged from using the right-of-way as an access road during construction through signage, awareness raising and the use of communication materials. Topsoil and subsoil stockpiles will be stored in accordance with the Soil Management Plan, be free draining and include gaps left in strategic locations to allow potential floodwater through. If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme • compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site.	Rills or gullies on topsoil stacks and or reinstated areas	No visible signs of erosion	Weekly until vegetation is established in reinstated areas	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers
Loss of soil structure, fertility and seed bank	Soil	Development of anaerobic conditions in stored soil. Mixing of different soil or soil with foreign materials leading to loss of drainage and fertility.	Soil management plan.	Topsoil and subsoil stockpiles will be stored in accordance with the Soil Management Plan, be free draining and include gaps left in strategic locations to allow potential floodwater through. If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme • compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site.	Compliance with soil management plan. Topsoil storage longer than 6 months; corrective measures implemented. Separate topsoil and subsoil stacks	Zero noncompliance with the Soil Management Plan	Weekly during period between stripping and reinstatement.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers
Disturbance, treatment and disposal of known/unknown contamination	Soil	Mobilisation of soil contaminants	Pollution prevention plan. Reinstatement plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to	Waste disposal and handling methods on project sites; Site verification and records demonstrating that hazardous materials	Zero noncompliance with pollution prevention plan and waste management plan.	Daily during wet river crossings. Twice weekly for all other work areas.	Project and Project contractors; Relevant Government bodies who may

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. Areas of surface contamination identified prior to construction within the project footprint will be remediated before or during project construction. Where cleanup of pre-existing contaminated land is required, a remediation proposal will be implemented including but not limited to: • remediation techniques • the cleanup standard to be achieved • monitoring and analysis of remediated land to be undertaken • all regulatory and project documentation requirements • appropriate environmental and occupational health and safety protection measures to be adopted. All cleanup and remediation activities will be adequately documented. Contaminated material storage areas will be provided with containment measures (e.g., bunds, ditches, impermeable base membranes and covers) to prevent runoff and airborne losses.	are handled, managed and stored according to the pollution prevention plan and waste management plan.			conduct independent monitoring or review the data include: NEMA, MEMD, PAU, WMD, DWRM, District Environment Officers
Management of waste and accidental release of oil or chemicals	Soil	Soil contamination	Pollution prevention plan. Waste management plan.	A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands,	Waste disposal and handling methods on project sites; storage of oil, chemicals and hazardous materials; Site verification and records demonstrating that hazardous materials are handled, managed and stored according to the pollution prevention plan and waste management plan.	Zero noncompliance with pollution prevention plan and waste management plan.	Daily during wet river crossings. Twice weekly for all other work areas.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers, OPM (Disaster Preparedness)

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				surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures.				
Management of surplus subsoil and aggregate	Soil	Loss of soil structure, drainage, fertility and seed bank	Waste management plan.	Environmental and social evaluations will be undertaken to identify suitable offsite disposal sites for waste soil and rock, and appropriate management measures to be implemented. All temporary borrow pits and soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented. Options will be considered for the use of surplus rock from blasting including: • crushing and onsite re-use • offsite re-use • offsite disposal • onsite placement. if this is in keeping with the local landscape character.	Presence of excess soil / rock remaining on site immediately after reinstatement is completed	Zero noncompliance with the waste management plan.	Immediately after reinstatement Weekly until all excess soil is removed, reused and or disposed of	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers
Erosion	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters	Soil management plan. Reinstatement plan.	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made and the area reinstated as quickly as possible. Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity.	Visual evidence of erosion of river banks and bank stability (cracks, sag, shearing) within 50m up and down stream of construction activities. Visual evidence of significant sedimentation (water colour, turbidity) greater than 50 m of construction activity.	Zero incidence of sedimentation greater than 50 m up- or downstream of crossings during construction Zero incidence of collapsed banks after reinstatement	Weekly after reinstatement until vegetation is re-established	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District

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				A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses. Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment				Environment Officers, DWRM, WMD, NFA, UWA
Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water	Soil management plan. Reinstatement plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g.	Waste disposal and handling methods on project sites; storage of oil, chemicals and hazardous materials; Documentation demonstrating that project activities are in compliance with	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or

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				impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.	the waste management plan and pollution prevention plan Site verification			review the data include: NEMA, MEMD, PAU, District Environment Officers, DWRM, WMD
Impeded flow of river or channel	Surface water	Deterioration of water quality	Biodiversity management plan. Soil management plan. Pollution prevention plan.	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. Open-cut river crossings will be undertaken during the dry season where possible; where not possible site-specific method statements will be developed addressing ecological sensitivities. Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control	Separate storage of bank and bed material during crossings. River crossing method statements developed for wet crossings. Bank and bed material is stored separately away	Zero incidence of sedimentation above background levels greater than 50 m up- or downstream of crossings during construction. Zero incidence of sediment loaded surface water run-	Daily during watercourse crossing and reinstatement activities. Weekly spot checks of watercourses along defined travel routes.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				• maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment. Other than when required for crossings excavations, construction equipment and traffic will normally not enter watercourses. Vehicles and equipment will cross watercourses via appropriately sized temporary culverts and bridging arrangements. Bathing or washing clothes, vehicles and equipment by project employees will be prohibited in watercourses.	from water flow. Vehicles and machinery entering water courses.	off entering water-courses (causing sediment load above background levels) from the RoW. Zero noncompliance with crossing method statement, soil management plan and reinstatement plan. Zero incidence of vehicles and machinery in water-courses other than during crossings.		review the data include: NEMA, MEMD, PAU, District Environment Officers, DWRM, WMD
Altered drainage pattern	Surface water	Trench can act as conduit for groundwater, draining higher areas and flooding lower areas	Reinstatement plan.	Trench breakers will be installed in the pipeline trench where downhill flow within the backfilled trench may lead to erosion.	Site verification that trench breaks are installed; document verification that trench break numbers and locations are fit for purpose.	Trench breaks installed as per plan.	Minimum of 7 days prior to backfill.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers, DWRM, WMD
Management of waste and accidental release of oil or chemicals	Groundwater	Potential for groundwater contamination	Waste management plan ; Pollution prevention plan; Natural resource management plan; Emergency preparedness and response plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g.	Storage of hazardous materials; Waste disposal and handling methods on project sites; Effectiveness of spill prevention measures; Documentation demonstrating that project activities are	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.	in compliance with the waste management plan and pollution prevention plan Site verification			include: NEMA, MEMD, PAU, District Environment Officers, DWRM, WMD
Visual intrusion of project components into landscape	Landscape	Change of landscape character and views caused by project components	Biodiversity Management Plan. Reinstatement Plan. Soil	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction	Height of stockpiles to avoid significant change in views and landscape; Restriction of vegetation	No significant change in landscape	Weekly during reinstatement	Project; Government bodies who may conduct

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
			Management Plan.	• conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Environmental and social evaluations will be undertaken to identify suitable offsite disposal sites for waste soil and rock, and appropriate management measures to be implemented. All temporary borrow pits and soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented. Where benching is required then the areas will be re-contoured to original profiles. Side casting in areas of steep terrain will be prohibited. The effects of accidental spoil slippage on steep slopes will mitigated, e.g., by using fences or a geotextile membrane. Recontouring should be sympathetic and in keeping with preconstruction profiles, where this is not precluded by risk to integrity of the pipeline or erosion considerations. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.	clearance to only within the construction ROW; Before and after photographs with regard to contouring, drainage, waste and debris; reinstatement of borrow pits .			independent monitoring or review the data include: NEMA, MEMD, UWA, WMD, District Environment Officers, NFA, PAU
Disposal of surplus subsoil and aggregate	Landscape	Permanent change of views as a result of	Soil Management Plan. Waste	Options will be considered for the use of surplus rock from blasting including: • crushing and onsite re-use	Height of stockpiles to avoid significant change in views and	Zero noncompliance with the	Immediately after reinstatement	Project and Project contractors;

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		disposal of surplus subsoil and aggregate	Management Plan. Reinstatement Plan. Biodiversity management plan.	• offsite re-use • offsite disposal • onsite placement. if this is in keeping with the local landscape character. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement.	landscape; Restriction of vegetation clearance to only within the construction ROW; reinstatement of borrow pits; Presence of excess soil remaining on site immediately after reinstatement is completed	Reinstatement Plan.	Weekly until all excess soil is removed, reused and or disposed of	Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU
Release of gases, exhausts and vapours to atmosphere	Air Quality	Reduced air quality from combustion of fuel in construction equipment and vehicles	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Servicing and maintenance of project vehicles, machines and equipment; Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero noncompliance with scheduled servicing and maintenance of combustion equipment	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD
Release of gases, exhausts and vapours to atmosphere	Air Quality	Hydrocarbon vapour emissions from refuelling operations causing reduced air quality	Pollution Prevention Plan	A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures.	Refuelling procedures; Effectiveness of spill prevention measures; Training records targeting refuelling.	All personnel responsible undertaking refuelling activities are trained to reduce spills and vapour emissions.	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Dust	Air Quality	Nuisance from dust emissions from construction site activities	Pollution Prevention Plan Traffic and Road Safety Management Plan	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Implementation of dust suppression measures Site verification Number of related complaints	Zero noncompliance with dust suppression measures described in the Pollution Prevention Plan Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement	Weekly - site verification Monthly - complaints, documentation	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU
Noise	Acoustic Environment	Disturbance or nuisance from noise from construction on the RoW	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Noise	Acoustic environment	Disturbance or nuisance from noise during commissioning of the pipeline	Pollution prevention plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Where possible new access roads will be constructed a minimum of 100 m away from sensitive receptors (hospitals, educational facilities or dwellings). To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log	Noise levels at sensitive receptors; Number of related complaints.	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly.	Project and Project contractors; Relevant Government bodies who may conduct independent

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				• be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.				monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Noise	Acoustic Environment	Disturbance or nuisance from noise from traffic movement	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Vibration	Acoustic Environment	Disturbance, nuisance or cosmetic / structural damage from vibration	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Documentation demonstrating noise and vibration assessments have been completed, mitigation is implemented, and noise levels meet project emission standards Number of related complaints	Zero noncompliance with project noise standards Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement	Daily during construction where construction occurs near sensitive receptors Monthly for documentation and complaints	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Employment	Economy	The generation of national employment opportunities leading to an increase in household income and an improvement in living standards.	Local Content Plan	A Procurement and Supply Chain Management Plan (PSCMP) will be developed to maximise the purchase of goods and services from within Uganda/Tanzania. This will be contingent on whether local suppliers can offer sufficient quality and reliability and can meet project requirements. PSCMP will include, as appropriate, enterprise development, capacity development and ring-fencing contracts. An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment.	Local recruitment target	Meeting local recruitment target	Quarterly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Provision of goods and services	Economy	Project procurement providing opportunities for national businesses.	Local Content Plan	A Procurement and Supply Chain Management Plan (PSCMP) will be developed to maximise the purchase of goods and services from within Uganda/Tanzania. This will be contingent on whether local suppliers can offer sufficient quality and reliability and can meet project requirements. PSCMP will include, as appropriate, enterprise development, capacity development and ring-fencing contracts.	Development of a Procurement and Supply Chain Management Plan (PSCMP) to maximise the purchase of goods and services from within Uganda/Tanzania	Zero noncompliance with the Procurement and Supply Management Plan	Monthly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Contribution to economy	Economy	Contribution to national economy from investment.	-	-	Contribution to the national economy		Annual	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU
Contribution to economy	Economy	Changes to the fiscal balance.	-	-	Contribution to the national economy		Annual-	Project; Relevant

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
								Government agencies who may conduct independent monitoring or review include: MEMD, PAU
Employment	Local economy (nonland-based livelihoods)	The generation of project local employment opportunities	Procurement and supply chain management plan. Labour management plan. Stakeholder engagement plan.	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. As part of the tendering process, (sub) contractors will be required to include training components in their proposal aimed at increasing local employment as well as improving skills of local staff.	Local recruitment target	Meeting local recruitment target	Quarterly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Employment	Local economy (nonland-based livelihoods)	The provision of training and skill development opportunities within employment	Procurement and supply chain management plan. Labour management plan.	As part of the tendering process, (sub) contractors will be required to include training components in their proposal aimed at increasing local employment as well as improving skills of local staff. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary through targeted meetings scheduled at times and locations that may increase women's participation As part of the OHSSP, a risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors; the training programme (including daily toolbox meetings) will be updated in accordance with changes made in scope, incident statistics and/or regulatory requirements. Daily toolbox meetings will be held where health and safety issues will be discussed.	Number and content of training sessions Number of training participants	Continuous improvement on percentage of training participants versus total number of workers One training sessions documented per week and work site	Quarterly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Project procurement providing opportunities for local businesses	Procurement and supply chain management plan. Labour management plan.	A Procurement and Supply Chain Management Plan (PSCMP) will be developed to maximise the purchase of goods and services from within Uganda/Tanzania. This will be contingent on whether local suppliers can offer sufficient quality and reliability and can meet project requirements. PSCMP will include, as appropriate, enterprise development, capacity development and ring-fencing contracts.	Development of a Procurement and Supply Chain Management Plan (PSCMP) to maximise the purchase of goods and services from within Uganda/Tanzania	Zero noncompliance with the Procurement and Supply Management Plan	Monthly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Improvements in road conditions for business owners and public transport	Infrastructure and Utilities Management Plan	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Road traffic accidents and congestion	No annual increase in number of project related road traffic accidents No increases in project related road congestion	Quarterly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Employment	Local economy (nonland-based livelihoods)	Loss of employment after project construction phase	Procurement and supply chain management plan. Labour management plan. Stakeholder engagement plan.	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment. The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities.	Documentation demonstrating worker awareness training on limited duration of employment and need to maintain existing livelihoods.	Full coverage of workforce at start of employment.	Monthly.	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Employment	Local economy (nonland-based livelihoods)	Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities	Project-induced in-migration management plan. Labour management plan. Stakeholder engagement plan.	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs	Documentation demonstrating worker awareness training on limited duration of employment and need to maintain existing livelihoods	Full coverage of workforce at start of employment. Continuous improvement on percentage of unresolved related complaints after Project has	Monthly	Project and project contractors; Relevant Government agencies who may conduct

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary, through targeted meetings scheduled at times and locations that may increase women's participation The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities.	Number of related complaints	proposed solution/s during engagement		independent monitoring or review include: MEMD, PAU, MGLSD
Employment	Local economy (nonland-based livelihoods)	Competition over employment opportunities	Project-induced in-migration management plan. Labour management plan. Stakeholder engagement plan.	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary, through targeted meetings scheduled at times and locations that may increase women's participation	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints.	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement.	Quarterly	Project and Project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Employment	Local economy (nonland-	Diversion of workers gaining employment from	Procurement and supply chain management	A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to:	Effectiveness on stakeholder messaging (by	Continuous improvement on percentage of	Quarterly for complaints. For	Project and Project contractors;

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
	based livelihoods)	the project away from existing local businesses or public-sector jobs	plan. Labour management plan. Stakeholder engagement plan.	• The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary, through targeted meetings scheduled at times and locations that may increase women's participation Before construction, a benchmarking exercise gathering data associated with average incomes in the private and public sector for each region/district will be undertaken. This information will be used to identify salary levels for the construction workforce so that disparities between project-related salaries and local businesses/public sector salaries are avoided. The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities.	feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints. Labour management plan is informed by pre-project salary benchmarking.	unresolved complaints after Project has proposed solution/s during engagement. Pre-project salary benchmarking is completed.	benchmarking, 90 days prior to construction commencing.	Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Employment	Local economy (nonland-based livelihoods)	School drops outs seeking employment in the project supply chain	Procurement and supply chain management plan. Monitoring and reporting plan. Labour management plan. Stakeholder engagement plan.	An awareness campaign targeting schools at sensitive locations within the project AOI will be developed, addressing: • Importance of staying in school. • Risks particularly to girls of relationships with transient workers, transactional and commercial sex. • Road safety awareness. • Awareness about their rights. • Project grievance mechanism and their right to use it.	Evidence of a standard clause in all contracts that no employees shall be hired, directly or indirectly, under the age of 18 years of age	No underage persons to be employed as part of the project workforce Inspections and audits to identify whether children under the age of 18 are being hired by the Project	Monthly	Project and Project Contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Inflation and effects on supply owing to project procurement	Procurement and supply chain management plan.	A Procurement and Supply Chain Management Plan (PSCMP) will be developed to maximise the purchase of goods and services from within Uganda/Tanzania. This will be contingent on whether local suppliers can offer sufficient quality and reliability and can meet project requirements. PSCMP will include, as appropriate, enterprise development, capacity development and ring-fencing contracts. Before construction, a benchmarking exercise to gather data associated with average prices for goods will be undertaken in each region/district. This information will be used to identify appropriate prices so that large price disparities between project-procured goods and local goods are avoided.	Documentation that demonstrates a benchmarking exercise is completed and that information informs the Procurement and Supply Management Plan.	Zero noncompliance with the Procurement and Supply Management Plan	90 days prior to construction commencing.	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU
Provision of Goods and Services	Local economy (nonland-	Restriction of access to small businesses, street vendors and local	Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A	Effectiveness on stakeholder messaging (by feedback templates	Continuous improvement on percentage of unresolved	Quarterly	Project; Relevant

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
	based livelihoods)	markets during construction	Stakeholder engagement plan.	Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	or interviews) regarding - compensation process - grievance procedure Number of related complaints	complaints after Project has proposed solution/s during engagement		Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MHLUD, MTWA, MGLSD
Temporary Road Closure	Local economy (nonland-based livelihoods)	Increased transportation costs and travel time with economic consequences	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notification; grievance procedure; compensation process. Number of related complaints	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement	Quarterly	Project; in consultation with respective utility service provider. Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, District Local Governments
Use of Road Network	Land-based livelihoods	Improved ability to sell agricultural produce to nearby markets for farmers and traders	Infrastructure and Utilities Management Plan	For major road crossings, crossing techniques that minimize the obstruction of traffic flow will be selected.	Completed roadworks	Roadworks completed as per engineered design	At the completion of roadworks	Project in consultation with respective utility service provider; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, Local Governments
Impeded Movement of Animals	Land-based livelihoods	Due to access restrictions, livestock cause damage to crops	Community health, safety and security plan. Stakeholder engagement plan. Monitoring and reporting plan.	Local people will be consulted on the optimum location of crossing points and pastoralists informed of the access restrictions in advance, advising them to avoid cultivated areas. Crossing points will be provided across open trenches and welded pipes and gaps will be left in soil stacks and pipe strings at strategic locations. Incidents in conflicts between crop farmers and herders in the vicinity of the project footprint will be monitored and support will be provided to local authorities to obtain a resolution in cases of conflict wherever possible.	Site verification - gaps in soil stacks and pipe strings and crossing points as per the Community Health Safety and Security Plan Number of related complaints	Zero noncompliance with the Community Health, Safety and Security Plan Continuous improvement on percentage of	Weekly - site verification Monthly - complaints	Project; Government bodies who may conduct independent monitoring or

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Regular meetings will be held with PAC representatives, during construction in their area, to update them on construction progress and to receive comments or queries. A community liaison log will be maintained detailing the content of all meetings.		unresolved complaints on damage to crops after Project has proposed solution/s during engagement		review the data include: PAU, MEMD, NEMA, Local Government
Accidents Due to Open Excavations	Land-based livelihoods	Livestock falling into excavations	Community health, safety and security plan. Stakeholder engagement plan. Monitoring and reporting plan.	The maximum length of open trench at any one time (per spread) will be defined based on: • the habitats present and potential ecological sensitivities (e.g., terrestrial commuting routes for large mammals) • community safety. Gaps will also be left in soil stacks and pipe strings at strategic locations to allow passage of animals where it is considered safe to do so. Community awareness programmes will be developed and implemented in project-affected communities to explain: • road safety risks and how to increase the safety of pedestrians particularly children • how to ensure their safety during construction • the measures that have been, or will be, implemented to protect their health and safety (e.g., provision of safe access).	Location and length of open excavations Documentation (reports, checklists, etc) demonstrating that appropriate risk assessment has been implemented Number of related complaints	Continuous improvement of percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, Local Government
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of land used for crop farming	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Quarterly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government, MGLSD, MTWA
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Temporary loss of grazing land	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Quarterly	Project; Relevant Government bodies who may conduct independent monitoring or review the data

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					Number of related complaints			include: PAU, MEMD, NEMA, MLHUD, Local Government, MGLSD, MTWA
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Increased traffic leading to spread of animal diseases	Transport and road safety management plan. Community health, safety and security plan. Biodiversity management plan.	The community health, safety and security plan will include measures to reduce the spread of animal diseases due to increased movement of livestock.	Evidence (records, inspections etc) that control measures have been implemented for vehicles passing through areas where animal disease exist; site verification of effectiveness of measures. Number of related complaints	Zero noncompliance with control measures. Continuous improvement on percentage of unresolved complaints on project vehicle related spread of animal disease after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MAAIF, Local Government
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of access to artisanal mining sites	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Quarterly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, Local Government, MGLSD, MTWA
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Permanent loss of natural resources	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Number of related complaints	solution/s during engagement		include: PAU, MEMD, NEMA, Local Government, NFA,
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Land-based livelihoods	Reduction in honey production due to loss of habitat	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, Local Government, MAAIF,
Disruption to Surface Water Catchments	Land-based livelihoods	Temporary disruption to surface water	Infrastructure and utilities management plan. Resettlement action plan.	Potentially affected landowners, land users, communities and other affected stakeholders (e.g. tourism operators) will be consulted if there is likely to be any disruption to the existing infrastructure and utility services. Feedback from communities will inform planning of the works, especially when determining the options for temporary alternatives. Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors.	Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project in consultation with respective utility service provider; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU,

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
								MEMD, NEMA, Local Government, DWRM, WMD
Restriction of Access to Fisheries	River and lake-based livelihoods	Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW	Resettlement action plan. Stakeholder engagement plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, Local Government, DWRM, WMD, MAAIF
Resettlement	River and lake-based livelihoods	Permanent loss of access to ponds used for aquaculture due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, Local Government, DWRM, WMD, MAAIF

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Resettlement	Land and property	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government, MTWA, MGLSD
Resettlement	Land and property	Land speculation by third parties	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The Project will continue monitoring of and liaising with authorities on land speculation. Where required additional interventions will be developed to enhance existing interventions. PACs will be sensitised to recent land speculation and instances of associated violence and informed of actions that can be taken. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government, MTWA, MGLSD

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Resettlement	Land and property	Land and property speculation by land owners	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The Project will continue monitoring of and liaising with authorities on land speculation. Where required additional interventions will be developed to enhance existing interventions. PACs will be sensitised to recent land speculation and instances of associated violence and informed of actions that can be taken. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government, MGLSD, MTWA
Resettlement	Land and property	New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding disputes and conflict. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government, MGLSD, MTWA

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Resettlement	Land and property	Permanent loss of physical structures due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government. MGLSD, MTWA
Resettlement	Land and property	Permanent loss of local enterprises due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government, MGLSD

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Resettlement	Land and property	Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government, MTWA, MGLSD
Resettlement	Land and property	Loss of access to informal support networks and social services after physical displacement due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding provision in the resettlement action plan to nurture informal support networks and project support for continued social support. Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD, Local Government, MGLSD

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Vibration	Land and property	The generation of vibrations during construction works	Infrastructure and utilities management plan.	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken or appropriate compensation paid if damage is proven. Potential noise and vibration impacts will be assessed where piling is to be undertaken close to sensitive receptors. Where possible, alternative techniques or materials will be used to reduce potential impacts, e.g. restrictions on times and duration in any given day that piling activities are undertaken. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Preconstruction record of condition. Documentation demonstrating noise and vibration assessments have been completed. Number of related complaints	Comprehensive preconstruction record of condition. Noise and vibration evaluations completed at sensitive receptors. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement	Once 30 days before construction commences for preconstruction record of condition and noise and vibration evaluations. Monthly for complaints.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Environment Officers, OSH Department - MGLSD

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Employment	Workers' health, safety and welfare	An improvement in the health and safety of workers from disease awareness and reduction programmes	Occupational health, safety and security plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. A HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to address: •awareness and understanding among drivers about the risks of HIV and STDs •the associated health implications •the preventative measures that can be taken •community awareness meetings •counselling and testing services •the distribution of information, leaflets and condoms. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. As part of the OHSSP, a risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors; the training programme (including daily toolbox meetings) will be updated in accordance with changes made in scope, incident statistics and/or regulatory requirements. Daily toolbox meetings will be held where health and safety issues will be discussed.	Number of instances of communicable diseases in workforce per worksite Trends in communicable diseases in PACs	No increase in communicable diseases of workforce by category and worksite against baseline	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Employment	Workers' health, safety and welfare	Risk of wildlife interaction/animal bites and contracting zoonotic diseases	Occupational health, safety and security plan.	As part of the OHSSP Risk Assessment process, the risk to worker health posed by wildlife at each camp and yard will be assessed and appropriate management measures will be developed and implemented.	Evidence that a risk assessment has been undertaken regarding worker health posed by wildlife at each camp and yard Evidence of appropriate management measures implemented	Number of recorded incidents of workforce interactions with wildlife at MCPYs	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, UWA, Ministry of Health

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Employment	Workers' health, safety and welfare	Other occupational health and safety incidents causing diseases, injuries and mortality	Community health, safety and security plan. Occupational health, safety and security plan. Labour management plan. Transport and road safety management plan.	As part of the project OHSSP, construction camps will be designed and built to meet national requirements and regulations. Measures will be detailed to avoid and reduce impacts associated with the development and occupation of construction camps, including but not limited to: • suitable and sufficient welfare facilities will be provided appropriate for both genders • clean and sanitary toilet facilities and showers will be provided appropriate for both genders. • adequate segregation between different areas (e.g. accommodation and hazardous areas) • measures to reduce or remove community disturbance or nuisance from the camps, e.g. preventing litter, dust generation, odours and noise. • include a helicopter landing area and secure fencing around the boundary. Provide workers with personal protection from prevalent diseases where feasible (e.g., condoms and ITN). As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities. As part of the OHSSP, a pest control plan will be developed for implementation on construction camps. As part of the OHSSP, a risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors; the training programme (including daily toolbox meetings) will be updated in accordance with changes made in scope, incident statistics and/or regulatory requirements. Daily toolbox meetings will be held where health and safety issues will be discussed. PPE appropriate for the task will be provided to all workers. As part of the OHSSP, basic workplace wellness programs that are culturally and religiously acceptable will be developed and implemented.	Health and safety incidents.	Trend of reduction of health and safety incidents.	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Use of Road Network	Social infrastructure and services	Road widening and improvement	Infrastructure and utilities management plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Completed roadworks	Roadworks completed as per engineered design	At the completion of roadworks	Project; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU,

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
								NEMA, MGLSD, UNRA, MLHUD (Physical Planning Department), District Local Governments.
Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)	Social infrastructure and services	Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction	Infrastructure and utilities management plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notifications; grievance procedure; compensation process. Number of related complaints	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement. Relevant stakeholder engagement records.	Quarterly	Project in consultation with respective utility service providers; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, MLHUD (Physical Planning Department), UETCL, District Local Governments
Use of Road Network	Social infrastructure and services	Deterioration of road conditions	Infrastructure and utilities management plan.	A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). The Project will conduct regular inspection of access roads to check for	Condition of roads against preconstruction survey	Agreement with lead agency regarding scope and extent of repairs	Every 6 months	Project and Project contractors; Relevant Government bodies that may conduct independent monitoring or review the data

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				damage caused by project vehicles to repair damage in a timely and efficient manner. Strict load management will be enforced on all project vehicles.				include: PAU, MEMD, MLHUD, UNRA, District Local Governments
Use of Road Network	Social infrastructure and services	Traffic congestion leading to delays	Stakeholder engagement plan. Transport and road safety management plan.	Community liaison officers will encourage PAC Leadership to provide advance warning of local events so that construction activities can be avoided at these times. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Authorities will be notified when oversize heavy loads need to be transported and such loads will be escorted by the project.	Documentation supporting journey management	Zero noncompliance with the Stakeholder Engagement Plan and the Transport and the Road Safety Management Plan	Weekly whilst heavy loads are being transported Monthly thereafter.	Project; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, District Local Government, UNRA, local police
Use of Road Network	Social infrastructure and services	Disruption of traffic flows	Infrastructure and utilities management plan. Transport and road safety management plan.	The Project will conduct regular inspection of access roads to check for damage caused by project vehicles to repair damage in a timely and efficient manner. Strict load management will be enforced on all project vehicles. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Community liaison officers will encourage PAC Leadership to provide advance warning of local events so that construction activities can be avoided at these times. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Authorities will be notified when oversize heavy loads need to be transported and such loads will be escorted by the project. A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner.	Documentation supporting journey management Road inspection records. Stakeholder engagement records. Exit survey.	Zero noncompliance with journey management. All access roads regularly inspected. Journey management responsive to community events. Exit survey completed.	Weekly whilst heavy loads are being transported. Monthly thereafter.	Project and Project contractors; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, District Local Government, UNRA, local police

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Resettlement	Community health	Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases	Resettlement action plan.	The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, Ministry of Health, MLHUD, District Local Governments
Resettlement	Community health	Resettled households' decreased food security	Resettlement action plan.	The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, MLHUD, District Local Governments
Community health	Community health	Project activities leading to an increase in vector-related diseases	Community health, safety and security plan. Occupational health, safety and security plan. Stakeholder engagement plan.	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, Ministry of Health,

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
								MLHUD, District Local Governments
Noise	Community health	Excessive noise exposure due to project activities	Community health, safety and security plan. Pollution prevention plan. Stakeholder engagement plan.	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Documentation (records, reports etc) demonstrating that noise monitoring at sensitive receptors is completed.	Zero exceedance of project environmental standards.	Monthly	Project and Project contractors; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, District Local Government
Disposal of Solid and Liquid Waste	Community health	Increased pressure on regional waste management facilities due to project activities	Waste management plan.	Adherence to waste management plan	Documentation (reports, records, etc) supporting that audits of waste facilities being used by the project are completed	Zero noncompliance with Waste Management Plan	Monthly	Project; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, Local Government
Use of Road Network	Community health	An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases	Community health, safety and security plan. Occupational health, safety and security plan. Infrastructure and utilities management plan. Stakeholder engagement plan.	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of non-compliance, workers will be disciplined in accordance with project disciplinary procedures and structures. A HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to address: •awareness and understanding among drivers about the risks of HIV and STDs •the associated health implications •the preventative measures that can be taken •community awareness meetings •counselling and testing services	Documentation demonstrating that community-based interventions covering malaria control and HIV/TB have been implemented Site verification (e.g. spot check) that HIV/STD awareness and prevention programme delivered as planned	HIV/STD awareness and prevention programme delivered as per plan (dates, locations, distribution of information and condoms etc.)	Documentation - 30 days before construction in a new location Site verification every 3 months (quarterly)	Project and Project contractors; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, Ministry of Health,

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				•the distribution of information, leaflets and condoms. An awareness campaign targeting schools at sensitive locations within the project AOI will be developed, addressing: • Importance of staying in school. • Risks particularly to girls of relationships with transient workers, transactional and commercial sex. • Road safety awareness. • Awareness about their rights. • Project grievance mechanism and their right to use it.				MLHUD, District Local Governments
Community Safety	Community safety, security and welfare	Community health and safety incidents associated with construction activities other than traffic accidents	Community health, safety and security plan. Occupational health, safety and security plan. Stakeholder engagement plan.	Construction barriers will have visible warning signs understandable by local communities. Signage will be in accordance with internationally accepted symbols and/or be well known to local communities. Regular meetings will be held with PAC representatives, during construction in their area, to update them on construction progress and to receive comments or queries. A community liaison log will be maintained detailing the content of all meetings. Appropriate measures will be implemented to prevent fauna or people from entering welded pipe sections or open excavations; there will be fauna ladders placed at suitable intervals in all open excavations. Animals will be removed safely and released into suitable habitat away from the working area. As part of the OHSSP, a first aid needs assessment will be undertaken for each camp to determine first aider and first aid kit requirements (e.g., qualifications, content of kits, locations).	Site verification that warning signs in appropriate languages and bright colours are installed. Stakeholder engagement records indicating PACs are regularly engaged regarding community relevant project information. First aid available at all camps.	Zero noncompliance with signage. Zero noncompliance with stakeholder engagement plan. First aid available 24/7.	Weekly for site verification. Monthly for stakeholder engagement records.	Project and Project contractors; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, Ministry of Health, MLHUD, District Local Governments
Community Dynamics	Community safety, security and welfare	The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs	Community health, safety and security plan. Stakeholder engagement plan. Labour management plan. Resettlement action plan.	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment. An Information Education and Communication (IEC) programme will be developed for workers addressing social conduct and including topics such as: gender-based violence and, drug and alcohol misuse. The IEC programme will explore opportunities to support community initiatives addressing vulnerable groups including gender balance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Compensation agreements.	Both spouses sign agreement.	Monthly.	Project; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, MLHUD. District Local Governments
Community Dynamics	Community safety, security and welfare	Conflict between PACs and project security personnel	Community health, safety and security plan. Stakeholder	Security personnel engaged by the project will receive training on Voluntary Principles (this will include where army and or security forces are engaged by the project); performance will be monitored. The Voluntary Principles on Security and Human Rights will be	Training records. Effectiveness on stakeholder messaging (by feedback templates or interviews)	Full coverage of security personnel. Zero community-security incidents.	Monthly	Project; Relevant Government bodies that may

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
			engagement plan.	implemented; compliance will be monitored. Public awareness programmes for stakeholders will include a specific section about the security presence around camps and security protocols which apply.	regarding project security.			conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MGLSD, MLHUD, Local Police, District Local Governments

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Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Increased knowledge of tangible and intangible cultural heritage. Employment of people to survey and investigate cultural heritage affected by the project.	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. A written scheme of investigation (WSI) will be prepared where an intervention is needed and appended to the cultural heritage management plan (CHMP). Until investigation and recording in accordance with the WSI, or avoidance or management activity is signed off by government authorities, construction may not proceed in that area.	Documentation (records, reports etc) demonstrating that a written scheme of investigation has been conducted Documentation (records, reports etc) demonstrating compliance to the Cultural Heritage Management Plan (CHMP)	Zero noncompliance with written scheme of investigation (WSI)	Monthly	Project and Project contractors; Relevant Government bodies including NEMA, Ministry of Tourism, Wildlife and Antiquities (MTWA) - Department of Museums and Monuments
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage, disturbance or disruption of access of unknown Category 1 and 2 tangible cultural heritage features, such as evidence of previous	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping	Documentation (records, reports etc) demonstrating that a written scheme of investigation has been conducted Documentation (records, reports etc) demonstrating	Zero noncompliance with written scheme of investigation (WSI). Zero noncompliance with chance finds procedure.	Monthly	Project and Project contractors; Relevant Government bodies including NEMA, Ministry of Tourism, Wildlife

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		settlement and graves.		• requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. A written scheme of investigation (WSI) will be prepared where an intervention is needed and appended to the cultural heritage management plan (CHMP). Until investigation and recording in accordance with the WSI, or avoidance or management activity is signed off by government authorities, construction may not proceed in that area. The senior cultural heritage monitor (SCHM) will prepare the chance finds procedure (CFP); Chance finds will be excavated by suitably qualified and approved archaeologists, in accordance with the CFP and authorised by the relevant government authority.	compliance to the Cultural Heritage Management Plan (CHMP)			and Antiquities (MTWA) Department of Museums and Monuments
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage, disturbance or disruption of access of unknown Category 3 intangible cultural heritage, such as meeting places, sacred natural sites, rivers or ceremonial ways, traditional dance, rituals, traditional	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any	Documentation (records, reports etc) demonstrating that a written scheme of investigation has been conducted Documentation (records, reports etc) demonstrating compliance to the Cultural Heritage Management Plan (CHMP)	Zero noncompliance with written scheme of investigation (WSI). Zero noncompliance with chance finds procedure.	Monthly	Project and Project contractors; Relevant Government bodies including NEMA, Ministry of Tourism, Wildlife and Antiquities (MTWA) Department of Museums and

Table J1.1-1 Generic ESMP Matrix – Construction Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		healing and syncretism		appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. A written scheme of investigation (WSI) will be prepared where an intervention is needed and appended to the cultural heritage management plan (CHMP). Until investigation and recording in accordance with the WSI, or avoidance or management activity is signed off by government authorities, construction may not proceed in that area. The senior cultural heritage monitor (SCHM) will prepare the chance finds procedure (CFP); Chance finds will be excavated by suitably qualified and approved archaeologists, in accordance with the CFP and authorised by the relevant government authority.				Monuments

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Introduction of competitive species or plants/animal diseases	Habitats of conservation importance	Poor re-colonisation by local flora through competition by non-natives following reinstatement	Biodiversity management plan.	Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive species on the RoW, work sites and camp facilities. The biosecurity measures will also outline specifics to protect the aquatic environment from alien invasive species.	Documentation supporting that the biosecurity measures are implemented. Visual inspection for incidence of alien invasive species.	Zero noncompliance with the Biodiversity Management Plan.	Weekly.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, UWA, WMD, District Environment Officers, PAU, NFA
Disturbance or harm to wildlife	Habitats of conservation importance	PIIM to areas around camps causing increased pressure on natural resources (farming, deforestation for fuel)	Project-induced in-migration plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Settlements developing around or near camps and AGIs.	Zero unplanned settlements.	Monthly.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, UWA, DWRM, District Environment Officers, PAU, NFA, WMD
Management of black and grey water	Flora and fauna species of conservation importance (terrestrial and aquatic)	Injury or mortality of flora and fauna due to surface water contamination	Natural Resource Management Plan Waste management plan.	The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards.	Disposal locations of treated effluent. Documentation to support treated wastewater (to be disposed of) meets	Zero noncompliance with statutory limits.	Monthly or As per permit conditions.	Project; Relevant Government bodies who may

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.	the relevant water quality standards.			conduct independent monitoring or review the data include: NEMA, DWRM, District Environment Officers, PAU
Introduction of competitive species or plants/animal diseases	Flora and fauna species of conservation importance (terrestrial and aquatic)	Modified habitats due to non-native species establishment leading to increased competition and loss of habitat for breeding and foraging	Biodiversity management plan.	Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive species on the RoW, work sites and camp facilities. The biosecurity measures will also outline specifics to protect the aquatic environment from alien invasive species.	Documentation supporting that the biosecurity measures are implemented. Visual inspection for incidence of alien invasive species.	Zero noncompliance with the Biodiversity Management Plan.	Weekly.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, UWA, DWRM, District Environment Officers, PAU, NFA, WMD
Disturbance or harm to wildlife	Flora and fauna species of conservation importance (terrestrial and aquatic)	Maintenance activities causing in directly mortality or loss of breeding and forage habitat to species	Biodiversity management plan.	Operation phase vegetation management activities will account for species of conservation importance and their habitat requirements for foraging, nesting and/or breeding.	Maintenance records identifying compliance with the biodiversity management plan with regard to seasonal constraints and impact reduction on habitats and species of conservation importance.	Zero noncompliance.	Every 3 months (quarterly)	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, UWA, DWRM, District

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
								Environment Officers, PAU, WMD, NFA
Soil erosion	Soil	Loss of topsoil causing reduced fertility and impaired reinstatement	Reinstatement plan. Biodiversity management plan.	Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Restored vegetation in terms of floral diversity, density and cover.	Floral species diversity, density and cover meets reinstatement objectives.	Weekly until vegetation is established in reinstated areas; twice yearly there-after	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, DWRM, PAU, District Environment Officers
Management of waste and accidental release of oil or chemicals	Soil	Soil contamination	Pollution prevention plan. Waste management plan.	A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater.	Documentation demonstrating that project activities are in compliance with the waste management plan and Pollution Prevention Plan Site verification.	Zero noncompliance with the Pollution Prevention Plan and Waste Management Plan.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, DWRM, PAU, District Local Government, OPM (Disaster Preparedness), Local Police

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures.				
Erosion	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters	Soil management plan. Reinstatement plan.	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made and the area reinstated as quickly as possible. Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity. A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils	Visual evidence of erosion of river banks and bank stability (cracks, sag, shearing) within 50m up and down stream of construction activities. Visual evidence of significant sedimentation (water colour, turbidity) greater than 50 m of construction activity.	Zero incidence of sedimentation greater than 50 m up- or downstream of crossings during construction Zero incidence of collapsed banks after reinstatement	Weekly after reinstatement until vegetation is re-established	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, District Environment Officers, DWRM, WMD

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				•restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses. Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment.				
Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water	Pollution prevention plan. Waste management plan. Emergency preparedness and response plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment	Site verification	Zero noncompliance with Pollution Prevention Plan	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, District Environment Officers, DWRM, WMD

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				• contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills.				
Altered drainage pattern	Surface water	Trench can act as conduit for groundwater, draining higher areas and flooding lower areas	Reinstatement plan.	Trench breakers will be installed in the pipeline trench where downhill flow within the backfilled trench may lead to erosion.	Site verification that trench breaks are installed; document verification that trench break numbers and locations are fit for purpose.	Trench breaks installed as per plan.	Minimum of 7 days prior to backfill.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, District Environment Officers, DWRM, WMD
Management of waste and accidental release of oil or chemicals	Groundwater	Potential for groundwater contamination	Waste management plan Pollution prevention plan. Natural resource management plan Emergency preparedness and response plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in	Documentation demonstrating that project activities are in compliance with the waste management plan and pollution prevention plan Site verification	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, District Environment

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system." "In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				Officers, DWRM
Visual intrusion of pipeline into landscape	Landscape	Change of landscape character and views caused by project components	Biodiversity Management Plan. Reinstatement Plan. Soil Management Plan.	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Environmental and social evaluations will be undertaken to identify suitable offsite disposal sites for waste soil and rock, and appropriate management measures to be implemented. All temporary borrow pits and soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented. Where benching is required then the areas will be re-contoured to original	Before and after photographs with regard to contouring, drainage, waste and debris.	No significant change	Weekly during reinstatement	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, UWA, WMD, District Environment Officers, NFA, PAU

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				profiles. Side casting in areas of steep terrain will be prohibited. The effects of accidental spoil slippage on steep slopes will mitigated, e.g., by using fences or a geotextile membrane. Recontouring should be sympathetic and in keeping with preconstruction profiles, where this is not precluded by risk to integrity of the pipeline or erosion considerations. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.				

