Kampala-Jinja Expressway PPP Project
Phase 1
Environmental and Social Impact Assessment

Volume B: ESIA Report

prepared for

Uganda National Roads Authority (UNRA)

by

Earth Systems and Atacama Consulting

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ACCRONYMS AND ABBREVIATIONS

Acronym	Full term
ACODE	Advocates Coalition for Development and Environment
ADT	Average Daily Traffic
AFD	Agence Francaise de Developpement
AfDB	African Development Bank
AHP	Analytical Hierarchy Process
AN	Aircraft Noise
AP	Affected Person(s)
ARI	Average Recurrence Interval
AU	African Union
AYDU	Action for Youth with Disabilities Uganda
BAP	Biodiversity Action Plan
BOD	Biological Oxygen Demand
CBGMC	Community Based Grievances Management Committee
CEMP	Construction Environmental Management Plan
CFR	Central Forest Reserve
CGV	Chief Government Valuer
CIP	Capital Investment Planning
CLO	Community Liaison Officers
CO	Carbon monoxide
COD	Chemical Oxygen Demand
DCP	Dynamic Cone Penetration
DDPs	District Development Plans
DfT	Department for Transport
DLB	District Land Board
DO	Dissolved Oxygen
DWRM	Directorate of Water Resource Management
EAC	East African Community
EC	Electrical Conductivity
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment

EIR	Environmental Impact Review
EIS	Environmental Impact Statement
ELU	Ministry of Works and Transport, Environment Liaison Unit
EMEP/EEA	European Monitoring and Evaluation Program/European Environment Agency
EPRP	Emergency Preparedness and Response Plan
ERA	Electricity Regulatory Authority
ERB	Engineers' Registration Board
ESAPs	Environmental and Social Assessment Procedures
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Statement
ESMMP	Environmental Social Management and Monitoring Plan
ESMS	Environment and Social Management System
EU	European Union
FIDA	Federacion Internacionnal de Abogadas
GDP	Gross Domestic product
GHG	Greenhouse gas
GIIP	Good International Industry Practice
GIS	Geographic Information System
GKMA	Greater Kampala Metropolitan Area
GoU	Government of Uganda
GRI	Global Reporting Initiative
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IBA	Important Bird Area
ICT	Information and Communications Technology
IFC	International Finance Corporation
IFD	Intensity Frequency Duration
IRCU	Inter Religious Council of Uganda
ISO	International Organization for Standardization
ISS	Integrated Safeguards System
KCCA	Kampala Capital City Authority
KEE	Kampala Entebbe Expressway
KJE	Kampala Jinja Expressway

KSB	Kampala Southern Bypass
LAMS	Land Asset Management System
LEMU	Land and Equity Movement of Uganda
LG	Local Government
LO	Labour Organization
MDAs	Ministry, Department and Agencies
MEMD	Ministry of Energy and Mineral Development
MFPED	Ministry of Finance, Planning and Economic Development
MGLSD	Ministry of Gender, Labour and Social Development
MJCA	Ministry of Justice and Constitutional Affairs
MLHUD	Ministry of Lands, Housing and Urban Development
MoFCA	Ministry of Justice and Constitutional Affairs
MoH	Ministry of Health
MoTWA	Ministry of Tourism, Wildlife and Antiquities
MoWE	Ministry of Water and Environment
MoWT	Ministry of Works and Transport
MSDS	Material Safety Data Sheets
MTIC	Ministry of Trade, Industry and Cooperatives
MTTI	Ministry of Tourism, Trade and Industry
MTWA	Ministry of Tourism, Wildlife and Antiques
NAPE	National Association of Professional Environmentalists
NATA	New Approach to Transport Appraisal
NAWOU	National Association of Women Organisations in Uganda
NDP	National Development Plan
NEMA	National Environment Management Authority
NEMP	National Environmental Management Policy
NFA	National Forestry Authority
NGO	Non-government Organization
NGOs	Non-Governmental Organisations
NHCC	National Housing and Construction Company
NHCCL	National Housing and Construction Company Limited
NOx	Nitrogen Oxides
NRSC	National Road Safety Council

NTMP	National Transport Master Plan
NWSC	National Water and Sewerage Corporation
ODS	Ozone Depleting Substances
OHS	Occupational Health and Safety
ORP	Redox Potential
OS	Operational Safeguards
PAPs	Project Affected People
PCU	Passenger Car Unit
PM	Particulate Matter
PPP	Public Private Partnership
PPV	Peak Particle Velocity
RAP	Resettlement Action Plan
REA	Rural Electrification Authority
RFP	Resettlement Policy Framework
RLRP	Resettlement and Livelihood Restoration Plan
ROW	Right of Way
RTN	Road Traffic Noise
SAICM	Strategic Approach to International Chemicals Management
SDGs	Sustainable Development Goals
SDI	Slum Dwellers International Federation
SDSP	Sector Development Sector Plan
SEP	Stakeholder Engagement Plan
SGR	Standard Gauge Railway
SHS	Second Hand Smoke
SOP	Standard Operating Procedures
SOx	Sulphur Oxides
STDM	Social Tenure Domain Model
STDs	Sexually Transmitted Disease
TDS	Total Dissolved solids
TLVs	Threshold Limit Values
TNM	Traffic Noise Model
TOR	Terms of Reference
TP	Test Pitting

TSS	Total Suspended Solids
TWA	Time Weighted Average
UAIA	Uganda Association for Impact Assessment
UETCL	Uganda Electricity Transmission Company Limited
UIA	Uganda Investment Authority
UIRI	Uganda Industrial Research Institute
UK	United Kingdom
ULA	Uganda Land Alliance
ULC	Uganda Land Commission
UMA	Uganda Manufacturers Association
UNACC	United Native American Culture Center
UNASO	Uganda AIDS Support Organisation
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
UNRA	Uganda National Roads Authority
UNYC	Uganda National Youth Council
UPF	Uganda Police Force
URSSI	Uganda Road Sector Support Initiative
USAID	United States Agency for International Development
USBM	US Bureau of Mines
USEPA	United States Environmental Protection Agency
UTL	Uganda Telecom Limited
UWA	Uganda Wildlife Authority
UWONET	Uganda Women's Network
VKT	Vehicle Kilometres Travelled
VOC	Volatile Organic Compound
WCS	Wildlife Conservation Society
WDPA	World Database Protected Areas
WHO	World Health Organisation
WMP	Water Management Plan
WTO	World Trade Organization
ZOI	Zone of Influence

KJE PPP Project Phase 1 ESIA

CHAPTER 1 Introduction

1. INTRODUCTION

1.1 Purpose of this Document

Earth Systems and Atacama Consulting, together referred to as the Consultant, were engaged by Uganda National Roads Authority (UNRA) to update the Environmental and Social Impact Assessment (ESIA)[1] for the Kampala-Jinja Expressway (KJE) PPP Project. The project will be implemented in two Phases. This Environmental and Social Impact Assessment (ESIA) covers Phase 1 (hereafter the 'Project'). A separate ESIA has also been prepared for Phase 2.

The ESIA update was commissioned by UNRA to reflect improvements and modifications to the Project design and route alignment, fill in gaps identified in the previous ESIA work and align the assessment with international standards including the International Finance Cooperation (IFC) environmental and social performance standards.

The update builds on the ESIA Scoping initially undertaken in 2011 that was approved by the National Environment Management Authority (NEMA) and guided a detailed ESIA work conducted in 2015 on the KJE and Kampala Southern Bypass (KSB) alignments. Further scoping work was also conducted between September 2016 and April 2017 following merging of the KJE and KSB into one PPP project. The current Phase 1 ESIA Report, supporting documentation, and management plans have been prepared in accordance with the National Environment Act Cap. 153, 1995 and take into account the other relevant government policies, laws and regulations relevant to road construction and the environment.

The proposed Project is a limited access tolled expressway in the central and eastern region of Uganda in East Africa. The overall project (including Phases 1 and 2) comprises the Kampala Jinja Expressway Mainline from the capital city of Kampala to the town of Jinja in the east and the Kampala Southern Bypass (KSB). Phase 1 consists of a 35km section of the mainline expressway from Kampala to Namagunga as well as the 18km KSB section.

The project proponent, UNRA, is a government agency responsible for managing, maintaining and developing the national road network across Uganda. The ESIA update identifies the likely types of environmental and social impacts associated with the construction and operation of the Project. It assesses the magnitude and likelihood of these impacts based on previous work commissioned UNRA and currently available Project information. Stand-alone management plans to address residual impacts are provided as part of the appendices to the ESIA (refer to Volume D). An update of the original Resettlement Action Plan has also been prepared (refer to *Resettlement and Livelihood Restoration Plan,* Volume D).

1.2 Background

UNRA is seeking to partner with the private sector to develop the Kampala-Jinja Expressway (KJE) Project Phase 1 utilising a Public-Private Partnership (PPP) development model. Prior to the aforementioned project, two different concepts, that is, Kampala-Jinja Mainline and Kampala-Southern Bypass (KSB) Projects were developed in 2009 and feasibility and detailed design studies were undertaken a year later. Thereafter, Scoping for Environment and Social Impact Assessment (ESIA) for each project were undertaken in 2011 and the ESIA Terms of Reference (ToRs) were approved by National Environment Management Authority (NEMA) in 2012. Additional feasibility studies of the KJE and KSB conducted in 2014 and 2015 assessed alignments that have since been modified during the detailed design stage. In 2015, ESIAs and Resettlement Action Plan (RAP) were conducted for the two separate components (the KJE mainline and the KSB), however before these were approved, a decision was made by UNRA to divide the KJE mainline into two phases and merge phase one of the KJE project with the KSB.

[1] Also referred to in Uganda as Environmental Impact Assessment (EIA) or Environmental and Social Impact Statement (ESIS)

At the same time UNRA decided to pursue international finance for this initiative. Consequentially, the project required adherence to the International Safeguards standards, that is, International Finance Cooperation (IFC) Performance Standards and the Integrated Safeguards Systems (ISS) of the African Development Bank (AfDB). Therefore, to secure financing for the Project, the existing Environmental and Social Impact Statement (ESIS) and related RAP needed to be updated to meet international standards.

To adhere to the international standards, there was also there was also a change in alignment of the Project to:

i. Optimise road design and minimise impacts through ecologically sensitive zones such as Mabira Central Forest Reserve (CFR), industrial and densely populated areas;
ii. Avoid impacts on the proposed Standard Gauge Railway (SGR) alignment which interacts with the Project's Right of Way in multiple locations and reduce cumulative impacts from both projects on the same receptors.
iii. To adhere to Kalagala Offset Management Plan agreed to during the financing of the Bujagaali Hydro Power Project.

In addition, further Scoping for the ESIA was conducted between September 2016 and April 2017; the ToRs were approved by NEMA in 2018 which guided the detailed ESIA studies. Therefore, a need to undertake an ESIA for the proposed new alignment before the Project is developed. Similar studies and ESIAs have been undertaken on the previous proposed routes, which contain information that remains relevant to this document.

1.2.1 Project Benefits and Need

As a result of progressive economic growth over the last few decades, increased population and associated traffic in the region has led to capacity constraints on the existing Kampala-Jinja road, particularly between Kampala and Mukono. This has led to delays and unreliability issues not only on the existing highway but also on the surrounding local road network and the Kampala Northern Bypass. Congestion in these areas affects trade, commuting, the environment and vehicle operating costs. The capacity issues on the road network are such that if improvements are not implemented, the reliability of the transport network is forecasted to be severely affected by 2037 (UNRA, 2017).

As a regional and international transport corridor, the overall KJE Project will contribute to key strategic transport priorities for the region and help meet the objectives of regional integration, socio-economic development and investment in transportation infrastructure outlined in key national policies such as the Uganda Vision 2040, the National Development Plan II (2015/16 – 2019/20) and National Transport Master Plan (refer to Chapter 2 – Policy and Legislative Framework).

The proposed KJE Project forms part of a series of major infrastructure investments within Uganda and the city of Kampala. An extensive network of roads is being planned to facilitate vehicle movement throughout and around Kampala city. This includes the Kampala Northern Bypass and the Kampala-Entebbe Expressway, which are both currently under construction. It also includes the planned Kampala-Jinja Expressway, the Kampala-Southern Bypass and the Kampala Outer Beltway project. These road developments are being planned in combination with other transportation projects including the Standard Gauge Railway (SGR) project and the development of a new port at Bukasa.

The Project is needed to relieve traffic congestion, improve road safety and cater for the substantial economic growth planned in the region. Specifically, the need for the KJE Project includes:

- **International transport and regional trade**- as the principal road link in the region, the existing Kampala-Jinja road serves as the main international transport corridor linking the Kenyan port of Mombasa to Uganda and other landlocked countries in the East African Community (EAC). As such, the highway corridor is a major contributor to Uganda's economic activity and is one of the most heavily used

roads in the country. Currently, heavy congestion and capacity constraints on the existing road have affected traffic flows and have also acted as a disincentive for efficient pricing of goods destined for Uganda (UNRA, 2017). The KJE Project is needed to contribute to the national objectives of improving international traffic flows and facilitate improved business with neighbouring countries.

- **Local trade and enterprise** -, the Kampala-Jinja road provides access to at least six major growth centres between Kampala and Namagunga, including Nakawa, Banda, Kireka, Bweyogerere, Seeta and Mukono. This has led to a net effect of concentrated traffic on this section of the road to Mukuno, resulting in a very high usage on the highway and severe congestions, delays in the transport of goods and services, and capacity constraints, particularly in peak times. The KJE Project is needed to facilitate greater access to these growth centres, reduce business operating costs and assist with the decentralisation of business activities (through providing faster access to regional centres) and provide opportunities to develop the outskirts of the Kampala CBD.
- **Traffic congestion around Kampala** - currently, the primary road network in southern Kampala consists mainly of radial roads connecting the central city area with the main outlying suburbs, and the intermediate localities. There are virtually no contiguous sections of reasonable quality roadway for lateral traffic between the outer suburbs and the city centre. The current network is poor, with lateral traffic being required to pass through residential areas or well into the central part of the city in order to make use of the radial roads. This has exacerbated traffic congestion in the area. The new KSB section is needed to provide high standard road that connects to the Kampala-Entebbe expressway project at Munyonyo spur. When completed and connected to the Kampala-Northern Bypass at Namboole, the KSB will form a ring road around Kampala city thus addressing issues of congestion in the city centre.
- **Road conditions** - the combination of high road demand, lack of capacity and road traffic related incidents has led to severe current problems for public and commercial road users, with long delays, unpredictable journey times, high accident rates and high travelling costs. The KJE Project would relieve congestion, improve road safety and improve conditions for road users.
- **Unviability of an existing road upgrade** - The option of increasing the capacity of the existing highway is severely constrained due to heavy human encroachment and settlements along the highway and the potential impact an expansion would have on the Mabira forest. Thus, a new alignment is required.

