TILENGA PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Non-Technical Summary

Submitted to:
National Environment Management Authority

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0 PREFACE

0.1 This Document

This document is the Non-Technical Summary (NTS) of the Environmental and Social Impact Assessment (ESIA) Report for the proposed *Tilenga Project* ("the Project").

The objective of this document is to summarise the key information and conclusions contained within the ESIA Report, in a way that is accessible and understandable to a broad audience of readers who may not have expertise in the technical and scientific specialties that inform the ESIA Report, so that all stakeholders and interested parties are able to:

- Understand the proposed Project;
- Understand the anticipated potential impacts of the Project and associated mitigation measures;
- Develop an informed opinion regarding the benefits and possible adverse impacts of the Project; and
- Use their understanding of the Project to engage in the ESIA review, provide feedback on the Project and facilitate/assist with the decision-making processes.

Should technical information be required, readers are invited to review specific technical chapters of the ESIA or the ESIA Report as a whole. The full ESIA Report is intended to be read by those who require a fuller, technical understanding of the Project and the associated studies conducted.

This document and the ESIA Report have been prepared in accordance with the requirements of applicable laws for purposes of the Project. They have been prepared with the specific circumstances of the Project in mind and the Project Proponents accept no responsibility for the use of this document other than for the purpose for which it was prepared.

0.2 The ESIA Report

The ESIA Report for the *Tilenga Project* has been prepared in accordance with the National Environment Act Cap 153 (Ref. 1), and Environmental Impact Assessment Regulations (EIA), 1998 (Ref. 2). The development of the ESIA Strategy for the Project was undertaken following discussions between the Project Proponents and the key Ugandan Regulators including National Environment Management Authority (NEMA) and Ministry of Energy and Mineral Development (MEMD). During the life of the Project, the Project Proponents will continually engage with relevant regulatory bodies including NEMA, the Petroleum Authority of Uganda (PAU), Uganda Wildlife Authority (UWA), the Directorate of Water Resource Management (DWRM) and others as necessary.

On behalf of the Project Proponents, Total Exploration & Production Uganda B.V. (TEP Uganda), Tullow Uganda Operations Pty Ltd (TUOP) and the China National Offshore Oil Company Uganda Limited (CNOOC) the ESIA Report was prepared by independent NEMA registered Environmental Practitioners from AECOM Uganda Limited (AECOM) and Eco & Partner Consult.

The Project Proponents are committed to meeting best international practice for undertaking ESIA and thus the Project's environmental and social performance will also meet the requirements of the International Finance Corporation (IFC) Performance Standards (PS) (2012) (Ref. 3).

0.3 Relationship to Other ESIA Reports

The ESIA is for the Tilenga Project as described in Chapter 4 of the ESIA Report. Other associated developments including the Tilenga Feeder Pipeline and the East Africa Crude Oil Pipeline (EACOP) are subject to separate ESIAs.

0.4 ESIA Report: Disclosure and Consultation

NEMA will lead the ESIA disclosure process with support from the Project Proponents, as required, to align the disclosure process with the national requirements. The Project Proponents welcome feedback

on the Project and the ESIA Report from all stakeholders and interested parties and will upload a copy on to their company websites[1]. Any feedback will need to be sent directly to NEMA.

The official consultation period for the ESIA Report will run for 28 days from the date of disclosure. During this period, the ESIA Report (including NTS and appendices) can be accessed in a number of ways including online and in a printed hard copy. Digital copies are accessible on the NEMA website (www.nema.go.ug); PAU website (www.pau.go.ug); and the Total (E&P) website (www.ug.total.com)

Printed copies will be located at a number of location including

- NEMA offices in Kampala
- PAU offices in Entebbe
- MEMD offices in Kampala
- Buliisa, Nwoya, Hoima and Masindi Districts headquarters.
- Makerere, Kyambogo and Gulu University Libraries;
- Uganda Wildlife Authority offices;
- National Library of Uganda

ESIA disclosure activities will be led by NEMA. Public hearing will be led by PAU and announcements regarding public hearings or meetings will be made in national, regional and local newspapers, in advance of these events as required.

0.5 Contacting the Project

Stakeholders are welcome to contact the Project Proponents at any time. Alternatively, communications specifically regarding this ESIA can also be addressed directly to NEMA and PAU.

Project Name and Contact Details

Project Title:	**Tilenga ESIA**

Role	**Contact Details**
Lead Project Proponents:	Total Exploration & Production Uganda B.V. Course View Towers, Plot 21, Yusuf Lule Road, Kampala, Uganda Email: EP.tepuinfo@total.com

[1] http://ug.total.com

1 INTRODUCTION

1.1 Tilenga Project

The 'Tilenga Project' ("the Project") refers to the development of six oil fields within Contract Area CA-1, License Area LA-2 (North) and Exploration Area EA-1A in the Albertine Graben, Western Uganda by Total Exploration & Production Uganda B.V. (hereafter referred to as 'TEP Uganda'), Tullow Uganda Operations Pty Ltd (hereafter referred to as 'TUOP') and the China National Offshore Oil Company Uganda Limited (CNOOC). The geographical context and location of the Project is shown in Figure 1. The Project forms part of the wider oil and gas development being undertaken in the Lake Albert region (Figure 2).

Figure 1: Geographic Context of Project Location

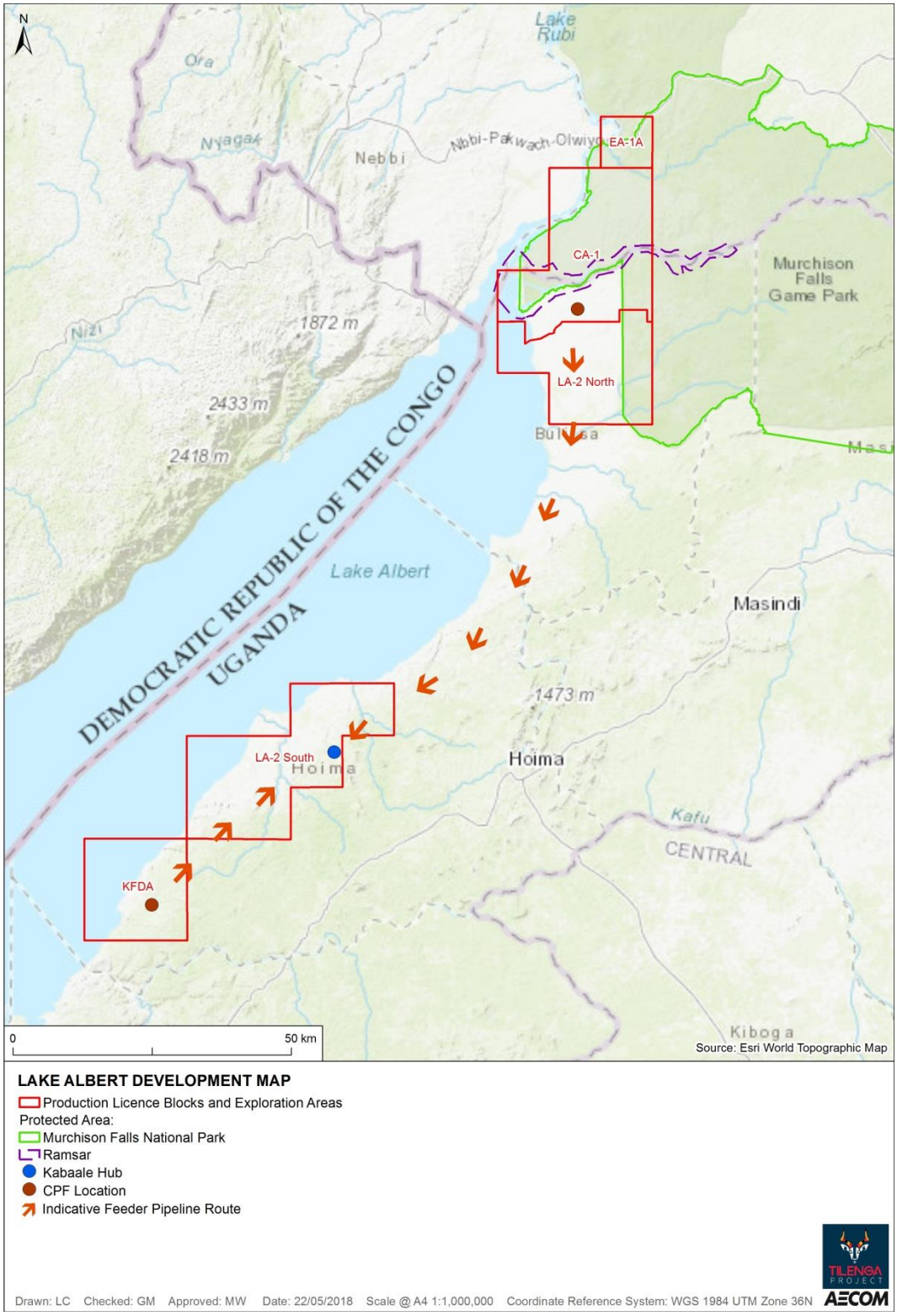


Figure 2: Lake Albert Development Map

The overall objective of the Project is to establish production of the oil fields located within CA-1, LA-2 North and EA-1A in an economically robust manner using sound reservoir management principles and best industry practice. It should be noted that exploration fields and well pads in the Exploration area EA-1A are not part of the current plan for development and therefore excluded from this ESIA. However a number of Project components located within EA-1A, including a camp and roads are included.

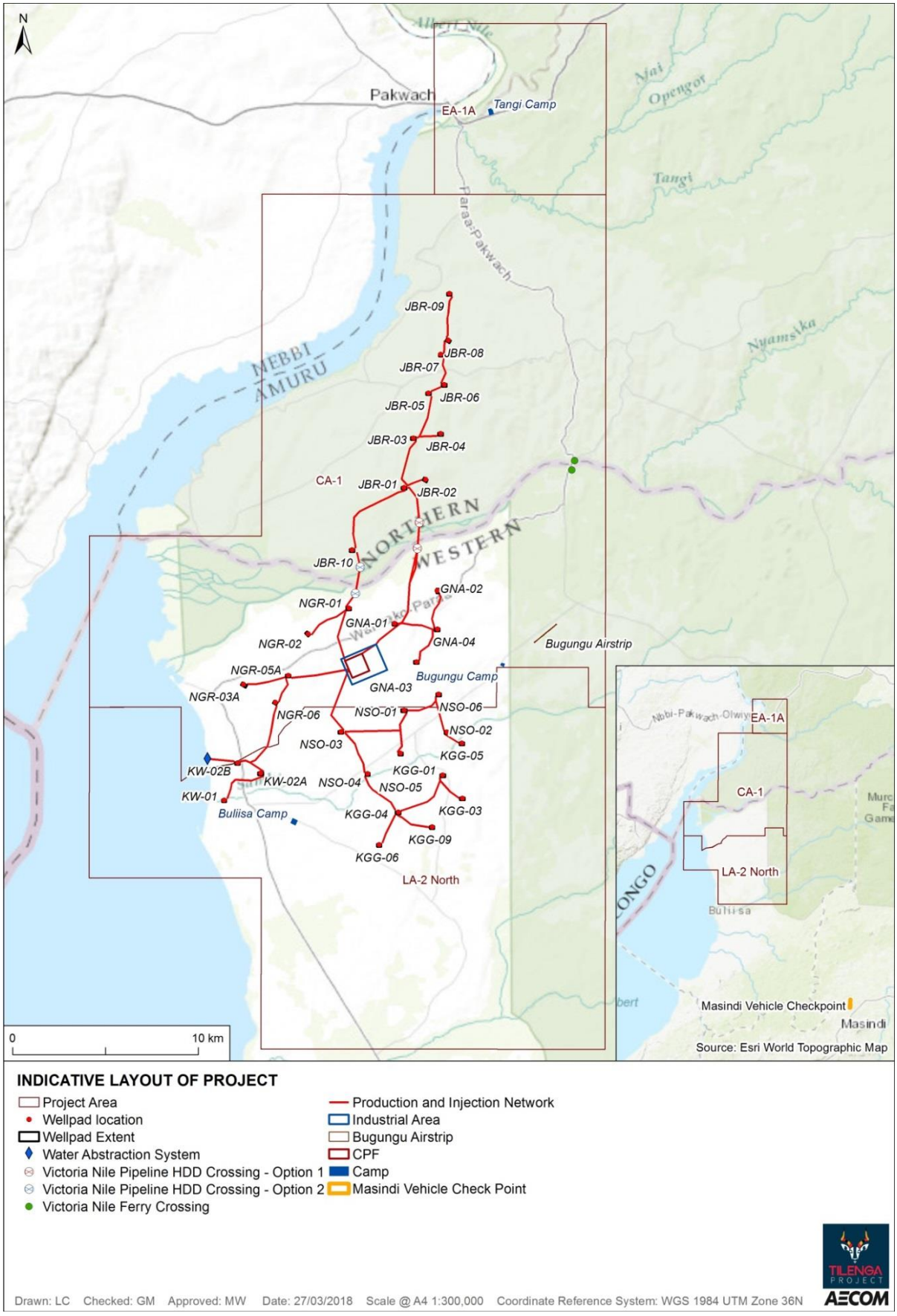


Figure 3: Indicative Layout of Tilenga Project

A total of about 400 wells will be drilled from 34 well pad locations, and a network of buried pipelines will collect the oil production from each well pad and transport it to a Central Processing Facility (CPF) located within the Industrial Area planned in Ngwedo sub-county, Buliisa District. From the CPF the treated oil will be sent to the oil export system via Tilenga Feeder Pipeline.

The Project infrastructure will also include a water abstraction system on the shores of Lake Albert, the construction of new roads and upgrades to existing roads and a vehicle checkpoint at Masindi. An overview of the Project Infrastructure is shown in Figure 3. Section 4 provides a summary of the Project description.

1.2 The Project Area

The Project Area is large, covering approximately 110,000 hectares (the Project Footprint itself covers around 1,170 hectares, equating to 1.1 % of Project Area) and is located within Buliisa and Nwoya Districts (Figure 3). The Project also includes temporary conversion of the disused Masindi airstrip into a Vehicle transit Checkpoint. The Project Area is naturally split between the north and south banks of the Victoria Nile River. This area includes the Murchison Falls-Albert Delta Wetland System Ramsar site along the Victoria River Nile. This is also an Important Bird Area (IBA) and is known to support rare, vulnerable and endangered species. Approximately 30% of CA-1 recoverable reserves, EA-1A east of the Albert Nile, and part of LA-2 (North), is within the Murchison Falls National Park (MFNP) which is the largest and the second-most visited national park in Uganda and it is ecologically important for a number of globally and regionally threatened species. Together with the adjacent Bugungu Wildlife Reserve and the Karuma Wildlife Reserve, MFNP forms part of the Murchison Falls Protection Area (MFPA). The Project Area of influence (AoI) extends over a wider area across the region and includes those areas potentially affected either directly or indirectly, by the activities associated with the development of the Project (including those within the main Project Area for Tilenga, plus the area related to any Associated Facilities) (Figure 4).

Bugungu Gate to MFNP

Vista from game track within MFNP

1.3 Need for the Project

Commercial accumulations of oil were first discovered in Uganda in 2006 within the Albertine Graben in the western part of the country. The current estimate of the country's petroleum oil in place is 6.5 billion stock tank oil-initially-in-place (STOIIP) barrels of oil (bbl), of which 1 billion bbl is estimated as recoverable in addition to 160 billion cubic feet of gas.

The Government of Uganda (GoU) has plans for commercialisation of the discovered resources, which includes the phased development of a refinery, use of crude oil to generate electricity and export of crude oil to international markets by pipeline via Tanzania. The GoU expects that the development of the oil and gas industry will stimulate accelerated economic growth, job creation, and contribute towards poverty eradication and general prosperity to the people in Uganda.

The Tilenga Project is a strategic project because of the anticipated benefits for the country including job opportunities (skilled and unskilled) and improved infrastructure such as roads. The Project is also anticipated to provide businesses with opportunities to supply goods and services to the oil companies and their contractors.

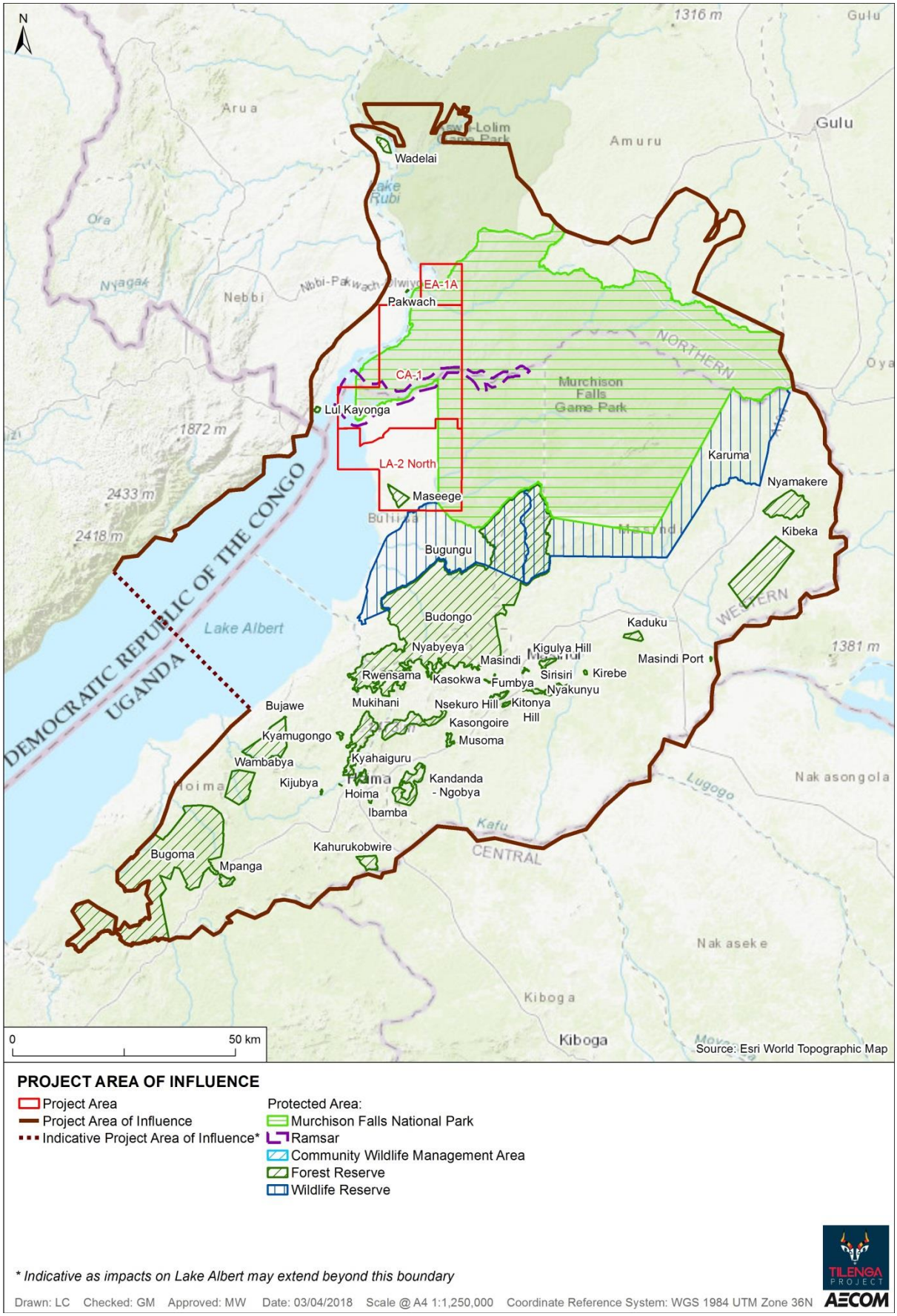


Figure 4: Project Area and Project Area of Influence

1.4 The Project Proponents

TEP Uganda, TUOP and CNOOC Uganda Ltd each held a 33.33% interest in the discovered oil fields located in the Lake Albert region of Western Uganda. The GoU at award of the Production Licenses exercised its right to participate in these Joint Ventures at a 15% interest through its private subsidiary, Uganda National Oil Company (UNOC), once approved the following split in interest will be adopted:

- TEP Uganda - 28.3%;
- TUOP - 28.3%;
- CNOOC - 28.3%; and
- UNOC - 15%.

However, currently discussions are also underway among the partners and the Government of Uganda to finalise the transfer of equity of about 22% of TUOP's interest equally to TEP Uganda and CNOOC, leading to TEP Uganda and CNOOC owning 37.5%, TUOP 10% and UNOC 15%.

The GoU has also committed to support development within the Albertine Graben through providing the required infrastructures and appropriately resourced reviews for approval of applications. The proposed infrastructure includes upgrades to existing infrastructure and development of new supporting infrastructure including roads, bridges and power transmission lines. These are subject to separate ESIA reports.

TERMS TO KNOW

The **Tilenga Project** comprises the development of six oil fields within Buliisa and Nwoya Districts of Western Uganda.

The name **Tilenga** is derived from the two local names for the Uganda Kob (Antelope), called "*Til*" in Acholi and "*Engabi*" in Lugungu.

A **Ramsar** site is a wetland site designated of international importance under the Ramsar Convention, an intergovernmental treaty established in 1971.

The **Albertine Graben** is a sedimentary basin forming the western branch of the East African Rift which contains a large reserve of oil.

The **Central Processing Facility** is a proposed facility within the **Industrial Area** in Ngwedo sub-county in Buliisa District which will include a number of key facilities to enable the processing of approximately 200,000 barrels of oil per day.

A **well pad** is a cleared area to accommodate the wellheads for a number of extraction and injection wells and the required supporting infrastructure.

1.5 Tilenga Project Phases and Schedule

For the purposes of the ESIA, four key Project phases have been considered as follows:

- ***Site Preparation and Enabling Works*** – initial phase of development consisting of activities for enabling infrastructure works and expected to take approximately *5 years*. The phase will include site preparation, Bugungu airstrip upgrade works, civils works for well pads and the water abstraction system, road modifications/construction and construction of the Victoria Nile Ferry Crossing and Masindi Vehicle Check Point.
- ***Construction and Pre-Commissioning*** – associated with the construction of main facilities at the Industrial Area (including the CPF), well pads (including drilling), production and injection network (i.e. pipeline and flowline network), and water abstraction system. This phase is anticipated to take approximately *7 years*.
- ***Commissioning and Operations*** – start-up and operation of the facilities, expected to commence approximately 36 months after effective date of the main construction contract award. The duration of this phase is estimated to be *25 years*; and
- ***Decommissioning*** – removal of infrastructure and restoration of the land at the end of the Project's life.

An indicative schedule of the overall Project timelines is provided in Figure 5.

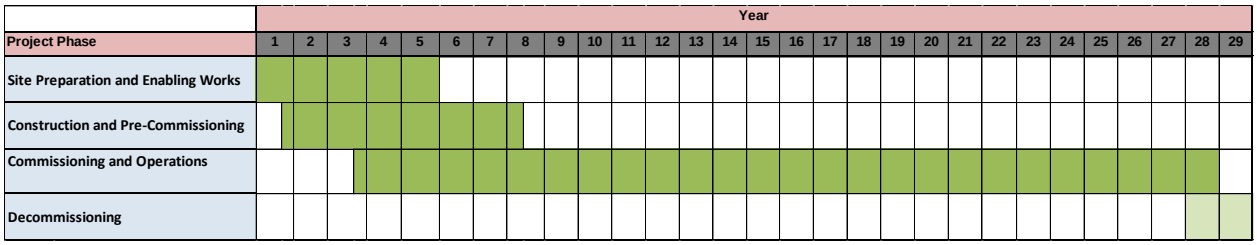


Figure 5: Project Schedule

1.6 Potential Future Field Developments

The Project Proponents may further develop the existing and some new fields within CA-1, EA-1A and LA-2 North in order to sustain the production. The development would be initiated several years after the initial Project.

2 IMPACT ASSESSMENT FRAMEWORK

The ESIA Report for the Project has been prepared in accordance with the Environmental Impact Assessment (EIA) Regulations, 1998 (Ref. 2) (provided under Section 7 of the National Environment Act Cap 153 (Ref. 1). In order to meet best international practice for undertaking environmental and social surveys, the ESIA also intends to meet the requirements outlined in the International Finance Corporation (IFC) Performance Standards (PS) (2012) (Ref. 3).

2.1 ESIA Standards and Guidelines

The key national legislation and international standards and guidelines of relevance to the ESIA include:

- National policies;
- National laws;
- National regulations (and associated standards);
- National guidelines;
- International standards (e.g. IFC PSs) and guidelines;
- Conventions ratified by Uganda; and
- Internal TEP Uganda and TUOP Policies and Guidance.

A more detailed overview of the relevant national legislation and international standards and guidelines is contained within ***Chapter 2: Policy, Regulatory and Administrative Framework*** of the main ESIA Report.

2.2 Ugandan EIA Process

As the Project is located within Uganda, the EIA Regulations, S.I. No 13/1998 (Ref. 2) are the key legislative regulations to which this ESIA must abide and comply with. In particular, these regulations provide an overview of what is required for producing an EIA.

Regulation 10 of the EIA Regulations, 1998 requires that the *Terms of Reference* for ESIA shall be prepared by the Project Proponents in consultation with NEMA and the lead agencies (through a process known as 'Scoping').

A Scoping Report for the Project which contained detailed terms of reference was submitted to NEMA in December 2015. NEMA subsequently provided formal approval of the Scoping Report and Terms of Reference on 21st April 2016. The ESIA has therefore been developed in line with the *Terms of Reference* submitted and approved by NEMA as well as in consideration of the comments made when

the approval was granted. Additionally, the ESIA Report complies with Regulation 14 of the EIA Regulations, which provides guidance on the expected contents of an ESIA Report.

In addition to national laws and regulations, further guidance on ESIA practice in Uganda is provided through a number of general and sector-specific guidelines as detailed in ***Chapter 2: Policy, Regulatory and Administrative Framework*** of the ESIA, and includes the Guidelines for EIA in Uganda (NEMA, 1997) (Ref. 4) and the EIA Guidelines for the Energy Sector (NEMA, 2014) (Ref. 5) from which the EIA process flow is shown in Figure 6 below.

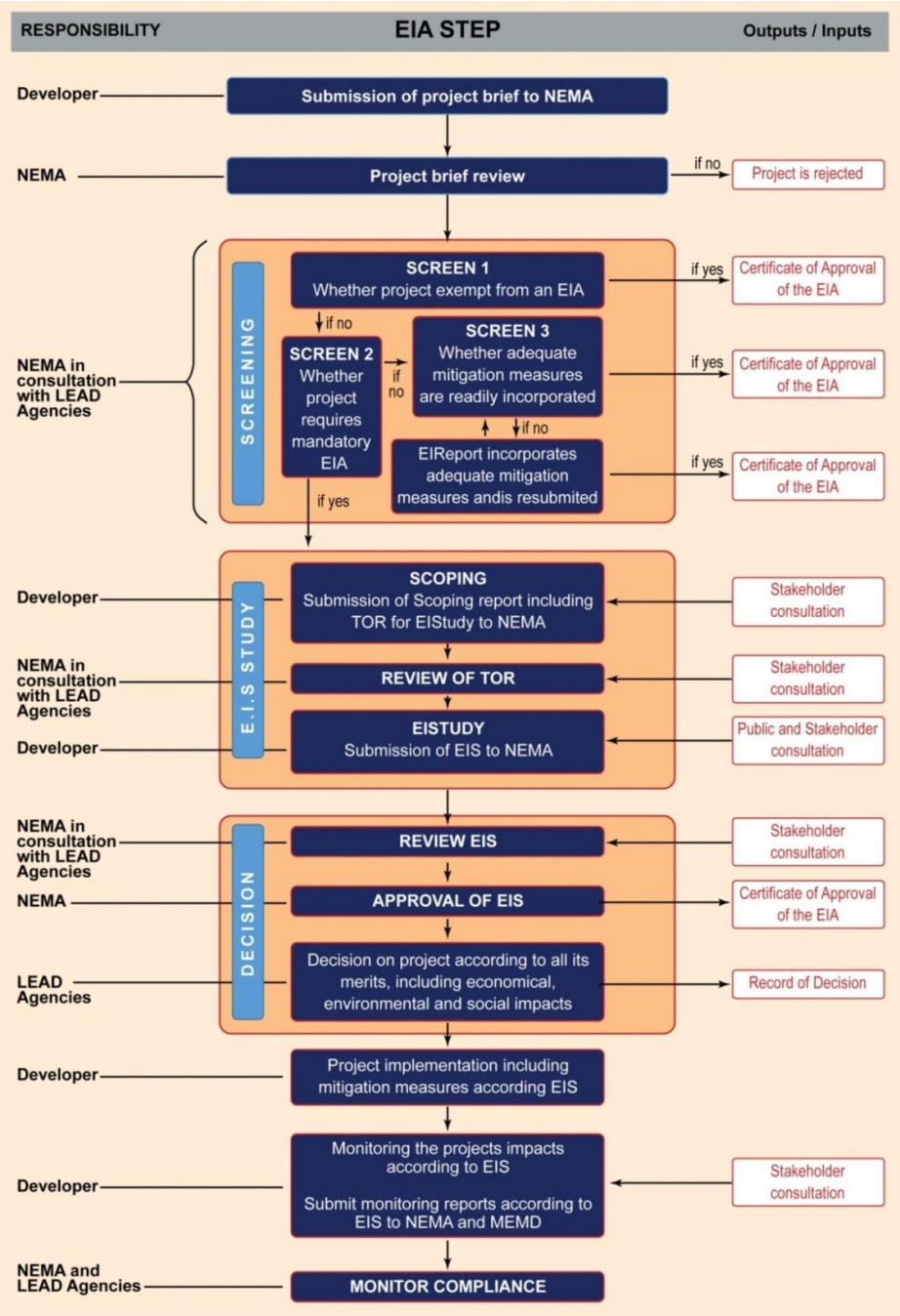


Figure reproduced from EIA Guidelines for the Energy Sector (NEMA 2004)

Figure 6: Ugandan EIA Process

2.3 International Finance Corporation Performance Standards

The ESIA has been prepared in accordance with seven of the eight IFC PS detailed below:

- ***IFC PS 1***: *Assessment and Management of Environmental and Social Risks and Impacts* - establishes requirements for social and environmental performance management throughout the life of a project;
- ***IFC PS 2***: *Labour and Working Conditions* - highlights the need for workers' rights regarding income generation, employment creation, relationship management, commitment to staff, retention and staff benefits;
- ***IFC PS 3***: *Resource Efficiency and Pollution Prevention* - defines an approach to pollution prevention and abatement in line with current internationally disseminated technologies and good practice;
- ***IFC PS 4***: *Community Health, Safety and Security* - specific requirements for mitigating any potential for community exposure to risks and impacts arising from equipment accidents, structural failures and releases of hazardous materials;
- ***IFC PS 5***: *Land Acquisition and Involuntary Resettlement* - recognises that project related land acquisition and restrictions could have adverse effect on communities or persons that use the land and outlines a policy to avoid or minimise involuntary physical resettlement as a consequence of development;
- ***IFC PS 6***: *Biodiversity Conservation and Sustainable Management of Living Natural Resources* - sets out an approach to protect and conserve biodiversity, including habitats, species and communities, ecosystem diversity, and genes and genomes, all of which have potential social, economic, cultural and scientific importance; and
- ***IFC PS 8***: *Cultural Heritage* - aims to protect irreplaceable cultural heritage and to provide guidance for protecting cultural heritage throughout a project's life cycle.

As no indigenous people were identified within the Project Area, it was not necessary to include ***IFC PS 7****: Indigenous Peoples*.

2.4 Objectives of the ESIA

The objectives of this ESIA are in line with the Uganda EIA Regulations and are also based on those of IFC PS1: Assessment and Management of Environmental and Social Risks, which are:

- *"To identify and evaluate environmental and social risks and impacts of the project;*
- *To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate / offset for risks and impacts to workers, affected communities, and the environment;*
- *To promote improved environmental and social performance (…) through the effective use of management systems;*
- *To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately; and*
- *To promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated."*

Additionally, and in line with feedback provided by NEMA, the purpose of this ESIA is to not only identify and assess negative impacts, but also identify and enhance any possible beneficial impacts associated with the Project.

2.5 The ESIA Report

The ESIA has considered the potential direct and indirect impacts of Project activities over all phases, as associated with:

- The physical environment (non-living components of the environment such as surface water, groundwater, noise, air, landscape and soils etc.);
- The biological environment (including living organisms such as fish, mammals, birds, vegetation and aquatic habitats);
- Archaeology and cultural heritage;
- Waste management (including solid and liquid wastes);
- Social and socio-economics (people, communities, and livelihoods);
- Community and occupational health and safety; and
- Ecosystem services (the ways in which people benefit from natural ecosystems).

An overview of the structure of the ESIA report is presented in Figure 7 below.

2.5.1 Content of the ESIA Report

The ESIA describes the main characteristics of the Project and the measures that will be implemented to avoid and minimise potential environmental and social impacts. The ESIA includes descriptions of:

- The Project components and Project activities;
- The alternatives that have been considered;
- The existing ("baseline") environmental and social conditions;
- The impact assessment methods that have been used;
- The initial embedded mitigation measures already built into the Project design;
- The potential environmental and social impacts associated with the Project;
- The additional mitigation measures that will be used to avoid or minimise these impacts;
- The impacts that will still remain after implementation of additional mitigation measures (the "residual impacts");
- The potential transboundary (crossing international borders) issues and impacts associated with the Project;
- The potential for unplanned events (such as accidents) and related impacts;
- The potential for cumulative impacts (where Project impacts may interact with the impacts of other developments in the area);
- The potential for In-combination effects with associated facilities; and
- The environmental and social management system that is being established including the identification of different environmental and social management plans.

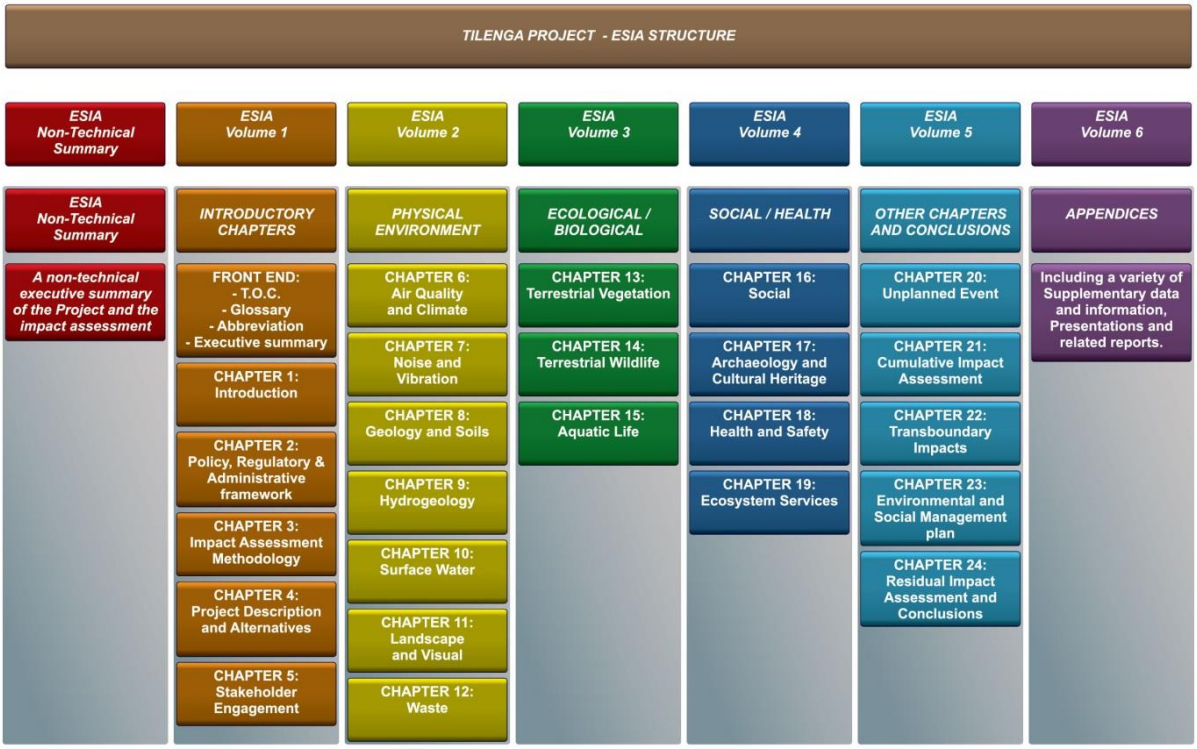


Figure 7: Tilenga Project ESIA Structure

3 ESIA APPROACH AND METHODS

ESIA is a systematic approach to identifying the potential impacts of a project, and describing the mitigation, management and monitoring measures that will be implemented to address the potential impacts. Ultimately, the results of this ESIA will allow NEMA and other government agencies to make informed decisions about the development proposals, and allow potentially affected stakeholders to participate in the process. This section describes the main features of the impact assessment and how it was conducted.

3.1 ESIA Approach and Stages

The impact assessment process is summarised within Figure 8 below. The steps identified in Figure 8 are simplified but convey the general approach to an ESIA.

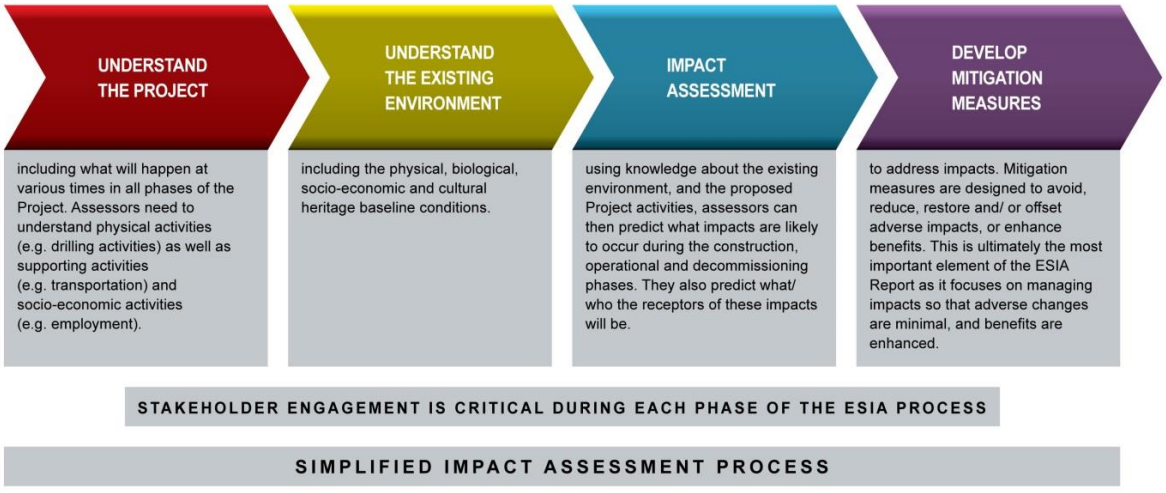


Figure 8: Simplified Impact Assessment Process

Box 1: ESIA STAGES

Screening: An early exercise to identify how the Project might interact with the environment. Screening is used to inform project planning and design.