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Release of gases, exhausts and vapours to atmosphere	Air Quality	Exhaust emissions from vehicles causing reduced air quality during operation	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Vehicle maintenance records	Zero noncompliance with scheduled servicing and maintenance of combustion equipment	Annually	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Environment Officers, PAU, MGLSD (OSH Department)
Dust	Air Quality	Nuisance from mobilisation of dust by project vehicles	Pollution Prevention Plan Traffic and Road Safety Management Plan	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Implementation of dust suppression measures Site verification Number of related complaints.	Zero noncompliance with dust suppression measures described in the Pollution Prevention Plan Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement.	Site verification twice weekly during dry periods Monthly - complaints, documentation.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Environment Officers, PAU
Noise	Acoustic Environment	Disturbance or nuisance from noise from traffic movement	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will:	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project; Relevant Government bodies who may conduct independent

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				• be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	site is up to date on manufacturer's recommended maintenance and servicing.	has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.		monitoring or review the data include: NEMA, District Environment Officers, OSH Department - MGLSD
Provision of goods and services	Economy	Project procurement providing opportunities for national businesses.	Local Content Plan	A Procurement and Supply Chain Management Plan (PSCMP) will be developed to maximise the purchase of goods and services from within Uganda/Tanzania. This will be contingent on whether local suppliers can offer sufficient quality and reliability and can meet project requirements. PSCMP will include, as appropriate, enterprise development, capacity development and ring-fencing contracts.	Development of a Procurement and Supply Chain Management Plan (PSCMP) to maximise the purchase of goods and services from within Uganda/Tanzania	Zero noncompliance with the Procurement and Supply Management Plan	Monthly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Contribution to economy	Economy	Contribution to national economy from investment.	-	-	Contribution to the national economy		Annual	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU,
Contribution to economy	Economy	Changes to the fiscal balance.	-	-	Contribution to the national economy		Annual	Project; Relevant Government agencies who may conduct

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
								independent monitoring or review include: MEMD, PAU
Provision of Goods and Services	Local economy (nonland-based livelihoods)	Improvements in road conditions for business owners and public transport	Infrastructure and utilities management plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Road traffic accidents and congestion	No annual increase in number of project related road traffic accidents No increases in project related road congestion	Quarterly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, OHS Department MGLSD, District Local Governments
Employment	Local economy (nonland-based livelihoods)	School drops outs seeking employment in the project supply chain	Procurement and supply chain management plan. Monitoring and reporting plan. Labour management plan. Stakeholder engagement plan.	An awareness campaign targeting schools at sensitive locations within the project AOI will be developed, addressing: • Importance of staying in school. • Risks particularly to girls of relationships with transient workers, transactional and commercial sex. • Road safety awareness. • Awareness about their rights. • Project grievance mechanism and their right to use it.	Evidence of a standard clause in all contracts that no employees shall be hired, directly or indirectly, under the age of 18 years of age	No underage persons to be employed as part of the project workforce Inspections and audits to identify whether children under the age of 18 are being hired by the Project	Monthly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD
Employment	Workers' health, safety and welfare	An improvement in the health and safety of workers from disease awareness and	Occupational health, safety and security plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. A HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to address: •awareness and understanding among drivers about the risks of HIV and STDs	Number of instances of communicable diseases in workforce per worksite Trends in	No increase in communicable diseases of workforce by category and	Monthly	Project and project contractors; Relevant Government

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		reduction programmes		•the associated health implications •the preventative measures that can be taken •community awareness meetings •counselling and testing services •the distribution of information, leaflets and condoms. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. As part of the OHSSP, a risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors; the training programme (including daily toolbox meetings) will be updated in accordance with changes made in scope, incident statistics and/or regulatory requirements. Daily toolbox meetings will be held where health and safety issues will be discussed.	communicable diseases in PACs	worksite against baseline.		agencies who may conduct independent monitoring or review include: MEMD, PAU, OHS Department MGLSD, Ministry of Health
Employment	Workers' health, safety and welfare	Other occupational health and safety incidents causing diseases, injuries and mortality	Community health, safety and security plan. Occupational health, safety and security plan. Labour management plan. Transport and road safety management plan.	As part of the project OHSSP, construction camps will be designed and built to meet national requirements and regulations. Measures will be detailed to avoid and reduce impacts associated with the development and occupation of construction camps, including but not limited to: • suitable and sufficient welfare facilities will be provided appropriate for both genders • clean and sanitary toilet facilities and showers will be provided appropriate for both genders. • adequate segregation between different areas (e.g. accommodation and hazardous areas) • measures to reduce or remove community disturbance or nuisance from the camps, e.g. preventing litter, dust generation, odours and noise. • include a helicopter landing area and secure fencing around the boundary. Provide workers with personal protection from prevalent diseases where feasible (e.g., condoms and ITN). As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities. As part of the OHSSP, a pest control plan will be developed for implementation on construction camps. As part of the OHSSP, a risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors; the training programme (including daily toolbox meetings) will be updated in accordance with changes made in scope, incident statistics and/or regulatory requirements. Daily toolbox meetings will be held where health and safety issues will be discussed. PPE appropriate for the task will be provided to all workers.	Health and safety incidents.	Trend of reduction of health and safety incidents.	Monthly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, OHS Department MGLSD

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				As part of the OHSSP, basic workplace wellness programs that are culturally and religiously acceptable will be developed and implemented.				
Use of Road Network	Community health	An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases	Community health, safety and security plan. Occupational health, safety and security plan. Infrastructure and utilities management plan. Stakeholder engagement plan.	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of non-compliance, workers will be disciplined in accordance with project disciplinary procedures and structures. A HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to address: •awareness and understanding among drivers about the risks of HIV and STDs •the associated health implications •the preventative measures that can be taken •community awareness meetings •counselling and testing services •the distribution of information, leaflets and condoms. An awareness campaign targeting schools at sensitive locations within the project AOI will be developed, addressing: • Importance of staying in school. • Risks particularly to girls of relationships with transient workers, transactional and commercial sex. • Road safety awareness. • Awareness about their rights. • Project grievance mechanism and their right to use it.	Documentation demonstrating that community-based interventions covering malaria control and HIV/TB have been implemented Site verification (e.g. spot check) that HIV/STD awareness and prevention programme delivered as planned	HIV/STD awareness and prevention programme delivered as per plan (dates, locations, distribution of information and condoms etc)	Documentation - 30 days before construction in a new location Site verification every 3 months (quarterly)	Project and Project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, Ministry of Health
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage or disturbance of Category 1 and 2 tangible cultural heritage	Cultural Heritage Management Plan	A CHMP will include details of all cultural heritage features identified before and during construction. The CHMP will inform cultural heritage management measures that may be required during project operation.	Verification that the CHMP includes details of all cultural heritage features identified before and during construction.	Zero noncompliance	Once; prior to 1st Oil	Project; Relevant Government bodies including NEMA, Ministry of Tourism, Wildlife and Antiquities (MTWA) Department of Museums and Monuments
Disturbance or loss of cultural heritage	Tangible and Intangible Cultural Heritage	Damage or disturbance of Category 3	Cultural Heritage Management Plan	A CHMP will include details of all cultural heritage features identified before and during construction. The CHMP will inform cultural heritage management measures that may be required during project operation.	Verification that the CHMP includes details of all cultural heritage features	Zero noncompliance.	Once; prior to 1st Oil	Project; Relevant

Table J1.1-2 Generic ESMP Matrix – Operational Phase

Aspect	VEC	Potential Impact	Management Plan(s)	Mitigation Measures	Parameter to be Monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		intangible cultural heritage			identified before and during construction.			Government bodies including NEMA, Ministry of Tourism, Wildlife and Antiquities (MTWA) Department of Museums and Monuments

J1.2 Location-Specific ESMP Matrix

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0-11 Guineo–Congolian semi-evergreen forest	Guineo–Congolian semi-evergreen forest	Loss of habitat	Loss of, Guineo–Congolian semi-evergreen forest	Biodiversity Management Plan. Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU
Hoima 6-32 Wetland forests (riverine forest and swamp forests) located throughout the extent of the pipeline route	Wetland forests (riverine forest and swamp forests) located throughout the extent of the pipeline route	Loss of habitat	Loss of wetland forest (swamp and riverine forest)	Biodiversity Management Plan Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing.	drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.		plan; there-after monthly until sites are fully restored.	review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU, WMD, DWRM
Kyankwanzi 78-82 Taala FR	Taala FR	Loss of habitat	Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR	Biodiversity Management Plan Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU
Kyankwanzi 78-82 Taala FR	Taala FR	Loss of habitat	Temporary loss of habitat from Taala FR	Biodiversity Management Plan. Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.		plan; there-after monthly until sites are fully restored.	review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU
Hoima 6 Various	Various	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance to Bohor reedbuck	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Gomba 165 Various	Various	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance to Bohor reedbuck	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Sembabule 187 Various	Various	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance to Bohor reedbuck	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Lwengo 218-231 Various	Various	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance to Bohor reedbuck	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Rakai 289 Various	Various	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance to Bohor reedbuck	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0-20 Wambabya–Bugoma corridor	Wambabya–Bugoma corridor	Loss of Habitat to Species of Conservation Importance	Loss of chimpanzee habitat	Biodiversity Management Plan. Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0-20 Wambabya–Bugoma corridor	Wambabya–Bugoma corridor	Disturbance or Harm to Wildlife	Disturbance to chimpanzee	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 4.5-8 Wambabya	Wambabya	Disturbance or Harm to Wildlife	Noise and visual disturbance to species of conservation importance using the adjacent reserve	Biodiversity Management Plan. Reinstatement Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. The total duration of construction disturbance (i.e. the time between initial site clearing and final reinstatement/biorestoration) will be minimised. Vegetation clearing in suitable nesting habitat for vultures will be undertaken in advance of the dry season (when nesting occurs). A preclearance check for occupied vulture nests will be undertaken in suitable nesting habitat within 500m of the RoW. If any occupied nests are found, avoid construction until the chick has fully fledged or install noise and visual screening to minimise disturbance.	Documentation scheduling vegetation clearance to be completed outwith nesting season. Survey plan to include nests within 500m of RoW; site verification. Noise levels at sensitive receptors; field verification. Documentation demonstrating that the duration of disturbance is minimised. Journey management with regard to defined routes. Speed infringements and effective corrective action. Noise levels at sensitive receptors; field verification. Maintenance records of vehicles and equipment. Documentation demonstrating that the duration of disturbance is minimised.	No vegetation clearance during nesting season. Construction avoided within 500m of an occupied nest. Zero exceedance of project environmental standards. Disturbance limited to a single growing season. Zero exceedance of project environmental standards. Disturbance limited to a single growing season. Zero noncompliance with journey management. Decreasing trend of speed infringements.	90 days prior to construction commencing for documentation. Weekly for site verification for occupied nests during nesting season. Weekly for noise level monitoring at sensitive receptors. Quarterly for documentation. Monthly for journey management records; daily during intense transport activities (pipe), weekly for people movement. Monthly for speed infringements.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU
Hoima 4.5-8 Wambabya	Wambabya	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat, and noise and visual disturbance during construction for grey parrot.	Biodiversity Management Plan. Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed;	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites	Project and Project contractors; Relevant Government bodies who may

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Reinstatement completed according to reinstatement plan.	are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	conduct independent monitoring or review the data include: NEMA, MEMD, UWA, NFA, District Environment Officers, PAU
Kakumiro 36-37 Kafu Crossing	Kafu Crossing	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance	Biodiversity Management Plan. Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.		plan; there-after monthly until sites are fully restored.	review the data include: NEMA, MEMD, UWA, DWRM, District Environment Officers, PAU, WMD
Kyankwanzi 79-80 Wetland on northern edge of Taala FR	Wetland on northern edge of Taala FR	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat supporting species of conservation interest and noise and visual disturbance during construction	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, NFA,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.			District Environment Officers, PAU, WMD, DWRM
Mubende 99.5 Secondary Acacia sp. woodland, bushland and wooded grassland	Secondary Acacia sp. woodland, bushland and wooded grassland	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	plant species that support forage, refuge and nesting.			
Rakai 276.5 Secondary Acacia sp. woodland, bushland and wooded grassland	Secondary Acacia sp. woodland, bushland and wooded grassland	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Sembabule 201.5 Secondary Acacia sp. woodland, bushland and wooded grassland	Secondary Acacia sp. woodland, bushland and wooded grassland	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Lwengo 217.5 Secondary Acacia sp. woodland, bushland and wooded grassland	Secondary Acacia sp. woodland, bushland and wooded grassland	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the gold star evergreen scrambling shrub *Blepharispermum pubescens*	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Mubende 93.1 Swampy grassland with occasional woody species	Swampy grassland with occasional woody species	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the endemic *Leucas calostachys*	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU, DWRM, WMD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Mubende 106-112.6 Swamp forest and Papyrus swamp	Swamp forest and Papyrus swamp	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the vascular plant, *Mondia whitei*	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU, DWRM, WMD, NFA

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.				
Mubende 147-148 River Crossing (Nabakazi River)	River Crossing (Nabakazi River)	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance	Biodiversity Management Plan. Reinstatement Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU, DWRM, WMD

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Gomba 164-165 Katonga River	Katonga River	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat supporting species of conservation interest, and noise and visual disturbance during construction	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU, DWRM, WMD
Sembabule 187 Wetland	Wetland	Loss of Habitat to Species of Conservation Importance and	Loss of habitat and direct mortality for	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the	Documentation (reports, checklists, etc) demonstrating	Comprehensive data records from supplementary preconstruction	Minimum of 7 days before vegetation clearance	Project and Project contractors;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		Disturbance or Harm to Wildlife	golden throated rocket frog		working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU, DWRM, WMD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Sembabule 203-270 Valleys in southern Uganda	Valleys in southern Uganda	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU, WMD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Kyotera 283 MCPY-4	MCPY-4	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit from MCPY4	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction. As part of the Biodiversity Management plan a vegetation removal method statement to reduce impacts on biodiversity will be developed. This will include but not be limited to measures such as: • directional felling of trees on land inside the right-of-way • avoiding damage to trees outside the right-of-way • identifying areas where strimming, coppicing or other works will be undertaken in advance of clearing. A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken, including but not limited to: • supplemental preconstruction flora and fauna surveys • supplemental preconstruction biodiversity surveys of pre identified species of conservation concern • a biodiversity assessment of watercourses and wetlands • an assessment of fish spawning habitat at open-cut river crossings where the watercourse crossing is planned to occur during the fish-spawning season and International Union for Conservation of Nature or Red Data Book species are known or likely to occur • preconstruction checks on the right-of-way. Ways to achieve an increasing trend in vegetation regrowth and diversity of desired species, specifically species composition and, plant species that support forage, refuge and nesting for species of conservation importance, in reinstated areas will be sought, with reference to nearby areas undisturbed by project activities. The re-establishment of vegetation will be monitored following reinstatement until long term re-vegetation targets have been reached.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Rakai 288-289 Disused airstrip and associated borrow pits	Disused airstrip and associated borrow pits	Disturbance or Harm to Wildlife	Noise and visual disturbance to bird and fauna species causing a restriction in species' distributions	Biodiversity Management Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. The total duration of construction disturbance (i.e. the time between initial site clearing and final reinstatement/biorestoration) will be minimised.	Noise levels at sensitive receptors; field verification. Documentation demonstrating that the duration of disturbance is minimised. Journey management with regard to defined routes. Speed infringements and effective corrective action.	Zero exceedance of project environmental standards. Disturbance limited to a single growing season.	Weekly for noise level monitoring at sensitive receptors. Quarterly for documentation. Monthly for journey management records; daily during intense transport activities (pipe), weekly for people movement. Monthly for speed infringements.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU
Hoima 4.5-8 Wambabya FR	Wambabya FR	Loss of Habitat and Disturbance or Harm to Wildlife	Loss of ecological function and integrity of protected site through impacts on species and habitats	Biodiversity Management Plan	Preconstruction biodiversity surveys will be undertaken at locations identified in the baseline appendices of the environmental and social impact assessment to record details of habitats and species of conservation importance within the working areas. This information will be used to produce site specific biodiversity management plans that will identify fine-scale route changes (where feasible), mark features for retention and protection, develop biorestoration measures including seed collection, translocation and species propagation and provide details of the specific mitigation measures (such as seasonal construction restrictions) to be implemented to reduce impacts on biodiversity during construction.	Documentation (reports, checklists, etc) demonstrating that supplementary preconstruction surveys have been completed; and site-specific biodiversity management plans have been drafted and implemented where necessary. Reinstatement plan to include increasing trend in vegetation regrowth and plant species that support forage, refuge and nesting.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement completed according to reinstatement plan.	Minimum of 7 days before vegetation clearance commences for preclearance surveys. There-after weekly until sites are reinstated for compliance with biodiversity management plan; there-after monthly until sites are fully restored.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment Officers, PAU, NFA

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
All locations sensitive to soil compaction	All locations sensitive to soil compaction	Soil compaction	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development. Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity.	Biodiversity Management Plan Community Health, Safety and Security Plan Transport and Road Safety Management Plan	Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency).	Compressed soil; driving, parking and or storage of machinery, equipment or materials on reinstated RoW.	Zero noncompliance with the Soil Management Plan	Weekly after reinstatement until vegetation is re-established	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers
All locations sensitive to soil erosion	All locations sensitive to soil erosion	Soil erosion	Loss of topsoil causing reduced fertility and impaired reinstatement	Soil management plan. Reinstatement plan.	Load-bearing/ ground protection materials, such as bog mats and geotextile membranes under temporary haul roads, will be used to support heavy loads in areas of soft ground, including wetland areas. Local communities will be discouraged from using the right-of-way as an access road during construction through signage, awareness raising and the use of communication materials. Topsoil and subsoil stockpiles will be stored in accordance with the Soil Management Plan, be free draining and include gaps left in strategic locations to allow potential floodwater through. If topsoil is stored for more than six months, the stacks will be monitored for: • the presence of weeds, which will be controlled in accordance with the weed and pest control programme • compaction and erosion – corrective measures will be implemented if either is identified. Reinstatement will be undertaken as early as practicable following completion of construction activities in any ROW section or site.	Rills or gullies on topsoil stacks and or reinstated areas	No visible signs of erosion	Weekly until vegetation is established in reinstated areas	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, PAU, District Environment Officers
Hoima 0 PAR-PS1 road KP2.5	PAR-PS1 road KP2.5	Management of waste and accidental release of oil or chemicals	Contamination of surface water	Soil management plan. Reinstatement plan. Waste	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation	Documentation demonstrating that project activities are in compliance with the waste	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				management plan.	measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to	management plan and pollution prevention plan Site verification			Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, WMD, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Kakumiro 40 MCPY1	MCPY1	Management of waste and accidental release of oil or chemicals	Contamination of surface water	Soil management plan. Reinstatement plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment	Documentation demonstrating that project activities are in compliance with the waste management plan and pollution prevention plan Site verification	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, WMD, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Mubende 126 ERU-MCPY2 road KP1.0	ERU-MCPY2 road KP1.0	Management of waste and accidental release of oil or chemicals	Contamination of surface water	Soil management plan. Reinstatement plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.	Documentation demonstrating that project activities are in compliance with the waste management plan and pollution prevention plan Site verification	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, WMD, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Sembabule 185 ERU-PS2 road KP0.5	ERU-PS2 road KP0.5	Management of waste and accidental release of oil or chemicals	Contamination of surface water	Soil management plan. Reinstatement plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards.	Documentation demonstrating that project activities are in compliance with the waste management plan and pollution prevention plan Site verification	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, WMD, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Rakai 283 MCPY4	MCPY4	Management of waste and accidental release of oil or chemicals	Contamination of surface water	Soil management plan. Reinstatement plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures	Documentation demonstrating that project activities are in compliance with the waste management plan and pollution prevention plan Site verification	Zero noncompliance with the pollution prevention plan and waste management plan	Weekly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				District Environment Officers, DWRM, WMD, OPM (Disaster Preparedness)
Mubende 126 ERU-MCPY2 road KP1.0	ERU-MCPY2 road KP1.0	Erosion and increased suspended sediment in watercourses	Erosion of river or channel banks, scour, sediment contamination of surface waters	Reinstatement plan. Soil management plan.	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be	Visual evidence of erosion of river banks and bank stability (cracks, sag, shearing) within 50m up and down stream of	Zero incidence of sedimentation greater than 50 m up- or downstream of crossings during construction Zero incidence of	Weekly after reinstatement until vegetation is re-established	Project and Project contractors; Relevant Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made and the area reinstated as quickly as possible. Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity. A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses. Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control	construction activities. Visual evidence of significant sedimentation (water colour, turbidity) greater than 50 m of construction activity.	collapsed banks after reinstatement		bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, WMD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment.				
Sembabule 185 ERU-PS2 road KP0.5	ERU-PS2 road KP0.5	Erosion and increased suspended sediment in watercourses	Erosion of river or channel banks, scour, sediment contamination of surface waters	Reinstatement plan. Soil management plan.	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made and the area reinstated as quickly as possible. Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity. A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be	Visual evidence of erosion of river banks and bank stability (cracks, sag, shearing) within 50m up and down stream of construction activities. Visual evidence of significant sedimentation (water colour, turbidity) greater than 50 m of construction activity.	Zero incidence of sedimentation greater than 50 m up- or downstream of crossings during construction Zero incidence of collapsed banks after reinstatement	Weekly after reinstatement until vegetation is re-established	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, WMD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses. Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment.				
Rakai 283 MCPY4	MCPY4	Erosion and increased suspended sediment in watercourses	Erosion of river or channel banks, scour, sediment contamination of surface waters	Reinstatement plan. Soil management plan.	During open-cut watercourse crossing activities, bank and bed material will be segregated, stored away from the active channels, and not be placed where flow or drainage will be obstructed. As much riparian vegetation as possible will be left in place until immediately before a watercourse crossing needs to be made to maintain stability of the banks. During site preparation, the height of vegetation on the riverbanks will be reduced, but roots will not be disturbed, to dissuade animals from nesting. The vegetation will then be removed when the crossing is made and the area reinstated as quickly as possible. Where watercourse bank reinforcement is required, the impact on riparian habitats and riparian fauna will be assessed to determine if the reinstatement or reinforcement is sufficient to maintain connectivity along the riparian elements of the watercourse. Mitigation will be installed to maintain habitat connectivity. A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during	Visual evidence of erosion of river banks and bank stability (cracks, sag, shearing) within 50m up and down stream of construction activities. Visual evidence of significant sedimentation (water colour, turbidity) greater than 50 m of construction activity.	Zero incidence of sedimentation greater than 50 m up- or downstream of crossings during construction Zero incidence of collapsed banks after reinstatement	Weekly after reinstatement until vegetation is re-established	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, WMD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Site specific erosion risk assessments will be completed by a qualified fluvial geomorphologist or soil scientist as appropriate; the information will be used to prepare a soil management plan and a reinstatement plan prior to construction. Erosion control measures will include but not be limited to: •consideration of information from preconstruction surveys •locations where soil compaction may result in increased sediment laden runoff to watercourses and waterbodies •details on construction through soft ground, considering the use of load-bearing materials to support heavy loads in soft ground •measures for working in areas of fragile and sensitive soils •restrictions to the storage of materials on steep slopes •provision for erosion and sediment control at watercourses. Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment.				
Hoima 0 PS1	PS1	Management of waste and accidental release of oil or chemicals	Contamination of groundwater	Waste management plan	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment	Site verification of compliance with waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of	Zero noncompliance with waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					(e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, cleanup and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, cleanup and remediate Tier 2 and Tier 3 spills.	contamination or sediment run-off	solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off		review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, OPM (Disaster Preparedness)
Sembabule 185 PS2	PS2	Management of waste and accidental	Contamination of groundwater	Waste management plan	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water	Site verification of compliance with waste	Zero noncompliance with waste	Monthly - complaints, groundwater	Project and Project contractors;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		release of oil or chemicals			channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following	management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off	monitoring Weekly- site inspections	Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Kakumiro 40 MCPY1	MCPY1	Management of waste and accidental release of oil or chemicals	Contamination of groundwater	Waste management plan	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a	Site verification of compliance with waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	Zero noncompliance with waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Mubende 126 MCPY2	MCPY2	Management of waste and accidental release of oil or chemicals	Contamination of groundwater	Waste management plan	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways	Site verification of compliance with waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	Zero noncompliance with waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Rakai 283 MCPY4	MCPY4	Management of waste and accidental release of oil or chemicals	Contamination of groundwater	Waste management plan	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will	Site verification of compliance with waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	Zero noncompliance with waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM, OPM (Disaster Preparedness)

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater. A spill response procedure based on Tier 1, 2 and 3 spill responsibilities defined in the Emergency Preparedness and Response Plan will be developed together with other responsible parties, and the necessary equipment and resources will be procured to implement it. The procedure will cover: • responses for any unintended or unauthorised release of a potentially hazardous material, identification of locations where spill response equipment and resources will be provided, and procedures for its deployment • contact details for the rapid response team and spill response organisation • notification requirements. • All Tier 1, 2 and 3 spills will be reported in accordance with the project incident reporting system. In the event of a spillage of hazardous materials the following actions will take place: • A trained rapid response team will be mobilised • Spill response personnel and equipment will be provided to contain, clean-up and remediate (Tier 1 spills). A wider range of resources will be utilised to contain, clean-up and remediate Tier 2 and Tier 3 spills.				
Hoima 0 PS1	PS1	Management of black and grey water	Contamination of groundwater	Pollution prevention plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays)	Site verification of compliance with pollution prevention plan and waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of	Zero noncompliance with pollution prevention plan and waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.	contamination or sediment run-off	proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off		include: NEMA, PAU, MEMD, District Environment Officers, DWRM
Sembabule 185 PS2	PS2	Management of black and grey water	Contamination of groundwater	Pollution prevention plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be	Site verification of compliance with pollution prevention plan and waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	Zero noncompliance with pollution prevention plan and waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off	Monthly - complaints, groundwater monitoring Weekly- site inspections.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.				
Kakumiro 40 MCPY1	MCPY1	Management of black and grey water	Contamination of groundwater	Pollution prevention plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.	Site verification of compliance with pollution prevention plan and waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	Zero noncompliance with pollution prevention plan and waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM
Mubende 126 MCPY2	MCPY2	Management of black and grey water	Contamination of groundwater	Pollution prevention plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation	Site verification of compliance with pollution prevention plan and waste management plan	Zero noncompliance with pollution prevention plan and waste management plan	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g. sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.	Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project environmental standards No evidence of contamination or sediment run-off		Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM
Rakai 283 MCPY4	MCPY4	Management of black and grey water	Contamination of groundwater	Pollution prevention plan. Waste management plan.	The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from any wetlands, surface watercourse or seasonal water channel. Such storage locations will be subject to site-specific environmental and social risk assessment that will inform site selection and the adoption of any additional mitigation measures. Storage areas for hazardous materials will be bunded (no drainage valves/holes), have impermeable floor and will be covered to minimise the ingress of rainwater. A refuelling procedure will be developed and implemented which will include but not be limited to: • details of mobile and static refuelling areas and equipment (e.g. impermeable drip trays) • regulatory / GIIP constraints of refuelling operations to sensitive environmental receptors • spill prevention measures • training on refuelling procedures. The grey water stream will be separated from black water (e.g.	Site verification of compliance with pollution prevention plan and waste management plan Number of related complaints Documentation relating to groundwater monitoring Visual inspection for evidence of contamination or sediment run-off	Zero noncompliance with pollution prevention plan and waste management plan Continuous improvement on percentage of unresolved complaints regarding potable water supply after Project has proposed solution/s during engagement Groundwater monitoring results meet project	Monthly - complaints, groundwater monitoring Weekly- site inspections	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. An industry-recognised manufactured grease trap will be installed at the outlet of the kitchen(s) facilities to prevent greases and fats from entering the grey water streams. Treated sewage effluent which is not reused will be preferentially discharged to land. Before any discharge, the soil permeability will be evaluated, and engineered soakaways will be constructed, where required, to avoid impacts on land, surface water drainage and groundwater.		environmental standards No evidence of contamination or sediment run-off		Officers, DWRM
Hoima 0 PS1	PS1	Abstraction of groundwater	Decreased water level due to water abstraction for project use	Natural resource management plan	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include; NEMA, PAU, MEMD, District Environment Officers, DWRM
Sembabule 185 PS2	PS2	Abstraction of groundwater	Decreased water level due to water abstraction for project use	Natural resource management plan	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and	Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.				include: NEMA, PAU, MEMD, District Environment Officers, DWRM
Kakumiro 40 MCPY1	MCPY1	Abstraction of groundwater	Decreased water level due to water abstraction for project use	Natural resource management plan	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM
Mubende 126 MCPY2	MCPY2	Abstraction of groundwater	Decreased water level due to water abstraction for project use	Natural resource management plan	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location	Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					for the community that is not or is less influenced by the project's abstraction.				Officers, DWRM
Rakai 283 MCPY4	MCPY4	Abstraction of groundwater	Decreased water level due to water abstraction for project use	Natural resource management plan	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment Officers, DWRM
Hoima 0 PS1	PS1	Visual intrusion of project components into landscape	Change of landscape character	Reinstatement plan	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document	Before and after photographs with regard to contouring, drainage, waste and debris.	No significant change	Weekly during reinstatement	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.				
Sembabule 184.5 PS2	PS2	Visual intrusion of project components into landscape	Change of landscape character	Reinstatement plan	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads	Before and after photographs with regard to contouring, drainage, waste and debris.	No significant change	Weekly during reinstatement	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.				
Hoima 0 PS1	PS1	Visual intrusion of project components into landscape	Change of views	Reinstatement plan	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for	Before and after photographs with regard to contouring, drainage, waste and debris.	No significant change	Weekly during reinstatement	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.				
Sembabule 184.5 PS2	PS2	Visual intrusion of project components into landscape	Change of views	Reinstatement plan	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.	Before and after photographs with regard to contouring, drainage, waste and debris.	No significant change	Weekly during reinstatement.	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
TBC Side Slope Areas with Permanent Benching	Side Slope Areas with Permanent Benching	Visual intrusion of project components into landscape	Change of landscape character	Reinstatement plan Soil management plan	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location • the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.	Before and after photographs with regard to contouring, drainage, waste and debris.	No significant change	Weekly during reinstatement	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU
TBC Side Slope Areas with Permanent Benching	Side Slope Areas with Permanent Benching	Visual intrusion of project components into landscape	Change of views	Reinstatement plan Soil management plan	A strategy for tree removal and replanting will be developed; the strategy will consider: • where trees are to be removed, the species and size/age of trees that will be recorded prior to removal; data to be recorded includes: trunk diameter at chest height, number of each species, species and, location	Before and after photographs with regard to contouring, drainage, waste and debris.	No significant change	Weekly during reinstatement	Project and Project contractors; Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• the number of trees and species to be removed during construction • conservation value of the species to be removed • variety of species to be replanted • provenance of species used for replanting • the region-specific environmental characteristics influencing replanting success. Preconstruction surveys will be referred to when deciding suitable locations for replanting of translocated species or species planted to compensate for those removed during construction. Before construction personnel and equipment are demobilised, temporary buildings and equipment, aboveground and belowground infrastructure, utilities, tools and any excess material brought onsite or generated during construction and commissioning will be removed. All off ROW sites impacted upon will be reinstated to meet pre-entry agreements with the landowner and in accordance with location-specific reinstatement method statements or plans to be prepared and implemented. Location-specific closeout reports, including photographs, will be produced to document the condition of temporary sites at handover following reinstatement. A preconstruction survey, including photographs, will be undertaken to document the condition of the land on which the RoW, construction and permanent facilities and access roads will be located. The survey will include immovable assets, crops and any remediation required to the land before construction. The survey will: • provide baseline evidence in the event of a claim for damage • identify existing contamination such as illegal disposal • inform pre-entry agreements including: o agreement for temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing) o reinstatement requirements. Pre-entry agreements will be made with landowners, including reinstatement requirements, prior to access onto a site.				bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU
Kakumiro 41 MCPY1	MCPY1	Release of gases, exhausts and vapours to atmosphere	Emissions of gaseous substances causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan.	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.				review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD (OSH Department)
Mubende 124.6 MCPY2	MCPY2	Release of gases, exhausts and vapours to atmosphere	Emissions of gaseous substances causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Release of gases, exhausts and vapours to atmosphere	Emissions of gaseous substances causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									Officers, PAU, OSH Department - MGLSD
Kyotera 288 MCPY4	MCPY4	Release of gases, exhausts and vapours to atmosphere	Emissions of gaseous substances causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
TBC TBC Hydrotest Sections	Hydrotest Sections	Release of gases, exhausts and vapours to atmosphere	Emissions of gaseous substances causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Kakumiro 41 MCPY1	MCPY1	Release of gases, exhausts and vapours to atmosphere	Emissions of fine particulate matter causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Mubende 124.6 MCPY2	MCPY2	Release of gases, exhausts and vapours to atmosphere	Emissions of fine particulate matter causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Release of gases, exhausts and	Emissions of fine particulate matter causing reduced air quality from	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		vapours to atmosphere	operation of generators		• be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.				Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Kyotera 288 MCPY4	MCPY4	Release of gases, exhausts and vapours to atmosphere	Emissions of fine particulate matter causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan.	Weekly	Project and Project contractors; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
TBC Hydrotest Sections	Hydrotest Sections	Release of gases, exhausts and vapours to atmosphere	Emissions of fine particulate matter causing reduced air quality from operation of generators	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions	Zero noncompliance with pollution prevention plan	Zero noncompliance with pollution prevention plan	Weekly	Project and Project contractors; Government bodies who may conduct

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.				independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Kakumiro 41 MCPY1	MCPY1	Dust	Nuisance from mobilisation of dust by project vehicles	Pollution Prevention Plan Traffic and Road Safety Management Plan	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Implementation of dust suppression measures Site verification Number of related complaints	Zero noncompliance with dust suppression measures described in the Pollution Prevention Plan Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement	Weekly - site verification Monthly - complaints, documentation	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Mubende 124.6 MCPY2	MCPY2	Dust	Nuisance from mobilisation of dust by project vehicles	Pollution Prevention Plan Traffic and Road Safety Management Plan	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Implementation of dust suppression measures Site verification Number of related complaints	Zero noncompliance with dust suppression measures described in the Pollution Prevention Plan Continuous improvement on percentage of unresolved complaints on	Weekly - site verification Monthly - complaints, documentation	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
							project vehicle dust emissions after Project has proposed solution/s during engagement		review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Dust	Nuisance from mobilisation of dust by project vehicles	Pollution Prevention Plan Traffic and Road Safety Management Plan	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Implementation of dust suppression measures Site verification Number of related complaints	Zero noncompliance with dust suppression measures described in the Pollution Prevention Plan Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement.	Weekly - site verification Monthly - complaints, documentation	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Kyotera 288 MCPY4	MCPY4	Dust	Nuisance from mobilisation of dust by project vehicles	Pollution Prevention Plan Traffic and Road Safety Management Plan	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Implementation of dust suppression measures Site verification Number of related complaints	Zero noncompliance with dust suppression measures described in the Pollution Prevention Plan Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has	Weekly - site verification Monthly - complaints, documentation	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
							proposed solution/s during engagement		include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
TBC Hydrotest Sections	Hydrotest Sections	Dust	Nuisance from mobilisation of dust by project vehicles	Pollution Prevention Plan Traffic and Road Safety Management Plan	Where construction generated dust may affect sensitive receptors, the following mitigation measures will be considered: • dust suppression at work-sites and transport routes • adherence to RoW speed limits supplemented by awareness training • sheeting of fine materials being transported or stored on-site	Implementation of dust suppression measures Site verification Number of related complaints	Zero noncompliance with dust suppression measures described in the Pollution Prevention Plan Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement	Weekly - site verification Monthly - complaints, documentation	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, OSH Department - MGLSD
Kakumiro 41 MCPY1	MCPY1	Noise	Disturbance or nuisance from noise generation during development of construction facilities	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.		maintenance of combustion equipment.		District Environment Officers, OSH Department - MGLSD
Mubende 124.6 MCPY2	MCPY2	Noise	Disturbance or nuisance from noise generation during development of construction facilities	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Noise	Disturbance or nuisance from noise generation during development of construction facilities	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use."		combustion equipment.		Officers, OSH Department - MGLSD
Kyotera 288 MCPY4	MCPY4	Noise	Disturbance or nuisance from noise generation during development of construction facilities	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Kakumiro 41 MCPY1	MCPY1	Vibration	Disturbance or damage due to noise or vibration generation during development of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Preconstruction record of condition. Documentation demonstrating noise and vibration assessments have been completed. Number of related complaints	Comprehensive preconstruction record of condition. Noise and vibration evaluations completed at sensitive receptors. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement	Once 30 days before construction commences for preconstruction record of condition and noise and vibration evaluations. Monthly for complaints.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									Department - MGLSD
Mubende 124.6 MCPY2	MCPY2	Vibration	Disturbance or damage due to noise or vibration generation during development of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Preconstruction record of condition. Documentation demonstrating noise and vibration assessments have been completed. Number of related complaints	Comprehensive preconstruction record of condition. Noise and vibration evaluations completed at sensitive receptors. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement	Once 30 days before construction commences for preconstruction record of condition and noise and vibration evaluations. Monthly for complaints.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Vibration	Disturbance or damage due to noise or vibration generation during development of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Preconstruction record of condition. Documentation demonstrating noise and vibration assessments have been completed. Number of related complaints	Comprehensive preconstruction record of condition. Noise and vibration evaluations completed at sensitive receptors. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement	Once 30 days before construction commences for preconstruction record of condition and noise and vibration evaluations. Monthly for complaints.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Kyotera 288 MCPY4	MCPY4	Vibration	Disturbance or damage due to noise or vibration generation during development of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Preconstruction record of condition. Documentation demonstrating noise and vibration assessments have been completed. Number of related complaints	Comprehensive preconstruction record of condition. Noise and vibration evaluations completed at sensitive receptors. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement	Once 30 days before construction commences for preconstruction record of condition and noise and vibration evaluations. Monthly for complaints.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Kakumiro 41 MCPY1	MCPY1	Noise	Disturbance or nuisance from operation of the MCPYs	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Mubende 124.6 MCPY2	MCPY2	Noise	Disturbance or nuisance from	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site.	Noise levels at sensitive receptors; field	Zero exceedance of project environmental	Weekly for noise level monitoring at sensitive	Project and Project contractors;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
			operation of the MCPYs		Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	receptors. Monthly for documentation.	Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Noise	Disturbance or nuisance from operation of the MCPYs	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Kyotera 288 MCPY4	MCPY4	Noise	Disturbance or nuisance from operation of the MCPYs	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Location specific assessments will be undertaken at sensitive	Noise levels at sensitive receptors; field verification. Number of related	Zero exceedance of project environmental standards. Continuous	Weekly for noise level monitoring at sensitive receptors.	Project and Project contractors;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					receptors in proximity to project activities occurring between 7 p.m. and 7 a.m. to identify appropriate mitigation where there is potential to cause disturbance from noise and vibration. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. "To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use."	complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Monthly for documentation.	Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Kakumiro 41 MCPY1	MCPY1	Noise	Disturbance or nuisance from noise generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Mubende 124.6 MCPY2	MCPY2	Noise	Disturbance or nuisance from noise generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.		bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Noise	Disturbance or nuisance from noise generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Kyotera 288 MCPY4	MCPY4	Noise	Disturbance or nuisance from noise generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	up to date on manufacturer's recommended maintenance and servicing.	engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.		monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Kakumiro 41 MCPY1	MCPY1	Vibration	Disturbance or damage from vibration generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Mubende 124.6 MCPY2	MCPY2	Vibration	Disturbance or damage from vibration generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	maintenance and servicing.	servicing and maintenance of combustion equipment.		District Environment Officers, OSH Department - MGLSD
Sembabule 184.5-191.2 MCPY3	MCPY3	Vibration	Disturbance or damage from vibration generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH Department - MGLSD
Kyotera 288 MCPY4	MCPY4	Vibration	Disturbance or damage from vibration generation during decommissioning of construction facilities	Pollution Prevention Plan	A preconstruction record of condition, including a photographic log, will be developed. The validity of any claims of damage resulting from project activities will be assessed against the preconstruction record of condition, repairs will be undertaken, or appropriate compensation paid if damage is proven. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. Activities that generate high levels of noise and vibration will be assessed to determine potential impacts and mitigation will be implemented where appropriate. Notifications of work will be given at least 72 hrs in advance of work to residents / occupants located within: • 100 m of RoW prior to trenching • 50 m of RoW prior to lowering and laying of pipe • 50 m of RoW prior to backfilling and compaction • 250 m of any road upgrades and new access roads.	Noise levels at sensitive receptors; field verification. Number of related complaints. Documentation to support that all combustion equipment on any Project or contractor site is up to date on manufacturer's recommended maintenance and servicing.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement. Zero noncompliance with scheduled servicing and maintenance of combustion equipment.	Weekly for noise level monitoring at sensitive receptors. Monthly for documentation.	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, OSH

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									Department - MGLSD
Hoima 0 Kayere	Kayere	Provision of Goods and Services	Improvements in road conditions for business owners and public transport	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Road traffic accidents and congestion	No annual increase in number of project related road traffic accidents No increases in project related road congestion	Quarterly	Project and project contractors; in consultation with respective utility service providers; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, OHS Department MGLSD, District Local Governments
Kakumiro 41 Katikara Trading Centre	Katikara Trading Centre	Employment	Competition over employment opportunities	Project-induced in-migration management plan. Stakeholder engagement plan.	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints.	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Quarterly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, District Local Governments

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary through targeted meetings scheduled at times and locations that may increase women's participation				
Mubende 125.5 Kyenda	Kyenda	Employment	Competition over employment opportunities	Project-induced in-migration management plan. Stakeholder engagement plan.	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary, through targeted meetings scheduled at times and locations that may increase women's participation	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints.	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement.	Quarterly	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, District Local Governments
Sembabule 190 Sembabule Market Zone	Sembabule Market Zone	Employment	Competition over employment opportunities	Project-induced in-migration management plan. Stakeholder engagement plan.	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement.	Quarterly.	Project and project contractors; Relevant Government agencies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary, through targeted meetings scheduled at times and locations that may increase women's participation	Number of related complaints.			review include: MEMD, PAU, MGLSD, District Local Governments
Kakumiro 61 Buswabwera	Buswabwera	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notification; grievance procedure; compensation process. Number of related complaints	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement	Quarterly	Project in consultation with respective utility service providers; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, Local police, District Local Governments
Mubende 111 Kabulasoke	Kabulasoke	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notification; grievance procedure; compensation process.	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement	Quarterly	Project in consultation with respective utility service providers; Relevant Government agencies who may

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Number of related complaints			conduct independent monitoring or review include: MEMD, PAU, Local police, District Local Governments
Gomba 160.5 Kyengera	Kyengera	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notification; grievance procedure; compensation process. Number of related complaints	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement	Quarterly	Project; in consultation with utility service providers; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, Local police, District Local Governments
Sembabule 189 Nsambya	Nsambya	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notification; grievance procedure; compensation process. Number of related complaints	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement	Quarterly	Project in consultation with utility service providers; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									Local police, District Local Governments
Lwengo 240 Bukulula	Bukulula	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notification; grievance procedure; compensation process. Number of related complaints	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement	Quarterly	Project in consultation with utility service providers; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, Local police, District Local Governments
Kyotera 287.5 Lukoma	Lukoma	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	Infrastructure and utilities management plan. Stakeholder engagement plan.	Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding: notification; grievance procedure; compensation process. Number of related complaints	Continuous improvement on percentage of unresolved complaints on employment after Project has proposed solution/s during engagement	Quarterly	Project in consultation with utility service providers; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, Local police, District Local Governments
Kyotera 295.5 Mutukula Town	Mutukula Town	Employment	Dissatisfaction arising from unmet expectations over the scale and	Stakeholder engagement plan. Project-induced in-migration	The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities. An approved recruitment procedure will be implemented that:	Documentation demonstrating worker awareness training on limited duration of	Full coverage of workforce training at start of employment. Continuous	Monthly	Project and Project contractors;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
			duration of project local employment opportunities	management plan.	• Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in PACs. Care will be taken to reach women and vulnerable groups if necessary, through targeted meetings scheduled at times and locations that may increase women's participation	employment and need to maintain existing livelihoods. Effective messaging to PACs (stakeholder engagement records). Number of related complaints.	improvement on percentage of unresolved related complaints after Project has proposed solution/s during engagement		Government agencies who may conduct independent monitoring or review include: MEMD, PAU, t MGLSD, District Local Governments
Kyotera 295.5 Mutukula Town	Mutukula Town	Employment	Competition over employment opportunities	Stakeholder engagement plan. Project-induced in-migration management plan.	An approved recruitment procedure will be implemented that: • Is transparent and open to all regardless of race, political opinion, colour, creed, sexuality or gender. • Includes a local recruitment strategy. • Considers social and cultural sensitivities. • Describes the employment criteria for the recruitment of professional, semiskilled and unskilled labour. • Prohibits discrimination or harassment of job applicants. Job descriptions will advertise vacancies in local languages in the PACs through accessible media and on the project website. Targets for local recruitment from project-affected communities will be set by the project. These will be designed to meet legal requirements. An employment office will be established in the local area to conduct local recruitment. A public awareness programme to communicate employment and training opportunities will be implemented that includes but is not limited to: • The local recruitment strategy. • Criteria for employment. • The number and types of employment opportunities. • The procedure for applying for employment. Information will be disseminated publicly, including via media announcements at regional and national levels and during public meetings in	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints.	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Quarterly	Project and Project contractors; Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, District Local Governments

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					PACs. Care will be taken to reach women and vulnerable groups if necessary, through targeted meetings scheduled at times and locations that may increase women's participation				
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government, MGLSD, MTWA
Mubende 125 PACs near MCPY2	PACs near MCPY2	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				MLHUD, Local Government, MGLSD, MTWA
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government, MGLSD, MTWA
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Loss/Severance of Land and Disruption to	Permanent loss of grazing land	Pollution prevention plan. Resettlement	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of	Effectiveness on stakeholder messaging (by feedback	Compensation process compliant with resettlement action plan.	Monthly	Project; Relevant