Transport infrastructure development is a critical element in the economic development policy of Uganda. The KJE Project (Phase 1 and 2) is expected to provide a range of direct and indirect benefits at the national, regional and local levels. Direct benefits include government revenue through fees and taxes, increased direct foreign investment in the country and new employment opportunities. Indirect benefits include flow on effects, training / skills development and infrastructure development. Benefits of the KJE Project (Phase 1 and 2) include:

- Investment of approximately $1.3 billion in capital expenditure for the KJE Project based on the Project Final Feasibility Study (UNRA, 2017b). This expenditure will likely result in flow on effects to the Ugandan national economy, resulting in an increased GDP and Foreign Direct Investments of at least $300million (UNRA, 2017);
- Tax revenue of at least $300m over the concession term (UNRA, 2017) and increased revenue through toll payments;
- Significant increase in regional and local employment opportunities with approximately 1,500 jobs created during construction and 250 jobs during operations (UNRA, 2017);
- Increased overall efficiency of the road network with a consequent improvement of the national/international road freight traffic through improving the reliability of transportation (UNRA, 2016);

- Improved conditions for road users through reduced vehicle-operating costs, time travel savings and fuel savings as a result of a more efficient road network. Road users will experience greater time savings of 70mins between Kampala and Jinja;
- Improved road safety through a high standard expressway with dual carriageway, improved alignment, improved road geometry, more overtaking opportunities and limited access (e.g. for pedestrians);
- Increased operations and maintenance efficiency along the road network;
- Skills development and capacity building in the field of motorway infrastructure management by involving prospective international concessionaires; and
- Reduction in cost of doing business in the region through an improved road network and more reliable journey times.

1.3 Presentation of the Project

1.3.1 Project Overview

The Project assessed in this ESIA is Phase 1 of the overall Kampala-Jinja Expressway (KJE) Project. As part of this overall project, UNRA is proposing to construct a limited access 76 km tolled expressway between Kampala and Jinja to relieve the current congestion and reliance issues on the radial routes out of Kampala city and on the existing Kampala to Jinja highway to cater for future growth. This infrastructure development is part of the Northern Corridor – a vital international highway connecting the port of Mombasa in Kenya to the landlocked countries of Uganda, Rwanda, Burundi and the Democratic Republic of Congo.

The Project also includes the Kampala Southern Bypass which will provide a bypass to the capital city of Kampala, linking to the Kampala Entebbe expressway and the Northern Bypass to form a complete ring road around the city. The overall KJE Project is planned to be undertaken in two phases as follows (Figure 1-1):

- **Phase 1 –** development of the first section (35 km) of the Kampala-Jinja Expressway (KJE) from Kampala to Namagunga and the Kampala Southern Bypass (KSB) (18 km) which is expected to be completed by 2023; and
- **Phase 2** - development of the second section of the Kampala-Jinja Expressway (KJE) from Namagunga to Jinja (41 km) at the New Nile bridge. Works for the second phase are anticipated to be completed by 2030.

The overall KJE Project is currently planned for a 30-year term, inclusive of the construction period, after which Project facilities will be transferred to UNRA. The KJE Project is expected to generate up to 1,500 jobs during construction and 250 jobs during operations, most of which will be taken up by Ugandans. Once operational, the expressway is expected to save up to 70 minutes of journey time between Kampala and Jinja.

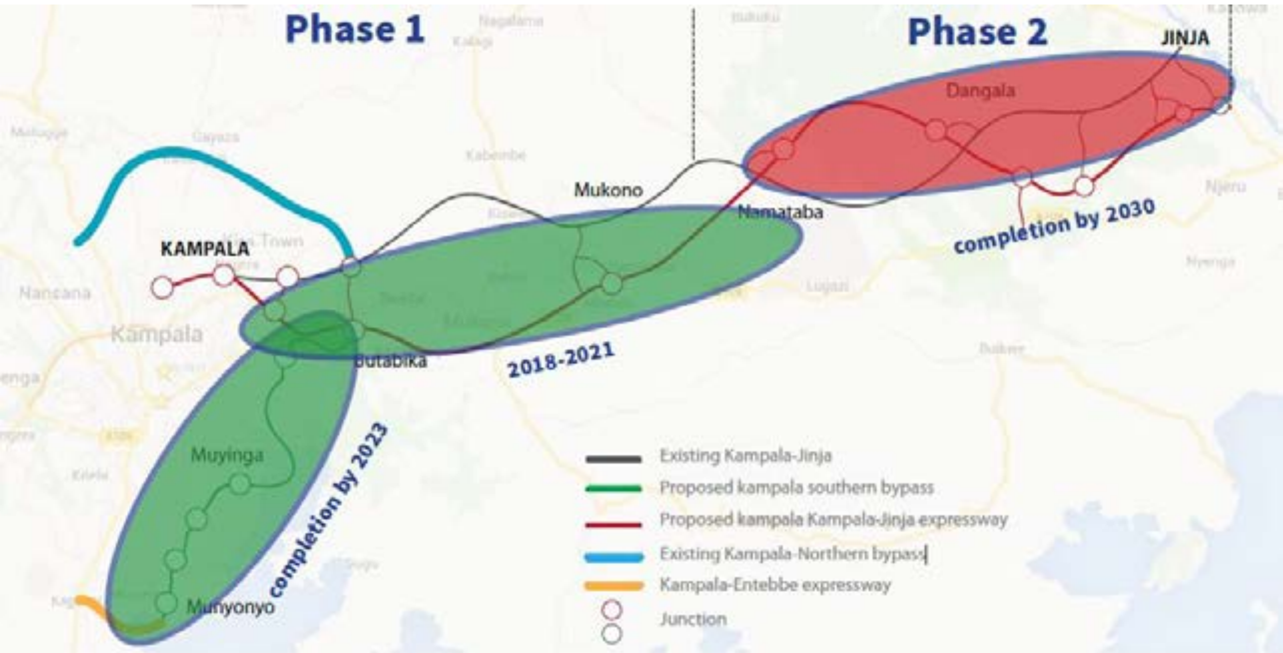

Figure 1-1: Project Phases with indicative construction schedule (UNRA, 2016c)

1.3.2 Phase 1 – KJE Mainline and KSB

The KJE Project is currently planned for a 30-year term, based on a Design, Build, Finance, Operate and Transfer (DBFOT) model that will form the basis of the concession agreement between the Government of Uganda and the successful private sector concessionaire. The period is inclusive of the construction period, after which Project facilities will be transferred back to UNRA. The KJE Project is expected to generate approximately 1,500 jobs during construction and 250 jobs during operations, most of which will be taken up by Ugandans. Once operational, the expressway is expected to save up to 70 minutes of journey time between Kampala and Jinja.

The KJE Project Phase 1 traverses Kampala City as well as three administrative districts of Wakiso, Mukono and Buikwe. The first section of the proposed mainline alignment is approximately 35 km with a number of interconnectors to join major towns near the expressway (Figure 1-1). The majority of the Project road, therefore, adopts a new alignment, entirely different from that of the existing main road from Kampala to Jinja.

However, the first section of the road corridor does follow the route of the existing main road, commencing at the location of the junction with the Lugogo Bypass, and passing along the existing road as far as Kyambogo (Km 2.5). It then diverges to the south side of the existing main road via an existing drainage reserve in a gap between the rear sides of two rows of factories. It emerges from the gap (Km 3.0) into a swampy area which it traverses, then crosses the existing Ugandan Railway line and Kinawataka Road (Km 3.6).

From the Kinawataka Road the corridor continues in a generally south-easterly direction passing along the valley between the Mbuya and Kireka hills to Butabika Interchange (Km 6.5), where it connects to the route of the Kampala Southern Bypass (KSB) section of the Project. East of Butabika Interchange the corridor traverses the fringe of an extensive swamp area then strikes through the Bukasa peninsula, passing through the ridge at a point north of the town of Bukasa (Km 8.6).

The part of the KJE mainline corridor thus far described is the only element of the Project that passes through densely urbanised areas. Having crossed the Bukasa ridge, the alignment, travelling generally easterly, crosses another extensive zone of swamp. The new road in this section will be carried by a viaduct of approximately 2 km in length, circumventing the southern extent of the future Namanve business park and dry port located to the

south side of the existing main road between Bweyogerere and Seeta After leaving the city boundaries, the route crosses mainly greenfield land comprising a mix of agricultural land, plantations, wetlands and other areas of natural habitat, with Phase 1 ending at Namagunga. During Phase 2, the road is then planned to continue to Jinja where it will join with the new bridge being constructed across the River Nile.

The KSB section of the Project connects with the Kampala Northern Bypass at Nambole Junction, the KJE mainline alignment at Butabika and with the new Kampala-Entebbe highway in Munyonyo currently under construction. After joining the KJE, it runs south for approximately 1.8 km through Wakiso District, then passes mostly through the Kampala City administrative area covering the divisions of Nakawa and Makindye.

The Project alignment has been selected based on detailed engineering design, feasibility and environmental and social studies conducted thus far which date back to 2011. After all the proposed road infrastructure projects in and around Kampala have been completed it is hoped that Kampala will have a robust, interconnected, road network allowing for easy and quick transport around Kampala, and between Entebbe, Kampala and Jinja.

Key design features of the Project are shown in Table 1-1.

Table 1-1: Key design features of the Project, including the KJE mainline alignment (Phase 1) and Kampala Southern Bypass

Design features	KJE Mainline to Namagunga (Phase 1)	Kampala Southern Bypass
Total length	35 km - Greenfield (3km brownfield)	18 km - Greenfield
Design speed (urban)	85 km/hr (first 10 km)	100 km/hr
Design speed (rural)	120 km/hr	Not applicable
Lanes	4+4(3km); 3+3 (32km);	2+2 (18km)
Lane width	3.5 m (main line – urban), 3.7 m (main line – rural) and 3.65 m for link/connector roads	3.5 m (main line)
Median	2-5m with 0.5 m hard strip	2-5 m with 0.5 m hard strip
Shoulder width	3.5 m	3.0 m
Grade separated junctions	9	5
Potential length of viaducts	Approx. 2000 m at km 9+100 – km 10+640	Approx. 2700 m mainly over swamps
Nominal Right of Way width	90 m	60 m
Minimum vertical clearance	5.2 m	5.2 m
Maximum vertical gradient	6% (urban) and 4% (rural)	6 (urban) and 4% (rural)
Vehicular under/overpasses	23(+16 underpasses)	4 (+12 underpasses)
Tunnels	None	None
Pavement type	Asphalt	Asphalt

Source: UNRA, KJE 2017 Feasibility Study Report.

The Project has been designed to include viaducts, underpasses, overpasses and pedestrian foot bridges to improve accessibility for adjacent communities, traffic flow management, minimise disturbance over wetlands and enhance vehicle and pedestrian safety.

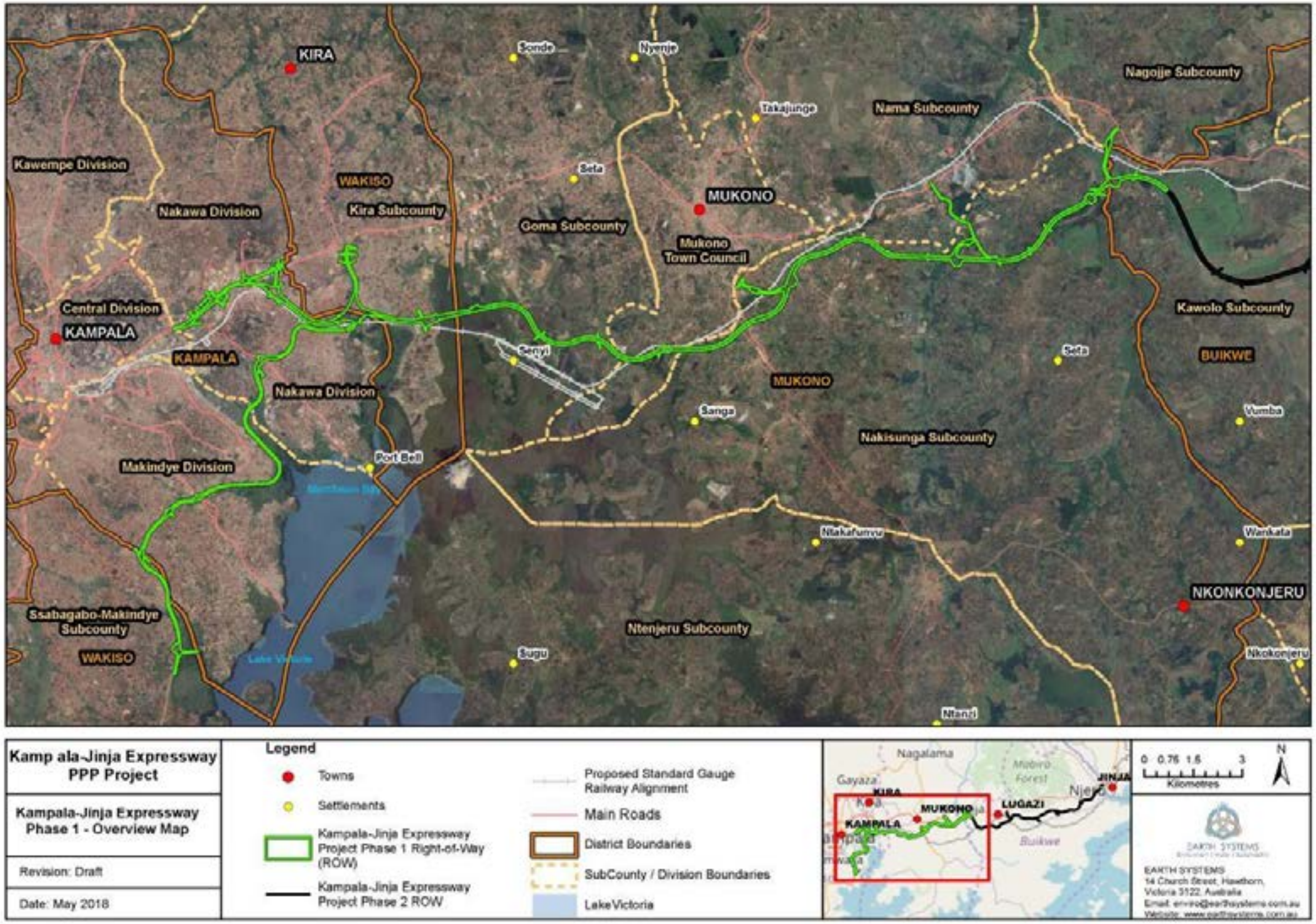

Figure 1-2 Overview of the Phase 1 of the Kampala-Jinja Expressway (KJE) Project

1.3.3 Purpose of the Project

The Project's primary objective is to develop and operate a limited toll expressway to relieve traffic congestion and cater for future economic growth that will benefit Uganda through promoting socio-economic development, reducing road transport costs, reducing vehicle emissions and improving road safety.