Scoping: Utilises more detailed engineering data along with some preliminary baseline data and feedback from stakeholders. Scoping asks: what potential negative impacts might occur? What benefits might the Project have? How significant might these potential impacts be? What can be done to mitigate them? The Scoping Stage also identifies the topics and methodologies which will be included within the main ESIA Report.

Baseline Studies: A process to understand the existing environment through desk-based and field-based research so that impacts can be more accurately predicted, and to provide a baseline against which changes can be measured. It is important to note that baseline studies commence during the Scoping stage and continue afterwards into the main ESIA Report.

Impact Assessment and ESIA Report: Predicts and assesses the expected potential impacts of the Project, based on the Project description, baseline studies, and feedback from stakeholders, engineering teams and professional expertise. The impact assessment categorises potential impacts based on their significance, which may be rated as either **Insignificant**, or of **Low**, **Moderate** or **High** significance. This also includes the development of mitigation and management measures and the re-evaluation of the impacts after measures are applied (residual impacts). Beneficial impacts are also determined and any enhancement measures which may be implemented as part of the Project identified. The output of this phase is contained within the ESIA Report.

Mitigation, Management, and Monitoring: Commitments relating to proposed mitigation measures in order to avoid, reduce, restore or offset negative impacts, and enhance beneficial measures.

Stakeholder Engagement: Stakeholder Identification and engagement is a key part of the ESIA process. Stakeholder engagement has taken place throughout each and every phase of the Project and the results of these consultations have informed the Impact Assessment and recommendations for Mitigation, Management and Monitoring.

The following sections describe how these steps were applied for the Project through the ESIA stages (Box 1).

3.1.1 Value of Stakeholder Engagement

Stakeholder engagement is recognised as an important part of the ESIA process, from start to finish (and beyond the ESIA into the construction and operations of the Project).

Formal stakeholder engagement periods have been structured around the disclosure of the Scoping and ESIA Reports. However, stakeholder input has been sought and considered throughout the development of the ESIA, including baseline data collection and consultations with national and local authorities, local communities and cultural leaders, and other interest groups such as Civil Society Organisations (CSOs) and Non-Governmental Organisations (NGOs), as discussed in Section 5 of this NTS.

3.1.2 Associated Facilities

The ESIA has also considered associated facilities within the assessment work where necessary. Associated facilities, as defined by IFC PS 1 (Ref. 1-3) are described as:

- *facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable;*

The assessment of the potential environmental and social impacts of Associated Facilities (detailed in Box 2) has been carried out taking into account the limited existing information available and the timing and location of their construction; using the ESIA documents when available. In the event of risks and impacts in the Project's AoI resulting from a third party's actions, the Project Proponents will address those risks and impacts in a manner commensurate with the Project Proponents control and influence over the third parties, and with due regard to any potential conflict of interest.

Box 2: ASSOCIATED FACILITIES

Tilenga Feeder Pipeline: A proposed 95 km pipeline which will export crude from the CPF to the Kabaale delivery point, Hoima District.

East Africa Crude Oil Export Pipeline (EACOP): A proposed export pipeline approximately 1,445 km in length which will route crude oil from the Kabaale Delivery Point to an export terminal on the Tanzanian coastline for export to international markets.

Waste management storage and treatment facilities: Existing, new or improved waste management facilities that will handle waste generated by the Project.

Critical Oil Roads: Road improvements that will be developed under the jurisdiction of the Ugandan National Roads Authority (UNRA) for the purpose of supporting the oil industry.

132 Kilovolt (kV) Transmission Line from Tilenga CPF to Kabaale Industrial Park: The transmission line will provide power to the Project, Kabaale Industrial Park and surrounding areas.

3.2 Assessing Impact Significance

The impact assessment methodology takes into consideration an impact's nature (adverse or beneficial), type (direct, indirect or induced), magnitude, and the sensitivity of the affected receptors, to yield a prediction of the impact's overall 'significance'.

Impact significance is assessed taking into account existing in-built control measures (embedded mitigation measures) that are incorporated into the Project design such as avoidance work which has been conducted to avoid sensitive environmental or social receptors as well as practical design measures such as the use of bunding or commitment for no operational flaring. After a preliminary assessment has been conducted and the potential impacts identified, additional mitigation measures are then developed. This may also include measures to enhance or optimise potential benefits of the Project.

Following the identification of the additional mitigation measures, the significance of the impacts is re-evaluated based on these mitigation measures. The resulting impact is known as the 'residual' impact, and represents the potential impact that will remain following the application of embedded and additional mitigation measures, and thus the ultimate level of impact associated with the Project.

The basic process adopted for assessing potential Project impacts is illustrated in Figure 9.

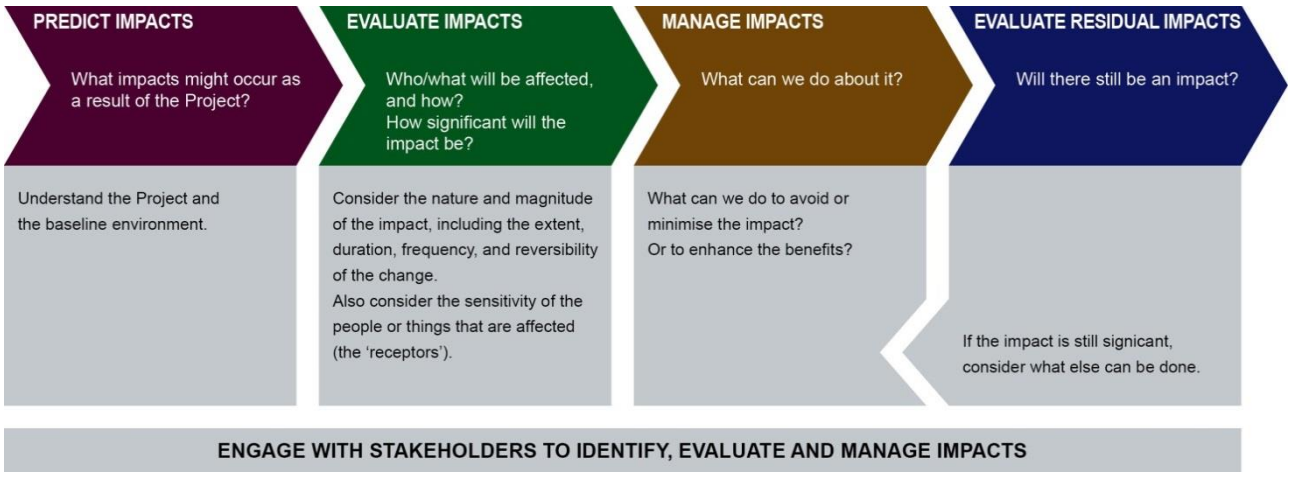


Figure 9: Impact Identification and Assessment Process

3.2.1 Impact Magnitude

The magnitude of a given potential or residual impact is a measure of the degree of change from the baseline conditions, and is determined through the consideration of the following factors:

- ***Extent***: the spatial extent (e.g. the area impacted) or population extent (e.g. proportion of the population/community affected) of a potential impact;
- ***Duration****:* how long the potential impact could last (e.g. hours, weeks, months or years);
- ***Frequency****:* how often the potential impact could occur (e.g. a one-off event, periodic, or continuous); and
- ***Reversibility***: the length of time and effort required for baseline conditions to return (e.g. reversible in the short-term or long-term, or irreversible).

The impact magnitude may be rated as **negligible**, **low**, **moderate**, or **high**. The criteria for each of these ratings is tailored for each study topic, and defined in the main ESIA Report.

3.2.2 Receptor Sensitivity

Receptors may be humans, ecological and physical components of the environment. Receptor sensitivity considers how a particular receptor may be more or less susceptible to a given impact. More sensitive receptors may experience a greater degree of change, or have less ability to deal with the change, compared with less sensitive receptors that may be more resilient or adaptable. As with magnitude, the concept of receptor sensitivity is based on multiple characteristics, namely:

- ***Vulnerability***: the degree to which a receptor is vulnerable to change (i.e. higher or lower sensitivity);
- ***Value***: the degree to which a receptor is valued or protected, with higher value receptors (based on ecological, cultural, social, economic, or other grounds) having a higher sensitivity; and
- ***Resilience***: the degree to which a receptor is able to recover from an impact.

The sensitivity of a receptor may be rated as **negligible**, **low**, **moderate** or **high**. The criteria for each of these ratings is tailored for each study topic, and defined in the ESIA Report.

3.2.3 Impact Significance

Once the receptor sensitivity and impact magnitude have been rated, the overall significance of the impact is predicted. Impact significance can be rated from Insignificant to High significance as explained below:

- ***High significance*** – potential impacts can have damaging and lasting changes to the functioning of a receptor, and may have broader consequences. These impacts are a priority for avoidance or mitigation.
- ***Moderate significance*** – potential impacts can be noticeable and result in lasting changes to baseline conditions. Broader consequences for the ecosystem or community are not anticipated. These impacts are a priority for mitigation in order to avoid or reduce their significance.
- ***Low significance*** – detectable but not significant. Potential impacts can cause noticeable changes to baseline conditions, beyond what would naturally occur, but are not expected to cause hardship or degradation. These impacts should be avoided or mitigated where practicable.

TERMS TO KNOW

Baseline conditions are the physical, biological, socio-economic, and cultural heritage characteristics that exist before the Project.

Impacts are defined as a potential change to the existing environment, whether negative or beneficial, wholly or partially arising from the Project.

Receptors An entity that receives a contaminant or pollutant and which can be subject to an impact. It can be a body of water, air, parcel of land, community, ecosystem or individual organism, human being or property.

Impact significance is a measure of how important or consequential a potential impact could be, based on its magnitude, and the sensitivity of the affected receptors.

Mitigation measures are strategic ways of avoiding, minimising, managing and/or offsetting adverse impacts, or enhancing benefits.

Design controls are measures intended to avoid or mitigate potential impacts, which have been integrated ('embedded') into the design of the Project. They are considered a part of the Project.

Residual impact is the impact that could remain after mitigation measures have been applied.

Potential Cumulative impacts result when the impacts from one project interact with those of another project or development.

Transboundary impacts result when the potential impacts could extend to multiple countries, beyond the host country of the Project.

- ***Insignificant*** – not significant potential impacts which are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

Potential impacts were assessed for following types of activities:

- Normal activities – when facilities are functioning in normal operating conditions; and
- Unplanned events – events which are not expected to occur during a project's normal activities, such as emergencies, and non-routine incidents.

This significance of impacts was derived through using the impact assessment matrix (Table 1). However, the resulting significance level was also interpreted based on professional judgement and expertise, and adjusted if necessary. Where any chapters have deviated from this matrix, details have been provided within the technical chapters of the main ESIA Report.

Table 1: Impact Significance Matrix

		Receptor Sensitivity *(vulnerability, value and resilience)*			
		Negligible	Low	Moderate	High
Impact Magnitude *(extent, duration, frequency, reversibility)*	Negligible	Insignificant	Insignificant	Insignificant	Insignificant / Low*
	Low	Insignificant	Low	Low / Moderate*	Moderate
	Moderate	Insignificant	Low / Moderate*	Moderate	High
	High	Insignificant / Low*	Moderate	High	High

* Professional expertise will determine the impact significance

3.3 Mitigation and Management

Where a negative impact has been identified, efforts have been made to develop strategies to avoid or minimise the impact. The selection of mitigation measures has considered a standard mitigation hierarchy (Figure 10), in line with IFC PS1 (Ref. 3), whereby preference is given to avoiding impacts altogether and subsequently to minimising the impact, repairing its effects, and/or offsetting the impact through actions in other areas.

Each technical chapter of the ESIA includes a section specifically relating to the identification of additional mitigation and enhancement measures. ***Chapter 23: Environmental and Social Management Plan*** provides a framework for implementation of the identified mitigation measures. A suite of detailed and individual environmental and social management plans will be developed by the Project Proponents ahead of the commencement of construction activities and updated as necessary for each Project phase. For the purposes of the ESIA, it is assumed that all identified additional mitigation measures will be implemented as part of the Project development.

3.4 Residual Impacts

After suitable mitigation measures were identified, the significance of each potential impact was re-evaluated to predict the post-mitigation ('residual') significance. It is this ***residual significance*** that has been used to support decision making and conclusions about the Project's impacts.

3.4.1 Cumulative, Transboundary and Unplanned Impacts

In addition to the core assessment and management of the potential impacts identified above, the ESIA Report also assessed potential cumulative, transboundary and unplanned impacts. An explanation is given below:

- ***Cumulative impacts***: While a residual impact may be relatively small when considering the Project on its own, this impact may be magnified in combination with potential impacts from other existing and/or future developments; these combined effects are known as potential "cumulative" impacts. The significance of cumulative impacts was evaluated qualitatively using the similar method as the impact assessment, focussed on priority Valued Environmental and Social Components (VECs).
- ***Transboundary impacts***: Transboundary impacts may be considered as potential impacts that extend to multiple countries, beyond the host country of the Project (in this case, beyond Uganda), but are not global in nature. The assessment of potential transboundary impacts was evaluated qualitatively using a similar methodology to that presented in Section 3.2.
- ***Unplanned events****:* Potential impacts may also arise as a result of unplanned events (i.e. activities or events that are not anticipated to occur in the normal course of operations of the Project, including accidents and malfunctions). These potential impacts were also assessed as part of the ESIA process, along with measures to manage risks and respond to unplanned events. Although the likelihood of unplanned events is low, appropriate management plans will be developed and implemented to ensure that the associated potential impacts are avoided, minimised and contained.

Figure 10: Mitigation Hierarchy

4 PROJECT DESCRIPTION

The following sections describe the technical components of the Project within each planned phase of works.

As part of the on-going Project design process, measures to avoid or minimise impacts have been identified and incorporated within the pre-project and Front End Engineering and Design (FEED) phases. These are referred to as embedded mitigation measures and include physical design features and management measures. They are based on Good International Industry Practice (GIIP) and are intended to avoid or control potentially significant impacts.

The Project will include the construction of 34 well pads within CA-1 and LA-2 North. Each well pad will host up to 22 wells, with an overall total of about 400 wells.

TILENGA PROJECT OIL FIELDS

North of Victoria Nile

- Jobi-Rii (**JBR**)

South of Victoria Nile

- Ngiri (**NGR**)
- Gunya (**GNA**)
- Kasemene/Wahrindi (**KW**)
- Kigogole (**KGG**)
- Nsoga (**NSO**)

4.1 Project Components

The Project will include the following permanent facilities:

- 34 well pads across six oil fields;
- An Industrial Area, including a CPF, operation camp to house workers/visitors, operations support base and drilling support base, a community / visitors centre, security camp and logistics support centre (Figure 11);
- A Lake Water Abstraction System at Lake Albert;
- A Production and Injection Network of pipelines and cables;
- Upgraded and new access roads;
- Victoria Nile Ferry Crossing Facility;
- Tangi Operation Support Base (north of Victoria Nile); and
- Bugungu airstrip.

The total permanent footprint of the Project is estimated to be 1,112 ha.

A number of facilities which are required temporary are summarised below:

- Temporary facilities at the Tangi Construction Support Base;
- Buliisa and Bugungu Construction Camps;
- Masindi Vehicle Check Point;
- Temporary facilities within the Industrial Area, including:
  - Construction Support Base to support the Project south of the Victoria Nile; and
  - Construction Camp to accommodate for works south of the Victoria Nile.

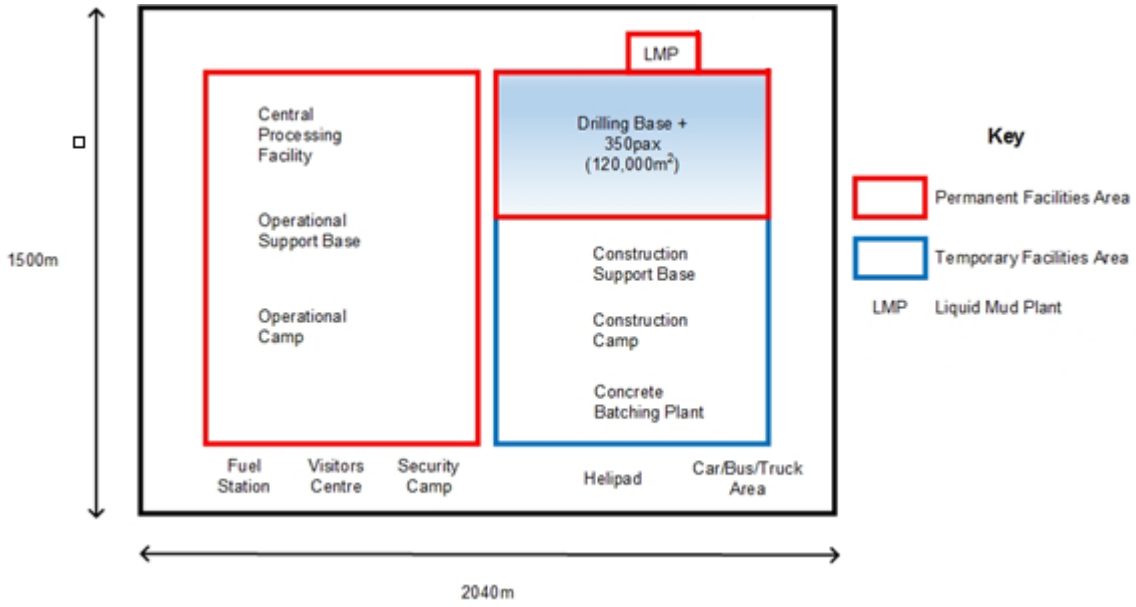


Figure 11: Indicative Schematic of the Industrial Area

4.2 Project Phases

4.2.1 Site Preparation and Enabling Works Phase

The Site Preparation and Enabling Works Phase comprise the following key activities:

- Site clearance and land preparation of the Industrial Area, well pads and Water Abstraction System onshore infrastructure. The site clearance and land preparation will include vegetation stripping, levelling, drainage, fencing and earthworks;
- Civil works for well pads and Water Abstraction System (concrete, drainage, fencing/bund walls etc.);
- Drilling of water supply boreholes;
- Upgrade works to roads A1, A2, A3, A4, B1, B2, W1, and the construction of new roads (N1, N2, N3, C1, C2, C3) to connect Project components as shown in Figure 12 below;
- Construction of the Victoria Nile Ferry Crossing jetties and associated buildings;
- Construction of Masindi Vehicle Check Point; and
- Upgrade of the Bugungu Airstrip.

The completion of the key activities during Site Preparation and Enabling Works Phase is expected to take approximately five years.

Box 3. Details of Key Project Facilities

A total of 34 **Well Pads** are planned to be located within CA-1 and LA-2 North, each ranging in size from 3.2 to 4.4 ha and holding up to 22 wells. Each well pad will include a concreted area where the wells will be located. There will be a 15 m wide buffer from the perimeter security structure, which will remain cleared of vegetation. Within the MFNP, the bund wall structure will be designed to prevent animals entering the well pads.

The **Industrial Area** which includes the **CPF**. The **CPF** is a facility within the Industrial Area that will separate the produced oil, water and gas from the well pads, stabilise oil, treat and utilise associated gas; and treat produced water/lake water for cleaning and re-injection.

A **Lake Water Abstraction System** will be constructed at Lake Albert to supply water for use during Project operations.

Production and Injection Network: A network of buried pipelines totalling approximately 180 km in combined length, including production pipelines to transport the oil and produced gas, the water abstraction line from Lake Albert to the CPF and water injection lines to transport water from the CPF to the well pads for reinjection. The network will also include three pipelines (production pipeline, water injection pipeline and, electrical and fibre optic cables) crossing under the Victoria Nile a minimum of 15 m beneath the riverbed.

Victoria Nile Ferry Crossing: Approximately 135 m east of the existing Paara ferry crossing, a new dedicated ferry will be used to service the Project activities during the Construction and Pre-Commissioning Phase and the Commissioning and Operations Phase of the Project. The Victoria Nile Ferry Crossing Facilities will comprise a number of onshore facilities and landing approaches extending from both the north and south banks of the Victoria Nile.

Masindi Vehicle Check Point will be used throughout the Construction and Pre-Commissioning Phase of the Project. It will be used for security checks/regulation of traffic entering Project Area south Nile.

The **Tangi Support Base**, to be located at the site of the existing Tangi Camp, will comprise a number of permanent and temporary facilities to support the Project during construction and operations.

To meet the access requirements for the Project a number of existing local **Roads** will be upgraded (widened and surfaced with asphalt or gravel) and new roads will be constructed. The locations of the proposed new and upgraded roads are shown in Figure 12.

Bugungu airstrip: The existing Bugungu Airstrip, located in the MFNP, will be used to transport people by small aircrafts.

4.2.2 Construction and Pre-Commissioning Phase

The Construction and Pre-Commissioning[2] Phase comprises the following key activities:

- Construction, installation and pre-commissioning of plant and equipment within the Industrial Area, at the Water Abstraction System and at each well pad;
- Erection of temporary facilities (Construction Camp and Construction Support Base) at the Industrial Area. The Construction Camp will be built to provide accommodation for up to 4,400 workers during this phase;
- Drilling of about 400 wells across the 34 well pad locations; and
- Construction, installation and pre-commissioning of the plant and equipment required for the Production and Injection Network.

The main Construction and Pre-commissioning Phase will commence once the enabling infrastructure is in place and will run concurrently with the Site Preparation and Enabling Works Phase.

[2] Pre-commissioning is defined as the process of undertaking integrity testing of equipment and the Production and Injection Network using water prior to the introduction of hydrocarbons.

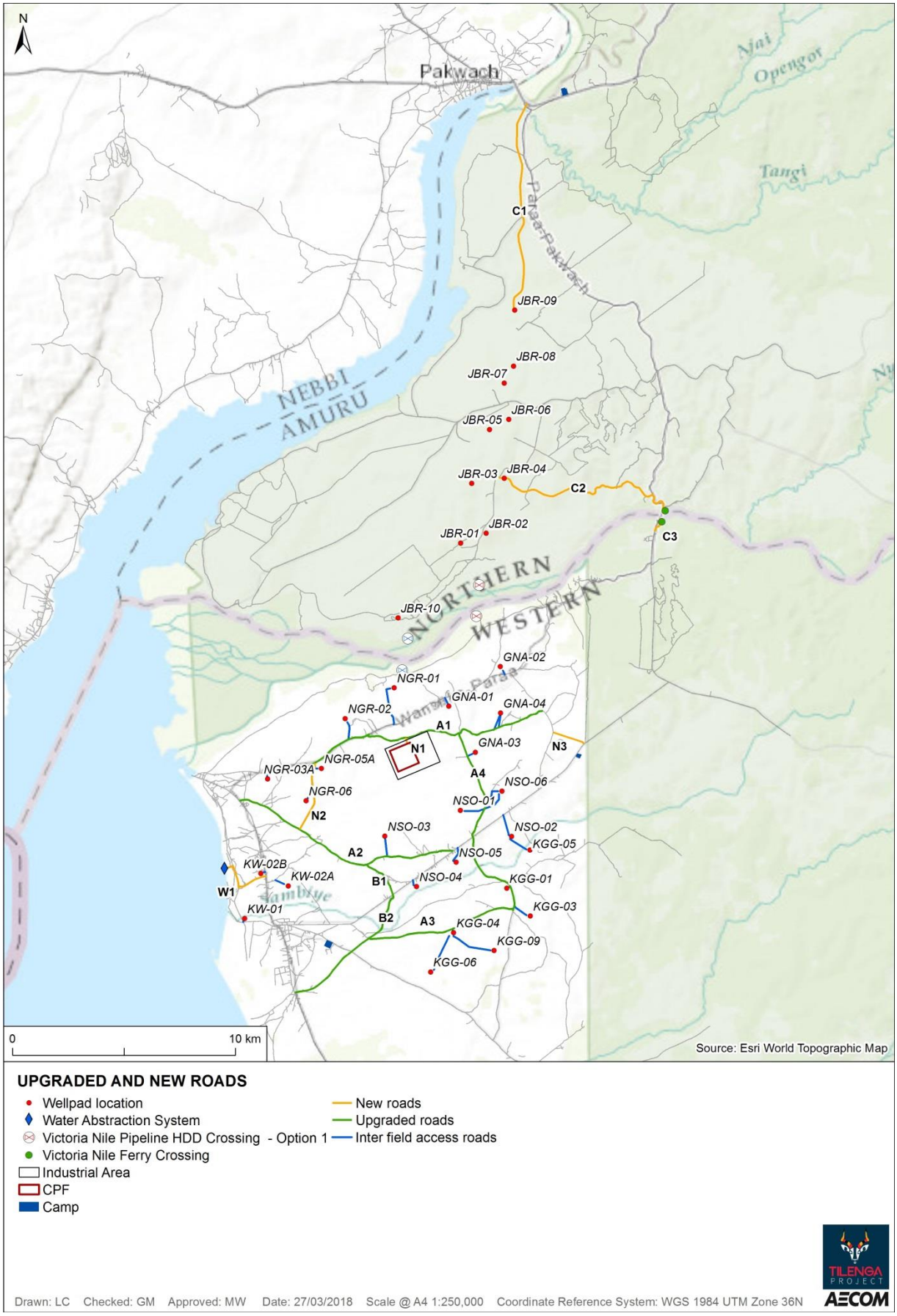


Figure 12: Upgraded and New Roads

4.2.3 Well Drilling

Each of the 34 well pads will host up to 22 wells and will range in size from approximately 3.2 ha to 4.4 ha[3]. The well pads will each include areas of hardstanding upon which the wells and associated components (e.g. tanks and pumps) will be situated. Each well pad will also include a mini workers camp and be served by a dedicated water borehole.

Typical Drilling Rig

Each well will take up to 11 days to drill and will be drilled on a 24 hour / 7 day basis.

The wells will be constructed using three drilling rigs simultaneously. One drilling rig will be positioned north of the Victoria Nile in the MFNP to drill the JBR field wells. The other two rigs will be positioned south of the Victoria Nile. The drilled wells will be a mixture of producer, injection and observation wells.

The total duration of the drilling phase is expected to be approximately 4.5 years, and thereafter the rigs will be demobilised and drilling activities will cease.

4.2.4 Production and Injection Network

A network of pipelines and cables will be installed to connect the well pads and Lake Water Abstraction System to the CPF. Indicative pipeline routes are illustrated in Figure 3.

The Production and Injection Network outside of the Industrial Area will be trenched and buried. The pipelines will be installed using open-cut trench methods with dedicated pipeline trenching machines as illustrated in Figure 13. The depth of the trenches will be between 0.8 m to 2 m, and open trench lengths will be approximately 1 km to allow safe passage of wildlife and locals. Animal crossing structures such as bridges, culverts, and over crossings, along pipeline and access road rights-of-way shall be installed where necessary.

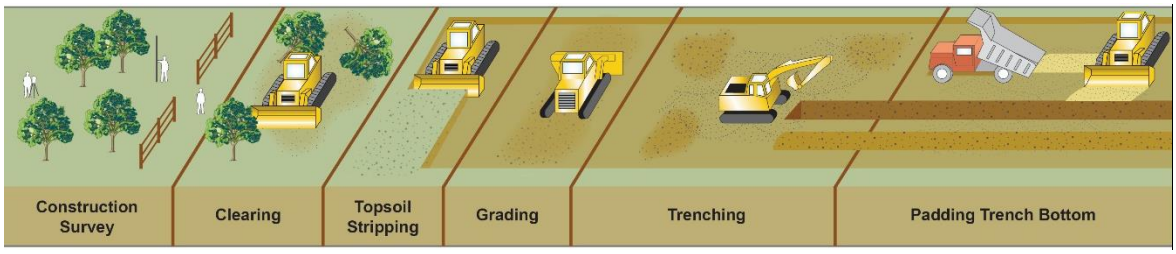
A permanent Right of Way (RoW) will be established extending 15 m either side of all pipeline routes. Construction activities will be contained within this RoW and there will be access restrictions to this area during the construction and pre-commissioning phase. Once the operational phase begins there will be no restrictions to the public using the RoW area.

The Production and Injection Network will be constructed concurrently on an estimated five work fronts consisting of four pipeline installation crews and one Horizontal Directional Drilling (HDD) crew for the Victoria Nile pipeline crossing.

Pipe laying and backfill activities are to be conducted as soon as practicable after trench excavation. The aim is to minimise the exposure of open trenches to wildlife and the local community.

[3] Sizes are provided without consideration of buffer around the well pads. Sizes may vary as Project engineering proceeds

Part 1



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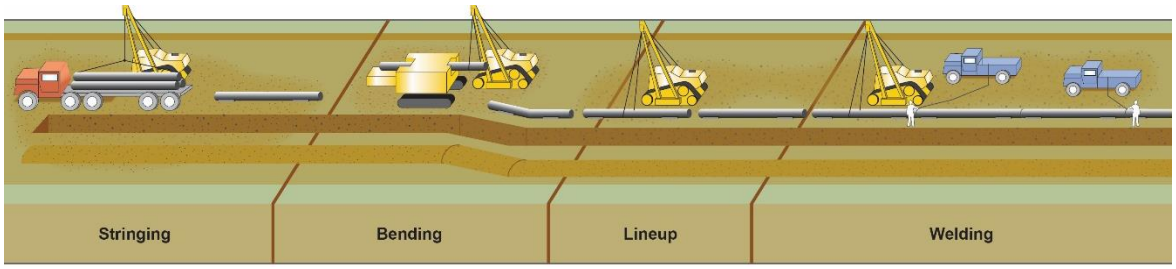

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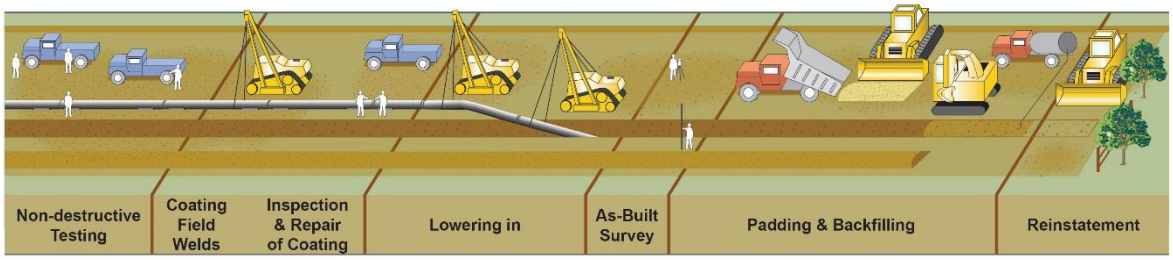


Figure 13: Typical Open-cut Pipeline Construction Technique

To connect the fields north of the Victoria Nile to the CPF, there will be a pipeline crossing under the Victoria Nile. Three pipelines will be installed 15 to 20 m beneath the riverbed using HDD. This drilling technique is illustrated in Figure 14.

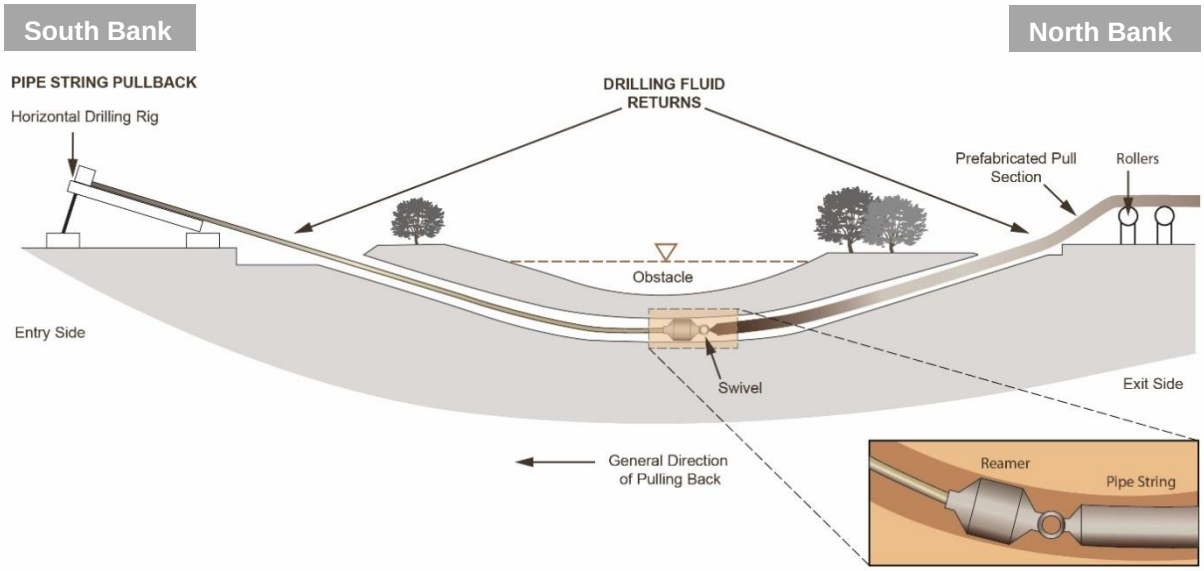


Figure 14: Victoria Nile HDD Crossing Construction Technique

The preferred location for the Victoria Nile crossing is Option 2 that will connect JBR-10 and NGR-01. It will require two HDD Construction Areas north and south of the Nile, each approximately 100 m x 100 m to contain necessary plant, equipment and materials. Pipe stringing will extend outside of this work area in order to assemble, weld and pressure test the 1.4 km of pipe to be pulled under the Victoria Nile. The HDD Construction Area north of the Nile and pipe stringing area will be located within the boundary of the Murchison Falls – Albert Delta Wetland System Ramsar site.

4.2.5 Commissioning and Operations Phase

The operating philosophy is to be based on low-impact and minimum intervention, e.g. to be achieved by multi-well pads usually operated as un-manned facilities, with inherent fail-safe design and capability for remote monitoring and control of the wells, etc.

The project will be managed and operated from the Operational Support Base located within the boundary of the Industrial Area.

4.2.5.1 Commissioning

Commissioning activities will be limited to checking the equipment and plant prior to first oil to ensure it operates correctly and addressing any issues identified. The testing of equipment and plant will be undertaken twice.

During Commissioning, equipment/ plant and system will be subject to an Operational Test, which consists of bringing into service, as close as possible to normal operating condition and for a significant period of time, the equipment, using inert or process fluids as necessary. All commissioning fluids will be collected and transferred off site at a licensed facility for disposal.

4.2.5.2 Start Up

Once commissioning is completed, and the plant is handed over to the Operations Team, a dedicated start-up procedure will be initiated and implemented.

4.2.5.3 Operations

During operations, with the exception of the JBR-04 well pad (which will be used as a pilot for polymer use to increase production), the well pads will be unmanned except for maintenance activities and should an accidental event occur.

Oil extracted from each well pad will be transported via the production network to the CPF, where it will be combined with oil extracted from other well pads for processing.

The purpose of the oil processing facilities at the CPF is to separate the produced oil, water and gas in order to produce oil which meets the export specification. The following streams will be produced, treated and stabilised at the CPF:

- ***Oil*** stream with a quality suitable for export;
- ***Produced water*** which will be mixed with de-oxygenated water from Lake Albert prior to reinjection back into the oil reservoir. There will be no discharge of produced water;
- ***Sludge*** residues which will be collected, treated and disposed of at a suitable licensed facility; and
- ***Gas*** to be utilised for power and heat generation. It is assumed that during an initial period (estimated at 5-8 years) there will be excess gas associated with the oil production to produce all power and heat requirements for the Project. Any surplus gas will be turned into surplus electricity for export to the Ugandan National Grid.

The CFP will include a flare stack which is a key safety feature that will only be used to depressurise the plant for emergency, process upsets and maintenance. There will be no routine flaring associated with production activities at the CPF and any flaring event is not expected to exceed 48 hours per event. The following two options for a flare system are currently being considered:

Option 1 - Enclosed Ground Flare (EGF)

The EGF system would be located within the CPF. During operations there would be no visible flame, smoke and minimal noise. The EGF would be approximately 26 m high with a diameter of approximately 13 m.

Option 2 - Elevated Flare

The Elevated Flare would have a smaller footprint within the CPF. Under normal operations there would be no visible flame, noise or smoke from the stack. The stack would be approximately 50 m high with a diameter of 1.25 m.

4.2.6 Production Profile

The preliminary production profiles for produced gas, oil, water, total liquid (oil and produced water) and injection water are shown in Figure 15 below.

TERMS TO KNOW

Flaring: The controlled burning of natural gas that cannot be processed for sale or use because of technical or economic reasons.

Flare Stack: A high vertical pipe for carrying unwanted gas so it can be burned off.

Produced Water: Water that is extracted from a production well as a by-product. It may include water from the rock formations, water that has been injected and any chemicals added during the production process.

Polymer: Chemical which increases the viscosity of the water present in the oil reservoir therefore enhancing oil recovery.

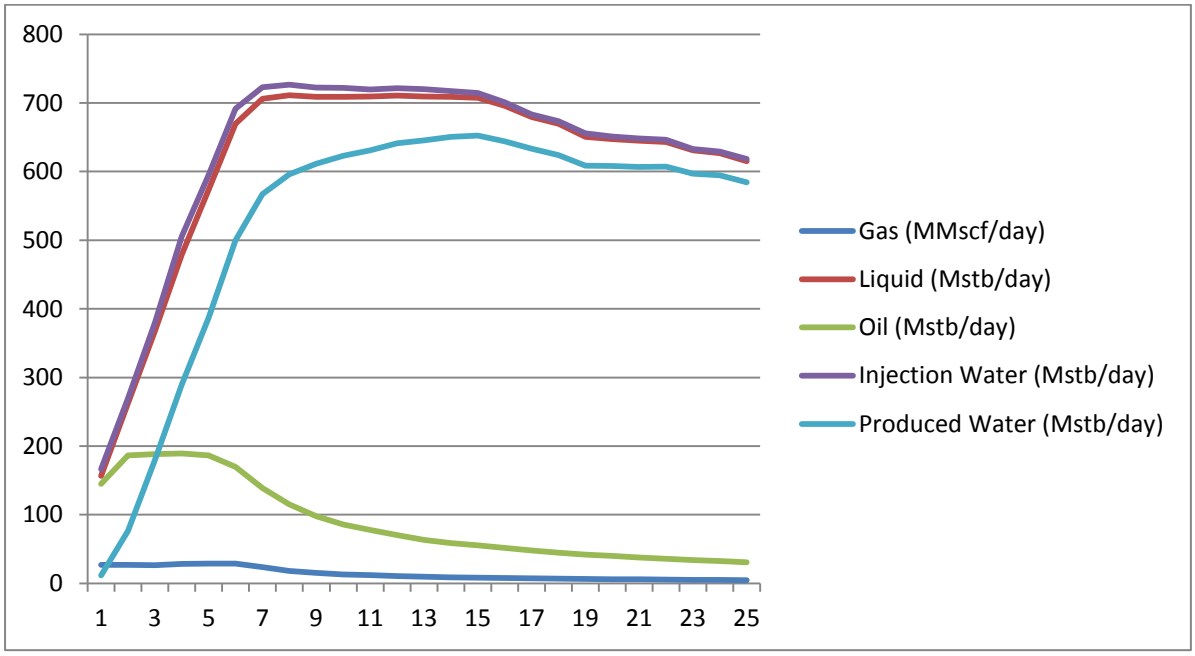


Figure 15: Preliminary Production Profile

4.2.7 Sustainable Drainage System

During the Commissioning and Operations Phase, surface water will be managed and discharged to the environment via a Sustainable Drainage System (SuDS) approach. The SuDS approach will deliver the most benefits for water quantity, quality, and amenity/biodiversity as it replicates as closely as possible the natural drainage from a site before development.