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
		Land-Based Livelihoods		action plan. Monitoring and reporting plan.	assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement		Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government, MGLSD, MTWA
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Employment	Household members seeking employment with the project will no longer be available for land-based livelihood activities	Stakeholder engagement plan. Labour management plan.	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment. The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities. A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints. Labour management plan is informed by preproject salary benchmarking.	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement. Preproject salary benchmarking is completed.	Quarterly for complaints. For benchmarking, 90 days prior to construction commencing.	Project and Project contractors; Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, District Local Governments
Mubende 125 PACs near MCPY2	PACs near MCPY2	Employment	Household members seeking employment with	Stakeholder engagement plan. Labour	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary	Effectiveness on stakeholder messaging (by feedback	Continuous improvement on percentage of unresolved	Quarterly for complaints. For benchmarking, 90	Project and Project contractors;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
			the project will no longer be available for land-based livelihood activities	management plan.	and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment. The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities. A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.	templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints. Labour management plan is informed by preproject salary benchmarking.	complaints after Project has proposed solution/s during engagement. Preproject salary benchmarking is completed.	days prior to construction commencing.	Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD; District Local Governments
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Employment	Household members seeking employment with the project will no longer be available for land-based livelihood activities	Stakeholder engagement plan. Labour management plan.	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment. The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities. A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints. Labour management plan is informed by pre-project salary benchmarking.	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement. Pre-project salary benchmarking is completed.	Quarterly for complaints. For benchmarking, 90 days prior to construction commencing.	Project and Project contractors; Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, District Local Governments
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Employment	Household members seeking employment with the project will no longer be available for land-based livelihood activities	Stakeholder engagement plan. Labour management plan.	Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods during this period and prepare through sound financial management for the ultimate termination of their employment. The Project will develop a campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities. A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - recruitment opportunities and process - grievance procedure Number of related complaints. Labour management plan	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement. Pre-project salary benchmarking is completed.	Quarterly for complaints. For benchmarking, 90 days prior to construction commencing.	Project and Project contractors; Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
						is informed by pre-project salary benchmarking.			District Local Governments
Hoima, Kakumiro and Lwengo 0-240 PACs located in areas of high value crop production	PACs located in areas of high value crop production	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of land cultivated with high value cash crops	Resettlement action plan. Stakeholder engagement plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government, MGLSD
Kakumiro, Kyankwanzi and Mubende 69-112 PACs where there is a concentration of gold ASM activities	PACs where there is a concentration of gold ASM activities	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of access to artisanal gold mining sites	Resettlement action plan. Stakeholder engagement plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				MLHUD, Local Government. MGLSD
Kakumiro, Gomba, Sembabule, Lwengo, Kyotera 53-289 PACs close to livestock watering points identified within the RoW	PACs close to livestock watering points identified within the RoW	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Temporary loss of access to livestock watering points	Resettlement action plan. Stakeholder engagement plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Number of related complaints	Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Quarterly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government, MGLSD
Hoima 0 PACs near PS1	PACs near PS1	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	Pollution prevention plan. Resettlement action plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				MLHUD, Local Government, MGLSD
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	PIIM	Reduction in local fish stocks due to PIIM	Project-induced in-migration management plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Settlements developing around or near camps and AGIs. Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding project opportunities.	Zero unplanned settlements.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MAAIF, WMD, MLHUD
Mubende 125 PACs near MCPY2	PACs near MCPY2	PIIM	Reduction in local fish stocks due to PIIM	Project-induced in-migration management plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Settlements developing around or near camps and AGIs. Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding project opportunities.	Zero unplanned settlements.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MAAIF, WMD, MLHUD

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	PIIM	Reduction in local fish stocks due to PIIM	Project-induced in-migration management plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Settlements developing around or near camps and AGIs. Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding project opportunities.	Zero unplanned settlements.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MAAIF, WMD, MLHUD
Kyotera 283 PACs near MCPY4	PACs near MCPY4	PIIM	Reduction in local fish stocks due to PIIM	Project-induced in-migration management plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Settlements developing around or near camps and AGIs. Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding project opportunities.	Zero unplanned settlements.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MAAIF, WMD, MLHUD
Hoima, Kakumiro, Mubende, Gomba, Sembabule, Kyotera 36.5-274 PACs close to pipeline river crossings	PACs close to pipeline river crossings	Impeded flow of river or channel	Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction.	Pollution prevention plan. Reinstatement plan.	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Procedures will be developed, incorporating plans for erosion and sediment control and reinstatement. These will be produced before work begins at areas of fragile, sensitive or thin topsoil, side slopes or narrow ridges and at watercourse crossings. Sediment interception measures will be installed, inspected and maintained to prevent sediment runoff from the right-of-way or construction sites affecting watercourses, wetlands, waterbodies or environmentally sensitive areas. Procedures will include additional precautions to be taken and	Documentation (records, reports etc) demonstrating that location specific method statements have been implemented Number of related complaints	Continuous improvement on percentage of unresolved complaints on water-based livelihoods after Project has proposed solution/s during engagement	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					increased monitoring (minimum twice per week), with the aim of preserving the topsoil for subsequent replacement. Location-specific method statements will be produced for watercourse crossing construction. These method statements will incorporate plans for: • erosion control • sediment control • maintaining environmental base flows downstream of water crossings for example by using measures such as pumping, channel diversions and fluming • notifying fisherfolk as appropriate • reinstatement • spill response equipment. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.				PAU, District Environment Officers, DWRM, WMD, MAAIF
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Resettlement	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement.	Monthly	Project and other developers in the AoI; Relevant Government bodies who may conduct independent monitoring or review the data

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.				include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Mubende 125 PACs near MCPY2	PACs near MCPY2	Resettlement	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in the AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Resettlement	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed	Monthly	Project and other developers in the AoI; Relevant Government bodies who may

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Compensation records Number of related complaints	solution/s during engagement		conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Resettlement	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in the AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Resettlement	Land speculation by third parties	Resettlement action plan. Stakeholder engagement plan. Community health, safety	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of	Monthly	Project; Relevant Government bodies who may

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				and security plan. Monitoring and reporting plan.	compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	unresolved complaints after Project has proposed solution/s during engagement		conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Mubende 125 PACs near MCPY2	PACs near MCPY2	Resettlement	Land speculation by third parties	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					(such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Resettlement	Land speculation by third parties	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kyotera 283	PACs near MCPY4	Resettlement	Land speculation by third parties	Resettlement action plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry	Effectiveness on stakeholder	Zero noncompliance	Monthly	Project;

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
PACs near MCPY4				Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement		Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Resettlement	Land and property speculation by land owners	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation.	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Number of related complaints			Local Government
Mubende 125 PACs near MCPY2	PACs near MCPY2	Resettlement	Land and property speculation by land owners	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Resettlement	Land and property speculation by land owners	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Resettlement	Land and property speculation by land owners	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed	Monthly	Project' Relevant Government bodies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Project liaising with authorities regarding land and property speculation. Number of related complaints	solution/s during engagement		review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding disputes and conflict. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government, Local police

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Mubende 125 PACs near MCPY2	PACs near MCPY2	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding disputes and conflict. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government, Local police
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding disputes and conflict. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.				Government, Local police
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding disputes and conflict. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government, Local police
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Resettlement	Permanent loss of physical structures due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				Local Government
Mubende 125 PACs near MCPY2	PACs near MCPY2	Resettlement	Permanent loss of physical structures due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Resettlement	Permanent loss of physical structures due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of	Monthly	Project; Relevant Government bodies who may

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				and security plan. Monitoring and reporting plan.	compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	- compensation process - grievance procedure Compensation records Number of related complaints	unresolved complaints after Project has proposed solution/s during engagement		conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Resettlement	Permanent loss of physical structures due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, Local Government

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Resettlement	Permanent loss of local enterprises due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Mubende 125 PACs near MCPY2	PACs near MCPY2	Resettlement	Permanent loss of local enterprises due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU,

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Number of related complaints			MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Resettlement	Permanent loss of local enterprises due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kyotera 283	PACs near MCPY4	Resettlement	Permanent loss of local	Resettlement action plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry	Effectiveness on stakeholder	Compensation process compliant	Monthly	Project.

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
PACs near MCPY4			enterprises due to project land acquisition	Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement		Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Hoima 15-22.5 PACs located between KP15 to KP22.5	PACs located between KP15 to KP22.5	Resettlement	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in the AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.				Local Government
Kyankwanzi 75-82.5 PACs located between KP75 to KP82.5	PACs located between KP75 to KP82.5	Resettlement	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in the AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Mubende 90-97.5 PACs located between KP90 to KP97.5	PACs located between KP90 to KP97.5	Resettlement	Permanent loss of private land due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in the AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.				MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Kyankwanzi 75-82.5 PACs located between KP75 to KP82.5	PACs located between KP75 to KP82.5	Resettlement	Permanent loss of physical structures due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process - grievance procedure Compensation records Number of related complaints	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Mubende 90-97.5 PACs located between KP90 to KP97.5	PACs located between KP90 to KP97.5	Resettlement	Permanent loss of physical structures due to project land acquisition	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding - compensation process	Compensation process compliant with resettlement action plan. Continuous improvement on percentage of unresolved complaints after	Monthly	Project; Relevant Government bodies who may conduct

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Monitoring and reporting plan.	restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.	- grievance procedure Compensation records Number of related complaints	Project has proposed solution/s during engagement		independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government
Hoima 0.5-15 PACs located between KP0.5 and KP15	PACs located between KP0.5 and KP15	Resettlement	Land speculation by third parties	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed. Ensure that benefits for spouses or dependants of employees (such as health insurance or pension schemes) are offered on a non-discriminatory basis. A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding land and property speculation. Stakeholder records that demonstrate Project liaising with authorities regarding land and property speculation. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government, Local police

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.				
Hoima 0.5-15 PACs located between KP0.5 and KP15	PACs located between KP0.5 and KP15	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding disputes and conflict. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in AoI; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government, Local police
Sembabule 190 Sembabule Market Zone	Sembabule Market Zone	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	Resettlement action plan. Stakeholder engagement plan. Community health, safety and security plan. Monitoring and reporting plan.	The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants. Objectives are expected to include: creation of a governance structure; assessment of regional cumulative impacts based on collective baseline data and ESIAs that have been prepared for projects in the region; establishment and monitoring of environmental and social thresholds; collaborative development of cumulative impact management plans and mitigation measures. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry	Effectiveness on stakeholder messaging (by feedback templates or interviews) regarding disputes and conflict. Number of related complaints	Zero noncompliance with stakeholder engagement plan. Continuous improvement on percentage of unresolved complaints after Project has proposed solution/s during engagement	Monthly	Project and other developers in AoI; Relevant Government bodies who may conduct independent monitoring or review the data

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels.				include: PAU, MEMD, NEMA, MLHUD, MGLSD, MTWA, District Local Government, Local police
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Employment	Increased risk of vector-related diseases amongst the local workforce	Occupational health, safety and security plan	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Mubende 125 PACs near MCPY2	PACs near MCPY2	Employment	Increased risk of vector-related diseases amongst the local workforce	Occupational health, safety and security plan	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									Local Government, OSH Department - MGLSD, Ministry of Health
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Employment	Increased risk of vector-related diseases amongst the local workforce	Occupational health, safety and security plan	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Employment	Increased risk of vector-related diseases amongst the local workforce	Occupational health, safety and security plan	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									Department - MGLSD, Ministry of Health
Kakumiro 41 Katikara Trading Centre	Katikara Trading Centre	Use of Road Network	Traffic congestion leading to delays	Stakeholder engagement plan. Transport and road safety management plan.	Where a safety risk assessment has identified a potential for construction interfaces to cause traffic accidents, temporary traffic control measures (signage, flagmen, temporary traffic lights, barricades) will be implemented. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner. An initial survey, supported by photographs, will be completed of the condition of roads to be used by the project including but limited to bridges, drainage structures, signage, traffic management and other road infrastructure. The survey will be agreed and signed by the road authority, local authority and any affected landowner. The survey will be made available to the road authority and municipal authorities if requested. The chosen project access routes will be improved as required to provide safe access for the project duration.	Documentation supporting journey management	Zero noncompliance with the Stakeholder Engagement Plan and the Transport and the Road Safety Management Plan	Weekly whilst heavy loads are being transported Monthly thereafter	Project in consultation with respective utility service providers; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, District Local Government, UNRA, local police
Mubende 125.5 Kyenda	Kyenda	Use of Road Network	Traffic congestion leading to delays	Stakeholder engagement plan. Transport and road safety management plan.	Where a safety risk assessment has identified a potential for construction interfaces to cause traffic accidents, temporary traffic control measures (signage, flagmen, temporary traffic lights, barricades) will be implemented. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Any planned diversion of utility services, closures of any road	Documentation supporting journey management	Zero noncompliance with the Stakeholder Engagement Plan and the Transport and the Road Safety Management Plan	Weekly whilst heavy loads are being transported Monthly thereafter	Project in consultation with respective utility service providers; Relevant Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner. An initial survey, supported by photographs, will be completed of the condition of roads to be used by the project including but limited to bridges, drainage structures, signage, traffic management and other road infrastructure. The survey will be agreed and signed by the road authority, local authority and any affected landowner. The survey will be made available to the road authority and municipal authorities if requested. The chosen project access routes will be improved as required to provide safe access for the project duration.				bodies that may conduct independent monitoring or review the data include: PAU, MEMD, District Local Government, UNRA, local police
Sembabule 190 Sembabule Market Zone	Sembabule Market Zone	Use of Road Network	Traffic congestion leading to delays	Stakeholder engagement plan. Transport and road safety management plan.	Where a safety risk assessment has identified a potential for construction interfaces to cause traffic accidents, temporary traffic control measures (signage, flagmen, temporary traffic lights, barricades) will be implemented. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the	Documentation supporting journey management	Zero noncompliance with the Stakeholder Engagement Plan and the Transport and the Road Safety Management Plan	Weekly whilst heavy loads are being transported Monthly thereafter	Project in consultation with respective utility service providers; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, District Local Government, UNRA, local police

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner. An initial survey, supported by photographs, will be completed of the condition of roads to be used by the project including but limited to bridges, drainage structures, signage, traffic management and other road infrastructure. The survey will be agreed and signed by the road authority, local authority and any affected landowner. The survey will be made available to the road authority and municipal authorities if requested. The chosen project access routes will be improved as required to provide safe access for the project duration.				
Kyotera 295.5 Mutukula Town	Mutukula Town	Use of Road Network	Traffic congestion leading to delays	Stakeholder engagement plan. Transport and road safety management plan.	Where a safety risk assessment has identified a potential for construction interfaces to cause traffic accidents, temporary traffic control measures (signage, flagmen, temporary traffic lights, barricades) will be implemented. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Any planned diversion of utility services, closures of any road or track, or planned traffic diversions will be communicated to local authorities and affected communities at least 72 hours before the works. Information provided to the community will include (as relevant to the diversion) but not be limited to details of the timing and duration of the diversion; the route of traffic diversions; and traffic control measures for road crossings where delays and public safety are key factors. A post-construction exit survey will be conducted covering all areas surveyed during preconstruction (and any additional land requirements during construction) to assess the condition of dwellings, roads used including bridges, drainage structures, signage, traffic management and other road infrastructure. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, village or landowner. An initial survey, supported by photographs, will be completed of the condition of roads to be used by the project including but limited to bridges, drainage structures, signage, traffic management and other road infrastructure. The survey will be agreed and signed by the road authority, local authority and any affected landowner. The survey will be made available to the road authority and municipal authorities if requested. The chosen project access routes will be improved as required to provide safe access for the project duration.	Documentation supporting journey management	Zero noncompliance with the Stakeholder Engagement Plan and the Transport and the Road Safety Management Plan	Weekly whilst heavy loads are being transported Monthly thereafter	Project in consultation with respective utility service providers; Relevant Government bodies that may conduct independent monitoring or review the data include: PAU, MEMD, District Local Government, UNRA, local police

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Abstraction of Groundwater	Reduced availability of groundwater	Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	Abstraction volumes, Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment and Natural Resources Officers, DWRM
Mubende 125 PACs near MCPY2	PACs near MCPY2	Abstraction of Groundwater	Reduced availability of groundwater	Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	Abstraction volumes, Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment and Natural Resources Officers, DWRM
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Abstraction of Groundwater	Reduced availability of groundwater	Natural resources management plan. Pollution prevention	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and	Abstraction volumes, Documentation (reports, checklists, etc)	Zero noncompliance with water abstraction permit or the Natural	Weekly – during water abstraction activities.	Project; Relevant Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				plan. Waste management plan. Stakeholder engagement plan.	these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	demonstrating that water-use checks have occurred and are within permit conditions.	Resource Management Plan.		bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment and Natural Resources Officers, DWRM
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Abstraction of Groundwater	Reduced availability of groundwater	Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered and these alternative locations will be subject to the same testing and impact assessment process. Groundwater levels will be monitored once every two weeks by the Project at all sites where groundwater abstraction occurs for the project. The location of monitoring well(s) will be determined by a qualified hydrogeologist to ensure that they are installed in the correct formation and at the correct distance between project abstraction boreholes and community water points. If the local water supplies are derogated to the extent that complaints are made by the community as a result of project abstraction, then the Project will provide alternative water supplies at a convenient location for the community that is not or is less influenced by the project's abstraction.	Abstraction volumes; Documentation (reports, checklists, etc) demonstrating that water-use checks have occurred and are within permit conditions.	Zero noncompliance with water abstraction permit or the Natural Resource Management Plan.	Weekly – during water abstraction activities.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, PAU, MEMD, District Environment and Natural Resources Officers, DWRM
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Employment	The transmission of communicable diseases between the project's externally contracted workforce and PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health	Number of instances of communicable diseases in workforce per worksite, Trends in communicable diseases in PACs	No increase in communicable diseases of workforce by category and worksite against baseline	Monthly	Project and Project contractors; Relevant Government bodies who may conduct

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Mubende 125 PACs near MCPY2	PACs near MCPY2	Employment	The transmission of communicable diseases between the project’s externally contracted workforce and PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community	Number of instances of communicable diseases in workforce per worksite Trends in communicable diseases in PACs	No increase in communicable diseases of workforce by category and worksite against baseline	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				plan. Stakeholder engagement plan.	HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Employment	The transmission of communicable diseases between the project’s externally contracted workforce and PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme.	Number of instances of communicable diseases in workforce per worksite Trends in communicable diseases in PACs	No increase in communicable diseases of workforce by category and worksite against baseline	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. Construction camps will be designated as having "closed" status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				Local Government, OSH Department - MGLSD, Ministry of Health
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Employment	The transmission of communicable diseases between the project's externally contracted workforce and PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and	Number of instances of communicable diseases in workforce per worksite Trends in communicable diseases in PACs	No increase in communicable diseases of workforce by category and worksite against baseline	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department -

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					visitors. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				MGLSD, Ministry of Health
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Employment	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Mubende 125 PACs near MCPY2	PACs near MCPY2	Employment	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Employment	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department -

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									MGLSD, Ministry of Health
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Employment	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps. As part of the project OHSSP, vector management on all project sites will be risk based. Corridor controls for landscape maintenance, as well as integrated pest management procedures (environmental, biological and chemical), will be implemented. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies.	Documentation (records, reports etc) demonstrating that appropriate vector control management plans have been developed Instances of vector related medical cases	One health talk per month and full camp coverage of participation. Decreasing trend in vector related medical cases.	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Employment	Outbreaks of infectious conditions within MCPYs affecting the health of PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local	Communicable disease management plan provisions to prevent spread of infectious diseases.	No net increase in the incidence of communicable disease above background levels. Positive trend on worker suggestions for preventing diseases	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					workforce. This plan will apply to all project workers and visitors. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				Department - MGLSD, Ministry of Health
Mubende 125 PACs near MCPY2	PACs near MCPY2	Employment	Outbreaks of infectious conditions within MCPYs affecting the health of PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. Construction camps will be designated as having “closed”	Communicable disease management plan provisions to prevent spread of infectious diseases.	No net increase in the incidence of communicable disease above background levels. Positive trend on worker suggestions for preventing diseases	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Employment	Outbreaks of infectious conditions within MCPYs affecting the health of PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures.	Communicable disease management plan provisions to prevent spread of infectious diseases.	No net increase in the incidence of communicable disease above background levels. Positive trend on worker suggestions for preventing diseases	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Employment	Outbreaks of infectious conditions within MCPYs affecting the health of PACs	Community health, safety and security plan. Occupational health, safety and security plan. Natural resources management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the project OHSSP, a Communicable Disease Management Plan will be developed to manage infectious disease outbreaks in construction camps/MCPYs and prevention of spread to PACs. Pre-deployment screenings will be described in the LMP and communicated during the recruitment process As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with Health Management Teams (HMTs) which consider: • The development and implementation of a Community Malaria Control Programme. • The development and implementation of a Community HIV/TB Programme. • The development and implementation of a Community Water, Sanitation and Hygiene (WASH) Programme. A vaccination plan will be identified to prevent communicable diseases for which vaccinations are available from being transmitted between the national/international and local workforce. This plan will apply to all project workers and visitors. Construction camps will be designated as having “closed” status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health	Communicable disease management plan provisions to prevent spread of infectious diseases.	No net increase in the incidence of communicable disease above background levels. Positive trend on worker suggestions for preventing diseases	Monthly	Project and Project contractors; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, District Local Government, OSH Department - MGLSD, Ministry of Health

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction. As part of the project OHSSP, ensure that vector management on all project sites (camps and construction) align with national vector control programmes and strategies. As part of the OHSSP, a food and water management plan will be developed and implemented to reduce the risk of water- and food-borne disease outbreaks occurring among the workers and the associated risk of transmission to local communities.				
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	PIIM	PIIM of job seekers affecting PACs	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, OHS Department MGLSD, District Local Governments
Mubende 125 PACs near MCPY2	PACs near MCPY2	PIIM	PIIM of job seekers affecting PACs	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction.	feedback on project perception (via targeted questionnaire)			review include: MEMD, PAU, OHS Department MGLSD, District Local Governments
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	PIIM	PIIM of job seekers affecting PACs	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, OHS Department MGLSD, District Local Governments
Kyotera 283 PACs near MCPY4	PACs near MCPY4	PIIM	PIIM of job seekers affecting PACs	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan.	The Project will identify potential PIIM areas of concern and work with local leaders to establish mitigation measures that will include informing PACs of risks and opportunities associated with PIIM. A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	As part of the CHSSP, a cooperation agreement with the Council Health Management Teams (CHMT) will be reached including periodic meetings to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction.	feedback on project perception (via targeted questionnaire)			review include: MEMD, PAU, OHS Department MGLSD, District Local Governments
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	PIIM	Reduction in the availability of potable water in PACs due to PIIM	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, District Local Government, DWRM, NEMA
Mubende 125 PACs near MCPY2	PACs near MCPY2	PIIM	Reduction in the availability of potable water in PACs due to PIIM	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.		feedback on project perception (via targeted questionnaire)			review include: MEMD, PAU, District Local Government, DWRM, NEMA
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	PIIM	Reduction in the availability of potable water in PACs due to PIIM	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, District Local Government, DWRM, NEMA
Kyotera 283 PACs near MCPY4	PACs near MCPY4	PIIM	Reduction in the availability of potable water in PACs due to PIIM	Project-induced in-migration management plan. Community health, safety and security plan. Occupational health, safety and security plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.		feedback on project perception (via targeted questionnaire)			review include: MEMD, PAU, District Local Government, DWRM, NEMA
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Provision of Goods and Services	Nutrition of PACs compromised by reduced food security	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation demonstrating that community programmes have been developed and implemented Number of meetings with DHMTs per district Number of related complaints	At least one DHMT meeting every second month. Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement.	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD,
Mubende 125 PACs near MCPY2	PACs near MCPY2	Provision of Goods and Services	Nutrition of PACs compromised by reduced food security	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation demonstrating that community programmes have been developed and implemented Number of meetings with DHMTs per district Number of related complaints	At least one DHMT meeting every second month. Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement.	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD,

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
				management plan. Stakeholder engagement plan.					
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Provision of Goods and Services	Nutrition of PACs compromised by reduced food security	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation demonstrating that community programmes have been developed and implemented Number of meetings with DHMTs per district Number of related complaints	At least one DHMT meeting every second month. Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement.	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD,
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Provision of Goods and Services	Nutrition of PACs compromised by reduced food security	Community health, safety and security plan. Occupational health, safety and security plan. Resettlement action plan. Natural resource management plan. Pollution prevention plan. Waste management plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration.	Documentation demonstrating that community programmes have been developed and implemented Number of meetings with DHMTs per district Number of related complaints	At least one DHMT meeting every second month. Continuous improvement on percentage of unresolved complaints on project vehicle dust emissions after Project has proposed solution/s during engagement.	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD,
Kakumiro 40	PACs near MCPY1	Community Dynamics	Change in local community	Project-induced in-migration	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify	Documentation (records, reports,	Continuous improvement on	Monthly	Project;

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
PACs near MCPY1			dynamics due to employment opportunities	management plan. Community health, safety and security plan. Stakeholder engagement plan.	requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement		Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government
Mubende 125 PACs near MCPY2	PACs near MCPY2	Community Dynamics	Change in local community dynamics due to employment opportunities	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Community Dynamics	Change in local community dynamics due to employment opportunities	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Community Dynamics	Change in local community dynamics due to employment opportunities	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Community Dynamics	PIIM causing an increase in social ills	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government, Ministry of Health
Mubende 125 PACs near MCPY2	PACs near MCPY2	Community Dynamics	PIIM causing an increase in social ills	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include:

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					PACs that complaints related to interactions with public or private security forces will be addressed.	project perception (via targeted questionnaire)			MEMD, PAU, MGLSD, NEMA, District Local Government, Ministry of Health
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Community Dynamics	PIIM causing an increase in social ills	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government, Ministry of Health
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Community Dynamics	PIIM causing an increase in social ills	Project-induced in-migration management plan. Community health, safety and security plan. Stakeholder engagement plan.	A PIIMP will aim to reduce the number of people that arrive into project-affected communities; the PIIM will also identify requirements for: • Monitoring effects of in-migration and demographic change. • Monitoring relations between communities and in-migrants. • Education of project workers and local communities on impacts related to in-migration. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Documentation (records, reports, etc.) demonstrating that a PIIM management plan has been developed and implemented Number of related complaints Stakeholder feedback on project perception (via targeted questionnaire)	Continuous improvement on percentage of unresolved complaints on in-migration after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government, Ministry of Health
Kakumiro 40	PACs near MCPY1	Community Dynamics	Tensions between non-local construction	Community health, safety and security plan.	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also	Effectiveness of messaging (by feedback templates or	Continuous decrease in noncompliance with worker's code	Monthly	Project; Relevant

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
PACs near MCPY1			workforce and PACs	Stakeholder engagement plan. Resettlement action plan.	interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of noncompliance, workers will be disciplined in accordance with project disciplinary procedures and structures.	interviews) regarding implementation of workers' code of conduct on PACs, incoming workforce and local workforce (by category) Number of noncompliance with worker's code of conduct. Number of related complaints	of conduct. Continuous improvement on percentage of unresolved related complaints after Project has proposed solution/s during engagement		Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government, Local police
Mubende 125 PACs near MCPY2	PACs near MCPY2	Community Dynamics	Tensions between non-local construction workforce and PACs	Community health, safety and security plan. Stakeholder engagement plan. Resettlement action plan.	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of noncompliance, workers will be disciplined in accordance with project disciplinary procedures and structures.	Effectiveness of messaging (by feedback templates or interviews) regarding implementation of workers' code of conduct on PACs, incoming workforce and local workforce (by category) Number of noncompliance with worker's code of conduct. Number of related complaints	Continuous decrease in noncompliance with worker's code of conduct. Continuous improvement on percentage of unresolved related complaints after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, NEMA, District Local Government, Local police
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Community Dynamics	Tensions between non-local construction workforce and PACs	Community health, safety and security plan. Stakeholder engagement plan. Resettlement action plan.	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of noncompliance, workers will be disciplined in accordance with project disciplinary procedures and structures.	Effectiveness of messaging (by feedback templates or interviews) regarding implementation of workers' code of conduct on PACs, incoming workforce and local workforce (by category) Number of noncompliance with worker's code	Continuous decrease in noncompliance with worker's code of conduct. Continuous improvement on percentage of unresolved related complaints after Project has proposed solution/s during engagement	Monthly	Project and Project contractors; Relevant Government agencies who may conduct independent monitoring or review include:

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
						of conduct. Number of related complaints			MEMD, PAU, MGLSD, District Local Government, Local police
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Community Dynamics	Tensions between non-local construction workforce and PACs	Community health, safety and security plan. Stakeholder engagement plan. Resettlement action plan.	A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with unemployed PAC members. Compliance with the workers' code of conduct will be a contractual requirement for all contractor, including subcontractors' employees. In the event of noncompliance, workers will be disciplined in accordance with project disciplinary procedures and structures.	Effectiveness of messaging (by feedback templates or interviews) regarding implementation of workers' code of conduct on PACs, incoming workforce and local workforce (by category) Number of noncompliance with worker's code of conduct. Number of related complaints	Continuous decrease in noncompliance with worker's code of conduct. Continuous improvement on percentage of unresolved related complaints after Project has proposed solution/s during engagement	Monthly	Project and Project contractors; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, MGLSD, District Local Government, Local police
Kakumiro 40 PACs near MCPY1	PACs near MCPY1	Community Welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs	Stakeholder Engagement Plan	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Applicable stakeholder engagement records.	Zero significant residual impacts.	Once, during decommissioning of construction facilities	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, NEMA, District Local Government
Mubende 125 PACs near MCPY2	PACs near MCPY2	Community Welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs	Stakeholder Engagement Plan	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Applicable stakeholder engagement records.	Zero significant residual impacts.	Once, during decommissioning of construction facilities	Project; Relevant Government agencies who may conduct

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
									independent monitoring or review include: MEMD, PAU, NEMA, District Local Government
Sembabule 195.5 PACs near MCPY3	PACs near MCPY3	Community Welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs	Stakeholder Engagement Plan	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Applicable stakeholder engagement records.	Zero significant residual impacts.	Once, during decommissioning of construction facilities	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, NEMA, District Local Government
Kyotera 283 PACs near MCPY4	PACs near MCPY4	Community Welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs	Stakeholder Engagement Plan	A Stakeholder Engagement Plan will be developed and implemented, identifying how the Project will engage and consult with internal and external stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them on the project's environmental and social performance.	Applicable stakeholder engagement records.	Zero significant residual impacts.	Once, during decommissioning of construction facilities	Project; Relevant Government agencies who may conduct independent monitoring or review include: MEMD, PAU, NEMA, District Local Government
Hoima 11 CHU129: Pentecostal Church.	CHU129: Pentecostal Church.	Disturbance or loss of cultural heritage	Damage or disturbance of feature	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site	Compliance with the CHMP Documentation supporting that findings reported by the ICHM are evaluated and any necessary action required to protect	Zero noncompliance with the CHMP Full audit trail of findings to action	Every 3 months (quarterly)	Project; Relevant Government bodies including

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					• Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. Information on intangible cultural heritage (ICH) collected during the preconstruction survey will be evaluated and integrated into the cultural heritage management plan (CHMP). This will include information on vulnerable groups if present.	intangible cultural heritage is implemented			NEMA, MEMD, PAU, Ministry of Tourism, Wildlife and Antiquities (MTWA) Department of Museums and Monuments
Kakumiro 43.15 CUH441: Pentecostal Church.	CUH441: Pentecostal Church.	Disturbance or loss of cultural heritage	Damage or disturbance of feature	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets	Compliance with the CHMP Documentation supporting that findings reported by the ICHM are evaluated and any necessary action required to protect intangible cultural heritage is implemented	Zero noncompliance with the CHMP Full audit trail of findings to action	Every 3 months (quarterly)	Project; Relevant Government bodies including NEMA, MEMD, PAU, Ministry of Tourism, Wildlife

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KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. Information on intangible cultural heritage (ICH) collected during the preconstruction survey will be evaluated and integrated into the cultural heritage management plan (CHMP). This will include information on vulnerable groups if present.				and Antiquities (MTWA) Department of Museums and Monuments
Sembabule 184.8 CHU413: Kraal.	CHU413: Kraal.	Disturbance or loss of cultural heritage	Damage or disturbance of feature	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management	Compliance with the CHMP Documentation supporting that findings reported by the ICHM are evaluated and any necessary action required to protect intangible cultural heritage is implemented	Zero noncompliance with the CHMP Full audit trail of findings to action	Every 3 months (quarterly)	Project; Relevant Government bodies including NEMA, MEMD, PAU, Ministry of Tourism, Wildlife and Antiquities (MTWA) Department of

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					plan (CHMP) and any appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. Information on intangible cultural heritage (ICH) collected during the preconstruction survey will be evaluated and integrated into the cultural heritage management plan (CHMP). This will include information on vulnerable groups if present.				Museums and Monuments
Lwengo 226.5 CHU398: Kyawagonya Cemetery.	CHU398: Kyawagonya Cemetery.	Disturbance or loss of cultural heritage	Damage or disturbance of feature	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the	Compliance with the CHMP Documentation supporting that findings reported by the ICHM are evaluated and any necessary action required to protect intangible cultural heritage is implemented	Zero noncompliance with the CHMP Full audit trail of findings to action	Every 3 months (quarterly)	Project; Relevant Government bodies including NEMA, MEMD, PAU, Ministry of Tourism, Wildlife and Antiquities (MTWA) Department of Museums and Monuments

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

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					cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. Information on intangible cultural heritage (ICH) collected during the preconstruction survey will be evaluated and integrated into the cultural heritage management plan (CHMP). This will include information on vulnerable groups if present.				
Kyotera 244.6 CHU399: Kanga / Rusheshe cemetery.	CHU399: Kanga / Rusheshe cemetery.	Disturbance or loss of cultural heritage	Damage or disturbance of feature	Cultural Heritage Management Plan	A preconstruction survey of the RoW will be undertaken to collect data on location, extent and mitigation measures of known and unknown assets (tangible and intangible cultural heritage (TCH and ICH)) and to consult community leaders about ICH sites or practices not yet identified. A report including a GIS file will be prepared that will recommend location-specific actions to be undertaken that could include: • Avoidance of a site • Access constraints to reduce disturbance to a site • Excavation of a site • a watching brief during vegetation removal or topsoil stripping • requirements to maintain access to cultural heritage assets A schedule of sites and actions to be undertaken will be prepared and included in the cultural heritage management plan (CHMP) and any appropriate licences obtained. A senior cultural heritage monitor (SCHM) will ensure that the cultural heritage management plan (CHMP) will be implemented, in agreement with relevant government authorities, in advance of construction. The CHMP will include a chance finds procedure. The cultural heritage team will	Compliance with the CHMP Documentation supporting that findings reported by the ICHM are evaluated and any necessary action required to protect intangible cultural heritage is implemented	Zero noncompliance with the CHMP Full audit trail of findings to action	Every 3 months (quarterly)	Project; Relevant Government bodies including NEMA, MEMD, PAU, Ministry of Tourism, Wildlife and Antiquities (MTWA) Department of Museums and Monuments

Table J1.2-1 Location-Specific ESMP Matrix – Construction Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
					schedule regular meetings and progress reports so that government authorities and appropriate community leaders are kept informed, including: • regular report on progress of excavations • a post-excavation assessment report • a research archive • a final publication of results of tangible or intangible heritage investigations as appropriate to the significance of the outcomes. • chance finds reports will be provided to the government authority and relevant stakeholders. The SCHM will be supported by a tangible cultural heritage monitor (TCHM) and an intangible cultural heritage monitor (ICHM) to evaluate the effectiveness of the cultural heritage protection measures and deliver awareness training for all project personnel. Information on intangible cultural heritage (ICH) collected during the preconstruction survey will be evaluated and integrated into the cultural heritage management plan (CHMP). This will include information on vulnerable groups if present.				

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 4.5-8 Wambabya FR	Wambabya FR	Loss of Habitat and Disturbance or Harm to Wildlife	Loss of ecological function and integrity of protected site through impacts on species and habitats	Biodiversity Management Plan	All mitigation described in the biodiversity management plan and the pollution prevention plan will contribute to control this impact. NOTE: correct implementation of construction phase mitigation will contribute to the operational phase control of this impact.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement.	Reinstatement completed according to reinstatement plan.	Monthly until reinstated vegetation reaches maturity.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment and Natural Resources Officers, PAU, NFA
Kyankwanzi 78-82 Taala FR	Taala FR	Loss of Habitat and Disturbance or Harm to Wildlife	Loss of ecological function and integrity of protected site through impacts on species and habitats	Biodiversity Management Plan	All mitigation described in the biodiversity management plan and the pollution prevention plan will contribute to control this impact. NOTE: correct implementation of construction phase mitigation will contribute to the operational phase control of this impact.	Comprehensive data records from supplementary preconstruction surveys Compliance with site-specific management plans. Reinstatement.	Reinstatement completed according to reinstatement plan.	Monthly until reinstated vegetation reaches maturity.	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, UWA, District Environment and Natural Resources Officers, PAU, NFA

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0 PS1	PS1	Visual intrusion of project components into landscape	Change of landscape character	Reinstatement plan Pollution prevention plan	NOTE: correct implementation of this construction phase mitigation will manage this impact.	Restored vegetation in terms of floral diversity, density and cover.	Floral species diversity, density and cover meets reinstatement objectives.	Weekly until vegetation is established in reinstated areas; twice yearly there-after	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU
Sembabule 184.5 PS2	PS2	Visual intrusion of project components into landscape	Change of landscape character	Reinstatement plan Pollution prevention plan	NOTE: correct implementation of this construction phase mitigation will manage this impact.	Restored vegetation in terms of floral diversity, density and cover.	Floral species diversity, density and cover meets reinstatement objectives.	Weekly until vegetation is established in reinstated areas; twice yearly there-after	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0 PS1	PS1	Visual intrusion of project components into landscape	Change of views	Reinstatement plan Pollution prevention plan	NOTE: correct implementation of this construction phase mitigation will manage this impact.	Restored vegetation in terms of floral diversity, density and cover.	Floral species diversity, density and cover meets reinstatement objectives.	Weekly until vegetation is established in reinstated areas; twice yearly there-after	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU
Sembabule 184.5 PS2	PS2	Visual intrusion of project components into landscape	Change of views	Reinstatement plan Pollution prevention plan	NOTE: correct implementation of this construction phase mitigation will manage this impact.	Restored vegetation in terms of floral diversity, density and cover.	Floral species diversity, density and cover meets reinstatement objectives.	Weekly until vegetation is established in reinstated areas; twice yearly there-after	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0 PS1	PS1	Release of gases, exhausts and vapours to atmosphere	Increased NO_2 concentrations at ground level from operation of bulk heaters (long and short term)	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Atmospheric emissions	No exceedance of national regulations and project environmental standards with regards to air quality and emission limits.	Annually	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD (OSH Department)
Sembabule 184.5 PS2	PS2	Release of gases, exhausts and vapours to atmosphere	Increased NO_2 concentrations at ground level from operation of bulk heaters (long and short term)	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Atmospheric emissions	No exceedance of national regulations and project environmental standards with regards to air quality and emission limits.	Annually	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD (OSH Department)

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0 PS1	PS1	Release of gases, exhausts and vapours to atmosphere	Increased $PM_{2.5}$ and PM_{10} concentrations at ground level from operation of bulk heaters (long and short term)	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Atmospheric emissions	No exceedance of national regulations and project environmental standards with regards to air quality and emission limits.	Annually	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD (OSH Department)
Sembabule 184.5 PS2	PS2	Release of gases, exhausts and vapours to atmosphere	Increased $PM_{2.5}$ and PM_{10} concentrations at ground level from operation of bulk heaters (long and short term)	Pollution Prevention Plan	To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use. Vehicles or equipment seen to be emitting excessive black smoke will not be permitted to continue work and will be sent for maintenance.	Atmospheric emissions	No exceedance of national regulations and project environmental standards with regards to air quality and emission limits.	Annually	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD (OSH Department)

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0 PS1	PS1	Noise	Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations.	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement.	Monthly for complaints. Annually for verification.	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD (OSH Department)
Sembabule 184.5 PS2	PS2	Noise	Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations.	Pollution Prevention Plan	Project noise emissions will not result in an exceedance of PES or national legislative noise criteria at any existing sensitive receptor site. Preference will be given to selecting low noise and vibration emitting equipment for all construction works. To minimise emissions to air, vehicles, machines and equipment will: • be appropriate for the task required • have a valid maintenance and inspection certificate or log books • be allocated a unique identifier to be used in a maintenance log • be maintained regularly in accordance with the manufacturer's recommendations to maximise fuel efficiency and help reduce emissions • not be allowed to idle – engines will be switched off when not in use.	Noise levels at sensitive receptors; field verification. Number of related complaints.	Zero exceedance of project environmental standards. Continuous improvement on percentage of unresolved complaints on noise after Project has proposed solution/s during engagement.	Monthly for complaints. Annually for verification.	Project; Government bodies who may conduct independent monitoring or review the data include: NEMA, MEMD, District Environment Officers, PAU, MGLSD (OSH Department)

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0 PACs near PS1	PACs near PS1	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Accidental damage to crops during maintenance activities	Stakeholder engagement plan. Resettlement action plan.	If project activities affect land-based livelihoods because of interruption to irrigation, drainage or agricultural production, appropriate compensation will be provided in accordance with the RAP. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Number of related complaints Stakeholder records demonstrating effective messaging addressing the grievance procedure.	Continuous improvement on percentage of unresolved complaints on appropriate compensation after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government
Sembabule 184.5 PACs near PS2	PACs near PS2	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Accidental damage to crops during maintenance activities	Stakeholder engagement plan. Resettlement action plan.	If project activities affect land-based livelihoods because of interruption to irrigation, drainage or agricultural production, appropriate compensation will be provided in accordance with the RAP. A Resettlement Policy Framework (RPF) has been developed in line with national legislation, Good International Industry Practice (GIIP) and IFC Performance Standard 5. The RPF will outline procedures related to compensation for loss of assets and livelihood restoration. A Resettlement Action Plan (RAP) will describe the modalities of identifying Project Affected People (PAP) and the procedures related to compensation for loss of assets and livelihood restoration strategies. Post resettlement monitoring of livelihood restoration measures will be implemented. Additional measures will be developed and implemented where necessary to ensure livelihoods are restored as a minimum to pre-project levels. The Project will implement a grievance procedure to provide opportunities for PACs to express grievances about project activities. The grievance process will be communicated to and promoted within all PACs; it will be clearly communicated to PACs that complaints related to interactions with public or private security forces will be addressed.	Number of related complaints Stakeholder records demonstrating effective messaging addressing the grievance procedure.	Continuous improvement on percentage of unresolved complaints on appropriate compensation after Project has proposed solution/s during engagement	Monthly	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: PAU, MEMD, NEMA, MLHUD, Local Government

Table J1.2-2 Location-Specific ESMP Matrix – Operational Phase

KP Location	Landmark	Aspect	Potential Impact	Management Plan	Mitigation Measure	Parameter to be monitored	Performance Indicators/Targets or Acceptance Criteria	Monitoring Frequency	Responsibility
Hoima 0 PACs near PS1	PACs near PS1	Disposal of Solid and Liquid Waste	Increased pressure on regional waste management facilities due to project activities	Waste management plan.	Compliance with waste management plan	Documentation (reports, records, etc) supporting that audits of waste facilities being used by the project are completed	Zero noncompliance Waste Management Plan	Every 6 months	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: MEMD, NEMA, Local Government
Sembabule 184.5 PACs near PS2	PACs near PS2	Disposal of Solid and Liquid Waste	Increased pressure on regional waste management facilities due to project activities	Waste management plan.	Compliance with waste management plan	Documentation (reports, records, etc) supporting that audits of waste facilities being used by the project are completed	Zero noncompliance Waste Management Plan	Every 6 months	Project; Relevant Government bodies who may conduct independent monitoring or review the data include: MEMD, NEMA, Local Government

J2 MONITORING PARAMETERS

EACOP has prepared a project environmental standards (PES) document (see Appendix F) that proposes project-wide standards based on national and international standards applicable at the time of writing. The PES, together with any applicable new legislation, the requirements of permits, licences and approvals obtained for the project and requirements for monitoring contained within the commitments register form the framework for project compliance monitoring.

Table J2.1-1 and Table J2.1-2 specify the minimum monitoring requirements for the construction and operational phases, respectively. These requirements will be incorporated into the monitoring and reporting plans for the construction and operational phases.