1.3.3.1 Socio-Economic Objectives and Commitments

Socio-economic objectives of the Project are to:

- Support economic growth by enhancing economic and social development at the national level through development of a good quality road network;
- Support the local Ugandan industry through enhanced job opportunities;
- Promote socio-economic sustainability through measures to protect and enhance existing livelihoods;
- Minimise potential impacts on social infrastructure and systems; and
- Develop the project in a manner that minimises potentially negative impacts while promoting socio-economic benefits.

1.3.3.2 Environmental Objectives and Commitments

The environmental objectives of the Project are to:

- Identify and mitigate potentially negative environmental impacts associated with the Project;
- Minimise adverse environmental impacts through adherence to Ugandan and international environmental standards and regulations, and by the application of international best practice in road development;
- Align the Project with relevant international standards and guidelines as well as UNRA's policies and standards.

1.3.3.3 Commercial Objectives and Commitments

The commercial objectives of the Project are to create a network of expressways linking major cities and towns within Uganda in addition to linking key economic centres within East Africa. This will support economic growth at the national and regional level through a good quality road network on major trade routes. The construction and operation of the Project will be undertaken in accordance with international environmental and social standards and the environmental and socio-economic objectives presented above.

1.3.3.4 Strategic Objectives

The strategic objectives of the project are to:

- Enhance capacity of the northern corridor to cope with any planned or unplanned incidents;
- Improve the national road network and its performance;
- Support economic growth in the east of the country by improving accessibility; and
- Improve the local air quality particularly on the approach to Kampala from Mukono.

1.4 Project Proponent

UNRA, established under the UNRA Act, No. 15 of 2006 and operational since 2008, is the Project Sponsor. As an independent corporate body, UNRA's mandate is to develop and manage the national road network in an efficient and sustainable manner and advise the Government on general road policy (UNRA, 2016).

The contact details for the Project proponent are as follows:

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Ugandan National Roads Authority

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1.5 ESIA Consultants

UNRA has engaged Earth Systems and Atacama Consulting as the 'Consultant Team' to conduct the ESIA.

Earth Systems has been operating in Africa since the early 2000's and has completed a number of projects in Uganda, Rwanda, Tanzania, Senegal, Mali and Guinea. Earth Systems has a proven track record working on infrastructure projects, from roads and highways to transmission lines and power generation and has worked on all project stages. As part of the Consultancy Team Earth Systems has extensive experience with projects that require a detailed understanding of the environmental and social policies, performance standards and guidelines of the World Bank / International Finance Corporation (IFC).

Atacama Consulting is a leading environmental consultancy based in Kampala, Uganda and one of the few in the country to be registered with Uganda's National Environmental Management Authority (NEMA). Over the past 13 years Atacama has provided cutting edge consultancy services in environmental management.

Earth Systems and Atacama's Project team includes specialists in all of the areas required to complete an ESIA, including:

- Project managers with environmental expertise and experience in conducting ESIAs of infrastructure projects;
- Soil scientist;
- Hydrologist;
- Hydrogeologist;
- Ecologists including flora, fauna and aquatics specialisations;
- Air, noise and vibration monitoring and modelling expertise;

- Social / socio-economics specialists;
- Health, safety, pollution and risk management expertise; and
- GIS and mapping.

A summary of the key staff and technical roles of the Consultant Team is provided in Table 1-2.

Table 1-2: ESIA consultants and roles

Name	Organisation	Technical Role
Nigel Murphy	Earth Systems	Team leader (international) and Project Director
Mirey Lopez		Project Manager and Social Specialist
Vanessa Lea		Environmental Specialist
Dr Paul Quinn		Air Quality, Noise and Vibration Expert
Dr Adrian Morphett		Greenhouse Gases and Climate Change Expert
Justin Mercer		Geology, Geomorphology and Soils Expert
David Dettrick		Hydrology, Hydrogeology and Waste Expert
Dr Brett Davis		Water Quality Expert
Dr Jo Nightingale		Biodiversity Expert
Kelly Horton		Social Support Specialist
Tom Callander		Resettlement and Social Expert
Naveena Wijesekara		Database, GIS and Spatial Analysis Specialist
Tom White		Information management specialist
Edgar Mugisha	Atacama Consulting	Team leader (national) and ESIA Specialist
Juliana Keirungi		Environmental Specialist
Lorna Ngabirano		Local Project Manager/Environmental Specialist
Gloria Kirabo bitebekezi		Biodiversity Expert (Avifauna)
Madinah Namyalo		Aquatic Biodiversity Specialist
Ezrah Natumanya		Hydrologist/ Water Resources Specialist
Dr Collins Bulafu		Biodiversity Expert (Flora)
Esther Kavuma		Sociologist and Resettlement Specialist
Dr Florence Asiimwe		Stakeholder engagement specialist
Tonney Ssemmanda		Sociologist
Edmond Twinobusingye		Botanist / Stakeholder engagement support
David Kalanzi Sepuya		Cultural Heritage and Archaeology specialist
Dr Deogratius Ssekimpi		Occupational Health and Safety specialist
Rhoda Nankabirwa		Environmental Specialist (Fauna)
Emmanuel Mwawula		Noise / Air Quality support

Name	Organisation	Technical Role
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Denis Kyongera		GIS Specialist

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1.6 ESIA Update Report Structure and Assessment Strategy

1.6.1 ESIA Objectives

The key objectives of the updated ESIA are to:

- Identify and evaluate environmental and social risks and impacts of the Project associated with construction and operation;
- Adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimise, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment;
- Promote improved environmental and social performance of the Project through the effective use of management systems;
- To ensure that grievances from the affected communities and the external communications from other stakeholders are responded to and managed appropriately; and
- Promote and provide means for adequate engagement with the 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 (ICS, 2015).

1.6.2 Baseline

An extensive amount of environmental and social baseline data has been collected for the Project since 2011. This information has enabled UNRA to evaluate design options and identify an alignment that avoids or minimises significant impacts to key environmental and social values. This ESIA builds on the previous baseline work undertaken and also includes information collected from further targeted investigations undertaken under the scope of the ESIA update.

1.6.3 Risk Assessment

A risk assessment approach was used to conduct an initial analysis of potential for environmental and social impacts to inform the need for management and mitigation measures (refer Chapter 6). The methodology was primarily based upon ISO31000 Risk management — Principles and Guidelines, 2009 and ISO31010 Risk Management – Risk Assessment Techniques, 2009.

The risk assessment has been conducted prior to consideration of management and mitigation to identify the most significant potential risks. These risks are assigned rankings in order of magnitude / probability, in the absence of mitigation. Once initial risks have been assessed and ranked, proposed controls are identified to avoid or reduce the anticipated impacts. Control measures focus on either reducing the likelihood of occurrence or on decreasing the magnitude of the consequence to reduce the residual risk ranking to acceptable levels. The overall risk matrix used is presented in Table 1-3.

Table 1-3 Risk assessment criteria matrix with Likelihood and Consequence rankings

Likelihood		Consequence				
Level		1	2	3	4	5
		Very low Very minor risk	Low Minor risk with short-term consequences	Medium Medium risk requiring ongoing management	High Major risk / high financial, environmental and/or human loss	Extreme Major risk / long-term, very high financial, environmental and/or human loss
5	Constant Is expected to occur in most circumstances	5 Moderate	10 Moderate - High	15 Moderate - High	20 High	25 High
4	Frequent Will probably occur in most circumstances	4 Moderate	8 Moderate	12 Moderate - High	16 Moderate - High	20 High
3	Occasional Might occur at some time	3 Low	6 Moderate	9 Moderate	12 Moderate - High	15 Moderate – High
2	Rare Could occur at some time	2 Low	4 Moderate	6 Moderate	8 Moderate	10 Moderate - High
1	Improbable May occur in very exceptional circumstances	1 Low	2 Low	3 Low	4 Moderate	5 Moderate

Further details on the methodology and results of the risk assessment process are available in Chapter 6.

1.6.4 Impact Assessment Approach

The ESIA process involves identification and prediction of potential impacts, and assessment of the risk level associated with those impacts.

The assessment of potential impacts associated with the Project incorporates the following steps:

1. **Baseline assessment** of the environmental and social setting by building on the extensive information available on the KJE Project, detailed spatial analysis and further definition of baseline conditions that

may be impacted by the Project including physical, biological, cultural and socio-economic environment through targeted field investigations;

2. **Risk assessment** based on internationally accepted risk assessment methodologies to rate the siginificance of potential environmental and social risks.
3. **Assessment of potential impacts** on receptors based on the Project design;
4. **Mitigation of impacts** by integrating into the Project design measures to avoid, reduce, mitigate or compensate for adverse impacts and to enhance benefits (as per the mitigation hierarchy below); and
5. **Assessment of residual impacts** after implementation of mitigation measures.

The assessment of risk is undertaken in accordance with the international standard practice of ISO 31000 in which impact/risk is classified according to likelihood and consequence level.

Typically, expected impacts and risks to sensitive receptors (physical, biological or social) are characterised in terms of the following aspects:

- Nature (direct, indirect or induced; positive or negative);
- Duration (permanent or temporary / reversible or irreversible); and
- Geographical extent (local, regional or national).

The ESIA predicts the impacts and assesses the risks associated with the project. The impacts/risks may be a direct result of the project (e.g. generation of dust) or may be indirect (e.g. pressure on local resources caused by an influx of migrants attracted by the project and other regional opportunities).

1.6.5 Mitigation Hierarchy

The mitigation hierarchy involves a series of steps to avoid or minimise the impact and risk to the environment and surrounding communities. As per the process outlined in Figure 1-3, the hierarchy of options for mitigation is applied to identify the preferred approach for significant negative impacts or risks identified in the ESIA process. The mitigation hierarchy includes:

1. Avoidance: Involves removing the source of the impact, or 'designing out' an impact or risk (e.g. relocating a project component, avoiding a harmful activity, employing a new technology etc.). Avoidance should be considered for where there are features that are particularly rare, vulnerable, difficult to restore to their former structure and function, and/or are recognised as the highest priority for conservation.
2. Minimisation: Minimising or reducing the impact by controlling the source of the impact or risk (e.g. road spraying, vehicle speed restrictions) or creating a barrier between the impact source and the receptor (e.g. noise screens). Minimisation aims to reduce the severity, duration and/or likelihood of impacts that cannot be prevented by avoidance.
3. Restoration / Rehabilitation: Some activities will result in unavoidable impacts to resources (e.g. loss of land uses due to road construction). Restoration measures aim to return a resource or livelihoods to their initial state, while rehabilitation measures aim to create safe, stable landforms and protect water quality. Secondary objectives for rehabilitation are based on stakeholder consultation and may include water resource protection and re-establishment of land uses.
4. Compensate / Offset: If other mitigation measures are not possible or fully effective, compensation or offset measures may be required to address the residual impact (i.e. those impacts that remain after avoidance and mitigation measures have been implemented).

Where possible, environmental and social impacts are avoided by making changes to the project design in an iterative manner (e.g. relocation of a road to avoid a key environmental feature).

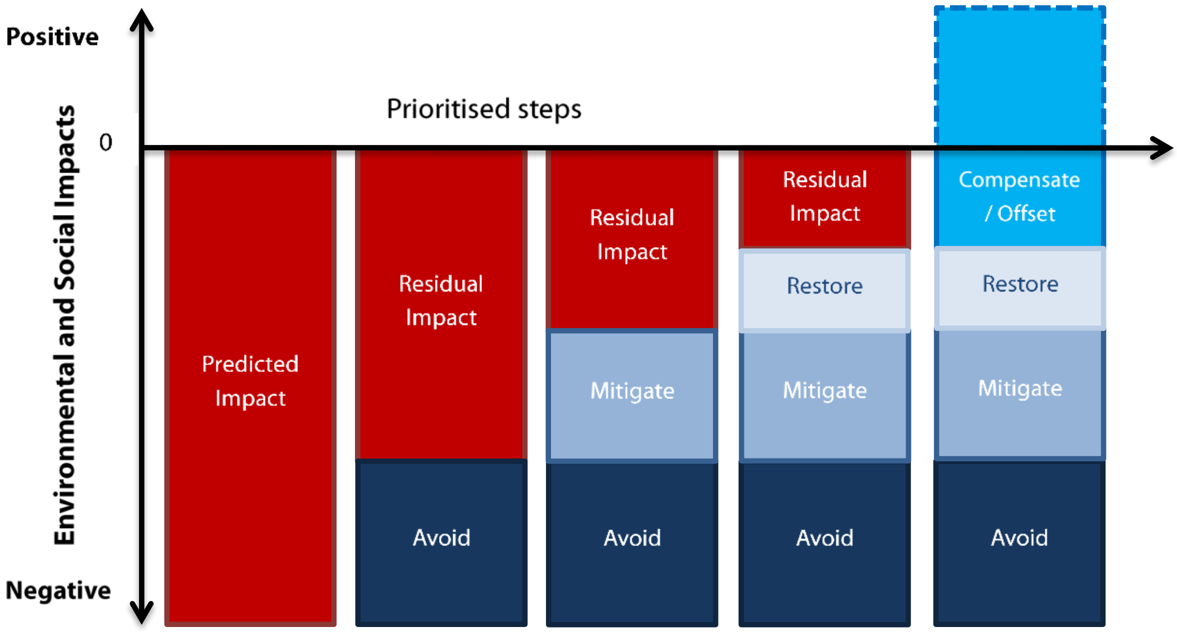


Figure 1-3: Application of the mitigation hierarchy

1.6.6 ESIA Report Structure

The structure and content of the ESIA is consistent with the EIA requirements stipulated in the Ugandan EIA Guidelines for Road Projects (2004, final draft version), and includes additional documentation to assist in meeting the relevant international standards.