The SuDS design provides a more flexible and efficient approach to traditional “hard pipe” drainage design, which takes into account the seasonal variations in localised hydrology and wildlife sensitivity such as in the MFNP.

4.3 Decommissioning Phase

The expected service lifetime of the Project is 25 years. A decommissioning program will be developed during the Commissioning and Operations Phase of the Project. It is likely that the technological options and preferred methods for decommissioning of such systems will be different in 25 years' time; however, decommissioning activities will be undertaken in accordance with the international and national legislation and regulations prevailing at that time. An ESIA may be required before decommissioning commences. This will be agreed with GoU departments responsible at the time.

Depending on the final land use agreed with the authorities, all or part of the site may need to be rehabilitated. In such circumstances, the Project Proponents will also develop a monitoring programme for completion criteria to verify that the sites are being returned to the agreed representative state.

4.4 National Content

The Project Proponents are committed to promoting economic development and national content. Implementing an industrial development is a long-term project which requires training, capital investment and maintaining a steady level of activity.

The Project will take an integrated approach to National Content development as shown in Figure 16 which aims to capitalise on the development phase to build the capacity of the companies and that will contribute to drive the growth of the Ugandan oil and gas industry and general economy.

The National Content strategy aims at enhancing the performance/capacity of Ugandan companies, Ugandan manpower and registered entities in petroleum activities so as to encourage local investment and participation.

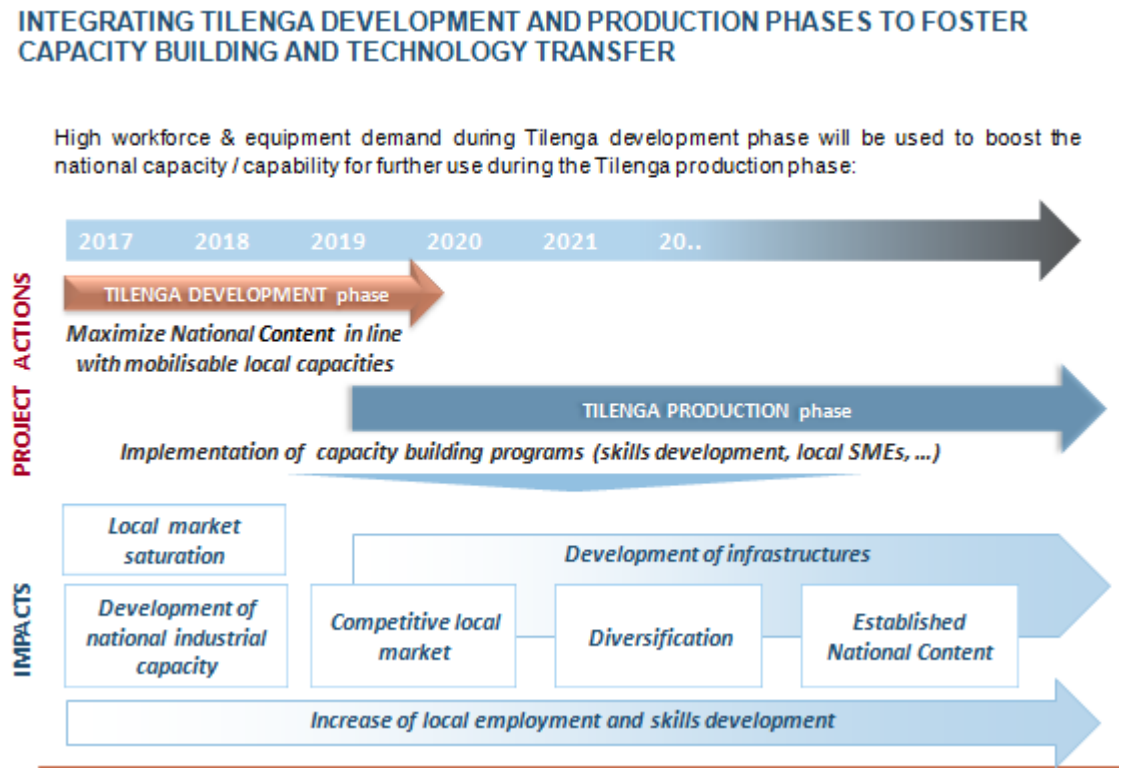


Figure 16: National Content Development

4.5 Logistics & Procurement

4.5.1 Procurement

Preference will be given to source equipment and materials which meet the required Project specifications from Uganda wherever possible. However, where this is not possible, plant and equipment will be imported from overseas.

4.5.2 Personnel Transportation

It is estimated that 80% of crew changes will be made by road and 20% will be transported by air from Entebbe Airport to either Bugungu or Pakuba airstrips every 4 weeks. Crew changes are expected to be undertaken 6 days a week.

4.5.3 Traffic Routing

As Uganda is a land-locked country, the nearest entryway by sea for materials internationally supplied is through East African coast lines where Mombasa Port in Kenya and Dar es Salaam Port in Tanzania are located. These two biggest ports are at distance of approximately 1,400 km and 1,900 km from the Project respectively. Road transport will be the preferred transportation option, with limited use of rail. All vehicles travelling to the Project Area south of the Victoria Nile will travel via the Masindi Vehicle Check Point.

Within the Project Area, a 'one-way' traffic flow is proposed as shown in Figure 17 with the R3 road being the main entry road into the Project work site and the R1 road being the main exit road from the site.

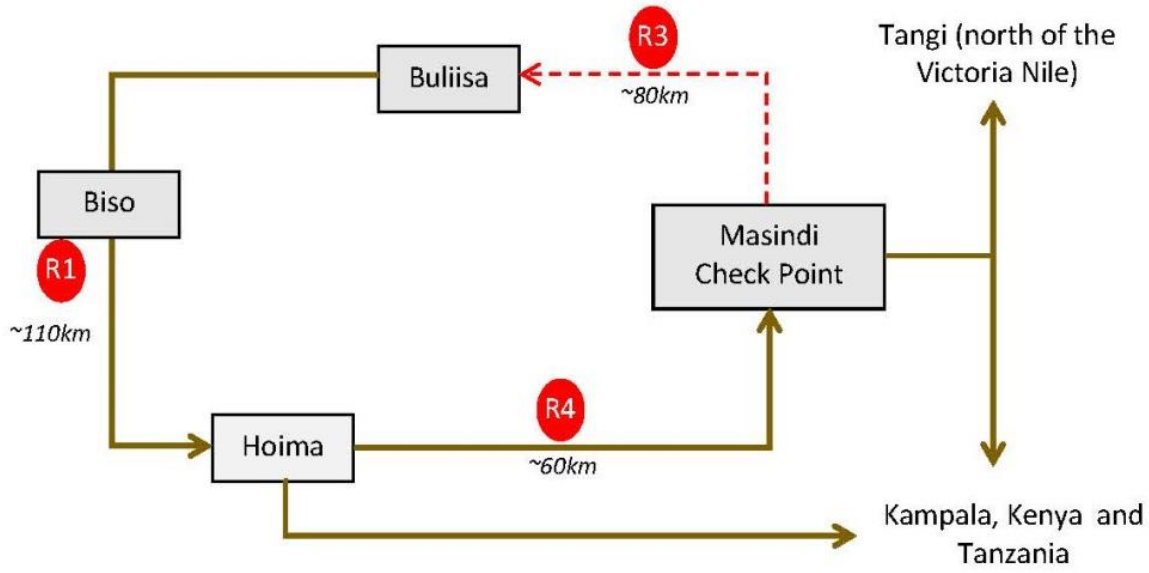


Figure 17: One-Way Traffic Flow In and Out of Buliisa

4.6 Waste Management

A Waste Management Plan will be developed and maintained for the duration of the Project; and will address the anticipated waste streams, likely quantities and any special handling requirements. Any waste transferred off-site will be sent to licensed waste treatment facilities for disposal.

The waste management facilities that will be deployed for each phase of the Project are anticipated to include the following:

- *Site Preparation and Enabling Works*: At least two waste storage areas will be established (Industrial Area and Tangi Camp) to which waste from construction sites will be sent for segregation prior to off-site disposal;

- *Construction and Pre-Commissioning*: All solid waste materials excluding cuttings / fluids from drilling activities will be transported to the centralised Integrated Waste Management Areas (IWMAs)[4] for segregation and pre-treatment prior to off-site disposal. Cuttings and fluids will be transported to a suitable and licenced facility;
- *Commissioning and Operations*: Waste will be stored and processed at the IWMA located south of Victoria Nile; and
- *Decommissioning*: It is envisaged that additional waste storage areas will be established at key locations to manage specific waste streams (e.g. fluids and solids from equipment cleaning, demolition wastes, and general wastes).

4.7 Impact Mitigation Hierarchy

Due to the sensitive environment within which the Project is based, the Project Proponents have considered potential environmental and social impacts as a key factor of the decision making process as the design of the Project has evolved. The design of the Project has been developed with the IFC mitigation hierarchy (as shown in Figure 10) being prominent in the decision making process of the FEED engineers, where the preference is the avoidance of negative environmental and social impacts avoid and then to minimise before restoring and finally offsetting.

4.7.1 Avoidance

The siting options considered for all Project components took into account both environmental and social sensitivities. As a result, the chosen options avoided, where feasible, the more sensitive areas/receptors where a greater impact would have been experienced. With regards to the Industrial area and CPF, it was decided to establish one CPF for the Project, which would be located south of the Victoria Nile to ensure the overall physical footprint within both the MFNP and Ramsar area were minimised as far as practicable. With regards to Construction Camps, a decision was made to use and expand existing camps to avoid further land take and disturbance to the local area.

4.7.2 Minimisation

The design of the Project was subject to further refinement to minimise the footprint of the key components, in particular the well pads. The minimisation process further helped the Project to avoid negative impacts that otherwise may have occurred. Minimisation consisted of both reducing the number of individual components required for the Project as well as reducing the individual footprint for each Project component. These two processes further helped the Project to avoid negative impacts that otherwise may have occurred.

The following philosophy is being applied for the Project, overall reducing the associated footprint:

- The reuse of temporary facilities for life of field permanent facilities whenever it is possible; and
- The optimisation of overall footprint by applying synergies for all shared services as waste handling, water supply, power supply, medical services etc.

4.7.3 Embedded Mitigation

In addition to minimisation of the Project footprint and avoidance of key environmentally and socially sensitive areas, the Enabling Infrastructure and FEED design teams have also incorporated embedded mitigation measures into the design of the Project to further reduce the impacts associated with the Project. The potential impacts identified within the impact assessment sections of each technical chapter in the main ESIA Report (and summarised in Section 6 of the NTS) are based on an assumption that all the embedded mitigation measures will be implemented.

[4] The location of the IWMAs is still under consideration as part of the Waste Management competitive call for tender process and was not defined at the time the ESIA Report was prepared.

4.8 Analysis of Alternatives

In accordance with the requirements of Uganda's EIA Regulations (1998) (Ref.2) and IFC PS 1 (Ref. 3), an examination of the technically and financially feasible alternatives to achieve the Project objective was conducted. These alternatives were considered during the development of Project and have led to the validation of the Project as presented within the ESIA.

An overview of the optimisation of the locations selected for the key components of the Project and a description of the approach to site selection and design development is provided in ***Chapter 4: Project Description and Alternatives*** of the ESIA.

4.8.1 Project Zero Alternative

The zero alternative for the purposes of the assessment is the situation where the Project does not proceed. Under the zero alternative for the Project there are no adverse environmental or social impacts as there is no construction or operation of the Project. However, this would need to be balanced against the fact that there would also be no beneficial impacts associated with the Project not being implemented. The GoU has made the decision to explore the possibility of extracting oil resources from the Albertine Graben since commercially viable oil reserves were discovered in 2006, and has taken significant strides to ensure that the appropriate policies, institutions and legal framework exist to harness the projected benefits of the Albertine Graben's oil resources and concurrently to ensure that the environment is managed sustainably.

The opportunity to enhance the national income of Uganda as a whole is considered in the national interest and the option of not developing the Project was therefore discounted. However, there is a clear commitment that all activities would be undertaken in an environmentally sustainable manner, in line with all applicable Ugandan regulations. In addition, due to the sensitive environmental and social context, the Project Proponents have expressed their commitment to the highest environmental and social standards and have chosen to follow the IFC PSs.

4.8.2 Project Alternatives

A summary of the alternative options considered for some of the key Project components during the development of the Project both during the early stages and within the FEED phase is presented below. Further details on the alternative options assessed are presented in ***Chapter 4: Project Description and Alternatives*** of the main ESIA Report.

4.8.2.1 Well Pads

A decision was made in the initial stages of the Project to limit the footprint within MFNP and that no well pads would be located within the Ramsar site. However, for the Project to remain viable it is necessary to develop fields located both North and South of the Victoria Nile.

The number of well pads has been optimised and reduced including by concentrating more wells onto a well pad. The well pad size was minimised through refinement and optimisation of design, clustering equipment etc. Well design was also modified to a slim design with the benefits of reducing the volume of materials required and waste generated, thereby also reducing transportation requirements.

4.8.2.2 Production and Injection Network

Although the location / routing of the Production and Injection Network has been primarily dictated by the well pad locations, the routing has been refined taking social and ecological sensitivities into account where practicable however, a key driver was technical and safety requirements such as minimisation of geohazard risks on facilities in a very faulted area. In consideration of the above, for example routing between JBR-01 and JBR-10 is not a straight line based on the need to minimise crossing through preferred habitat for giraffe, lions and elephants,

Production flowlines, water injection flowlines and electrical and fibre optic cables have been grouped together to minimise the overall footprint of the Production and Injection Network. An additional pipeline for polymer has been removed from design. Should the polymer pilot be successful, the water injection line will be used for polymer injection. This resulted in optimisation of the pipelines footprint, use of fewer materials and one fewer crossing underneath the Victoria Nile.

Given the ecological sensitivity of the Victoria Nile pipeline crossing area, the Project Proponents committed to minimising the permanent above ground footprint of this component, resulting in the selection of a trenchless solution. Of the trenchless solutions evaluated, HDD was selected based on a number of factors including time and materials requirements and waste volumes generated.

4.8.2.3 Industrial Area

It was decided to establish CPF outside of the MFNP and Ramsar site. Furthermore, it was decided that grouping the CPF and the other facilities located with the Industrial Area would have a positive impact enabling the majority of supplies to be delivered to one location south of the Victoria Nile.

Two site options for the Industrial Area were considered and the location within Kasinyi village was selected due to the lower physical and economic displacement, less inter-dependency on land and lower expected long-term impacts for livelihood and resettlement.

The CPF plant layout optimisation is constrained by the need to maintain minimum safe separation distances, however minimisation of the footprint is done as far as practicable, through optimising the number of required facilities.

4.8.2.4 Water Abstraction System

Initially, three locations for the Water Abstraction System at Lake Albert were assessed. The chosen option was selected in consideration of environmental and social sensitivities.

The footprint of the pipeline transferring water from the Water Abstraction System to the CPF has been designed to utilise the existing Production and Injection Network RoW from the nearest well pad.

4.8.2.5 Victoria Nile Ferry Crossing

Four locations were initially considered for the ferry crossing, all of which required infrastructure to be constructed within MFNP. The chosen option was selected due to the low risk of collision with the existing Paara ferry (highest operational safety) and its avoidance of pristine and sensitive habitats including important habitats for hippopotamus, Nile crocodile, roosting areas and watering holes for elephants.

A Feasibility Study was completed to consider both a bridge and a ferry crossing as potential options to cross the Victoria Nile. The weighting criteria included ecological sensitivity, impact on species of conservation importance, condition of flora, resilience to anticipated Project impacts, impacts on soils, crops and structures, and impacts on the local tourism industry. The ferry option was considered more favourable across a number of the criteria.

5 STAKEHOLDER ENGAGEMENT

5.1 Overview

Stakeholder engagement is a continuous process and with the help of the Project Proponents Community and Tourism Liaison Officers (CTLOs) communities in the Project Area have been regularly consulted since the start of Project related oil and gas activities.

Consultation with stakeholders is a key aspect of the ESIA process and essential to building a longer term ‘social licence to operate’. The Tilenga Project ESIA consultation process was designed to comply with the requirements for public participation as prescribed in Uganda’s EIA, No. 13 (1998) (Ref. 2) and the IFC PS 1 (Ref. 3) and guidelines for stakeholder engagement.

The consultation process aimed to give stakeholders an opportunity to comment on the proposed Project and share their apprehensions, grievances and concerns. Stakeholder feedback was an essential part of the process of identifying real and perceived impacts and suitable mitigation and enhancement measures.

5.1.1 Stakeholder Engagement Plan

A Stakeholder Engagement Plan (SEP) was developed as part of the ESIA process and provides the overarching framework for all engagement relating to the ESIA. It is a live document that was regularly updated throughout the ESIA process. A Project SEP has also been developed by the Project Proponents that will continue to be updated throughout the Project lifecycle.

5.1.2 Stakeholders

The Project Proponents welcome input from all interested parties, and have been actively engaging with a broad spectrum of stakeholders via a number of consultants since the beginning of the Project. Feedback received from stakeholders has been an important part of the planning, design and impact assessment processes. Some of the stakeholder groups engaged to date includes:

- Ugandan local, national and regional governmental authorities;
- Project-affected communities (PACs) and Project-affected People (PAPs) – both those whose boundaries fall within the Project Areas and those outside the Project Area but who are likely to be indirectly affected by the Project;
- Traditional and Religious Authorities;
- Local businesses and tourism operators;
- Developers of Associated Facilities;
- CSOs and NGOs;
- Academic and research organisations; and
- Intergovernmental organisations.

Within PACs, special efforts were made to identify potentially vulnerable groups such as women, children, youth, elderly, persons with disabilities, migrants, minority ethnic groups others as described in Social section (6.4).

A stakeholder database listing all identified stakeholders was developed as part of the ESIA and will continue to be maintained and updated by the Project Proponents throughout the Project lifecycle.

5.2 ESIA Stakeholder Engagement Activities

Based on Ugandan EIA regulations (Ref. 2) and IFC PSs (Ref. 3), stakeholder engagements were an integral part of the ESIA process (see Figure 18).

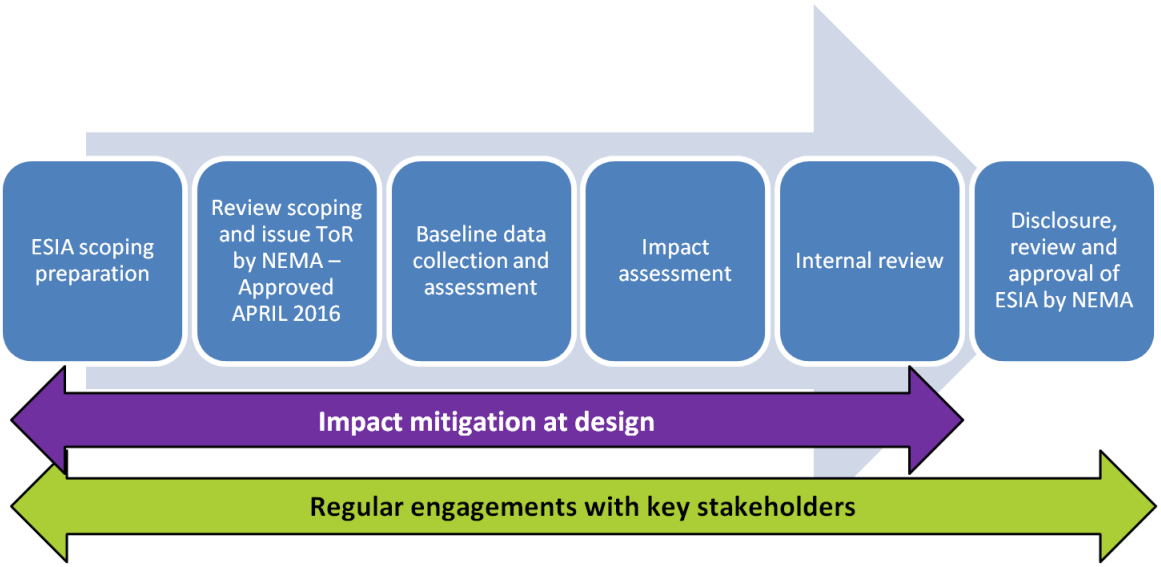


Figure 18: Stakeholder Engagement during the ESIA Process

Stakeholder engagements were undertaken during following phases:

5.2.1.1 Scoping phase

Scoping phase consultations were held with district and sub-county government representatives, and representatives of government agencies and departments, as well as with tourism stakeholders, CSOs and NGOs through small group and one-on-one meetings. Meetings took place in August-September 2015. Consultations with villages were conducted via public community meetings.

5.2.1.2 Baseline data collection phase

Baseline data collection meetings were held national, regional and local government authorities, traditional leadership, NGOs, Community Based Organisations (CBOs), service providers and PACs in November-December 2017 and January-February 2017. The primary purpose of these meetings was to gather baseline data, however, during meetings the opportunity was also taken to update stakeholder on the Project and ESIA process and to note their feedback and concerns about potential impacts (positive and negative) and mitigation options. Methods used for the SBS included semi-structured interviews with majority stakeholders and focus group discussions with a sample of PACs.

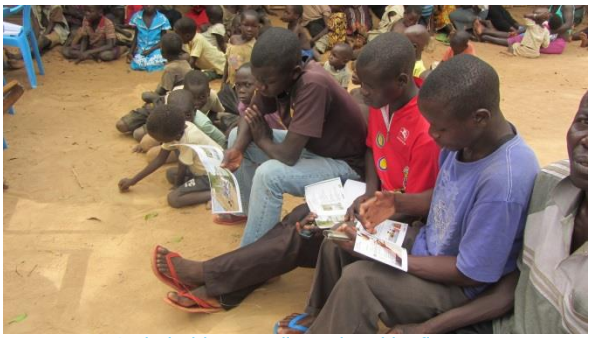
5.2.1.3 Impact assessment phase

Consultations were undertaken at national and community level in January 2018. The stakeholder engagement team presented updates from the Project and explained key findings from the ESIA report, and stakeholders had the opportunity to comment on the preliminary findings from the ESIA process and proposed mitigation measures. Stakeholder engagements were done in the form of workshops and community meetings.

Meeting minutes and attendance were taken at all meetings and a record of questions and comments was recorded and logged in a Project Issue and Response Register, which enabled stakeholder perceptions and concerns about the Project and the ESIA process to be fed back into the ESIA and Project design process.

Community Meeting in Gotlyech

Community Meeting in Kigwera South East



Stakeholders reading printed leaflets

Stakeholders reading printed leaflets

Women's Focus Group Discussion, Kibambura

Youth Focus Group Discussion, Ngwedo Farm

Focus Group Discussion with Elders, Kirama

Meeting in Got Apwoyo Sub County

Meeting in Kitahura village

Meeting in Waiga village

Meeting in Kakoora village

Meeting in Bugana-Kichoke village

5.3 How Information from Stakeholders Helped the ESIA Process

Comments and feedback received from stakeholders to date have informed the ESIA Report in many ways. Input from stakeholders has been incorporated into baseline studies, and helped to guide the identification and assessment of potential impacts, as well as mitigation and management measures, where necessary. The main issues and concerns raised by stakeholders included potential impacts to health, safety and the environment, disruption to livelihoods (e.g. fishing, farming and tourism), resettlement and compensation, use of local labour and businesses, communication and Project-induced in-migration. All of the issues raised have been considered as part of the impact assessment within the ESIA in the development of suitable mitigation measures to reduce negative impacts and enhance beneficial impacts.

5.4 Ongoing Engagement

Stakeholder engagement will continue over the life of the Project, including throughout site preparation activities, construction, operations and decommissioning. Stakeholders will be able to provide feedback and receive responses to questions and comments from the Project Proponents and their contractors and consultants. The Project Proponents have established a formal complaints procedure (also known as a Grievance Mechanism) to ensure that grievances are addressed through a transparent and impartial process. The grievance procedure has been and will continue to be disclosed to the public via individual or group meetings and via printed material.

6 IMPACT ASSESSMENT SUMMARY

The following sections summarise the key impacts that have been identified and assessed in the main ESIA Report for the Project. This includes:

- A summary of the relevant baseline characteristics;
- The identification and assessment of potential impacts;
- A brief summary of the key additional mitigation measures to avoid or address potential Project impacts; and
- Overview of the residual impacts and conclusions.

Grievance Procedure

A Grievance Procedure is in place for the Project. Leaflets explaining the process are available to local communities

6.1 Project Phases

Potential impacts have been assessed in detail for the Site Preparation and Enabling Works; Construction and Pre-Commissioning; and Commissioning and Operations phases of the Project. For each subject matter, potential impacts have been assessed in accordance with the methodology presented in Section 3 unless otherwise specified.

Potential impacts arising from the Decommissioning Phase of the Project have not been assessed in detail and have been considered at a high-level in the main ESIA Report as the planned Project lifetime is more than 25 years. Plans for the decommissioning are not detailed at this stage. In addition, within this time period there may be changes to statutory decommissioning requirements, as well as advances in technology and knowledge so at this stage the full extent of the decommissioning requirements are not known.

The following sections are organised by topic, and focus on the more important or interesting results of the ESIA process. For a full and detailed review of the impact assessment for each topic, please refer to the main ESIA Report.

6.2 Physical Environment

The physical environment assessment covers potential impacts related to the non-living environment, including air quality and climate; noise and vibration; geology and soils, hydrogeology; surface water; landscape and visual, and waste.

6.2.1 Air Quality and Climate

6.2.1.1 Baseline

Based on data from a series of meteorological stations located in the region, the regional climate can be characterised as generally hot and humid. It has average monthly temperatures varying between 27 degrees Celsius (°C) and 31°C and consists of a double rainy season resulting in annual rainfall ranging between 1,000 millimetres (mm) and 1,500 mm.

The review of both primary data and data from secondary sources indicates that baseline air quality in the region is of a good standard and that most measured concentrations are significantly below the applicable national and international air quality standards. The survey did identify, however, that ambient concentrations of particulate matter (<10 micrometres) were elevated above the relevant air quality standards for annual and daily mean averaging periods. This is due to the often arid nature of the Project Area (outside of the wetter months), rather than existing sources of urban or industrial emissions.

6.2.1.2 Potential Impacts

Representative human health and amenity sensitive receptors were selected to identify the likely worst case impacts associated with emissions to air from the Project at locations where there is relevant exposure (see example in Figure 19). These locations comprise residential dwellings, schools, and medical facilities that are located within the potential range of air quality impacts from Project sources. Receptor sensitivity is determined by the standard of air quality that is currently experienced and the use of the land at that location. Representative ecological receptors were also selected for consideration in this assessment MFPA, including MFNP, Bugungu Wildlife Reserve, Budongo Forest Reserve, and Karuma Wildlife Reserve.

The potential air quality impacts which were assessed and modelled (taking into account implementation of the embedded mitigation measures) included the following:

- *Emissions of dust and particulate matters* associated with the storage, handling, and manipulation of potentially dusty materials and movement of construction vehicles on public roads;
- *Combustion emissions* from the operation of Non-Road Mobile Machinery (NRMM);
- *Emissions of Volatile Organic Compounds (VOCs)* during construction and operation of well pads and the CPF;
- *Emissions of odour* from the storage of waste material prior to removal from the Project area;
- *Vehicle emissions* from construction-related vehicle movements; and
- *Energy generation plant* exhaust emissions.

The potential significance of identified impacts prior to the implementation of additional mitigation measures were assessed to range from Low Adverse to Moderate Adverse.

The estimated greenhouse gas emissions (GHG) associated with the Project were also assessed as these are the atmospheric emissions that have the potential to cause climate change, according to the general scientific community. The Project activities which could generate GHG include vehicle / machinery emissions, embodied carbon in construction materials, and the loss of carbon stock sources during site clearance activities, as well as GHG emissions during the operations of the Project. Taking a conservative assumption that the atmosphere and climate is of high sensitivity to change in GHG emissions, as suggested by the general scientific community, the impact significance of GHG emissions was judged to range between Insignificant and Moderate Adverse.

6.2.1.3 Mitigation and Management

The design of the Proposed Development incorporates a number of embedded mitigation measures to minimise impacts on air quality. For example, diesel generator(s) will be located in the Industrial Area for the provision of power and small diesel generator packages will be used for all other work sites to provide power for small items of equipment such as pumps/compressors. There will be no routine flaring during normal operations. And a Vapour Recovery Unit will be located at the CPF to process gases generated. The Project Proponents will also ensure the implementation of a Dust Control Plan.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential impacts to air quality. The key additional mitigation measures which will be employed to reduce risks include use of water for dust suppression, utilising solid screens/barriers around dusty activities where necessary, prohibiting unnecessary idling of plant, conducting regular maintenance of plant to ensure efficiency, providing contractors with the means to detect and control emissions as early as practically possible; enforcing low speed limits for NRMM in working areas and storage of odorous waste in sealed containers prior to off-site disposal.

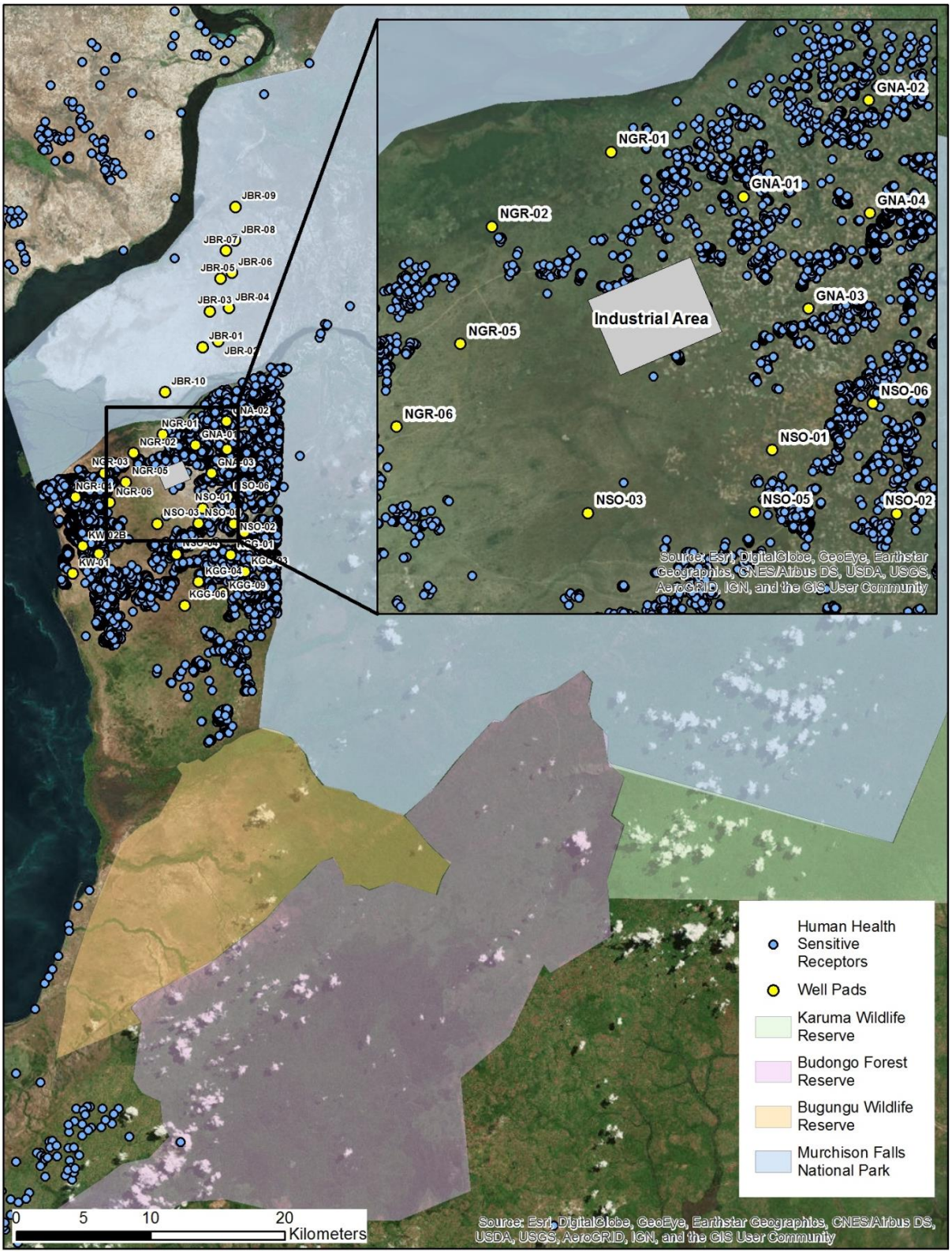


Figure 19: Air Quality Sensitive Receptors around the Industrial Area

6.2.1.4 Residual Impact and Conclusions

During the preparation of the ESIA a number of potentially significant impacts to air quality were identified; however, through implementation of the identified additional mitigation measures the significance of the impacts will be reduced. Residual impacts to air quality have been assessed as **Low Adverse** significance.

The GHG calculations performed did not take into account the planned restoration of the affected land within the Project Area after decommissioning which should help offset some of the negative impacts through reintroduction of vegetation cover that will act as a future carbon stock source. The reinstatement is a commitment by the Project Proponents and will be managed through the implementation of a Construction Environmental Management Plan to ensure that the overall residual impact can be classed as **Low Adverse** significance.

The results of the impact assessment indicate that implementation of the embedded and additional mitigation measures will be adequate to address potential impacts on air quality as a result of the Project.

6.2.2 Noise and Vibration

6.2.2.1 Baseline

Baseline noise conditions were derived using a combination of secondary data obtained from a desktop review of previous studies in the Project Area, and baseline surveys conducted by the ESIA consultants and others within the Project Area between 2014 and 2017.

The results of the primary baseline survey conducted by the ESIA consultants in 2016 at selected Project component locations generally showed daytime baseline noise levels of 35 to 40 decibels dB(A) L_{eq} (A-weighted, equivalent sound level) with increased background noise levels of 40 to 45 dB(A) L_{eq} at measurement positions located close to towns. Noise levels were below maximum permissible noise levels for general environment under the National Environment (Noise and Vibration Standards and Control) Regulations, which can be attributed to the overall absence of significant anthropogenic noise sources (e.g. road, air, rail traffic) across the Project Area. While noise from residents of homesteads and villages was audible at most positions, the dominant noise source at most locations was from insects, birds and wind rustling through vegetation.

Night-time levels were shown to be higher than daytime noise levels (ranging from 33 to 49 dB(A) L_{eq}). Based on site observations, this was due to the increased noise from insects during night periods. Night time noise levels for locations other than Well pad JBR-06 were above the maximum permissible noise levels for general environment under the National Environment (Noise and Vibration Standards and Control) Regulations. Similar results were noted during other surveys, with noise levels in the range of 30 to 45 dB(A) L_{eq} in isolated areas (e.g. within the MFNP or inside the Ramsar Site) and influenced mainly by natural sources, and higher noise levels (50 to 70 dB(A) L_{eq}) in the vicinity of more built-up areas and along main roads, attributed to the operation of diesel generators, human presence and vehicle traffic.

The desktop review of previous studies indicated that there were no existing sources that were considered to generate significant levels of vibration within the Project Area, and no perceivable level of ambient vibration was observed during attendance at site.

6.2.2.2 Potential Impacts

Receptors were identified for each Project component and assessed for their sensitivity. The identified noise and vibration receptors included hospitals, recreational sites, residential areas, tourist lodges, field camps, and offices. When assessing night-time noise and vibration impacts, only residential properties and hospitals are considered occupied and thus sensitive to impacts.

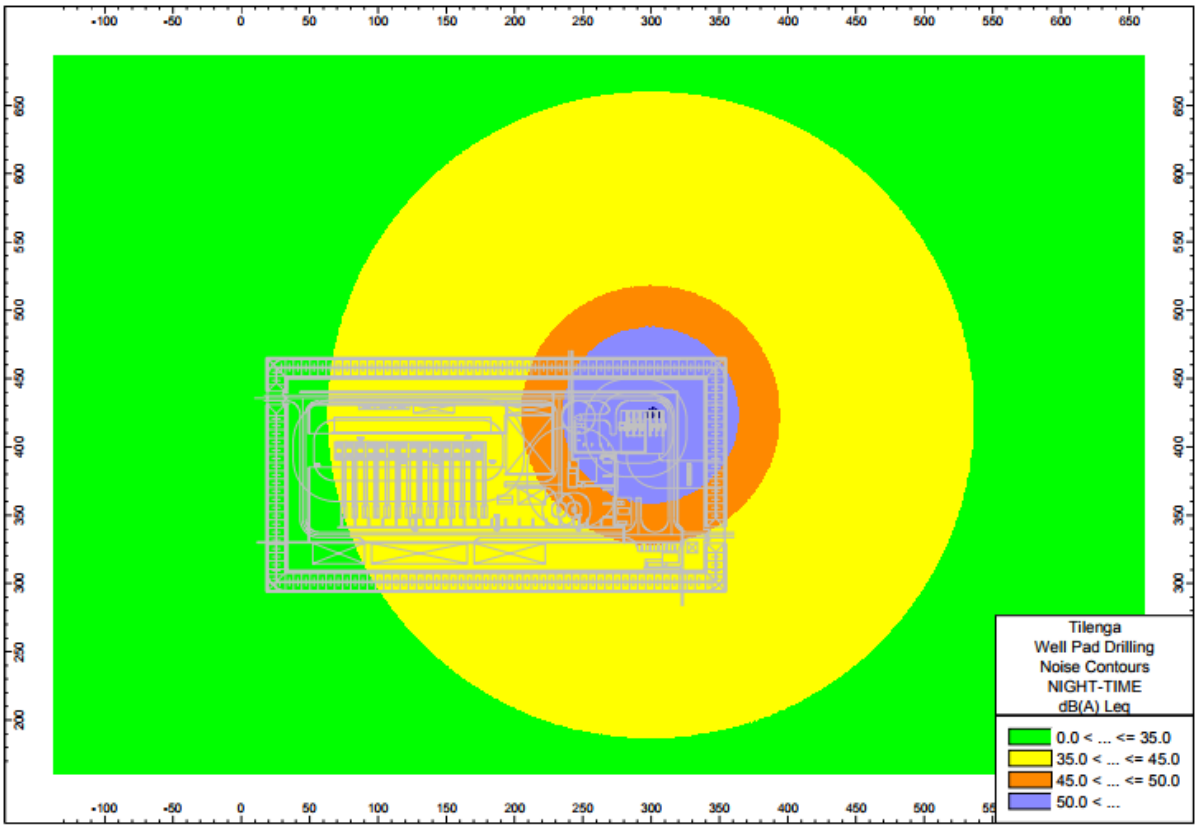


Figure 20: Example Noise Contour (Well Pad Drilling Night-time Noise)

6.2.2.2.1 Noise

To assess potential noise impacts, noise contour plots were generated for Project components during each phase to illustrate predicted noise emission levels experienced at a height of 1.5 m above ground level. An example of the noise contour plots is shown in Figure 20. The modelled noise levels for the Project components were screened against the relevant guidelines listed below, with the level of exceedances of the criteria defining the magnitude of impact:

- *Operational Site Activity Noise Criteria:* Based on a combination of Ugandan regulations, World Health Organisation (WHO) Guidelines and IFC criteria (e.g. daytime guideline levels of 50 to 55 dB $L_{Aeq,16h}$ and night-time guideline levels of 35 to 45 dB $L_{Aeq,9h}$ for residential receptors; and
- *Road Traffic Noise Criteria:* Road traffic is an existing source of noise, and human receptors are less sensitive to changes in noise level of an existing source than they are to the introduction of a new noise source; therefore, the criteria for determining the impact magnitude is more lenient than criteria used for the assessment of site activities that introduce a new noise source. The assessment criteria used are based on IFC Guidelines stating that noise should not increase by 3 dB at the nearest receptor and WHO Guidelines stating that a significant increase in noise is typically equivalent to a greater than 5 dB increase.