J2.1 Construction Phase

Table J2.1.1 Monitoring – Construction Phase

Identifier	Activity/Issue	Location(s)	Frequency	Parameters	Monitoring Methodology	Commitment No	Comments
A1	Dust impacts on sensitive receptors	Access roads, MCPYs and other areas of dust generation	Daily	Dust clouds; dust deposition on sensitive receptors; grievances received	Visual; grievance log	AIR01	
A2	Air emission controls	At any work location nominated by EACOP	Daily	black smoke from mobile generators and pumps and heavy plant and equipment	Visual; grievances received	AIR03	.
A3	Air emissions from mobile waste incinerators	MCPYs	To be proposed by Contractor, subject to review and approval by EACOP	Parameters provided in Waste Incineration Emission Standards, Appendix F PES, Section 2.1.5, Table 2.12	To be proposed by Contractor, subject to review and approval by EACOP	-	
N1	Noise from generators, vehicles and equipment	Residential properties, schools; other receptors if required by the conditions of any licence required	Before and immediately after the commencement of construction activities; and subsequently monthly, or whenever new noise sources have been introduced or grievances received; or in accordance with the conditions of any licence required if more stringent	Parameters provided in Construction Noise, Appendix F PES, Section 4.2, Table 4.2-1 or the conditions of any licence required if more stringent	In accordance with any licence conditions, or as proposed by Contractor subject to review and approval by EACOP if no licence required	ACO01; ACO02; CHSW25	
N2	Blasting and piling	Residential properties, schools; other receptors if required by the conditions of any licence required;	During blasting and piling	Parameters provided in Construction Noise, Appendix F PES, Section 4.2, Table 4.2-1 or the conditions of any licence required if more stringent	In accordance with any licence conditions or as proposed by Contractor, subject to review and approval by EACOP, where no licence required	ACO06; ACO08; CHSW25	
P1	Potential pollution from fuel storage	Each location where fuel stored	Initially, every 2 weeks; and subsequently monthly, if approved by EACOP	Volumes of fuel received and dispatched	Inventory of the fuel received and dispatched for project use will be taken at each fuel centre location. The result of the inventory will be compared to tank measurements on a monthly basis.	WTR01	
P2	Potential pollution from machinery at work sites and maintenance areas	Each work area where machinery is located	Periodically	Currency of technical service certificates	Contractor to maintain log of certificates and copies to be kept with each item	AIR02	
P3	Potential pollution from spills during refuelling	Every refuelling location	Continuous during the refuelling process	No overfill	To be proposed by Contractor, subject to review and approval by EACOP	WTR02	
P4	Potential pollution from inappropriately stored hazardous materials and wastes	Each location where hazardous materials and wastes stored	Weekly	Storage conditions in accordance with requirements of MSDSs, chemical and waste management plans	To be proposed by Contractor, subject to review and approval by EACOP	SOL15; WTR01	

Identifier	Activity/Issue	Location(s)	Frequency	Parameters	Monitoring Methodology	Commitment No	Comments
P5	Potential pollution due to equipment leaking oil and lubricants	Each watercourse crossing, machinery, equipment and pumps within 50m of each watercourse crossing	Daily	Leak-free equipment, bunds around pumps in place and not over full	To be proposed by Contractor, subject to review and approval by EACOP	-	
S1	Erosion detection and control	Areas cleared and graded	Before predictable major storms and after storm events; minimum twice a week	Areas of possible erosion	Visual	SOL12; WTR03	Once identified, areas of possible erosion will be treated or covered with erosion control materials. Barriers (berms or terraces) will be installed to redirect runoff to stable vegetated areas
S2	Drainage control	Roads and accesses	Daily	No sedimentation of watercourses	Visual	SOL18	The primary aim of these daily inspections is to ensure that barriers, berms, silt fences etc are working effectively to direct sediment run-off to stable vegetated areas and to prevent sediment run-off to watercourses.
	Watercourse margin protection	Pipeline Crossings of watercourses	Daily	No sedimentation of watercourses Sufficient buffer zone at watercourses		BIO14; WTR05	
	Geotechnical cut-off walls, berms, silt fences etc installed to minimise sediment run-off and erosion	All locations	Daily	No sedimentation of watercourses Signs of erosion or slope failure Sediment control		SOL12; WTR03; WTR05	
S3	Erosion detection and control	Pipeline river crossings	Regularly, and after heavy rainfall, up to a minimum of two years after construction	Areas of possible erosion	To be proposed by Contractor, subject to review and approval by PTP	WTR05	Monitoring should be continued at specific locations if chronic erosion occurs, or if riparian vegetation recovery is delayed.
S4	Topsoil storage	Topsoil storage stacks	After topsoil is stored for more than six months	Presence of weeds; compaction and erosion	Weeds – visual; Probe - compaction	SOL07	
W1	Quality and quantity of project water supplies	At point of supply	Prior to and during use	Parameters provided in Drinking Water Standards, Appendix F PES, Table 3.3-1 (for potable water supplies) or water permit conditions for other supplies; volume and rate (T, pH, TDS, TSS, nitrates and true colour of user's water; flow rate)	Laboratory	WTR13; WTR23	
W2	Impacts on community wells of groundwater abstraction for the project	Monitoring wells drilled to monitor impacts	Prior to use and once every 2 weeks during use or as specified by water permit, whichever is more stringent	Parameters provided in Drinking Water Standards, Appendix F PES, Table 3.3-1 (for potable water supplies) or water permit conditions for other supplies; volume and rate (T, pH, TDS, TSS, nitrates and true colour of user's water; flow rate)	Laboratory	WTR23; WTR27; WTR28; WTR30	

Identifier	Activity/Issue	Location(s)	Frequency	Parameters	Monitoring Methodology	Commitment No	Comments
W3	Withdrawal of water from surface water courses, including hydrotest water	Withdrawal location	Prior to use, then monthly during use, or in accordance with permit requirements, whichever is more stringent	In accordance with permit requirements. To include volume and rate	Meter	WTR06	Any sensitive ecological receptors that require monitoring will be notified to the Contractor by EACOP
W4	Licensed and unlicensed water intakes, irrigation works and private domestic water systems in the immediate vicinity of the RoW	Any located within 50 m of RoW	Before, during, and after construction (post-reinstatement)	Parameters provided in Drinking Water Standards, Appendix F PES, Table 3.3-1 (for potable water supplies) or water permit conditions for other supplies; volume and rate (T, pH, TDS, TSS, nitrates and true colour of user's water; flow rate)	Laboratory	WTR23; WTR30	
W5	Impacts of construction at or near watercourses or other surface waterbodies on water quality	Watercourses – within area of influence and upstream (control point) of area of influence.	Before, during, and after construction or in accordance with current legislation and/or permit requirements, whichever is more stringent Daily during river crossing / instream works or in accordance with permit requirements or standards, whichever is more stringent	Turbidity, sedimentation, oil, other contamination	Visual assessment	MBIO12; WTR07; WTR11	
W6	Discharges of wastewater including black and grey water	MCPYs	Prior to use, then monthly, or in accordance with permit requirements, whichever is more stringent	Parameters provided in Appendix F PES, Table 3.1-1 and/or wastewater permit conditions whichever is more stringent; volume and rate.	Laboratory	WTR08; WTR13	
W7	Discharge of Hydrostatic Test water	Water in pipe or sedimentation basin, if used	Prior to discharge of each test section	In accordance with wastewater permit conditions; Appendix F PES, Section 3.1 Industrial Effluent and Sewage Discharge Standards, Table 3.1-1; volume, rate; any substances added to the hydrostatic test water	Laboratory test; to include a microtox bioassay if the water used for testing contains methanol, ethylene glycol, or other additives	N/A	Visual monitor that no soil erosion occurs. If discharged to land, monitor to ensure that discharge does not cause erosion or flooding.
W8	Surface water run-off	MCPYs	Daily visual; monthly laboratory test	In accordance with wastewater permit conditions; Appendix F PES, Section 3.1 Industrial Effluent and Sewage Discharge Standards, Table 3.1-1 and/or wastewater permit conditions whichever is more stringent	Laboratory	WTR20	

J2.2 Operational Phase

Table J2.2.1 Monitoring – Operational Phase

Identifier	Activity/Issue	Location(s)	Frequency	Parameters	Monitoring Methodology	Commitment No	Comments
A4	Air emissions from combustion plant	Crude oil bulk heaters at pumping stations	In accordance with any licence conditions or as proposed by Contractor, subject to review and approval by EACOP, where no licence required	PES, Table 2.1-1 or the conditions of any licence required if more stringent	In accordance with any licence conditions or as proposed by Contractor, subject to review and approval by EACOP, where no licence required	AIR05	
N3	Noise emissions from combustion plant	Dwelling(s) nearest to the crude oil bulk heaters at pumping stations	In accordance with any licence conditions or as proposed by Contractor, subject to review and approval by EACOP, where no licence required	PES, Table 4.1-1 or the conditions of any licence required if more stringent	In accordance with any licence conditions or as proposed by Contractor, subject to review and approval by EACOP, where no licence required	ACO01	
P3	Potential pollution from spills during refuelling	Every refuelling location	Continuous during the refuelling process	No overfill	To be proposed by Contractor, subject to review and approval by EACOP	WTR02	
S5	Soil erosion affecting security and integrity of the pipeline	RoW	Monthly – all locations; weekly at locations susceptible to erosion	Rill or gully formation	Visual	SOL16	
W6	Discharges of wastewater including black and grey water	Pumping stations	Prior to use, then monthly, or in accordance with permit requirements, whichever is more stringent	PES, Table 3.1-1 and/or wastewater permit conditions whichever is more stringent; volume and rate.	Laboratory	WTR08; WTR13	
W8	Surface water run-off	Pumping stations	Daily visual; monthly laboratory test	PES, Table 3.1-1 and/or wastewater permit conditions whichever is more stringent	Laboratory	WTR20	

Appendix K: Resettlement Policy Strategy

February 2020

EAST AFRICAN CRUDE OIL PROJECT

UGANDA RESETTLEMENT STRATEGY

1. INTRODUCTION

Total E&P Uganda B.V. (TEPU), Tullow Uganda Operations Pty Ltd (TUOP) and CNOOC Uganda Limited (CUL) ('Upstream Partners') hold interests in petroleum resource licenses near Lake Albert, Uganda. The East African Crude Oil Pipeline (EACOP) (the 'Project') involves the construction and operation of a buried, trans-boundary pipeline to transport crude oil from the Lake Albert area in Uganda to the eastern coast of Tanzania for export to international markets.

The pipeline will run from Kabaale in Hoima District, Uganda, to a Marine Storage Terminal (MST) at Chongoleani, Tanga Region, in Tanzania, on the East African coast. The Government of Uganda (GoU) and the Government of Tanzania (GoT), combined with the Upstream Partners, wish to construct this transboundary export pipeline and related facilities and infrastructure.

Purpose

The Upstream Partners prepared a Land Acquisition & Resettlement Framework (LARF) for the land acquisition and resettlement planning for the upstream Lake Albert Development Project (Dec 2016). This LARF has been endorsed by the GoU and the Upstream Partners are responsible for the implementation of the LARF in the execution of the upstream operations in their License Areas. The EACOP Project is a midstream project associated with the upstream development. The construction and operation of this pipeline and associated components will require the acquisition of land which could involve economic displacement of land owners and users and some limited physical displacement.

This **Resettlement Strategy** has been prepared for the Ugandan section of the EACOP project to guide the land acquisition and resettlement process. The approach contained in this Resettlement Strategy is based on the principles already endorsed by the GoU embodied in the Upstream LARF as far as applicable to a midstream linear trans-boundary project. This Resettlement Strategy describes how the EACOP Project developer will implement the land acquisition and resettlement programme for the Ugandan section of the EACOP Project. A separate RPF has been developed to guide the land acquisition and resettlement programme on the Tanzanian section of the EACOP Project.

The EACOP Project will be developed in line with the Ugandan legal framework and international standards for example IFC PS5. Of particular importance, the Governments of Uganda and Tanzania signed an Inter-Governmental Agreement (IGA) for the EACOP Project on 26 May 2017. This sets out the land rights framework for the Project agreed by the governments, including compliance with international EHSS and Human Rights financing standards.

IFC PS5 requires the preparation of a Resettlement Action Plan (RAP) for any project which results in physical displacement (which may or may not be accompanied by economic displacement), and preparation of a Livelihood Restoration Plan (LRP) for projects that will only involve economic displacement. In instances where a given project comprises sub-projects or multiple components that cannot be identified before project approval, or that may be implemented sequentially over an extended period, PS5 allows for the prior development of a Resettlement Policy Framework (RPF) outlining the general principles for the resettlement planning. The purpose of this Resettlement Strategy is to define the principles for land access, compensation and resettlement planning for the Ugandan section of the EACOP Project, and is the precursor to the detailed RAPs and/or LRPs for individual project components that will be developed later.

The Host Government Agreements (HGAs) between the Upstream Partners and the Governments for the Project will follow on from the IGA, and will cover in its remit agreement over land rights. It is currently under development and discussion with the Government of Uganda, and is yet to be signed. The proposed approach and principles set out in this Resettlement Strategy will be reviewed once the HGA is agreed, and any required refinements will be made to the resettlement planning if required at that stage. These will either be reflected in an updated RPF and/or the subsequent comprehensive RAPs/LRPs.

Box 1-1 Resettlement Strategy

This **Resettlement Strategy** for the Ugandan section of EACOP outlines:

- The land access and resettlement objectives & principles to ensure adequate land rights for the EACOP Project and Fair and adequate compensation for the Project Affected Persons.
- The legal framework and standards governing the EACOP Project land access and resettlement planning: namely, the Ugandan legal framework and international good practice (IGP) standards, as represented in the IFC's Performance Standard (PS) 5 on Land Acquisition and Involuntary Resettlement[1].
- The Land acquisition and Resettlement process
- The compensation methodology
- The consultation and engagement approach with affected people, including a grievance mechanism.

The intention for the EACOP Project is to establish a Pipeline Company that will be the ultimate developer and operator of the Project, comprising various parties with an interest, including the Upstream Partners together with the governments of Uganda and Tanzania. The process to establish the Pipeline Company is underway.

During this initial Project planning stage the TEAM B.V. will be performing the functions of the Project Developer.

[1] http://www.ifc.org

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1. OBJECTIVES & PRINCIPLES OF LAND ACQUISITION & ACCESS PROCESS

1.1. Objectives

In facilitation of the successful execution of the Project, the overarching objective for the land acquisition process in Uganda is to achieve land access for the Project in line with the project schedule and in line with Ugandan and international financing standards in order to limit the project's impacts on the affected persons and ensure that the project obtains 'a social licence to operate'. Concretely, this objective translates into certain requirements as to the nature of the land rights for the Project and the process for their execution, as recognized by Uganda through the agreement under Article 3 (Land Rights) of the Inter-Governmental Agreement (IGA):

a) **Identifiable land rights free from third party interests**: Land rights for the Project are required to be (i) clearly identifiable, subject to registrable title and (ii) free from third party interests (including encumbrances, rights or claims), other than certain third party interests that may be agreed by the Project (such as, for example, encumbrances in favour of the Project's lenders);

b) **Strongest available title or rights**: Land rights for the Project are required to represent the strongest available title (or in the case of land rights needed on a short-term basis, to represent an appropriate type of tile or right for the related use and period of use).

c) **Duration**: Land rights are required to be obtained for the entire duration of the Project or as long as needed for the relevant construction and other Project activities, as the case may be.

d) **Uninhibited implementation of the Project**: Land rights for the Project are required to allow the uninhibited implementation of the Project.

e) **Ownership of facilities**: Land rights for the Project must be in a form such that the Project Company is the full owner of all Project facilities in Uganda.

f) **Lender security**: The Project's lenders must be able to take legal, valid and enforceable first priority security over the land rights for the Project and over the Project facilities, and the land rights must be in the requisite form therefor.

g) **Terms**: Land rights for the Project must be obtained on fair, transparent, legally enforceable and clear commercial terms and conditions in favour of the Project Company.

h) **Compliance with EHSS and Human Rights Standards**: The land acquisition process for the Project needs to be undertaken in compliance with EHSS Standards and Human Rights Standards at a national and international level.

1.2. Principles

In addition to the objectives outlined in Article 3 of the IGA, the land acquisition process is based on the following general operational principles, complying with Uganda legislation and International standards:

1. The project seeks to avoid or minimize displacement to the extend practically and affordably possible.
2. All land required for the Project will be acquired on the basis that the Project is in the public interest and land required for the Project shall be deemed as in the public purpose.

3. All land required for the Project will be acquired and consolidated on a permanent basis, by the Government of Uganda (the Project expects that the Acquiring Authority for most of the land required for the Project will be the Uganda Land Commission, **"ULC"**), and then provided for use to the Project.
4. The Project will aim to promote an active and informed stakeholder participation. A database of affected people, assets and resources will be established to enable PAPs to be adequately informed and consulted on all matters affecting them. Cultural and religious practices will be respected.
5. The compensation framework will be based on the Uganda legislation (including "Guidelines for Compensation Assessment under Land Acquisition" (**GCALA**) issued by the MLHUD on June 2017) and the IFC standards.
6. Compensation shall identify and recognize multiple layers of rights on the affected land and property as contained in the laws of Uganda. Affected persons with no formal legal rights to land shall be included in the assessment provided that they have established rights to property on the land taken, prior to the cut-off date. Vulnerable group will receive special attention.
7. The Project will develop packages to match Replacement Cost for purposes of establishing fair and adequate compensation as required by the Constitution of the Republic of Uganda and IFC standards that include both monetary and in-kind compensation as well as other forms of assistance to restore livelihoods and living standards and to support vulnerable People.
8. A grievance mechanism will be established enabling affected people to lodge a complaint or a claim without cost and assurance of a timely consideration and response.
9. The Project will aim to reach a consensual agreement for compensation of affected land and assets with Project Affected Persons (**PAP**s). Only where this cannot be reached with PAPs despite the grievance mechanism (or if they are absent), PAPs will be subject to implementation of measures of compulsory land acquisition as defined in Ugandan Law and such measures will only be undertaken by the Government of Uganda (GoU).
10. Monitoring and evaluation procedures will be implemented to assess the effectiveness of the compensation and relocation programme.
11. Resettlement will be an integral part of the project with consideration given upfront to the implications of land access and resettlement in terms of project design, planning and costs.

2. PROJECT DESCRIPTION & CONTEXT

2.1 Summary of the Project

The East African Crude Oil Pipeline (EACOP) ("the Project") entails the construction and operation of a 24-inch underground pipeline to transport crude oil from the inlet flange at Kabaale Pumping Station in the Hoima District of Uganda (in the area of the Lake Albert Development) to an export facility at a Marine Storage Terminal (MST) in the Tanga region of Tanzania. The EACOP Project location and proposed pipeline route in Uganda is indicated in Figure 2-1.

Figure 2-1 EACOP Project Location & Uganda EACOP Route

The pipeline will be buried at an average depth of between 1.8 and 2 meters and will cover a total distance of 1,443 km, of which 296 km is located in Uganda and 1,147 km in Tanzania. The pipeline will run through 9 Districts and 24 sub-counties in Uganda (see Section 2.4). Refer to Section 2 for the detailed project description.

The design flow rate of the pipeline will make it capable of transporting 216,000 barrels of crude oil per day (Kbpd). To ensure the continued waxy condition of the oil, (to allow flow), the oil will be heated to about 50 degrees Centigrade to make it fluid enough to flow through. The entire pipeline with be thermally insulated with polyurethane foam and electrically heat traced (EHT). EHT is a surface heating system used to raise and/or maintain the temperature of the pipe by an electrical heating element that runs in physical contact along the length of the pipeline.

The EHT will provide heating during reduced flow rates, shutdowns or when maintenance is required. This EHT system will require electrical power, which will be in the form of an underground 22/33kV-powerline that will be installed parallel to the pipeline trench. The power required for the EHT will be acquired from generators at the pumping stations and converted to the required voltage via step-down substations located at 40-60 km intervals along the pipeline route.

2.2 EACOP Main Project Components

The development of the EACOP PROJECT in Uganda consists of the following main components:

- Four (4) Main Construction Camps or Marshalling Yard: 1 pipe marshalling yard and 3 Construction camps, pipes may be stored during the construction at each of these sites as well as other facilities.
- Pipeline construction corridor (30 m wide) 296 km long in Uganda and within it the permanent operational corridor for the buried heated export pipeline. The construction corridor may be wider at specific locations to allow for additional working space (e.g. at river and road crossings).
- Permanent Above-Ground Installations (AGIs):
    - One (1) Export Pipeline Facility (EPF) located within the Kabaale Refinery area, and includes a pump station and a heating station (PS-1);
    - One (1) pump station combined with a heating station located outside of the EPF (PS-2);
    - Main line block valve stations & heat tracing relay sub-stations (constructed within the pipeline corridor so no additional land required ; and
    - Hydro-test water storage facilities (including withdraw and disposal / evaporation pits).
- River pipeline crossings as well as pipeline block valve stations at each shore.
- New access routes to pipeline corridor, AGIs and construction sites and existing road upgrades and logistics, to be agreed with the GoU.

Table 2-1 Main Project Components

Project Components in Uganda	Example of facility[2]
Construction Facilities:	
Marshalling Yard (1 No.) : One of the camps will also be used as a marshalling yard for pipes. This facility will be located in KYOTERA District. This site is likely to be the first EACOP construction facility established in Uganda. The Marshalling Yard will have a footprint of approximately 17.5 ha	
Construction Camps (4 No.): A construction camp consists of temporary housing, offices, a kitchen, a dining hall and entertainment areas. Camps are self-sustained and do not rely on local services. Each camp will be able to accommodate up to 1,000 people and will be located at reasonable intervals along the pipeline construction corridor. Each camp will also house a pipe storage yard, a sewerage treatment facility and waste management yard, access roads and, in some cases, a helipad. The construction camps will each have a footprint of approximately 17.5 ha and will be located in the Districts of Kakumiro, Mubende, Sembabule and Kyotera.	
Construction Access Routes: Gravel roads will be established and maintained by the Project to provide access to construction facilities and the pipeline construction corridor. Construction access roads will link up to the existing road network. Arrangements for the use of these roads after construction will be agreed with the relevant government authorities.	
Pipeline Construction Corridor (296 km x 30 m wide): The construction and installation of the pipeline will require a 30m-wide construction corridor that is used as the workspace to construct the pipeline. This corridor might be wider in certain areas as additional working space may be required, for road and river crossings for example, and depending on the local environment. The corridor is restored once construction is complete.	

Operational Facilities:	
Export Crude Oil Pipeline: The pipeline will be buried at an average depth of between 1.8 and 2 meters. Once construction is completed, a 10 m permanent corridor is required for the safe operation and maintenance of the pipeline, this will be set within the construction corridor. Once the pipeline is buried, only the permanent route corridor pipeline markers (at regular intervals) will be visible. The 10 m permanent route corridor must be kept clear of any permanent structures or deep rooted vegetation to ensure easy access to the pipeline for maintenance purposes.	
Pumping Stations (2 No.): Pumping stations contain one or more electrically driven pumping units that are strategically placed to boost the pipeline's internal pressure and flow to ensure safe operating limits. These pumping stations are also used to monitor the flow in the pipeline and can be used to increase the throughput of the pipeline.	
Electrical Sub-stations: The entire pipeline with be thermally insulated with polyurethane foam and electrically heat traced (EHT). This EHT system will require electrical power, in the form of an underground 22/33kV-powerline that will be installed parallel to the pipeline trench. The power required for the EHT will be acquired from generators at the pumping stations and converted to the required voltage via step-down substations located at 40-60 km intervals along the pipeline route.	
Main Line Valves: Main Line Valves (MLVs) are required primarily to isolate a section of the pipeline in the event of a rupture (which is very unlikely). MLVs will be located at major crossing points, active seismic areas and at each of the pumping stations and pressure reduction sections.	

Hydro Test Water Storage Facilities: Hydrostatic testing is a controlled process to confirm the threshold measurement for the safe operation of the pipeline. A hydrostatic test is usually performed following new pipeline construction before the actual product (i.e. crude oil) is introduced into the system. All sections of the pipeline will undergo a hydrostatic test, which entails that each section of the pipeline is filled with water and pressurized for a certain time to allow for the identification of defects or leaks. The water is then released back to the hydro test water storage facilities. If required, hydrostatic testing can be repeated when the pipeline is in operation to confirm pipeline integrity and shipping capacity.	

2.3 Overview of Pipeline Construction Process

The construction of the Project will commence with the establishment of construction facilities – construction camps, pipe yard(s), marshalling yards and construction access roads.

The construction of the pipeline will be undertaken as indicated in Figure 2-2[3] and Table 2-2 below. Construction will start concurrently in several locations along the pipeline route, each construction team will cover an areas referred to as a " spread".

Figure 2-2 Schematic of Pipeline Construction Process

Table 2-2 Pipeline Construction Stages

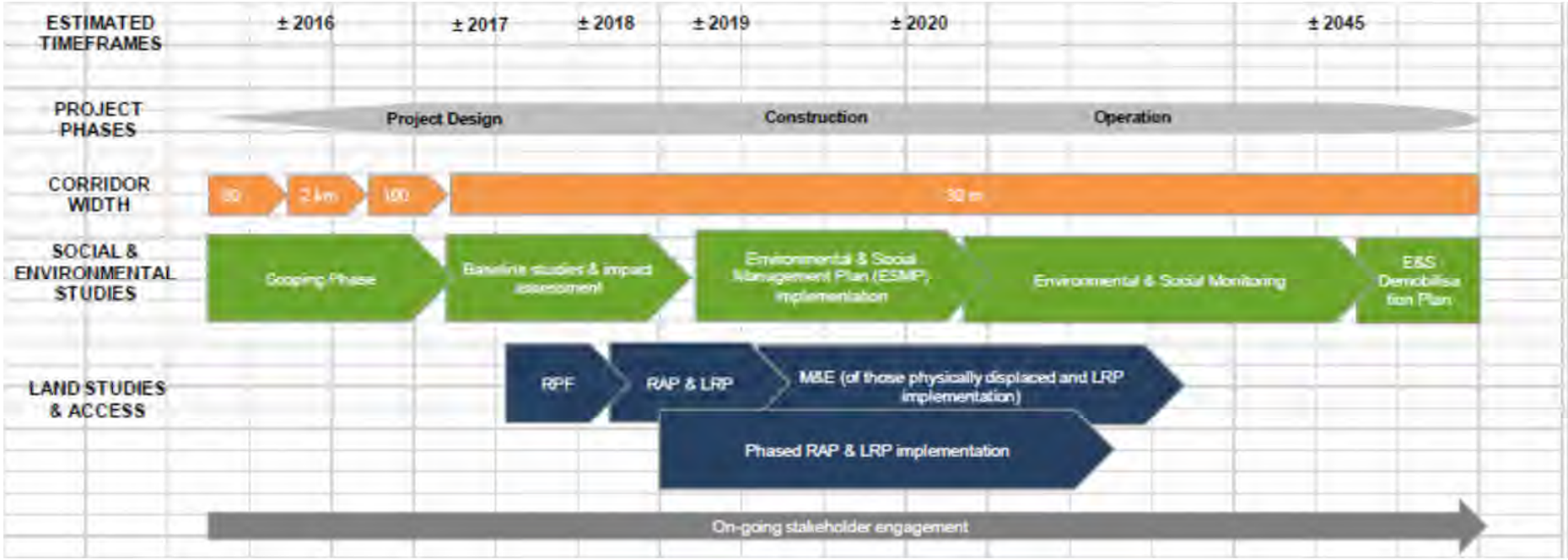
[3] Source: www.gdi.com.mx/pipeline.html

1	**Pre-Construction Survey:** • Environmental features (e.g. utility lines and natural drainage lines) along the route corridor are surveyed and marked to prevent accidental damage during construction • Pipeline's centre line and outer most boundaries of the construction corridor (i.e. construction workspace) are pegged
2	**Clearing:** • The construction corridor is cleared of all vegetation (any other infrastructure would have already been relocated as part of the resettlement process)
3	**Grading and topsoil stripping:** • Temporary erosion control measures are put in place prior to trenching • Topsoil is removed from the construction corridor and stockpiled for later use
4	**Trenching:** • Backhoes and trenching machines are used to excavate the trench • Excavated soil is temporarily stockpiled in the construction corridor (to be used later for backfilling)
5	**Pipe stringing and bending:** • A pipe bending machine bends individual joints of the pipe to the desired angle to accommodate changes in the natural contours or where the pipeline route changes direction
6	**Line-up:** • Coated pipe sections are placed along the excavated trench
7	**Welding, coating and testing:** • Pipe sections are aligned and welded together and coated at the welded joints • All welds are x-rayed and welds repaired, if necessary
8	**Lowering pipe:** • The assembled pipeline is lowered into the trench using side boom tractors
9	**Backfilling:** • The trench is backfilled using the soil that was excavated during the trenching process • After backfilling, the pipe is subjected to a hydro power test, which entails that each section of the pipeline is filled with water and pressurised for a certain time to allow for the identification of defects or leaks.
10	**Restoration:** • Disturbed areas are restored as close as possible to their original condition • Environmental control measures are maintained until the construction corridor is completely restored

2.4 Project Schedule & Phases

Figure 2-3 indicates the main Project phases and overall Project schedule.

Figure 2-3 Project Phases and Schedule[4]



[4] [INSERT REF. RECOMMEND TZ & UG RPF CONTAIN SAME FIGURE]

2.5 Summary of Project Land Requirements

The Project will require access to over 600 (ha) of land in Uganda . Most of this (nearly 90%) comprises the construction corridor for the export pipeline corridor. For most of its length, the corridor required for construction purposes will be 30 meters wide; in some areas additional workspace will be required during construction (such as at river crossings). A 10-meter wide permanent access corridor is required for the pipeline during Operation phase and this will be located within this construction corridor.

The current estimated land requirements of the Project are summarized in Table 2-3.

Table 2-3 Project Land Requirements in Uganda

Phase	**Area**	**No.**	**Total**
Construction Only			
Main Camps with pipe yards (marshalling yards)	17.5 – 18.4 ha	4	74 ha approx.
Construction and Operations			
New access roads to construction facilities, pipeline RoW and AGIs			74 ha approx.
Pipeline RoW	30 m	296 km	89 ha approx.
Additional temporary work space (crossings) (Estimate)			333 ha approx.
Pumping stations (includes buffer, additional construction worksite, helipad)	15 ha with 1 ha in pipeline corridor	2	30 ha approx. total surface area (2 ha additional outside corridor)
Mainline block valve stations	0.028 ha	19	Located within pipeline corridor
Electric substations	0.04 ha	7	
Total areal requirement			602 ha approx.

2.6 Route selection, alignment and reduction

Alternative routes for the crude oil export pipeline were considered from the Kabaale area to potential ports on the East African coast. Multiple port locations were identified and potential 50-km-wide pipeline corridors evaluated. Secondary information, including remote sensing, was used to assess potential corridors from Uganda using geographic information system (GIS).

Using the GIS and statistical analysis, least risk and cost potential routes were identified for the EACOP System, namely a Kenya north route to Lamu, a Kenya south route to Mombasa and a northern Tanzania route to Tanga. Using higher-resolution satellite imagery, the identified routes were refined by integrating evaluation of social and environmental constraints, geohazards, constructability and constraints associated with terrain, e.g., river crossings and slopes. Further to consideration of the detailed studies of the three identified routes, the Uganda–Tanzania route was selected.

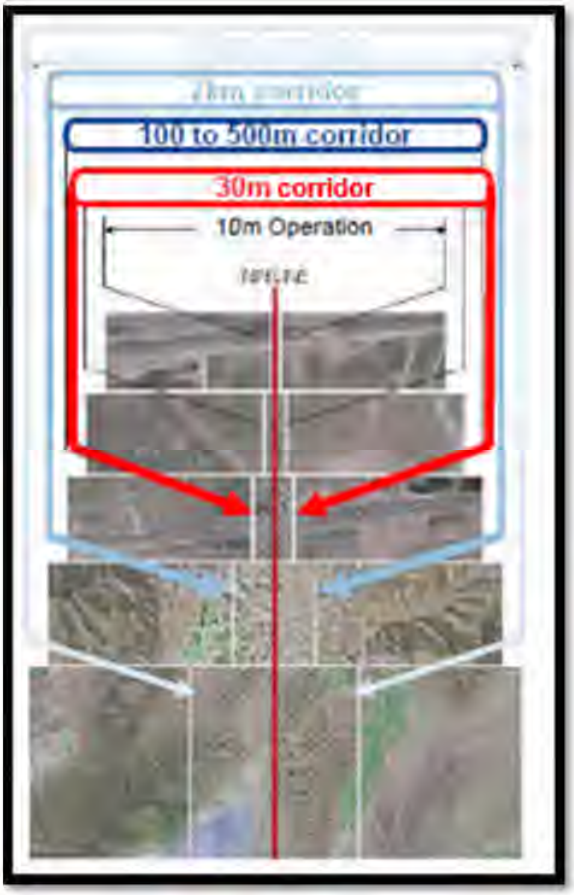
In 2013, the Tanzanian and Ugandan Governments approved a 50-km wide route corridor, which was reduced to a 2-km wide corridor in 2016 and 100 m wide in early 2017. The route has recently been reduced again to a 30m width within which the construction and permanent corridor will be located.

TEAM B.V. intends to avoid or minimise involuntary resettlement wherever feasible through the assessment of alternative project and engineering designs, the preferred route alignment was determined through stringent routing criteria that considered the following aspects:

- Constructability criteria, including: route length, terrain, bends, road/track crossings, flooding hazards etc.
- Environmental criteria, including: International protected areas, critical habitats, natural habitats and other notable biodiversity areas.
- Socio-Economic & Cultural criteria, including: industrial land use, structures (e.g. dwellings & settlements), crops/cultivated land, tourism facilities and sites etc.

The pipeline route corridor has been progressively reduced from a 50 km to a 30 m corridor based on concept study works and FEED activities (. This is a continuous and iterative process based on the criteria highlighted above and ongoing technical studies. Route alignment will continue to evolve as more data is collected or becomes known.

Figure 2-4 Route Refinement



2.7 Land & Socio-Economic Context

2.7.1 Project Affected Districts, Sub-counties & Villages

The pipeline will run from Kabaale through 9 Districts (at the time of developing this document, the Government was in the process of creating a new District; Kikube which will change the number to 10 in the future), starting in Hoima District and ending in Kyotera District.

Table 2-4 and

Figure 2-5 show the Districts and Sub-counties the pipeline corridor will affect. Based on the available information the pipeline will run through lands associated with an estimated 148 villages. The route has been designed to avoid as far as possible urban areas, dwellings and settlements, and predominantly runs across rural land use.

Table 2-4 Project Affected Districts & Sub-Counties in Uganda

District	District capital	Sub-county	kms in the sucounty
Hoima	**Hoima**	Buseruka	6
		Kiziranfumbi	26
		Buhimba	4
Kakumiro	**Kakumiro**	Katikara	12
		Kisiita	7
		Mpasaana	12
		Nkooko	2
Kyankwanzi	**Kyankwanzi**	Gayaza	14
Mubende	**Mubende**	Butoloogo	21
		Madudu	7
		Kitenga	35
Gomba	Kanoni	Maddu	18
Sembabule	**Sembabule**	Lugusulu	24
		Mijwala	10
		Sembabule TC	2
		Lwebitakuli	15
Lwengo	**Lwengo**	Lwengo	20
		Lwengo TC	2
		Ndagwe	7
Kyotera	**Kasaali**	Nabisaga	5
		Kasaali	2
Rakai	**Rakai**	Lwanda	15
Kyotera	**Kasaali**	Kasasa	5
	Rakai	Kifamba	4
	Kasaali	Kakuuto	22

Figure 2-5 District & Sub-Counties Traversed by the EACOP Project

2.7.2 Socio-Economic Context

Table 2-5 below provides the socio-economic context of the Project affected Districts alongside a summary of the national context, this is followed by a summary of for the affected Districts in Table 2-6:

Table 2-5 Socio-Economic Context[5]:

District	Demographics & Key Characteristics of Population & Households	Households: Standards of Living, Housing Conditions & Access to Utilities & Services	Main Livelihood Activities
National Context	• Population increased from 24.2 million (mil) to 34.6 mil between 2002 and 2014, with an average growth rate of 3 % per annum. Life expectancy at birth in 2014 was 63.3 years. • Population per District in 2014 ranged from 53,406 persons in Kalangala to nearly 2mil in Wakiso. Approximately 20% of the total population lived in urban areas in 2014. • Nearly 48% of the total population was below the age of 15 years in 2014 representing a relatively young population with persons over 60 years and above only representing less than 3% of the population. • Education: 87% primary school age children attending school. 1 in 10 children (6-12 years old) never been to school.	• Average household (HH) size 4.7 (UBOS 2014 – 7.3 mil HHs). • One in 5 HHs had access to electricity with 'Tadooba' (paraffin tin lamps) being the predominant source of lighting (52%) and wood the most common fuel for cooking. • Two thirds of HHs reside in detached dwellings, with nearly half having dwellings with only one room for sleeping. Nearly 50% of dwellings in 2014 census had used permanent materials to construct walls. • 30% of HHs having unimproved toilet facilities and sanitation representing a key issue, with approx. 8% HHs having no toilet facility. • Radio was the dominant source of information in 2014 still, with over 60% of HHs owning a radio.	• Nearly 79% of the population were residing in rural areas in 2014 and agricultural was the dominant sector is the economy with over two thirds (69%) of HHs deriving livelihoods from subsistence farming and majority of working age population being engaged in this sector. • Approximately 11% of HHs censused received financial/livelihoods support from abroad. • Less than a third (27%) of HHs rely on waged employment/earned income.
Hoima	• *Population:* in 2014 UBOS was recorded as 572,986, 48% of the population was below the age of 15 years and 3.6% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Hoima of 642,400. • *Population Density & Growth:* In DDPs (period 15/16-19/20) population had increased very slightly to 573,903 with a population density of 158.9 per km^2 and population growth 4.27% per year. • *Education:* 79.4% primary school age children (6-12) were attending school and 26.2% persons (13-18 years)	• *Average household (HH) size*: 4.6 (UBOS 2014 – total HHs 125,399). • *Dwellings:* 68.1% of HHs were living in dwellings with permanent roof materials and 35.6% with permanent wall materials in 2014. • *Water & Sanitation*: 8.4% of HHs had access to piped water for drinking with 27.2% using a borehole and 6.5% of HHs in the area that had no toilet facility. • *Power*: 16.8% of HHs had access to electricity and 58.3% used Tadooba lamps for lighting.	• Overview: Hoima is 81.5% rural and the main sources of income are from farming such as food crops including sorghum, maize, millet, peas, groundnuts, sunflowers, sweet potatoes, beans, cotton, tea, coffee, tomatoes, cabbage, onions and tobacco as well as fishing (Ref. Hoima District Local Government 2015). Fishing on Lake Albert employs several hundred people. The recent discovery of petroleum in the district is increasingly attracting people to the many activities that the industry entails.

[5] Certain data from: UBOS (www.ubos.org) 2014 Census Profile (Published April 2017); UBOS Population Projections (2015-2020) (Updated 25th July 2017); and Tilenga Feeder Pipeline & EACOP Uganda Section ESIA Scoping Report (RSK, July 2017). Data on population density and growth original source: district development plans (DDPs) for the period 2015/16 – 2019/20.

District	Demographics & Key Characteristics of Population & Households	Households: Standards of Living, Housing Conditions & Access to Utilities & Services	Main Livelihood Activities
	were attending secondary school in 2014. Of 6 to 15 year old children 16.6% were not attending school. Illiteracy rate in 2014 for persons 18 years and above was 31.9%. • *Key Development Challenges:* Rapid population growth, rural poverty, environmental degradation, resource depletion, high fertility rate, low agricultural productivity (Hoima District Local Government 2015).	• *Access to Education Facilities:* 18.3% of HHs are 5km or more to the nearest public primary school with 62.6% being 5km or more from the nearest public secondary school. • *Access to Health Facilities:* 39.5% of HHs are 5km or more to the nearest public health facility. • *Information Sources:* Radio was the dominant source of information in 2014 (65.9% of HHs), with 66.8% of HHs owning a radio.	• *Agriculture:* 68% of HHs main source of livelihood depended on subsistence farming. HHs engaged in either crop growing or livestock farming was 86.3% with the dominate crops being maize and beans. • *Non-agricultural:* with 87.2% of HHs had at least one member engaged in non-agricultural based enterprises. • *Remittances from abroad:* 6.5% of HHs censused received financial/livelihoods support from abroad in 2014. • *Bank accounts:* 22.4% of HHs only had a member which held a bank account in 2014.
Kakumiro[6]	• *Population:* in 2014 UBOS Census in Sub-counties now forming Kakumiro population was recorded as 293,108, over 56% of the population was below the age of 17 years and approximately 3% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Kakumiro of 368,600. • *Population Density & Growth:* Based on UBOS 2014 Census data population density was 176 per km^2 and based on the DDPs (period 15/16-19/20) population density would be slightly higher at 184 km^2. • *Education:* 87% primary school age children (6-12) were attending school. Illiteracy rate in 2014 for persons 18 years and above was 32%. • *Key Development Challenges:* Poor road network, inadequate staffing in critical sectors like health and education, inadequate funding, low quantity and quality of social services (education, health, water), low agricultural production, high population growth (Kakumiro District Local Government 2015).	• *Average household (HH) size*: 4.6 (UBOS 2014 – total HHs 63,543). • *Dwellings:* 81% of HHs were living in dwellings with permanent roof materials and only 31% with permanent wall materials in 2014. • *Water & Sanitation*: 62% of HHs had access to protected water sources (e.g. piped water, borehole, well/spring, gravity flow or bottled water) and 4% of HHs in the area that had no toilet facility. • *Power*: 14% of HHs had access to electricity and 57% used Tadooba lamps for lighting. • *Information Sources:* Radio was the dominant source of information in 2014, with 66% of HHs owning a radio.	• *Overview:* Agriculture is the major economic activity in the district, employing over 70% of the district. Major crops grown include maize, bananas, beans, rice, coffee, tea and cassava. Major livestock kept include cattle, goats, poultry, pigs and sheep. Other economic activities include trade especially in agricultural produce and finished products, leisure and hospitality. (Kakumiro District Local Government 2015). • *Agriculture:* 84% of HHs main source of livelihood depended on subsistence farming. • *Remittances from abroad:* 17% of HHs censused received financial/livelihoods support from abroad in 2014.
Kyankwanzi	• *Population:* in 2014 UBOS was recorded as 214,693; 48.3% of the population was below the age of 15 years	• *Average household (HH) size*: 4.5 (UBOS 2014 – total HHs 47,687).	• *Overview:* The district is 88.6% rural and the main economic activities are agriculture, livestock keeping,

[6] Kakumiro District was created by the split of Kibaale District into three Districts of Kagadi, Kakumiro and Kibaale. This change was effective on 1 July 2016. The Kakumiro District comprises of a number of sub-counties including Nkooko, Kakindo, Mpasaana, Kakumiro TC, Birembo, Kasiita, Nalweyo, Kasambya and Bwanswa. Further some sub-counties have been divided to make additional sub counties, such as Katikara sub-county was part of Kasiita sub-county which are both affected by EACOP. Therefore data has been extracted from the UBOS Population Projections (2015-2020) and UBOS Western Region Sub-County Data Census 2014 reported (Rel. 23/03/2016).