The ESIA submission is comprised of the following documents:

- Volume A: Executive Summary;
- Volume B: ESIA Report (this document);
- Volume C: Technical Appendices; and
- Volume D: Management Plans:
  - Environmental and Social Management and Monitoring Plan (ESMMP);
  - Resettlement and Livelihood Restoration Plan (RLRP);
  - Biodiversity Action Plan (BAP);
  - Revegetation Plan;
  - Water Management Plan (WMP);
  - Stakeholder Engagement Plan (SEP).

An overview of this ESIA report is outlined in Table 1-4 below.

Table 1-4: Overview of ESIA Chapters

Chapter	Title	Overview
Chapter 1	Introduction	Summary of the proposed project, project history, the proponent, and ESIA consultants.
Chapter 2	Policy, Legal and Institutional Framework	The policy, legal and administrative framework for environmental assessment of the project.
Chapter 3	Project Description	A detailed description of the project and its scope.
Chapter 4	Project Alternatives	An analysis of alternatives considered in terms of alignment, technology and design.
Chapter 5	Community and Stakeholder Engagement	A summary of the stakeholder consultation process and public involvement in the project.
Chapter 6	Risk Assessment	Summary of risk assessment methodology and outcomes for the Project.
Chapter 7	Land, Assets and Infrastructure	The existing land use, assets and infrastructure setting within the Project area, as well as potential impacts on land use, assets and infrastructure and their proposed management and mitigation.
Chapter 8	Traffic, Transport and Accessibility	The existing traffic, transport and accessibility baseline within and around the Project, as well as potential traffic and accessibility related impacts and their proposed management and mitigation.
Chapter 9	Materials Use and Waste Management	Description of the material use and waste management strategies of the Project and potential related impacts and their proposed management and mitigation.
Chapter 10	Air Quality	The existing air quality baseline within and around the Project and potential air quality impacts and their proposed management and mitigation.
Chapter 11	Noise and Vibration	The existing noise and vibration baseline within and around the Project and potential noise and vibration impacts and their proposed management and mitigation.
Chapter 12	Greenhouse Gas Emissions and Climate Change	The existing greenhouse gas emissions baseline and climate change setting within and around the Project, as well as potential greenhouse gas emissions related impacts and their proposed management and mitigation.
Chapter 13	Visual Amenity and Lighting	The existing visual amenity baseline within and around the Project, as well as potential visual and lighting impacts and their proposed management and mitigation.
Chapter 14	Geology, Geomorphology and Soils	The existing geology, geomorphology and soils baseline within and around the Project, as well as potential impacts and their proposed management and mitigation.
Chapter 15	Surface and Ground Water	The existing surface water and groundwater setting within and around the Project and potential water quality, groundwater quality and hydrology/hydrogeology impacts and their proposed management and mitigation.
Chapter 16	Ecology and Biodiversity	The existing ecology and biodiversity setting within and around the Project and potential ecology and biodiversity impacts and their proposed management and mitigation.
Chapter 17	Ecosystem Services	The existing ecosystem services within and around the Project and potential impacts on ecosystem services, as well as their proposed management and mitigation.

Chapter	Title	Overview
Chapter 18	Archaeology and Cultural Heritage	The existing archaeology and cultural heritage setting within and around the Project and potential archaeology and cultural heritage impacts and their proposed management and mitigation.
Chapter 19	Socio-economic and Livelihoods	The existing socio-economic setting within and around the Project and potential social impacts and their proposed management and mitigation.
Chapter 20	Community Health and Safety	The existing health setting within and around the Project and potential community health and safety impacts and their proposed management and mitigation.
Chapter 21	Cumulative Impact Assessment	An assessment of the potential cumulative impact of the project in consideration of other development activities, and analysis of data and management gaps.
Chapter 22	Environmental and Social Management and Monitoring Plan	A summary of the environmental and social management and monitoring framework and program for implementation.
Chapter 23	Conclusions	The key conclusions derived from the ESIA.
Chapter 24	References	References used in the ESIA.

KJE PPP Project Phase 1 ESIA

CHAPTER 2 Legislative Framework and Policy Guidelines

2. LEGISLATIVE FRAMEWORK AND POLICY GUILDELINES

This chapter describes the legislation and policy framework that is relevant to the project. It covers national legislation, international standards, and international treaties and agreements to which Uganda is a signatory, as well as relevant Ugandan institutions and UNRA policies.

The requirements stipulated within this framework encompass all phases of the Project including project alignment and design; land acquisition and resettlement; and development of the permanent infrastructure (for Phase 1) and other temporary facilities (e.g. construction camps, stone quarries etc.).

2.1 Uganda Environmental Permitting and ESIA Process

2.1.1 Primary Agencies

The primary government agency responsible for the environmental and social assessment of the Project via the EIA process is the National Environment Management Authority (NEMA). NEMA an independent central government agency responsible for co-coordinating all environment-related matters to ensure the sustainable management of the environment. Its functions relating to ESIA development include:

- Coordinating the ESIA process for listed activities;
- Undertaking, alongside other stakeholders, environmental monitoring and audits of infrastructure activities;
- Ensuring and monitoring compliance of listed activities in line with environmental guidelines; and
- Harmonising national and international performance standards in the road/infrastructure sector on environmental sustainability.

As part of the ESIA process, NEMA will also delegate certain functions to the Environmental Liaison Units in lead agencies, and District and Local Environment Committees in district and sub-county local governments (refer to section 2.2.3). A Technical Committee is also convened by NEMA during the evaluation of the ESIA.

As the ministry from which UNRA derives its mandate, the Ministry of Works and Transport (MoWT) is likely to have a key role in the ESIA process. The MoWT is responsible for transport infrastructure and engineering works and will play a role in ensuring that applicable environmental and social management measures are used in the ESIA and that the proposed project is developed according to relevant sectoral standards and guidelines. Other agencies with a role in the ESIA process are presented in Section 2.2.3.

2.1.2 ESIA Process

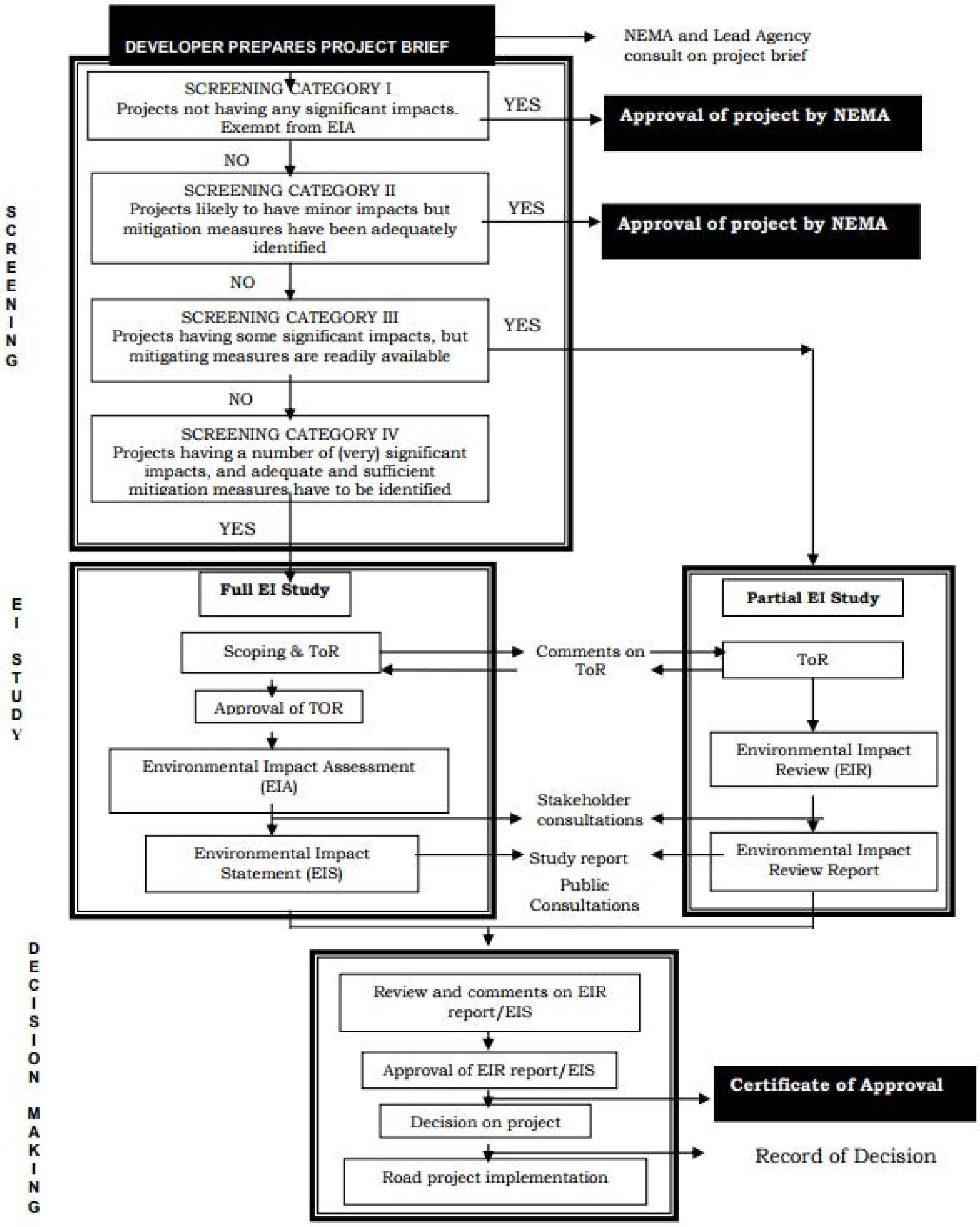
The current ESIA and environmental permitting process in Uganda is based on the requirements of the National Environment Act, Cap 153 (1995) and the process stipulated under National Environment (Impact Assessment) Regulations (1998). Further guidance is provided in the Guidelines for Environmental Impact Assessment in Uganda, 1997 and the Reference Manual, Environmental Impact Assessment (EIA) (2002), and for the road sector specifically, in the Environmental Impact Assessment Guidelines for Road Projects (2008).

Under Schedule Three of the National Environment Act, Cap 153 any major roads such as the proposed KJE Project and roads passing through scenic, wooded or mountainous areas require an EIA.

The EIA Guidelines for Road Projects provides for the classification of projects as Category IV (requiring a full ESIA), Category III (subject to an environmental impact review - EIR), Category II and Category I (exempt from an EIA). According to these guidelines, the proposed project is considered a Category IV project requiring a full ESIA prior to implementation.

Previous ESIAs conducted for the KJE Project in 2011 and 2015 followed the statutory ESIA process, however, several gaps have been identified in an initial gap analysis conducted in 2016. Furthermore, the preferred alignment design has been slightly modified, thus an updated ESIA is required.

The ESIA process as specified by the EIA Guidelines for Road Projects is shown conceptually in Figure 2-1.



Source: Draft EIA guidelines for road projects (Ministry of Works, Housing and Communications, 2004)

Figure 2-1 ESIA process in Uganda

The main chronological stages of the ESIA process according to National Environment (Impact Assessment) Regulations (1998) and the Guidelines for Environmental Impact Assessment in Uganda (1997) are:

Phase I – Screening

Screening is conducted to identify the category of the project as follows:

- Clearly does not require EIA ie; exempt category,
- Has significant environmental impacts for which mitigation measures can readily be identified either directly or through environmental impact review, or
- Has significant environmental impacts whose mitigation measures cannot readily be identified, hence requiring a detailed Environmental Impact Study.

Phase II – Environmental Impact Study

This phase includes the following activities:

1. Scoping study and drafting of the Terms of Reference (TOR) for the environmental impact study;
2. Submission of the TOR to NEMA for review;
3. Approval of the TOR by NEMA;
4. Preparation of the ESIA;
5. Submission of the ESIA by the proponent to NEMA.

Phase III – Decision Making

This phase includes:

1. Review of ESIA by NEMA in consultation with the lead agency (within 30 days);
2. Public inquiry (at the invitation of Executive Director) for a duration of 28 days;
3. Ministry decision.

At the point of ESIA submission, the evaluation process is divided into different components:

1. Review by the lead agency;
2. Public enquiry (which is conducted over approximately 28 days);
3. During the review process, the Executive Director may call for an additional public hearing if it is deemed necessary for promoting environmental protection and good governance;
4. Technical evaluation performed by the Technical Committee on Environmental Impact Assessment (as per Section 11 of National Environment Statute, 1995) for the purposes of evaluating the ESIA.

After submission of the EIA report, a decision by the Executive Director is required within 180 days from the date of submission. This decision is based on the requirements outlined in National Environment (Impact Assessment) Regulations (1998). In the event of a favourable opinion, a Certificate of Approval of the Environmental Impact Assessment is issued. The developer will then need to undertake an initial environmental audit of the project within 12 - 36 months after the commencement of operations. Should the opinion be unfavourable, an appeals process may be undertaken.

The disclosure process will also take into account disclosure requirements of Project Donors.

2.1.3 Scoping Process / ESIA Terms of Reference

The scoping process is a requirement of the Ugandan environmental legislation under the Guidelines for Environmental Impact Assessment in Uganda, 1997 and Draft National Environment Management Policy (NEMA, 2014). The scoping exercise delineates the boundaries of the study area, identifies preliminary alternatives, suggests a schedule for the completion of the environmental assessment and for public involvement during the study, and identifies the full range of stakeholders who may be interested in or affected by the project. The scoping process assists with ESIA planning and forms the basis for the terms of reference (TOR).

Scoping was undertaken in 2011 for the KJE and KSB as two separate projects and a previous ESIA Terms of Reference was submitted and approved by National Environment Management Authority (NEMA) in 2012. In 2015, ESIAs were conducted for the two separate components, however before these were approved, a decision was made by UNRA to merge the two projects into one and seek international finance.