6.2.2.2.2 Vibration

The assessment of vibration impacts is undertaken through the consideration of the specific level of vibration from a source associated with the Project at which annoyance or structural damage becomes an issue; therefore, the assessment of vibration impacts is not dependent on the baseline ambient level of vibration so an assessment of baseline ambient levels of vibration was not considered necessary. The impact assessment for vibration utilised estimated Peak Particle Velocity (PPV) vibration levels, based on guidance contained in BS 5228-2 (Ref. 6). High levels of vibration may cause human annoyance and damage to building structures; however, levels of vibration that may cause building damage are far in excess of those that may cause annoyance. If vibration levels are controlled to those specified by significant human annoyance then it is unlikely that buildings will be damaged by Project induced vibration.

The significance of potential noise and vibration impacts prior to the implementation of additional mitigation measures were assessed to range from Insignificant to High Adverse.

6.2.2.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on noise and vibration, especially during the more sensitive night-time periods, including ensuring that working hours will be based on the normal work day in line with Ugandan law, As per base case, there will be no routine nightshift activities associated with the Site Preparation and Enabling Works Phase, except in the case of an emergency event. With the exception of drilling and HDD construction activities there will also be no permanent night time working in the MFNP. For the Commissioning and Operations phase, operational equipment in the CPF will be designed to achieve occupational noise level compliance of 85dBA at 1 metre (which is an industry accepted standard) where practicable.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential impacts from noise and vibration. These include use of noise abatement measures such as silencers and mufflers on equipment, acoustic barriers and enclosures during high-noise generating activities at locations with sensitive receptors nearby; selection of low-noise rated machinery / generators where possible; restrictions on night-time working and driving; road maintenance to minimise noise from surface irregularities; shutting down equipment, machinery and vehicles when not in use to minimise idle time; and monitoring of noise and vibration levels associated with Project activities at nearby sensitive receptors by the Project Contractor (as part of the Environmental Monitoring Programme).

6.2.2.4 Residual Impact and Conclusions

Through the adoption of design controls (embedded mitigation) and the implementation of additional mitigation measures, residual impacts from noise and vibration during all phases of the Project have generally been assessed as **Insignificant** or **Low Adverse** significance with the exception of the following activities which have been assessed to have **Moderate Adverse** significance:

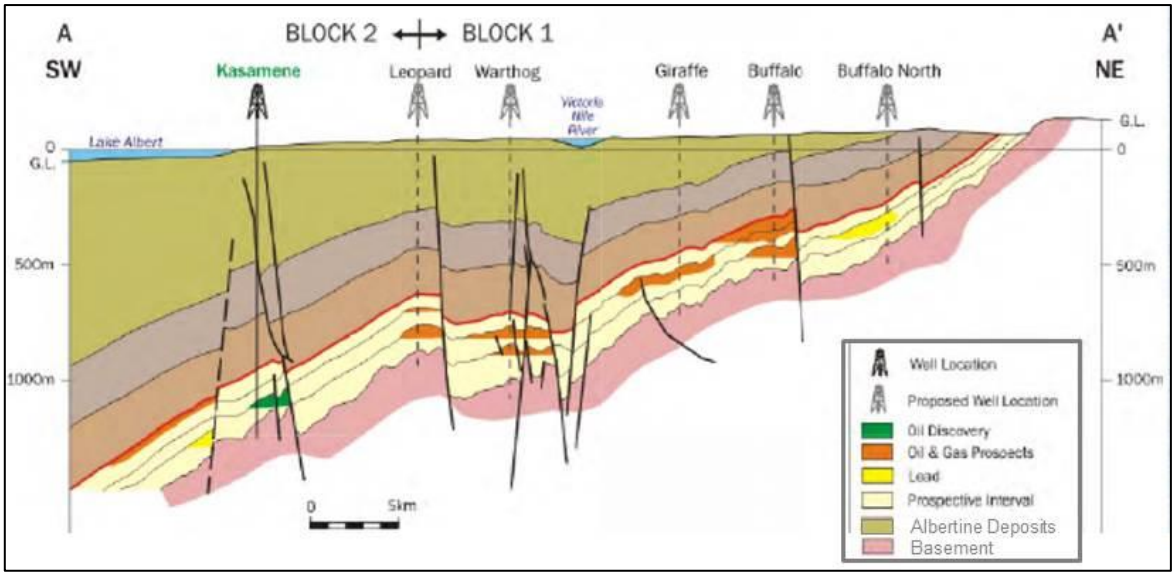
- Construction and Pre-Commissioning Phase – Night-time Well Pad Drilling Noise;
- Commissioning and Operations Phase – Night-time CPF (Option 2) for the scenario of site layout with high noise generating plant located in the northeast of the site, which is the nearest location to receptors; and
- Commissioning and Operations Phase – Night-time Well Pad Noise.

Of the identified residual significant (Moderate Adverse) impacts, it is considered that the potentially significant CPF noise impacts can be designed out through selection of the CPF (Option 1) layout with high noise generation equipment located further from the receptors, and it is proposed that additional noise modelling for well pad sites is undertaken once the final locations of the plant items is known to identify if significant impacts can be suitably reduced/ offset. The results of the impact assessment indicate that implementation of the embedded and additional mitigation measures will be adequate to reduce potential impacts from vibration and the vast majority of impacts from noise.

6.2.3 Geology and Soils

6.2.3.1 Baseline

The Project Area is located at the northern end of the Albertine Graben, a rift basin defined by a series of faults within the East African Rift System. The sedimentary sequence of the Albertine Graben and Albertine Nile formation is up to 4 km thick beneath the Project Area and largely comprises Tertiary river delta and lake deposits. The Albertine Graben sedimentary deposits that exist at depths of more than 2 km form the main hydrocarbon-bearing sequence beneath the Project Area (see Figure 21).



Source: From 1:1,000,000 scale Geological Map of Uganda

Figure 21: Schematic Geological Cross-Section across the Project Area

The most dominant soil type in Uganda is ferralitic soil which forms in humid locales as a result of chemical weathering and decomposition of organic materials. Previous soil surveys confirmed the presence of ferralitic soils with variable permeability and, in some cases, severe signs of erosion in the CA-1/EA-1Aand LA-2 North. Soils in the North Nile area include fine acidic, loam sand-silty soil and soils in the South Nile area of CA-1 and LA-2 North are characterised primarily as sandy clay loams and clay loams. Greyish black, acidic sands generally occupy rivers and valleys of the South Nile area. Soils and sediments within river valleys in LA-2 North comprise peaty sands and clays as well as clay loams overlaying murram and ironstone. Mapped soils within the area are illustrated in Figure 22.

Two oil seeps are reported to lie within the Project Area in the CA-1 block on the Victoria Nile near Paraa (Ref. 7). The presence of these oil seeps indicates that mature, organic-rich source rocks are present in the Albertine Graben, and that some of them have generated and expelled oil (PEPD, 2008) (Ref. 8). However, during surveys conducted for this ESIA the seeps were not observed.

Soil analytical results were all below United Kingdom (UK) and United States Environmental Protection Agency (USEPA) health criteria, which were used in the absence of Ugandan standards. No evidence of major contamination was recorded in any of the areas investigated but low levels of contaminants were identified in some areas, likely due to natural background levels or human activity (e.g. burning of coal / wood, use of vehicles). Naturally-occurring elevated total petroleum hydrocarbon concentrations were recorded in samples collected in the vicinity of the identified oil seeps.

6.2.3.2 Potential Impacts

The potential impacts on soils which were assessed were:

- *Soil Compaction* can result from the movement of heavy machinery or stockpiling (i.e. laydown) of equipment or excavated soils, and soils in the Project Area were identified to be susceptible to compaction; especially during wet conditions;
- *Soil Erosion* may be exacerbated by construction activities, in particular the clearance of topsoil / vegetation when preparing ground surfaces for construction, stockpiling of loose material, and vehicle and equipment movement over unpaved surfaces. During heavy rain events, excessive storm water flows from site drainage can cause erosion of discharge channels and discharge points. Soils in the Project Area were identified to be moderately susceptible to erosion; and
- *Soil Quality* impacts may result from accidental spills or leaks of waste, fuels, chemicals, or oils from Project vehicles, equipment, and storage tanks throughout the life of the Project. The potential impacts of soil contamination are expected to be localised, however if not appropriately and immediately cleaned-up then contaminants could be carried or leached to surface and groundwater

sources respectively. Impacts to soil quality from the release of contaminated materials to ground may also potentially impact the health of construction and maintenance workers or local residents / wildlife utilising land which has been contaminated.

The potential significance of identified impacts prior to the implementation of additional mitigation measures were assessed to range from Insignificant to High Adverse.

6.2.3.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on soils. These focus on spill prevention and include for example: all fuels and hazardous materials will be stored within appropriate bunds and drip trays, providing appropriate containment, where practicable. Dedicated procedures will be developed for fuel and hazardous material transfers and personnel will be trained to respond. Spill kits will be available at all storage locations. The pipelines will comprise carbon steel with adequate corrosion allowance built into material specifications (wall thickness) to prevent leaks, and an anticorrosion coating will be applied for external protection and a corrosion inhibitor will be injected for internal protection. As well as leak prevention and response, the design has sought to protect soil quality. The top soils will be removed to a required depth; material will be temporarily stored areas within designated areas. Material from trenching activities will be stored within the pipeline Right of Way and used as backfill. Excess material will be reused on site where possible. All temporary land required associated with the construction of the roads will be restored following construction in line with the Site Restoration Plan.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential impacts to soils and human health. These include establishing environmental monitoring programmes, developing health, safety and environment policies and procedures, minimising the extent of removal of vegetation and soil cover, appropriate storage of potentially hazardous materials and use of secondary containment, minimising stockpile and storage areas, and ensuring installation of appropriate drainage schemes.

6.2.3.4 Residual Impact and Conclusions

Through the adoption of design controls (embedded mitigation) and the implementation of additional mitigation measures, all residual impacts on soil and human health receptors during all phases of the Project have been assessed as **Insignificant** or **Low Adverse** significance.

The results of the impact assessment indicate that implementation of the embedded and additional mitigation measures will be adequate to address potential impacts to soils and to human health (from soil quality impacts) as a result of the Project.

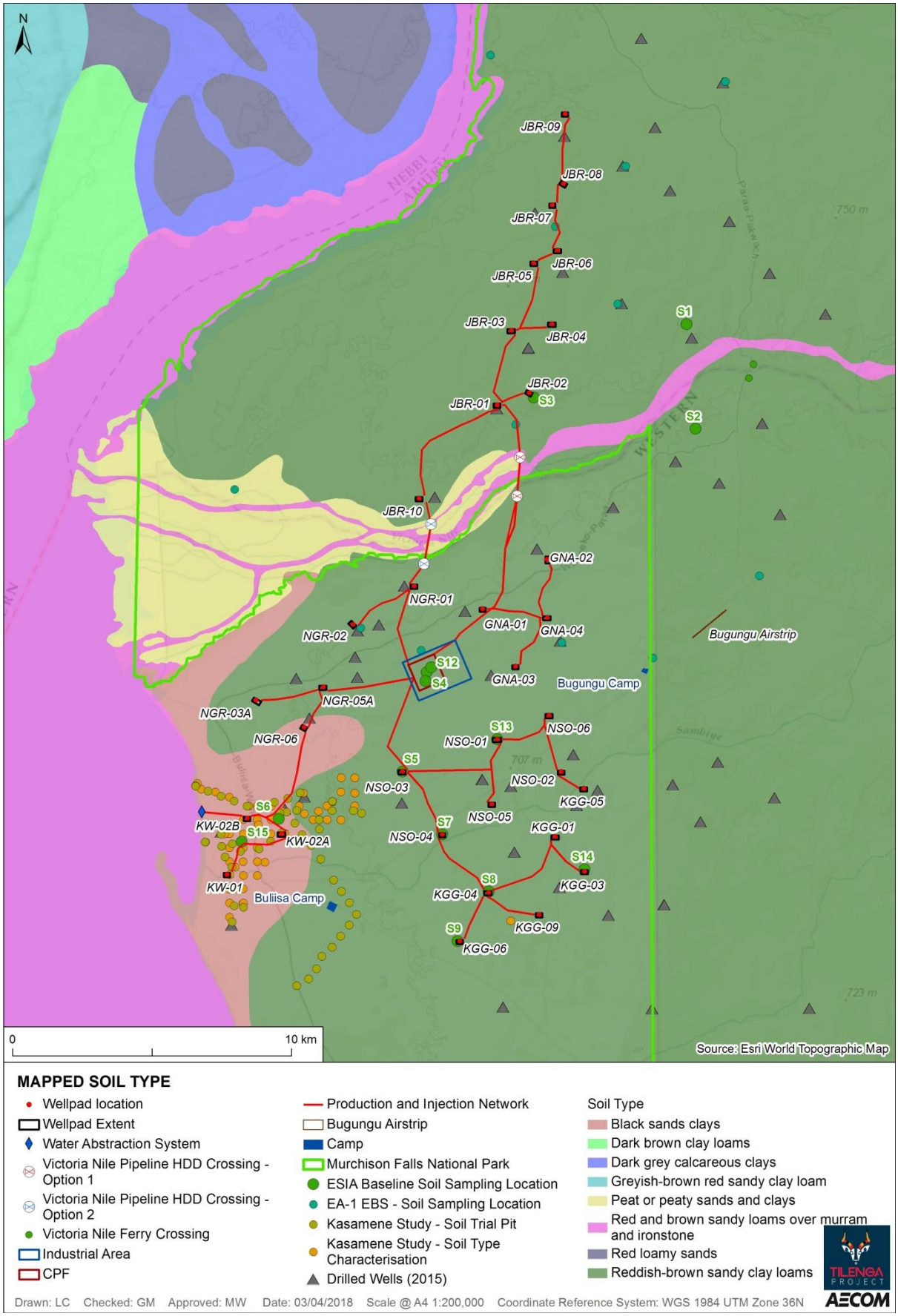


Figure 22: Mapped Soil Type

6.2.4 Hydrogeology

6.2.4.1 Baseline

Within the Project Area, the main aquifer (i.e. water bearing horizon) is within the upper 150 m of the Albertine Nile deposits and the thickness of the productive aquifer is greater than 50 m thick in some areas. The depth to the groundwater table beneath the Project Area ranges from 5 m to 72 m below ground level, with shallower groundwater (with potential to support wetland areas) in lower-lying areas and adjacent to the main rivers and Lake Albert. Recharge to the aquifer is primarily from percolation of rainfall.

Groundwater flow across the Project Area is generally from east to west towards Lake Albert. A schematic conceptual site model across the site area is presented in Figure 23.

Based on the results of groundwater samples taken by Environmental consultants between 2014 and 2018 and data from secondary sources, groundwater in the sand aquifer is of satisfactory quality and generally meets the Ugandan standards for natural potable water with occasional exceedances of the Ugandan standards for ammonia, likely due to human activity, and for iron, manganese, bromide and arsenic, likely due to natural conditions. There is no significant difference in groundwater quality north and south of the Victoria Nile.

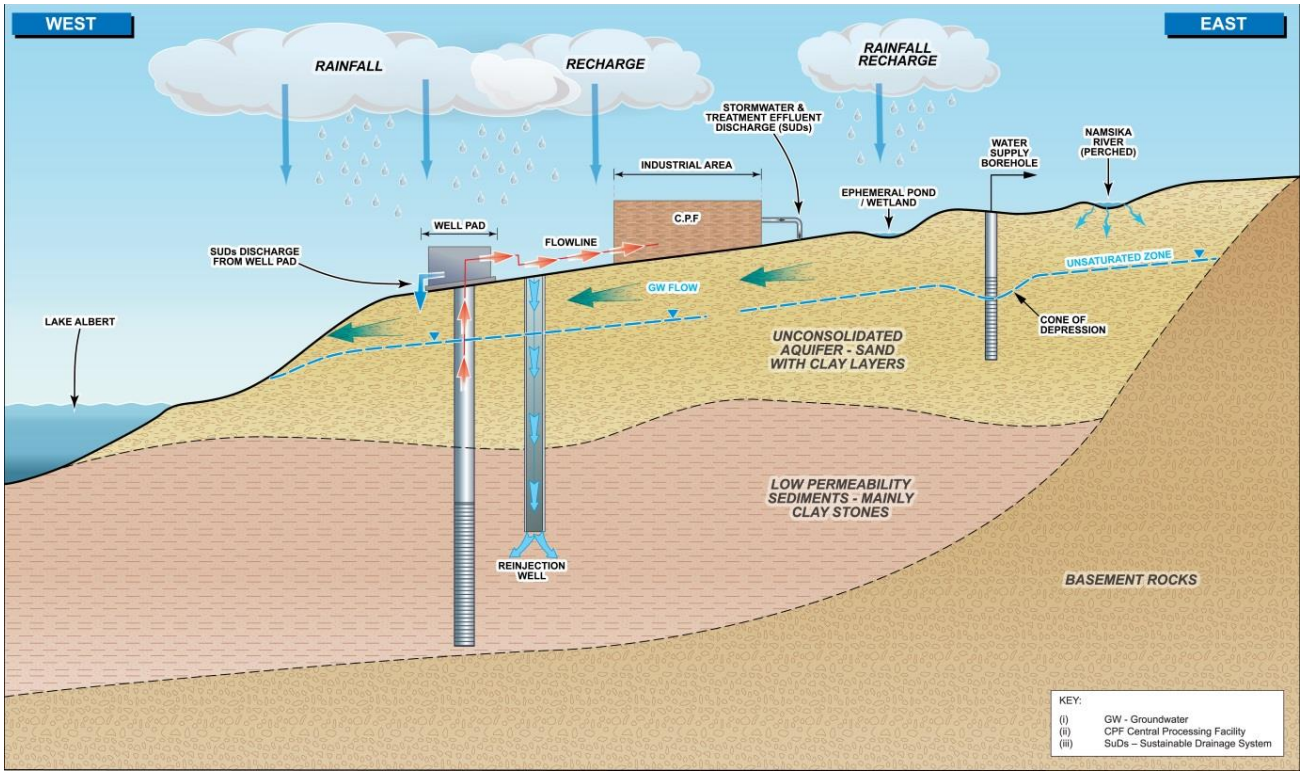


Figure 23: Schematic Conceptual Site Model across the Study Area

6.2.4.2 Potential Impacts

The potential impacts on groundwater which were assessed are detailed below:

- *Regional Groundwater Resources*: The derogation of regional groundwater resources could arise from the proposed water abstraction activities associated with the Project if the expected regional rainfall will not sufficiently recharge the aquifer;
- *Local Groundwater Level and Flow* could be impacted by the proposed water abstraction activities associated with the Project, with peak demand during Year 1 of 960,000 m^3. Pumping from boreholes depresses the groundwater level in the vicinity of the boreholes and this cone of depression could extend outside of the boundary of the individual elements of the Project, potentially affecting existing community water supply boreholes.

For the purpose of the assessment, it is assumed that existing boreholes can withstand a drawdown of 1 m without affecting the ability of the borehole to maintain its operation as natural fluctuations in the groundwater level of 1m to 2m are common; therefore, the assessment only considers impacts on existing boreholes where Environmental consultants have predicted a drawdown of >1 m.

The extent of the drawdown of more than 1m from the Project components is following: for well pads <10 m, for the camps from 200 to 400 m and for the Industrial area/CPF is 600 m. Within these distances from the Project components the drawdown is assumed to be possible. However, in the majority of cases there are no existing water supply boreholes this close to the water supply boreholes at the Project components, there are no existing water supply sources at risk of derogation from the proposed groundwater abstraction.

- *Groundwater Quality* could be impacted in case of improper use, storage and uncontrolled discharges of contaminants, such as fuel oils and chemicals and from operations associated with the Project, principally at the well pads and in the Industrial Area/CPF. Groundwater is considered to be vulnerable to co48ntamination from surface activities via infiltration, particularly in areas where the groundwater table is shallow. Impacts to water quality from the release of contaminated materials to soils that may leach into the groundwater potentially also impact on the health of domestic water users through the use / consumption of untreated, contaminated water.

The potential significance of identified impacts prior to the implementation of additional mitigation measures were assessed to range from Insignificant to Low Adverse.

Selection of Existing Boreholes in the Project Area sampled as part of survey campaign 2016-2017

6.2.4.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise impacts on hydrology. The installation of boreholes across the Project Area is subject to the outcome of the Water Abstraction Feasibility Study currently being undertaken by the Project Proponents. Should additional boreholes be installed during the Site Preparation and Enabling Works Phase they will be drilled to target deep water aquifer zones using water and bentonite. Flow meters will be installed on all boreholes to measure flow, water level and quality.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential impacts to groundwater quality, level and flow, and to human health. These include establishing groundwater quantity and quality monitoring programmes, appropriate storage of potentially hazardous materials and use of secondary containment, obtaining abstraction permits and ensuring compliance with permitted abstraction limits, implementing efficient water use, and pump testing new abstraction boreholes to refine drawdown predictions.

6.2.4.4 Residual Impact and Conclusions

Based on worst-case water balance calculations, it is considered that the residual impacts to regional groundwater resources from proposed rates of groundwater abstraction for the Project will be **Insignificant**.

Through the adoption of design controls and the implementation of additional mitigation measures, the residual impacts during all phases of the Project on groundwater quality, level and flow, and on human health receptors have been assessed as **Insignificant** to **Low Adverse** significance.

The results of the impact assessment indicate that implementation of the embedded and additional mitigation measures will be adequate to address potential impacts to groundwater and to human health (from groundwater quality impacts) as a result of the Project.

6.2.5 Surface Water

6.2.5.1 Baseline

Surface water is an important socio-economic resource and forms part of the fresh water supply sources in Uganda. As at 2015, about 8% of the total population of Uganda rely on surface water resources to meet their water supply demand (Ref. 9). A number of surface waterbodies including Lake Albert, the Victoria Nile River, the Albert Nile River, wetlands, and named and unnamed rivers and streams are present within the Project Area. Primarily, these waterbodies are used for irrigation and agriculture; including fisheries, livestock farming and a small proportion for domestic purposes. The main surface waterbodies, in particular, the Victoria Nile River, Lake Albert and Albert Nile River are considered to be highly sensitive because of their value to the water environment and water resources supply potential for the Project Area and surroundings.

Lake Albert is a typical Rift Valley lake lying between two parallel escarpments. The lake is about 150 km long, with an average width of about 35 km, and a maximum depth of 56 m within 7 km of the mid-western shore.

Most of the Project Area falls within the hydrological/water catchment of Lake Albert and Victoria Nile River with a small proportion of the Northern Boundary of the Project Area that lies within the Albert Nile River Catchment. The inflows and outflows of Lake Albert are presented in Figure 24.

Based on the results of surface water samples taken by Environmental consultants between 2014 and 2017 and data from secondary sources, the quality of the surface waterbodies within the Project Area is generally good with the exception of some trace metals and a few other constituents which slightly exceeded the Ugandan potable water standards. Iron, manganese and aluminium were the predominant trace metals detected in most of the surface waterbodies in the Project Area. These are linked to the geology of the area.

Baseline water quality monitoring of the area (NEMA, 2017) (Ref. 10) also used ecological species such as Stoneflies and Mayflies found in some waterbodies in the Project Area to demonstrate the sound quality of the surface waterbodies, as these organisms can only survive in the most pristine water conditions.

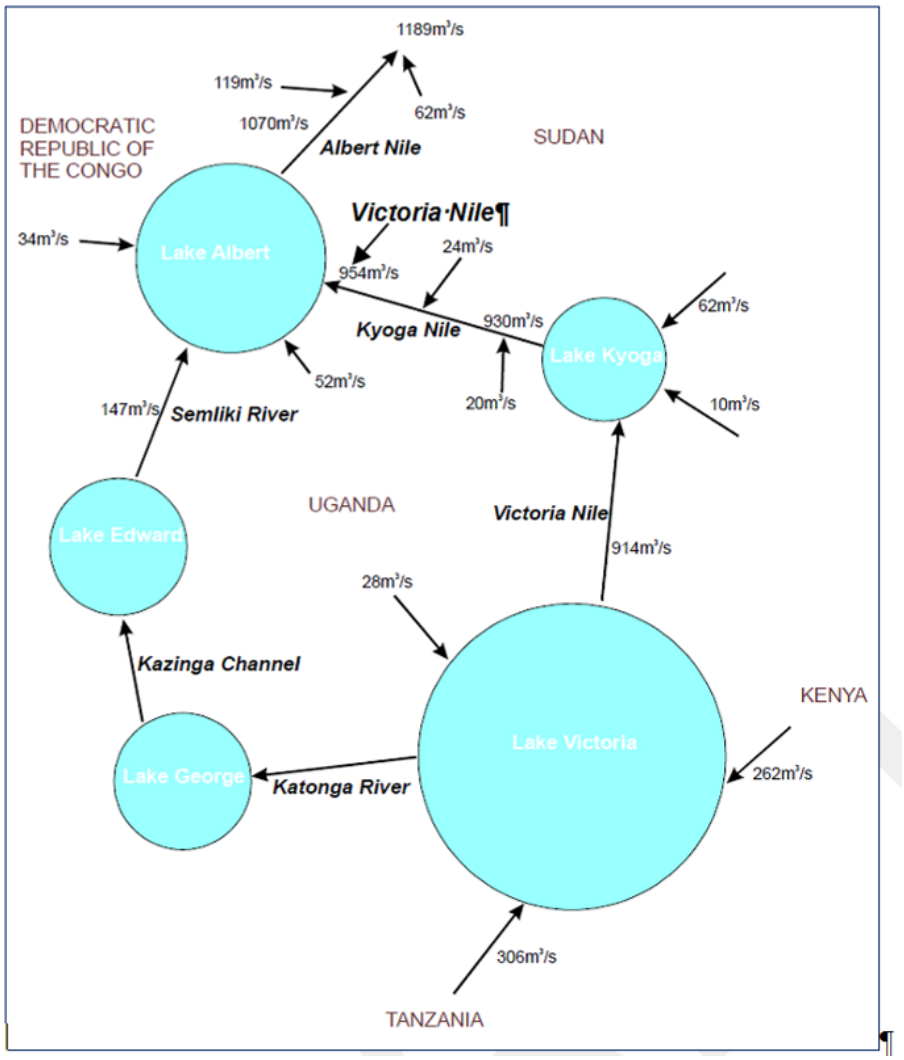


Figure 24: Inflows and Outflows of Lake Albert

6.2.5.2 Potential Impacts

Following completion of the Water Abstraction System on Lake Albert during the Construction and Pre-Commissioning Phase of the Project, it is planned that surface water from Lake Albert will be the main source of water supply during the remainder of the Project lifetime.

Land use activities that directly or indirectly have an impact on water flow or have the potential to affect the quality of the surface waterbodies in the Project Area could lead to potential environmental impacts. Development in vulnerable surface water areas could alter the surface water dynamics and may lead to increased flood risk.

Taking into account the mitigation measures in-built into the Project design, the potential impacts on surface water which were assessed are detailed below:

- *Water Quantity:* The potential impacts have been assessed from a water resources sustainability (i.e. demand and supply) perspective and take into account the volumes of surface water required by the Project and how the proposed Project would use water efficiently.

  The peak water abstraction volume for the Project is estimated to be 13 million m^3/year from Lake Albert. The water abstraction needs equate to 0.02-0.06% of the outflow from Lake Albert on average. The impact significance of the surface water abstraction volumes for all phases of the Project is therefore assessed to be Insignificant.

- *Water Quality:* could be impacted due to direct or indirect accidental discharges of contaminants, such as fuel oils, chemicals or poorly treated wastewater or from contaminated/untreated surface

runoff entering surface waterbodies close to Project worksite. Potential impacts to surface water quality may result in the exceedance of Ugandan standards which could pose a risk to public health (humans and livestock) through the use of untreated, contaminated water.

- *Flood Risk and Morphology:* Works that involve removal of floodplain or wetlands could limit the storage capacity of the affected waterbodies or obstruct floodplain flows. Works conducted close to waterbodies have the potential to alter flood overland flow routes locally and in turn, may change flood characteristics of work sites and affected waterbodies. There is potential that the Project components may cause changes to seasonal flood flows and cause changes to the flood risk potential. Any increase in flood risk as a result of the Project has the potential to alter downstream hydraulic characteristics. Works in the vicinity of waterbodies also have the potential to alter the baseline morphology (e.g. channel width / depth) of a surface water feature, potentially resulting in changes to flow regimes which may lead to deterioration or even total loss of a feature.

The potential significance of identified impacts prior to the implementation of additional mitigation measures were assessed to range from Insignificant to Moderate Adverse with the exception of flood risk/morphology impacts to the Victoria Nile due to construction and operation of the Victoria Nile Ferry Crossing which was assessed to have a High Adverse impact significance if no mitigation measures are implemented.

6.2.5.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise impacts on surface water. Surface water will be managed via temporary sustainable drainage systems (SuDS) to manage flood and contamination risk, and buffer zones will be established to protect watercourses and habitats. The Project Proponents are aware of the need to employ water efficiency measures throughout the lifetime of the Project; they will consider water reduction measures, where feasible. For example, pre-commissioning water (used for pipeline cleaning and hydrostatic tests) will be reused wherever practicable on multiple pipelines.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential impacts to surface water quantity and quality and to flood risk. These include development of Water Management and Monitoring Plans, retaining status quo for natural hydrological systems where possible, undertaking waterbody crossing works during dry weather where possible, appropriate storage of potentially hazardous materials and use of secondary containment, use of sediment control measures, implementing efficient water use practices and designing drainage systems for surface run-off to avoid poor quality water directly entering watercourses.

6.2.5.4 Residual Impact and Conclusions

Residual impacts to surface water quantity are considered to be **Insignificant**.

Through the adoption of design controls (embedded mitigation) and the implementation of additional mitigation measures, the residual impacts during all phases of the Project on surface water quality and associated impacts to public health (humans and livestock) have been assessed as **Insignificant** to **Low Adverse** significance.

The residual impacts to flood risk during all phases of work are considered to be **Insignificant** to **Low Adverse** significance with the exception of short term flood risk impacts associated with the Victoria Nile Ferry Crossing during the Site Preparation and Enabling Works and Commissioning and Operations phases which are considered to be **Moderate Adverse** significance due to the proximity of the infrastructure to the Victoria Nile and the potential that the landing structure could pose a potential obstruction to flood flows which in turn could cause localised flooding.

The results of the impact assessment indicate that, for the most part, implementation of the embedded and additional mitigation measures will be adequate to address potential impacts to surface water as a result of the Project.

6.2.6 Landscape and Visual

6.2.6.1 Baseline

The study on the baseline conditions of the landscape and visual resource of the Project Area took place in November / December 2016 and February 2018. Baseline conditions were established for landscape characteristics and visual amenity.

The ESIA consultants have carried out a local landscape character assessment of the Project Area, including the applicable areas of the MFNP. The identified LCAs are shown on Figure 25 and summarised in Table 2.

The Project Area to the north of the Nile generally offers widespread visibility and is highly valued and recognised as a scenic tourist area through which popular safari routes pass. The rolling lowland topography to the south of the Nile results in a range of scenic qualities form very short vistas to occasional medium and distant views from isolated highpoints.

The potential visual receptors identified include:

- People visiting the MFNP for recreational purposes, using the local road network, game tracks and waterways;
- People who work within the MFNP and nearby settlements;
- People passing through the area, particularly on the major transport routes; and
- People living in the major and minor settlements within close proximity to Project components where little screening is provided by vegetation or topography.

Eighteen representative viewpoints were selected to cover a range of views and viewer types, and were intended to represent the typical views that people who live, visit and pass through the Project Area are likely to experience. For each viewpoint the receptor type (e.g. residents, tourist lodges, road use), relative numbers of people represented by the viewpoint and nature of the existing view were considered.

TERMS TO KNOW

Landscape Character Areas: Areas which are unique, discrete geographical areas of the landscape which demonstrate a series of recognisable features and characteristics.

Visual Amenity: The overall pleasantness of the views people enjoy of their surroundings.

Representative Viewpoints: Views selected to represent the experience of different types of visual receptor, where larger numbers of viewpoints cannot be included individually and where significant effects are unlikely to differ.

Visual Envelope: the area of land from which the Project is theoretically visible, on the assumption that there are no intervening landforms, vegetation or other elements.

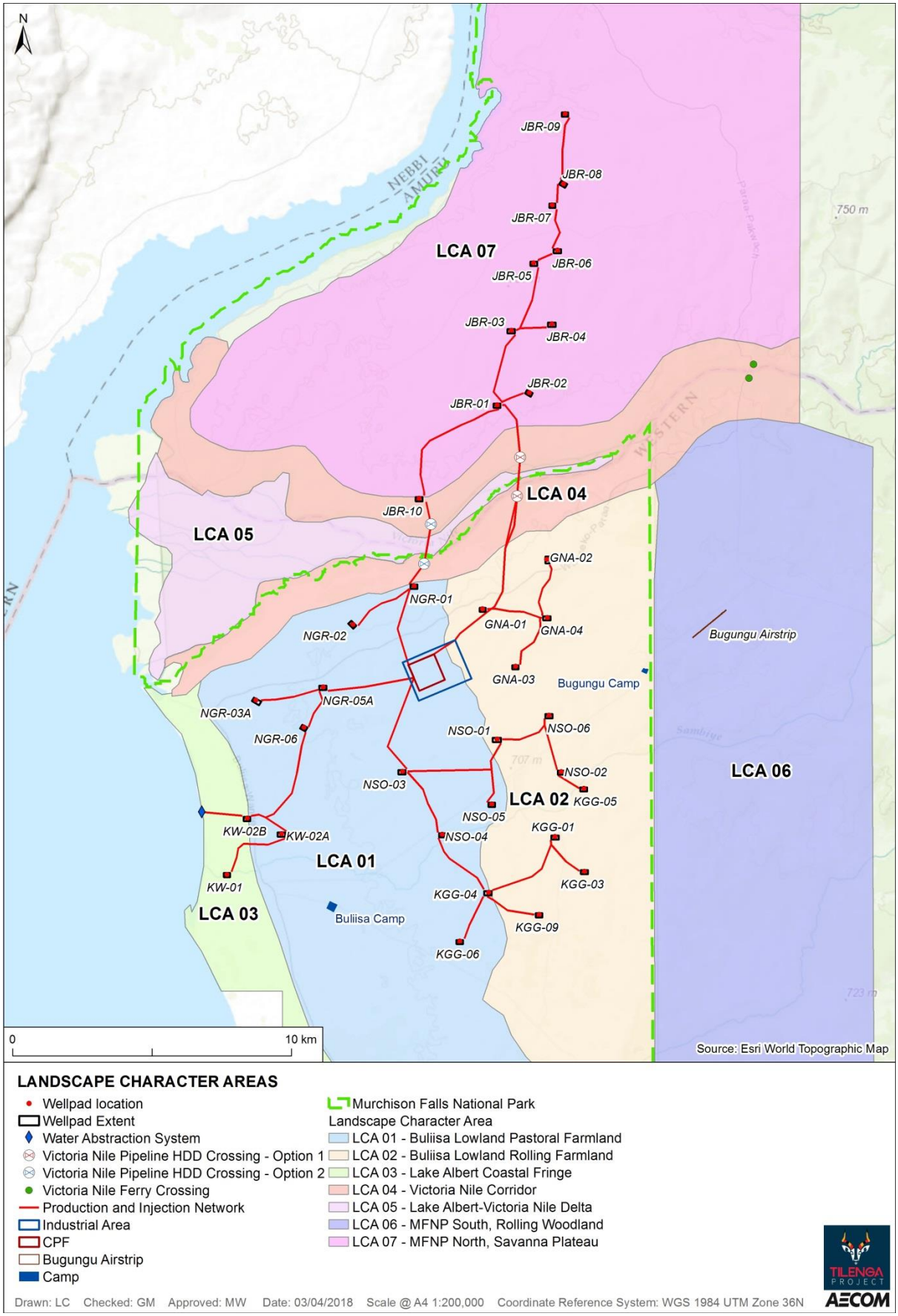


Figure 25: Landscape Character Areas

Table 2: Summary of Landscape Character Areas (LCAs)

Number	Landscape Type	Dominant Land Use and Vegetation
LCA 01	*Buliisa Lowland Pastoral Farmland*	Predominantly grassland for rough cattle grazing.
LCA 02	*Buliisa Lowland Rolling Farmland*	Dominated by a dense network of small scale crop cultivation.
LCA 03	*Lake Albert Coastal Fringe*	Mixed vegetation ranging from open grassland in the east to wetlands in the west. Much of the area comprises fishing communities.
LCA 04	*Victoria Nile Corridor*	The river banks comprise wetlands and riverine forests and fall within Ramsar site. Land use comprises of a mix of subsistence and community farming. Majority of LCA is within MFNP.
LCA 05	*Lake Albert-Victoria Nile Delta*	Uninhabited dynamic wetlands with a network of island traversed by numerous tributaries. Entire LCA is within the Ramsar site.
LCA 06	*MFNP South, Rolling Woodland*	LCA is within the Tourism and Wilderness Zones of the MFNP and is designated parkland. Predominantly comprises dense woodland opening up to rough grassland further south.
LCA 07	*MFNP North, Savanna Plateau*	LCA is within the MFNP and designated parkland. Predominantly comprises open savanna grassland.

6.2.6.2 Potential Impacts

Impact assessments were based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor, taking into account the mitigation measures in-built into the Project design. Two specific categories were reviewed:

- *Landscape Impacts*: The Project could directly affect the land cover, features and character within the Project Area as well as the aesthetic and perceptual aspects of the landscape and its distinctive character. The potential effects were determined through an assessment of the existing character of the landscape, and how this is likely to be altered by the development; and
- *Visual Impacts*: The visual assessment determined the degree of anticipated change to visual amenity that would occur as a result of the development, considering buildings, areas of public open space, roads and footpaths. An assessment of the sensitivity of the identified viewpoints was conducted and indicated that the viewpoints to the north of the Nile (in MFNP) were considered to be of high sensitivity.

To assist in the impact assessment, computer generated Zone of Theoretical Visibility (ZTV) maps were prepared for well pads north of the Nile to give an indication of the areas from where it may be possible to view part or the entire well pad infrastructure.

The potential significance of identified impacts prior to the implementation of additional mitigation measures were assessed to range from Insignificant to High Adverse with respect to both landscape character areas and viewpoints.