District	Demographics & Key Characteristics of Population & Households	Households: Standards of Living, Housing Conditions & Access to Utilities & Services	Main Livelihood Activities
	and 4.2% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Kyankwanzi of 244,400. • *Population Density & Growth:* In DDPs (period 15/16-19/20) population density of 95.2 per km^2 and population growth 4.73% per year was cited. • *Education:* 79.3% primary school age children (6-12) were attending school and 24.7% persons (13-18 years) were attending secondary school in 2014. Of 6 to 15 year old children 11.8% were not attending school. Illiteracy rate in 2014 for persons 18 years and above was 33.9%. • *Key Development Challenges:* Low groundwater potentials, high incidence of urban and rural poverty, environmental degradation, inadequate funding, disparities in access to social services and infrastructure, low operation and maintenance of water facilities (Kyankwanzi District Local Government 2015).	• *Dwellings:* 72.1% of HHs were living in dwellings with permanent roof materials and 39.2% with permanent wall materials in 2014. • *Water & Sanitation*: 4.7% of HHs had access to piped water for drinking with 44.9% using a borehole and 6.9% of HHs in the area that had no toilet facility. • *Power*: 10.9% of HHs had access to electricity and 59.1% used Tadooba lamps for lighting. • *Access to Education Facilities:* 18.4% of HHs are 5km or more to the nearest public primary school with 70.6% being 5km or more from the nearest public secondary school. • *Access to Health Facilities :* 54.8% of HHs are 5km or more to the nearest public health facility. • *Information Sources:* Radio was the dominant source of information in 2014 (61.6% of HHs), with 62.6% of HHs owning a radio.	and logging and charcoal production. As the district is in a cattle corridor, many residents keep cattle and organise bimonthly trading centres. The main food crops for both cash and subsistence purposes are maize, common beans, groundnuts, upland rice of NERICA varieties, pineapples, tobacco, plantain, sweet potatoes, cassava, millet and sorghum. (Kyankwanzi District Local Government 2015). • *Agriculture:* 78.3% of HHs main source of livelihood depended on subsistence farming. HHs engaged in either crop growing or livestock farming was 92%, with the dominate crops being maize and beans. • *Non-agricultural:* with 90.3% of HHs had at least one member engaged in non-agricultural based enterprises. • *Remittances from abroad:* 11.2 of HHs censused received financial/livelihoods support from abroad in 2014. • *Bank accounts:* 11.1% of HHs only had a member which held a bank account in 2014.
Mubende	• *Population:* in 2014 UBOS was recorded as 684,348; 49.3% of the population was below the age of 15 years and 3.6% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Mubende of 761,700. • *Population Density & Growth:* In DDPs (period 15/16-19/20) population had increased only incrementally to 688,819 with a population density of 148 per km^2 and population growth 4.06% per year. • *Education:* 81.7% primary school age children (6-12) were attending school and 26.8% persons (13-18 years) were attending secondary school in 2014. Of 6 to 15 year old children 12.1% were not attending school. Illiteracy rate in 2014 for persons 18 years and above was 29.5%. • *Key Development Challenges:* Poor road network, shortage of qualified personnel (health, education, production), inadequate funding, low agricultural production, high population growth (Mubende District Local Government 2015)	• *Average household (HH) size*: 4.5 (UBOS 2014 – total HHs 151,100). • *Dwellings:* 90.3% of HHs were living in dwellings with permanent roof materials and 42.9% with permanent wall materials in 2014. • *Water & Sanitation*: 10.8% of HHs had access to piped water for drinking with 16.9% using a borehole and 3.2% of HHs in the area that had no toilet facility. • *Power*: 14.6% of HHs had access to electricity and 66.7% used Tadooba lamps for lighting. • *Access to Education Facilities:* 24.7% of HHs are 5km or more to the nearest public primary school with 64% being 5km or more from the nearest public secondary school. • *Access to Health Facilities:* 45.4% of HHs are 5km or more to the nearest public health facility. • *Information Sources:* Radio was the dominant source of information in 2014 (70.2% of HHs), with 69.1% of HHs owning a radio.	• *Overview:* The district is 83.6% rural. The main economic activity in the district is agriculture, specifically producing mainly food crops such as sweet potatoes, beans, cassava, maize, bananas, groundnuts, onions, cabbage and tomatoes. The main cash crops are coffee and tea. (Mubende District Local Government 2015). • *Agriculture:* 79.2% of HHs main source of livelihood depended on subsistence farming. HHs engaged in either crop growing or livestock farming was 91.2% with the dominate crops being maize and beans. • *Non-agricultural:* with 92.1% of HHs had at least one member engaged in non-agricultural based enterprises. • *Remittances from abroad:* 21.2% of HHs censused received financial/livelihoods support from abroad in 2014. • *Bank accounts:* 15.6% of HHs only had a member which held a bank account in 2014.

District	Demographics & Key Characteristics of Population & Households	Households: Standards of Living, Housing Conditions & Access to Utilities & Services	Main Livelihood Activities
Gomba	• *Population:* in 2014 UBOS was recorded as 159,922, over 56% of the population was below the age of 18 years and approximately 5.3% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Gomba of 165,900. • *Population Density & Growth:* In DDPs (period 15/16-19/20) population had increased very slightly to 160,075 with a population density of 180 per km^2 and population growth 2.9% per year. • *Education:* 85.5% primary school age children (6-12) were attending school and 30% persons (13-18 years) were attending secondary school in 2014. Of 6 to 15 year old children 6.9% were not attending school. Illiteracy rate in 2014 for persons 18 years and above was 27.6%. • *Key Development Challenges:* Poor economic growth, climate change and animal disease outbreaks, lack of human capital and skills gaps, high infant mortality rate, low quantity of social services (Education) (Gomba District Local Government 2015).	• *Average household (HH) size*: 4.5 (UBOS 2014 – total HHs 35,240). • *Dwellings:* 88.4% of HHs were living in dwellings with permanent roof materials and 52.1% with permanent wall materials in 2014. • *Water & Sanitation*: 3.4% of HHs had access to piped water for drinking with 34.2% using a borehole and 5.5% of HHs in the area that had no toilet facility. • *Power*: 13.2% of HHs had access to electricity and 68.2% used Tadooba lamps for lighting. • *Access to Education Facilities:* 14% of HHs are 5km or more to the nearest public primary school with 55.3% being 5km or more from the nearest public secondary school. • *Access to Health Facilities:* 36.7% of HHs are 5km or more to the nearest public health facility. • *Information Sources:* Radio was the dominant source of information in 2014 (69.2% of HHs), with 72.2% of HHs owning a radio.	• *Overview:* The district is 92.2% rural and the main economic activity is livestock farming and subsistence agriculture. (Gomba District Local Government 2015). • *Agriculture:* 78.8% of HHs main source of livelihood depended on subsistence farming. HHs engaged in either crop growing or livestock farming was 93.5%, with the dominate crops being maize and beans. • *Non-agricultural:* with 89.1% of HHs had at least one member engaged in non-agricultural based enterprises. • *Remittances from abroad:* 9.2% of HHs censused received financial/livelihoods support from abroad in 2014. • *Bank accounts:* 9.9% of HHs only had a member which held a bank account in 2014.
Sembabule	• *Population:* in 2014 UBOS was recorded as 252,597; 50.2% of the population was below the age of 15 years and 4.4% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Sembabule of 271,800. • *Population Density & Growth:* In DDPs (period 15/16-19/20) population had increased only incrementally to 252,994 with a population density of 79 per km^2 and population growth 2.83% per year. • *Education:* 82.1% primary school age children (6-12) were attending school and 24.9% persons (13-18 years) were attending secondary school in 2014. Of 6 to 15 year old children 12.4% were not attending school. Illiteracy rate in 2014 for persons 18 years and above was 32.5%. • *Key Development Challenges:* Shortage of qualified health workers, personnel shortages and high drop-out rates in education, prolonged droughts, soil degradation, limited market information for farmers, lack of transport means, animal disease outbreaks (Sembabule District Local Government 2015).	• *Average household (HH) size*: 4.7 (UBOS 2014 – total HHs 55,330). • *Dwellings:* 86.7% of HHs were living in dwellings with permanent roof materials and 66.4% with permanent wall materials in 2014. • *Water & Sanitation*: 1.9% of HHs had access to piped water for drinking with 12.8% using a borehole and 4.7% of HHs in the area that had no toilet facility. • *Power*: 14.6% of HHs had access to electricity and 62.6 used Tadooba lamps for lighting. • *Access to Education Facilities:* 10.5% of HHs are 5km or more to the nearest public primary school with 62.6% being 5km or more from the nearest public secondary school. • *Access to Health Facilities:* 41.7% of HHs are 5km or more to the nearest public health facility. • *Information Sources:* Radio was the dominant source of information in 2014 (73.5% of HHs), with 69.4% of HHs owning a radio.	• *Overview:* The district is 93.3% rural and livestock farming, fish farming and dairy farming are the backbone of the region's economy. Crops grown include sweet potatoes, matoke, potatoes, cassava, yams, maize, millet, cabbage, peas, mangoes, pineapple, groundnuts and passion fruit (Sembabule District Local Government 2015). • *Agriculture:* 80.9% of HHs main source of livelihood depended on subsistence farming. HHs engaged in either crop growing or livestock farming was 93.3%, with the dominate crops being maize and beans. • *Non-agricultural:* with 1.9% of HHs had at least one member engaged in non-agricultural based enterprises. • *Remittances from abroad:* 15.7% of HHs censused received financial/livelihoods support from abroad in 2014. • *Bank accounts:* 15.2% of HHs only had a member which held a bank account in 2014.

District	Demographics & Key Characteristics of Population & Households	Households: Standards of Living, Housing Conditions & Access to Utilities & Services	Main Livelihood Activities
Lwengo	• *Population:* in 2014 UBOS was recorded as 274,953; 51.6% of the population was below the age of 15 years and 5% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Lwengo of 281,400. • *Population Density & Growth:* In DDPs (period 15/16-19/20) population had increased very slightly to 275,450 with a population density of 192 per km^2 and population growth 2.06% per year. • *Education:* 85.2% primary school age children (6-12) were attending school and 33.1% persons (13-18 years) were attending secondary school in 2014. Of 6 to 15 year old children 7.6% were not attending school. Illiteracy rate in 2014 for persons 18 years and above was 24%. • *Key Development Challenges:* Low levels of socio-economic infrastructural development (roads, education, health, water, electric power), narrow local revenue base, climate change, inadequate funding, poor sanitation and hygiene (Lwengo District Local Government 2015).	• *Average household (HH) size*: 4.5 (UBOS 2014 – total HHs 61,753). • *Dwellings:* 97.2% of HHs were living in dwellings with permanent roof materials and 76.5% with permanent wall materials in 2014. • *Water & Sanitation*: 4.3% of HHs had access to piped water for drinking with 23.7% using a borehole and 2.9% of HHs in the area that had no toilet facility. • *Power*: 18.1% of HHs had access to electricity and 64.6% used Tadooba lamps for lighting. • *Access to Education Facilities:* 7.6% of HHs are 5km or more to the nearest public primary school with 48.2% being 5km or more from the nearest public secondary school. • *Access to Health Facilities:* 35.5% of HHs are 5km or more to the nearest public health facility. • *Information Sources:* Radio was the dominant source of information in 2014 (68% of HHs), with 71.3% of HHs owning a radio.	• *Overview:* The district is 84.4% rural and the main economic activities of the district are livestock farming, fisheries, and trade and pit sawing. (Lwengo District Local Government 2015). • *Agriculture:* 75.6% of HHs main source of livelihood depended on subsistence farming. HHs engaged in either crop growing or livestock farming was 90.4%, with the dominate crops being maize and beans. • *Non-agricultural:* with 86.7% of HHs had at least one member engaged in non-agricultural based enterprises. • *Remittances from abroad:* 28.6% of HHs censused received financial/livelihoods support from abroad in 2014. • *Bank accounts:* 16.2% of HHs only had a member which held a bank account in 2014.
Rakai & Kyotera[7]	• *Population:* in 2014 UBOS was recorded as 516,309; 50.6% of the population was below the age of 15 years and approximately 5% of the population was aged 60 years and over. UBOS population projections (2015-2020) projected the 2017 populations for Rakai of 252,600 and Kyotera of 290,800. • *Population Density & Growth:* In DDPs (period 15/16-19/20) population had increased very slightly to 518,002 with a population density of 159.4 per km^2 and population growth 2.06% per year. • *Education:* 81.2% primary school age children (6-12) were attending school and 27.5% persons (13-18 years) were attending secondary school in 2014. Of 6 to 15 year old children 11.8% were not attending school. Illiteracy rate in 2014 for persons 18 years and above was 27.6%.	• *Average household (HH) size*: 4.4 (UBOS 2014 – total HHs 116,390). • *Dwellings:* 91.9% of HHs were living in dwellings with permanent roof materials and 58.4% with permanent wall materials in 2014. • *Water & Sanitation*: 9.5% of HHs had access to piped water for drinking with 11.1% using a borehole and 4.5 % of HHs in the area that had no toilet facility. • *Power*: 14.7% of HHs had access to electricity and 68.6% used Tadooba lamps for lighting. • *Access to Education Facilities:* 15.1% of HHs are 5km or more to the nearest public primary school with 52.2% being 5km or more from the nearest public secondary school. • *Access to Health Facilities:* 29% of HHs are 5km or more to the nearest public health facility.	• *Overview:* The district is 93.4% rural and the main economic activity is agriculture. Crops grown include maize, millet, sorghum, rice, beans, peas, groundnuts, simsim, soybean, cassava, sweet potatoes, potatoes, tomatoes, cabbage, eggplant, onion, banana, mangoes, orange, pineapple, coffee, cacao, cotton and tobacco (Ref.: Rakai District Local Government 2015). Because of the relatively dry climate, cattle ranching for beef and dairy farming are the important economic activities in the district. Fish farming is being implemented increasingly in the district as well, given the close proximity of Lake Victoria. • *Agriculture:* 73.4% of HHs main source of livelihood depended on subsistence farming. HHs engaged in either crop growing or livestock farming was 89.5%, with the dominate crops being maize and beans.

[7] Kyotera District was created in 2015 by an Act of Parliament and became functional in mid-2017. It was formed from the Kakuuto and Kyotera counties which previously formed part of the Rakai District. The UBOS (www.ubos.org) 2014 Census Profile for Rakai District which covers the areas now within the new Kyotera District. Therefore, Rakai and Kyotera Districts socio-economic context is presented together.

District	Demographics & Key Characteristics of Population & Households	Households: Standards of Living, Housing Conditions & Access to Utilities & Services	Main Livelihood Activities
	• *Key Development Challenges:* Limited social services budget, encroachment on forests and other reserves, slow industrial growth, natural resource exploitation, environmental degradation (Rakai District Local Government 2015).	• *Information Sources:* Radio was the dominant source of information in 2014 (69.5% of HHs), with 69.3% of HHs owning a radio.	• *Non-agricultural:* with 88.2% of HHs had at least one member engaged in non-agricultural based enterprises. • *Remittances from abroad:* 19.9% of HHs censused received financial/livelihoods support from abroad in 2014. • *Bank accounts:* 18.4% of HHs only had a member which held a bank account in 2014.

Table 2-6 Summary of Socio-Economic Context[8]

District	Population Demographics					Education		
	Total Population (UBOS 2014)	Population Density per/km²	Population Growth %/year	% Population <15 years	% Population > 59 years	% Children Attending Primary School	% Children Attending Secondary School	% Illiteracy Rate (<17 years)
Hoima	572,986	158.9	4.27	48	3.6	79.4	26.2	31.9
Kakumiro	293,108	176	n/a	56% (<17yrs)	3	87	n/a	32
Kyankwanzi	214,693	95.2	4.73	48.3	4.2	79.3	24.7	33.9
Mubende	684,348	148	4.06	49.3	3.6	81.7	26.8	29.5
Gomba	159,922	180	2.9	56% (<18yrs)	2.9	85.5	30	27.6
Sembabule	252,597	79	2.83	50.2	4.4	82.1	24.9	32.5
Lwengo	274,953	192	2.06	51.6	5	85.2	33.1	24
Rakai & Kyotera	516,309	159.4	2.06	50.6	5	81.2	27.5	27.6
	Households		**Housing Conditions**		**Water & Sanitation**			**Information**
	Household (HH) Nos. (UBOS 2014)	Average HH Size	% HHs with Perm. Roof Materials	% HHs with Perm. Wall Materials	% HHs Access to Piped Water	% HHs Using Boreholes Drinking	% HHs with No Toilet Facility	% HHs Radio is Main Information Source
Hoima	125,399	4.6	68.1	35.6	8.4	27.2	6.5	65.9
Kakumiro	63,543	4.6	81	31	62% access to protected water supplies		4	66% own a radio
Kyankwanzi	47,687	4.5	72.1	39.2	4.7	44.9	6.9	61.6
Mubende	151,100	4.5	90.3	42.9	10.8	16.9	3.2	70.2
Gomba	35,240	4.5	88.3	52.1	3.4	34.9	5.5	69.2
Sembabule	55,330	4.7	86.7	66.4	1.9	12.8	4.7	73.5
Lwengo	61,753	4.5	97.2	76.5	4.3	23.7	2.9	68
Rakai & Kyotera	116,390	4.4	91.9	58.4	9.5	11.1	4.5	69.5
	Power & Lighting		**Livelihoods**					
	% HHs Access to Electricity	% HHs Tadooba for Lighting	% District which is Rural	% HHs Main Livelihood Activity - Subsistence Farming	% HHs Engaged in Crop and/or Livestock Farming	% HHs a Member engaged in Non-Agricultural Enterprises	% HHs Remittances from Abroad	% HHs with Bank Account
Hoima	16.8	58.3	81.5	68	86.3	87.2	6.5	22.4
Kakumiro	14	57	n/a	84	n/a	n/a	17	n/a
Kyankwanzi	10.9	59.1	88.6	78.3	92	90.3	11.2	11.1
Mubende	14.6	66.7	83.6	79.2	91.2	92.1	21.1	15.6
Gomba	13.2	68.2	92.2	78.8	93.5	89.1	9.2	9.9
Sembabule	14.6	62.6	93.3	80.9	93.3	1.9	15.7	15.2
Lwengo	18.1	64.6	84.4	75.6	90.4	86.7	28.6	16.2
Rakai & Kyotera	14.7	68.6	93.4	73.4	89.5	88.2	19.9	18.4

n/a – not available from Census or other available sources.

Traditional Leadership & Kingdoms

Uganda has cultural and traditional kingdoms as recognized under the Institution of Traditional or Cultural Leaders Act (2010). The EACOP corridor runs through two kingdoms, **Bunyoro-Kitara** and **Buganda.** Bunyoro-Kitara is located along the south eastern shores of Lake Albert. Buganda is located in the south-central region of Uganda running up to the north west shores of Lake Victoria and the border with Tanzania.

[8] Based on datasets summarised in Table 2-5.

Kingdoms are responsible for cultural matters, such as funeral rites and marriage ceremonies. They also can have other responsibilities such as community development programmes for health, education and land access.

A traditional ruler (king) represents the kingdoms. Below this level traditional leadership includes councils of elders and clan leaders. Women can hold leadership positions on the council of elders, even if this is rare, but cannot hold positions as clan leaders. The traditional leadership provide an important role and influence in community attitudes and resolution of disputes, particularly over land. The system of traditional leadership continues to be recognised and respected by communities.

Kingdoms legally own land and some sections of the EACOP project could potentially be on Kingdom land.

Ethnic Groups

Ethnic groups identified within the areas potentially affected by the Project include the Baganda, Banyoro, Bagungu, Alur, Banyankole and Bakiga. Besides these, several other ethnic groups are present in the study area as well as immigrants and refugees from neighbouring countries e.g. Rwanda.

Vulnerable Groups

The Project Area of influence is understood to be home to several vulnerable groups which may include orphans, the elderly, the landless, the disabled, those with little education, widowers, indigenous peoples, women, children, young people, HIV and AIDS patients, sex workers and those suffering from ill health. Land rights of ethnic minorities, pastoral communities, women and children, dwellers of informal settlements and slums and other vulnerable groups are referred to in the Ugandan National Land Policy, 2013.

As part of the RAP planning studies socio-economic surveys will be undertake of affected households and communities impacted by the land acquisition programme. A detailed socio-economic baseline will be provided within each RAP document.

2.7.3 Land Tenure

Land in Uganda belongs to the citizens of Uganda. The Constitution of the Republic of Uganda (1995) and the Land act (Cap. 227) recognize both formal and informal land uses and provide that land in Uganda may be held in four tenure categories:

- Customary;
- freehold;
- leasehold; and
- mailo.

These categories are summarized below in

Table 2-7. Under the legal framework the rights associated with these tenures are provided, whether owned in perpetuity or leasehold. Categorization of land in terms of its manner of use are not fully defined within legal instruments. This matter is addressed in the national Policy framework and referred to in the Uganda National Land Policy (2013) and sets the Policy Statement that land will be categorized into: Private Land, Public Land and Government Land.

Table 2-7 Summary of Land Tenure Categories in Uganda

Tenure	Summary Points:
Customary	• Defined by Land Act (Cap. 227) as a system regulated by customary rules which are limited in their operation to a particular description or class of persons. Rights held either individually, by the family, by the clan or by a community. Land is owned in perpetuity. • Two mechanisms in which rights under this tenure can be *formally* recognised: o **Certificate of Customary Ownership (CCO):** any person, family or community holding land under customary tenure on former public land may acquire a CCO. There is a procedure to acquire a CCO under the Land Act (Cap. 227) involving the Area Land Committee and District Land Board (Section 4.2). o **Communal Land Association (CLA):** a CLA can be formed by any group of persons under the Land Act for any purpose connected with the communal ownership and management of land, whether under customary law or otherwise. • Many holders of land under customary tenure do not have formal documentation, such as a CCO.
Freehold	• Land ownership by an individual or private organisation with full powers of disposition and the compulsory registration of title in perpetuity. • Freehold tenure is only permitted for Ugandan citizens and companies with a minimum Ugandan ownership of 50 %. • Public policy regards freehold as the property regime of the future to the extent that current laws provide for conversion from leasehold tenure or customary tenure to freehold. This process is expensive as it requires substantial resources for adjudication, consolidation and registration. • Government institutions prefer to own land in perpetuity; therefore, most Government Land is held under freehold tenure.
Leasehold	• Individuals or institutions can obtain a lease by means of a contract or operation by the law. • Under this form of tenure, tenants or lessees have exclusive possession, interest and security of tenure on the land for a defined period of time in return for rent. A contractual arrangement where interest on land is ensured for a period less than five years in return for rent or lump sum compensation is referred to as a *tenancy agreement*. However, for a period exceeding five years, parties are obliged to apply for a *leasehold title* which is formally registered. • Common law recognizes the statute of '*tenancy agreements*' and '*sharecropping*' that are not defined under the Land Act. In sharecropping arrangements, licensees are typically granted authority to use land only for agricultural production (annual and semi-annual crops). In both these cases tenure is purely contractual and no legal security of tenure is provided. However, licensees are empowered by the Land Act to convert such interests in land into freehold title through a prescribed process. • Foreign entities can only access land in Uganda through leasehold and are restricted from owning land in perpetuity.
Mailo	• Mailo land was introduced under the 1900 Uganda Agreement and is mainly land owned by cultural and traditional institutions • Key characteristics of mailo tenure is it involves holding registered land in perpetuity. • *Mailo tenure* and "*native" freeholds* separate the ownership of land from occupancy or ownership of developments by lawful or bonafide occupants. This creates conflicting interests and overlaps in rights on the same piece of land. The Land (Amendment) Act of 2010 grants statutory protection to the bonafide and lawful occupants against any arbitrary eviction as long as the prescribed nominal ground rent is paid. However, the nominal ground rent provided for is largely ignored creating a land use deadlock between tenants and registered land owners. The landlord-tenant relationship as legally regulated is often not amicable or harmonious[9]. • Land held under mailo tenure (approximately 9000 square miles) is mostly confined to Buganda (central Uganda) and Bunyoro (western Uganda) kingdoms, both of which the Project corridor traverses.

Common Property Resources: are usually managed through institutional arrangements, customs and social conventions designed to induce joint solutions to issues of access and benefit sharing. These resources are often situated on land owned privately by individuals and/or communities (including clans). Common property resources, especially communal grazing land, have in the past been illegally appropriated or sold, or individualised by members of local communities without their consent[10].

[9] Uganda National Land Policy, 2013.
[10] Uganda National Land Policy, 2013.

2.7.4 Land Use Context

Land use in Uganda is predominantly agricultural with over 70% of the country being classified as agricultural land comprising arable, permanent crop land and permanent pastures. The other land covers comprise forest, nature protection areas (including environmental reserves and wildlife areas) and urban areas.

The EACOP project route corridor will traverse gently undulating grass and farmland, hills with open plateaus and bare rocky outcrops, open grassland, wetlands and, near the border with Tanzania, a drier, more sparsely vegetated landscape. **Error! Reference source not found.** indicates the land cover along the route. The pipeline route runs through predominantly rural areas, the majority of land cover likely to be in agricultural use, comprising cultivation followed by grazing land use as the dominant features. The route planning sort to avoid physical displacement and therefore impacts on areas likely to be urban land uses have been minimized.

During the route development careful consideration was made to avoid areas of high biodiversity value, including several areas that are recognised internationally. The EACOP Project corridor runs through or near a number of forestry areas or reserves, some of these are summarized below. Forest Reserves may be designated for harvesting timber, replanting and biodiversity conservation:

- Runs close to the southern edge of Wambabya Forest Reserve. The southern part of the reserve supports relatively intact forest. Although only 3420 ha in size, Wambabya has the highest population density of chimpanzees in the Albertine Rift (Lamprey 2015).
- Runs through the western part of the Taala Forest Reserve. The project is immediately adjacent to a village enclave and the existing land use is mostly agriculture, with some eucalypt plantations to the north.
- Runs adjacent to the Kasana-Kasambya Forest Reserve. This part of the reserve is exclusively pine tree plantations that are commercially harvested.
- Runs near the small Lwengo Forest Reserve, which comprises eucalyptus trees and subsistence farming which has encroached on the forest.

Whilst the initial part of the EACOP route, as it runs south east from Lake Albert, traverses areas with potential natural habitat value, elsewhere along the pipeline routes, habitats are generally degraded, with high levels of anthropogenic influence (agricultural cultivation, grazing and charcoal production etc.).

3. LEGAL & REGULATORY FRAMEWORK

The Project is obliged to meet Ugandan legislative requirements for land acquisition, compensation and resettlement as well as applicable international financing standards enshrined in the Equator Principles III and the IFC Performance Standards. This Chapter summarizes the pertinent legal, policy and institutional framework for the Project's approach to land acquisition, compensation and resettlement. The key agreements of direct relevance to the EACOP Project, including the Inter-Governmental Agreement (IGA), are summarized. It also compares Ugandan regulatory requirements to international financing standards, and proposes a way forward when gaps are identified.

3.1 Corporate Policies

The Upstream Partners each have corporate policies pertaining to their social responsibilities. These are referred to differently by each Partner and include Environment, Health and Safety policies, Ethics Charters, commitments to the protection of biodiversity and strategies for operating in sensitive environments. Social commitments, including stakeholder engagement, are summarized for each Partner in the table below.

Table 3-1 Summary of the Upstream Partners Corporate Social Commitments

Company	Policies
Total TEPU	TOTAL commits, among others, to: • Developing transparent, constructive relationships with all of its stakeholders; • Reducing negative socio-economic impacts related to its operations; • Participating in the economic diversification of host communities and countries by supporting local initiatives; • Contributing to human development by emphasizing education and the strengthening of local skills and capacities; and • Enhancing the value of the historical, natural and cultural heritage of local communities. In their Health, Safety and Environment Charter, TOTAL commits itself to comply with applicable Ugandan laws and regulations, international standards, as well as TOTAL Group policies in the fields of Health, Safety and Environment. In matters of safety, health, environment and quality, Total further adopts a constructive attitude based on open dialogue with stakeholders and outside parties. Through its social commitment, it focuses on developing its activities in harmony with the neighbouring communities. In its Ethics Charter, TOTAL commits to contributing to the social and economic development of the countries in which it operates, in compliance with local legislation and regulation. It is committed to protecting the environment and respecting local cultures.
CNOOC CUL	CUL, in its social policies, is committed to contributing to the economic development of the country and ensure that the communities where CUL operates benefit from their operations. CUL will operate in compliance with Ugandan laws and regulations and pursue high standards of business ethics and corporate governance, and implement advanced standards and industry best practice. It is committed to pursuing a win-win relationship with stakeholders, and to respect the rights and interests of stakeholders, by supporting local communities in the development of education, and contributing to poverty alleviation, among others.
Tullow TUOP	In its Environment and Social Performance Standard, TUOP states that it will comply with the requirements of all applicable host country laws and regulations, and apply their Standard where their requirements are more stringent than host country laws. The Standard requires that a robust stakeholder engagement process is followed, which is well-planned and coordinated, including the identification of potential stakeholders and the participation of project impacted people to discuss and contribute to project design, scope, impacts and mitigation measures prior to the start of project activities. In its policy statement on human rights, TUOP commits to a human rights due diligence from the start of a potential project and to actively engage employees and contractors with appropriate cultural awareness training. TUOP will undertake all its operations in conformity with the Voluntary Principles on Security and Human Rights.

3.2 Ugandan Legislation & Policy

A range of laws and policies exist in Uganda relevant to the oil and gas sector as well as to land acquisition, compensation and resettlement related to types of legally defined land. The Upstream LARF contains a comprehensive review of the applicable Ugandan legal framework. A summary of the key Ugandan legislation and policy pertinent to the Project's land acquisition, compensation and resettlement is provided below.

The major legislation governing land acquisition and compensation in Uganda is the Constitution of Uganda 1995, the Land Act Cap 227, and the Land Acquisition Act 1965 Cap 226, described in Table 3-2 below, along with key legislation for the oil and gas sector.

Table 3-2 Summary of Key Legislation

Legislation:	Summary Description:
The Constitution of the Republic of Uganda, 1995 (as amended)	Land in Uganda belongs to the citizens of Uganda and is vested in them in accordance with four land tenure systems: Customary, Freehold, Mailo and Leasehold. Article 26 of the Constitution provides that; • Every person has a right to own property either individually or in association with others. • No person shall be compulsorily deprived of property or any interest in or right over property of any description except where the following conditions are satisfied: o the taking of possession or acquisition is necessary for public use or in the interest of defence, public safety, public order, public morality or public health; and o the compulsory taking of possession or acquisition of property is made under a law which makes provision for: ▪ prompt payment of fair and adequate compensation, prior to the taking of possession or acquisition of the property; and ▪ a right of access to a court of law by any person who has an interest or right over the property.
The Land Act (Cap. 227) 1998 (as amended)	This law regulates the tenure, ownership and management of land in Uganda. The Act establishes a number of land administration institutions, notably District Land Boards, District Land Office, Land Tribunals and Land Committees. The Act has a number of provisions in relation to compensation, including regarding: • District Land Tribunal shall, in assessing compensation, take into account: in the case of a customary owner, the value of land shall be the open market value of the unimproved land; and the value of the buildings on the land, which shall be taken at a replacement cost. • Disturbance allowances and their relation to minimum periods of notice to vacate the land. • Lists of rates to be referred to determining the amount of compensation payable.
The Land Acquisition Act (Cap. 226) 1965	• Compulsory acquisition of land is defined as the intervention of Government, including local government, to acquire land in the national interest, such as public use, interest of defence, public safety, public order, public morality and public health. There is no provision for compulsory acquisition of land by individuals or corporate bodies in the name of public interest, and is thus the explicit prerogative of the State (and those defined as 'authorised undertakers'). This Act makes provision for the procedures and methods of compulsory acquisition of land for public purposes whether for temporary or permanent use. • The Minister of Lands may authorize any person to enter the land, survey the land, dig or bore the subsoil or any other thing necessary for ascertaining whether the land is suitable for a public purpose. • The Act requires that adequate, fair and prompt compensation is paid before taking possession of land and property. Disputes arising from the compensation to be paid should be referred to the court for decision.
Petroleum (Exploration, Development and Production) Act (No. 3 of 2013)	• The interest in land in a development area belongs to the land owner. The GoU is, however, vested with the interest in the petroleum in or under any land or water in Uganda. Subject to any law relating to acquisition of land, and Section 135 of the same Act, a holder of a petroleum production licence may obtain a lease of the land or other rights to use it upon such terms as to the rent to be paid for the land, the duration and extent or area of the land to which the lease or other right of the lease shall relate as may be agreed upon between the holder of a licence and the land owner. • A licensee should pay to the land owner a fair and reasonable compensation for any disturbance of his or her right and for any damage done to the surface of the land, any crops, tree, building or works. • The exploration, appraisal, development and production activities of the JV Partners are regulated by 4 Production Sharing Agreements (PSAs) which set out a range of terms and conditions for the petroleum development of the Upstream facilities. With regard to land acquisition, the PSA states that all land shall become the property of the Government as soon as it is acquired by the Licensee, subject to its continued use rent-free by the Licensee until the date upon which the Agreement is terminated. The responsibility for the land acquisition process for the Upstream developments thus lies with the JV Partners while ownership of the acquired land will be vested in ULC on behalf of the Government of Uganda.
Midstream Regulations: The EACOP Project is a **midstream development** therefore in addition to the IGA and Host-Government Agreement a midstream license is likely to be required. The details of the HGA and any midstream license are the matter of discussion with the GoU and Partners at the time of writing this Resettlement Strategy . It is assumed at this stage that the responsibility for the land acquisition process for the EACOP lies with the JV Partners and once established the Pipeline Company, while ownership of the permanently acquired land will be vested in ULC on	

Legislation:	Summary Description:
behalf of the Government of Uganda. Arrangements for any temporary acquired land (e.g. for the construction sites) will also be covered within the HGA and licensing.	
Petroleum (Refining, Conversion, Transmission and Midstream Storage) Regulations, 2016	• Part III includes requirements associated with pipelines, including pipeline construction licencing, routing, design and safety considerations, construction, operation and decommissioning. • S(68) contains provisions prohibiting construction in an area adjacent to pipelines. • With the application process for a licence to construct and operate a pipeline information shall be provided related to land, including evidence that the necessary notification have been given to the applicable land owners and agreements entered into or proposed to be entered by the applicant for the easements over the lands affected by the Pipeline route. • A permit is required to begin operation of a pipeline.
Petroleum (Refining, Conversion, Transmission and Midstream Storage) (National Content) Regulations, 2016	The Regulations: • Promote the empowerment of Ugandan citizens and entities during the execution of midstream operations; • Local content provisions seek to prioritise Ugandan suppliers and service providers in the procurement of goods and services, and to promote the transfer of technology and training of Ugandan nationals; • State that MEMD is required to consider national content when evaluating any licence application under the Petroleum (Refining, Conversion, Transmission and Midstream Storage) Act, 2013.

Compulsory Acquisition

The intention is for land acquisition for the EACOP Project to be carried out using as far as possible negotiated settlements in order to avoid compulsory acquisition. Discussions between the Project and the Government of Uganda as part of the Host Government Agreement (HGA) and Project licensing are being undertaken as to determine the Project's rights with regard to the application of compulsory acquisition if this was required as a last resort. Details of these rights are disclosed in the chapter dealing with the Land Acquisition & Compensation Process.

Table 3-3 Summary of Key Policy & Guidelines

Legislation:	Summary Description:
National Oil & Gas Policy for Uganda, 2008	• This Policy was intended to create a conducive environment for petroleum exploration and the anticipated development, production and utilisation of discovered resources. Provides a framework for the efficient management of oil and gas resources as well as revenues accruing from it. • The Policy envisages the need to acquire land for the different aspects of the petroleum value chain like provision of transportation corridors, i.e. pipelines and roads, together with infrastructure such as wellheads, oil and gas processing facilities and refineries. It anticipates that agreements will have to be entered into with landowners to cover aspects like compensation for their land surface interests. As such, Government shall, where necessary and in accordance with the Constitution, acquire land in the public interest to support the implementation of oil and gas activities.
Uganda National Land Policy, 2013	The Policy: • provides a framework for articulating the role of land in national development, land ownership, distribution, utilisation, alienability, management and control of land; • harmonises the diverse views on historical land injustices, land management and land use, and contemporary land issues; • protects the rights of citizens to own land, which should be optimally utilised. • provides a framework for reform geared towards having an efficient and effective land delivery system, which is the basis for poverty reduction, wealth creation and socio-economic transformation. • provides a mandate to Government to protect the land rights and resources of customary owners, individuals and communities owning land in areas where petroleum deposits exist or are discovered, and to allow, to the extent possible, co-existence in such areas. • provides that in the use and management of natural resources, Government should recognise and protect the right to ancestral lands of ethnic minority groups and shall pay prompt, adequate and fair compensation to ethnic minority groups that are displaced from their ancestral land by government action.
Environmental Impact Assessment Guidelines for	• Guidelines include sections on compensation for loss of assets, as well as resettlement. States that it is Government's policy goal to improve living standards and earning capacities of displaced persons and recognizes the importance of ensuring that displaced people benefit from the displacing project; that resettlement takes place according to a timetable that makes sufficient time allowances for the development of resettlement infrastructure; lost incomes are restored, and that sufficient

Legislation:	Summary Description:
the Energy Sector, 2004 (NEMA)	financial resources are made available in order to afford resettlement. The issue of livelihood restoration is addressed in the National Environment Act 1995 CAP 153. • With regard to compensation (i.e. cash payments) it should be sufficient to purchase replacement assets so that displaced persons are not worse off, economically and socially, than before displacement. • It acknowledges the constraints of monetary compensation and recognizes the rights of secondary affected persons (e.g. tenants, 'squatters') to compensation and thus provides for the development of a comprehensive baseline to identify all affected persons. Asset recording must take cognizance of all affected privately-owned, community and public assets. Reference is made to a cut-off period, but no further details are provided about its procedure. With regard to a census, this must precede the compensation and relocation process, and should identify all affected persons and their means of livelihood, as well as vulnerable categories. • The guidelines include a basic framework for a Compensation or Resettlement Plan including the provision for consultations with displaced persons, a grievance mechanism and monitoring and evaluation.
National Physical Planning Standards & Guidelines, 2011	• The Physical Planning Guidelines and Standards are intended to guide the preparation and implementation of physical development plans, with the basic aim of ensuring orderly, coordinated and efficient development. This Guideline consolidates existing standards relating to social, economic and physical infrastructure provision from various sectors into one document for ease of implementation and enforcement and includes provisions for specific development processes and the application of the standards. It includes standards and guidelines for residential, commercial and industrial developments and associated infrastructure requirements.
Guidelines for Compensation Assessment under Land Acquisition (GCALA) June 2017 (MLHUD)	• Government has developed guidelines to harmonise and improve the overall practice of valuation assessment to achieve fair and adequate compensation for compulsory acquisition to project affected persons in accordance with the Constitution, and to support the Chief Government Valuer (CGV). • Guidelines based on compensation principle of fairness and adequacy, which means that the PAP should be no worse off in financial terms after the acquisition than the PAP was before. • The Guidelines consider the international best practices, including the International Valuation Standards (IVS) and the international financing institutions standards (World Bank Environmental & Social Standard 5 & IFC Performance Standard 5).

Other pertinent legislation was reviewed within the Upstream LARF(2017), including related environmental, planning, infrastructure and social protection legislation and policy.

3.3 Host Government Agreement and Inter-Governmental Agreement

The Inter-Governmental Agreement (IGA) was signed by the Governments of Uganda and Tanzania on 26 May 2017. Within the IGA, Article 3 established the land rights framework. This framework addresses:

- **Compliance with EHSS and Human Rights Standards**: The land acquisition process for the Project needs to be undertaken in compliance with EHSS Standards and Human Rights Standards at a national and international level.
- **Identifiable land rights free from third party interests**: Land rights for the Project are required to be (i) clearly identifiable, subject to registrable title and (ii) free from third party interests (including encumbrances, rights or claims), other than certain third party interests that may be agreed by the Project (such as, for example, encumbrances in favour of the Project's lenders);
- **Strongest available title or rights**: Land rights for the Project are required to represent the strongest available title (or in the case of land rights needed on a short-term basis, to represent an appropriate type of tile or right for the related use and period of use).
- **Duration**: Land rights are required to be obtained for the entire duration of the Project or as long as needed for the relevant construction and other Project activities, as the case may be.
- **Uninhibited implementation of the Project**: Land rights for the Project are required to allow the uninhibited implementation of the Project.
- **Ownership of facilities**: Land rights for the Project must be in a form such that the Project Company is the full owner of all Project facilities in Uganda.

- **Lender security**: The Project's lenders must be able to take legal, valid and enforceable first priority security over the land rights for the Project and over the Project facilities, and the land rights must be in the requisite form therefor.
- **Terms**: Land rights for the Project must be obtained on fair, transparent, legally enforceable and clear commercial terms and conditions in favour of the Project Company.

The Host Government Agreements (HGAs) between the Upstream Partners and the Governments for the Project will follow on from the IGA, and will cover in its remit agreement over land rights. It is currently under development and discussion with the Government of Uganda, and is yet to be signed. The proposed approach and principles set out in this Resettlement Strategy will be reviewed once the HGA is agreed, and any required refinements will be made to the resettlement planning if required at that stage. These will either be reflected in an updated RPF and/or the subsequent comprehensive RAPs/LRPs.

3.4 International Guidance & Standards

The EACOP Project will be developed in line with the Ugandan legal framework and standards and, since it will seek finance from international financing institutions, the Project will be compliant with these. The relevant international financing standards for land acquisition, compensation and resettlement are summarised below.

3.4.1 International Finance Corporation (IFC) Performance Standards (PSs)

The IFC, a member of the World Bank Group, has adopted a suite of performance standards on social and environmental sustainability. The IFC and other international financial institutions (IFIs) applies these performance standards to manage project-related social and environmental risks and impacts, as well as to enhance development opportunities in its private sector financing. The full series of Performance Standards, designed to improve social and environmental outcomes, consist of the following and are each accompanied by a Guidance Note:

Table 3-4 IFC Performance Standards

PS1	Assessment and Management of Environmental and Social Risks and Impacts
PS2	Labour and Working Conditions
PS3	Resource Efficiency and Pollution Prevention
PS4	Community Health, Safety and Security
PS5	Land Acquisition and Involuntary Resettlement
PS6	Biodiversity Conservation and Sustainable Management of Living Natural Resources
PS7	Indigenous Peoples
PS8	Cultural Heritage

The three Performance Standards of particular relevance to this Resettlement Strategy are PS1, PS5 and PS8:

PS 1 - Assessment and Management of Environmental and Social Risks and Impacts

This Standard recognizes that the need for managing environmental and social performance and mitigating associated risks is essential for all projects. It contains various key pieces of guidance that are relevant to this project particularly around stakeholder engagement and grievance management.

PS5 – Land Acquisition & Resettlement

PS5 is the core standard related to land acquisition and resettlement. It refers to the management of physical displacement (i.e. relocation or loss of shelter) and economic displacement (i.e. loss of assets or access to assets that leads to loss of income sources or means of livelihood) as the result of project-related land acquisition.

Table 3-5 Summary of PS5 – Land Acquisition & Involuntary Resettlement

Objectives:	• To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs; • To avoid forced eviction; • To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost, and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected; • To improve, or restore, the livelihoods and standards of living of displaced persons; and • To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.
Summary of Key PS5 Requirements:	
General Requirements:	• Project proponent identify those persons who will be displaced and establish a cut-off date to establish eligibility for compensation; • Project proponent to offer land-based compensation, where feasible, where livelihoods of displaced persons are land-based, or where land is collectively owned; • Negotiated settlements to be encouraging to avoid forcible removal of people; • Private sector companies to "bridge the gap" between domestic legal requirements and the requirements of the Performance Standard where necessary; • Preparation of a RAP, which demonstrates how displacement will be managed in accordance with PS5; • Requirements for clients where there is Government-managed land acquisition for the project; and • PS5 requires project proponents to identify, review, and abide by all laws of the host country that are applicable to land acquisition and involuntary resettlement.
Compensation:	• Standards for compensation be transparent and consistent within a project, and established with the participation of those impacted. • Project proponents must offer displaced persons compensation for loss of assets at full replacement cost, and other assistance to help them improve or at least restore their standards of living or livelihoods. • For physically displaced persons project proponents should offer the choice of replacement property of equal or higher value, equivalent or better characteristics, and advantages of location and security of tenure, or cash compensation at full replacement value where appropriate.
Loss of Income or Livelihood Impacts:	If land acquisition for the project causes loss of income or livelihood, regardless of whether or not the affected people are physically displaced, project proponents are required to: • Promptly compensate economically displaced persons for loss of assets or access to assets at full replacement cost; • Where land acquisition affects commercial structures, compensate the affected business owner for the cost of re-establishing commercial activities elsewhere; for lost net income during the period of transition; and for the cost of the transfer and reinstallation of the plant, machinery or other equipment; • Provide replacement property (e.g. agricultural) of equal or greater value, or cash compensation at full replacement cost where appropriate, to persons with legal rights or claims to land which are recognized or recognizable under the national laws; • Compensate economically displaced persons who are without legally recognizable claims to land for lost assets (such as crops, irrigation infrastructure and other improvements made to the land) other than land, at full replacement cost; • Provide additional targeted assistance (e.g. credit facilities, training, or job opportunities), and opportunities to improve or at least restore their income-earning capacity, production levels, and standards of living to economically displaced persons whose livelihoods or income levels are adversely affected; and • Provide transitional support to economically displaced persons, as necessary, based on a reasonable estimate of the time required to restore their income-earning capacity, production levels, and standards of living.