As outlined in Chapter 1, UNRA has engaged the Consultant to update the ESIA for the Kampala-Jinja Expressway (KJE) Project Phase 1, which includes Phase 1 of the original KJE as well as the KSB. A new Scoping Report and TOR for the current ESIA update was submitted to NEMA to reflect improvements and modifications to the Project design and route alignment, fill in gaps identified in the previous ESIA work and align the assessment with international standards including the IFC environmental and social performance standards and AfDB operational safeguards under their Integrated Safeguard System. This 2017 TOR was prepared in line with Annex 4, Model TOR for an EIA of Proposed Road Works, from the Ugandan EIA Guidelines for Road Projects (2004, final draft version) and formed the framework for this ESIA. The TOR was formally approved by NEMA on 2 February 2018.

A new Scoping Report and TOR for the ESIA update were submitted to NEMA on the 27th November 2017 to reflect improvements and modifications to the Project design and route alignment, fill in gaps identified in the previous ESIA work and align the assessment with international standards including the IFC environmental and social performance standards. The 2017 TOR were prepared in line with Annex 4, Model TOR for an EIA of Proposed Road Works, from the Ugandan EIA Guidelines for Road Projects (2004, final draft version).

2.2 Policy and Legislation

This section outlines the national policies, legislation and regulations applicable to the Project and the ESIA process, and which are referred to in the design and management of the project.

2.2.1 National Policy, Legal and Regulatory and Policy Framework

A summary of key Ugandan policies, laws and regulations that are relevant to the environmental and social management of Phase 1 of the KJE Project are provided in Table 2-1. Relevant national discharge standards and guidelines are also included in Table 2-1. Key Ugandan legislation relevant to permitting of the project is as follows:

- National Environment Act, Cap 153 ;
- EIA Regulations, 1998;
- Road Act, Cap 358;
- Traffic and Road Safety Act, Cap 361, 1998.

As part of the regional and international transport corridors being developed in Uganda, the KJE Project will also contribute to key strategic transport priorities for the region and help meet the objectives outlined in key policies such as the Uganda Vision 2040. These are also summarised in Table 2-1 below.

Table 2-1 National policies, laws and regulations relevant to the Project

Instrument / Legislation	Overview	Relevance to Project
National Policies		
National Environment Management Policy (NEMP), 1994 (and Draft 2014)	The National Environment Management Policy (1994) provides an enabling framework for the management of environmental resources in all aspects of national planning including providing a system of environmental impact assessment so that the adverse impacts of development activities can be foreseen, avoided or mitigated. This is currently under review and plans to have a new one in place are in the advanced stages being updated and a 2014 draft is available. The NEMP also outlines national strategies for protecting riverbanks and lakeshores, conserving biodiversity and generating sustainable and renewable energy.	The Proponent is required to undertake an ESIA prior to commencement of works in line with the relevant legislation. The proposed project will traverse wetlands (Munyonyo, Bukasa, Nakivubo, Kansanga, Kito, Kinawataka and Namataba among others) and Namanve Central Forest Reserve. The traversed wetlands and forest reserve are also habitats for wildlife. Under the Guiding Principles of Environmental Impact Assessment (EIA) in Uganda, this Project should be environmentally sound and sustainable; the EIA should consider the social, economic, and cultural impacts of the Project as well as the environmental ones; EIA should be prepared for all activities and where a negative environmental threshold is determined in the EIA; Environmental Audits will also be required.
The National Water Policy, 1999	This policy aims to manage and develop the water resources of Uganda in an integrated and sustainable manner. The water policy requires an integration of the water and hydrological cycle concerns in all development programmes. The Policy further emphasises the need for participatory planning at the lowest possible level and specifically mentions the requirement for districts to set priorities, by-laws and annual development plans within policies and guidelines set by national level ministries.	
National Policy for the Conservation and Management of Wetland Resources, 1995	The overall objective of this policy is to ensure the sustainable use of wetland resources through guaranteeing conservation of key species, maintenance of ecological functions and promoting equitable access to resources therein. The policy commits government to enhancing public awareness and understanding of wetlands resources and actively encourages participation of the public, local government authorities and institutions in environmental management. The policy provides the framework for implementing the Ramsar Convention on Wetlands of International Importance, and provides for the requirement of ESIA for all planned developments in protected wetland areas	
The Uganda Wildlife Policy, 2014	The policy is an update of the Uganda Wildlife Policy (1999) which forms the basis of the Uganda Wildlife Act, Cap 200. One of the strategies to achieve the objectives of this policy include ensuring that all new developments and interventions within protected areas are subjected to appropriate environmental impact assessments.	
The Uganda Forestry Policy, 2001	The Goal of the Forestry Policy is to ensure an integrated forestry sector that achieves sustainable increase in the economic, social and environmental benefits from forests and trees by all the people of Uganda, especially the poor and vulnerable. The government of Uganda acknowledges that the country's forests and woodlands are central to the three pillars of sustainable development - the economy, society and the environment - and that the sector is not being given adequate priority. The country's forest resources provide energy, forest and tree products, employment, livelihoods support, government revenues, business opportunities, environmental functions and services, and they maintain ecological integrity.	

Instrument / Legislation	Overview	Relevance to Project
The Uganda Gender Policy, 2007	The Uganda Gender Policy, 2007 provides a framework for redressing gender imbalances as well as a guide to all development practitioners. The aim of the policy is to guide all levels of planning, resource allocation and implementation of development programmes with a gender perspective. The emphasis on gender is based on the recognition that "gender" is a development concept useful in identifying and understanding the social roles and relations of women and men of all ages, and how these impact on development. The policy gives a clear mandate to the Ministry of Gender, Labour and Social Development and other Line Ministries to mainstream gender in all sectors. It sets priority areas of action at the National, Sectoral, District and Community levels. The ultimate objective of the policy, therefore, is to evolve a society that is both informed and conscious of gender and development issues and concerns.	At all the Project phases, gender issues will need to be considered in the management of the Project. Gender issues have been specifically considered in the development of mitigation measures for the ESIA.
National Environment Health Policy, 2005	Environmental health encompasses a wide range of subjects, however this policy is concerned primarily with; water supply, sanitation and hygiene promotion, solid, liquid and hazardous and health care waste management, air pollution control, food safety and hygiene, the control of insect vectors and vermin, occupational health and safety, road safety and housing conditions. The policy is primarily implemented by the Ministry of Health.	UNRA will need to provide sanitary facilities for use by the workers during road construction in addition to providing them with water for drinking, PPE and a proper waste management system.
Occupational Safety and Health Profile, 2004	This Profile was prepared by the Ministry of Gender, Labour and Social Development and summarises the legislative framework regarding OHS in Uganda. It also summarises the institutional arrangements regarding OHS in Uganda and associated responsibilities, including for developments by the private sector. Notably a Draft National Occupation Safety and Health Policy was prepared in 2017, but has not yet been approved.	The OHS requirements outlined in the Profile and draft policy have been considered in the development of the OHS requirements for the Project.
The Uganda Wildlife Policy, 2014	The policy is an update of the Uganda Wildlife Policy (1999) which forms the basis of the Uganda Wildlife Act, Cap 200. One of the strategies to achieve the objectives of this policy include ensuring that all new developments and interventions within critical habitat areas are subjected to appropriate environmental impact assessments.	The proposed project will traverse forests, wetlands and a Central Forest Reserve area which could be important wildlife habitat areas and as such, wildlife aspects will need to be considered during the proposed project development.
The Uganda National Land Policy, 2013	The Uganda National Land Policy provides a framework for having an efficient and effective land delivery system. Among its other objectives, the policy seeks to harmonise and streamline the complex land tenure regimes in Uganda for equitable access to land, and to clarify the complex and ambiguous constitutional and legal framework for sustainable management and stewardship. It also aims to ensure sustainable utilisation, protection and management of environmental, natural and cultural resources on land for socio-economic development.	The Proposed Project will need to comply with relevant land tenure Regulations since the Project will involve land take and this must be done in congruence of this policy in terms of the modalities of acquiring the land.
National Land Use Policy, 2007	The aim of the policy is to: “achieve sustainable and equitable socio-economic development through optimal land management and utilisation”. The specific goals include; To reverse and alleviate adverse environmental effects at local, national, regional and global levels; • To promote land use activities that ensure sustainable utilisation and management of environmental, natural and cultural resources for national socio-economic development;	It’s important that the activities associated with the development of the proposed project conform to sustainable land use practices within the proposed Project area/alignment.

Instrument / Legislation	Overview	Relevance to Project
	• To ensure planned, environmentally friendly, affordable and well-distributed human; and settlements for both rural and urban areas; and To update and harmonise all land use related policies and laws, and laws and strengthen institutional capacity at all levels of Government.	
The National Policy for Disaster Preparedness and Management Policy, 2011	The policy defines the framework for management of disasters at national, regional and local levels.	Paragraph 4.15 stipulates that private sector organisations have a responsibility to ensure that their operations do not pose a risk to their workers, the general public, or the environment. It further states that the owners of installations are responsible for educating workers on safety measures and emergency response measures.
The Uganda National Policy on HIV/AIDS and the World of Work, 2007	The National Policy on HIV/AIDS and the world of work covers all workers and prospective workers, all employers and prospective employers from the public and private sectors both formal and informal. The policy spells out the key principles underlying its implementation namely: non-discrimination; confidentiality; HIV testing; greater involvement of people living with HIV/AIDS; promotion of prevention; treatment, care and support; and gender concerns in the work place. The goal is to provide a framework for prevention of further spread of HIV and mitigation of the socio-economic impact of HIV/AIDS within places of work in Uganda. Furthermore, this policy makes it the role of every employer to formulate a sound HIV/AIDS policy, around the principle of non-discrimination, equality, confidentiality, care and support. The policy also notes that HIV/AIDS disrupts production as it affects the workforce both directly and indirectly. The policy defines the role of the private sector including the construction sub-sector. This includes development and implementation of programs for the management of HIV/AIDS in line with national policy guideline, mobilisation of resources for the education of workers and the related communities, integration of HIV/AIDS in training programs as well as documentation and replication of best practices and providing a forum for sharing information and feedback.	The proposed Project will be required to comply with the policy as an employer in Uganda – the proposed Project will develop and implement an HIV/AIDS management plan/policy during project execution.
Ministry of Works and Transport OHS Policy, 2008	The OHS Policy is guided by the Constitution of the Republic of Uganda and other global, national and sectoral Regulations and policies. The Policy also takes into recognition of the Transport Sector Policy and the Health Sector Strategic Plan, both of which aim to improve the quality of life for all Ugandans in their living and work settings. The Policy seeks to: • Provide and maintain a healthy working environment. • Institutionalise OHS in the road-sector policies, programmes and plans. • Promote efficient road safety management practices. Contribute towards safeguarding the physical environment.	The propose Project will have to comply with this policy since the project is part of the transport sector and as such, OHS measures for workers and efficient road safety management practices must be prioritised in addition to safeguarding the physical environment.
The Fisheries Policy, 2000	The goal of this policy is to ensure increased and sustainable fish production and utilisation by properly managing the capture of fish; promoting aquaculture and reducing postharvest losses. This goal contributes to the overall national development policy of poverty eradication and food security. The policy provides that participatory planning and policy-making form the	The requirements of this Policy will need to be considered during development of the proposed Project, and its potential impact on fisheries resources since the project will traverse wetlands that are habitats for fish and also which wetlands drain into Lake Victoria that is a habitat for fish.

Instrument / Legislation	Overview	Relevance to Project
	basis of fisheries management, so as to ensure that fisheries management systems are based on dynamic processes that take into account technical, biological, social, economic, environmental and cultural aspects. The policy further provides that adverse environmental impacts on fisheries are to be minimised, and mechanisms established at appropriate levels to achieve this by protecting fisheries and aquatic ecosystems from adverse environmental impacts.	
The National Industrial Policy, 2008	One of the core objectives of this Policy is exploiting and developing natural domestic resource-based industries and promoting competitive industries that use local raw materials.	The proposed project will require construction materials during the development Phase but most importantly the proposed project will traverse industrial areas of Namanve, and Luzira that are host to industrial parks.
The National Climate Change Policy, 2015	The goal of this Policy is to ensure a coordinated approach towards a climate-resilient and low carbon development path for sustainable development in Uganda.	The proposed Project must comply with the policy since activities such as vegetation clearing, earth work movements and construction activities can lead to emission of greenhouse gases. In addition, the transport sector is one of the leading sources of GHG emissions which are key contributors to climate change.
Buy Uganda Build Uganda (BUBU) Policy (2014)	The Policy is aimed at “promoting the consumption of locally produced goods and services”. The policy aims at increasing the consumption of local products through public procurement and encouraging the Private Sector to consume locally originating products thus increasing the participation of the locally established firms in domestic trade.	The ESIA has considered this Policy in relation to the procurement processes of the Project during construction and operations. The procurement of local goods and services by the Project where possible will assist in ensuring local people benefit from the Project.
Other important national instruments		
Uganda Vision 2025	This is a set of goals that the Uganda government set to achieve for the common good and economic development of the country by the year 2025. The goals cover political, economic, social, environmental, and cultural aspects of life. Key in the environmental goal, is the desire by Ugandans to have a sustainable socio-economic development matched with environmental quality and ecosystem resilience. In order to achieve a sustainable socio-economic development, the government prioritised development of infrastructure (roads) as a key factor.	Development of the proposed KJE Phase I will ensure that environmental quality and ecosystem resilience are promoted in all project phases. Also development of the road will contribute towards improving the socio-economic environment within Uganda since the transport sector is a major driver for the other sectors (agriculture, education, etc.).
Uganda Vision 2040	The Vision 2040 is conceptualised around strengthening the fundamentals of the economy to harness the abundant opportunities around the country. The fundamentals include among others the transport infrastructure. In this Vision, the country will develop the road infrastructure to improve transport connectivity, effectiveness connectivity, effectiveness and efficiency to comparable levels of the developed countries. The main strategies will include: development of highways connecting Uganda to the neighbouring countries and the major productive centres within the country; improvement of road infrastructure within the Greater Kampala Metropolitan Area and other urban areas. Multi-lane expressways and superhighways connecting major cities, exit ports and economic zones will be built.	The proposed project is an opportunity enshrined under the transport sector of Vision 2040. It is therefore in line with Uganda’s Vision 2040 goals for the transport sector. The ESIA Update will explore all avenues to ensure that the KJE is implemented in consideration of the protection and sustainable utilisation of the natural resources in line with the provisions of this Vision.
Second National Development Plan (2015/16 – 2019/20)	The Second National Development Plan (NDP II) outlines the country’s medium term development priorities and implementation strategies. The NDP II advocates for development of adequate Transport Infrastructure, noting that there is a close relationship between regional	The proposed project is in line with the priority development areas of the NDPII and is listed as one of the ‘core projects’ under the Plan.