Viewpoint at Kimoli Residential Area

Viewpoint at Kirama Residential Area

Viewpoint at Murchison River Lodge (Tourist Lodge)

Viewpoint at Albert Track Tourist Route

6.2.6.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on landscape and visual amenity, including the location of Project assets. Lighting will be reduced to the minimum without impacting safety and security. Where feasible, the light will be directed inwards the facilities and will be of a warm / neutral colour so as to limit nuisance to the surrounding communities and to avoid attracting animals. With the exception of drilling and HDD construction activities there will also be no permanent night time working in the MFNP. There will be no permanent access restrictions to the pipeline Right of Way once the Project is constructed and operational.

Additional mitigation measures were identified to reduce some landscape and visual effects; minimisation of Project facility lighting; restoration of construction-disturbed land; selecting appropriate material / colour-finishes to infrastructure to reduce glare and visibility; softening of Industrial Area boundary edges with native planting; and planting naturalistic vegetation to provide screening of infrastructure.

6.2.6.4 Residual Impact and Conclusions

Following the adoption of design controls and the implementation of additional mitigation measures, the residual impacts on landscape and visual receptors ranged from **Insignificant** to **High Adverse** significance, with significant residual impacts predicted for all Project phases with the exception of Decommissioning.

Although implementation of the additional mitigation measures would result in a slight reduction in effects for a number of Landscape Character Areas and Viewpoints, due to the scale and spread of activity including removal of vegetation, loss of landscape pattern and introduction of uncharacteristic infrastructure within MFNP, significant impacts (Moderate to High Adverse) are predicted to remain to five Landscape Character Areas and 14 Viewpoints during at least one Project phase. Negative impacts were identified to the perceptive qualities and pockets of tranquillity experienced throughout the landscape.

6.2.7 Waste

The waste assessment considered the types and quantities of waste products that will be generated by the Project, and how these wastes would be managed and disposed of.

6.2.7.1 Baseline

The baseline information on waste generation and management practices within the Project Area is based on several waste specific reports prepared on behalf of the Project Proponents and reviews of other documentation, interviews.

The per capita per day generation at household level within the Project Area is predicted at approximately (115 – 102) grams which is less than the national average waste generation rate of 0.55 kilograms/capita/day. Most areas were found to be clean, with limited occurrences of littering. The major waste stream in the area is domestic waste. Waste is managed at household level through rubbish heaps, collection pits and pit latrines, with burning of waste conducted to reduce volumes. Waste disposal facilities were not observed at community level and in public places such as markets, town centres, churches and community schools; open burning was the most common waste management activity practised by communities. However, reuse of waste like plastic mineral water bottles for stocking and selling Kerosene and automobile fuel was also observed.

As part of the baseline data collection, information on available waste facilities (including hazardous waste management facilities) was compiled and included a provisional assessment of whether or not the facilities are likely to comply with GIIP.

6.2.7.2 Potential Impacts

The waste study assessment framework differs from the methodology presented in Section 3 as it focuses on identifying appropriate measures for managing waste, given the type and quantities of wastes likely to be produced by the Project, and then identifying and assessing any potential impacts

depending whether or not suitable management routes are available. Embedded mitigation measures relating to how waste is handled, stored and transported were also identified as part of the process and will be described in the Project Waste Management Plan.

Table 3 outlines the impact assessment criteria used for the various categories of waste, according to the proposed method of managing that waste type, and indicates that the highest potential impacts would be associated with managing hazardous wastes where suitable facilities are not available / have not been identified. Suitable facilities are those which are licensed by the relevant regulatory authorities and are operating in accordance with GIIP.

Table 3: Waste Management Impact Significance Criteria

Management Route for Project Waste	Type of Waste		
	Inert	**Non-hazardous**	**Hazardous**
Suitable facilities available with sufficient capacity to manage the quantities of wastes generated	**Insignificant**	**Insignificant**	**Low**
Suitable facilities available but capacity to accept waste from project may be constrained due to size of facility or distance from site	**Low**	**Moderate**	**Moderate**
Facilities are unavailable or unsuitable; or means of management is uncertain.	**Moderate**	**Moderate**	**High**

As waste vendors and actual facilities to be used have not yet been identified and waste facilities have not been audited for GIIP compliance, hazardous waste streams are assessed to have a High Adverse impact significance pre-additional mitigation. The impact significance for non-hazardous waste streams was assessed to be Insignificant to Moderate Adverse.

6.2.7.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise waste. A Waste Management Plan will be developed and maintained to cover the duration of the Project; and will address the anticipated waste streams, likely quantities and any special handling requirements. The Project Proponent's will also implement a waste tracking system to ensure traceability of all wastes removed off site.

The waste management elements of the ESMP and Waste Management Plan will reflect the waste hierarchy, placing priority on waste minimisation, followed by recycling or reuse if economically practicable, then by environmentally sound methods of waste treatment and/ or disposal. All wastes will be stored in suitable containers which are appropriate for the materials in question and which are clearly labelled.

Prior to using waste management facilities for the disposal of Project waste, the Proponent will audit these facilities to determine whether they comply with GIIP. If proposed facilities for managing waste are found to be non-compliant with GIIP, the Proponent will either agree an improvement plan with the facility to bring it into line with GIIP or identify alternative facilities / management routes which are compliant with GIIP.

6.2.7.4 Residual Impact and Conclusions

With implementation of the embedded and additional mitigation measures including the Project Proponent's commitment to managing Project waste using GIIP-compliant facilities, residual impacts are expected to be reduced such that they are not expected to be significant, with only remaining residual impacts of **Low Adverse** or **Insignificant** significance for the variety of waste streams experienced.

6.3 Biological / Ecological Environment

6.3.1 Impact Assessment Methodology for Biological / Ecological Environment

6.3.1.1 Overview

The assessment which addresses the ecological environment (biodiversity) identifies the relevant sensitive receptors within the Project's Area of Influence (AoI) and considers the potential for these receptors to be impacted by Project activities.

The approach to the assessment follows the recommendations of the IFC PS 6: *Biodiversity Conservation and Sustainable Management of Living Natural Resources* (Ref. 3) and other applicable standards. The assessment describes the existing baseline conditions within the AoI, including presence (or likely presence) of "priority species" of animals and plants as well as protected areas and threatened habitats.

Priority species are defined in this assessment as those species identified as Critical Habitat Qualifying Species (CHQS) as well as certain other species that, although not CHQS, are regarded by stakeholders as being of conservation concern. The baseline is based on review of previous studies and the results of fieldwork undertaken directly for this ESIA by Environmental consultants.

The significance of impacts was determined based on a combination of the sensitivity of the receptor and the predicted character of the potential effect. Based on this approach a potential impact of Moderate, High or Critical as indicated on the assessment matrix is regarded as a **significant** impact. As there are a number of species of very high sensitivity present within the Project AoI this is reflected in the Impact Assessment Matrix (see Table).

This deviates slightly from the standard approach presented in Section 3**,** as due to the nature of the environment where the Project is located, it was necessary to extend the standard impact significance matrix to allow for an extra category in determining the receptor sensitivity.

TERMS TO KNOW - Ecology

Critical Habitat: Areas with high biodiversity value, including habitat of significant importance to Critically Endangered and/or Endangered species or endemic and/or restricted-range species; habitat supporting globally significant concentrations of migratory and/or congregatory species; and highly threatened and/or unique ecosystems.

Critical Habitat Qualifying Species (CHQS): Species present within the Project's Area of Influence and represent qualifying features that meet one or more of Criteria 1 to 3 of the IFC PS6. CHQS are defined on the basis of their international and/or national status. The presence of CHQS therefore defines the landscapes and habitats where they are found as Critical Habitat.

Priority Species: Priority species include CHQS as well as other species which may be considered by stakeholders to be important receptors and/or little known species that are not included in lists such as the Uganda Red Data List but were recorded within the Project Area; and/or are specifically protected by Ugandan legislation.

Critical Habitat Assessment considers the conservation principles of threat (vulnerability) and geographic rarity (irreplaceability) for particular qualifying features. CHA is carried out at the landscape scale.

Landscape Contexts: Six Landscape Contexts were identified in the Critical Habitat Assessment that illustrates a landscape-scale view of potential Project interactions with all of the Critical Habitat Qualifying Species.

Table 4: Ecology Impact Assessment Matrix

	Impact Magnitude			
Receptor Sensitivity	***Negligible***	***Low Adverse***	***Medium Adverse***	***High Adverse***
Negligible	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	LOW
Low	INSIGNIFICANT	INSIGNIFICANT	LOW	MODERATE
Medium	INSIGNIFICANT	LOW	MODERATE	MODERATE
High	LOW	MODERATE	MODERATE	HIGH
Very High	LOW	MODERATE	HIGH	CRITICAL

6.3.1.2 Critical Habitat Assessment

As part of the impact assessment process a Critical Habitat Assessment (CHA) was undertaken. CHA is an IFC PS6 process to identify significant biodiversity risks associated with a project. PS6 outlines the requirements for development in areas of Critical Habitat. CHA considers the conservation principles of threat (vulnerability) and geographic rarity (irreplaceability) and the assessment is undertaken on a landscape level.

Based on the conclusions of the CHA six 'Landscape Contexts' were defined in order to provide a clear focus for management of the relevant criteria and the impacts on them (Ref. 12 and Ref. 13). The Landscape Contexts include protected and other areas of conservation and are shown on Figure 26. Table 5 below summarises how each of the defined Landscape Contexts are anticipated to interact with the Project.

Table 5: CHA Landscape Contexts and Project Interactions

Context	Name	Description	Interaction with Project Footprint
A	**MFPA**	Grassland and woodland within the MFPA and to its north.	Victoria Nile Ferry Crossing, HDD Pipeline Crossing, well pads, pipelines and roads in CA-1 north of the Nile, borrow pits, and to a smaller extent well pads, pipelines and roads elsewhere in CA-1 and LA-2 North. Direct and indirect impacts are possible.
B	**Savanna corridor**	Grassland and open wooded or scrub habitats along a weakly-protected savanna corridor	Well pads, pipelines, roads, CPF and Industrial Area. Direct and indirect impacts are possible.
C	**Lake Albert, rivers and wetlands**	Lake Albert and fringing wetlands including the Murchison Falls-Albert Delta Wetland System Ramsar Site.	Victoria Nile Ferry Crossing, HDD Pipeline Crossing Water Abstraction System, and pipeline and road crossings of smaller waterbodies such as the River Tangi. Direct and indirect impacts are possible.
D	**Tropical high forest**	Forest and forest fragments and corridors, including the large Central Forest Reserves of Budongo and Bugoma.	No Project footprint anticipated and no direct impacts are expected, although indirect impacts may occur.
E	**Nebbi**	Unprotected savanna habitats in Nebbi District (West Nile sub-region),	No Project footprint anticipated and indirect impacts are unlikely.
F	**Mixed landscape**	'Catch all' context that covers mixed habitats landscape-wide, including agriculture.	All Project infrastructure. Direct and indirect impacts are possible.

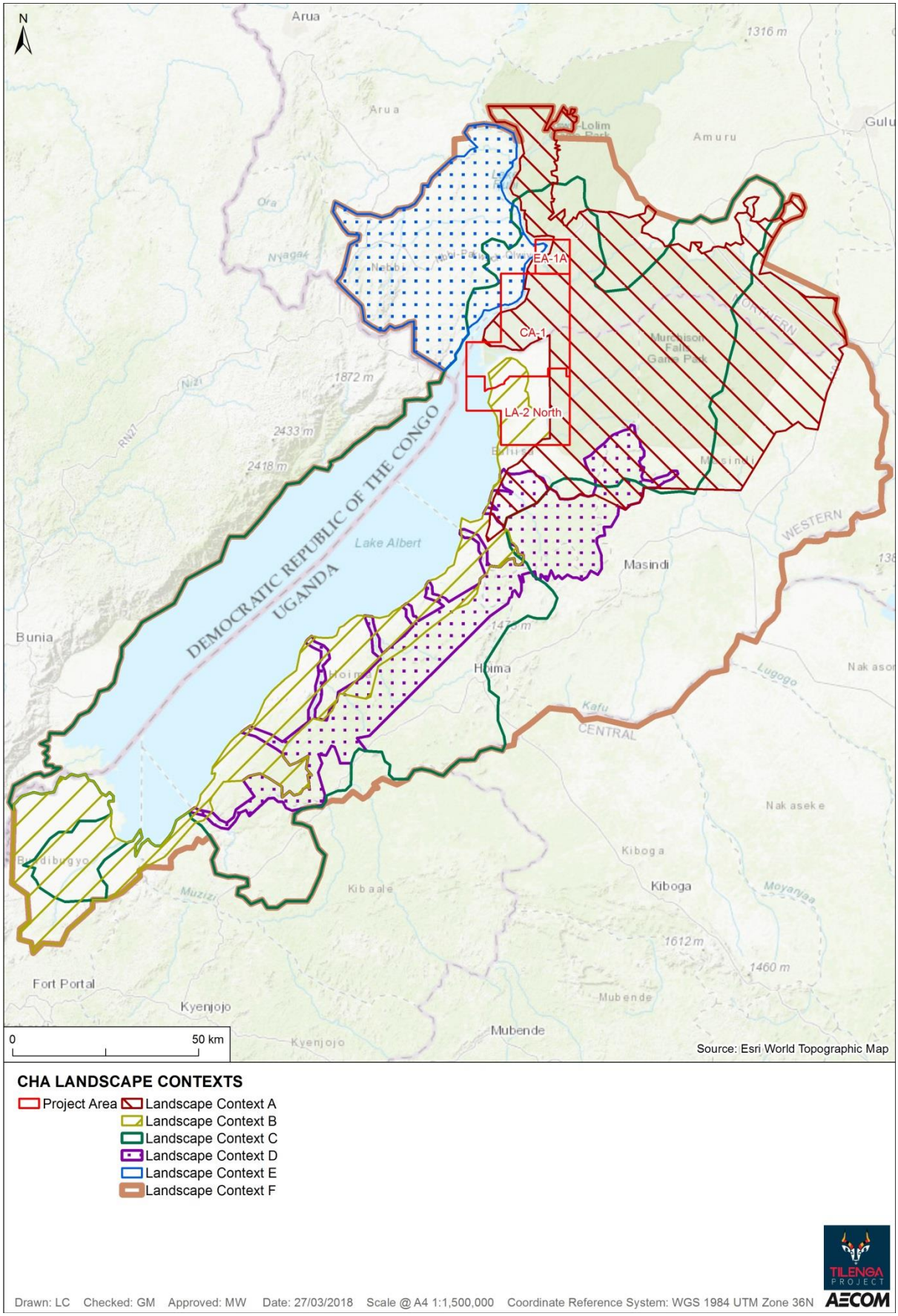


Figure 26: Landscape Contexts

It should be noted that some of these Landscape Contexts are geographically extensive and it is likely that the Project will not interact discernibly with all parts of some of these contexts, although there will be potential indirect impacts in areas outside of the immediate Project footprint.

For this ESIA the assessment of impacts on terrestrial vegetation, terrestrial wildlife and aquatic life has been separated. However, the presence of wildlife is generally dependent on the habitats and vegetation types that are present in the Project AoI so there are clearly inter-relationships between these separate assessments. The separate assessments are summarised in the following sections.

6.3.2 Terrestrial Vegetation

The terrestrial vegetation assessment addressed potential impacts to vegetation within the varying landscape contexts in the Project Area.

6.3.2.1 Baseline

Baseline data was collected at the Project components and environs. In addition, various ecological field studies in recent years have been undertaken and are ongoing with the objective of trying to understand, at a landscape level, the ecological characteristics of the region, such as land cover and vegetation types and their associations with plant species of conservation concern. All of these studies provide extremely useful (and up-to-date) background information on the distribution and dynamics of biodiversity elements within the region.

The JBR Field, which occupies 30% of CA-1 east of the Albert Nile, lies within the MFNP, which hosts a range of emblematic wildlife and attracts national and international tourism.

MFNP is the largest and the second-most visited national park in Uganda. However, there are also a number of protected areas in the Project AoI such as Bugungu Wildlife Reserve (WR) and Budongo Central Forest Reserve (CFR). The Murchison Falls Protected Area (MFPA), which includes these three areas already described, therefore comprises a diverse array of protected sites throughout the region (including MFNP itself), plus the forest reserves form important animal corridors and represent biodiversity hotspot areas for tourism but are also of recreational importance.

In addition, there are a number of other CFR located within the AoI but further from the areas where oil development will take place, but which for the purposes of the assessment are defined as potential receptors, particularly due to potential indirect impacts. These include the Bugoma CFR and the CFR around Masindi.

The oil fields in the development area located north of Victoria Nile are entirely located within the MFNP. However, most of the well pads south of the Victoria Nile are located in a populated area with dispersed dwellings, grazing land and crops.

Box 4 – Landcover / Vegetation Types within Project AoI

- Bushlands
- Cyperus Papyrus Swamp
- Closed Moist Woodlands
- Dry Grassland
- Dry Wooded Grassland
- Medium altitude moist semi-deciduous Forests
- Open Moist Woodlands
- Palm Savanna
- Palm Savanna
- Standing Waters
- Permanent Rivers
- Swamps

Using the definitions set out in IFC PS6, there are three main types of habitat in the Biodiversity Project AoI. These comprise Natural, Transitional (Natural) or Modified, where:

- ***Natural habitat*** refers to habitat with a low level of on-going disturbance or anthropogenic modification (e.g. within the MFNP);
- ***Transitional habitat*** refers to natural habitat that is degraded but could be improved (or get worse) depending on how it is managed in future; and
- ***Modified habitat*** includes areas that have been radically changed such as cultivated land or settlements.

The Project Area is large and is divided between the western part of the MFNP, north of the Victoria Nile, comprising natural habitat, and large areas of transitional and modified habitat south of the river, as well as some transitional, modified and natural habitat adjacent to Lake Albert.

The landcover / vegetation types within the Project AoI are shown on Figure 27. The main natural landcover / vegetation types (with specific landcover code) present within the Project Footprint that will be directly lost or affected are presented in Box 4 above.

Other vegetation types may be impacted indirectly. Using this information, calculations were made to determine how much of each vegetation type would be lost directly due to construction of the Project.

In addition to identification and mapping of landcover / vegetation types, the priority flora species were determined. These receptors were selected based on whether they had been identified as CHQS in the CHA process. In addition, species listed as Reserved Species in Uganda in Schedule 8 to the National Forestry and Tree Planting Regulations 2016, were included as receptors. The list of priority species is very extensive and includes trees, herbaceous plants and even a rare parasitic plant. Consideration of invasive plants was also included in the assessment.

Protected Areas, such as MFNP and Bugungu Wildlife Reserve, were also defined as receptors for this part of the assessment.

Savanna with Borassus Palm (JBR-07)

Wooded Grassland (JBR-09)

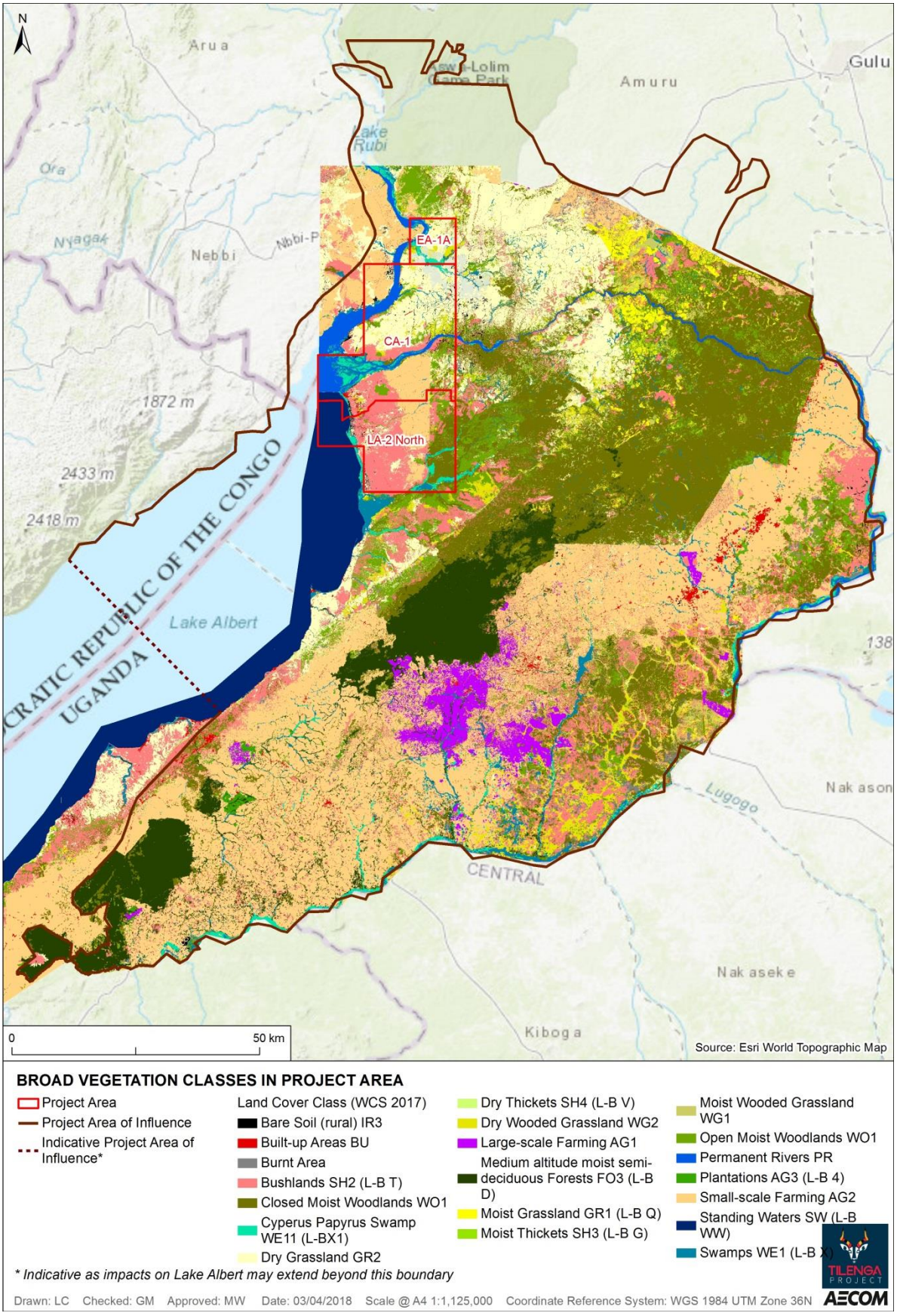


Figure 27: Landcover / Vegetation Types

6.3.2.2 Potential Impacts

Potential impacts were considered to be: *direct*, i.e. those impacts that may occur as a consequence of the Project design or activities such as site clearance, excavation and construction, storage and handling of fuels and chemicals, and changes to hydrology and shallow groundwater; or *indirect*, which may occur as a result of induced effects, for example an associated increase in human population that puts pressure on biodiversity through habitat loss or direct loss of species.

Potential impacts in this assessment took into account the embedded mitigation that had been built into the Project design, which included avoidance during footprint identification work.

Based on the Project activities for each Project phase, direct and indirect impacts on vegetation can ultimately be defined as two main impact types, comprising:

- Habitat or ecosystem loss, degradation or fragmentation; and/or
- Species population loss.

Overall, potential impacts on priority species were considered to be generally Low Adverse, as such species which had been identified during the baseline surveys had largely been avoided. However, Moderate Adverse potential impacts were identified with regard to Protected Areas, mainly due to the potential for indirect impacts due to assumed induced population changes and the pressures these would put on natural resources, particularly forests such as Budongo and Bugoma.

Seasonal River Bed (between JBR-08 and JBR-09)

Large Waterhole near Pakubu Lodge

6.3.2.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on terrestrial vegetation. All site clearance activities will be undertaken in line with the Site Clearance Plan which will be developed by the Contractor(s) prior to commencing the Site Preparation and Enabling Works Phase to limit extent of vegetation clearance, wherever possible. There will be a 15 m wide buffer from the perimeter security structure, which will be cleared of vegetation; this will provide fire breaks. At the end of the Construction and Pre-Commissioning Phase the Project site will be restored in accordance with a Site Restoration Plan.

Mitigation measures have been developed that take into account the likely locations of species, based on their habitat presence, their behaviour, sensitivity and seasonal constraints. Examples of such mitigation measures for potential direct impacts include:

- A *Biodiversity and Ecosystem Services Management Plan (BMP)* will be developed, ensuring that potential impacts of site clearance on plant species of conservation concern will be minimised. The objective of the plan is to state the measures and methods required to manage activities so that they create the minimum of impact for biodiversity. For each identified receptor (species, habitat or system) the BMP will describe the potential impacts associated with that receptor, defines the mitigation objectives and sets out how they will be achieved, including roles and responsibilities, timescales and metrics;
- The *Site Clearance Plan* will be developed to structure and schedule clearly site clearance activities, noting any constraints. Prior to site clearance each site will be surveyed for the presence of plant

species of conservation concern, as listed in the BMP. If any such species are found, these will be recorded and if possible either avoided or transplanted to similar habitat under supervision of a botanist/ecologist;

- A specialist ecologist (Environment Compliance Officer (ECO)) will be present on site during site preparation and construction phases where further soil stripping or excavations are required (e.g. construction of pipelines) to oversee the works and ensure compliance with the ESMPs;
- The detailed *Site Restoration Plan* will be implemented and at each site this will be monitored for success of vegetation establishment, erosion issues and presence of invasive species to ensure that all sites are effectively restored;
- Plant nurseries will be established to provide plant materials (e.g. seedlings and/or seeds) for restoration of impacted sites, as well as for replacement of felled trees as appropriate. This will include trees as well as common herbaceous species for general coverage;
- A risk-based *Alien/Invasive Species Management Plan* will be developed and implemented;
- Works and traffic/plant movement will maintain strict adherence to agreed footprint design including access roads and other infrastructure;
- Materials to be used in forming platforms, bund walls and other site preparation works within Protected Areas will be locally sourced as much as possible (i.e. materials used in the MFNP should be from other sites within the MFNP), but away from sensitive biodiversity areas where practicable;
- Strict controls on traffic, on access of workers to sites outside of site boundaries;
- Land-based effluent / runoff will be controlled to prevent sedimentation and pollution;
- *Influx Management Strategy* will be developed to mitigate in-migration impacts and maximise benefits for local communities. The strategy will consider looking at ways to provide alternative sources of fuel, building materials, farming land and food. Implementation of the strategy will depend on joint coordination between the Project, government, other project developers, local communities and civil society;
- *Community Impact Management Strategy* will consider measures aimed at mitigating impact of population growth on natural resources; and
- *Resettlement Action Plans* will include livelihood restoration and will also provide alternative livelihoods/ income diversification programmes to ease dependence on natural resources or protected areas as a source of livelihood.

6.3.2.4 Residual Impact and Conclusions

Following implementation of mitigation, residual impacts on all species are assessed as **Low Adverse** significance or **Insignificant**.

Residual impacts on threatened ecosystems are mainly defined as **Low Adverse** significance to **Insignificant**, with the exception of Forest-Savanna Mosaic, which is defined as **Moderate Adverse** significance, due mainly to land use changes and loss of habitats.

However, there may be potential indirect impacts caused by population movements and in-migration pressures to the region. It is considered that these potential indirect impacts may be more significant overall than the potential direct impacts and harder to mitigate, because their exact extent and nature cannot be known until they start to develop.

There is likely to be more and increasing pressure on forest and other habitats outside of the Project Footprint due to induced in-migration, causing land use changes and pressure on natural resources and habitats. This is reflected in the elevated residual impacts (**Moderate Adverse** significance) on forest-savanna mosaic ecosystems and also Protected Areas.

The assessment indicates that despite identified mitigation the impact is not mitigated down to an insignificant condition, therefore further measures are required in order to reach the objective of no net loss (Natural Habitat) / net gain (Critical Habitat) as presented in Section 6.3.5.

6.3.3 Terrestrial Wildlife

The terrestrial wildlife assessment considered potential impacts to wildlife (including mammals, insects, herpetiles and birds) in the various habitats present across the Project AoI.

6.3.3.1 Baseline

As with the Terrestrial Vegetation assessment (Section 6.3.2), baseline information was derived from two types of data, comprising desk study review of previous reports and field surveys commissioned for the Project.

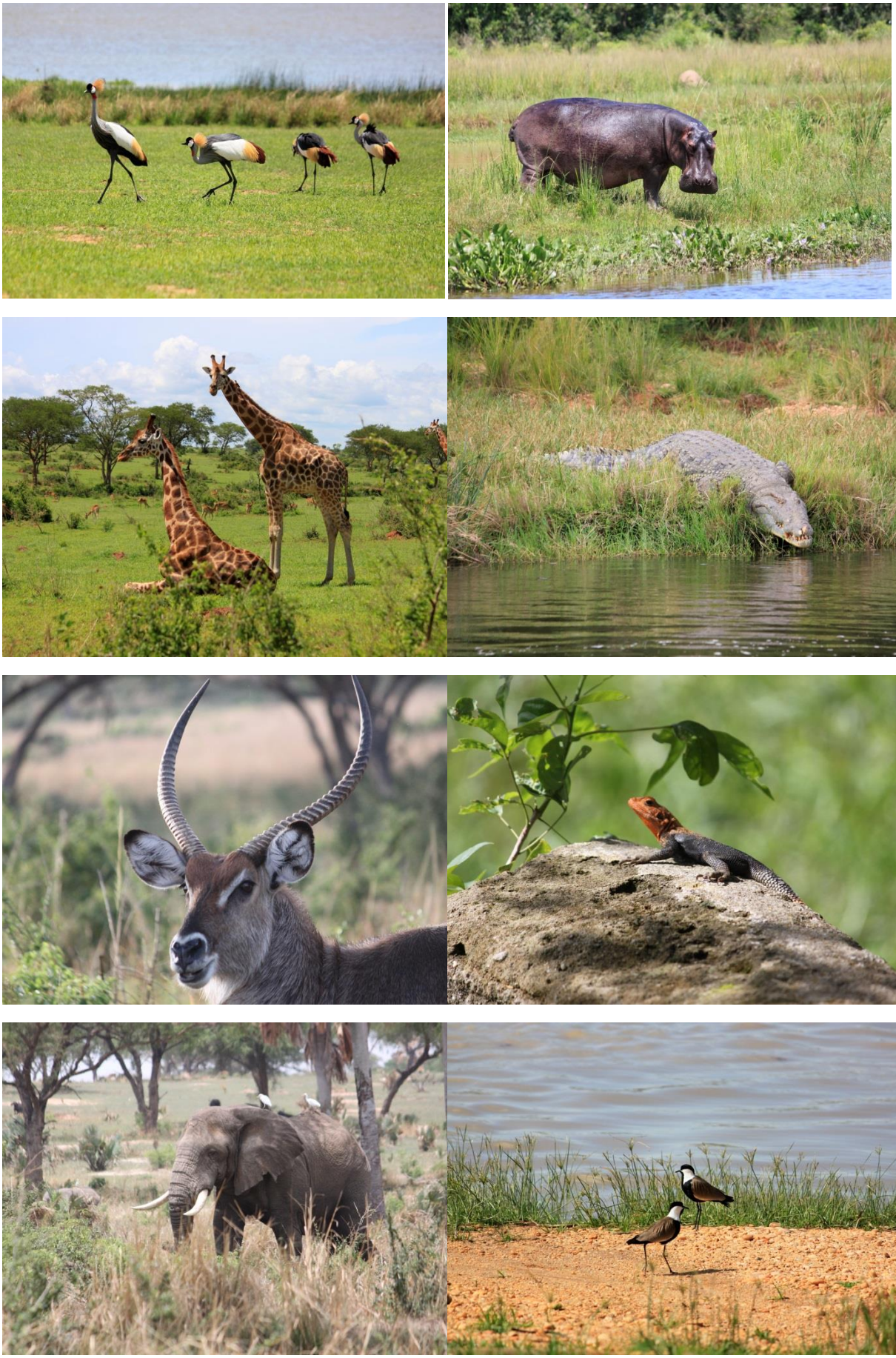
The Project is located in the Albertine Graben, Western Uganda, which encompasses two savanna biomes represented respectively by the sub-biomes of Acacia savanna grasslands and Guineo-Congolian Forest/Savanna Mosaic. In addition, there are Albertine Rift montane forest areas that extend from the south into the Project AoI. Biodiversity studies and reports available for the Albertine Graben demonstrate that it is recognised as one of Africa's most important areas for biodiversity.

There are 39 protected areas listed within the Albertine Rift, most of which are CFR. The most sensitive protected sites within the Project AoI include Murchison Falls National Park, Murchison Falls-Albert Delta Wetland System Ramsar Site, Bugungu WR, Karuma WR, Budongo CFR, Bugoma CFR and CFR located around Masindi. The MFNP hosts a range of emblematic wildlife and attracts national and international tourism.

As with Terrestrial Vegetation a large number of priority animal species were defined as receptors for the assessment. The main mammal species included in the assessment comprise the endangered Rothchild's giraffe, Lelwel hartebeest, and chimpanzee, in addition to African elephant, lion, spotted hyena, Uganda kob, Bohor reedbuck, leopard and hippopotamus which are listed on the IUCN and Uganda Red Lists. In addition there are a number of small mammal and bat species listed on the IUCN and Uganda Red Lists such as Bunyoro rabbit and Mongalia Free-tailed Bat. Most of these species are associated with protected areas.

Bird species on the IUCN and Uganda Red Lists which were defined as receptors include various species of vulture, the grey crowned crane, the Madagascar pond heron, shoebill, Denham's bustard, Nahan's partridge (a forest species), African skimmer and a number of raptors. Herpetiles (amphibians and reptiles) included a range of frogs as well as terrapins, a tortoise species and some snake species. In addition, a number of butterflies and dragonflies were included in the list of receptors.

The baseline studies included field surveys to identify the presence of these species within the Project Area. These included walked transects as well as setting up infra-red camera traps for six months to record what species were using areas within MFNP within and close to the Project facilities locations. In addition, various ecological field studies on terrestrial wildlife in recent years have been undertaken, and are ongoing or planned with the objective of trying to understand the species population, habitat area and behaviours of the priority biodiversity species.



Selection of Wildlife Observed in the Project Area during Field Surveys

6.3.3.2 Potential Impacts

Potential impacts on receptor species and their habitats were considered in the assessment. The way the Project activities could potentially impact on terrestrial wildlife can be condensed into four main types: Potential for Loss, degradation or fragmentation of species habitat; for Population impacts; for Disturbance; and for Barrier effects.

However, it was noted that there is a certain amount of overlap between potential impact types, for example where a potential loss, degradation or fragmentation of habitats could have an effect on species populations; nevertheless, the aim was to try to separate out further the causes of potential impacts for the assessment.

In addition, for the purposes of the assessment and because the Project comprises considerable linear or interconnected infrastructure elements which could result in barrier effects (which are also a kind of disturbance); this was included as a separate category of potential impact.

The assessment found that the highest level of potential direct impacts (i.e. direct impacts prior to mitigation) affected sensitive savanna species. The species that were considered to have potentially High Adverse significance impacts were Rothchild's giraffe, Lelwel hartebeest and lion (potentially Critical impacts at some Project stages), which reflects the very high level of 'sensitivity' of these species. Other species where a potential Moderate Adverse direct impact was identified were chimpanzee, African elephant, spotted hyena, Bohor reedbuck, Uganda kob, hippopotamus, leopard, various small mammals, most bird species and some reptile and amphibian species.

The assessment found that all of these species may also be potentially subject to Moderate Adverse indirect impacts, due to likely human population changes in the region induced by the Project that could create pressures on habitats, increases in poaching and other human-wildlife conflict issues. In addition, many of the species identified as receptors for the assessment are associated with forest habitats, and although are unlikely to be subject to potential direct impacts, may be vulnerable to potential significant (Moderate Adverse) indirect impacts as mentioned above.

As noted, the assessment concluded that these various types of potential impacts could occur directly or indirectly. With regard to potential indirect (induced) impacts these are likely to relate mainly to increased pressures on natural resources due to the influx of workers and their social and economic dependents.

6.3.3.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on terrestrial wildlife. The footprint in MFNP was minimised, for example Industrial area was placed outside of the MFNP, HDD rig is planned to be located on the south bank, access roads to the well pads will use RoW of the Injection and Production Network. Within the MFNP, the structures will be designed to prevent the ingress of animals entering the well pads and will comprise a bund wall structure. During Construction, the use of animal crossing structures along pipeline and access road Right of Ways will be installed where necessary.

Additional mitigation measures will be similar to and will be combined with those measures that will be implemented to mitigate potential impacts on Terrestrial Vegetation as detailed in section 6.3.2.3 above.

Additionally, the assessment included species-specific mitigation related to particular characteristics and locations of priority species.

6.3.3.4 Residual Impact and Conclusions

The findings from the assessment indicate that, taking all embedded and additional mitigation into account, the residual direct impacts will generally be **Moderate Adverse** significance for species associated with MFNP and savanna habitats across all phases of the Project. This includes species such as giraffe, elephant, Lelwel hartebeest and Uganda kob. This is because these habitats are where most of the Project infrastructure and main activities will be present.

In contrast, direct residual impacts on species not recorded as being present within the Project footprint are lower and are generally **Insignificant**. However, for these species there may be potential indirect impacts.

The assessment of potential indirect impacts indicates that there may be indirect impacts on a variety of priority species across different landscapes. Within the MFNP and savanna habitats, these potential impacts may be associated with increased human-wildlife interactions such as poaching, mainly because there will be more people in the vicinity due to elevated economic activity in the area. Consequently species in these landscapes will be likely to be affected by a combination of both potential direct and indirect impacts.

In addition to potential indirect impacts on species in the MFNP and savanna landscapes there may be potential indirect impacts on species associated with other landscapes such as forests and aquatic habitats. Species that may be affected include chimpanzees and other forest species. These impacts may be significant (**Moderate Adverse** significance) and would be due to induced human population changes (increases) within the Project AoI.

Such population changes would increase pressure on ecological resources such as forests and water. Potential loss of habitat, as well as increased human-wildlife interactions (e.g. poaching, fire, disease), will be the main causes of potential impact to these species. Consequently there will be a need for some broader strategies and initiatives, involving other stakeholders, as discussed in the mitigation section above, to manage and reduce the potential indirect impacts on these priority species and the habitats upon which they are dependent.

The assessment indicates that despite identified mitigation the impact is not mitigated down to an insignificant condition, therefore further measures are required in order to reach the objective of no net loss (Natural Habitat) / net gain (Critical Habitat) as presented in Section 6.3.5.

6.3.4 Aquatic Life

The aquatic ecology assessment addressed potential impacts on wildlife (including fish and macroinvertebrates) at the varying freshwater habitats within the Project Area.

6.3.4.1 Baseline

Baseline aquatic life conditions were established using a combination of desk study review of previous reports (secondary data) and field surveys which were directed by the desk study activities (primary data). Field surveys were performed during dry season (December 2016) and wet season (April-May 2017).

The proposed Project is located at the northern end of Lake Albert and includes both the Victoria Nile inlet and the Albert Nile outlet, which together represent the primary surface water resources within the Project Area.

The Project Area includes several different major hydrological catchments, namely the Albert Nile, the Victoria Nile and Lake Albert. The catchments are all freshwater and comprise several broad aquatic habitat types, as described below:

- Lentic habitats (still waters), i.e. Lake Albert;
- Lotic habitats (riverine), i.e. the Victoria Nile, Albert Nile and River Waiga;
- Transitional habitats, i.e. the Nile Delta and Waiga/Waisoke Delta; and
- Temporary habitats, i.e. Rivers Sambiye, Zoliya and Ngazi.