PS8 - Cultural Heritage

Land acquisition and involuntary resettlement also impact on communities' cultural heritage – both tangible and intangible. PS8 aims to ensure that clients protect cultural heritage in the course of Project activities and support its preservation.

3.5 Comparison of IFC Standards & Ugandan Regulations

A comparison of IFC standards and Uganda legislation is provided in Table 3-6. Gaps are identified and a project specific s

Table 3-7 Gap Analysis Table[11]

Resettlement Topic	IFC Performance Standard	Uganda Regulation	Gaps
Alternative project designs	Feasible alternative Project designs should be considered to avoid or at least limit physical or economic displacement.	Activities must be exercised in a manner that affects land owners as little as possible[12].	IFC Standards explicitly require that resettlement be minimised by considering alternative project design.
Planning Instruments	In the case of physical displacement, a Resettlement Action Plan will be developed. In the case of economic displacement only, a Livelihood Restoration Plan will be developed. Where both physical and economic displacement is caused, livelihood restoration will be incorporated in the Resettlement Action Plan.	Displacement resulting from development project activities is not defined in Uganda laws. However, EIA Guidelines for the Energy Sector refer to compensation and resettlement as consequences of displacement. It also makes provision for the development of a Compensation Plan or a Resettlement Plan[13].	Resettlement plans are not required by Uganda laws, but are prescribed in the EIA Guideline for the Energy Sector.
Consultation and Information Disclosure	Resettlement activities must be planned and implemented with appropriate disclosure of information, consultation and the informed participation of those affected including host communities in decision-making. The perspectives of women, minority groups and other categories with special requirements must be obtained and their interests factored into resettlement planning and implementation.	A midstream licence application requires that land owners have been notified and agreements over land demonstrated. Disclosure and consultation are generally required as soon as the need for resettlement has been identified. For compulsory land acquisition, the Minister of Lands, Housing and Urban Development must declare the location, approximate area and plan of the land required[14]. All land owners and occupiers must receive a copy of this declaration and must be informed on	Despite references to consultation and disclosure, community participation does not drive the land acquisition and resettlement process. According to the Petroleum (Exploration, Development and Production) Act, accounting for the "[…] interests of the community" is done after having obtained consent from affected persons. There is no mention of how host communities or women shall be engaged during resettlement activities.

[11] Adapted from Upstream LARF and updated for GCACAL.
[12] Section 10.1 of EIA Guideline for the Energy Sector, 2004
[13] Section 10.7 of EIA Guideline for the Energy Sector, 2004
[14] Section 3 (1) Land Acquisition Act Cap. 226

Resettlement Topic	IFC Performance Standard	Uganda Regulation	Gaps	Proposed Project Specific Solution to Address Gap
		when and where they can inspect the plan of the land.		
Eligibility	Eligibility criteria should recognize the rights of those affected people: • Who have formal legal rights to the land or assets they occupy or use; • Who do not have formal legal rights to land or assets, but have a claim to land that is recognized or recognizable under national law; and • Who have no recognizable legal right or claim to the land or assets they occupy or use. The census will establish the status of the displaced persons.	Uganda laws recognise land occupancy under four regimes of land tenure, namely freehold, leasehold, *mailo* and customary. Under these different types of land ownership, occupants and land owners are eligible for compensation for land, improvements to land, crops and structures.	Uganda laws and the IFC PS 5 are consistent in the recognition of the rights of occupants and land owners under the different land tenure regimes.	The Project will recognize the rights of all affected people including those with formal legal rights; those without formal legal rights and those who have no recognizable legal right to land or assets used or occupied by them. The census to be undertaken prior to land acquisition and resettlement activities will establish the status of the displaced persons
Cut-Off Date	In the absence of government procedures the client will establish a cut-off date for eligibility which will be well documented and disseminated throughout the project area.	There is no legal provision for the establishment of a cut-off date, but the EIA Guidelines for the Energy Sector make reference to the cut-off date for the determination of eligibility, but does not provide any procedural guidance[15]. With regard to compulsory land acquisition the intention to acquire land must be published in several notices; exhibited at "convenient places on or near the land" and should state who should be compensated[16].	The Uganda regulations are unclear on how a cut-off date is to be enforced.	Cut off dates for eligibility will be well documented and disseminated throughout the project area, including relevant national ministries and local government.
Census	Where involuntary resettlement is unavoidable, a census will be carried out to collect appropriate socio-economic baseline data to identify the persons who will be displaced by the project, determine who will be eligible for compensation and assistance.	Uganda laws do not require that a census be taken of the persons who will be displaced by the project. However, the EIA Guidelines for the Energy Sector refer to the census as the means to identify all affected persons and their means of livelihood. It also refers to a baseline study to identify all interests in	The Guidelines require that a census be conducted in the event of compensation and resettlement.	The Project commits to identifying all persons who will be displaced as a result of their development activities. This will be done in the form of a census prior to resettlement to determine who will be eligible for compensation and assistance.

[15] Section 10 of EIA Guidelines for the Energy Sector, 2004.
[16] Section 5 (1) Land Acquisition Act Cap. 226

Resettlement Topic	IFC Performance Standard	Uganda Regulation	Gaps	Proposed Project Specific Solution to Address Gap
		affected assets, including the rights of tenants[17].		
Physical Displacement and Relocation	Physically displaced persons will be offered a choice of replacement property of equal or higher value, security of tenure, equivalent or better characteristics, and advantages of location or cash compensation where appropriate.	Uganda laws do not require that physically displaced persons be offered a choice of resettlement housing (out of the options available) and relocation assistance. However, the EIA Guidelines for the Energy Sector refers to the requirement to provide suitable materials for resettlers to build their own housing. The Physical Planning Standards specify plot sizes and materials to be used for the establishment of new residential infrastructure[18].	There is no specific requirement for the resettlement of persons who are physically displaced by a development project in Uganda laws, other than making replacement building materials available.	The Project's aim is to provide physically displaced persons the right to choose from a number of resettlement options, including resettlement sites with equivalent or improved living conditions and to provide suitable relocation assistance.
Economic Displacement (loss of land)	Economically displaced persons will be compensated for the loss of economic assets at full replacement cost (PS5, §27) and with replacement land of at least the same productive potential and location advantage (PS5, §28).	Displacement resulting from development project activities is not defined in Uganda law. The EIA Guidelines for the Energy Sector considers compensation for the loss of land[19]. The type of compensation packages that should be awarded to project affected persons is not described.	The Uganda laws do not categorise project affected persons according to the impact that proposed land acquisition and resettlement activities have on them. There is no specific requirement to provide replacement land to project affected persons, but it is an option available for consideration.	The Project commits to compensating economically displaced persons: • with replacement land of at least the same productive potential and location advantage, or • for the loss of economic assets at replacement cost (to achieve fair and adequate compensation)
Economic displacement (businesses)	Economically displaced persons will also be provided with (i) assistance to re-establish commercial activities (businesses), (ii) replacement property of equal or greater value, and will be provided with transitional support as necessary to restore their income-earning capacity and standards of living (PS5, §29).	Unlike economically displaced persons who own land, commercially displaced persons only have legal claims to land by virtue of occupancy. The Uganda laws recognise this ownership as a formal land right and such occupants must be considered under Section 139, Subsection 1b of the Petroleum (Exploration, Development and	The local laws are inconsistent with what is stipulated in the IFC guidelines when it comes to assistance in the re-establishment of commercial activities and provision of replacement property with transitional support as necessary to restore the affected person's income earning capacity.	The Project is committed to the provision of support to commercially displaced persons, who will receive: • assistance to re-establish commercial activities; • replacement property of equal or greater value; and • transitional support to restore their income earning capacity and standards of living.

[17] Section 10.4 of EIA Guidelines for the Energy Sector, 2004.
[18] Chapter 2 (see also Table 1, p. 8) of National Physical Planning Standards and Guidelines, 2011.
[19] Section 10 of EIA Guidelines for the Energy Sector, 2004.

Resettlement Topic	IFC Performance Standard	Uganda Regulation	Gaps	Proposed Project Specific Solution to Address Gap
		Production) Act which provides that "account shall be taken of any improvements effected […] the benefit of which has or will accrue to the land owner".		
Full Replacement Cost	Mitigation measures to mitigate adverse impact should include compensation at full replacement cost for loss of assets and other assistance to help them improve or restore their standards of living and livelihoods. Where livelihoods of displaced persons are land-based, or where land is collectively owned, affected persons will be offered land-based compensation where feasible. Land will be taken into possession only after compensation has been made available and resettlement sites and moving allowances have been provided to affected persons (PS5, §2, 9).	The District Land Boards assess compensation based on open market value of the unimproved land; and buildings on the land are compensated at open market value (in urban areas) and depreciated replacement cost for the rural areas[20]. Standing crops which can be harvested during the period of notice shall not be compensated. The list of rates of compensation compiled by the district land boards are to be used in determining the rates of compensation. However, the GCALA recommend compensation assessments at replacement cost, including disturbance allowance (15% or 30% depending on notice period). The EIA Guidelines for the Energy Sector refer to "acceptable compensation rates" which are to be established after consultation with representatives of the affected communities[21].	Computation of compensation as outlined in the Land Act does not offer full replacement cost prescribed by the IFC. However, the GCALA for compulsory acquisition recommend compensation assessments at replacement cost, including disturbance allowance (15% or 30% depending on notice period).	The Project commits to mitigating the adverse impacts associated with land acquisition and resettlement by compensating affected persons at replacement cost (to achieve fair and adequate compensation) of the affected assets.
Form of Compensation	Compensation in kind should be considered in preference over cash.	Article 26 of the 1995 of the Constitution of Uganda protects Ugandans from deprivation of property. Land can only be accessed once "prompt payment of fair and adequate compensation prior to the taking of possession of the property" has been undertaken.	Uganda laws do not generally consider compensation in kind although the EIA Guidelines for the Energy Sector refer to the "constraints to monetary compensation".	The Project commits to compensating affected persons for loss of rights over land or property in kind in preference over cash.

[20] Section 24 of Land Regulations, 2004.
[21] Section 10.5 of EIA Guidelines for the Energy Sector, 2004.

Resettlement Topic	IFC Performance Standard	Uganda Regulation	Gaps	Proposed Project Specific Solution to Address Gap
Vulnerable Groups	In resettlement planning, particular attention should be given to the poor and vulnerable, and compensation in kind should be offered to facilitate permanent relocation and establishment at an alternative location.	The 1995 Uganda Constitution stipulates that: "the State shall take affirmative action in favour of groups marginalised on the basis of gender, age, disability or any other reason […] for the purpose of redressing imbalances which exist against them". This regulation is not fully described in the context of resettlement and land acquisition. The EIA Guidelines for the Energy Sector require that vulnerability is established during the census[22].	The Uganda laws offer protection of vulnerable groups from exploitation. However, this does not provide the procedure for this category of project affected persons to be consulted, engaged or further protected.	The Project commits to planning with particular focus to vulnerable project affected persons. Resettlement packages will be to give preference to compensation in kind with special facilitation of permanent relocation.
Grievances	Affected persons will have access to an independent grievance mechanism to lodge concerns and complaints about compensation and relocation without impeding access to any judicial or administrative remedies (PS5, §11).	Disputes regarding compensation will be determined by Government (in practice the Chief Government Valuer). In addition, any person who has an interest or right over property being acquired compulsorily has a right of access to a court of law[23].	Uganda laws do not explicitly require that development project implementers develop independent grievance redress mechanisms that are accessible to affected communities and individuals. However, the EIA Guidelines for the Energy Sector makes provision for a grievance committee "at the lowest level of activity"[24].	The Project commits to making an free grievance mechanism accessible to project affected persons.
Monitoring and Evaluation	A procedure to monitor and evaluate the implementation will be established; affected persons will be consulted during the monitoring process (PS5, §14).	An evaluation procedure is prescribed in the EIA Guidelines for the Energy Sector, including a team of experts to provide technical advice during monitoring. Monitoring is based on the Resettlement Plan[25].	Uganda laws do not require development project implementers to develop a monitoring and evaluation procedure for the land acquisition and resettlement process contrary to what is required by the IFC. However, the EIA Guidelines for the Energy Sector makes recommendations about monitoring and evaluation of resettlement plans.	The Project commits to developing a Monitoring and Evaluation procedure that will assess the implementation of land acquisition and resettlement activities. Affected persons will be consulted during the M&E activities.

[22] Section 10.4 of EIA Guidelines for the Energy Sector, 2004.
[23] Section 2 and other related sections of Land Acquisition Act Cap 226.
[24] Section 10.11 of EIA Guidelines for the Energy Sector, 2004.
[25] Section 10.11 of EIA Guidelines for the Energy Sector, 2004.

4. LAND ACQUISITION & RESETTLEMENT

The Land acquisition and resettlement methodology for the EACOP Project has been designed to provide secure land rights to the Project and ensure the related land acquisition process meets Ugandan legislation and international financing standards, including IFC PS5 requirements (outlined in Chapter 3).

The detailed land acquisition process is subject to discussion and agreement with the Government of Uganda, and may thus be refined in future along with refinement of institutional roles and responsibilities (Section 4.2).

4.1 Land Acquisition & Resettlement Methodology

Resettlement methodology is managed around two main phases which include a number of activities:

Resettlement planning: which comprises all the pre-acquisition activities, including the preparation of the RPF, the detailed surveys and valuations, and will culminate in the development of a suite of RAPs and/or LRPs (depending on whether physical and economic displacement occurs, or only economic displacement), as well as valuation report(s). Pre-acquisition activities also include screening activities to assess ways to avoid and minimise impacts (e.g. route planning to avoid settlements etc.). Any required declarations that acquisition of land is in the public purpose by the Government of Uganda should be carried out during the resettlement planning phase; and

Resettlement implementation: will result in the acquisition of land and granting of land rights to the Project. This will involve the subsequent implementation of the RAPs/LRPs, including agreements with PAPs, compensation payments, physical relocation, livelihood restoration assistance, arrangements for land rights to be granted to the Project etc.

Ongoing **monitoring and evaluation** activities are important quality assurance mechanisms to guide and direct the planning and implementation phases in relation to agreed outcomes.

Resettlement planning is an integral aspect of the overall Project planning process and will be incorporated into and aligned with the overall project schedule, taking into consideration the nature and extent of displacement and the duration of resettling affected households and enterprises to their new resettlement sites. Land access and construction will only commence once compensation has been paid and all physical resettlement has been completed.

Resettlement planning and implementation activities have linkages to a number of other project activities and regulatory and approval processes, such as the ESIA, route planning midstream licensing and corporate approval processes. The social impact assessment activities and the resettlement planning (RAP) work have close linkages with mutual application of the social data collected during these activities. A RAP is one of the social management plans to mitigate displacement as a significant social impact. While some resettlement planning activities are likely to start prior to the granting of all necessary regulatory approvals, detail disclosure of the resettlement planning process to affected communities will be dependent on these approvals, unless the regulators determine otherwise. To avoid speculative behaviour, the timing of disclosure will be linked to the Project's readiness to progress the planning phase to its final end.

The overall Project land acquisition methodology is indicated in Figure 4-1.

The Project proposes to undertake a consensual process to try and obtain agreements for land acquisition, with the intention that compulsory acquisition will only be used where agreement cannot be reached. The Project is in discussion with the Government of Uganda over the process and the measures that will be undertaken to avoid compulsory acquisition, as far as possible, and the cases where compulsory acquisition may be required as a last resort. The potential need for public purpose to be declared and compulsory powers available for the Project if required is therefore recognised and part of the points for discussion with the Government.

Figure 4-1 Resettlement Planning & Implementation Methodology – EACOP Uganda Section

4.2 Institutional Roles

4.2.1 Main institutional entities

The main Institutional entities involved in the process of EACOP Project resettlement and compensation are described below:

Institution	Roles
Petroleum Exploration, Development and Production Department in the Ministry of Energy and Mineral Development	Ministry of Energy and Mineral Development (MEMD) oversees and approves all the Project activities. MEMD has a regulatory role in the oil and gas industry and is, therefore, responsible for ensuring that the Project is compliant with Uganda legislation in all of their activities. In addition, MEMD is responsible for the approval of both project technical and financial planning. Since some of the activities carried out by the Project are cost-recoverable, MEMD approval of planned and executed work is required.
Ministry of Lands, Housing and Urban Development	The CGV in the Valuation Division of the MHLUD is responsible for approving all valuations. The CGV's office is also involved in resolving public complaints and disputes that arise from valuation for land acquisition and compensation payments. It is further anticipated that the Land Administration, Land Registration, and the Surveys and Mapping Departments, as well as the Ministry Zonal Offices at regional level will be involved in resettlement activities.
Ministry of Local Government	Ministry of Local Government oversees the decentralisation and devolution of functions, powers and services; and to ensure good governance and democratic participation in, and control of decision making by the people. The lower local governments function under this Ministry, including the District Local Government and the lower systems under that. Elected Councils and their executive committees have, among other, a function to receive and solve disputes from lower local governments.
National Environmental Management Authority (NEMA)	National Environment Management Authority (NEMA) is charged with the management of environmental issues and provides for sustainable management of the environment. The Authority in consultation with the lead agencies is empowered to issue guidelines and prescribe measures and standards for the management and conservation of natural resources and the environment. The Authority has issued EIA regulations for the energy sector, including sections on land acquisition and associated public consultation requirements. NEMA, therefore has an interest in the resettlement and compensation plans in the petroleum industry.
Uganda Land Commission (ULC)	The Uganda Land Commission (ULC) holds and manages land in Uganda vested in or acquired by the Government of Uganda. Leases on public land are granted by the ULC. When the Project has acquired the land for the development of project infrastructure, the land will be transferred to the ULC.

District Local Government	All districts have four levels of local councils (LCs). Local Councils are responsible for local policy matters, economic development, resolving local conflicts and providing orderly leadership. In the project affected area, LC Is, LC IIs and LC IIIs interact directly with the affected population. These councils will thus be able to assist during the identification of rightful property owners, and resolving compensation grievances. District Local Government includes the District Land Office, District Land Board and Area Land Committees (see following sections).
District Land Office	The District Land Office (DLO) should include a District Physical Planner, a District Land Officer, a District Valuer, a District Surveyor, a District Registrar of Titles and a District Cartographer, which provides technical services to the DLB through its own staff or arranges for external consultants to facilitate the Board in the performance of its functions.
District Land Board	District Land Boards (DLBs) set compensation rates for crop and temporary structures and facilitate land registrations. It is, therefore, important that RAP implementation involves participation of DLBs. In this regard, the DLBs will oversee the appropriation of public land; facilitating registration; and transfer of interests in land.
Area Land Committee	Area Land Committees (ALCs) determine, verify and mark the boundaries of all interests in land that is subject to an application for certificate of customary ownership or in grant of freehold title. The ALC assists the DLB in an advisory capacity on matters relating to land including ascertaining rights in land boundaries and disputes.
Private Sector entities	RAP implementation will entail involvement of private sector consultants for various planning and implementation activities, including the assessment and verification of assets, and payment of compensation to PAPs.

4.2.2 The Land working Group

A Land Working Group is necessary to oversee, facilitate and implement relevant actions for the land acquisition programme for EACOP in Uganda. This group was established during HGA negotiations in May, 2018. Its objective is to prepare and support the process of negotiation during HGA discussion and to achieve land access in line with the Project schedule and nature of the land rights set out in the IGA.

- ✓ The Land Working Group is comprised of members from:
  - MEMD
  - MLHUD
  - UNOC
  - ULC
  - Other representative of Government agencies as necessary (NEMA, UNRA, …)
  - EACOP legal team and advisers
  - EACOP Land team

- ✓ Main topics under discussion
  - Legal status of TEAM B.V. / PipeCO: PPT to be introduced as "authorized undertaker of Public Works"
  - Compulsory acquisition detailed process + Compliance with IFC standards
  - Land rights for reserved Land (wet land, forest reserve, national park,…, historical Monuments, road….)
  - Registration & conversion of different land tenures to Freehold in the Name of ULC (Uganda Land Commission)
  - Provision of compliant lease to TEAM B.V. / PipeCo (detailed terms & conditions, number of lease, duration…)

4.3 Land Requirements & Land Access Approach

This section sets out the land rights required by the Project in Uganda for the various land uses at different stages in the Project's life. All land required for the Project in Uganda will be acquired and consolidated on a permanent basis, even for the construction facilities, by the GoU (the Project expects that the Acquiring Authority for most of the land required for the Project will be the ULC), and then provided for use to the Project in accordance with the IGA principles outlined above.

- ▪ Land requirements
  - Land rights required for construction facilities & associated access roads
  - Land rights required for permanent Above Ground Installation (**AGI**s) & associated access roads
  - Land rights required for the Pipeline Corridor (30m width)

4.3.1 Temporary (short – term) land requirements: Construction facilities

Land required by the Project on a temporary (short-term basis, during the construction phase) includes land for:

1) temporary construction facilities (including construction camps with pipe yards, hydrotest water storage, waste storage); and
2) associated access roads;

In relation to (1) and (2) above, the Project requires:

- the Government of Uganda (through the Uganda Land Commission (the "**ULC**")), in close coordination with the Project, to acquire the freehold (or Mailo title as the case may be) to such land (including any necessary conversion to freehold where land is held under customary tenure etc.); and
- the ULC to then provide a short-term lease to the Project which grants land rights to the Project which comply with the principles set out in the IGA.

On the expiry or termination of the Project's land rights, land will be returned by the Project to Government of Uganda in accordance with the terms of the relevant leases (land shall be reinstated to previous conditions unless the relevant leases specify otherwise) and thereafter the Government of Uganda will be responsible for such land.

4.3.2 Permanent (long–term land requirements) : AGIs and Pipeline Corridor

Land required by the Project in Uganda on a permanent (long-term, during the operation phase) basis includes land for:

1) the permanent Above Ground Installations (AGIs) and related ; and
2) the 30m-wide EACOP pipeline corridor in Uganda plus widened sections where technically required by the Project.

4.3.2.1 Permanent Above Ground Installations

Land required by the Project for Above Ground Installation (**AGI**s) includes land for:

- those parts of the EACOP System in Uganda that are used for controlling the flow of Petroleum and/or for ensuring the safety and maintenance of the EACOP System, including in Uganda (only): intermediate Pumping Stations (2), Electrical sub-stations (6) and Main Line Valves Stations (13);

In relation to AGIs the Project requires:

- the Government of Uganda (through the Uganda Land Commission (the "**ULC**")), in close coordination with the Project, to acquire the freehold (or Mailo title as the case may be) to such land (including any necessary conversion to freehold where land is held under customary tenure etc.); and

- the ULC to then provide a long-term lease to the Project (for an initial term of forty-nine (49) years, unless the Project specifies otherwise) which grants land rights to the Project which comply with the principles set out in the IGA.

4.3.2.2 Pipeline Corridor

Land required by the Project for the Pipeline Corridor includes land for the 30m-wide EACOP pipeline corridor where the Project requires long-term access rights & **long-term restricted land-use*** (for the life of the Project) (such part being with a 30m width plus widened sections where technically required).

In relation to the Pipeline Corridor, the Project requires:

- Government of Uganda (through the Uganda Land Commission (**ULC**)), in close coordination with the Project, to acquire the freehold (or Mailo title as the case may be) to such land (30m-wide EACOP pipeline corridor) (including any necessary conversion to freehold where land is held under customary tenure etc.); and
- the ULC to then provide to the Project a long-term lease (for an initial term of forty-nine (49) years, unless the Project specifies otherwise) which grants land rights to the Project which comply with the principles set out in the IGA.

**** Long-term restricted Land-use:*** The land required by the Project for the 30m-wide EACOP pipeline corridor shall be subject to the following land use arrangements after the construction period and during the whole Project's operation phase:

- ✓ In areas of land other than "Reserved Land[26]" all 30m of the corridor will be (after end of relevant construction activities) restored by the Project to grassland. No development of structures, planting of deep-rooted trees or agricultural activities (e.g. crop production) will be allowed with the exception of grazing of livestock crossing the corridor;
- ✓ In areas categorized as "Reserved Land" prior to the Project - all 30m of the corridor will be (after end of relevant construction activities) restored by the Project to achieve equivalent biological capacity. No development of structures or agricultural activities (e.g. crop production) will be allowed in the corridor with the exception of grazing of wildlife and livestock crossing the corridor. Deep-rooted trees will not be planted on the 10 m strip above the pipeline;

[26] Areas of land with a special regime driven by the need to be protected (and thus inalienable) in the interest of communities and/or the citizens of Uganda. Such areas of land include: (a) any natural lake, river, ground water, natural pond, natural stream, wetland, forest reserve, national park and any other land reserved for ecological and touristic purposes, in each case, in Uganda and held by the central government or by any local government in Uganda, for the common good of the citizens of Uganda, (b) any area of land in Uganda which contains a preserved object under section 2 of the Historical Monuments Act, (c) any area of land in Uganda which is the subject of a protection agreement under section 4 of the Historical Monuments Act, (d) any area of land in Uganda which is or contains a place of worship or a tomb declared to be a protected object under section 6 of the Historical Monuments Act, (e) any road and road reserves in Uganda, and (f) any railway and railway reserve in Uganda.

- ✓ The Project will require access to the EACOP pipeline corridor at all times during operation for inspection, maintenance and repair; and
- ✓ The pipeline corridor will not generally be fenced, and pedestrian and livestock crossing will be generally allowed, vehicle crossing will be limited to the existing road and infrastructure crossing arrangements (this is a matter for discussion with the relevant roads agency).

4.3.3 Necessary further discussions

- The Project acknowledges that there exist certain types of land in Uganda mainly with an enhanced environmental and/or historic/cultural/religious sensitivity but also Land under proprietorship /occupation of government agencies where the above-mentioned land rights may not be fully available. The Project understands that these are areas of land with a special regime driven by the need to be protected (and thus inalienable) in the interest of communities and/or the citizens of Uganda (referred as "Reserved Land"[27]). The Project will continue to work with the Uganda authorities to determine acceptable arrangements in respect of all types of Reserved Land in order to ensure that the Project is granted land rights in accordance with the IGA principles (Art. 3 of the IGA). These matters are currently addressed in the Project draft Uganda HGA Land Rights Appendix (the "**Uganda Land Appendix**").

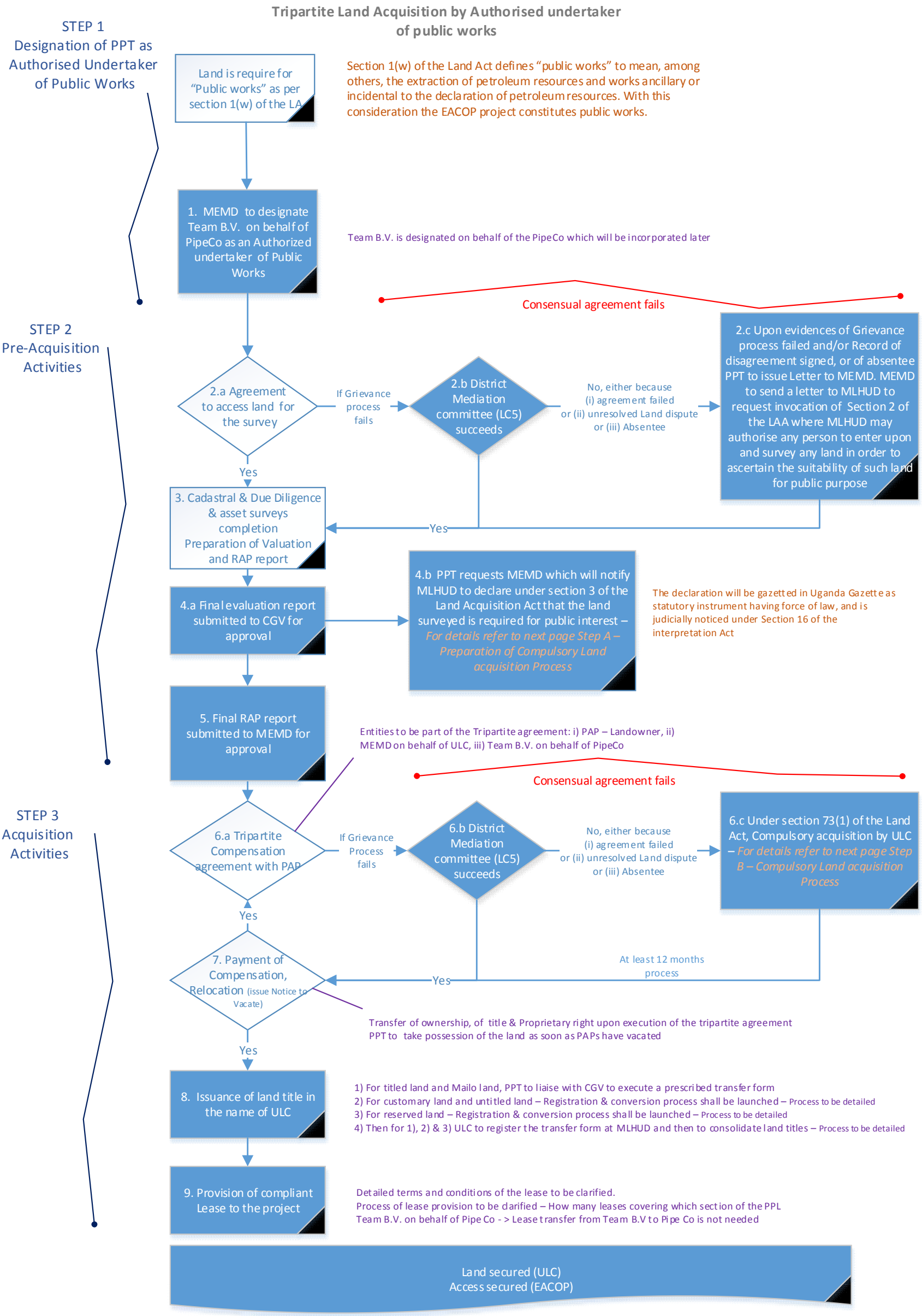
- Given the Project's required land use for new roads or upgrades for construction and the operation, the EACOP Project envisages that appropriate road-related land arrangements will be established and agreed with relevant roads Authorities (e.g. on technical design criteria, construction and maintenance of roads, scheduling). These will need to ensure that the Project is provided with land rights of such nature and granted in such a manner as will be compliant with the IGA principles.

- Further detail on the characteristics of the freehold (or Mailo title) on the required land and on the nature of the land rights required by the Project in Uganda will be agreed between the Project and the State. These matters are currently addressed in the Uganda Land Appendix.

- In addition, the Project recognises that there may be certain crossing arrangements on the required Project land and that there will need to be various discussions and need for agreements at times between the Project and the relevant persons in respect of access and shared use.

[27] Areas of land with a special regime driven by the need to be protected (and thus inalienable) in the interest of communities and/or the citizens of Uganda. Such areas of land include: (a) any natural lake, river, ground water, natural pond, natural stream, wetland, forest reserve, national park and any other land reserved for ecological and touristic purposes, in each case, in Uganda and held by the central government or by any local government in Uganda, for the common good of the citizens of Uganda, (b) any area of land in Uganda which contains a preserved object under section 2 of the Historical Monuments Act, (c) any area of land in Uganda which is the subject of a protection agreement under section 4 of the Historical Monuments Act, (d) any area of land in Uganda which is or contains a place of worship or a tomb declared to be a protected object under section 6 of the Historical Monuments Act, (e) any road and road reserves in Uganda, and (f) any railway and railway reserve in Uganda.

4.4 Land Acquisition detailed process in Uganda



5. COMPENSATION FRAMEWORK

Each RAP will define the compensation framework for the proposed components. The Project will ensure that the compensation framework will be developed in close consultation with Communities and Local Authorities and will define the following:

- Valuation approach for asset and land improvement losses that will be considered for compensation as well as the basis of valuation and rates;
- Eligibility criteria defining the categories of PAPs that will be eligible for compensation and assistance;
- Entitlements defining what each category of eligible owner, user or business will receive in compensation.

The Project will develop packages that include both monetary and in-kind compensation as well as other forms of assistance to restore and improve livelihoods and living standards.

5.1 Valuation Methodology in Uganda

The Uganda legislation provides specific guidelines in terms of valuation. Compensation following the acquisition of land in Uganda is based on the principle of equivalence, which is broadly assumed to be the financial equivalent of the asset taken. Under this principle, PAPs should not be worse off or better off in financial terms from their status prior to acquisition. The asset is valued on the basis of market value without any increase or decrease attributed to the reasons that led to the acquisition. Any special value to the owner which is not reflected in market value is excluded. In addition to the compensation derived from market value, the PAP is entitled to other payments which are generally referred to as 'disturbance allowance' of 15 or 30 percent. Compensation will reflect the cost incurred and losses sustained as a direct, natural and reasonable consequence of having to relocate.

Compensation may also arise where land or improvements are affected but not necessarily acquired in the interest of the execution of works. This type of compensation is payable when the loss occurs i.e. when some right in property other than its acquisition are temporarily affected due to interference with the activities being conducted on it.

There are five conventional valuation methods which are used in Uganda to determine market value:

- Comparison method;
- Contractor's method;
- Investment method;
- Profit method; and
- Residual method.

The description are summarized in Table 2-3.

Method	Description
Comparison method	The asset to be valued is compared to an asset that is similar in its physical properties or attributes and its legal status. The basis for comparison is "same for same" and is subject to allowances for situational variables. This is the most commonly used valuation method.
Contractor's method	This method is sometimes referred to as the Replacement Method. The basis for the valuation is the cost of replacing the affected asset. The method is normally applied to assets that are not readily available on the market such as places of worship.
Investment method	The assessment for this method rests on the understanding that the capital value of an interest in landed property is directly related to the income or annual value derived from the land including any improvements. The valuation process involves estimating the future net income that would have been yielded from the land and discounting it at an appropriate interest rate.
Profit method	This method of valuation considers the trade of an enterprise and its actual or estimated profits. A number of years of trading results (e.g. financial statements) are considered in order to determine a fair average and to allow for any fluctuations in trade. With gross income (turnover) as the basis for valuation, a deduction is made for reasonable overheads and working expenses to arrive at the net value of the enterprise.
Residual method	This method is used in the valuation of development properties. The method calculates the surplus value after meeting all costs of developments including the cost of finance, and allowing for profits. This could be undeveloped land which is to be developed, or land with existing buildings which are to be refurbished or torn down and redeveloped

Table 5-1 Valuation Methods in Uganda

There is no active land market in the Project area and land transactions are largely informal and remain unregistered. It is anticipated that land valuations will be done predominantly based on the comparative method.

5.2 Valuation Procedure in Uganda

In Uganda valuation for compensation of land and improvements that are affected by Government projects was originally undertaken by the office of the CGV. This practice has changed in recent times and private valuers are now used to compile valuation assessment reports on behalf of Government. However, the CGV has retained its oversight role in ensuring that standards are maintained and government interests are duly protected. The valuation is carried out in consideration of established practices, policies, regulations and Ugandan laws.

The valuation process starts with the identification of the affected property owner and the assets to be affected. The affected owner is informed and sensitized about the project and permission is sought to allow access to the land for inspection. Once the affected property and improvements are identified, all relevant details are recorded such as crops (type and growth stage), economic trees and buildings (size, materials), and, where relevant, the features and characteristics of the land. The asset recording is witnessed, at a minimum, by the property owner, local leaders and Project representatives.

The valuation assessment is reached through a direct application of the applicable rates and is submitted in draft to the CGV for review and comments. The approved report becomes an official document for implementation of compensation payment.

The Two categories of rates used in the valuation of assets for compensation are:

1) Statutory rates as provided for in the Constitution and the Land Act. These include rates for crops, economic trees, temporary structures and graves, and are determined by District Land Boards (DLBs) with input from the relevant professionals.
2) Market related rates derived from market analyses conducted by the office of the CGV or a delegated appointee who is a registered Valuer. These rates are specifically applied to land interests and permanent buildings. Factors considered during the assessment of these assets include market conditions, tenure systems, covenants, securities, and physical conditions of the asset.

The legal provisions in the Constitution and other statutes do not provide detailed information on valuation methods and procedures. The office of the CGV adheres to the International Valuation Standards (2013) and best practices and appreciates the Royal Institute of Chartered Surveyors' Guidelines. The office of the CGV has also developed national guiding principles and procedures (GCALA).

Statutory rates determined by District Land Boards (DLBs) are infrequently updated and the process of review is not firmly adhered to. Certain rates, including those for economic fruit trees, graves and shrines, do not reflect the full cost of replacement, and appear to be inadequate compensation of losses. There is also no functional land market in the Project area. It is, therefore, anticipated that valuations for this Project will have to involve a combination of methodologies described above in order to reach a fair and acceptable value for project affected persons' land and assets. The Project will support the DLBs and CGV office to achieve their duty by conducting a Market research with their participation in each district crossed by the Pipeline corridor.

In addition, non-cash compensation options must be offered in land acquisition and compensation plans. The provision for non-cash compensation options must be aimed at livelihood restoration and the improvement of standards of living.

5.3 Compensation and Valuation Policy

The Project is committed to providing fair and adequate compensation for losses as a result of displacement. A resettlement package based on the entitlement matrix will be offered after

consultation with eligible households. The final package will be tailored to specific characteristics of the project affected people as well as their current and future resettlement situation. This will also include a disturbance component to meet the demand for adequate compensation. The disturbance component must consider the Project's impacts on livelihoods i.e. the loss of future opportunities to earn income and standards of living; and the interruption of the progressive improvement over time of living conditions. In this context fair and adequate compensation must take cognizance not only of the value of the asset that is lost, but also the disruption resettlement is likely to cause. Some categories of assistance for disturbances induced by the Project's development activities will be common to all entitlements defined for each PAP, while others will be linked directly to specific Project impacts.

In addition, interests in assets may be vested in more than one person or entity. The valuation procedure must, therefore, be able to recognize each interest and allocate the appropriate value to these interests so that fair and adequate compensation can be demonstrated in terms of individual interest, and not merely the combined interests in an asset. The test of fairness and adequacy must, therefore, be met for each individual interest.

Against this background, the valuation policy for this Project includes the following principles:

a) Valuation of assets will be at fair and adequate replacement cost without consideration of the condition of the asset. Depreciation will not be taken into consideration;

b) Valuation of assets must separate the different interests in the asset under review. Each interest must be valued in terms of fairness and adequacy;

c) Land must be valued separately from any improvements to facilitate the valuation of separate interests and allow the establishment of consistent land rates across the project;

d) Where replacement land is offered, the offer must include all transactional costs associated with the acquisition of replacement land, including titling and transfer fees, required taxes and utility permits;

e) Where replacement housing is offered, the value of the structures is determined by the replacement cost of adequate replacement housing including the cost of materials and labour, and any other statutory requirements. Replacement housing criteria must include aspects such as floor area, number of rooms, functionality of social spaces and socio-cultural values associated with the house as social space;

f) Annual crops are not valued if sufficient notice is given to harvest the crops. In the event that crops cannot be harvested, or incidental damage is caused, standard rates for annual crops will apply for the assessment of damaged crops;

g) The value of perennial crops must include the net present value (NPV) of forgone income for the duration of the period of re-establishment of the crop to the maturity stage at the time of displacement;

h) The value of salvaged materials at the time of resettlement will not be deducted from compensation.

Whereas valuation methods may be technically complex, the underlying principles must be disclosed in simple and understandable terms to PAPs during consultation so that they can participate meaningfully in the determination of a valuation approach that achieves fair and adequate compensation for all affected assets.

5.4 Implementation Assistance

Resettlement is a complex process often characterized by competing interests and conflict. Low literacy levels, and increased availability of cash from recent compensation and other Project-related sources of cash (e.g. annual rental for temporary access during exploration, land leases for camps) highlights the need for independent guidance for affected people to manage these social and economic changes. Following the practice in Uganda on similar projects, the Project will provide assistance to affected communities to participate in the resettlement planning and implementation processes and to ensure their informed participation.

Compensation will be paid directly to the affected household or individual based on the asset and census surveys. All agreements will be signed by the eligible PAPs and their spouses, a Partner representative, and representatives from relevant authorities to be identified during the planning phase.

The Project recognizes the lack of financial infrastructure and limited financial literacy in the project area. The Project will take appropriate measures to the extent feasible to invite financial institutions to provide services in the project area. The Project will also provide appropriate advice to PAPs with regard to money management. Examples of such advice may include the following:

- Financial forward planning;
- Investment options;
- Improvement and/or ‘start up’ of business ventures; and
- Training and employment opportunities.

Detailed assistance packages will be developed during the RAPs based on baseline conditions and the needs of PAPs.

5.5 Entitlement Framework and Eligibility

For each RAP an Entitlement Matrix will be prepared providing details of all categories of affected people, type of losses associated with each category and types of compensation and assistance to which category will be entitled.

Eligibility will be determined by the cut-off date which will be disclosed and documented after the census and asset surveys. In the absence of Government procedures for setting a cut-off date, it is common for a project to use the completion of the census and survey as the cut-off date. International standards do not specify when notification should be given to the community. However, it must be demonstrated that the notification about the cut-off date is well documented, and disseminated throughout project area. The cut-off date is used as a basis to deny compensation or resettlement assistance for persons who settled or establish their assets and economic activities after such cut-off date.

5.6 Resettlement and Livelihood restoration

5.6.1 Replacement Land Strategy

Resettlement preferences in clan-held areas will be determined with approval from clan leaders to assure clans of their control over their communal resources.

Replacement farmland where livelihoods are land-based is a critical aspect of livelihood improvement. To the extent feasible, land will be replaced with land although not necessarily of the same size. However, criteria such as land quality, its productive capacity, location and other appropriate aspects will be included in the assessment of the suitability of replacement farmland.

Alternative approaches to maximise access to farm land include the following:

- Optimisation of existing unaffected farmland to which PAPs already have access; and
- Identifying vacant or under-utilised land held under communal tenure.

Self-identification of available land for resettlement will be encouraged, especially in areas managed by clans. In addition, the Project will commission relevant studies to identify appropriate resettlement areas based on a set of criteria including, but not limited to the following:

- Distance from the formal original site;
- Possibility of in-fill resettlement – this is the preferred option;
- Availability of equivalent area of crop land free of settlements,
- Access to main social infrastructure and road systems;
- Acceptance by receiving communities.

The Project will be responsible for the completion of all land transactions.

5.6.2 Replacement Housing and Community Structures

The Project will as far as possible avoid physical displacement. In the event that this is not possible, replacement housing will be offered with due consideration of pre-existing housing arrangements recorded in the asset and census surveys. Replacement housing for primary residences will be offered under two options:

- Project-built replacement housing based on agreed materials and design and constructed by Project-appointed contractors; or
- Self-built replacement housing based on a pre-approved house plan and construction programme. Building materials will be provided in several instalments, either as cash or in-kind based on estimated material requirements linked to any phased construction requirements. The feasibility of this option will be assessed on an individual basis to ascertain that risks associated with this option are identified and appropriately managed and mitigated.

Auxiliary household structures (e.g., granaries, barns, animal enclosures) will be compensated in cash and materials may be salvaged in order to reconstruct these structures at the resettlement site.

Replacement housing will, as far as possible, be constructed within existing communities at available residential sites. Sites will be identified by the Project with participation from physically displaced households. Where a group of households are displaced by Project activities, a suitable resettlement site will be identified based on approved site selection criteria, including aspects such as ground suitability and safety, access to public facilities and distance from existing community and social network.

The Project will rebuild all replacement communal structures (e.g., schools, health clinics) with preference for local contracting and employment opportunities as far as this is feasible, without sacrificing the quality, cost, and duration of construction. The designs of communal facilities will be concluded in collaboration with the relevant authorities and affected communities.

5.6.3 Livelihood Restoration Strategy

The Project recognizes that livelihood restoration is both critical to the success of the resettlement of affected persons and difficult to achieve without prior participatory planning. Livelihoods in the project area are largely land-based, but diversified (for instance to include animal husbandry or seasonal fishing activities) with a view to maximize food production and cash generating opportunities, and to spread the risks often associated with subsistence livelihoods. It is therefore recognized that many households engage in various livelihood strategies and that these are often perceived as equally important.