Instrument / Legislation	Overview	Relevance to Project
	integration, growth, and transport infrastructure. In particular, transport infrastructure development helps to: reduce the cost of production and of doing business; widen and integrate markets; achieve economies of scale; encourage participation of the private sector; and attract foreign direct investment and technology, hence increase a country's competitiveness and effective participation in regional and global value chains.	
National Transport Master Plan	The National Transport Master Plan including a Transport Master Plan for Greater Kampala Metropolitan Area (NTMP/GKMA) sets out a framework for development of the transport sector over the next 15 years, 2008-23 in Uganda. It is a high-level document that summarises the optimal and economically viable infrastructure investment projects in Uganda. The availability of high-quality and reliable transport infrastructure and services is pre-requisite for the effective functioning of the productive and service sectors, NTMP/GKMA sets a 15-year scenario for future development and management of the transport sector, including a transport sector investment plan, and an outline of the required institutional and regulatory framework and its implementation. This scenario aims to be consistent with the country's longer-term overall development goals, as outlined in the 'Vision 2040 setting overall frameworks to the years 2025 to 2040.	The proposed project is in line with the objectives of the NTMP.
Transport Development Strategy for the Greater Kampala Metropolitan Area (GMKA)	The GKMA Transport Plan and the NDP propose a number of measures for decongesting the Kampala CBD and improving trade movement in the GKMA	The Project is located in parts of the GMKA and will help meet the objectives or reducing traffic congestions within the metropolitan area.
Local Policies/Plans		
Kampala Capital City Authority (KCCA) Strategic Plan (2014/15 – 2018/19)	The KCCA Strategic Plan (2014/15 -2018/19) outlines the authority's plan to inject US$1.55Bn to address major infrastructure gaps and priority social and economic investments needed to transform Kampala and respond to the challenges of increasing urbanisation and rural-urban migration. The plan outlines the development of several new flyovers, including one associated with the Kampala-Jinja road (Kitgum House junction).	The design of the Project will need to take into account the planned infrastructure and development projects outlined in this Plan.
Proposed Kampala Physical Development Plan	A planning team from Israel performed an analysis of the Greater Kampala Metropolitan Area (GKMA) and constructed the Kampala Physical Development Framework (KPDF) aimed at carrying out the Vision of Kampala to create a well-organized and modern urban metropolitan system. The KPDF led to the creation of the Kampala Physical Development Plan (KPDP) which focuses on the development of the KCCA area as the heart of the GKMA. The objectives of KPDP are to guide the orderly, sustainable physical development of the city in the short and long term.	The design of the Project will need to take into account the planned physical developments outlined in this Plan.
Kampala, Wakiso and Mukono District Development Plans (DDPs)	These are planning documents for each district and they have a five (5) year time horizon. They are used as a basis for tracking government programs and directing investment and also taken environmental considerations into account. The DDP is a minimum standard that environmental issues be incorporated in the development plan. The DDP requires that all projects are screened, and issues and recommendations included both in the project profiles and project bid documents for contractors' consideration and requires contractors to comply with such issues.	The proposed KJE Phase I will be carried out within the boundaries of Kampala, Wakiso, and Mukono districts. All Project activities should be in tandem with the requirements of the respective DDPs.

Instrument / Legislation	Overview	Relevance to Project
	It is worth noting that there are planning documents developed at the sub-county level (lower local government) that feed into the DDPs that are geared towards accelerating development in the sub-counties in an environmentally sound and sustainable manner.	
Laws/Acts of Parliament		
The Constitution of the Republic of Uganda, 1995 (as amended)	The Constitution, as the supreme law, provides the legal and regulatory framework in the country and provides for all aspects pertaining to land, to the environment and other related aspects. It provides for: • Promoting, sustainable development and public awareness on the need to manage land, air, water resources in a balanced and sustainable manner for the present and future generations;. • Take possible measures to prevent or minimise damage and destruction to land, air and water resources resulting from pollution or other causes; and. • Promote the rational use of natural resources so as to safeguard and protect bio-diversity of Uganda. Under Article 39, the Constitution guarantees the right of every Ugandan to a clean and healthy environment.	The constitution therefore, requires that the Project should be implemented without endangering human health and the environment. The Proposed project will have to be undertaken in line with these constitutional obligations.
The National Environment Act, Cap. 153	The National Environment Act, Cap 153, is the most important legal instrument in Uganda with respect to environmental management, providing for an institutional framework through establishment of the National Environment Management Authority (NEMA). It also specifies management measures, addresses pollution control and stipulates mechanisms for enforcement of the law. Under Section 19, the Act states the criteria under which EIA shall be required and the process is further elaborated in the Environmental Impact Assessment Guidelines of Uganda (July 1997). The Act provides for environmental audits and inspections by NEMA's environmental inspectors and other Lead Agencies. This Act requires operators of projects to maintain records and make annual reports to NEMA to demonstrate environmental compliance. Also, the Act prescribes projects for which EIA is mandatory, and road projects are among of these (Section 3 in Third Schedule of the Act). The ESIA Update will therefore be conducted in compliance with this Act. It is worth noting that a draft bill that seeks to introduce new provisions in the NEA, Cap 153 of 1995 has been proposed by the Ministry of Water and Environment was proposed by NEMA. The draft bill seeks to retain many of the existing provisions, but the new provisions include	In accordance with Section 19(4) (a) and the Third Schedule to the Act, the Proposed Project qualifies for EIA.

Instrument / Legislation	Overview	Relevance to Project
The Uganda Wildlife Act, Cap 200	The Act provides for sustainable management of wildlife, consolidation of the laws relating to wildlife management, establishment of a coordinating, monitoring, and supervisory body for that purpose and all associated matters.	Section 15 of the Act requires that any project that may have a significant effect on any wildlife species or community is subject to environmental impact assessment in accordance with the National Environment Act.
The Uganda National Roads Authority Act, 2006	UNRA was established as a result of this Act. The purpose of UNRA is to manage the provision and maintenance of the national roads network in a more efficient and effective manner; to render advisory services to Government; and for related matters. UNRA's functions include: • Management of the national roads network; • Maintenance and development of the national roads network; • Advisory to Government on policy matters concerning roads generally, and to assist in the co-ordination and implementation of the policy relating to roads; • Contribution to the addressing of transport concerns in overall national planning through co-ordination with the relevant ministries, departments and agencies of Government; • Collaboration with international organisations, intergovernmental organisations and agencies of other states and the private sector on issues relating to the development and maintenance of roads; • To advise and assist the Minister, subject to such conditions as may be agreed upon.	This Act defines the functions of the Project Sponsor, UNRA.
The Public Health Act, Cap 281	This Act aims at avoiding pollution of environmental resources that support health and livelihoods of communities. The Act gives local administrative units authority (Section 103) to prevent pollution of watercourses in interest of public good. Section 54 provides a general prohibition of nuisances or conditions liable to be hazardous to health on any land.	This Act will not only be relevant in regard to several watercourses along the proposed alignment of the expressway but also land where workers camps, equipment yards and quarries will be located as the proposed Project must undertake all necessary and reasonable practical measures for preventing the occurrence of, or dealing with any outbreak or prevalence of, any infectious communicable or preventable disease in addition to minimising vibration and noise nuisances within the proposed project area.
The Physical Planning Act, 2010	The Physical Planning Act, 2010 repealed the Town and Country Planning Act, Cap 246 as the principal law pertaining to physical planning requirements, and makes it mandatory for any person undertaking a development to obtain development permission. Section 24 (1) of the Act, however, stipulates that The Minister may, on the recommendation of the Board, by statutory instrument, declare an area with unique development potential or problems, a special planning area for the purposes of preparation of a physical development plan.	The Proponent will be required to obtain planning permission for the Project under this Act.
The Local Governments Act. Cap. 243	Local Governments Act, 1997 establishes a form of government based on the district as the main unit of administration. Districts are given legislative and planning powers under this Act (Sections 36-45). They are also enjoined to plan for conservation of the environment within their local areas. District Environmental Committees established under section 15 of the National Environment Act Cap 153 are supposed to guide district authorities in that regard.	Under Section 35, the districts of Wakiso, Mukono and Kampala Capital City Authority (KCCA) will have the mandatory duty to monitor compliance with all relevant environmental laws and Regulations for the proposed project since it will traverse the aforementioned districts. Also, the proposed project will be required to comply with the respective DDPs when undertaking the proposed project.

Instrument / Legislation	Overview	Relevance to Project
The Roads Act, Cap 358	The Act provides for the establishment of road reserves and for maintenance of roads. Standard road reserve requirements will therefore, have preference under the law and that UNRA, within this mandate may have to acquire such land in line with this standard requirement. Further, the Act allows the roads authorities to extract and take materials from the road reserve for the construction and maintenance of roads.	The proposed project is for the development of an expressway and as such, this Act is a critical piece of legislation with respect to the proposed KJE.
The Access to Roads Act, Cap 350	The Access Roads Act regulates the rights of private landowners who have no reasonable means of access to public highways through adjoining land. The land owner may apply for leave to construct a road of access to a public highway. The Act further provides for maintenance of access roads in a good and efficient state of repair and for payment of compensation to land owners of adjoining land in respect of the use of the land, the destruction of crops, trees and such other property.	In essence, this means that road construction should take into consideration that private land owners should access highways. The proposed project will have restricted access; however, it will be designed to ensure that land owners and the public have access at appropriate points.
The Water Act, Cap 152	The objective of the Act is to enable equitable and sustainable management, use, and protection of water resources of Uganda through supervision and coordination of public and private activities that may impact water quantity and quality. Section 18 requires that before constructing or operation of any water works, a person should obtain a permit from the Directorate of Water Resources Management (DWRM). Construction is herein defined to include alteration and improvement of bridges. The Act also aims to control pollution of water resources. Section 19 provides that subject to guidelines established by the Minister from time to time, the Director (of water resources management) may exempt a public authority or a class of persons or works from requirements in Section 18 on such conditions as he or she may deem fit. Since this decision is reached upon evaluation of an application submitted to the Directorate, Section 19 does not automatically preclude works by public agencies from applying for permits prescribed by this Act. Section 20 has provisions for the standard conditions under which a holder of a permit should use a water resource.	All construction and operation works will comply with this Act. This Act will specifically be applicable to three aspects of the proposed road project: • Water abstraction for road construction and camp use;. • Activities associated with construction of bridges and viaducts across rivers; and. • Discharge of construction and associated waste water in water courses.
The Fish (Amendment) Act, Cap 197, 2011	The Act makes provision for the control of fishing, the conservation of fish, the purchase, sale, marketing and processing of fish and matters connected therewith. Section 12, subsection (4) stipulates that 'except where otherwise expressly provided by any written law, no person shall divert the waters of any lake, river, stream, pond or private waters in which fish, their eggs or progeny have been introduced with the consent of the chief fisheries officer, unless the ditch, channel, canal or water pipe conducting the water is equipped at or near the entrance or intake with a screen or a filter of a design approved in writing by the chief fisheries officer, that is capable of preventing the passage of fish, their eggs or progeny into the ditch, channel, canal or water and where the chief fisheries officer so directs there is also provided a by-pass.	The proposed project will comply with this Act since it will traverse sensitive ecosystems (wetlands) that may be breeding grounds for fish. Also, the wetlands that will be traversed by the proposed project drain into Lake Victoria which is a breeding ground for fish.
The National Forestry and Tree Planting Act, 2003	The Act prohibits the destruction, damage or disturbance of natural forests and forest reserves except in the course of carrying out activities for their sustainable management, or in accordance with a licence issued under this Act.	In implementing this project this Act will guide operations related to removal of trees and related biodiversity since the Proposed Project is expected to have direct impacts on Namanve CFR.

Instrument / Legislation	Overview	Relevance to Project
	Section 38 of the National Forestry and Tree Planting Act, 2003 also requires a person or organisation intending to undertake a project or activity which may, or is likely to have a significant impact on a forest to undertake an Environmental Impact Assessment. The Act further facilitates greater public awareness of cultural, economic and social benefits of conserving and increasing sustainable forest cover.	
The Plant Protection and Health Act 2015	The Plant Protection and Health Act intends to consolidate and reform the law relating to plant protection regarding destructive diseases, pests and weeds. This Act is focused on prevention of introduction and spread of harmful organisms that may adversely affect Uganda's agriculture, the national environment and livelihood of the people. The Act aims to regulate the export of plants and plant products and introduction of new plants in accordance with international commitments. The Commissioner for Agriculture is responsible for the implementation of this Act.	The Project will need to consider measures to minimise the introduction and spread of invasive species.
The Prohibition of the Burning of Grass Act, Cap 33	The Act prohibits the unauthorised burning of grass within a forest reserve, national park, and wildlife reserve or wildlife sanctuary.	Requires the Proponent to take appropriate measures to prevent burning of grass in CFR within the project area as a consequence of Project activities.
The Historical Monuments Act, Cap 46	The Historical Monuments Act, Cap 46provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical and traditional interest. The Act grants the minister wide ranging powers to protect any of the above objects and under section 8, no person whether owner or not shall cultivate or plough the soil so as to effect to its detriment any object declared to be protected or preserved. The Act further gives mandate to the Department of Museums and Monuments to collect, document and preserve cultural relics that have values to the community, the nation and the international community. Under section 11, any person who discovers any object which may reasonably be considered to be a historical monument or an object of archaeological, paleontological, ethnological, and traditional interest is required to report it to the Conservator of Antiquities within 14 days of the discovery.	The Act requires the Proponent to identify objects or resources within the project area that are protected under this Act, and to take appropriate measures to preserve them. Chance find objects that may be found during the project activities will need to be reported to the Department of Museums and Monuments for advice and where necessary undergo a forensic assessment. The ESIA team will have specialists in this field to aid determination of baseline data with regards to objects of archaeological, paleontological, ethnographical and traditional interests.
The Land Act, Cap. 227 (1998) as well as the Land (Amendment) Act, 2010	The Land Act, Cap 227 provides for the ownership and management of land. Under Section IV, it provides for four different types of land tenures (Customary, Leasehold, Mailo and Freehold) and the procedure for applying for grant of any of the tenures. The Land (Amendment) Act 2010 aims to enhance the security of occupancy of lawful and bona fide occupants on registered land in accordance with article 237 of the Constitution, and for related matters. In addition, section 45 addresses the control of environmentally sensitive areas. Besides relevant environmental sections of the Land Act, 1998 (Sections 42, 43, 44, 45, 70, 71, and 72) specific attention will be taken of section 40 of the Land Act which deals with Conditions on Transfer of Land by family. Subsection (1) states that No person shall enter into any contract for or actually sell the land on which that person usually lives with a spouse or dependent children of the age of 18 or above except with prior written consent of either the spouse or the children.	The proposed project should seek to enter into mutual agreement with the occupier or owner of the affected land in accordance with this Act and provide the valuation principles for compensation.