As presented in Section 6.3.1, the CHA identified Landscape Context Areas. The Landscape Contexts relevant to aquatic life are Landscape Context A which includes the Victoria Nile and Landscape Context C which covers Lake Albert, rivers and wetlands.

Surveys aimed to gain an understanding of populations of fish, macroinvertebrates (e.g. snails, dragonflies, and molluscs), zooplankton and phytoplankton, as well as information on the supporting water quality at each location.

A number of survey methods were utilised including gill nets, metallic fish traps and electric fishing (fish), kick-nets (macroinvertebrates) and conical nets (zooplankton and phytoplankton), with sampling conducted from boats or by wading in shallow areas.

Victoria Nile River

Lake Albert

Unnamed Watercourse within MFNP (dry)

River Tangi

Although the species of phytoplankton or zooplankton recorded are generally not designated (IUCN or otherwise) or have other species level protection, they provide a key ecological role as primary producers in the food chain and thus have a key role in aquatic ecosystems, and for this reason are of importance in terms of aquatic biodiversity.

6.3.4.2 Potential Impacts

The priority species identified during the baseline studies were defined as the receptors for the impact assessment with sensitivities ranging from medium to very high. As it is an IFC PS 6 requirement for potential impacts on natural habitats to be assessed, the Murchison Falls-Albert Delta Wetland System Ramsar site was also included as a receptor and considered to be very high sensitivity.

Taking into account the embedded mitigation measures in-built into the Project design, the potential impacts on aquatic life which were assessed are detailed below:

- *Loss, degradation or fragmentation of species habitat*: Including potential loss of habitat from infrastructure construction; soil erosion or smothering of adjacent habitats; introduction of alien or invasive plant species; changes to seasonal wetlands / other habitats due to surface and groundwater changes; and contamination of surface waters;
- *Population impacts*: Including potential species mortality due to a reduction in water quality / quantity or entrainment at the lake abstraction intake; loss of breeding areas / disruption of breeding behaviours; and destruction or disturbance of spawning and nursery areas;
- *Potential disturbance* by visible human presence, lighting and night-time working, vehicle movements, noise, vibration, and contamination of water resources;

- *Barrier effects* caused by linear infrastructures such as road construction creating a barrier for smaller streams and rivers; pipelines creating a barrier to fish migration; and physical positioning of Project components;
- *Potential indirect or induced impacts* relating mainly to increased pressures on natural resources due to the influx of workers, their economic dependents and others to the area.

Consideration was also given to landscape level impacts, particularly to the aquatic habitat within Murchison Falls-Albert Delta Wetland System due to the landscapes' elevated sensitivity and vulnerability to increased pressures (e.g. land clearance which has the potential to reduce habitat availability for aquatic species, particularly in relation to water quality).

The assessment of potential impacts prior to additional mitigation, indicates that potential Moderate Adverse significant impacts were identified for a number of receptors within Landscape Contexts A and C during the Site Preparation and Enabling Works Phase, and that potential significant impacts (Moderate Adverse to Critical significance) were identified for all aquatic receptors within Landscape Contexts A and C for the remaining Project phases. Potential impacts to the Murchison Falls–Albert Delta Wetland System Ramsar site were assessed to be High Adverse to Critical for all Project phases.

Surveying activities at the River Waiga

Surveying activities at the water abstraction point in Lake Albert

Surveying activities at the River Nile Delta

Electric fishing on the Zoliya

6.3.4.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on aquatic life. Prior to starting HDD activities a risk assessment will be undertaken to identify the necessary design of the HDD tunnels including appropriate tunnelling and slurry management practice to control groundwater ingress and minimise slurry loss from the tunnel into surrounding aquifers/surface waters. Once operational, there will be restricted access either side of the pipeline location in Lake Albert.

The additional mitigation measures identified to reduce potential impacts to aquatic life include the measures similar to the ones for the Terrestrial Vegetation and Terrestrial Wildlife, thus not detailed here and additional related to Aquatic impacts:

In addition to the measures outlined under Terrestrial Vegetation in section 6.3.2.3 above, a number of measures with specific focus on the aquatic environment have been identified. These include:

- A *Wetland Management Plan* will be established to ensure no disruption to wetland areas. The main measures will comprise avoiding and minimising impacts on wetlands and restricted exclusion zones;
- A *Chemical Management Plan* will be developed that will describe the selection, transport, storage and usage processes as well as mitigation measures against releases or toxic effects and spill contingency measures in case of spills. The plan will be based on the results of Chemical Risk Assessment;
- Testing and Monitoring of the water intake will take place during pre-commissioning to ensure that intake velocities and activities at the Water Abstraction System (WAS) are not having a detrimental impact on fish;
- In locations where tracks, roads and/or pipelines cross smaller surface water bodies such as the River Tangi, crossing options/methods (e.g. bridges, culverts etc.) will be assessed and the most appropriate implemented; and
- Workers will not be permitted to collect shells, timber or fibres from area around the working areas. Fishing by workers will not be permitted. Ensure control at the camps and work sites.

Mitigation measures relevant to potential indirect impacts will include:

- Inclusion of community based fisheries management and monitoring programme in the *Community Impact Management Strategy* and consideration of fisheries based livelihoods in the Resettlement Action Plans;
- The BMP will include mitigation measures linked in influx to reduce the potential impact of increased pressure on fisheries resources due to population growth; and
- A pilot scheme for wetland restoration will be linked to the Restoration Plan - developed in partnership with WMD and DWRM.

6.3.4.4 Residual Impact and Conclusions

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives and therefore residual direct impacts are considered not to be significant (i.e. **Insignificant** to **Low Adverse** significance). The residual indirect impacts were assessed to be **Low Adverse** significance for the Site Preparation and Enabling Works and Decommissioning phases, but **Low Adverse** to **Moderate Adverse** significance for the Construction and Pre-Commissioning and Commissioning and Operations phases. These significant residual indirect impacts are expected as a result of in-migration pressures to the region and greater access created by the development of the Project. By their nature, these are harder to mitigate.

The assessment indicates that despite identified mitigation the impact is not mitigated down to an insignificant condition, therefore further measures are required in order to reach the objective of no net loss (Natural Habitat) / net gain (Critical Habitat) as presented in Section 6.3.5.

6.3.5 Biodiversity Loss/Gain Accounting and Measures to Achieve Net Gain

As indicated above, another level of mitigation (which relates mainly to potential indirect impacts) is necessary in order to achieve the objectives of No Net Loss / Net Gain. These are referred to as mitigation concept strategies as they have been agreed to by the Project Proponents and although their parameters and objectives have been defined they require further detailed development. These initiatives consist of the following strategies:

- Measures to reduce human pressures and increase resilience of the MFPA, and surroundings, including protecting/maintaining connectivity of savannah habitat in and adjacent to Bugungu Wildlife Reserve. This shall include provision of support, resource and capacity development to

enable enhanced park management and to empower communities and provide alternative livelihood opportunities;

- Working with local communities to manage and restore wetlands along the southern shore of the Albert Delta Ramsar site. This shall include identifying and working with wetland user groups to develop and promote sustainable use practices, regulations, wetland restoration and alternative livelihoods; and
- Measures to conserve and restore forests and forest connectivity along the eastern shore of Lake Albert (including Budongo and Bugoma FRs). This will include identifying, supporting and scaling up existing community-based forest conservation initiatives that are demonstrating lasting success and also improving management of forested protected areas (Budongo and Bugoma FR).

These concepts will be developed in detail by the Project Proponents and a joint approach will be pursed with other stakeholders to identify specific actions, define targets and monitoring requirements and to work towards achieving Net Gain in relation to Priority Biodiversity identified in this assessment.

6.4 Social

The social assessment considered the potential for impacts on people, communities, and livelihoods (including socio-economics; health and safety; archaeology and cultural heritage; and ecosystem services) associated with the Project.

6.4.1 Social and Socio-Economics

The social assessment considered the potential direct and indirect social, economic and cultural changes and impacts (both beneficial and negative) that the Project will give rise to. Key sources of social impacts will be land acquisition, influx, employment and economic opportunities including contributions to the local and national economy from taxes and revenues. Social impacts are likely to be experienced both within communities located in proximity to the Project and across the wider region as well as at the national level.

Topics covered within the social assessment comprised:

- Governance and Administration;
- Population, demographics and education;
- Culture, traditions and social dynamics;
- Social infrastructure and services;
- Settlements and housing;
- Economy and livelihoods;
- Land tenure and land use; and
- Human Rights.

6.4.1.1 Baseline

The Social Baseline looked at information about communities within proximity to the Project infrastructure as well as populations within the wider region that may experience potential indirect or induced impacts linked, for example, to influx or economic effects of the Project. Baseline information for the social assessment was therefore gathered for the following areas:

- Communities immediately surrounding Project components – referred to as the 'Primary Study Area' and including:
  - Buliisa District: specifically, villages within Buliisa sub county, Ngwedo sub county, Kigwera sub county and Buliisa Town Council; and
  - Nwoya District: specifically, Purongo sub county and Got Apwoyo sub county.
- Populations in the wider geographic area in which indirect impacts may be experienced – referred to as the 'Secondary Study Area', this includes:

- Wider parts of Buliisa District including Biiso Town Council;
- Hoima Municipality (Hoima District);
- Masindi Municipality (Masindi District); and
- Pakwach Town Council (Pakwach District).

Information about existing social conditions for local populations is based on primary and secondary data collected via desktop review and field work (interviews, focus group discussions, household surveys and community mapping).

Figure 28 shows a map of villages, sub counties and districts against the Project layout.

6.4.1.1.1 National Overview

The national population was 41.5 million in 2016. Uganda has one of the youngest populations in the world with 78% of the population below the age of 30. Approximately 1.5% of the total population in Uganda were recorded as non-citizens in the 2014 census. Most of the non-Ugandan population (88.7%) are citizens of neighbouring countries.

In 2016, Uganda's Gross Domestic Product (GDP) was 24 billion United States Dollars (USD), with a Gross National Income (GNI) per capita of USD 630. Uganda's GDP has been steadily growing since 2012, averaging 5.5% between 2010/11 and 2013/14, and is forecast to grow by 6.7% in 2018. This growth is primarily due to growth in services and construction. Uganda's exports per capita are amongst the lowest in the world and exports are dominated by primary products including coffee, tobacco, fish, flowers, maize, cocoa beans and gold. According to the Second National Development Plan (NDPII) the minerals sector (including the oil and gas sector) contributed 0.3% to GDP in 2013. Significant progress has been made in addressing poverty, and the national poverty rate has declined from 56% in 1992 to 19.7% in 2012/2013. The services sector contributed 50.3% to Uganda's GDP in 2012/13, followed by agriculture with 23.5% and industry with 18.4%.

The total labour force in Uganda in 2012/2013 was 16.3 million persons and the labour force growth rate is estimated at 4.7% per annum. The majority of the working population are in the informal sector and are self-employed (81.5% in 2013) while the proportion of the labour force in paid employment was 18.5% in 2012/13. In 2013, 15% of the workforce had no formal education. Of the total working population, youth constituted a large proportion (4.4 million) with the majority living in rural areas (3.5 million) and working in non-wage employment in 2011.

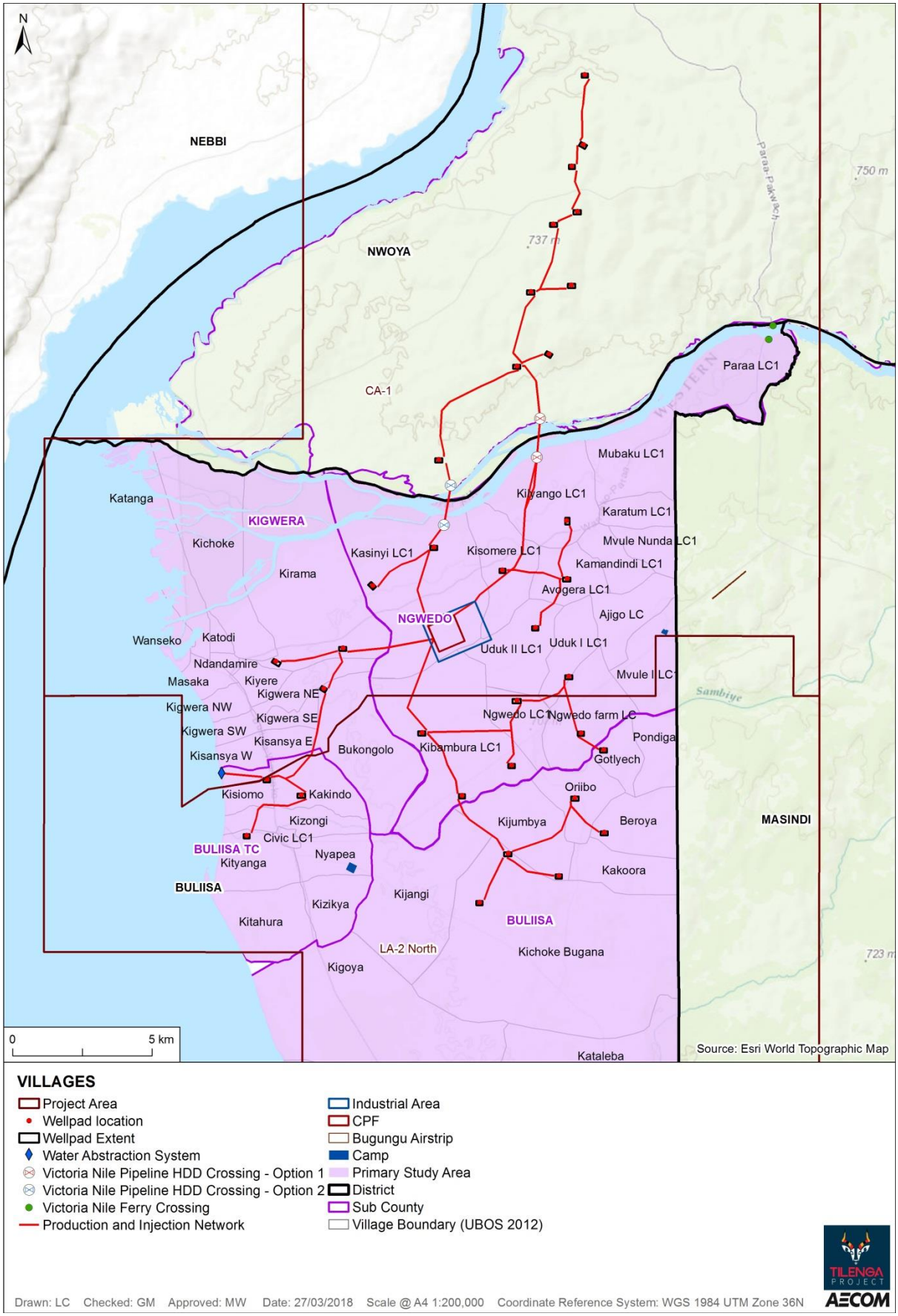


Figure 28: Map of Local Communities versus Project Layout

6.4.1.1.2 Study Area

The text below provides a summary of key social baseline information for the Primary and Secondary Study Area.

Governance and Administration

The local governments of Buliisa and Nwoya face capacity and resource constraints. Key constraints include a poor resource base and general poverty within the population, inadequate staffing, lack of logistical resources (e.g. transport) and poor roads hampering service delivery, poor technical capacity, limited monitoring or accountability for service delivery, and corruption and misuse of public resources. Poor technical and leadership capacity of sub county governments is also a challenge.

The Project falls within the traditional cultural institutions of the Acholi Chiefdom and Bunyoro-Kitara Kingdom. Clan leaders and elders play an important role in communities, especially around governance and land related issues, mediation of family conflicts and in maintaining community cohesion. There are several obstacles to accessing formal justice for local communities including unaffordability; public unfamiliarity with the formal justice system; corruption and ethnic bias within court systems. For these reasons traditional justice systems generally remain preferable to formal mechanisms for local communities (Ref. 14).

Population & Demographics

Population information for the Study Area is given in Table 6.

Both Buliisa and Nwoya Districts have high population growth rates (4.9% and 9.5% respectively) compared to the national average (about 3 %) and young populations (58% and 61.9% of the populations respectively falling under the 0-19 age group). The majority of the population in Buliisa and Nwoya Districts (94% and 89% respectively) live in rural areas, although the populations of urban areas are growing quickly, such as Buliisa Town Council, Wanseko, and Masaka. Population density is higher along the lake shores. The local populations are characterised by low levels of educational attainment, literacy and skills (Ref. 15).

Bugungu and Alur are the two main ethnic groups in Buliisa District. In Nwoya the dominant group is the Acholi. In Pakwach the dominant group is Alur while in Hoima and Masindi it is Bunyoro. People from most of Uganda's tribes and ethnic groups, as well as other nationalities, can be found across the area. The main religions in the area are Christianity and Islam.

Table 6: Population in Study Area

District / Sub County	Population	
Buliisa District	**113,161**	
	Population	*% of District Population*
Buliisa Sub County	17,138	15.1%
Kigwera Sub County	13,628	11.9%
Ngwedo Sub County	17.472	14.6%
Buliisa Town Council	7,238	6.4%
Nwoya District	**133,506**	
Purongo Sub County	31,478	
Pakwach Town Council	**22,987**	
Hoima Municipality	**100,099**	
Masindi Municipality	**94,438**	

Source: Ugandan Bureau of Statistics (UBOS) – various data sets, accessed at: http://www.ubos.org/, including National Population and Housing Census 2014 Report and 2016 Statistical Abstract.

Migration into Buliisa, Nwoya, Hoima, Masindi and Pakwach is driven by economic opportunity particularly fishing along the shores of Lake Albert and availability of land to grow crops or graze cattle. People also come to set up businesses in urban centres and for employment opportunities associated with farming and agricultural processing particularly in Pakwach, Nwoya and Masindi. Other factors pushing migration are porous borders, cross border cultural ties, violence and instability in neighbouring countries, and availability of better facilities in urban centres. The continued return of Internally

Displaced Peoples following the end of the conflict in Northern Uganda is also a driver of population growth in Nwoya District.

Social Dynamics

The Bugungu and Alur have a long history of peaceful co-existence as a result of strong kinship ties and intermarriage, as well as mutual dependence.

Social ills include alcohol abuse (especially in villages along the Lake Albert shores); domestic violence; and commercial sex (especially in towns such as Hoima, Pakwach and Masindi and in villages and towns along the Lake Albert shores or more populated trading centres). Child labour is also an issue at fish landing sites and in Pakwach Town Council where children work in petty trade and as casual labourers in fishing and agriculture. Local police face capacity and resource constraints, their main challenges being a lack of transport and logistical support.

Land is a common source of tension. The difficulties in implementing land administration system makes customary land owners vulnerable to speculation, which is a source of tension. Furthermore, there is a lack of structures and institutions with the capacity to resolve competing claims between communal ownership rights and individual rights. Competition over productive resources between pastoralists and crop farmers is also a common source of dispute. There are historic tensions between the Acholi of Nwoya District and Jonam (Alur) of Nebbi District relating to competing claims over land ownership east of the Albert Nile.

Infrastructure & Services

Water

Access to safe water varies from approximately 70% for Buliisa, Nebbi and Masindi Districts, 83% for Nwoya District and 59% for Hoima District. Sanitation coverage is low (Ref. 16).

Shallow Well

Water Tap

Borehole

Solar Water Tower, Ngwedo TC

Types of Water Points in the Primary Study Area

Transport

Existing roads in the Primary Study Area are generally in poor condition. Hoima Municipality, Masindi Municipality and Pakwach Town Council have higher proportions of tarmacked roads and are relatively easily accessible.

Road Conditions in Primary Study Area

Energy

Access to energy is low – the main sources of lighting are paraffin, firewood, generators and electricity. Wood is the primary source of fuel for cooking followed by charcoal.

Communication

Radio is an important source of communication and information for local communities. Mobile phone coverage in the area is generally good.

Village Infrastructure

Typical village infrastructure and resources include religious buildings, trading centres, meeting points, boreholes and open water sources, grinding mills, community access roads, football fields, crop farming areas (mainly in the east of Buliisa) and grazing areas (mainly in the west of Buliisa). Graves are located within homesteads and are therefore scattered across village territories. The majority of households in the Primary Study Area are traditional structures, built from mud with wattle walls and grass thatched roofs.

Education

Education services within the Primary Study Area are hindered by inadequate educational infrastructure, staffing[5] and numbers of teachers. The majority of schools in the Primary Study Area are primary level (44 in Nwoya District and 54 in Buliisa District). There are only a few secondary schools (three in Nwoya and five in Buliisa) and no Business, Vocational and Education Training (BTVET) institutes in Buliisa but two in Nwoya (in Anaka and Purongo). There are also six BTVETs in Gulu, Masindi and Hoima districts. Universities are located in larger urban areas such as Gulu and Kampala.

Economy and Livelihoods

Livelihoods are mainly subsistence based and are primarily centred on agricultural activities, livestock rearing, fishing and natural resource exploitation, with some employment generated by the tourism industry. Households will often rely on more than one livelihood strategy. Production practices are traditional with limited access to and use of modern inputs. The photographs below depict typical livelihoods within the Primary Study Area.

[5] *At the national level only 4.5% of primary school teachers are licensed (Ref. 17)*


Cattle Grazing, Buliisa District


Crop Area, Uduk 1 Cassava Garden, Beroya

Crop Areas in Eastern Buliisa District



Boats in Wanseko



Grass Harvesting in Got Apwoyo

Crop farming in the Primary Study Area is undertaken in areas where land is the most fertile, especially eastern Ngwedo sub county. Cattle keepers and fishers from other parts of Buliisa District commonly migrate to Ngwedo to undertake crop farming on a seasonal basis. Very small scale cultivation is also undertaken within fenced gardens around homesteads in the rangeland area of Buliisa District.

The major economic activity in Nwoya District is cultivation with mechanised and commercial farming activities employing over 90% of the total active population.

In 2011, 20% of households in Buliisa District practiced fishing for subsistence and income generation. Fishing in Nwoya District is more restricted due to the MFNP. Fishing is an important aspect of food security and is a primary source of income for communities living near or on the Lake Albert shoreline (Katanga, Katodio, Wanseko, Masaka and Kisansya West) and as a secondary income source for communities living inland. Fishing is generally practiced in Lake Albert, the Albert Delta and Victoria Nile River.

A small percentage of total revenue in Nwoya and Buliisa districts comes from tourist activities in the region (more than 60,000 tourists visit MFNP annually as shown in Table 7). Using the revenue derived from the mandatory 20% of park entrance fee paid by visitors, a revenue sharing scheme exists that aims to support poverty reduction and provide an incentive for participating communities to support conservation.

Table 7: Visitors to MFNP (citizens and Foreigners) 2011 to 2015

National Parks	2011	2012	2013	2014	2015
Murchison Falls	60,273	60,803	70,798	66,844	72,964

Source: Ref 24

Approximately 20-30% of required supplies, mostly fruit and seasonal products are sourced from local producers; however, most of the lodges reportedly source the majority of their supplies from Kampala and transport them by road to the Park. It is estimated that the tourism sector provides approximately 525 jobs for the local community (representing 10-20% of people employed by the lodges) (Ref. 15).

Other livelihoods practiced locally include apiculture (beekeeping), trade and services, boda boda drivers, small businesses, casual labour, and various natural resource based livelihoods (see Section 6.4.4).

Land Use & Tenure

The main land uses identified in the Primary Study Area are:

- Crop farming (hills of Ngwedo sub county and Biiso sub county);
- Livestock grazing (flatlands close to Lake Albert);
- Commercial infrastructure (including trading centres, landing sites);
- Public infrastructure including schools, health centres and administrative units;
- Residential including private residences; and
- Protected areas (MFNP and Bugungu Wildlife Reserve), used for nature conservation and tourism activities (e.g. lodges, game drives, river cruises).

Land Use

Land in the eastern part of Buliisa District is predominantly used for crop farming and land in the central part as rangelands for cattle grazing. The western part has a mixed land use pattern (covering the lake shore area) with a combination of semi-rural/urban areas, rangeland and wetland. A map showing land use in Buliisa District is shown in Figure 29.

In Nwoya District a significant proportion of land within the Primary Study Area is within the MFNP. In the Primary Study Area (Got Apwoyo and Purongo sub counties), the dominant land use is agricultural,

both for large-scale agricultural projects and smaller scale subsistence farming. Grass harvesting and use of trees to make charcoal are also important land uses within the area. Other land uses include: residential (a few settlements concentrated along the main road and by the railway), commercial (three lodges close to the River Nile), industrial (oil and gas companies operational bases), natural resource exploitation (exploit resources at River Nile and seasonal streams, nearby grazing areas), and public infrastructure (Uganda railway, from Pakwach to Tororo).

The Ministry of Lands, Housing and Urban Development (MLHUD) has developed physical development plans for the Albertine Graben area, published as the Albertine Graben Physical Development Plan. This area, which includes the Project Area, has been classified as a special planning area by the government. The plan aims to sustain broader socio economic development in the area, and has seven strategies focused on: developing institutions, infrastructure, economic growth, urbanisation and resettlement, natural resource development, environment, and industrialisation. The plan divides the Albertine Graben into three areas and the Primary Study Area is within the central segment. The key priorities for this central segment are developing: oil and gas industry, agriculture, tourism, and industrialisation. To date no District Physical Development Plans have been developed for any districts in the Albertine Graben.

Land Tenure

Land in Buliisa and Nwoya district is predominantly held under customary tenure managed by different ethnic groups (Bugungu, Alur, Acholi). The Bugungu, Alur and Acholi have different systems of customary ownership. Most of the Bugungu own land (primarily grazing land) communally on a clan basis; while the Alur, who are mainly cultivators, recognise individual land ownership and have/use more clear demarcations of land parcels. Dispute resolution for land matters is based on mediation by local leaders.

Although customary land tenure is still predominant in the Project Area, there is a move towards converting or trying to convert customary land into freehold or leasehold tenure. Freehold and leasehold tenures are found in Buliisa and Nwoya District in areas of public buildings and business infrastructure; for private businesses and religious institutions. Large acres of land under leasehold tenure in Nwoya are managed by private and foreign investors developing large-scale farming products.

The process for obtaining a freehold land title is prohibitively long and expensive for most members of local communities due to administrative and surveyor fees.

Land speculation has been a growing issue due partly to the increased value of land driven by oil and gas and other developments in the area. In an effort to address land speculation, in February 2017 the MLHUD rescinded all land applications that were made in Buliisa from 2010 until 2017, declaring all transactions and approvals that had taken place within that timeframe null and void.

Human Rights

Key human rights issues reported[6] in Uganda include:

- Poor treatment of suspects, detainees and prisoners; absence of accountability and harsh prison conditions; lengthy pre-trial detention; official corruption; biased application of the law;
- Violence and discrimination against marginalized groups such as women, children, persons with disabilities, and the lesbian, gay, bisexual, transgender, and intersex (LGBTI) community;
- Restrictions on civil liberties (freedoms of press, expression, assembly, association, and political participation);
- Societal violence, trafficking in persons, and child labour; and
- Limits on freedom of association.

[6] Based on reports from the Uganda Human Rights Commission (2015); United States Department of State's annual Human Rights Report for Uganda 2016 and the Human Rights Water World Report (2016).

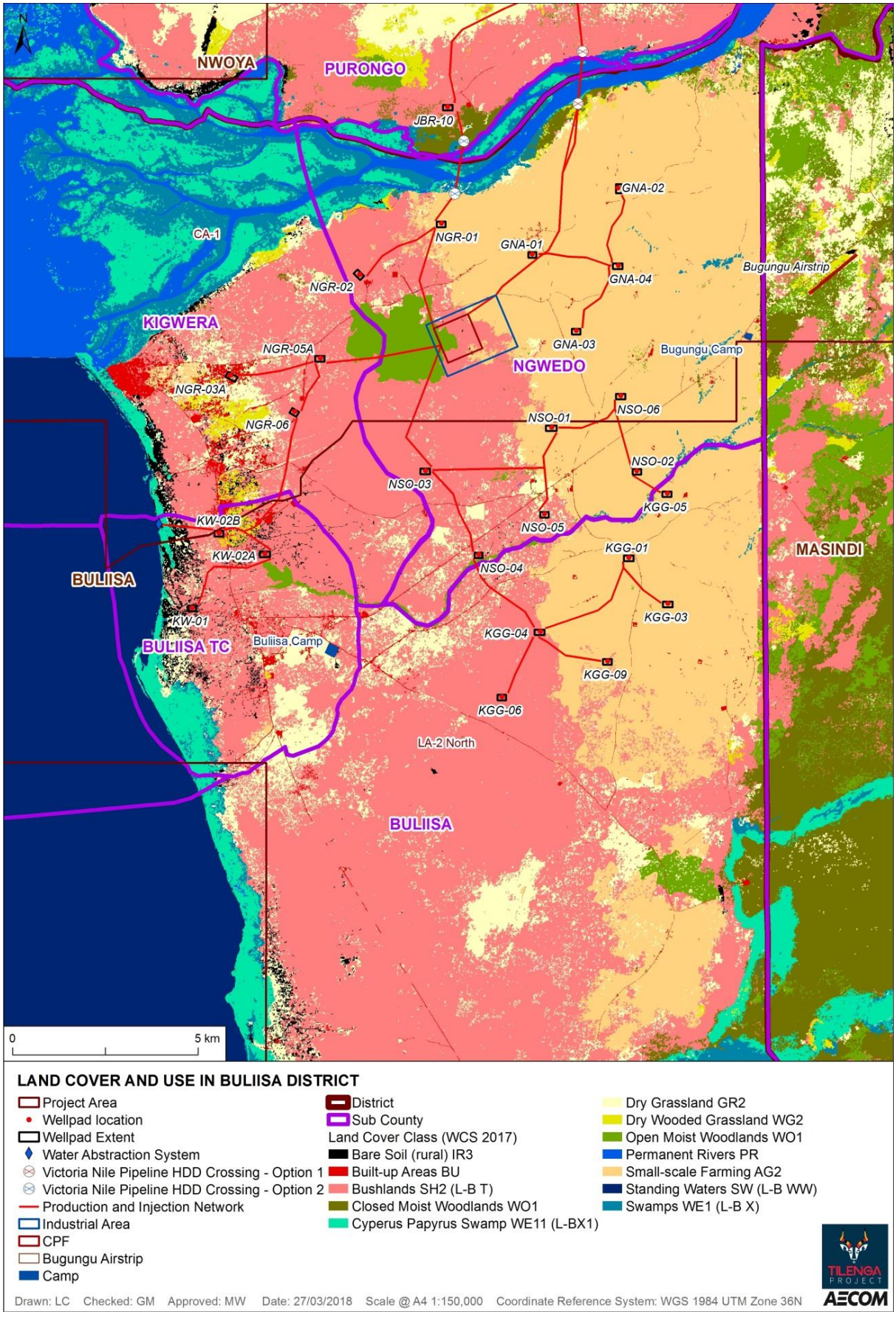


Figure 29: Land Cover and Use in Buliisa District

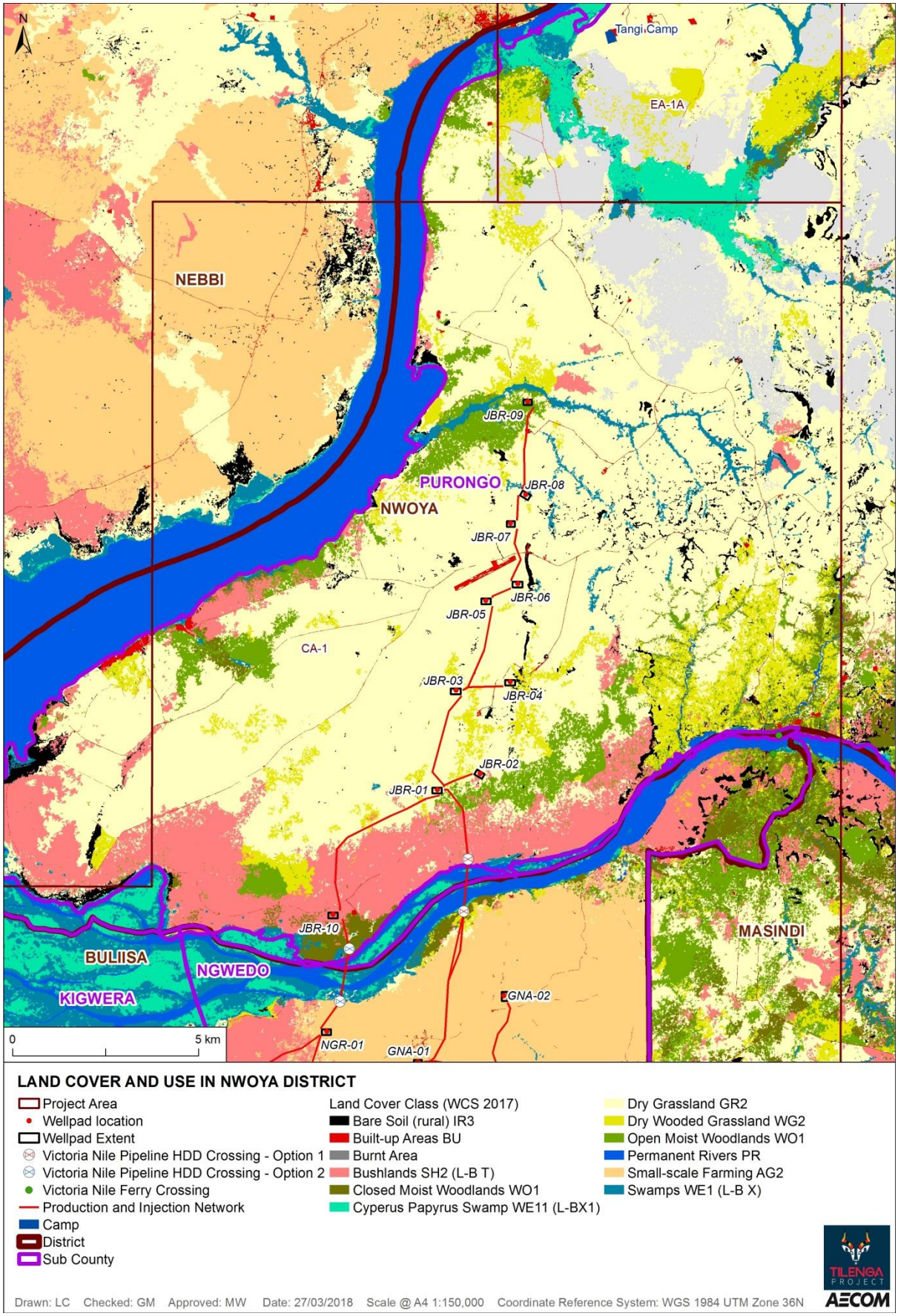


Figure 30: Land Cover and Use in Nwoya District

Vulnerable groups[7] identified within the Study Area are:

- women: particularly widows, female headed households, and women in the workplace;
- children;
- unmarried youth;
- elderly;
- persons with disabilities or chronically ill;
- migrants and refugees;
- minority ethnic groups;
- fishing communities;
- sex workers;
- Balaalo cattle herders; and
- People living with Human Immunodeficiency Virus (HIV) / Acquired Immunodeficiency Syndrome (AIDS).

6.4.1.2 Potential Impacts

Potential social impacts (positive and negative) are summarised in Table 8.

Table 8: Potential Social Impacts

Identified Potential Impacts	*Details of Potential Impact*
Displacement	
Physical Displacement of Communities due to Land Acquisition for the Project (direct impact) Loss of housing used as primary residence as well as for secondary purposes, requiring project affected people to physically relocate to establish dwellings elsewhere with potential detrimental effects on their standard of living.	**Phase:** Site Preparation and Enabling Works **Receptors:** The following villages will be affected by physical displacement: *Ngwedo Sub County:* Kasinyi, Kisomere, Kirama, Kilyango, Uduk II, Avogera, Ngwedo, Ngwedo Farm, Kibambura, Uduk I, Kisiimo *Buliisa Sub County:* Uribo, Bugana Kichoke, Kijumbya, Gotlyech, Kijangi, Beroya *Buliisa Town Council* Kakindo, Kizongi, Kityanga, *Kigwera Sub County:* Kiyere, Bukongolo, Kisansya East, Kisansya West
Economic Displacement of Communities due to Land Acquisition for the Project (direct impact) The acquisition of land will cause temporary and permanent loss of farming land and crops, grazing land, perennial crops such as fruit trees; loss of access to fishing areas and other natural resources. Structures linked to agricultural activities such as kraals and other structures used for storage of tools as well as premises used for small trading activities will also be permanently lost. This has the potential to detrimentally affect the standards of living of affected individuals and households.	**Phase:** Site Preparation and Enabling Works & Decommissioning **Receptors:** as for physical displacement impact with the addition of Got Apwoyo sub county in Nwoya District.

[7] These are groups that are considered relatively more vulnerable than the rest of the population due to factors that place them more at risk of discrimination, poverty or abuse (such as age, gender, ethnicity, disability).