The Project further recognizes that land-based livelihood improvement opportunities have not been widely tested in Uganda. There is therefore a significant need for appropriate baseline information to plan livelihood restoration activities. This data collection will be an integral part of the resettlement planning process, and all livelihood restoration plans will be incorporated into the RAPs and executed as part of the RAP implementation process.

Livelihood restoration planning will follow a number of broad guidelines:

- It will follow an integrated approach aimed at sustainable local development, using existing opportunities as much as possible, and promoting partnership and collaboration in view of long-term sustainability.
- It will ensure that land-based programmes are discussed and agreed to with affected communities only if replacement land is available and secured. When there is insufficient replacement land, other measures such as improving of productivity of remaining land or training/capacity building will be explored.
- It will equally endeavour to re-establish existing business enterprises and provide additional support to business owners in order to improve business operations (marketing, administration, operational efficiency) through training and other support measures.

- Livelihood restoration will be the focus of all monitoring and evaluation programmes until after completion of the resettlement to assure that the Project has successfully restored and improved livelihoods and standards of living.

While livelihood restoration will aim to sustain and when possible improve existing livelihood strategies, the primary focus during RAP implementation will be on ensuring continued food security. Where feasible, livelihood programmes will be aligned with relevant existing national and district programmes.

Programmes could include the following:

- Agricultural awareness and training programs;
- Identification and assessment of new technologies to improve production of cash crops, marketing and value chain activities;
- Mentoring programs and support for farmers/fishermen;
- Small enterprise training;
- Vocational skills and development; and
- Scholarship scheme

5.6.4 Assistance to Vulnerable People

Vulnerable individuals and households will be identified during the detailed census survey for the RAP, and will be supported with tailored assistance, to ensure their access to the benefits from resettlement opportunities. Appropriate measures will be determined in the entitlement framework and each vulnerable person/household's needs will be assessed prior to their relocation. Additional support will be provided to these individuals during the planning phase to ensure that they are informed of the process and are able to give their consent to the agreements.

6. RESETTLEMENT CONSULTATION

The objective of the Resettlement Consultation is to secure the meaningful participation of all PAPs (including their leaders and spokespersons) during planning and implementation. Effective resettlement planning requires regular engagement with a wide range of stakeholders, including individuals and groups that can play a significant role in shaping or affecting the project, people who are directly impacted by the Project, as well as representatives from host communities. The Project will engage frequently and throughout the different project phases for at least the following purposes:

1. Information disclosure at the start of the Project;
2. Consultation with affected communities and people about Project impacts; and
3. Negotiation of resettlement options and benefits.

A Stakeholder Engagement Plan (SEP) will be developed for the resettlement process that identifies project stakeholders; provides for engagement with local government and community leaders; describes the procedure for the announcement of the cut-off date; general stakeholder engagements for the dissemination of information; and to seek their project support. More specifically, the different phases of engagement will include the following:

6.1 Project Disclosure with Affected Communities

During this engagement, stakeholders will be given general information about the Project, general project descriptions, a summary of potential social (and other) impacts and proposed mitigation measures. Stakeholders will also be given an opportunity to engage for the assessment of project alternatives, especially in relation to the selection of suitable location for project infrastructure components.

Project disclosure may occur over several meetings, each having a specific purpose. The cumulative dissemination of project information must at least enable affected communities to engage meaningfully in discussions.

6.2 Consultation with PAPs

Once the displacement impacts have been identified and there is a better appreciation of the scope of impact (through an initial screening or preliminary impact studies), affected communities will be engaged in further discussions to provide more details about the displacement impact, as well as the measures that have been taken to avoid or at least minimise displacement.

During these consultations, PAPs will be given further opportunity to identify additional options to minimise impacts and engage with the Project in more detail on project impacts. The procedures for the census and asset surveys, including the dissemination of information regarding the cut-off date, will be communicated during these engagements.

This consultation will also serve to start the identification of potential resettlement areas as the basis for the screening of site suitability and any other factors pertinent in the site selection process.

Finally, the need for resettlement planning ccommittees will be introduced during this consultation phase.

6.3 Participatory Planning and Consultation

During this phase, PAPs will be engaged in detailed planning and discussions to understand compensation packages and eligibility requirements; resettlement assistance including livelihood restoration; site selection; design of replacement houses and other details pertaining to their resettlement and restoration of livelihoods and standards of living, as well as the timing of resettlement activities.

Based on international best practice, project consultation with people affected by resettlement is mandatory. It not only provides for the dissemination of information, but also creates opportunities for people to voice their concerns about the project, and propose alternatives. Early engagement is preferred in order to manage public expectations concerning the impact of the project and its expected benefits.

Furthermore, keeping affected people fully informed of their rights and responsibilities is crucial to the success of resettlement planning. To achieve this objective, information must be made accessible and understandable and special arrangements must be made to reach marginalised individuals. In order to ensure that women and members of vulnerable groups are reached, the Project must engage women and members from these vulnerable groups to participate in the stakeholder engagement activities.

For the purposes of this Project, Resettlement Planning Committees will be established in the project area representing affected households and other key stakeholders, including women and youth. These representatives will be elected onto the RPCs in order to represent the interests of PAPs in the discussions, and to provide regular feedback to PAPs on progress, and seek support and approval in decision-making processes. Selection criteria will be determined with community participation, and will include aspects such as local residence, good standing in the community, local knowledge and availability. This Committee will also serve as a mediation mechanism when consensus cannot be reached.

The final RAP will be disclosed in an appropriate format to provide PAPs with sufficient information about the planning process and its outcomes. While the need for project support prior to implementation is not legislated, it is an important aspect of obtaining social licence to operate.

6.4 Grievance Management

The Project has adopted a formulized grievance management mechanism that seeks to address complaints and grievances in a manner that brings a resolution in an acceptable timeframe.

The objective of the grievance management mechanism is to provide opportunities to affected communities and individuals to discuss concerns and raise grievances with the aim to finding long term solutions that do no harm to the local population and that reduce social risks. Ultimately, the Project

endeavours to maintain positive relationships with the affected and neighbouring communities, and all stakeholders at large.

The procedure applies to all concerns and grievances related to all activities of the project and is intended for the use by all stakeholders concerned with the Project. The application of this procedure does not deny communities and individuals their right to utilize other grievance resolution mechanisms and facilities provided by the laws of Uganda.

During the implementation phase of the RAP, once the compensation that is owed to a landowner or user has been calculated, the owner or user will be notified of the compensation offer. The offer will include all relevant details. The process to secure agreements starts with the first visit to the PAP by a representative of the Project land access team. The procedure for securing land access is elaborated upon, after which the offer is presented and explained. During a period of approximately two weeks, the PAP can be given the time to consider the offer, to ask for additional explanation and information, or to seek legal advice. Community liaison officers will be the first point of contact and will address questions on procedures and other legal solutions to legal department. A witness (for example LC1 Chairman) will accompany the representative of the Project land access team, to be present during the signing of the land agreement and compensation forms with the PAP.

If the PAP refuses to sign the offer during the second visit, a record of disagreement will be signed by the representative of the Project and the witness. If despite reasonable endeavours of the Project land team, the PAP cannot be persuaded to sign the offer, and the record of disagreement is drawn up, the procedure will be deemed unsuccessful. In that case, the Project and MEMD reserve the right to call upon the expropriation procedure to obtain rights for the land required for the Project. The offer remains open until the expropriation has ended, to allow the PAP to change his/her mind and sign the Offer.

EACOP Grievance Mechanism is illustrated below.

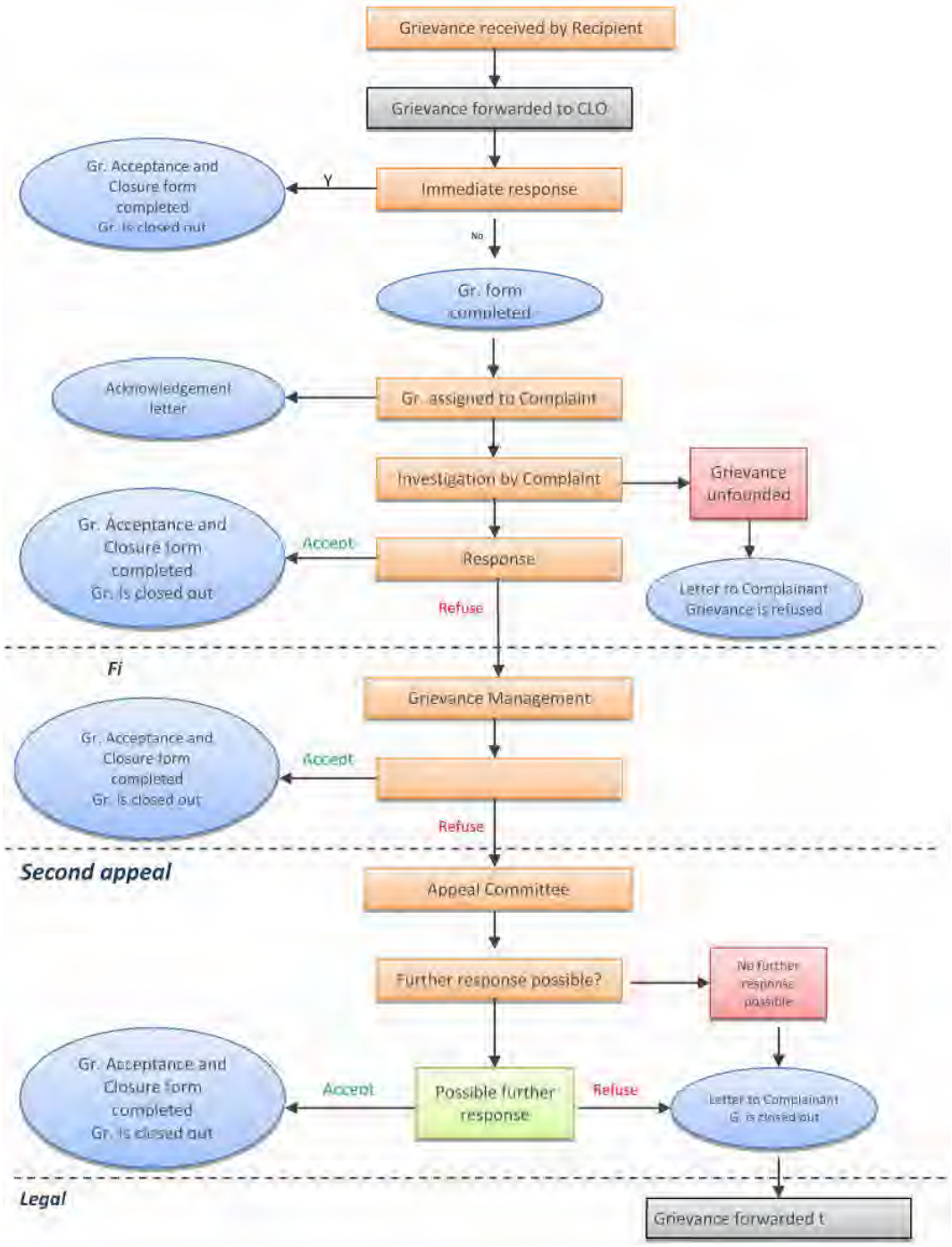


Figure 6-1 EACOP Grievance Mechanism

6.5 Monitoring and Evaluation

The Project will establish a resettlement monitoring and evaluation system, consistent with the requirements of IFC PS5 at two levels:

- Internal monitoring: by the resettlement teams with active participation of affected communities as far is possible; and
- External monitoring: by a third party specialist

The monitoring activities will assess the requirements of each RAP performance against the schedule of activities and budget. The need for any changes or corrective action will be identified in order to improve the resettlement delivery. Monitoring will periodically assess the progress and effectiveness of RAP implementation in restoring and improving living standards of PAPs. Local communities will be given opportunities to provide feedback on RAP monitoring activities through the Resettlement Village Committees and the Resettlement Advisory Group.

6.5.1 Internal Monitoring

Typical internal monitoring activities may include the following:

- Reporting progress against the RAP schedule – input and output indicators;
- Verifying that land acquisition and compensation entitlements are being delivered in full;
- Monitoring vulnerable households to ensure that they receive the agreed additional
- assistance;
- Collating periodic records of grievances and undertake status analysis; and
- Preparing general status reports for the Project management team.

The purpose of the internal monitoring outputs will be to inform Project management of implementation progress, any corrective actions to improve processes and procedures, and additional resource requirements.

6.5.2 External Monitoring

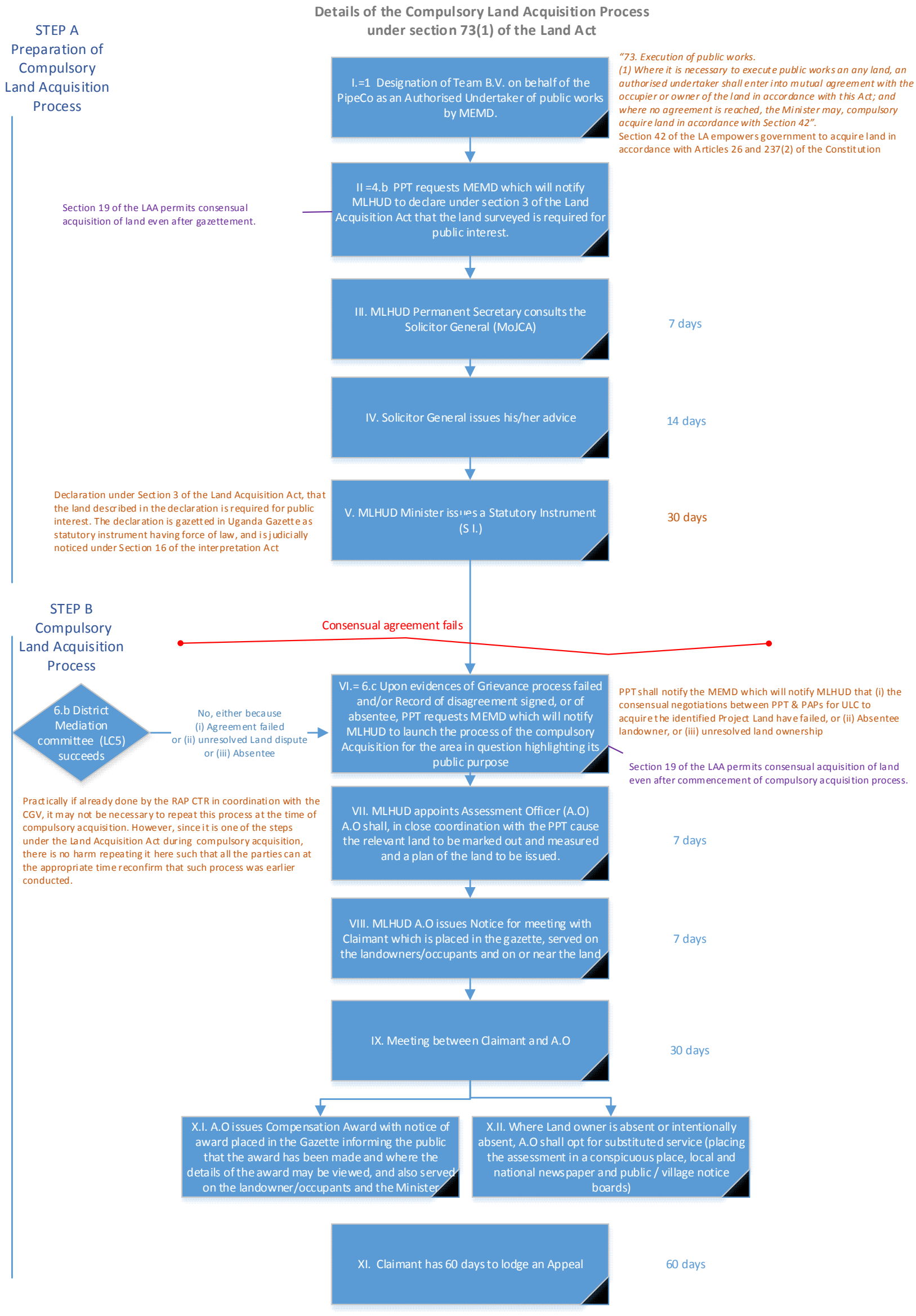
External monitoring activities will entail the following:

- Periodic evaluation of implementation progress; and
- A completion audit.

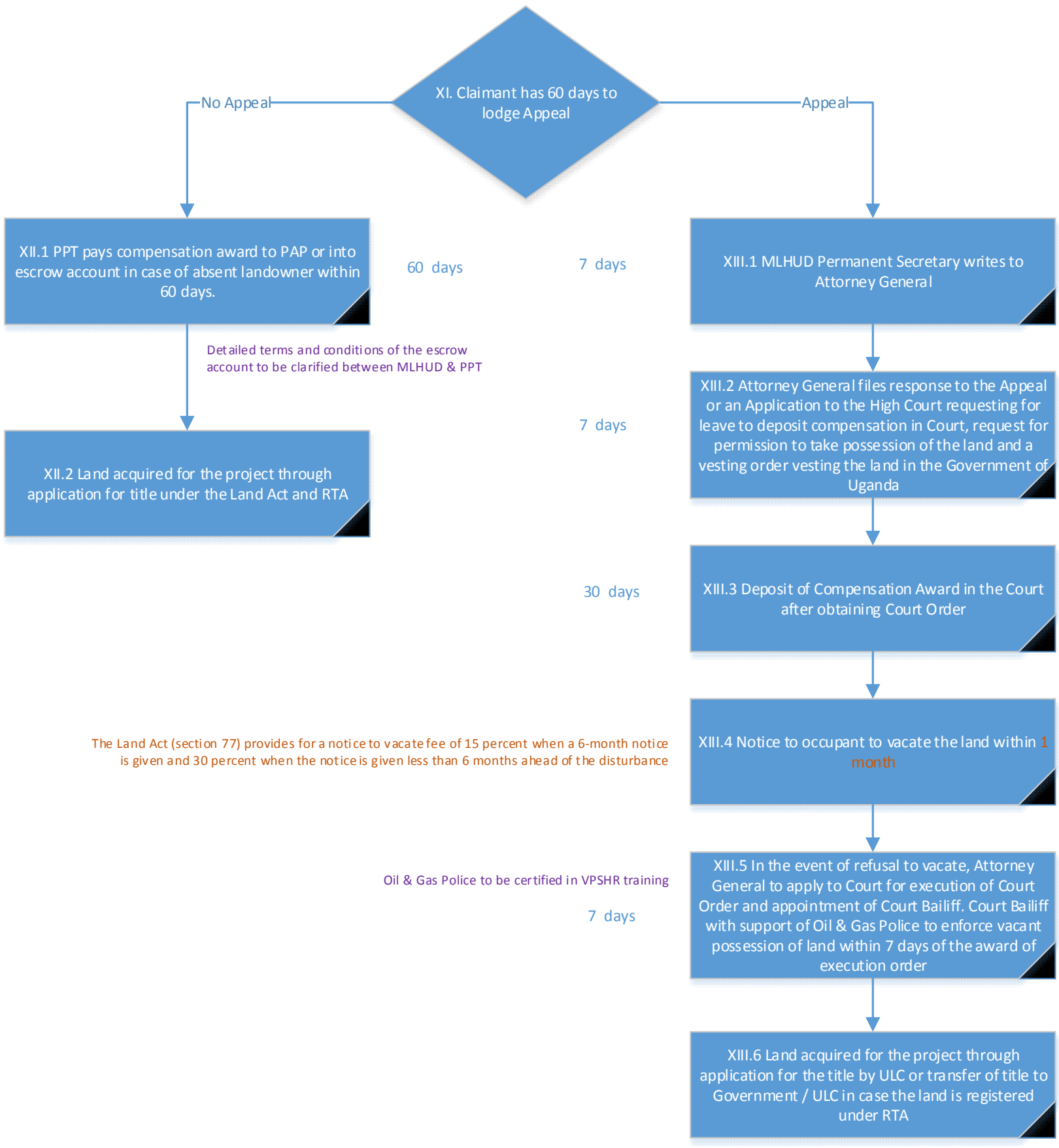
The Project will at a minimum annually conduct independent monitoring to assess the Project outcomes as envisaged in the RAPs and engage with PAPs in this regard to verify that the Project is implemented in accordance with the measures outlined in the RAPs.

A completion audit for each RAP will be conducted by an independent evaluator. The overall purpose of the completion audits will be to determine whether the RAP and its implementation comply with the requirements of Ugandan Legislation and IFC PS5. The completion audits for all resettlement will specifically focus on livelihood restoration (both measures and effects) to assess that adverse impacts have been adequately mitigated and benefits optimized.

Appendix 1 – Compulsory Land Acquisition Flowchart



Details of the Compulsory Land Acquisition Process in case the Claimant lodge an Appeal



Appendix L: Concordance Table

February 2020

Comment Reference	EIS Section	Comment Identification	Comment	ESIA Response	ESIA Section References
General Comments	Executive Summary	A.i.a	Ensure consistency and logical flow in the presentation of information on the project and potential risks/impacts through the report.	Act, Cap 153, 1995; the Environmental Impact Assessment Regulations 1998; the Guidelines for Environmental Impact Assessment in Uganda, 1997; the Environmental Impact Assessment Guidelines for the Energy Sector in Uganda, 2004 and, the Environmental and Social Impact Assessment Guidelines for the Energy Sector in Uganda, 2014 where applicable. The structure of the EIS conforms with national requirements (Annex D2 of the 2004 Energy Sector Guidelines) and good international industry practice. The EIS report is structured such that so that the project description, method, baseline, stakeholder engagement and impact assessment and environmental and social management plan are separate from each other but there are cross references. Consistency and logical flow was verified during quality check when the EIS was finalised.	Section 1
General Comments	Executive Summary	A.i.a.i	There is a disconnect between Chapter 7 (Impact Identification and Evaluation Methodologies) and the previous chapters (2-5).	The structure of the EIS conforms with national requirements (Annex D2 of the 2004 Energy Sector Guidelines) and good international industry practice. Impact assessment in Section 8 followed methodology approach as described in Section 5	Section 1

General Comments	Executive Summary	A.i.a.ii	There was a break in the logical flow between chapters 5 and 6. Ideally, the 'Project Area of Influence and the Baseline conditions' (Chapter 6) should precede 'impact and risk analysis' (chapter 5).	EIS sections follow national requirements and good international industry practice and are: Introduction; Project Background and Description; Alternatives; Legislative, Policy and Administrative Framework; EIS Process and Methodology; Environmental and Social Baseline Conditions; Stakeholder Engagement; Potential Impact Identification and Evaluation - Normal Operations; Potential Impact Identification and Evaluation - Abnormal Operations and Unplanned Events; Environmental and Social Management Plan; Summary and Recommendations; References; Appendices. The EIS report is structured such that Section 6 Environmental and Social Baseline does precede Chapters 8 and 9 on Impact Identification and	Section 1
General Comments	Executive Summary	A.i.a.iii	Recognize that there are local data sources that should be considered exhaustively before reference is made to external sources e.g. the use of internet databases (Chapter 8: Reference to online fish databases, air quality data is not appropriate.)	Local, secondary data sources have been used to inform baseline studies and "external" sources have been used to supplement local data sources where applicable and appropriate. For example local litrature and studies have been used to supplemement data collected from field surveys for the geology and soils, fauna, habitat and botany baselines. Field surveys, specifically the social and biodiversity surveys, were completed using Ugandan personnel and expertise.	Sections 6 and 7 Section 8, Appendix A1, A4, A5

General Comments	Executive Summary	A.i.b	Consider evaluation the potential drivers of climate change such as greenhouse gas emissions in relation to the project activities other than assessing climate change as proposed in the ToR.	The project contribution to greenhouse gas emissions and hence climate change has been assessed in terms of impacts to national emissions targets.	Sections 6 and 8; Appendix A14
General Comments	Impact Evaluation	A.ii.a	The evaluation and assessment of impacts should be comprehensive enough to cover all identified impacts of the project. (Appendix E should be part of the core document).	All potential impacts have been identified to the extent possible. This has made the impact assessment table very long and hence included in Appendix E. A detailed explanation of the impacts and potential mitigation measures is presented in Section 8.	Section 8; Appendix E.
General Comments	Impact Evaluation	A.ii.b	Some impacts identified in Appendix E as potentially significant were not considered in the ToR for further assessment and mitigation action.	All potential impacts for planned activities and unplanned events have been identified and evaluated as part of the ESIA process. Mitigation actions have been proposed to minimise both significant and not significant impacts.	Section 8; Appendix E.

General Comments	Legal Framework	A.iii.a	Section 1.1 makes reference to the legal framework and Production Sharing Agreements (PSAs) to guide EIA process. However, given that there is a limited access to the PSAs, it is recommended that the EIA process should not be based on the PSAs but rather on the environmental regulatory framework and other national or regional laws.	The EIS has been completed using applicable Ugandan National environmental regulatory legislation and guidelines as the primary reference source for the legislative framework; where appropriate this is supplemented with international standards.	Section 4
General Comments	Alternatives	A.iv.a	There is need to provide for adequate alternatives analysis in line with the EIA guidelines (refer to sections 1.3 and 1.5).	The EIS includes a section on alternatives including routing, siting, technology and construction technologies.	Section 3

General Comments	Alternatives	A.iv.b	Assessment/evaluation of alternatives to certain specific works e.g where it is inevitable to cross fragile ecosystems such as wetlands, rivers, forests among others; provide for alternatives to open cut methods and make use of BAT/BEPs.	Alternatives have been described for project routing, siting, technology and construction technology. For water crossings, the open-cut technique is the preferred option among other alternatives owing to its simplicity and minimal construction footprint. Best practices for minimisation of impacts during open cut crossings, like seasonal avoidance, optimisation of width of RoW, have been considered.	Section 3
General Comments	Waste Management	A.v.a	Describe the different waste streams giving the detailed description of the likely characteristics of the waste including pigging water and hydrotest water, among others across all phases of the project as the scoping report predominantly focuses on construction waste.	Hazardous and non-hazardous waste streams and waste management are described based on the engineering activity completed to date; as engineering progresses waste streams will be further characterised. A waste management plan will be developed to define waste streams for all the types of waste produced by project.	Section 2

General Comments	Waste Management	A.v.b	Evaluate the impacts that may result from waste generated during the project implementation. Waste should be assessed as a potential contaminant of soils and water, among others.	Unplanned release of waste to the environment is assessed in the EIS; typically waste will be managed according to the project Waste Management Plan and there will not be disposal of untreated waste to the environment.	Section 8
General Comments	Waste Management	A.v.c	Propose and develop a robust waste management strategy.	The strategy for dealing with project waste is outlined in the project description.	Section 2
General Comments	Decommissioning	A.vi.a	The decommissioning strategy is not very clear (Section 2.3.5). Aspects related to project decommissioning should be clearly highlighted and the proposed strategy spelt out in the EIA report.	A decommissioning plan for the construction facilities will be developed, which includes a social management component that addresses associated impacts. When pipeline oil shipping volumes diminish to the point that it becomes inefficient to transport oil via the pipeline, then the pipeline will be decommissioned based on Ugandan regulations and standards and international standards and protocols.	Section 2
General Comments	Other reference documents	A.vii.a	The study team should in addition to the documentation listed in the ToR, make reference to: Existing studies on the Kabaale industrial park.	Third party projects included in the Kabaale Industrial Park have been addressed; all available secondary data has been used.	Sections 2 and 8.

General Comments	Other reference documents	Avii.b	The study team should in addition to the documentation listed in the ToR, make reference to: Relevent sectoral EIA guidelines e.g. water sector.	The EIS has been completed using applicable Ugandan National Legislation. Legislation, together with what the legislation means in terms of the project are presented in Table 4.2-1.	Section 4
General Comments	Other reference documents	A.vii.c	The study team should in addition to the documentation listed in the ToR, make reference to: The sensitivity atlas for MFNP.	The sensitivity atlas has been extensively used and referenced.	Section 6; Appendices A1, A2, A3 and A4.
General Comments	Other reference documents	A.vii.d	The study team should in addition to the documentation listed in the ToR, make reference to: The water source protection guidelines, 2013 (MWE).	The guidelines were taken into consideration when establishing project mitigation measures	Section 4
General Comments	Other reference documents	A.vii.e	The study team should in addition to the documentation listed in the ToR, make reference to: The Nabugabo Wetlands system Ramsar Site Management Plan, 2016-2017.	All secondary data relevant to the study area has been used to inform the baseline studies; secondary data is fully referenced.	Section 6

General Comments	Other reference documents	A.vii.f	The study team should in addition to the documentation listed in the ToR, make reference to: Strategic Environmental Assessment for the Albertine Graben, 2013.	The Strategic Environment Assessment (SEA) for the Albertine Graben has informed the ESIA process.	Section 4.
General Comments	Other reference documents	A.vii.g	The study team should in addition to the documentation listed in the ToR, make reference to: Relevant sector plans in consultation with the relevant agencies (e.g. Ministry of Works, Ministry of Agriculture investment plans, DEAPs/SEAPs and Local Government Development Plans to inform and risks/plans).	The different sector plans have been used to inform the ESIA. For example the cummulative impact assessment which has taken into account potential interaction between EACOP and major government infrastructure projects like the standard gauge railway, power projects and major road upgrades	Section 6 Section 8, Baseline Appendicies

General Comments	Other reference documents	A.vii.h	The study team should in addition to the documentation listed in the ToR, make reference to: Guidelines for oil and gas operations in wildlife protected areas as issued by Uganda Wildlife Authority.	The guidelines have been used to inform the ESIA process, specifically for Tilenga feeder pipeline.	Section 4, Section 11
General Comments	Other reference documents	A.vii.i	The study team should in addition to the documentation listed in the ToR, make reference to: UWA strategic plan and Murchison falls National Park general Management Plan (GMP). Note that 'UWA GMP' does not exist.	The guidelines have been used to inform the ESIA process, specifically for Tilenga feeder pipeline.	Section 4
General Comments	Other reference documents	A.vii.j	The study team should in addition to the documentation listed in the ToR, make reference to: The Wetland Atlas.	All secondary data relevant to the study area has been used to inform the baseline studies; secondary data is fully referenced.	Section 6
General Comments	Other reference documents	A.vii.k	The study team should in addition to the documentation listed in the ToR, make reference to: Draft Hydrological Year Book, 1978-2014.	The Draft Hydrological Year Book, 1978-2014 is referenced in the baseline to ensure all relevant information has been included.	Section 6; Appendix A

General Comments	Other reference documents	A.vii.l	The study team should in addition to the documentation listed in the ToR, make reference to: The draft air quality standards and the WHO standards.	Both standards have been taken into consideration when drafting the project environmental standards.	Section 6; Appendix A
General Comments	Other reference documents	A.vii.m	The study team should in addition to the documentation listed in the ToR, make reference to: Wetland inventory reports (accessible from the respective districts and Ministry of water and Environment).	Wetland Inventory Reports were reviewed to inform the ESIA process; use was compromised as the reports do not present maps that identify the location of the wetlands being described in the inventory.	No section reference.
General Comments	The administrative units within the project AOI in the local Governments	A.viii.a	To ensure proper consultations, revisit the list of administrative units to ensure that they are correctly documented as some errors were observed (refer to Table 6.3-5).	Stakeholders were selected based on a stakeholder mapping exercise undertaken by EACOP/ Tilenga feeder pipeline ESIA teams as well as the EIS team's experience of consultation. Errors were corrected.	Appendix C
General Comments	The administrative units within the project AOI in the local Governments	A.viii.b	New districts came up effective July 2017 e.g. Kyotera, the ESIA process should consider the new districts.	New districts within the area of influence have been identified and included	No section reference.

General Comments	The administrative units within the project AOI in the local Governments	A.viii.c	Statements related to the operation of the District council should be revisted as some of them are not correct, e.g. the role of district council (Section 6.3.3.9).	Statements have been updated.	Section 6 and Appendix A
General Comments	Other concerns and observations.	A.ix.a	The Wildlife Act, 2000. The phrase 'Wildlfe…..benefit to the people of Uganda', it is important to include the phrase '….and the global community'- this is as it is provided in the Act to cater for the tourism aspect.	Noted and included.	Section 4
General Comments	Other concerns and observations.	A.ix.b	The Scoping Report makes reference to 'Minorities' however, there were not identified within the AOI of the project during the scoping.	Noted.	No section reference.
General Comments	Other concerns and observations.	A.ix.c	Section 6.3.3.9: Tourism; Makes mention of 'preservation' not 'conservation' as is the case.	Noted.	No section reference.
General Comments	Other concerns and observations.	A.ix.d	AOI abbreviation used interchangeably for 'Area of Influence' and 'Area of Interest' (Appendix A)	The abbreviation "AOI" has been used throughout the EIS meaning area of influence.	Section 6; Appendix A

General Comments	Other concerns and observations.	A.ix.e	The proposed 'Resource Management Plan' is not clear, there is need to clarify which resources are referred to therein (Chapter 8).	Resources that will be addressed in the Resource Management Plan are described in the ESMP section.	Section 10
General Comments	Other concerns and observations.	A.ix.f	How will the management plans be presented? Are they part of the ESIA submitted to NEMA?	These management plans are part of the environmental and social management plan (ESMP) which describes the parameters to be monitored, performance indicators and monitoring frequency for generic and location-specific potential impacts. The ESMP has been prepared in accordance with all applicable legislation. This consist of an ESMP section with an outline for all the proposed management plans and a Generic and Site-Specific detailed ESMP matrices. In addition to the ESMP included in the ESIA, a separate volume will be submitted that contains the detailed ESMP.	Section 10
General Comments	Other concerns and observations.	A.ix.g	The ToR makes reference to 'administrative framework'/Administrative bodies' (Section 3.2.4, section 8.7.1). It is proposed that this term replaced with 'institutional framework'.	Noted.	Section 4
Specific Comments	Chapter 1 Introduction	B.i.a	(i) Section 1.2: The developer's contact details are not clear; There is need to specify the developer as this is a joint venture project.	The developer is fully described in the introduction to the EIS.	Section 1

Specific Comments	Chapter 1 Introduction	B.i.b	There is need to clarify if the developer for each project (despite the scoping and ToR having been steered by the JV partners) for the Tilenga and EACOP projects is the same.	The developer is fully described in the introduction in the respective EIS.	Section 1
Specific Comments	Chapter 1 Introduction	B.ii	Section 1.4: the proposed methodologies were not aligned with the objectives of the study. Hence difficult to verify if all objectives have been addressed. Align methodologies to objectives.	The EIS has been prepared pursuant to all relevant national legislation and guidance; the objectives, methodology and the legislative and policy framework reflect this. Methodology was developed to reach objectives of the EIS.	Sections 1, 4 and 5.
Specific Comments	Chapter 1 Introduction	B.iii	Section 1.3 Tilenga Pipeline system should minimize interface with Protected areas during design.	During route optimisation the Tilenga feeder pipeline was routed to use the area outside the Murchison Protected Area (Refer to Section 3 Alternatives)	Sections 3 and 8.
Specific Comments	Chapter 1 Introduction	B.iv	Section 1.4 ref. pg 1-6 sub-bullet 6: The statement that 'Not Significant Impacts' will not be assessed and that focus will only be put to assessing only significant impacts is not clear.	Potential significant and not significant impacts have been identified and evaluated as part of the ESIA process and mitigation for both has been documented in the ESMP and the commitments register.	Sections 8 and 10.

Specific Comments	Chapter 1 Introduction	B.v	Table 2.2-2. Core components: the coating yard was not included as part of the project components.	All project components are described; there is no coating yard in Uganda	Section 2.
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	i	Figure 2.2-12: statement that the diesel generators 'can use crude oil' raises concern for instance; Will the emissions be assessed in the EIA? There is need to document how potential emissions will be handled.	There is no power generation in the EACOP portion in Uganda and the Tilenga feeder pipeline. Power is generated at the Tilenga Project CPF and the impacts assessed in the ESIA for the Tilenga Project.	Sections 2 and 8.
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(ii)	Section 2.2.6.1. The statement that associated facilities 'may require EIA' is not true as all associated facilities WILL require EIA>	Associated facililties are not core project components and are not part of the EACOP system or the Tilenga feeder pipeline. However their contribution to cumulative impacts has been identified and assessed as part of the cumulative impacts assessment (CIA) sections. Non-CIA impacts of the AFs are also summarized. It is clarified that Associated facilities will require EIA	Sections 2 and 8.
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(iii)	Section 2.3.2.2; The proposed use of silt fences may not be sufficient in some areas e.g. with sandy soils, there is need to evaluate practicality in such areas.	Erosion control will be responsive to site-specific conditions and assessed on a site by site basis.	Section 8; Appendix G1.

Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(iv)	Section 2.3.2.2: There is need to account for and compensate for the ecosystem services that may be lost.	Compensation is the last step in the mitigation hierarchy applied by the project, and may be applied when other steps (avoid, minimise, restore) are not effective or feasible. Ecosystem services have been identified and evaluated in the assessment of potential impacts on VECs. Mitigation measures proposed to minimize impacts on VECs also will generally minimize impacts on ecosystem services.	Section 8
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(v)	Section 2.3.2.2 Other infrastructure such as camps should be captured under support facilities, as to make the project description clearer i.e. project includes; the pipeline and associated facilities/AGIs, support infrastructure-camps, material storage yards, coating yards etc (much of which is temporal). These support facilities should be subjected to separate ESIAs as they have not been given adequate attention in the scoping report and ToR.	All project components are described; potential impacts have been identified and evaluated; impacts are presented by district where these are location-specific.	Sections 2 and 8.

Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(v) a	Section 2.2.3: Associated infrastructure (waste management, borrow pits and quarries) should be subjected to separate EIA.	Waste management description is included in the project description section. Mitigation measures to reduce impacts arising from waste management were assessed consistently. A waste management plan will be developed to identify the waste streams and refine mitigation measures if required. The plan is to use existing borrow pits and quarries.	No section reference.
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(vi)	Section 2.3.1: There is a need to map out all the rivers, streams and wetlands crossed by the pipelines.	All surface water features including rivers, streams and wetlands within the project area of influence have been mapped and assessed as part of the ESIA process.	Sections 6 and 8
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(vii)	Section 2.3.2.3: Water requirements, need to be specified in regard to the specific water resources for abstraction, as permits may be required.	Provisional water requirements are identified in the project description. Water sources will be confirmed during the preparation of a water supply study as described in the project description however potential water sources were assessed in the ESIA process; water abstraction will be subject to all necessary permits	Sections 2 and 10
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(viii)	Section 2.3.2.9: Makes reference to 'Drivers rest stops'; it is not clear what they are? These should be clearly described (including the proposed amenities and activities to take place at these stops and hence the potential impacts and mitigation measures required).	The project description describes driver's rest stops as: Drivers will be required to take day rest stops every two hours of driving and overnight rest stops every 10 hours of driving. A survey of suitable rest stops along the proposed routes has concluded that existing facilities are sufficient.	Section 2.

Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(ix)	Section 2.3.2.4: Labour: Consider the Gender Policy and gender differentiation for labour requirements.	Gender Policy and gender differentiation for labour requirements is addressed. These will be further considered in the local recruitment and training plan.	Section 6
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(x)	Section 2.3.2.4: Labour: The statement that…'plans are to use the same personnel for EACOP on the Tilenga spread' is not clear, i.e. whether all labour will be moved along the construction spread and whether there will be no use of local labour?	Labour requirements and utilisation are described; specialized labour will move from EACOP to the Tilenga spread and local labour will be sourced independently.	Sections 2 and 6
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(xi)	The EIS should clearly document how the land will be maintained within the RoW during operation and after decommissioning.	Reinstatement and decommissioning is described in the project description.	Section 2
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(xii)	Provide the proposed locations for the AGIs which should minimize interface with fragile ecosystems.	The location of the main AGIs are described,mapped and assessed; impacts resulting from the construction and operation of the AGIs are identified and evaluated. Avoidance of environmental and social sensitive features was considered during identification of AGIs locations.	Sections 2 and 8; Appendix E

Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(xiii)	The project footprint is not clear (2.3.2.5) and should be clearly defined in the EIA report.	The project footprint is described.	Section 2
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(xiv)	Describe the pipeline design exhaustively including; cover material on the pipeline and design of the side of trench, external diameter of the pipe, width of the excavation, placement of the high voltage line.	Pipeline design is described.	Section 2
Specific Comments	CHAPTER II: PROJECT DESCRIPTION	(xv)	Take into consideration the life of the pipeline after 25 years, including possibilities of 'reverse flow' from the coast to serve other proposes/needs.	The current project plan is to decommission the pipeline and the Decommissioning process is described.	Section 2
Specific Comments	CHAPTER III: LEGAL FRAMEWORK	i.a	(i) Make reference to all relevant laws such as among others; Animal Act, Cap 220 as project traverses rangelands,	The EIS has been prepared pursuant to all relevant national legislation; relevant laws including the Animal Act, Cap 220 are presented in the Legislative Framework.	Section 4
Specific Comments	CHAPTER III: LEGAL FRAMEWORK	i.b	(i) Make reference to all relevant laws such as among others; The Investment Code Act,	The EIS has been prepared pursuant to all relevant national legislation; relevant laws including the Investment Code Act are presented in the Legislative Framework.	Section 4

Specific Comments	CHAPTER III: LEGAL FRAMEWORK	i.c	(i) Make reference to all relevant laws such as among others; The Rivers Act 1962 which relates to dredging and hydraulic works on watercourses and will require a permit for that purpose of the DWRM.	The EIS has been prepared pursuant to all relevant national legislation; relevant laws including the Rivers Act 1964 are presented in the legislative framework section.	Section 4
Specific Comments	CHAPTER III: LEGAL FRAMEWORK	(ii)	There is a need to note that two different Permits will be required from the Directorate of Water Resources Management under borehole construction: A drilling permit and permit for water abstraction.	All necessary permits will be obtained. Permits,licences and authorisations required for the project are identified.	Sections 2 and 4.
Specific Comments	CHAPTER III: LEGAL FRAMEWORK	(iii)	Make reference to international standards including ISO 14001, ISO 18001, ISO 9001	Relevant International Management System Standards are presented in the Legislative Framework.	Section 4

Specific Comments	CHAPTER III: LEGAL FRAMEWORK	(iv)	Provide for a systematic flow of the applicable laws. There is need to recognize that the supreme law is the Constitution of the Republic of Uganda, 1995 which forms the basis for other laws.	All relevant national legislation including the Constitution of the Republic of Uganda, 1995 are presented in a systematic flow in the Legislative Framework.	Section 4
Specific Comments	CHAPTER III: LEGAL FRAMEWORK	(v)	The dates of enactment for laws and dates of commencement for the Multi-lateral Environment Agreements/conventions should also be quoted correctly. E.g., The Wildlife Act, Cap 200 of 2000 not 2003 as quoted.	Applicable International Conventions and Agreements are presented in the Legislative Framework.	Section 4
Specific Comments	CHAPTER III: LEGAL FRAMEWORK	(vi)	There is need to make reference to the National Population Policy, National Content Policy, and National Gender Policy and any other relevant policy that has not been cited within the scoping report.	Noted. All Applicable policies have been included in the legislative framework section.	No section reference.

Specific Comments	CHAPTER III: LEGAL FRAMEWORK	(vii)	For the laws under revision, the developer should make reference to provisions in the revised laws that may be relevant to the project and identify aspects that can be incorporated into the project. Consult with the relevant agencies.	Upcoming legislation is accounted for in the Legislative Framework	Section 4.
Specific Comments	CHAPTER IV: STAKEHOLDER ENGAGEMENT	(i)	Also consult with regional offices e.g. a. Water management zones under DWRM to obtain information, b. Lake Mburo NP for the Community hunting areas along the pipeline route in Rakai, governed by the Lake Mburo National Park management.	Stakeholders and the Institutions that were consulted are listed; institutions were selected based on a stakeholder mapping exercise undertaken by EACOP as well as the EIS team's experience of consultation.	Appendix C

			At Local government level, ensure that all the relevant entities are represented in the consultative process at the District, Sub County, Parish and Village. There is need to coordinate stakeholder engagements with the relevant focal persons from the relevant institutions and provide adequate information to guide the process. Contact persons for EIA in the Local Government should be District Environment Office/District Natural Resources Officer while District Community Development Office plays a key role in mobilization of stakeholders/PAPs.		Appendix C
Specific Comments	CHAPTER IV: STAKEHOLDER ENGAGEMENT	(ii)		Relevant entities were consulted; stakeholders and the institutions that were consulted are listed. District Environment Officers for all districts crossed by pipeline were consulted. Attendance lists are attached as part of the documentation of stakeholder engagements with local government.	
			At national level, ensure all relevant stakeholders are consulted including Ministry of Agriculture, Animal Industry and Fisheries.		Appendix C
Specific Comments	CHAPTER IV: STAKEHOLDER ENGAGEMENT	(iii)		Relevant stakeholders were consulted, including Ministry of Agriculture, Animal Industry and Fisheries; stakeholders and the institutions that were consulted are listed in Appendix C.	