Instrument / Legislation	Overview	Relevance to Project
	The Act creates a series of land administration institutions consisting of Uganda Land Commission (ULC), District Land Boards (DLB) and Section 78 of the Act gives valuation principles for compensation.	
The Land Acquisition Act (Cap 229)	The Act makes provision for the compulsory acquisition of land for public purposes and for other matters incidental thereto.	The Act stipulates that in the case of compulsory land acquisition for the project, the project affected persons must be adequately compensated.
The Registration of Titles Act, Cap 230	The Act stipulates the requirements relevant to the registration and issuance of titles to land transfer of registered land.	The Proponent is required to comply with the requirements of the Act during any acquisition of land for establishment of project components.
The Illiterates Protection Act, Cap 78	The Act provides for the protection of illiterate persons in relation to writing and signing of documents on behalf of such persons.	Requires the Proponent to ensure adherence to this Act during any writing, signing or endorsement of documents pertaining to land acquisition or compensation related to the project.
The Employment Act, Cap. 219	The Employment Act aims to regulate employment and other associated matters.	The Proponent is required to comply with the Act and any associated Regulations for all project-related employment. It mandates labour officers to regularly inspect the working conditions of the workers to ascertain the rights of workers and ensures that their provisions are provided for as well as their welfare.
The Occupational Safety and Health Act, 2006	It makes provisions for the health, safety, welfare and appropriate training of persons employed in workplaces. Section 13 (b), requires employers to ensure as far as reasonably practicable that the working environment is kept free from any hazard due to pollution by employing technical and supplementary organisational measures. Section 13, Subsection (2) (c): it is the employer's duty to ensure the provision of adequate and appropriate information, instructions, training and supervision necessary to ensure, as far as is reasonably practicable, the safety and health of the employees, and the application and use of occupational safety and health measures, taking into account the functions and capabilities of the different categories of workers in an undertaking. Section 18 of the Act tries to safeguard the environment by requiring employers to monitor and control the release of dangerous substances into the environment, where there is a major handling of chemicals or any dangerous substance which is liable to be airborne or to be released into rivers, lakes or soil and which are a danger to animal and plant life. Section 25 (a): it is the duty of the employer to display or provide safety precautions to any person who may be affected by the manner in which the employer conducts his undertaking, whether or not that person is his or her worker.	The Act lays out the general safety, health and environmental requirements for workplace safety to be applied during all phases of the project including obligations to inspect statutory equipment and register workplaces.
The Workers Compensation Act, Cap. 225	This Act provides for compensation to workers for injuries suffered and scheduled diseases incurred in the course of their employment. Section 3 (1), states that, "If personal injury by accident arises out of a worker's employment, the injured worker's employer shall be liable to pay compensation in accordance with this Act." Section 18 (1) states that, "Subject to sub-sections (2) and (3), every employer shall ensure and keep himself or herself insured in respect of any liability which he or she might incur under this Act to any worker employed by him or her".	The Proponent is required to comply with the requirements of the Act during the planning, construction and operation phases of the Project.

Instrument / Legislation	Overview	Relevance to Project
	Section 22 (1) elaborates the duty of the employer towards contractors or subcontractors. Where a person awards a contract or subcontract to an employer for the execution of any piece of work, that person shall be liable to pay to any worker employed in the execution of the contract or subcontract by the employer any compensation under this Act as if that person had been directly employed by that person.	
The Labour Disputes (Arbitration and Settlement) Act, 2006	This Act repealed and replaced the Trade Disputes (Arbitration and Settlement) Act, Cap 224. The Act makes provisions for dispute resolution between an employee and employer and/or between employees. Section 3 (1) states that, "Subject to subsection (2), a labour dispute whether existing or apprehended, may be reported, in writing, to a Labour Officer, by a party to the dispute in such a form and containing such particulars as may be prescribed by Regulations made under this Act".	In the event that there is a labour dispute between an employer and employee(s), and all forms of lower arbitration have failed, the proposed project proponent is expected to resolve the dispute in accordance with the requirements of this Act.
The Labour Unions Act, 2006	This is an Act to regulate the establishment, registration and management of labour unions. Section 3 makes provisions for employees' rights to organise themselves in any labour union. Section 4 further stipulates that an employer shall not interfere with, restrain or coerce an employee in the exercise of his or her rights guaranteed under this Act. He shall not interfere with the formation of a labour union or with the administration of a registered organisation.	The proposed project proponent is expected not to interfere with the rights of its employees in the event that they decide to form a labour union or with the administration of a registered organisation.
The Explosives Act, Cap. 298	The state reserves all the rights to importation and storage of quarrying explosives and exercises this right through The Explosives Act. This Act regulates use and management of explosives for civil purposes. Under this Act, explosives are kept at a site approved by the Ministry of Internal Affairs and can only be transported to the blast site under Police escort. Charging of explosives and blasting are carried out under Police supervision. Under Sections 9 and 10, the Proponent will be required to acquire permits to import and use explosives.	The Act will be applicable in KJE especially during rock blasting and operation of quarries. It is mandatory for quarry operators to comply with this law.
The Investment Code Act, Cap. 220	The Investment Code Act provides for local and foreign investments in Uganda by creating more favourable conditions for investment. Also, the Act, requires an investor to take necessary steps to ensure that the operations of his or her business enterprise do not cause injury to the ecology or environment (Section 18 (2) (d)).	All forms of investment on the proposed Project will have to comply with this Act.
The Traffic and Road Safety Act, 1998	This is the main Act governing road transport in the country. In particular, the Act provides for among other things the use of a motor vehicle trailer or engineering plant on any road, need for the registration of all motor vehicles, the need for obtaining driving permits, the requirement to comply with road signs and speed limits, the procedure to be followed at the time of an accident, and the need for the employer to keep record of drivers.	The project proponent should ensure that all motor vehicle usage is in line with this Act during implementation of the proposed Project.
The Traditional Rulers (Restitution of Assets and Properties) Act, Cap 247	This Act restored ownership of property to Traditional Rulers and gives them powers to negotiate with the Central government with a view of returning to them such assets and properties as may be agreed.	The proposed Project is located within the central region where some land belongs to traditional leader. Acquisition of land in such areas will require negotiation with these (traditional) leaders.

Instrument / Legislation	Overview	Relevance to Project
Petroleum Supply Act 2003	The Act provides for the supervision and monitoring of transportation, supply, storage and distribution of petroleum products for road construction works. The Act regulates licensing and control of activities and petroleum installations for protection of public health and safety and control of environmental pollution. Section 3, Part (d) ensures public safety and protection of public health and the environment in all petroleum supply operations and installations. According to this Act, "petroleum products" includes asphalts and bitumen, oils as well as conventional petroleum fuel. This Act will apply to management (construction, operation and decommissioning) of fuel handling facilities during road construction including fuel transportation, constructing and operation of storage tanks and consumption of petroleum products. Section 17(1) prohibits constructing a petroleum products installation without having obtained a petroleum construction permit. Section 18 provides guidance on process leading to securing this permit.	Road projects consume considerable amounts of petroleum products therefore all foregoing provisions will be important for construction and operation of onsite fuel storage facilities during road construction.
The Mining Act, 2003	The Mining Act, 2003, which repealed the Mining Act, Cap. 148, aims to manage the ownership of all mineral rights in Uganda, and to provide for the acquisition of mineral rights and any related matters. Section 110 (2b) gives guidance on restoration activities. It provides that the environmental restoration plan shall include a detailed timetable for accomplishment of each major step to be carried out under the restoration plan which may include reinstatement, levelling, re-vegetation, reforesting and contouring of disturbed land; the filling in, sealing, or fencing off of excavations, shafts and tunnels.	Construction of KJE will involve auxiliary activities including stone quarrying and borrow materials extraction. Such activities especially stone quarrying will involve excavations and creation of work spaces for operations. Requirements under Part XI of the Act for the Protection of the Environment are therefore, relevant. Such requirements include: Environmental Impact Assessment and Audits and Environmental standards for the prevention and minimisation of pollution of the environment and waste management.
National Regulations		
The Environmental Impact Assessment Regulations, 1998	These Regulations reinforce the EIA requirement and prescribe procedures to be followed in conducting EIA of projects. The Regulations also charge the developer with the responsibility of ensuring that mitigation measures from the EIA are complied with. The Regulations further require projects to undertake post assessment environmental audits to ensure that predictions made during the assessment are properly managed. The Regulations provide for self-auditing by the project owners (Section 31) and by NEMA (Section 32). The Regulations require a project to undertake the first audit not less than 12 months but not later than 36 months from project commencement, and submit findings thereof to NEMA. Public participation: Sub-regulation (1) of Regulation 12 requires the developer to take all measures necessary to seek the views of the people in the communities that may be affected by the Project. Regulations 19, 20, 21, 22 and 23 outline further requirements for public participation. Amendments were made to the EIA Regulations of 1998 as of August 2014, and these take note of the screening and project brief stage which may be used to identify the need for a full environmental impact study.	The Proponent (UNRA) will undertake an ESIA in accordance with the Regulations including, preparation and submission of Terms of Reference, and provision of all contents for an environmental impact statement outlined under Regulation 14.

Instrument / Legislation	Overview	Relevance to Project
The Water Resources Regulations, 1998	The Regulations apply to motorised water abstraction from boreholes or surface watercourses or diverting, impounding or using more than 400 cubic meters of water within a period of 24 hours. Part II, Regulation 3 requires a water permit for operation of a motorised water pump from a borehole or waterway. Under Regulation 6, application for a permit may be granted on condition of projected availability of water in the area, existing and projected quality of water in the area and any adverse effect which the facility may cause among other considerations.	The project will comply with provisions of this law in regard to water abstraction for construction activities, dust suppression during works and domestic use at the camps among others.
The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2000	These Regulations in section 34 oblige the developers to undertake an Environment Impact Assessment in accordance with sections 20, 21 and 22 of the National Environment Act 2000 on projects that may have significant impacts on wetlands, riverbanks or lake shores. The Proponent will also have to undertake annual audits and monitoring of any activities that could significantly affect the river bank due to the nature of the Project (Section 34). Under Section 11 of these regulations, the Proponent will be required to make an application in Form A of the First Schedule of the Regulations for construction and operation activities in wetland areas. Under Section 23 of these regulations, the Proponent will be required to make an application in Form A of the First Schedule of the Regulations for construction and operation activities affecting river banks.	Considering that KJE will cross some streams, rivers and wetlands, the proposed project will have to undertake the following: • ESIA is mandatory for all major activities on riverbanks and lakeshores (e.g. bridges), • Measures such as preventing soil erosion, siltation and water pollution, should be put in place for protection of riverbanks. • Required permits will need to be obtained for infrastructure construction in wetlands and on river banks.
The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999	Section 4 of this regulation requires facilities to install pollution control equipment for onsite management of waste, effluent and emissions. These Regulations will influence management of effluent generated at workers camps, equipment yards and work areas near surface water courses. Section 6 (2) of the Regulations specifies maximum permissible discharge limits for 54 contaminants, that must not be exceeded before effluent is discharged into water or onto land. Through limits on over 54 pollutants, these Regulations control discharges in surface watercourses.	All discharge related to the proposed Project shall conform to the standards specified in these Regulations. The Proponent is also required to maintain records of such discharge that will be periodically submitted to NEMA and relevant authorities.
The Water (Waste Discharge) Regulations, 1998	Regulation 4 prohibits any person from discharging effluent or waste on land or into the aquatic environment contrary to set standards. In the circumstances that there is an exception, such should be undertaken under a permit issued by the Directorate of Water Resources Management.	This regulation applies to discharges likely to come from workshops, vehicle wash bays, bitumen preparation areas and workers' camps and as such this regulation should be adhered to.
The National Environment (Waste Management) Regulations, 1999	These Regulations streamline the storage, movement and disposal of waste. The Regulations require waste disposal in a way that would not contaminate water, soil, and air or impact public health. This is in relation to onsite storage, haulage and final disposal. All waste handling operations including storage, haulage and disposal should be done by licensed entities. These Regulations apply to hazardous and non-hazardous waste and to their storage and disposal or movement into and out of Uganda. The Regulations promote cleaner production methods and require waste minimization by eliminating use of toxic materials; reducing toxic emissions and recovering and reuse of waste.	The Regulations promote cleaner production methods that enable the recovery and reuse of wastes, reclamation and recycling. Further the Regulations require hazardous waste to be stored in facilities specially designed for that purpose and that such facilities obtain licenses from NEMA. The Regulations will influence management of solid waste at workers camps, equipment yards and road construction site.