Identified Potential Impacts	*Details of Potential Impact*
Changes to Traditional Land Tenure System (individualisation of land) exacerbated by Project Resettlement Process (induced impact) The perceived benefits of the resettlement and compensation process present incentives for commercialisation of land, which depends on privatisation and individualisation of land. The process of land acquisition and compensation therefore risks exacerbating land speculation and a transition from a communal ownership land tenure system to individual ownership.	**Phase:** Site Preparation and Enabling Works **Receptors:** Project affected communities (PACs) in Buliisa and Nwoya District
Increased Impoverishment due to lack of Financial Literacy and **Misuse of Compensation Payments** (indirect impact) Cash compensation as a result of land acquisition risks could cause increased impoverishment due to limited financial literacy and lack of experience in the long-term management of large sums of money.	**Phase:** Site Preparation and Enabling Works & Decommissioning **Receptors:** PACs affected by resettlement in Buliisa and Nwoya District
Increased travel distance to education facilities for displaced communities (indirect impact) Resettled households may end up living further away from school facilities or, in some cases, closer to schools.	**Phase:** Site Preparation and Enabling Works **Receptors:** PACs affected by physical displacement
Social Infrastructure and Services	
Displacement of Public Infrastructure due to Land Acquisition (direct impact) Land acquisition will trigger displacement of some public infrastructure and services currently accessed by local communities.	**Phase:** Site Preparation and Enabling Works **Receptors:** PACs in Buliisa District
Improved accessibility within the Project Area due to upgrading of access roads and construction of new roads (direct impact) Upgrading of the roads will enhance accessibility within the Project Area can have induced beneficial impacts such as increased trade and increased productivity (resulting in higher incomes) and improved delivery of public services.	**Phase:** Site Preparation and Enabling Works **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Increased pressure on education facilities (indirect / induced impact) Potential for increased pressure due to influx and increased demand for school places thanks to increased household incomes.	**Phase:** Site Preparation and Enabling Works, Construction and Pre-Commissioning & Decommissioning **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Disruption to road users from project traffic, construction and upgrading of access roads and due to access restrictions caused by land expropriation (direct impact) Road upgrade work and project traffic will restrict passage of vehicles (pedestrian access and access for livestock will be maintained), which will cause disruption to existing road users.	**Phase:** Site Preparation and Enabling Works, Construction & Pre-Commissioning & Decommissioning **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach

Identified Potential Impacts	*Details of Potential Impact*
Social Cohesion and Cultural Identity	
Social Disarticulation and **Increased Community and Family Conflict** (indirect/induced impact) The Project will potentially create sources of increased conflict within the community leading to social disarticulation, break-up of community ties, and family breakdown. Potential sources of conflict include: in-migration; the land acquisition and resettlement process; project employment and procurement; and access to information.	**Phase:** Site Preparation and Enabling Works and Construction and Pre-Commissioning **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Changes to Traditional Way of Life Leading to **Loss of Sense of Place and Community** (indirect/induced impact) Sense of community and social identity may be lost as the social context and way of life within the local communities changes due to: in-migration; land acquisition and resettlement; employment and procurement; physical changes to the environment affecting amenity.	**Phase:** Site Preparation and Enabling Works and Construction and Pre-Commissioning **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Increase in Crime Rate due to Project Induced In-migration and Increased Wealth Generation (indirect/induced impact). Influx and increased perceptions of wealth in the Project Area may lead to increased rates of crime and/ or increased perception of insecurity by the local community.	**Phase:** Site Preparation and Enabling Works; Construction and Pre-Commissioning; Decommissioning **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Increased **Pressure on Local Police Force** (indirect/induced impact) Existing resources for law enforcement are unlikely to have the capacity to deal with increased demands for their services due to Project induced changes to social cohesion, crime rates, increased traffic levels and due to influx both from within Uganda and from border countries (e.g. Democratic Republic of Congo (DRC)).	**Phase:** Site Preparation and Enabling Works; Construction and Pre-Commissioning; Decommissioning **Receptors:** Local police forces
Increase in Prostitution (indirect/induced impact) Project induced influx (particularly of single males) and increased levels of disposable incomes in the region could create increased demand for sex workers.	**Phase:** Site Preparation and Enabling Works; Construction and Pre-Commissioning; Decommissioning **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Employment and Economic Development	
Direct and Indirect **Employment Opportunities** (direct, indirect and induced impact) The Site Preparation and Enabling Works Phase will require a work force of up to approximately 2,000 personnel. Peak employment during construction will be approximately 4,000 workers. The Project has in place the following targets for employment and training of Ugandan citizens in Year 0 and Year 5: • Management staff: Year 0: 30% / Year 5: 45% • Technical staff: Year 0: 40% / Year 5: 60% Other staff (i.e. support and middle level staff): Year 0 and Year 5: 95%	**Phases:** All phases **Receptors:** local and national workforce and PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach

Identified Potential Impacts	*Details of Potential Impact*
Increased Demand for Goods and Services Stimulating Economic Growth (direct, indirect and induced impact) Procurement of local goods and services by the Project and increased spending by people working on the Project and by in-migrants will stimulate local economic growth resulting in improved living standards and quality of life for local communities.	**Phases:** All phases **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Development of more Educated and Skilled Workforce through **Training and Skills Development** for Affected Communities and Project Workers. (direct and indirect impact) Education and training will be provided to upskill the workforce in order to meet targets on local content. Employees will also get on the job and classroom training. The increase in the level of skills and safe working practices will contribute to an overall improvement in the skill-base of the local and national workforce.	**Phases:** All phases **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach as well as the local and national business communities.
Potential **Economic Loss due to Damage to Assets or Injury to Livestock** by Project Activities from Unplanned Events (direct impact) Project activities could directly or indirectly cause the loss Direct loss or damage may result from accidental collision with Project traffic or accidental damage caused by Project workers. Indirect loss or damage could occur from environmental contamination or degradation caused by the Project subsequently damaging community assets or damage of community assets leading to temporary loss of income.	**Phases:** All phases **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach as well as roadside settlements along the transport corridor.
Local Price Inflation (induced impact) Increased demand for local goods and services due to influx increased spending in the local economy by Project workers may cause local price inflation.	**Phases:** Site Preparation and Enabling Works and Construction and Pre-Commissioning **Receptors:** PACs in Buliisa, Nwoya, Hoima, Masindi and Pakwach
Job Losses Leading to Sudden Fall in Income Levels and Local Spending (direct impact) At the end of the construction phase the workforce will be gradually reduced, which could lead to a fall in income and reduced spending in the local area if workers fail to find an alternative job.	**Phases:** End of Construction and Pre-Commissioning and Decommissioning **Receptors:** Project workers and local business community
Increased Revenue for Uganda Leading to National Economic Growth (direct impact) The Project is expected to generate revenues during the operations phase in the form of royalties, annual fees, the State's share of profit oil, and corporate income tax.	**Phase:** Commissioning and Operations **Receptors:** National population
Loss in Government Revenues at Project Closure Impacting National and Local Economy (direct impact) At Project closure, the payment of royalties and taxes will stop, leading to a decrease in government revenues and reduced expenditure in the economy.	**Phases:** Decommissioning **Receptors:** National government & national population, Local government & Local population

Identified Potential Impacts	*Details of Potential Impact*
Governance	
Community Empowerment and Increased Community Participation in Decision Making (induced impact) The experience of participating in the processes of community engagement and dialogue in relation to the Project will enhance communities' competence in communicating their needs, grievances and expectations.	**Phase:** All phases **Receptors:** PACs in Buliisa and Nwoya District
Overburdening and Challenges to Local Government (indirect impact) Increased pressure is likely to be placed on local and national government because of an increased need for their services in monitoring oil and gas activities and helping to manage Project related environmental and community impacts such as resettlement, influx and land issues.	**Phase:** All phases **Receptors:** Local and national governments
Increased **Risk of Corruption** in the Public and Private Sector (indirect impact) Increased revenues for local and national government generated by the Project; increased opportunities to benefit from employment and procurement contracts; and opportunities to benefit from the compensation process for land and assets expropriated for Project infrastructure are all likely to create new incentives for bribery and corruption within the public and private sector locally and nationally.	**Phase:** All phases **Receptors:** Local and national governments, national business community and local business owners
Tourism	
Loss of Tourism Revenue due to the Presence of the Project Deterring Visitors to MFNP and Reduced Access to Key Visitor Sites within MFNP (indirect impact) The presence of the Project could reduce the demand for tourism in MFNP, which will lead to a loss in revenue to tourism operators, local government and national government, UWA and local communities bordering the park.	**Phase:** All phases **Receptors:** Tourism businesses, local and national government (including UWA), and communities bordering the park
Labour and Working Conditions	
Risk to Welfare of Workers in the Project Supply Chain due to Poor Enforcement of Standards to Uphold Labour and Working Conditions (indirect impact) Workers employed by secondary sub-contractors and project suppliers might be exposed to labour and working conditions that put their welfare at risk.	**Phase:** All phases **Receptors:** Supply chain workers
Increased use of **Child Labour** (indirect/induced impact) There is a risk that child labour may be used by companies supplying goods or services to the Project, which may also increase the rate of school dropout.	**Phase:** All phases **Receptors:** Children in PACs

The potential significance of identified impacts prior to the implementation of additional mitigation measures were assessed to generally range from Low to High Adverse during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases, and from Low to Moderate Adverse during the remaining Project phases. Beneficial impacts were assessed to range from Low to High

Beneficial during the Site Preparation and Enabling Works and Commissioning and Operations phases, and from Moderate to High Beneficial during the other Project phases.

Physical and economic displacement due to land acquisition for the Project will be managed in line with the Land Acquisition and Resettlement Framework (LARF) and approved Resettlement Action Plans (RAPs). The LARF, endorsed by GoU, the Project Proponents and JVPs in 2016, sets out 12 key principles and aims at standardising the way in which land acquisition and resettlement planning is conducted across the Albertine Graben Basin, assuring a consistent approach in line with the IFC PS (particularly PS5 on Involuntary Resettlement and Land Acquisition).

The development and implementation of RAPs in compliance with the LARF is an ongoing process aimed at identifying and outlining the actions required to acquire land and relocate people affected by the Project. It is estimated that there will be in total six RAPs. RAP 1 covering the Industrial Area and N1 Access Road in Buliisa, was submitted in September 2017 and approved by GoU on January 2018. As RAP 1 was carried out concurrently with the ESIA process, its findings have been incorporated into the ESIA report. The planning phase for RAP 2, RAP 3a, 4 and 5 has begun in 2018 and will be initiated in 2019 for RAP 3b.

6.4.1.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise impacts on people and communities. A Stakeholder Engagement Plan is already in place; this will ensure the community are informed both prior to the commencement of work on site, during the works on a regular basis and after. A Grievance Mechanism is established for the local community to raise compliant and concerns relating to Project activities. The LARF has been and will continue being implemented prior to the start of the Project and describes the legal and administrative framework, the land-use and land tenure of the Project Area, and provides guiding principles on valuation methodology, entitlements, resettlement action planning, and livelihood restoration.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential social impacts. The following list provides an indication of the key additional mitigation measures which will be employed to reduce adverse risks of social impacts and enhance potential beneficial impacts:

- Development of an *Influx Management Strategy* to mitigate in-migration impacts and maximise benefits for local communities. Implementation of the strategy will depend on joint coordination between the Project, government, other project developers, local communities and civil society;
- *Stakeholder Engagement Plan* to ensure that open and trustful relationships are maintained with stakeholders and they are fully aware and participate in decision making related to their environment;
- *Grievance Management Procedure* to allow recording and follow up on any grievances related to Project activities, in a constructive, proficient, and timely manner;
- *Labour Management Plan* to provide an overarching policy statement on labour and working conditions and a comprehensive set of human resource policies and procedures;
- *National and Community Content Strategy* which will build upon the Community Content, Economic Development & Livelihood Plan as well as national programs to build the capacity of Ugandan nationals and suppliers; and
- *Community Impact Management Strategy* to manage direct and indirect social, health and cultural heritage impacts to Project Affected Persons (PAPs) related to land acquisition / resettlement, and to manage other social Project impacts to Project Affected Communities (PACs) affected communities within the Project AoI:

  a) Project Affected Persons (PAPs)

  - *RAPs* and *Livelihood Restoration Plans (LRPs)* will be developed for future land acquisition in accordance with the *LARF*. The RAPs / LRPs will include specific actions such as avoiding forced eviction, providing compensation for loss of assets at replacement cost, restoring or improving livelihoods and living conditions of displaced persons and providing PAPs with financial literacy training to minimise the risk of misuse of the compensation package;
  - *RAP Monitoring and Evaluation Plan*; and

- *Cultural Heritage and Archaeological Management Plan* to provide support for cultural activities and to enhance the preservation and awareness of cultural heritage and traditions including language.

b) Project Affected Communities and Project AoI

- *Community Content, Economic Development & Livelihood Plan* which will comprise programmes that aim to improve and diversify local livelihoods of PACs to mitigate the risks and effects of influx; to enhance the capacity of local producers and service providers to provide goods and services to the Project; and to enhance the potential for members of PACs to participate in the Project workforce. The plan will include Livelihood Programmes, an Education Support Programme and a Community Employment Programme;
- *Community Health, Sanitation, Safety & Security Plan* to set overall objectives and targets for management of impacts on community overall health, safety and security, including measures to mitigate the risks / effects of population influx. The plan will include a Child and Gender Based Violence Prevention Programme, Health and Wellness Education Programmes, Disease Prevention and Vector Control Programme and an Institutional Capacity Building Programme;
- *Community Environmental Conservation Plan* to give communities a sense of ownership over the management of their local environment and natural resources. The plan will include a community based fisheries management and monitoring programme, a component on Community-Wildlife Prevention, and mitigation measures to manage influx;
- *Community Cultural Heritage and Archaeological Management Plan* and *Chance Find Procedure;*
- *Tourism Management Plan;*
- *Road Safety and Transport Management Plan; and*
- Compensation Procedure for unexpected damages.

6.4.1.4 Residual Impact and Conclusions

The main source of potential social impacts will be from Project induced in-migration, land acquisition and resettlement, employment and procurement opportunities. Additional mitigation measures will help to mitigate the negative impacts and enhance the beneficial impacts. However, some **Moderate Adverse** significance impacts could remain despite additional mitigation:

- Economic Displacement;
- Changes to Traditional Land Tenure System;
- Increased Pressure on Education Facilities;
- Local Price Inflation;
- Loss of Tourism Revenue;
- Social Disarticulation and Increased Community and Family Conflict;
- Changes to Traditional Way of Life leading to Loss of Sense of Place and Community; and
- Increase in Prostitution.

Taking into account additional mitigations it is considered that the residual negative impacts during the Commissioning and Operations and Decommissioning phases will be **Insignificant** to **Low Adverse** significance.

The Project is also expected to lead to a number of residual impacts with a significance of **Moderate Beneficial** and **High Beneficial** that will be experienced at the local and national level:

- Improved Accessibility within the Project Area;
- Direct and Indirect Employment Opportunities;
- Increased Demand for Goods and Services Stimulating Economic Growth;
- Development of more Educated and Skilled Workforce;

- Community Empowerment and Increased Community Participation in Decision Making; and
- Increased Revenue for Uganda Leading to National Economic Growth.

The Project Proponents are committed to implementing the identified embedded and additional measures contained within this ESIA. Due to the nature of the potentially significant negative impacts which have been identified (e.g. most are indirect or induced impacts) the Project Proponents recognise that there will be a need to work with government agencies and other developers within the region to help implement further mitigation to remediate any potentially significant negative indirect impacts. This collaborative approach will ensure that efforts can be focussed on where they are most needed and measures are monitored to ensure their effectiveness at reducing any negative impacts and enhancing benefits

6.4.2 Health and Safety

The health and safety assessment considered potential direct and indirect impacts on community health and safety as well as potential occupational, health and safety risks to workers. The potential for influx into the region of people seeking to benefit from jobs and wider economic opportunities created by the Project is one of the main sources of many of the potential community health and safety impacts.

6.4.2.1 Baseline

The Study Area for the health baseline is the same as that described in Section 6.4.1.1 for the Social Baseline. Information about existing health conditions for local populations is based on primary and secondary data collected via desktop review and field work (interviews, focus group discussions, household surveys and health facility assessments).

The most common three causes of morbidity and mortality in the Study Area are malaria, HIV and pneumonia, while diarrhoea is still another major illness especially among children under 5 years. The prevalence of malaria in children under 5 decreased significantly in all areas between 2009 and 2014.

Similar to the national trends, the prevalence of HIV/AIDS in the Study Area has increased over the recent past. According to the most current statistics at the Ministry of Health, the prevalence of HIV in the western (including Buliisa, Hoima and Masindi Districts) and mid-northern regions (including Nwoya District) is higher than the national average (8.2% and 8.3%, compared to 7.3%), while the West Nile region (includes Pakwach Town Council) recorded the second lowest prevalence at 4.9%. It is thought that the relatively high HIV prevalence in the western and northern regions is at least in part due to the presence of the vibrant fishing industry along Lake Albert. The most at risk populations (MARPs) for HIV identified across the Study Area are: female sex workers, fishermen, boda boda drivers, long-distance truck drivers and persons in uniformed services. In Purongo and Got Apwoyo Sub-Counties (Nwoya district) and Masindi district, casual labourers in the farming community (mainly men) are also considered a MARP. The hotspots or places where MARPs operate vary ranging from bars and night clubs (particularly in urbanised areas such as Hoima and Pakwach Town Council) to landing sites. Other places where MARPs operate include streets, restaurants, hotels, lodges, trailers, truck parking yards, and barracks.

Overall, the disease epidemiology of the regions across the Study Area is generally similar. The top three diseases diagnosed across the whole Study Area are malaria, upper respiratory tract infections, and acute diarrhoea. Other commonly reported diseases and health problems are intestinal worms, Sexually Transmitted Infections (STI), skin infections, eye infections, gastrointestinal disorders, pneumonia and ear, nose and throat Infections, and hypertension. Of note, interviews with the different health teams during the 2016 baseline survey revealed that cholera outbreaks are also quite prevalent especially along the river banks in Buliisa District.

While these are the most common diseases diagnosed and reported at the district level, villages bordering Lake Albert and the River Nile also experience a high burden of neglected tropical diseases, such as schistosomiasis (bilharzia) and onchocerciasis (river blindness). Non-Communicable Diseases are also reported to be becoming more common in the Study Area.

People most commonly seek healthcare advice and treatment from a medical doctor or health worker although traditional healers are also consulted for certain conditions and herbal or traditional remedies are also used to treat symptoms of disease.

All facilities in the Study Area provide outpatient services while in-patient care services are provided by all the hospitals and Health Centre (HC) IVs, and most of the HC IIIs and a few HC IIs. Health facilities available within Buliisa District are outlined in Table 9.

Table 9: Health Facilities in Buliisa District

SUB-COUNTY	HC II	HC III	HC IV	HOSPITAL	TOTAL
Biiso	-	Biiso	-	-	1
Buliisa S/C	-	Bugana	-	Buliisa General Hospital	2
Buliisa TC	-	-	Buliisa	-	2
	Uganda Martyrs (private)	-	-	-	
Butiaba	Butiaba*	-	-	-	3
	Bugoigo	-	-	-	
	Marine Military (private)	-	-		
Kigwera	Kigwera	-	-	-	1
Kihungya	Kihungya	-	-	-	1
Ngwedo	Avogera*	-	-	-	2
		-	-	-	
Total	**7**	**2**	**1**	**1**	**12**

*Although officially designated a HC II, the health centres in Avogera and Butiaba operate as HC IIIs. Plans to officially upgrade these facilities to HC III levels are underway however there have been delays in appointing and posting additional human resource. Source: Ref. 18 updated based on findings from 2016 baseline survey.

The major challenges faced by health facilities visited in the Study Area during the course of the 2014 Health Baseline Assessment (HBA) (Ref. 19), 2015 Social and Health Baseline Survey (SHBS) (Ref. 15) and 2016 baseline survey can be summarised as follows:

- Inadequate human resource capacity;
- Inadequate accommodation facilities for health workers;
- Lack of transport facilities to conduct outreach or provide emergency services;
- Medicine stock-outs;
- Staffing levels and infrastructure unable to meet high patient workload;
- Language barriers between patients and health workers due to in and out migrations;
- Shortage of safe and clean water;
- Lack of space;
- Financial constraints;
- Inadequate protection against mosquito ingress and transmission; and
- Inadequate emergency services provision (only one functioning ambulance to serve whole of Buliisa District).

In 2011, Uganda was reported to have the highest rate of construction accidents in the world, with 4,200 major injuries occurring per year. Underreporting of workplace accidents and diseases and lack of data on workplaces, as well as absence of District Occupational Health and Safety officers are common issues.

6.4.2.2 Potential Impacts

The following potential health impacts were assessed:

- *Increase in malaria* as a result of land use / habitat changes, resettlement, influx, and potentially improper drainage creating new vector breeding grounds (e.g. pooling of water);
- *Increased rates of Tuberculosis (TB) and respiratory disease* due to influx; potential inadequate worker accommodation for supply chain workers (outside Project camps); resettlement; and increased dust from construction activities;
- *Increased rates of zoonotic disease* (including rabies, ebola, ascariases and brucellosis) due to land use changes; overcrowding due to influx; and resettlement (people may move to more crowded areas);
- *Increased prevalence of HIV/AIDS and Sexually Transmitted Infections (STIs)* due to increased presence of commercial sex workers; increased presence of long distance truck drivers; and increased practice of risky sexual behaviour;
- *Improper management of Project waste or discharge* that could be leading to contamination of local environment and impact on human and livestock health;
- *Increase in prevalence of water, soil, sanitation and waste related disease* due to influx (overcrowding in makeshift accommodation without proper water and sanitation facilities and people living in closer proximity to each other); and resettlement (people may move to more crowded areas with reduced access to safe water sources and sanitation facilities);
- *Deterioration in nutritional status* due to changes in land use; displacement; influx (increased pressure on land and resources); and food price inflation;
- *Improvement in nutritional status* for those who benefit from increased household incomes thanks to direct and indirect employment opportunities created by the Project;
- *Injuries from road traffic accidents* due to increase in traffic on public roads;
- *Personal injury* due to possible inappropriate use of force by government or private security staff;
- *Risk of accident or injury* from infrastructure or machinery if community members get unauthorised access to worksites;
- *Injury due to increase in domestic violence or violence in the community* due to tensions caused by influx; the resettlement and compensation process; and competition over employment;
- *Increased prevalence of substance misuse* due to increased incomes from compensation payments and employment, increased levels of stress due to the resettlement process and influx;
- *Increase in teenage and unwanted pregnancy* due to increased practice of risky sexual behaviour;
- *Improvement in health seeking behaviour* thanks to increased disposable incomes, improved road network and influx (which could attract providers of transport services);
- *Overburdening of health infrastructure* due to influx;
- *Improved regional health planning and service delivery* due to the Project sharing data from its ongoing monitoring with other health partners;
- *Increase in non-communicable disease* due to increase in disposable incomes from employment spent on unhealthy diets or habits; influx and improved road network (leading to increased import of unhealthy foods, alcohol and tobacco products); and increased stress from resettlement and general changes to the area caused by the Project; and
- *Potential Exposure of workforce to insufficient occupational health and safety standards* due to non-implementation of adequate workplace health and safety practices.

The potential significance of identified negative impacts prior to the implementation of additional mitigation measures were assessed to range from Insignificant to High Adverse significance across all Project phases. Beneficial impacts were assessed to range from Low to Moderate Beneficial significance across all Project phases.

6.4.2.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on health and safety. This includes periodical medical check-ups for the

workers. A Road Safety and Transport Management Plan will be developed prior to commencing the Construction and Pre-Commissioning Phase. During construction and hydrotesting activities, there will be access restrictions to the RoW for safety reasons. Once complete there will be no restrictions to the public using the area.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential social impacts. The following list provides an indication of the key additional mitigation measures which will be employed to reduce potential risks of health and safety impacts and enhance potential beneficial impacts. Key measures include:

- *Influx Management Strategy* (note: Influx management will be addressed in individual plans);
- *Community Impact Management Strategy*, including:
    - LARF;
    - *RAPs*, including measures to mitigate any potential adverse community health and safety impacts caused by the resettlement process and measures to improve water and sanitation provision for physically resettled PAPs;
    - *Community Environmental Conservation Plan*, including the following initiatives:
        - Community Wildlife Conflict Prevention;
        - Livestock Health, providing support for monitoring and surveillance of livestock health; and
        - Community Natural Resources Enhancement, providing for extension of tree nurseries.
    - *Community Health, Sanitation, Safety & Security Plan* including the following sub-plans and measures:
        - Child and Gender Based Violence Prevention Programme;
        - Health and wellness education and communication campaigns for local communities;
        - Safeguarding Access to Community and Health Infrastructure;
        - Infection Prevention and Control Plan;
        - HIV Workplace Policy;
        - Health monitoring and reporting;
        - Human Rights training for security personnel; and
        - Vector and Malaria Control Programme.
- *Labour Management Plan* which will specify the level of healthcare that will be provided for different categories of employees, include a ban on drugs / alcohol for workers and include provisions under supply chain management to perform a health, safety and sanitation check of worker accommodation outside Project camps;
- *Road Safety and Transport Management Plan* to address the potential impacts of road traffic accidents due to increase in traffic on public roads;
- *National and Community Content Strategy* to build the capacity of Ugandan nationals and thereby enhance the associated beneficial impacts from improvement in standards of living and increased income; and
- *Occupational Health and Safety Management Measures* to which all Project staff, including contractors, will be required to adhere to, including policies on incident reporting, health and safety performance monitoring, hazard identification, and health surveillance.

6.4.2.4 Residual Impact and Conclusions

The main source of potential community health and safety impacts will be from Project induced in-migration, and employment and procurement opportunities. Additional mitigation measures will help to mitigate the negative impacts identified to ensure that the vast majority will be classed as **Insignificant** to **Low Adverse** significance. Additionally, enhancement measures will be put in place to further increase any identified **beneficial** impacts, where practical. However, some **Moderate Adverse** significance impacts may remain despite additional mitigation:

- Increased prevalence of HIV/AIDS and other STIs; and
- Increase in teenage and unwanted pregnancy leading to adverse impacts on maternal and new born health.

The Project is also expected to lead to a small number of residual **Moderate Beneficial** impacts that will be experienced at the local and national level:

- Improved health seeking behaviour; and
- Improved regional health planning and programme delivery.

The adherence to occupational health and safety regulations for all site personnel will help to ensure there are no negative impacts.

6.4.3 Archaeology and Cultural Heritage

6.4.3.1 Baseline

Baseline archaeology and cultural heritage conditions were established through a review of previous reporting and publicly available information (including inventories of archaeological sites, monuments and findspots), interviews with key informants, communities and stakeholders, and walkover surveys which were conducted in December 2016 and June/July 2017.

The walkover surveys involved the visual observation of exposed ground, sections and upcast soil, to identify any surface/buried archaeological remains such as areas of former settlements, and pottery or finds scatters. Any finds were photographed and locations recorded. It is proposed that all significant recovered materials will be deposited with the Uganda Museum, Kampala, following analysis.

Archaeological remains identified in the Project Area comprise (a) surface scatters or the features identified on the ground with limited vegetation, (b) surface scatters identified in areas of disturbed ground or in up-cast spoil from geotechnical works, earthworks, quarrying etc., or (c) features identified in sections, such as road and quarry cuttings, eroded sedimentary facies etc. These finds are indicators of wider buried archaeological sites.

TERMS TO KNOW

Cultural Heritage: The heritage that includes artefacts, monuments, groups of buildings and sites that have a diversity of values including symbolic, historic, artistic, aesthetic, ethnological or anthropological, religious, scientific and social significance (UNESCO 1972).

Archaeology: The scientific study of the physical evidence of past human societies recovered through collection, artefact analysis, and excavation.

Findspot: the place where an archaeological object has been found.

Chance Find Procedure is a Project-specific procedure that outlines what will happen if previously unknown physical resources are encountered during Project activities.

Ekihongo kya Sambiye cultural site

A family shrine in the vicinity of well pad NSO-06.

The survey team recording grave locations with members of the local community in the vicinity of well pad NGR-02.

A ritual site, with local elder in the foreground, in the vicinity of well pad KGG-06. The large tree formed the focus of worship.

Over 1,400 identified palaeontology, archaeology and cultural heritage sites have been identified within the Project Area; however, there are no internationally recognised or designated tangible cultural heritage features or areas, or proposed critical cultural heritage features or areas, within the Project Area. The Project Area does not contain any World Heritage Sites or Tentative List World Heritage Sites.

An assemblage of pottery collected in the vicinity of well pad KGG-01 from within approximately 3m of this spot.

A pottery scatter in an erosion scar near the seasonal river in the vicinity of well pad NSO-04. The site was identified as a ritual site by local elders.

Modern decorated pottery sherds recorded in the vicinity of well pad NS0-06.

Pottery identified in the mud walls of a structure in the vicinity of well pad KGG-09. The pottery had been excavated from a clay pit nearby during the construction of the house.

6.4.3.2 Potential Impacts

The closest archaeological and cultural heritage receptors to the Project activities were identified and categorised by their sensitivity. The identified receptors included sacred trees, traditional religious cultural sites, places of worship, graves, and palaeontological and archaeological sites and findspots (of regional or local significance).

Taking into account the embedded mitigation measures built into the Project design, the potential impacts on archaeology and cultural heritage which were assessed are: Potential for Loss of access / damage to sacred trees; sacred watercourses, springs and marshes; traditional religious cultural sites (clan sites and family shrines); Loss of access to or disruption of services at places of worship – churches and mosques; Damage to or removal of cemeteries and graves; and Damage to or removal of palaeontological and archaeological remains (complex or isolated).

Potential impacts were considered with respect to whether they would be temporary or permanent, direct or indirect, beneficial or negative, and may occur throughout the life of the Project, or be restricted to a single phase.

The potential significance of identified impacts prior to the implementation of additional mitigation measures were generally assessed to range from Low to Moderate Adverse.

6.4.3.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on archaeology and heritage. The location and layout of the Proposed Development has sought to avoid known heritage and archaeology assets to minimise direct potential impacts, as well as being considerate to potential indirect impacts on setting.

The mitigation of archaeology and cultural heritage within the Project Area involves a range of standard mitigation measures adhering to national and international best practice, and also presents a significant opportunity to develop innovative and appropriate methodologies in terms of the investigation of archaeological sites. The identified additional mitigation measures for each of the potential impacts include the following:

- Relocation of sacred sites, places of worship, or graves where necessary;
- Archaeological investigation and recording;
- Developing and implementing a Archaeology and Cultural Heritage Management Plan, a Chance Find Procedure and Cultural Heritage Awareness Training;
- Fixed traffic routes and traffic management;
- Flagging of vulnerable sites;
- Building capacity in archaeology and cultural heritage management; and
- Building capacity in museum development.

6.4.3.4 Residual Impact and Conclusions

The mitigation of archaeological remains through excavation and recording will contribute to the national and international scientific knowledge base via research and capacity-building in cultural heritage, and will therefore be classed as a **Beneficial** impact. The Project will contribute to workers' training and has the potential to make a significant contribution to national research and institutional capacity building.

Overall, with mitigation, the residual impact significance on archaeology and cultural heritage is assessed to vary between **Insignificant** and **Low Adverse** significance. The residual impacts on archaeology are not anticipated to be significant in consideration of the mitigation strategy. It currently revolves around four key concepts: avoiding or minimising impacts by design (protection and preservation), mitigation (excavation and relocation), cultural heritage management systems (plans and procedures) and offset via technical and institutional capacity building and development of cultural heritage aspects of ongoing social programmes and is therefore expected to result in some Beneficial impact.

6.4.4 Ecosystem Services

6.4.4.1 Baseline

Ecosystem services are defined as "*the benefits that people, including businesses, obtain from ecosystems*" (IFC, PS 6 (Ref. 3)). A baseline assessment was undertaken to establish the status of these services within the affected ecosystems within the project AoI. This included identifying the location of ecosystem service beneficiaries and the extent to which they benefit from the services, where

feasible. Four broad categories of ecosystem service were identified by the Millennium Ecosystem Assessment (Ref. 20):

- ***Provisioning Services***: the products people obtain from ecosystems e.g. water, crops, and livestock;
- ***Regulating Services***: the benefits people obtain from the regulation of ecosystem processes e.g. pollination, noise regulation and local/global climate regulation;
- ***Cultural Services***: the cultural, educational and spiritual benefits people obtain from ecosystems e.g. sacred sites, fishing, and ecotourism; and
- ***Supporting Services***: the natural processes that maintain the other services e.g. soil formation and nutrient and water cycling.

Supporting services differ from provisioning, regulating, and cultural services in that, unlike the other types of service from which people can directly benefit, their impacts on human well-being are indirect and mostly long-term in nature. All other ecosystem services ultimately depend on them. Supporting services are linked to particular biophysical structures or processes of an ecosystem, such as the way water storage is linked to soils, trees, plants, and other vegetation, and underpin the provision of the services which are of direct value to people, such as reduced surface water runoff, filtering of air and water quality, timber provision, and wild foods. These final ecosystem services provide benefits to people such as reduced damages from flooding, as shown in Figure 31.

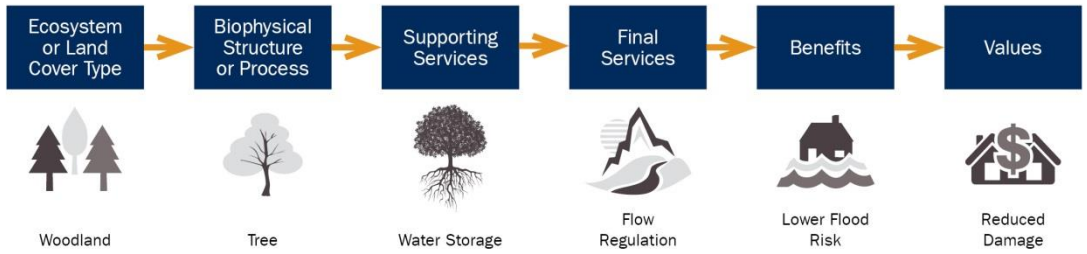


Figure 31: Relationship between Ecosystem, Services, and Benefits

As a result of prior scoping exercise and further baseline data collection a list of priority ecosystem services to be included in the impact assessment were identified. The priority ecosystem services and beneficiaries are presented in Table 10 below.

Table 10: Priority Ecosystem Services

Priority Ecosystem Service	Service Type	Beneficiaries
Crop Production	Provisioning	Local people engaged in crop production and their families
Livestock and Fodder / Pastoralism	Provisioning	Livestock owners, Balaalo and other herders
Capture Fisheries	Provisioning	Communities engaged in fishing activities
Timber and Woody Biomass (including energy)	Provisioning	Local communities and charcoal producers
Wildfoods and Bushmeat	Provisioning	Hunters (for subsistence, commercial and cultural purposes)
Water (for Drinking, Supply and Regulation)	Provisioning	Communities within Project Area and grazing animals
Fibres and Ornamental Resources	Provisioning	Local people engaged in the collection and preparation of materials
Bio-chemicals and Natural Medicines	Provisioning	Traditional healers and local people who use natural medicines and the services of traditional healers
Local and Global Climate Regulation	Regulating	Local people and climate

Priority Ecosystem Service	Service Type	Beneficiaries
Hazard Regulation	Regulating	Local people whose dwellings or livelihoods leave them vulnerable to damaging weather events such as floods or climatic changes such as extended drought periods
Cultural and Spiritual Values	Cultural	Local people who use sites of cultural and/or spiritual importance
Tourism and Recreation Values and Wild Species Diversity	Cultural	Local people employed in the tourist sector around MFPA and Central Forest Reserve, and national and international visitors to MFPA and Central Forest Reserve.
Scientific and Knowledge Values	Cultural	Researchers, academic community, local people who are employed in research efforts and/or learn from the research themselves, and local people, tourists and conservation organisations who benefit from research findings

6.4.4.2 Potential Impacts

The assessment of impacts on ecosystem services broadly follows the approach set out in Section 3 but differs in that it assesses potential impacts from the point of view of the ecosystem service beneficiaries. The potential impact is therefore measured as the change in human well-being (relative to the baseline) as a result of a change in the level of provision of an ecosystem service.

The relationship between the Project Area, the Affected Ecosystems, and the Affected Beneficiaries is illustrated in Figure 32 below.

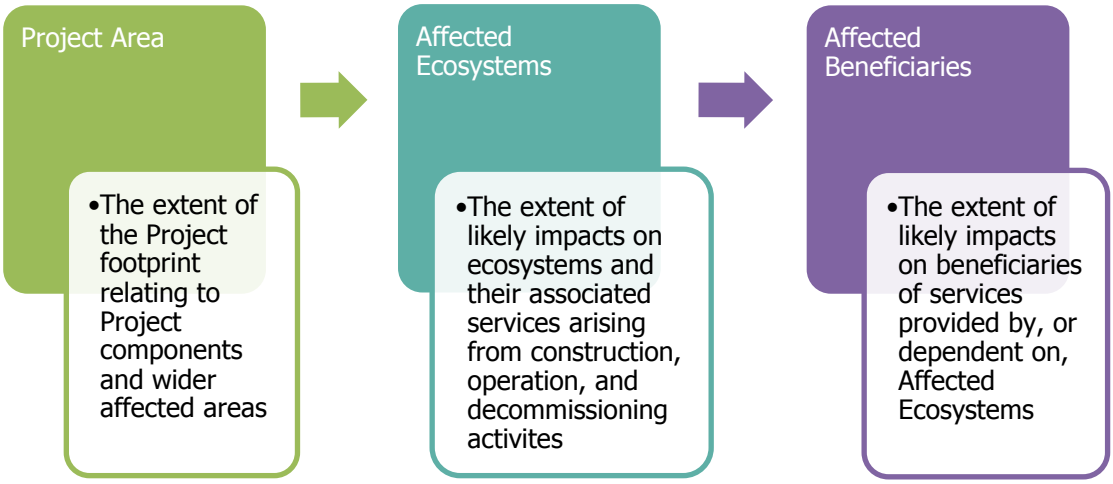


Figure 32: Relationship between Project Area and Affected Beneficiaries

In addition to Project-specific activities, each phase of the Project will create employment and procurement opportunities (both direct and indirect), which will be a source of direct, indirect and induced impacts. Resettlement and influx triggered by the Project will also be key sources of further indirect and induced social impacts. Other ecosystem service impacts are likely to arise from the presence of the Project as a whole and the overall changes it will bring to the physical and social environment and therefore cannot be attributed to a single Project activity.

For each of the identified priority ecosystem services, receptor sensitivity was assigned based on:

- The degree to which the livelihoods of receptors depend on the ecosystem service;
- The number of available substitutes for the ecosystem service; and
- The extent to which provision of the ecosystem service would be impaired by an impact.

An impact magnitude was defined based on the number of beneficiaries affected, the degree and speed with which the ecosystem service can recover, the duration of the impacts, and the regularity with which beneficiaries are affected by the impacts on the ecosystem service. Taking into account the in-built

design measures, the receptor sensitivity and impact magnitude were used to determine an impact significance based on the criteria presented in Table 1.

The potential significance of identified negative impacts prior to the implementation of additional mitigation measures were assessed to range from Insignificant to High Adverse. Moderate Beneficial impacts to scientific and knowledge values were identified for all phases, with additional Low Beneficial impacts identified for a number of ecosystem services during the Decommissioning phase only.

6.4.4.3 Mitigation and Management

The design of the Proposed Development has incorporated a number of embedded mitigation measures to minimise potential impacts on ecosystem services as discussed in sections 6.3.2 and 6.3.3 above.

A number of the additional mitigation measures identified within other technical chapters of the ESIA are also relevant for the mitigation of potential impacts to ecosystem services. Of particular relevance are a number of the plans and strategies presented in ***Chapter 16: Social*** e.g. Resettlement Action Plans, Stakeholder Engagement Plan, Community Impact Management Strategy and Influx Management Strategy, Community Content, Economic Development and Livelihood Plan and the Community Environmental Conservation Plan.

Additional relevant mitigation measures are presented in ***Chapter 13: Terrestrial Vegetation, Chapter 14: Terrestrial Wildlife, Chapter 15: Aquatic Life,*** and ***Chapter 17: Archaeology and Cultural Heritage***.

6.4.4.4 Residual Impact and Conclusions

Following the implementation of the identified additional mitigation measures, negative impacts to priority ecosystem services will be reduced to **Insignificant** to **Low Adverse** residual significance for the majority of ecosystem services during all phases with the exception of the following which have been assessed as having **Moderate Adverse** residual impacts:

- Capture fisheries (indirect and induced impacts due to increasing short and medium term fishing pressures and contribution to over-fishing);
- Tourism and Recreation Values and Wild Species Diversity (direct impacts on noise and visual amenity, and induced and indirect impacts to visitor's perceptions of the MFPA and an increase in hunting activities associated with influx); and
- Wildfoods and Bushmeat (indirect and induced impacts due to an increase in hunting activities).

Moderate Beneficial significance impacts to scientific and knowledge values were identified for all phases, with additional **Low Beneficial** significance impacts identified for a number of ecosystem services during the Decommissioning phase only.

Overall, it is considered that the potential indirect impacts are likely to be more significant than the potential direct impacts identified and harder to mitigate. However, if the implementation of mitigation strategies addressing potential indirect impacts are successful, pressures on the key ecosystems supporting these ecosystem services are likely to be less significant. Monitoring on the effectiveness of the mitigation will be required.