Specific Comments	CHAPTER IV: STAKEHOLDER ENGAGEMENT	(iv)	Consult with cultural institutions and religious bodies, including their representatives at the lower levels to inform the field baseline surveys (refer to chapter viii) and development of appropriate mitigation actions.	Relevant cultural institutions and religious bodies were consulted. Stakeholders and the institutions that were consulted are listed.	Appendix C
Specific Comments	CHAPTER IV: STAKEHOLDER ENGAGEMENT	(v)	Document the stakeholders consulted during the ESIA and provide a stakeholder engagement plan (cross reference to Section 8.2). The EIS should demonstrate that the stakeholder consultation has been undertaken sufficiently e.g. photographic evidence, attendance registers.	Stakeholders and the institutions that were consulted are listed Appendix C Photographs and attendance lists are also attached in the appendix.	Appendix C
Specific Comments	CHAPTER IV: STAKEHOLDER ENGAGEMENT	(vi)	Ensure that the stakeholders consulted should be the right entities so as to capture all the issues and design the right mitigation actions.	Stakeholder mapping was undertaken to identify the appropriate stakeholders and the institutions for consulation, which are listed in Appendix C.	Appendix C

Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	(i)	Clearance of right of way may affect primate populations in Wambabya area (Chimpanzees are canopy animals, if the right of way is constructed, it may affect interactions between families). This should be included among the impacts that will be assessed.	Impact on primates, including chimpanzees have been assessed as in the biodiversity part of the EIS.	Sections 6 and 8.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	(ii)	Section 5.3: The EIS should clearly define the proposed pipeline route and identify impacts based upon the route.	The EIS clearly defines the proposed pipeline route and identifies and evaluates impacts based upon the route.	Sections 2, 6 and 8.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	(iii)	Section 5.3: The EIS should consider options for enhancing vegetation regeneration of areas under restoration.	Typically, land will be reinstated to a capability similar to that which existed prior to construction activities.	Sections 2, 6 and 8.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	(iv)	Section 5.3: Consider measures to ensure that the natural flow regime of the water courses is not interfered with.	Measures will be used to ensure that potential impacts to drainage are mitigated.	Sections 2, 6 and 8.

Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	(v)	Residual impacts analysis did not adequately exhaust issues on community and livelihoods (section 5.5)	The ESIA process has addressed all potential impacts that may occur in the project area of influence according to the impact assessment methodology.	Sections 5 and 8.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	vi.a	Impact analysis may maintain the proposed approach (assessment based on VECs), but the mitigation actions should focus on project specific mitigation.	Proposed mitigation has been designed to ameliorate generic type impacts and, location-specific type impacts. A generic impact is an impact that potentially occurs at multiple locations across the project AOI where the VEC and or impact characteristics are similar across those multiple locations. A location-specific impact is a potential impact that may occur at a specific location or, where the sensitivity of a VEC at a particular location warrants generic mitigation as well as additional, location-specific mitigation.	Sections 5 and 8.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	vi.b	Ensure to evaluate impacts of the project explicitly across the different project components e.g. pipelines, AGIs, etc (table 5.5-1) and not amalgamating them together to ease relation of the impacts and mitigation measures to the specific project components.	Potential impacts have been assessed as either generic type impacts or location-specific type impacts.	Sections 5 and 8.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	vi.c	Impacts identification and evaluation was insufficient in relation to spillages and biodiversity (Table 5.5-1). This should be addressed in the EIS.	Impact identification and evaluation with regard to spillages and biodiversity have been fully accounted for in the ESIA process.	Sections 8 and 9.

Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	vi.d	As part of the biodiversity VEC assessment, evaluate potential stress on animals/wildlife (make reference to studies undertaken in MFNP).	Potential impacts to fauna and avifauna of conservation importance have been assessed and evaluated in the context of a pipeline project where the linear disturbance is of relatively short duration compared to a field development project. Relevant studies performed for MFNP and wider area were considered.	Sections 6 and 8 and; Appendix C.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	(vii)	Evaluation of socio-economic VEC should incorporate potential impacts on productivity and crime rates (potential increase or decline) and management of anxiety (Table 5.5-1).	The identification and evaluation of potential impacts on the socio-economic VEC has included livelihood, social cohesion and civil services such as primary healthcare and policing.	Sections 6 and 8.
Specific Comments	CHAPTER V: KEY PROJECT IMPACTS AND RISK ANALYSIS	(viii)	Assess potential for biodiversity offsets and how this can be implemented (cross reference to Section 7.2.4).	In concordance with IFC PS6 guidance a Biodiversity Action Plan incorporating enhancement and conservation measures will be developed and implemented, to achieve net gain for critical habitat and no net loss for other biodiversity features (including natural habitat).	Section 8.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ii.a	The EIA should exhaustively map water bodies impacted by the project.	All water bodies identified to be in the project area of influence have been assessed as part of the ESIA process.	Sections 6 and 8.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ii.b	The EIS should document the geo-reference points for all rivers/wetlands crossed by the pipeline and document the crossing point for Nkusi-Kafu river.	Locations of water-course crossings are described.	Section 6

Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ii.c	The assessment of water quality should incorporate total coliforms and *E. coli* and nutrient parameters e.g. for AGIs as standard analyses (Section 4.3.1).	Water quality surveys were carried out and the results of these surveys including the coliforms and nutrient parameters are included in the EIS.	Section 6; Appendix A6
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ii.d	Capture information on water quality and quantity for water bodies within the project AOI in consultation with DWRM and the local governments.	Baseline information that is required to complete comprehensive impact assessment according to Ugandan national requirements and good international industry practice has been recorded. DWRM were consulted as part of the stakeholder engagement process and also as part of the separate water source study.	Section 6; Appendix C.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ii.e	The evaluation of the VEC focuses on water quality and availability for community use and makes no reference to potential diversion of the water flow e.g. during 'open cut construction'. This should be taken into consideration and ensure that it is addressed.	All potential impacts on this VEC including the effects of open cut construction have been assessed.	Section 8.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ii.f	The assessment should also take into consideration that other uses such as availability for water for hydropower plants.	Project-related impacts on water availability were assessed. All potential sources of cumulative impact have been identified and evaluated in the ESIA process.	Section 8.

Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(iii)	There is focus on the pipeline route as compared to associated facilities, for the retrospective VECs (soils, archaeology, water). There is need to provide information on the footprint/AOI for all the project components likely to impact each VEC.	All potential project related impacts that could occur within the area of influence have been assessed where relevant for each VEC as part of the ESIA process; the area of influence includes the project footprint of pipeline corridor and AGIs.	Sections 6 and 8.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(iv)	Section 6.3.3.6: Air quality and climate change: There I need to separate 'air quality' and 'climate change'. The scope of climate change consideration has not been clearly defined, therefore for purposes of capturing contribution of the project and associated facilities to climate change, the study may focus on GHG emissions.	Air Quality and climate change are addressed as two seperate disciplines in the EIS	Sections 6 and 8.

Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	v.a	Threatened species identified in the project AOI do not include the Elephant and Giraffe in Bugungu Wildlife reserve and fish species which may exist in the rivers that form part of the L. Albert and Victoria catchments. There is need to note that Giraffes were introduced to the southern bank of MFNP while more information on fish can be obtained from the Frame Survey of 2012, and Catch Survey of 2012.	Noted.	No section reference.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	v.b	There is focus on threatened species of animals and not plants. This should be captured in the EIS.	The EIS has fully accounted for vascular plant species of conservation importance.	Sections 6 and 8; Appendix A1.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(vi)	Section 6.3-9: All vulnerable groups including widows should be considered.	All vulnerable groups within the relevant VEC area of influence have been accounted for in the ESIA process.	Sections 6 and 8; Appendix C.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	vii.a	Reference is made to Wambabya FR (pg 6-14) but omitted Kaiso-Tonya WR in the AOI.	All potential impacts that could occur within the area of influence have been identified and evaluated where relevant for each VEC as part of the ESIA process; the area of influence includes the project footprint of pipeline corridor and AGIs. Kaiso-Tonya WR is considered outside of the AOI.	Sections 6 and 8; Appendix A.

Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	vii.b	The methods for sampling the biodiversity VEC should be explicitly documented in the EIS and the samples should be representative enough of the various ecosystems/habitats.	Samples representative of various ecosystems/habitats were collected. The methodology used to gather baseline information addressing both secondary and primary information is fully documented in the biodiversity Appendix.	Section 6; Appendix A.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(viii)	Geographical references should be factual e.g. Figure 6.3.1 indicated a site 'Bugaya West' in Buliisa which is located in Hoima District.	Noted.	No section reference.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ix.a	The baseline information should be backed up with relevant statistical data. Statements such as '….intensive poaching in Bugungu WR…' (pg 6-11) should be backed up with facts.	Baseline information is referenced.	Section 6; Appendix A
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	ix.b	Statistical data on air quality was provided but with no references/data sources (section 6.3.3.6). These should be provided.	Baseline information is referenced.	Section 6; Appendix A.

Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	x	The scoping report predominantly focuses on indirect impacts (pg 6.2) and makes little reference to direct impacts from permanent and temporary footprints.	Potential impacts have been fully characterised in the EIS as direct, indirect and induced as well as in terms of magnitude, duration, extent and the sensitivity of the VEC.	Section 8; Appendix E.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(xi)	The scoping report provides the AOI range of 300m for assessment of impacts of noise and vibration, however, experience from road construction and blasting of rock activities has indicated that persons/settlements within 500m can equally be affected especially if isolated on hills. Therefore the EIA should revisit this range.	The AOI considered in the impact assessment is 500 m and the study area is extended to 1 km around PS1 and PS2; blasting during construction is not required in Uganda.	Section 6 and Appendix A10.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(xii)	Indicate the administrative boundaries of key VECs whenever possible in the text for ease of understanding	Administrative boundaries have been referenced where-ever practical in the EIS.	Section 6; Appendix A11

Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(xiii)	Ensure that the EIS captures adequate information on geology along the pipeline route and its associated infrastructure (section 6.3.3.1).	Geology within the project area of influence and, the geotechnical studies that have been used to inform the selection of the pipeline route are fully described in the EIS.	Sections 3 and 6; Appendix A5
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	xiv.a	The EIA should take into consideration existing and planned government infrastructure e.g. water related investments along the pipeline AOI e.g. water supply systems and power plants.	All potential sources of cumulative impact have been identified and evaluated in the ESIA process.	Section 8; Appendix H.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	xiv.b	The EIA should take into consideration existing and planned government infrastructure e.g. the proposed standard gauge railway.	All potential sources of cumulative impact have been identified and evaluated in the ESIA process.	Section 8; Appendix H.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	xiv.c	The EIA should take into consideration existing and planned government infrastructure e.g. any other linear infrastructure within the AOI.	All potential sources of cumulative impact have been identified and evaluated in the ESIA process.	Section 8; Appendix H.

Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(xv)	EIA should provide soil classification along the AOI of the project.	Soil classification is fully documented.	Section 6; Appendix A5.
Specific Comments	CHAPTER VI: PROJECT AREA OF INFLUENCE AND EXISTING BASELINE CONDITIONS	(xvi)	Provide topographic mapping along the AOI - this can inform estimates of cut, fill or spoil material that may be generated/required.	Studies completed to facilitate the development of the project, the use of remote sensing and, engineering field visits completed are described in the EIS.	Section 3.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(i)	Section 7.2.3.2 & 7.2.3.3 (Spatial and temporal boundaries). The CIA should cover a broader scope beyond the proposed 6 months particularly in relation to projects under central and local government. This should be done in consultation with relevant MDAs to incorporate the planned projects. Also make reference to sectoral investment plans.	All potential sources of cumulative impact have been identified and evaluated in the ESIA process; information gained through stakeholder engagement was used to inform the assessment of cumulative impacts.	Section 8; Appendices C and H.

Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(ii)	The scope of the assessment for the soils VEC should consider other potential impacts on soil disturbance beyond potential pollution/contamination (section 7.3.2.1). Impacts such as erosion should be factored into the scope.	All potential impacts, including erosion, that could occur within the area of influence have been assessed where relevant for each VEC as part of the ESIA process; the area of influence includes the project footprint of pipeline corridor and AGIs.	Sections 6 and 8; Appendix G1.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(iii)	Cumulative impact assessment on surface water sources (section 7.3.2.2) should go beyond the aspects of water quality and water for communities, and encompass 'other water uses' within the project AOI.	All potential sources of cumulative impact have been identified and evaluated in the ESIA process.	Section 8; Appendix H.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(iv)	The assessment of landscape (section 7.3.2.4) should go beyond the visual impacts. Issues such as landslides on escarpments/the structural integrity of the landscape should be studied.	All potential project related impacts that could occur within the area of influence have been assessed where relevant for each VEC as part of the ESIA process; the area of influence includes the project footprint of pipeline corridor and AGIs. The ESIA describes the studies completed, remote sensing utilised and engineering field visits completed in order to design out the potential for project related land-slide.	Sections 3, 6 and 8.

Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(v)	Assessment of air quality (section 7.3.2.5) needs to recognize that here is meteorological data that is locally available that should be incorporated into the assessment beyond the data from Eldoret.	Monitoring of air quality was completed at PS1 and PS2 and data obtained to inform the impact assessment. Local sources of data were not required for the air quality assessment as there were not considered to be substantive emissions sources as to require dispersion modelling.	Sections 6 and 8; Appendix A9
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(vi)	The assessment of ecosystem services (section 7.4.1) should clearly define the ecosystem services that are going to be evaluated.	Ecosystem services are identified and evaluated.	Sections 6 and 8; Appendix A.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(vii)	Risks associated with the project (section 7.4.2: Accidental events) should be clearly identified and mitigation measures suggested. Also assess the other potential emergencies that can occur such as fires at the AGIs.	Potential impacts resulting from planned, project activities; abnormal operations and unplanned events are fully identified and evaluated.	Sections 8 and 9.

Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	viii.a	In regard to transboundary impacts: should capture issues of HIV/AIDS, oil spills, spill over impacts (either –ve or +ve)(section 7.2). This should be addressed in the ESIA.	Community health is fully addressed. Potential impacts resulting from abnormal operations and unplanned events are fully identified and evaluated. Potential transboundary impacts are identified and evaluated.	Sections 8 and 9.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	viii.b	In regard to transboundary impacts:: proposed use of the Transboundary Environmental Assessment Guidelines by EAC (section 7.2.4). The study should also refer to other regulatory tools beyond East Africa because of the trans boundary issues e.g. Nile basin Initiative.	All potential transboundary impacts as well as, all potential sources of cumulative impact, have been identified and evaluated in the ESIA process.	Section 8; Appendix H.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	viii.c	In regard to transboundary impacts:: consultations need to be done to harmonize related studies in the impacted countries in the project AOI.	Stakeholders that were consulted are listed; stakeholders were selected based on a stakeholder mapping exercise undertaken by EACOP as well as the EIS team's experience of consultation. Transboundary impacts were discussed in the meetings with relevant stakeholders (for exampe, with Nile Basin Secretariat)	Appendix C

Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(ix)	Explicitly describe the biodiversity assessment tools as section 7.3.1 documents different tools from those indicated in chapter 8.	The methodology used to gather baseline information addressing both secondary and primary information is described. The methodology used to evaluate potential, likely impacts is described.	Sections 5, 6 and 8; Appendix A.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(x)	The assessment did not consider below ground biodiversity (section 7.3.1)	Potential impacts on Stygofauna have been identified and evaluated.	Section 8; Appendix A.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	(xi)	The assessment did not consider water demand requirements (section 7.3.2) and its impacts on water resources.	The EIS describes the project water requirements and the studies that are being completed in order to identify sustainable sources.	Section 2.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	xii.a	In regard to the socio-economic assessment, there is need to document: How the impacts arising from influx of people would be assessed and mitigated?	Potential impacts arising from influx have been assessed with regard to the relevant VEC in terms of direct and indirect potential impacts.	Section 8; Appendix E.
Specific Comments	CHAPTER VII: IMPACT IDENTIFICATION AND EVAULATION METHODOLOGY	xii.b	In regard to the socio-economic assessment, there is need to document: The methodology for assessing socio-economic VECs (section 7.3.4).	The methodology used to establish the baseline socio-economic conditions is described. The impact assessment methodology is described.	Sections 6 and 8; Appendices A11 and E.

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(i)	Stakeholder concerns raised the issue of HIV/AIDS spread, the ESIA should document commitments on non-fraternization and other social safeguards (refer to section 8.3.2.2: Influx). In addition, Appendix A should highlight HIV/AIDS as part of the VEC evaluation on community health (pg A-13).	Stakeholder concerns regarding HIV/AIDS were addressed during the consultation exercise. Community health, including HIV/AIDS, has been fully addressed in the baseline and impacts and mitigation sections.	Sections 6 and 8; Appendices A11 and C.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(ii)	Stakeholder concerns reflect that the persons consulted did not adequately understand the concept of the 'heated pipeline' (section 8.3.2.4 Community Health and Safety). The stakeholder consultations should be comprehensively done to capture all aspects of the project and sufficient information given in order to obtain buy-in from all relevant stakeholders.	Continous stakeholder consultations have been conducted to educate stakeholders on the project and on the concept of a 'heated pipeline'. Stakeholder concerns regarding "heated pipeline" were addressed during the consultation exercise. Stakeholder consultation was comprehensive; stakeholder consultation was completed after a stakeholder mapping was undertaken by EACOP together with input from the EIS team's experience of consultation.	Appendix C

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(iii)	Assessment of impacts on biodiversity (section 8.3.3) should include potential impacts of animal kills/deaths as a result of traffic and excavations, and clearly document commitments to minimize these impacts on biodiversity.	All potential project related impacts within the area of influence have been identified and evaluated; appropriate mitigation is recorded in the commitments register.	Sections 8 and 10; Appendix E
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(iv)	ESIA should document how potential impacts from obstruction of natural flows of water (sub-surface flow and surface water) from pipeline construction will be mitigated (section 8.3.4). The ESIA should establish the relationship between the upstream and downstream water courses (connectivity) so as to among others, inform the design of the pipeline appropriate mitigation measures to ensure continuous flows.	All potential impacts and mitigation, including that addressing ground water and surface water, is documented.	Sections 8 and 10; Appendix E

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(v)	Provide factual and not speculative information with appropriate statistics e.g. air quality, soil contamination, poaching statistics. Dependence on online fish databases is not recommended.	All baseline information is referenced where relevant.	Section 6; Appendix A.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	vi.a	During the ESIA, the field sampling (refer to Section 8.4 and Table 8.4-1) should include: methodology for collection of data on biodiversity, and the frequency of data collection.	The methodology used to: select sample locations; identify the number of sample-site visits; identify the season of sampling; complete sampling; species recording and; species identification are described.	Section 6; Appendix A.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	vi.b	During the ESIA, the field sampling (refer to Section 8.4 and Table 8.4-1) should include: criteria for selection of the proposed sampling locations, number of water sources sampled and duration for indicative sampling for water resources (flows).	The methodology used to: select the number of sample locations, the sample locations and; identify the duration of sampling are described.	Section 6; Appendix A.

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	vi.c	During the ESIA, the field sampling (refer to Section 8.4 and Table 8.4-1) should include: seasonal and permanent wetlands.	Seasonal and permanent wetlands in the project AOI are included.	Section 6; Appendix A.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	vi.d	During the ESIA, the field sampling (refer to Section 8.4 and Table 8.4-1) should include: traffic assessment in Lwengo town as the proposed pipeline route crosses Mbarara-Masaka highway in Lwengo town council.	Potential impacts on the Mbarara-Masaka highway as a result of the pipeline crossing have been identified and evaluated in the EIS. The Mbarara-Masaka highway will not be used by the project for construction related traffic.	Sections 6 and 8, Appendix E.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(vii)	There is need to assess impacts of the project on the aquatic ecosystems (flora and fauna) beyond fish (Ref; pg 8-14).	Potential impacts on aquatic biodiversity have been assessed.	Section 8; Appendix A.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(viii)	Color water to be included	Surface water baseline information includes recording of water colour.	Section 6; Appendix A6.

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(ix)	In regard to the VEC on avifauna, explore locally available data sources beyond birdlife international, such as data with Wildlife Conservation Society and Nature Uganda.	Local, secondary data sources have been used to inform all baseline studies and "external" sources have been used to supplement local data sources where applicable and appropriate. Field surveys, specifically the social and biodiversity surveys, were completed using Ugandan personnel and expertise.	Section 6; Appendix A.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(x)	During the ESIA process, there is need to seek guidance and authorization from the relevant authorities to undertake the fish surveys. Consult with the National Fisheries Research Institute and Directorate of Fisheries Resources.	Noted.	No section reference.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(xi)	The proposed ESIA schedule (section 8.6) seems unrealistic given the timelines provided. This schedule may need to be revisited to ensure that the quality of work is not compromised	The EIS process has followed Ugandan national requirements and good international industry practice; a technically robust EIS has been completed using subject matter experts and a project management team with a proven track record of successfully delivering similar EISs.	No section reference.

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xii.a	The ESIA should: document baselines on any existing alien and invasive species within the project area of influence in consultation with National Agricultural Research Organization (make reference to Appendix E and Section 8.3.3): with a view of avoiding the spread of these species or the introduction of others.	Detailed mapping of Alien Invasive Species is beyond the scope of EIS however. A biosecurity plan will be developed and implemented that includes a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive species on the right-of-way, work sites and camp facilities. The biosecurity plan will also outline specific measures to protect the aquatic environment from alien invasive species.	Section 10
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xii.b	The ESIA should: assess potential habitat and wildlife disturbance by wildfires.	Wild fires are not a planned or unplanned activity of the EACOP project. The hazard of fire has been addressed in the design and planning of the EACOP project.	Sections 2 and 9.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xii.c	The ESIA should: assess the likelihood of potential human-wildlife conflicts and propose appropriate mitigation measures.	Potential impacts resulting from human-wildlife conflicts have been assessed in the ESIA process and appropriate mitigation has been presented.	Section 8.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(xiii)	Consult with the Uganda Bureau of Statistics (UBOS) on parameters for measuring standard of living.	Information from the Uganda Bureau of Statistics (UBOS) has informed the EIS and is referenced.	Section 6; appendix A

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xiv.a	In regard to the assessment of ecosystem services (section 8.4.11) there is need to:: identify and justify ecosystem services that will be assessed per VEC and the methodology for assessing each as the proposed application of a questionnaire may not be adequate to evaluate all ES.	Ecosystem services have been identified and evaluated according to the relevant VEC.	Sections 6 and 8; Appendix A.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xiv.b	In regard to the assessment of ecosystem services (section 8.4.11) there is need to: ensure that comprehensive views are obtained from the relevant stakeholders.	Stakeholders that were consulted are listed in Appendix C; stakeholders were selected based on a stakeholder mapping undertaken by EACOP as well as the EIS team's experience of consultation. Attendence register and feedback from the stakeholders is included in the appendix.	Appendix C.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xv.a	The Project (section 8.8) should incorporate: a clear grievance handling mechanism and management plan.	The Environmental and Social management Plan and the commitments register identifies the requirement for a grievance mechanism: The project will implement grievance procedure to provide opportunities for project-affected communities to express grievances about construction and commissioning related activities. The grievance procedure will also be used to record the reporting and investigation of claims of physical or economical damage due to project activities. Grievance handling mechanism is explained in details in Section 7.	Section 10, Appendix E

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xv.b	The Project (section 8.8) should incorporate: decommissioning plan (cross reference to section 1.4.1)	Decommissioning is described to the level of detail known at current stage. Overview of Decommissioning plan is presented in Section 10.	Section 2.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(xvi)	The management plans should be developed in consultation with the relevant lead agencies while proposing practical and feasible actions.	Noted.	No section reference.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xvii.a	In regard to the assessment on Archaeology (section 8.3.4.4): the thirteen features identified during the scoping phase that may be impacted by the project should be clearly documented in the EIS.	The thirteen features that were identified during the scoping phase that may be impacted by the project are documented in the EIS.	Section 6; Appendix A.
Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	xvii.b	In regard to the assessment on Archaeology (section 8.3.4.4): the field baseline surveys should include opinion and cultural leaders among stakeholders to be consulted.	Relevant cultural institutions and religious bodies were consulted.	Appendix C

Specific Comments	CHAPTER VIII: TERMS OF REFERENCE	(xvii)	Critical habitats should be clearly defined, identified and assessed in the EIS (Section 8.4.1.2).	A critical habitat assessment has been completed as part of the ESIA process.	Appendix B
Specific Comments	C: ESIA TEAM	(i)	By Ugandan law, environmental practitioners are liable for work undertaken. Consequently, RSK as a limited liability company may not be held liable for the work presented but rather the individual practitioners that are certified by this authority.	Noted. Registered practitioners from Eco & Partner Consults were actively contributors in all the stages of the ESIA process.	No section reference.
Specific Comments	C: ESIA TEAM	(ii)	Only practitioners registered and certified by NEMA should undertake the ESIA.	Noted.	Section 1
Specific Comments	C: ESIA TEAM	(iii)	A waste management specialist has not been included and therefore should be on the team.	A waste management specialist is included in the EIS and project teams.	No section reference.
Specific Comments	C: ESIA TEAM	(iv)	The ESIA team is biased towards hydrogeology with limited expertise in hydrology. The team should incorporate Hydrologist.	Noted.	No section reference.

Specific Comments	C: ESIA TEAM	(v)	Prioritize national expertise wherever available and the international expertise should only fill the gaps e.g. stakeholder engagement and noise lead person.	International expertise has been used to supplement and support the work completed by the Ugandan national consultants Eco and Partner for the EIS.	No section reference.
Provided by letter Ref: NEMA/4.5, dated 19th September 2018	1: Main Review Findings	1	The Scoping report and TOR for the EISA is generally well written, well structured, contains most of the required elements, has good maps and graphics, which increases comprehensiveness. The report is readable and in line with international practice with respect to approach and methodologies. In view of the very short timelines indicated for the completetion of the ESIA process for the project, it is recommended that the ESIA should aim at:	Noted	No section reference.
Provided by letter Ref: NEMA/4.5, dated 19th September 2019	1: Main Review Findings	(i)	Meeting legal requirements as part of the Ugandan permitting process.	Noted	Section 4

Provided by letter Ref: NEMA/4.5, dated 19th September 2020	1: Main Review Findings	(ii)	Focus very effectively on the key issues with respect to social and environmental impacts.	Noted	Section 8
Provided by letter Ref: NEMA/4.5, dated 19th September 2021	1: Main Review Findings	No Number	The review process nonetheless noted that the ESIA scoping report had several shortcomings and recommends that the gaps should be incorporated in the ToR and addressed during the ESIA and preparation of the report. Sections 2-3 below discuss these issues in more detail.	Noted	No section reference.

Provided by letter Ref: NEMA/4.5, dated 19th September 2023	2. Key Priority Areas	(i)	The ESIA should address the following key areas besides the scope identified in the ToR: Land use disturbance/damage: The ESIA report should provide a clear descripotion of the potential extent/magnitude of disturbance and displacement of persons/settlements including compensation. A well communicated compensation scheme should be provided in the RAP that should be part of the ESIA process.	Potential impacts to land use have been identified and evaluated. A Resettlement Policy Framework is described in Section 8 and included in Appendix K.	Section 8; Appendices A and J
Provided by letter Ref: NEMA/4.5, dated 19th September 2024	2. Key Priority Areas	(ii)	The ESIA should address the following key areas besides the scope identified in the ToR: Access restrictions: The ESIA should determine the extent to which access will be restricted (temporarily or permanently. The ESIA/RAP should provide measures to mitigate the impact of any access restrictions.	Potential impacts on Social and Biodiversity VECs have been identified and evaluated.	Sections 6 and 8.

Provided by letter Ref: NEMA/4.5, dated 19th September 2025	2. Key Priority Areas	(iii)	The ESIA should address the following key areas besides the scope identified in the ToR: A transparent and realistic plan with respect to increasing/boosting potential benefits of the project should be documented. For instance the labour requirements of the project should be document and any other undertakings such as investing money in corporate social responsibilities (CSR), could be encouraged but should be done in consultation with the relevant government/local authorities.	Labour requirements and utilisation are described in the EIS. Benefits and local content is described. Social related projects needed to minimise project impacts are described.	Section 2.

Provided by letter Ref: NEMA/4.5, dated 19th September 2026	2. Key Priority Areas	(iv)	The ESIA should address the following key areas besides the scope identified in the ToR: Management of project personnel: Concrete plans for the management of the project workforce should be provided including fraternization restrictions to mitigate socioeconomic risks/impacts on the communities in the project area and prohibition of hunting in areas within/adjacent to protected areas.	Potential impacts resulting from construction activities including workforce are identified and evaluated. Mitigation measures on management of project workforce are described in the EIS.	Sections 8 and 10

Provided by letter Ref: NEMA/4.5, dated 19th September 2027	2. Key Priority Areas	(v)	The ESIA should address the following key areas besides the scope identified in the ToR: Whereas social issues should be presented in the ESIA, the report should demonstrate how these concerns have been taken into consideration. The Resettlement Action Plan should be developed and submitted alongside the ESIA report to provide a better understanding of how these issues have been handled.	All potential impacts resulting from the EACOP project have been identified and evaluated as part of the ESIA process; the Resettlement Policy Framework is described in Section 8 and included in Appendix K.	Sections 6 and 8; Appendix J.

			Disturbance of local hydrology and hydrogeology: The ESIA should provide clear descriptions of how the pipeline construction will be undertaken without causing significant (geo)hydrological changes, for instance in wetlands and other areas with vulnerable water conditions.		Section 2.
Provided by letter Ref: NEMA/4.5, dated 19th September 2028	2. Key Priority Areas	(i)	Mitigation measures should be provided for all impacts that cannot be avoided.	The construction methods, including methods to cross surface waters and maintain drainage, are described.	

			Disturbance of soils and landscapes: The ESIA should demonstrate that any disturbances to soils and landscapes for the project will be mitigated effectively. In particular, the procedures of work along the escarpment wall, managing excavated soils and site rehabilitation after the construction stage should be documented.	The construction methods, including soil management and erosion control, are described. Mitigation addressing soil management and control of erosion are documented.	Sections 2, 8 and 10; Appendix E
Provided by letter Ref: NEMA/4.5, dated 19th September 2029	2. Key Priority Areas	(ii)			
			Impacts of noise, vibrations and dust: Clear avoidance/mitigation measures should be documented to manage nuisance arising from project activities..	Mitigation is fully documented for each VEC on which the nuisance will potentially impact.	Sections 8 and 10; Appendix E
Provided by letter Ref: NEMA/4.5, dated 19th September 2030	2. Key Priority Areas	(iii)			

Provided by letter Ref: NEMA/4.5, dated 19th September 2031	C: Biodiversity	(i)	Impacts on biodiversity: The ESIA should clearly provide the extent of the ecosystems that will be disturbed and the duration of the disturbance, particularly habitats for species of conservation concern (like the chimpanzee) and migration routes, linking project activities to potential impacts on biodiversity. Concrete measures to prevent/minimize unnecessary disturbance should be documented. The ESIA should propose a monitoring plan of key elements of biodiversity, which are most vulnerable to the disturbance.	Potential impacts, including those to ecosystem services, have been fully characterised in the EIS with specific emphasis on species of conservation importance. The proposed ESMP is documented.	Section 8; Appendix E.

			The Albertine rift area and sections of the proposed route are prone to seismic activity which poses risks to the pipeline. The ESIA should assess and provide measures to address risks (such as geohazards, sabotage, spills, explosions, etc). Potential environmental and social consequences of these risks with regard to the pipeline should be addressed and the EIS should clearly indicate how these risk have been integrated into the design.		Sections 2, 3 8 and 9
Provided by letter Ref: NEMA/4.5, dated 19th September 2032	D: Incidents and Emergencies	(i)		The route selection process aimed to design out risk is documented. Potential impacts resulting from planned, normal construction and operations and, abnormal operations and unplanned events have been identified and evaluated as part of the ESIA process.	

Provided by letter Ref: NEMA/4.5, dated 19th September 2033	D: Incidents and Emergencies	(ii)	A clear project description and evaluation should be provided in regard to safeguards (developed in compliance to National Legislation and International Standards), in the event of force majeure/pipeline failure/spills that could arise during the implementation of the project, so as to demonstrate the effectiveness of these safeguards.	Measures to maintain and monitor the integrity of the pipeline and AGIs are described in the EIS. An emergency response plan will be developed.	Sections 2 and 10.
Provided by letter Ref: NEMA/4.5, dated 19th September 2034	E: FEED-ESIA-FID Correlation/Interaction	(i)	It is important that the ESIA aspects inform the Front End Engineering and Design (FEED) and Financial Investment Decision (FID) for this project. The developer should demonstrate that the ESIA and its recommendations are integrated into the FEED and FID.	Noted. The ESMP and the commitments register describe the mitigation that will be required to inform detailed design and the management of construction and operation activities. The EIS has been completed as an iterative process with the FEED team. Recommendations from EIS were integrated into construction contracts documentation.	Section 10; Appendix E

Provided by letter Ref: NEMA/4.5, dated 19th September 2035	3. Other Observations	i	Provide a clear description of the entire project (1145km) to give a good understanding of the development by regulatory entities so that decisions/compliance requirements are not considered in isolation but rather with hindsight of implications to the entire project.	The EACOP System is fully described in the EIS and presents sufficient information to identify and evaluate potential project impact, pre- and post mitigation, cumulative impacts, transboundary impacts.	Section 2.
Provided by letter Ref: NEMA/4.5, dated 19th September 2036	3. Other Observations	ii	The ESIA for Tilenga feeder line should make reference fo the Strategic Environment Assessment (SEA) for the Albertine Graben and adhere to the applicable recommendations of the SEA.	The Strategic Environment Assessment (SEA) for the Albertine Graben has informed the ESIA process.	Section 4.

Provided by letter Ref: NEMA/4.5, dated 19th September 2037	(iii) Institutional framework and procedural requirements	iii	Whereas reference is made to many international conventions and agreements, the obligations and requirements of these conventions to the pipeline are not highlighted. The ESIA should provide the linkage and requirements of the pipeline project with these conventions, many of which have not been domesticated yet. There is need to revise the scope to those relevant to the	The EIS has identified the application of relevant international conventions to the EACOP project.	Section 4.

Provided by letter Ref: NEMA/4.5, dated 19th September 2038	(iv) Public and lead agency involvement	iv (a)	There is insufficient attention given to the social issues during the scoping exercise and the ToR are similarly lacking in terms of the ESIA strategy to address the social concerns such as livelihoods, use of the Right of Way (ROW), unrealistic expectations (e.g. employment available to locals), land use rights, and compensation among others. Clear strategies to address/manage social issues should be provided in the ESIA report.	Potential impacts have been fully characterised in the EIS, especially considering livelihood, land-use, acces, etc and, appropriate mitigation is described.	Section 8; Appendix A11.

			Not all relevant groups were identified and consulted during the scoping. The proposed stakeholder engagement plan referred to in chapter 8 should be comprehensive for the EIA process and the entire project cycle. This should include marginalized groups such as women and the elderly and entities that may influence the project such as Members of Parliament.	Stakeholders that were consulted are listed; stakeholders were selected based on a stakeholder mapping exercise undertaken by EACOP as well as the EIS team's experience of consultation. Community engagements included consultations with marginalised groups such as women and elderly.	Appendix C.
Provided by letter Ref: NEMA/4.5, dated 19th September 2039	(iv) Public and lead agency involvement	iv (b)			

			The ESIA should go beyond evaluation of direct impacts and consider potentially significant indirect impacts arising from the project such as, the opening up of areas which may cause bigger and long-term environmental, social, demographic and biodiversity impacts. The EISA should or instance clearly show where new temporary and permanent access roads will be constructed as a result of the project. Similarly, the potential residual impacts from the implementation of this project should be identified and addressed during the ESIA.		Section 8.
Provided by letter Ref: NEMA/4.5, dated 19th September 2040	(v) Evaluation of Impacts	v		Impacts have been fully characterised in the EIS as direct, indirect and induced as well as in terms of magnitude, duration, extent and the sensitivity of the VEC. Residual impacts have been characterised, quantified and assessed. Temporary and permanent roads have been assessed.	

			While extensive baseline studies have been proposed, the potential impacts of the project should be emphasised and the correlation between the project and the baseline should be clear. The need for baseline studies also depends on the actual design of the project activities, and its interference with the		Section 6 and Appendix A.
Provided by letter Ref: NEMA/4.5, dated 19th September 2041	(vi) Management and Monitoring Plan	vi (a)	pristine environment of existing anthropogenic activities.	The area of influence and associated study area for each VEC is described.	

			A comprehensive management and monitoring plan for the project should be developed indicating the capacity requirements (logistical and human resource) and associated costs (for instance increased management costs of Protected Areas) to implement the plan. This should be done in consultation with the relevant lead agencies. The rationale behind the monitoring program should be clear and it should be demonstrated that it is effective to address environmental and social concerns of the project. For instance, the rationale behind the surface water and ground water monitoring programs		Section 10 and ESMP
Provided by letter Ref: NEMA/4.5, dated 19th September 2042	(vi) Management and Monitoring Plan	vi (b)		The proposed ESMP is described.	

Provided by letter Ref: NEMA/4.5, dated 19th September 2043	(vi) Management and Monitoring Plan	vi (c)	While a number of management plans have been proposed, the ESIA should document which management plans or actions therein are applicable to specific sections of the pipeline and associated activities/projects.	Proposed mitigation has been designed to ameliorate generic type impacts to an acceptable level and, location-specific type impacts to an acceptable level; location-specific mitigation has been described in terms of the location along the pipeline and the characteristics of the potential impact. A generic impact is an impact that potentially occurs at multiple locations across the project AOI where the VEC and or impact characteristics are similar across those multiple locations. A location-specific impact is a potential impact that may occur at a specific location or, where the sensitivity of a VEC at a particular location warrants generic mitigation as well as additional, location-specific mitigation. These generic and location-specific mitigation measures will inform the development of the construction management plans and the operational management plans. This is reflected in the EIS ESMP.	Sections 5, 8 and 10.

Appendix M: Acknowledgements

February 2020

APPENDIX M ACKNOWLEDGEMENTS

This environmental and social impact assessment (ESIA) for the EACOP project in Uganda has been carried out by registered environmental practitioners on behalf of Total East Africa Midstream BV.

RSK and Eco & Partner acknowledge the collective and individual contributions from a range of companies and external stakeholders in the preparation of this ESIA report. RSK and Eco & Partner are grateful for the willing assistance of the local authorities in the districts of Gomba, Hoima, Kakumiro, Kyankwanzi, Lwengo, Mubende, Rakai and Sembabule that were instrumental in organising the community members and availing information on various developments in these areas. RSK and Eco & Partner are also grateful to these companies and individuals and their valuable contribution to a rigorous and comprehensive ESIA report.

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Fauna and Flora International

Nomad Consulting Ltd

Rickshaw Travels Ltd

Shape Consulting Ltd

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WSP UK Ltd

Consultations and Discussions

Chamber of Mines and Petroleum

Department of Museums and Monuments

Directorate of Employment and Occupational Health

Directorate of Physical Planning and Urban Development

Directorate of Water Resource Management (DWRM)

Ministry of Agriculture, Animal Industry and Fisheries (MAIIF)

Ministry of Energy and Minerals Development (MEMD)

Ministry of Gender, Labour and Social Development (MGLSD)

Ministry of Lands, Housing and Urban Development (MLHUD)

Ministry of Tourism, Wildlife and Antiquities (MTWA)

Ministry of Water and Environment (MWE)

Ministry of Tourism, Wildlife and Antiquities (MWTA)

National Environment Management Authority (NEMA)

National Forestry Authority (NFA)

Office of the Prime Minister

Petroleum Authority of Uganda (PAU)

Uganda Electricity Transmission Company Limited (UETCL)

Uganda National Oil Company (UNOC)

Uganda National Roads Authority (UNRA)

Uganda Wildlife Authority (UWA)

Wetlands Management Department (WMD)

UN Chief Security Advisor – Uganda

World Vision

Representatives of the regions, districts, wards and villages in the project area

Appendix N: Project Chemicals

February 2020

APPENDIX N PROJECT CHEMICALS

Chemical	Drilling	Construction Camp	Construct Pipe	Catering	Water Treatment Plant	MST	Pump Station	Pressure Station	Wastewater Treatment Plant
Bentonite HV	y								
Soda Ash	y								
AUS - Det	y								
Pac -R	y								
AMC Shur - Seal	y								
AMC Xan- Bore	y								
Liquisperse	y								
AMC CR - 650	y								
AMC- Aus - Grip A	y								
Nitric Acid	y								
Unleaded Gasoline	y	y	y	y		y	y	y	
Cyclopentane									
Tolylene Di-isocyanate (TDI)									
Methylene Diphenyl Di-isocyanate (MDI)									
Acetylene									
Polyol									
Polyurethane									
Fusion Bonded Epoxy Coating (FBE)									

Chemical	Drilling	Construction Camp	Construct Pipe	Catering	Water Treatment Plant	MST	Pump Station	Pressure Station	Wastewater Treatment Plant
Polyethylene									
Sulphuric Acid (Battery Acid)		y	y			y			
Silicon Sealant (Silicon Rubber Sealant)		y	y						
Red Oxide									
Spray Paint (Acrylic Epoxy)		y	y						
Methyl Formate (MF)									
Various Thinner & Solvents									
Hydrofluoroolefine (HFO)									
Coolants									
Cement		y							
Thinner		y							
Battery Terminal Protectors (Aerosols)		y	Y						
Epoxy Paints and Primers		y							
Epoxy Grout		y							
Adhesives		y							
Form Sealers		y							
Form Release Agents		y							
Biocides (hydrotest)			y						
Tolcide PS575 Biocide			y						
Acetic Acid 60% buffer			y						

Chemical	Drilling	Construction Camp	Construct Pipe	Catering	Water Treatment Plant	MST	Pump Station	Pressure Station	Wastewater Treatment Plant
Caustic soda 50% buffer (NaOH)			y						
Alclean 5032 (Phosphoric Acid)			y						
Squirts (Aerosols) Range (Aerosols)			y						
Pine-o-Clean Glen 20 Surface Spray			y						
Bleach Jik				y					
Detol Soap PKT				y					
Fabric Conditioner (Star soft)				y					
Liquid Soap				y					
Harpic				y					
Lt disinfectant				y					
Oven Cleaner				y					
Sterol Sterilising FLU				y					
Algae Control: Copper Sulphates (Algaecides)-CuSO4					y				
Flocculants:					y				y
Aluminium Sulphates-Al2(SO4)3.14H2O					y				
Iron Sulphates-Fe2(SO4)3					y				
Iron Chloride-FeCl3					y				
Sodium Silicate-Na2O(SiO2)n					y				

Chemical	Drilling	Construction Camp	Construct Pipe	Catering	Water Treatment Plant	MST	Pump Station	Pressure Station	Wastewater Treatment Plant
pH Control, Corrosion & Scale Control:					y				
Sodium Hydroxide-NaOH					y				
Calcium Carbonate-CaCO3					y				
Calcium Hydroxide-Ca(OH)2					y				
Disinfectants & Oxidants:			Y		y				
Sodium Hypochlorite-NaOCl					y				
Ion-Exchange Resins					y				
Calcium Hypochlorite-Ca(OCl)2					y				
Chlorine-Cl2					y				
Calcium Oxide-CaO					y				
Sodium Carbonate-Na2CO3					y				
Fluoridation:					y				
Fluosilicic Acid-H2SiF6					y				
Sodium Fluoride-NaF					y				
Alkanes (crude)						y	Y	Y	
Pyrene (crude)						y	y	y	
Benzothiophene (crude)						y	Y	Y	
Diesel	Y	Y	Y	Y		y	Y	Y	
Coagulants					Y				y
Poly-Aluminium Chloride									y
Polyamine									y

Chemical	Drilling	Construction Camp	Construct Pipe	Catering	Water Treatment Plant	MST	Pump Station	Pressure Station	Wastewater Treatment Plant
Anti-foams:									y
Polyglycol									y
Sodium dioctylsulphosuccinnate									y
Bacteria Cultures & Nutrients: Peptone									y
Odour Control									y
Sodium Nitrate									y