6.5 Unplanned Events

6.5.1 Introduction

Unplanned events are activities that are not expected to occur during the Project's normal activities, such as emergencies, accidents, and incidents. The Project follows a defined process for ensuring that unplanned events are appropriately assessed throughout the Project lifecycle in terms of their potential to impact on Health, Safety, Social and Environmental receptors. This process ensures that engineering design criteria is established in order to reduce the likelihood and severity of unplanned events to a level that is As Low As Reasonably Practicable (ALARP).

The key activities / events which could result in an unplanned event that have been assessed in the ESIA include:

- Road traffic and equipment/plant use which could bring an increased risk of traffic accidents, spills, fires, damages to third party assets or accidental introduction of Alien/Invasive Species;
- Third Party activities that may result in fire, but also sabotage, protests, violence or damages generated by animals;
- Natural events such as seismicity;
- Health epidemics that may spread to the local community or wildlife;
- Drilling of wells, which could bring risks of fluids losses or blowouts; and
- Equipment failure, which could bring risks of spills but could also result in need for emergency flaring, venting, and associated requirement for power generation.

6.5.2 Impact Assessment

The likely significance of potential impacts from unplanned events has been identified using the descriptors given in the standard impact significance criteria (outlined in section 3), which define an impact significance as *High*, *Moderate, Low, or Insignificant*. The methodology applied to assess unplanned events however slightly differs to the standard approach due to the undefined location and inherently high magnitude of impacts, meaning it is not always possible to accurately determine the receptor sensitivity (although broad assumptions have been made and are noted in this chapter).

The nature of an unplanned event being an emergency or unexpected, means the significance of any potential impact is generally likely to be *High*.

With appropriate control measures and monitoring in place, the probability of unplanned events occurring is much reduced. Measures to reduce the likelihood of occurrence and minimise any impacts that do occur have been described. Reducing the likelihood of an event happening has been key to the design and development of the Project.

6.5.3 Emergency Preparedness and Response Plan

The Project Proponents have implemented the following method as part of its Emergency Preparedness and Response Plan to define and assess risks associated with unplanned events:

- Hazard identification – identification of the activities that could lead to the occurrence of an unplanned event;
- Development of unplanned event scenarios;
- For each unplanned event scenario, defining the likelihood of occurrence;
- For each unplanned event, defining the potential impacts in relation to potentially affected receptors (Health, Safety, Environment and Social);
- Defining and describing the geographic range of occurrence of potential unplanned events;
- Defining appropriate risk reduction and management measures to reduce the likelihood of occurrence and the potential impacts of each unplanned event to minimise the residual significance of any resulting impacts to ALARP.

Project Proponents are in the process of defining the risk register of the events which will constitute the basis to prepare the Emergency and Response Plan for the future operations.

The purpose of this document is to provide practical guidelines on how the Project Proponent shall respond to an emergency situation. As well this document will provide guidelines on emergency response organisation, on training and periodic drill requirements. Each risk of an unplanned was categorised into one of three levels, with level 1 being an unacceptable risk (meaning action is required) and Level 3 is an acceptable list. Level 2 risks may be acceptable only if the demonstrate to be ALARP.

6.6 Potential Cumulative Impacts

6.6.1 Cumulative Impact Assessment Methodology

An assessment of potential cumulative effects of the Project together with other developments that will also have effects within the Project's AoI was conducted to meet the requirements of the GoU EIA Regulations (Ref. 2) and IFC PS 1 (Ref. 3). The approach taken was based on the IFC's *Good Practice Handbook to Cumulative Impact Assessment and Management* (Ref. 21).

The recommended approach to Cumulative Impact Assessment (CIA) focuses on the effects on identified valued environmental and social components (VECs).

The IFC guidance states that Government and regional planners have ultimate responsibility for CIA and introduces the concept of a rapid CIA; a preliminary approach for private sector developers that can be integrated in to the ESIA process. The rapid CIA may evolve into a more robust and comprehensive CIA led by Government or regional planners.

The IFC Guidance sets out six key steps for rapid CIA as shown in Figure 33.

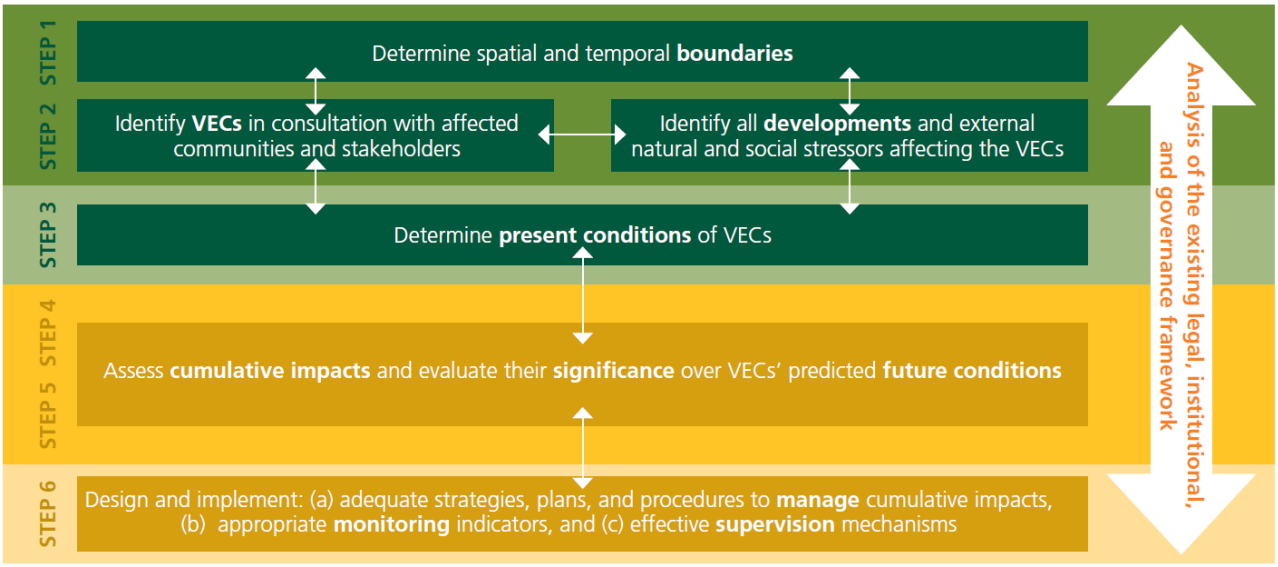


Figure 33: Key Stages in the Rapid CIA Process following IFC Guidelines

Box 5 - Priority VECs

- Nature-based tourism in protected areas
- Critical and Natural Habitat and key indicator species
- Climate change linked to carbon emissions
- Sustainable woodland
- Bushmeat
- Access to land and shelter
- Open-access grazing land
- Food security
- Community health
- Access to safe drinking water resources
- Primary and secondary school education
- Lake Albert capture fisheries
- Local economic stability
- Safe communities
- Social cohesion

6.6.2 Selection of Priority VECs

The selection process for prioritising VECs was based on the following criteria:

- The Tilenga Project has impact on the VEC. (As the IFC guidance (Ref. 21) says '*VECs to include are those that would be affected by the project. Thus VECs for which an impact was deemed insignificant in the ESIA are not to be included in the CIA'*);
- The VEC will also be affected by other development(s);
- The VEC was identified as being of particular concern to stakeholders; and
- The VEC should be prioritised because it is, or is declining towards, in an unsustainable state and/or critical threshold.

An initial long list of candidate VECs was identified in the Project Scoping Report and then a stakeholder workshop was undertaken in November 2016 with the purpose of further prioritising VECs (Ref. 22). Further refinements were made to the list of VECs based on the results of the ESIA and in order to reduce overlaps between VECs.

Based on the above, and linked to the results of the Project ESIA, the priority VECs selected for the Rapid CIA are listed in Box 5.

IFC DEFINITIONS

Cumulative Impacts those that '*result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted*'.

Cumulative Impact Assessment is *'the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen VECs over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible'*.

Valued Environmental and Social Components are *'sensitive or valued receptors whose desired future condition determines the assessment end points to be used in the CIA process'*.

'VECs are environmental and social attributes that are considered to be important in assessing risks'.

6.6.3 Other Developments

Following IFC guidance (Ref. 21) the CIA considers the potential cumulative impacts on VECs as a result of the Project together with other *'reasonably defined developments at the time the risks and impact identification process is conducted'*.

A list of other known developments within the Project AoI, or likely to have impacts in areas that overlap with the Project AoI was prepared between November 2017 and March 2018 and is presented in Table 11 below. This list includes the associated facilities identified in Section 4.

Table 11: Other Developments

Project Title	Description
Tilenga Feeder Pipeline:	A proposed 24-inch-diameter, 95 km pipeline which will transport export crude from the CPF to the planned delivery point in Kabaale, Hoima District.
Further development in EA-1A, CA-1 and LA-2 North.	Development of existing and additional fields in EA-1A, CA-1 and LA-2 North consisting of similar infrastructure (well pads, flowlines, access roads) to the Project and connecting to the CPF.
East Africa Crude Oil Export Pipeline (EACOP)	A proposed 24-inch-diameter export pipeline approximately 1,445 km in length which will route produced oil from the delivery point in Kabaale to an export terminal in Chongoleani, Tanga, Tanzania.
Waste management storage and treatment facilities	The Project Proponents are currently investigating the need for new or improved waste management facilities at locations not yet specified.
Critical Oil Roads	Road improvements that will be developed under the jurisdiction of the UNRA for the purpose of supporting the oil industry. Upgrades to 11 roads and several bridges to bituminous standard are proposed.
132 kV Transmission Line from Tilenga CPF to Kabaale Industrial Park	The transmission line will both evacuate excess power being generated at the Tilenga CPF and also import power to the CPF when the excess gas is reduced / depleted.
Kingfisher Development	An oilfield development south of the Project Area which will include 31 wells on four onshore well pads. To be developed by JV Partners TEP Uganda, TUOP, and CNOOC.
Kabaale Industrial Park	The industrial park is to include a greenfield refinery, an international airport, a crude oil export hub, energy based industries, petrochemical industries and other associate infrastructure including roads, power generation and transmission and water supply.
Kabaale Airport	Airport within Kabaale Industrial Park to accommodate large cargo planes and enable the transport of long, heavy and sensitive materials and equipment to be utilised in the planned refinery and other oil related activities.
Kaiso-Tonya Field Development (LA-2 South)	An oilfield development area south of the Project Area, likely to be similar to the Tilenga and Kingfisher Developments. To be developed by TEP Uganda, TUOP, and CNOOC.
The Hoima–Kampala Petroleum Products Pipeline	A proposed 210 km pipeline to transport refined crude oil products from the Kabaale Refinery in Hoima to a distribution terminal in Kampala.
Karuma Hydroelectric Power Station	A 600 megawatt (MW) hydroelectric power station under construction upstream of Karuma Falls on the Victoria Nile.
Ayago Hydropower Project (HPP)	A proposed 600 MW hydroelectric power project to be constructed along the Victoria Nile, downstream of Karuma Power Station, but upstream of Murchison Falls.
Other major hydro power projects on Victoria Nile	An additional three large hydro power projects are proposed within MFNP: Oriang (392 MW), Kiba (288 MW) and Murchison (648 MW).
Karuma Interconnection Project	Project comprises lines and substations between Karuma and Olwiyo and is likely to run through MFNP.
Nkenda- Fortportal-Hoima Transmission Project	Project comprises transmission line, substation and substation extension. Part of the line would run through Hoima District.
Agricultural Developments	Numerous, including several within the Project AoI.
Railways	The Government of Uganda through the Ministry of Works and Transport is leading the development of a Standard Gauge Railway network. The proposed Gulu to Pakwach line lies within the Project AoI.
Small Scale Power Projects	Several projects, generally within the Project AoI comprising the Hoima Small HPP (constructed), Nkusi HPP (under construction), and proposed Biogas Plant in Bwendero and Pachwa Small HPP.

Project Title	Description
Industrial Developments	Including a Batching Plant in Kigorobya and Distillery Facility in Kisalizi.
Tourism Developments	Three tourism lodges within or close to MFPA may be expanded or constructed. These are Pakuba Lodge (expansion), Albert Nile Lodge (a new lodge), and Twiga Safari Lodge (expansion).

6.6.4 Impact Assessment

6.6.4.1 Potential Impacts

For each of the identified priority VECs, the following was identified:

- *Indicators* of baseline conditions with a summary of trends (where data was available);
- The *sensitivity* of the VEC;
- A *threshold* (a goal, target and/or limit of acceptable change against which the threat to the sustainability of the VEC can be determined);
- *Developments* that could contribute to potential cumulative impacts on the VEC; and
- The potential cumulative effect and the magnitude of the effect which were used to determine the overall impact *significance* based on the risk that the threshold will not be met.

The significance of the potential cumulative impacts for each VEC were assessed as presented in Table 12:

Table 12: Potential Cumulative Impact Significance

VEC	Potential Impact Significance	VEC	Potential Impact Significance
Nature Based Tourism in Protected Areas	Moderate to High Adverse	***Food Security***	Moderate Adverse
Critical and Natural Habitat and Associated Species	High Adverse	***Primary and Secondary School Education***	Moderate Adverse
Sustainable Woodland	High Adverse	***Safe Communities***	Low to Moderate Adverse
Open-Access Grazing Land	High Adverse	***Climate Change linked to Carbon Emissions***	Low to Moderate Adverse
Access to Safe Drinking Water Resources	Moderate Adverse	***Access to Land and Shelter***	High Adverse
Local Economic Stability	Beneficial Effect	***Community Health***	High Adverse
Lake Albert Capture Fisheries	High Adverse	***Social Cohesion***	Moderate Adverse
Bushmeat	High Adverse		

6.6.4.2 Mitigation and Management

The Project Proponents will aim to mitigate potential cumulative impacts in the following ways:

- By informing Project level mitigation to mitigate the Project's contribution to potential cumulative impacts;
- By identifying the Project level mitigation measures that could also be applied to other developments that will have the same types of impact to promote common standards and approaches;
- By identifying opportunities to scale up specific, priority Project level mitigation strategies by inviting other developers or Government agencies to contribute funding (or some other form of support); and
- To support the mitigation of cumulative effects by identifying and promoting possible supervision mechanisms to implement measures that are beyond the capacity of the Project. To this end, the CIA promotes the establishment of a Regional Cumulative Impacts Management (RCIM) initiative.

6.6.4.3 Conclusions

The effectiveness of the identified mitigation measures will depend on the success of the collaborative efforts between all stakeholders to reduce negative impacts and ensure that all potential impacts are reduced to an acceptable level.

In order to promote and implement collaboration between developers the Project Proponents will promote the RCIM initiative; a regional mechanism for the sustainable management of priority VECs. The RCIM initiative envisages that mitigation measures would be designed and implemented collectively by developers, and other stakeholders, under GoU's leadership. The first stage in the implementation process will be to establish the RCIM in liaison with Government and other stakeholders and agree its objectives and priorities. Once agreement with Government and other participants is confirmed, the RCIM will subsequently develop detailed strategies and actions for the implementation of collaborative mitigation which will help to reduce any potential adverse impacts to an acceptable level.

6.7 Transboundary Impacts

Potential transboundary impacts are those which could extend to multiple countries, beyond the host country of the project, but are not global in nature. An assessment of the potential for transboundary impacts resulting from the Project was conducted to meet the requirements of IFC PS1 (Ref. 3).

6.7.1 Potential Transboundary Effects

Uganda shares its borders with Kenya to the east, Tanzania and Rwanda to the south, South Sudan to the north and the DRC to the west. The Project is entirely within Uganda, with the closest international border being the DRC, approximately 15 km away from the closest point. The Project is located approximately 200 km from South Sudan, 250 km from Kenya, and 400 km from either Tanzania or Rwanda.

The following potential transboundary impacts were initially identified during the ESIA process:

Potential Impacts on Transboundary Ecosystems

- *Land take in the Albertine Rift Ecosystem (Insignificant):* The Project will involve some direct land take in the Albertine Rift ecosystem, and is expected to lead to some potential indirect impacts through the loss of habitat due to firewood / plant collection, fire setting, poaching activities, and land clearance and settlement activity. Although local residual impacts are assessed to be Moderate Adverse significance, they are not expected to be of sufficient magnitude to lead to any noticeable transboundary impacts;
- *Water Abstraction in Lake Albert (Insignificant)*: The construction of the Water Abstraction System in Lake Albert (which shares an international boundary with DRC), could lead to noise and direct lakebed interference; however, localised residual impacts are not expected to be significant and are therefore unlikely to affect DRC or other neighbouring countries. The total volume of abstraction is not expected to affect the lake's water levels or hydrodynamic regime; and

- *Sustainable Fisheries (Low Adverse)*: Any potential impacts affecting the freshwater environment and fish abundance in Lake Albert would have a knock on impact relating to fisheries and fishermen. Any population increase in the local area as a result of the Project and induced in-migration could also put added pressure on existing fish resources. The Project is predominantly onshore and where works are happening within the water or shoreline they will be relatively localised and unlikely to affect fisheries in the region or in neighbouring countries. Additional fishing activity occurring as a result of immigration and population pressures is expected to be small relative to the size of the waterbodies.

Potential Impacts on Other Ecosystems

- *Deterioration of Water Quality in the Nile Basin (Insignificant)*: There is the potential for environment and social impacts downstream if land degradation, sedimentation, accidental pollution, or water abstraction occur within the Nile Basin in Uganda due to Project activities. Any over-abstraction of water with social impacts would represent a major risk to the Project. However, the Nile Basin has a large recharge capacity and massive dilution effects due to its size and number of tributaries. Although accidental spills / pollution may have significant impacts locally, they are unlikely to have any impact outside of Uganda; and
- *Abstraction from groundwater aquifers and accidental spills (Insignificant)*: There is a groundwater aquifer in the Lake Albert area that is shared between Uganda and DRC. Groundwater level and quality monitoring will be carried out to establish any Project impacts on groundwater level and quality and if insufficient groundwater exists the Project water shall be abstracted from Lake Albert. Any minor spills are unlikely to cause noticeable change to the groundwater conditions, and in the event of major spillages the viscosity of the oil should slow its rate of percolation and transport, facilitating remediation. Due to the distances involved and dispersion that would be expected, it is not considered that any significant transboundary impacts will occur as a result of impacts on the groundwater aquifer.

Potential Impacts on People and Communities

- *Air quality and greenhouse gas (GHG) emissions (Insignificant to Moderate Adverse):* The Project will emit atmospheric pollutants and GHG emissions. Although the impact on neighbouring countries' air quality is considered insignificant, GHG emissions have the potential to contribute to climate change on a national and global scale, and are a well-documented transboundary issue. The estimated Project GHG emissions are considered to present impacts with Insignificant to Moderate Adverse residual significance. However, this impact has been judged to be Moderate Adverse in a national context, against the Ugandan national annual emissions target for 2030; the impact on neighbouring countries will be indirect and cannot be quantified. In-built design measures, such as appropriate stack heights, implementation of no operational flaring, and ensuring that emission sources have high efficiency will allow minimising the Project's GHG emissions.
- *Community Health (Low Adverse)*: Labour and social migration through the Project also has the potential to increase the prevalence of communicable diseases and sexually transmitted infections (mainly due to influx. Many infectious diseases, such as cholera, influenza and meningitis, can be rapidly and easily spread across national borders, particularly when a project attracts a large influx of potential job seekers during a construction phase. The Project Proponents will prepare a series of management plans that will aim to safeguard community health and reduce localised and transboundary impacts;
- *Increase in Road Traffic (Low Adverse)*: As Uganda is a land-locked country, the nearest entryway by sea for materials coming from abroad is either Mombasa Port in Kenya or Dar es Salaam Port in Tanzania. Onward travel by road or rail transport will then be used. Increased road traffic can lead to negative impacts on noise and air quality, and increase the risk of traffic collisions. Even if it was conservatively assumed that 10% of the estimated additional road journeys involve routes within Kenya, as only major routes through Kenya would be affected, Project related traffic would not be expected to significantly increase the road traffic numbers; and
- *Waste Disposal (Insignificant)*: In case waste export to another country is required it would be carried out in compliance with the Basel Convention on the Control of Transboundary Movements

of Hazardous Wastes and Their Disposal (Ref. 23) with notification and approval of the relevant authorities. Consequently, no significant transboundary impacts are predicted.

6.7.2 Conclusions

There are several potential, theoretical pathways for transboundary effects on neighbouring countries; however, due to the nature and type of the Project, and the effectiveness of the embedded and additional mitigation measures identified in main ESIA Report no significant transboundary impacts are expected to occur upon other countries and states.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The main ESIA Report presents a Project Environmental and Social Management Plan (ESMP). It outlines the project phases, activity potential impact description, mitigation and enhancement measures, monitoring mechanisms, performance indicators and associated costs. It further discusses the roles and responsibilities of entities that shall be involved in implementation of mitigation measures and monitoring, and outlines the environmental and social Management plans required to support the ESMP, descripting those that are existing and those to be developed.

The embedded and the additional mitigation measures outlined in each of the technical chapters of this ESIA have been collated into an ESMP Table (also referred to as aspect/impact register), Table 23-2 and a Mitigation Checklist, which is presented in Appendix T and should be read in conjunction with this chapter. The ESMP table provides a list of mitigation per technical chapter (e.g. air quality, noise, etc..) with details on responsibilities related to implementation and the related monitoring mechanisms. The Appendix T lists each embedded and additional mitigation measure per Project phase and highlights their relevance to each technical chapter of the ESIA. Mitigation measures presented are required to be implemented by the Project to ensure the residual impacts outlined in ***Chapter 24: Residual Impact Assessment and Conclusions*** are adhered to.

The ESMP will be a 'live' document, meaning that it will be reviewed, amended, and updated by the Project Proponents and the appointed contractor(s) as the Project design develops and more detailed information becomes available and as a result of monitoring (adaptive management). This will allow for continuous improvement of the Project's environmental and social performance. The ESMP Table shall be expanded in line with National Environment Management Authority (NEMA) approval conditions following submission of this ESIA and prior to the start of any work to provide more detail on mitigation and monitoring, and roles and responsibilities, also in relation to the production of detailed and dedicated Project management plans.

7.1 Project Proponents Integrated Management System

The ESMP will form part of the wider Project Proponents Health Safety, Security, Social and Environmental Integrated Management System (HSSSE-IMS), which has been developed based on 10 key principles in line with the *PDCA* principle (plan–do–check–act) as defined below and shown in Figure 34:

- ***PLAN***: define the policy and conduct planning as to effectively consider within the context of the operation the hazards and risks, the legal and other requirements, the Project Proponents objectives and targets, and the requirements for management programs.
- ***DO***: execute the plan and to take steps in an organised way to enact the management programs in line with the policy, objectives and targets.
- ***CHECK***: to conduct monitoring and measurement, to deal with non-conformities, in order to take preventive and corrective actions, audits, and inspections.
- ***ACT***: following a systematic review of performance, to take action to standardise, or improve the process.

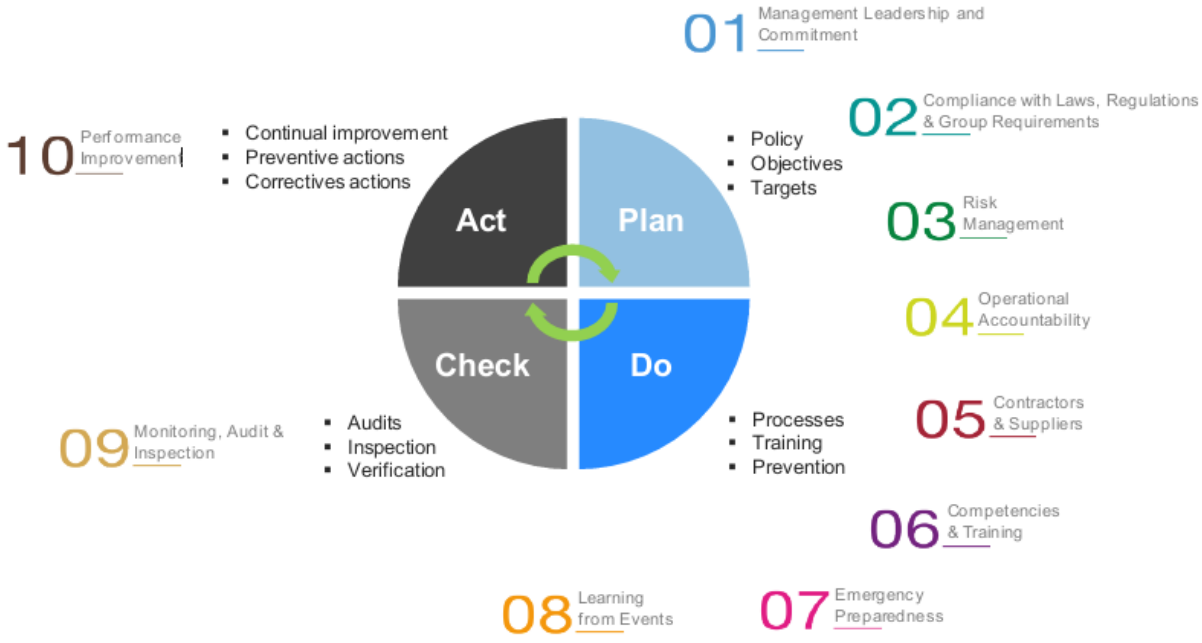


Figure 34: Project Proponents PDCA Principles

The Project Proponents HSSSE-IMS provides a framework to protect the environment, health and safety of employees, and respond to changing environmental conditions in balance with socio-economic need. The Project Proponents HSSSE-IMS Manual describes the core elements of the organisation's EMS and their interaction.

7.1.1 Environment Approach

The Project Proponents' EMS forms part of the overall HSSSE-IMS and is organised around the principles of ISO14001:2015 and around objectives defined in Figure 35. Since the start of its activities in Uganda, the Project Proponents have implemented several rules on environmental aspects. The rules include:

- Developing an EMS with defined objectives for improvement of the environmental performance;
- An initial environmental status shall be undertaken and then at regular intervals throughout Project's Life of Field;
- Potential Risks and Impacts have to be identified prior the activities start and appropriate management measures defined;

- Management Plans and procedures have to be developed in order to implement measures identified;
- A preparedness and response system needs to be implemented and maintained to respond adequately to accidental spills; and
- A system needs to be in place to allow for quantification and reporting on environmental performance.

Figure 35: Project Proponent's EMS Principles

In addition, the Project Proponents environmental framework incorporates the following core principles for action related to Biodiversity:

- *Deploy the mitigation hierarchy "avoid-mitigate-compensate"* - the Project Proponents will apply this approach for the duration of its Project lifecycle to minimise the potential impact of its activities on biodiversity;
- *Take into consideration the sensitivity of ecosystems in the course of its business* - the Project Proponents will identify and take into account the diversity and sensitivity of various environments in terms of biodiversity;
- *Manage the biodiversity* - the Project Proponents will incorporate the management of potential biodiversity impact and risk into their environmental management system and refer to good practices within the industry;
- *Report* - The Project Proponents will report to stakeholders on biodiversity performance; and
- *Improve knowledge of biodiversity* - The Project Proponents will participate in the improvement of knowledge of biodiversity and ecosystems as well as managing the stakeholders involved, through Research and Development initiatives taken with local and international partners and professional associations.

A specific Biodiversity and Livelihood Advisory Committee has been set up with external stakeholders from national and international organisations, who are specialised in the protection of nature and

relations between communities and the wild fauna. This committee is tasked with ensuring that best practices are properly implemented by the Project Proponents in Project operations, so that it achieves its targets of net gains in biodiversity, which are currently one of the best biodiversity management practices.

7.1.2 Social Approach

Since the start of its activities in Uganda, the Project Proponents have ensured that an open and ongoing dialogue is maintained with stakeholders as this is considered key to the success of the Project. The social approach which has been, and will continue to be taken is illustrated in Figure 36.

Figure 36: Social Approach

7.1.3 Interface Project Proponents - Contractors

The contracting and supplier companies involved in the Project development activities will be required to have a management system in place in line with the Project Proponents' requirements. This will need to address the 10 areas defined in . The Principal Contractor (for each phase) is expected to develop its own set of plans with respect to the activities, location, and expected level of interaction with the community; in line with the Project Proponents' management plans. These will need formal approval by the Project Proponents before works can start.

7.2 Project ESMP

An overview of the ESMP and how it relates to the Project Proponents HSSSE-IMS is presented in Figure 37. The Project Proponents have taken commitments for the Project to be implemented in line with internal, national, and international standards, and good international industry practices. This includes developing and implementing the Project in line with the impact mitigation hierarchy (i.e. avoid, minimise, restore, offset/compensate).

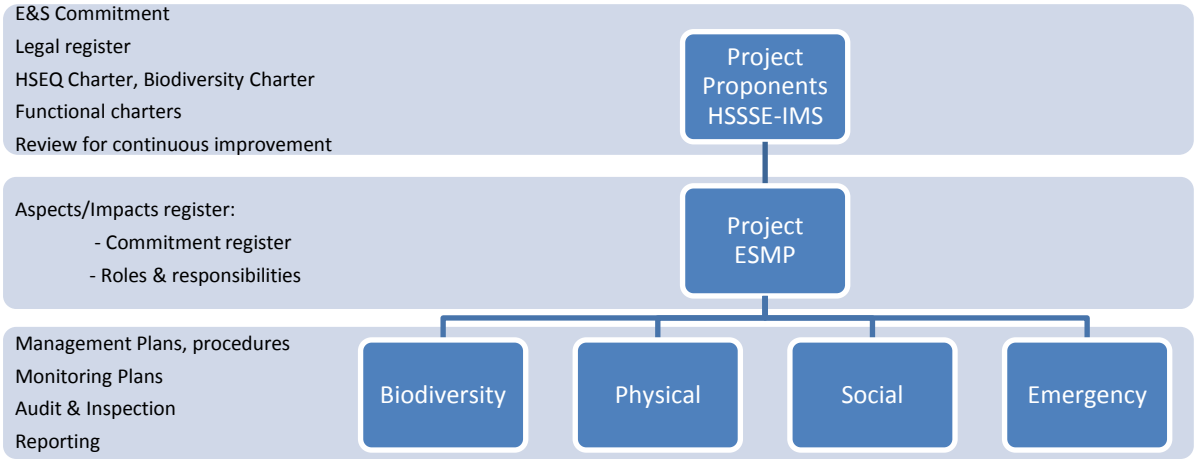


Figure 37: Overview of the Project ESMP relative to the Project Proponents' HSSSE-IMS

7.3 Supporting Strategies and Plans

The Management Plans which will be updated or developed for the Project are presented in Box 6.

In addition, in consideration of the sensitive environmental context, the Project Proponents have defined the following vision for this Project: '*to leave the Murchison Falls National Park and, where feasible, its surrounding landscape in better ecological condition than if the Project had not taken place, by achieving a positive effect for biodiversity*.'

The Project ESMP will be supplemented by a set of supporting plans which will provide procedures, guidelines and protocols for the day to day activities to be carried out during the Project to manage potential risks and impacts identified, and to implement project controls and mitigation measures. The ESMP will provide overarching mechanisms for:

- The *implementation of the supporting plans*, including mitigation measures and monitoring requirements;
- *Non-compliances and incidents reporting*, including the corrective actions necessary to address new hazards / changes to hazards;
- *implementation of control and mitigation measures*; and
- *Non-compliances or non-conformances* with the requirements defined for the Project.

In consultation with NEMA and other relevant lead agencies such as UWA and DWRM, each main contractor shall prepare corresponding ESMPs relative to their scope of work and submit it for review / approval by the Project Proponents prior to the start of each phase.

7.4 Monitoring of the Implementation of Mitigation Measures

The detailed ESMP and associated management plans will include details outlining the monitoring requirements to demonstrate compliance with the relevant national (and international) Standards as well as to provide verification of the overall design and effectiveness of the implemented mitigation and management measures. The monitoring requirements outlined in the detailed ESMP and associated supporting management plans will provide greater clarify and definition on the monitoring methodology presented in the ESIA.

Box 6: Overview of Project Management Plans

Overarching Strategies & Mechanisms

- Community Impact Management Strategy
- Influx Management Strategy
- National and Community Content Strategy / Framework
- Stakeholder Engagement Plan
- Grievance Management Procedure
- Biodiversity Strategy
- HSE Management System

Physical Environment

- Physical Environment Monitoring Plan
- Surface Run Off and Drainage Management Plan
- Dust Control Plan
- Noise and Vibration Management Plan
- Waste Management Plan
- Chemical Management Plan
- Water Management Plan
- Landscape Management Plan

Social

- Resettlement Action Plan (RAP)
- Livelihood Restoration Plan
- Labour Management Plan
- Cultural Heritage and Archaeology Management Plan (CHMP)
- Chance Find Procedure (CFPr)
- Community Content, Economic Development and Livelihood Plan (CCEDLP)
- Community Health, Sanitation, Safety, and Security Plan (CHSSSP);
- Community Environmental Conservation Plan (CECP)
- Tourism Management Plan
- Road Safety and Transport Management Plan
- Journey Management Plan

Biodiversity

- Biodiversity and Ecosystem Services Management Plan
- Biodiversity and Ecosystem Services Action Plan
- Alien/Invasive Species Management Plan
- Site Clearance Plan
- Site Restoration Plan
- Wetland Management Plan

Emergency Preparedness

- Spill Prevention Plan
- Oil Spill Contingency Plan (OSCP)
- Emergency Preparedness and Response Plan (ERP)
- Blow Out Contingency Plan (BOCP)
- Frack Out Plan

In green are those to be updated.

7.5 Environmental Inspections and Audits

The performance of all contractors will be assessed by a number of inspections and audits that are designed to identify positive implementation and also missing elements or non-compliance with the Project Proponents' HSE systems. The ESMP will detail the nature, frequency, and responsibility of inspections and audits.

8 CONCLUSIONS

The ESIA has systematically reviewed the potential effects of the Project on the existing environmental, social and ecological sensitive receptors. The impact assessment covered the entire life of the Project, including four individual phases including Site Preparation and Enabling Works, Construction and Pre-Commissioning, Commissioning and Operations and Decommissioning. The assessment was undertaken in accordance with the Ugandan EIA Regulations, 1998 (Ref. 2), and the IFC PSs, 2012 (Ref. 3).

Potential short term and long term, direct and indirect as well as cumulative impacts were identified using standard assessment methodology and subsequently additional mitigation measures and enhancement controls were identified to try and help ensure that any negative impacts are minimised and reduced to a level which is ALARP. For any beneficial impacts identified, ways to further enhance and improve them were also explored.

For all large scale oil and gas projects both beneficial and adverse impacts are identified. The majority of potential negative impacts for each of the four phases have been mitigated to an ALARP level with the significance of the residual impacts being identified as being Low or Insignificant. However, a number of potential negative impacts remain and these have been stated within the ESIA Report. In this regard, monitoring will be required to help ensure that the implemented mitigation measures are effective. The Project will also bring numerous beneficial impacts including social, health, cultural heritage and archaeological impacts.

Overall, the Project needs to be viewed as a whole and be determined on the vast array of benefits that it will bring to the Country, which will far outweigh any short term localised negative impacts. The GoU expects that the development of the oil and gas industry will stimulate accelerated economic growth, job creation, contribute towards poverty reduction and general prosperity to the people in Uganda.

9 References

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Ref. 21	International Finance Corporation, Good Practice Handbook, Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013).
Ref. 22	Consultation on Candidate Priority Valued Environmental and Social Components, Tilenga ESIA (2017).
Ref. 23	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989)
Ref. 24	Uganda Bureau of Statistics, 2016, Statistical Abstract

10 Acronyms and Abbreviations

Abbreviation / Term	Description
AIDS	Acquired Immunodeficiency Syndrome
ALARP	As Low As Reasonably Practical
AoI	Area of Influence
AWE	Air Water Earth - Engineers Ltd
bbl	barrels of oil
BTVET	Business, Technical, Vocational Education and Training
BMP	Biodiversity Management Plan
CA	Contract Area
CBO	Community Based Organisation
CFR	Central Forest Reserve
CHA	Critical Habitat Assessment
CHQS	Critical Habitat Qualifying Species
CIA	Cumulative Impact Assessment
CNOOC	China National Offshore Oil Company
CPF	Central Processing Facility
CSEMP	Construction Environmental and Social Management Plan
CSO	Civil Society Organisation
CTLO	Community and Tourism Liaison Officer
dB(A)	Decibel (Acoustic)
DRC	Democratic Republic of Congo
EA	Exploration Area
EACOP	East African Crude Oil Pipeline
ECO	Environmental Control Officer
EGF	Enclosed Ground Flare
EIA	Environmental Impact Assessment
EPs	Equator Principles
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
FEED	Front end engineering design
GDP	Gross Domestic Product
GHG	Greenhouse gas
GIIP	Good International Industry Practice
GIS	Geographic Information System
GNI	Gross National Income
GoU	Government of Uganda
ha	Hectares
HBA	Health Baseline Assessment
HC	Health Centres
HDD	Horizontal Directional Drilling
HIV	Human Immunodeficiency Virus
HPP	Hydropower Project
HSEMS	Health, Safety and Environmental Management System
HSSSE	Health, Safety, Security Social and Environment
IBA	Important Bird Area
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
km	Kilometre
kV	Kilovolt
LA	License Area
L_{Aeq}	Equivalent sound level
LC	Local Council
LCA	Landscape Character Areas
m	Metre

Abbreviation / Term	Description
m^3	Cubic metre
MARP	Most at Risk Population
MEDEVAC	Medical Evacuation
MEMD	Ministry of Energy and Mineral Development
MFNP	Murchison Falls National Park
MFPA	Murchison Falls Protected Area
MLHUD	Ministry of Lands, Housing and Urban Development
mm	Millimetre
MoU	Memorandum of Understanding
Mstb	Thousand Stock Tank Barrels
$MtCO_2e$	Metric Tons of Carbon Dioxide Equivalent
MW	Megawatt
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
NRMM	Non-Road Mobile Machinery
NTS	Non-Technical Summary
OECD	Organisation for Economic Cooperation and Development
PAC	Project Affected Community
PAP	Project Affected Person
PEPD	Petroleum Exploration and Production Department
PM_{10}	Coarse particulate matter (<10 micrometres diameter)
PPV	Peak Particle Velocity
PS	Performance Standards
RAP	Resettlement Action Plan
RCIM	Regional Cumulative Impacts Management
RoW	Right of Way
SBS	Social Baseline Survey
SEP	Stakeholder Engagement Plan
SHBS	Social and Health Baseline Survey
STI	Sexually Transmitted Infection
STOIIP	Stock tank oil-initially-in-place
SuDS	Sustainable Drainage System
TB	Tuberculosis
TC	Town Council
TEP Uganda	Total Exploration & Production (E&P) Uganda B.V
TUOP	Tullow Uganda Operations Pty Ltd
UK	United Kingdom
UNRA	Uganda National Roads Authority
USD	United States Dollars
USEPA	United States Environmental Protection Agency
UWA	Uganda Wildlife Authority
VECs	Valued Environmental and Social Components
VOC	Volatile Organic Compounds
WHO	World Health Organisation
WR	Wildlife Reserve
ZTV	Zone of Theoretical Visibility