Instrument / Legislation	Overview	Relevance to Project
The National Environment (Noise Standards and Control) Regulations, 2003	These Regulations prescribe the maximum permissible noise levels from a facility or activity to which a person may be exposed, and set provisions for control of noise. Part III Section 8 (1) requires machinery operators, to use the best practicable means to ensure that the emission of noise does not exceed the permissible noise levels. The Regulations require that persons to be exposed to occupational noise exceeding 85 dBA for 8 hours should be provided with requisite ear protection.	The Proponent is required to implement appropriate measures to keep construction and operational noise within the prescribed limits, and, where excessive noise is deemed unavoidable to obtain a licence to permit noise in excess of permissible limits.
National Environment (Control of Smoking in Public Places) Regulations, 2004	These regulations prohibit smoking in public places including working areas because of consequent health and fire hazards associated with smoking. Second hand smoke (SHS) is a complex mixture of more than 4,800 chemical compounds, including 69 known carcinogens. WHO indicates "scientific evidence has unequivocally established that exposure to tobacco smoke causes death, disease and disability". According to WHO, SHS is a human carcinogen for which there is no "safe" exposure level. To avoid public health risk from SHS, Uganda enacted a law: National Environment (Control of Smoking in Public Places) Regulations 2004 to avoid smoking in public places. Under this law, a public place is defined as, "any place to which members of the general public or segments of the general public ordinarily have access by express or implied invitation and includes any indoor part of a place specified in this schedule" and these places include, office buildings, work places, eating areas, toilets and public service vehicles. Under section 3(1) of these regulations it is stipulated that every person has the right to a clean and healthy environment and the right to be protected from exposure to second hand smoke.	In regard to proposed KJE, these regulations will apply to areas communally used by construction workers such as site offices, eateries in camps and workers transport vehicles.
National Environment (Mountainous and Hilly Areas Management) Regulations, 2000	These provide for the sustainable management of mountainous and hilly areas, and prescribe rules for soil conservation. The Regulations also prohibit the introduction of invasive alien species.	Requires the Proponent to apply appropriate measures necessary to prevent soil erosion in hilly areas, and to prevent the introduction of invasive alien species.
The National Environment (Management of Ozone Depleting Substances and Products) Regulations 2001	The Regulations operationalise Uganda's commitment to the Montreal Protocol, through restrictions on the trade of controlled substances and licencing of persons intending to import or export controlled substances.	Resourcing of goods and materials should not be from a country that is not a signatory of the Montreal Protocol. Additionally, any imports of controlled substances should be licenced by the relevant authority, and free of listed materials.
The National Environment (Draft Air Quality Standards) Regulations 2006	These draft regulations provides limits for 34 air quality parameters in two forms: • Standard for Ambient Air; and • Standards for Emissions (point sources).	The construction activities of the proposed Project will generate odour and dust respectively, which are likely to have a negative effect on the ambient air quality. Therefore, the proponent is expected to comply with the requirements of the draft air quality regulations.
National Environment (Conduct and Certification of Environmental Practitioners) Regulations, 2003	The Regulations establish the code of conduct for certification, registration of Environmental Practitioners and for the practice of environmental impact assessment in Uganda.	The Proponent is required to engage a competent team of registered environmental practitioners to undertake the ESIA, and to adhere to the requirements of the Regulations.
National Environment (Audit) Regulations, No. 12 of 2006	The Audit Regulations operationalise Section 3 (3) c of the National Environment Act, Cap 153 in which it is a requirement for ongoing activities which are likely to have environmental impacts to be subjected to an environmental audit in accordance with Section 22 of the Act. The Regulation also operationalises the Environmental Impact Assessment Regulation, in	Audits shall be carried out once the Project commences in line with this Act and in line with the EIA Certificate of Approval conditions.

Instrument / Legislation	Overview	Relevance to Project
	which it is a requirement to follow up projects that carried out an EIA with an Audit at least three years after the commencement of the project.	
The National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001	These Regulations emphasise the need to: maintain and restore the minimum soil quality standards as well as enhance the inherent productivity of the soil in the long term; maintain minimum standards for the management of the soil for specified agricultural practices; follow the criteria and procedures for the measurement and determination of soil and apply the prescribed measures and guidelines for soil management.	Project planning and execution should ensure that the quality of the soils within the proposed Project area is not compromised, and if it is, that it is restored to as close to its original state as possible.

2.2.2 Approvals, Licenses and Permits

Based on relevant national legislation, a number of approvals, permits and licences will be required prior to commencement of the Project or for specific activities within the scope of the Project. Key requirements are summarised in Table 2-2 and ongoing consultation with relevant Government agencies will be required to identify any additional approvals, permits and licences that may be required during construction and operations.

Table 2-2 Permits and Licenses required for the Project (Phase 1)

Type of Permit/Approval	Supporting Legislation	Applies To	Approving Authority
Construction Permit	The Water Act, Cap 152 The Water Resources Regulations, 1998	Any works or structures constructed in or adjacent to natural waters (rivers or lakes) whether temporary or permanent. Includes hydraulic structures across rivers.	Directorate of Water Resources management (DWRM)
Groundwater Abstraction Permit/Surface Water Abstraction Permit	The Water Act, Cap 152 The Water Resources Regulations, 1998	Any abstraction of water from natural surface waters (lake, river or stream) and groundwater (aquifer, spring, etc.)	DWD
Waste Water Discharge Permit	The Water (Waste Discharge) Regulations, 1998	Any project likely to result in the discharge of effluent or waste water (treated or untreated) onto land or into a water body	DWRM
Licence to Emit Noise in Excess of Permissible Noise Levels	The National Environment (Noise Standards and Control) Regulations, 2003	Projects in which it is highly likely that noise levels generated by the proposed activity will exceed permissible levels and cause a significant nuisance effect (e.g. flaring and quarrying)	NEMA
Permit to Carry Out a Regulated Activity in a Wetland/River Bank/Lake Shore	The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2000	Any regulated activity (listed in the Second Schedule to the Regulations) undertaken in a wetland, or within the protection zone of a riverbank: • 100m from the highest watermark of a river listed in the Sixth Schedule; 30m for a non-listed river and • 200m from the low watermark for a listed lake; 100m for a non-listed lake	NEMA
Registration of a Workplace	The Occupational Safety and Health Act, 2006	Any project requiring the establishment of a work place	Department of Occupational Safety and Health Ministry of Gender, Labour and Social Development
Development Permission	The Planning Act, 2010	Any development involving construction of permanent or semi-permanent structures or establishments	District Technical Planning Committee
Licence for Storage of Hazardous /Non Hazardous Waste	The National Environment (Waste Management) Regulations, 1999	Any project requiring construction or operation of a storage facility for hazardous or non-hazardous waste	NEMA
Licence for transportation of Hazardous /Non Hazardous Waste	The National Environment (Waste Management) Regulations, 1999	Any project requiring transport of hazardous or non-hazardous waste	NEMA
Licence to erect or carry on a magazine/Permit to store and use of explosives.	The Explosives Act, (Cap 298)	Activities requiring the temporary storage of explosives	Ministry of Internal Affairs

Type of Permit/Approval	Supporting Legislation	Applies To	Approving Authority
EIA certificate of approval	National Environment Act Cap 153, 1995	Any development that is likely to have significant impact on the environment.	NEMA
License for extraction of stone/aggregate and marram materials	The Mining Act, Cap. 148	Any development that requires new quarry sites and/or borrows pits to be established.	Department of Geological Survey and Mines and/or District Local Governments.
Storage of petroleum products	The Petroleum Supply (General) Regulations, 2009	Storage and supply of petroleum products at any site.	MEMD
Work Permits for Foreign Workers	The Employment Act, 2006 (Act No. 6)	Foreign workers for a project	Ministry of Internal Affairs
Land Agreement	The Registration of Titles Act, (Cap 230)	Access to or use of land for project activities	District Land Board and/or Ministry of Lands, Housing and Urban Development.
	The Land Act, (Cap 227)		
	The Land Acquisition Act, (Cap 226)		

2.2.3 Institutional Framework

The development of the proposed Project will require coordination involving a number of national lead and regulatory agencies assisted by district level sectoral departments. Non-Governmental Organisations and Civil Society Organisations will also contribute to the success of this project. The sections below present a profile of relevant institutions for the implementation of the proposed Project.

2.2.3.1 National Level

Table 2-3 presents the key regulatory authorities and institutional stakeholders at the national level that are involved in permitting and environmental management of the road and transport sector in Uganda.

Table 2-3 National institutions in Uganda and their relevance to the Project

Institution / Agency	Mandate and relevance to the proposed Project
The Cabinet	Under Article 111 of the Constitution of Uganda, the functions of the Cabinet, among others, include formulation and implementation of Government Policies. In practice, the cabinet is the executive arm of Government that approves policies and projects such as the proposed Project (KJE Phase I).
Parliament	The Parliament is the legislative arm of government with the power to make laws on any matter within Uganda. The Parliament also scrutinises Government policy and administration, and also serves to hold public institutions accountable.
National Environment Management Authority (NEMA)	NEMA was established in January 1996 under the National Environment Act, Cap. 153 and is an independent Central Government Agency responsible for co-coordinating all environment-related matters to ensure the sustainable management of the environment. It has the following functions in relation to the proposed project: it co-ordinates the processes of EIA for listed activities; carries out, alongside other stakeholders, environmental monitoring and audits of road infrastructure activities; ensures and monitors compliance of listed activities with environmental guidelines; and harmonises national and international performance standards in the road/infrastructure sector on environmental sustainability.
Ministry of Works and Transport (MoWT)	Lead ministry from which UNRA derives its mandate. It has responsibility over policy matters. The Department of Construction Standards and Quality Management in the Ministry is mandated to among

Institution / Agency	Mandate and relevance to the proposed Project
	others: to develop adequate engineering specifications and standards; promote good standards in the construction industry; undertake research and materials testing in the construction industry; and promote integration of crosscutting issues namely - Environment, Climate change, Gender, HIV/AIDS, Occupational Health and Safety and Disability in the sector. The MoWT will ensure that applicable environmental and social management tools are used in the ESIA, and that roads are constructed following sectoral standards and guidelines.
Uganda National Roads Authority (UNRA)	The mandate of UNRA is to develop and maintain the national road system, advise Government on general roads policy and contribute to addressing transport concerns. In this KJE, UNRA is both a developer and lead agency. As a lead agency, UNRA manages national roads infrastructure and is responsible for mitigation of impacts associated with road development. As a developer on the other hand, UNRA is required to comply with National Environmental laws including undertaking EIA and Audits for road projects.
The Ministry of Water and Environment	The Ministry of Water and Environment is the line ministry responsible for the formulation and enforcement of environmental policies, laws and regulations in Uganda. Its main functions include: mobilisation of resources required to run and implement environment related projects and related issues; overall responsibility for environmental policy formulation and implementation; introduction of new draft laws and regulations to parliament and draft amendments of existing laws and regulations; and coordination with local governments on environment related issues.
Directorate of Water Resources Management Directorate. *Ministry of Water and Environment (MoWE)*	The Directorate Water Resources Management – (DWRM), has a responsibility to regulate quality and quantity of water resources in the country. The Directorate is responsible for the full range of integrated water resources management (IWRM) activities including monitoring, assessing, planning, allocating and regulating water resources. Specifically, the Water Resources Planning Department is responsible for water regulation through issuance of permits for water abstraction and wastewater discharge. Abstraction of water for road construction purposes and for domestic use in campsites will be regulated by this directorate. Civil works on surface water courses will also be regulated by this Directorate.
Wetland Management Department. *MoWE*	The Department is mandated to manage and monitor the use of wetlands to ensure sustainability. The road project will traverse a number of wetlands which requires monitoring and guidance from this Department.
Directorate of Labour, Employment and Occupational Health and Directorate of Gender and Social Development – Ministry of Gender, Labour and Social Development (MGLSD)	The Ministry through its Directorate of Labour, Employment and Occupational Health (which is responsible for administering the Occupational Safety and Health Act, 2006) carries out regular statutory inspections to ensure health and safety in the work place including construction sites and in the transport sector. Its functions include: ensuring that employment policies are in line with the country's labour policies and guidelines; monitoring compensation for occupational injuries and diseases; monitoring compliance with labour standards; and ensuring that equipment and technologies brought into the country comply with the desired safety and health standards. In addition, through the Directorate of Gender and Social development carries out cultural growth, skills development and labour productivity for sustainable and gender responsive development. The Directorate is key in streamlining matters of gender, child protection.
Ministry of Tourism, Wildlife and Antiquities (MoTWA)	The mandate of the Ministry of Tourism, Wildlife and Heritage (MTWH) is derived from Article 189 and Sixth Schedule the Constitution of the Republic of Uganda (1995), Uganda Wildlife Act Cap 200, Uganda Tourism Act, 2008, Historical Monuments Act 1967, Universities and other Tertiary Institutions Act, 2006.

Institution / Agency	Mandate and relevance to the proposed Project
	The Ministry will have to be engaged by the proposed Project given the potential for the project to infringe on certain aspects of the afore-mentioned legal and regulatory aspects as part of the process.
Department of Museums and Monuments (MoTWA)	Archaeologists from the department responsible for museums and monuments would be useful in monitoring road project construction activities, especially excavations at borrow sites and any other excavation areas to ensure that chance finds or artefacts of cultural significance are not destroyed.
Department of Geological Survey and Mines (*Ministry of Energy and Mineral Development*)	One of the main roles of the Ministry of Energy and Mineral Development (MEMD) is managing mineral resources. It is responsible for the formulation, implementation and regulation of mining related policies and managing the commercial/business aspects of exploration, development and production which are applicable to the proposed Project. The Department of Geological Survey and Mines controls the mining sector (including stone quarrying) through the Mining Act.
Ministry of Lands, Housing and Urban Development (MLHUD)	Ministry of Lands, Housing & Urban Development is responsible for all matters concerning lands, housing and urban development. The Ministry will play a key role in the project with regards to land acquisition and, urban planning and development matters. The office of the Chief Government Valuer is located in the Lands Ministry. The Chief Government Valuer is responsible for determining the Compensation rates for all properties to be affected by road construction and auxiliary activities.
Ministry of Health (MoH)	Health governance in Uganda is spearheaded by the MoH and shared with other ministries, health development partners, district leadership, providers (public and private), and representatives of civil society organisations (CSOs). The MoH is tasked with the role and responsibility of delivering on the health goals and objectives of government. The Ministry will play an advisory role in identifying credible health service providers and information on HIV/AIDS.
The National Road Safety Council (NRSC)	The council is the principal coordinator of road safety activities in the country. Its role is critical in ensuring road design and construction meet safety requirements
National Forestry Authority (NFA)	NFA is a body of the Ugandan central government that is responsible for among others managing the Uganda's Central Forest Reserves. It was created as a semi-autonomous corporation through the National Forestry and Tree Planting Act of 2003 to replace the prior Forestry Department. NFA will be key in determining practical mitigation measures for impacts on the forests that will be directly or indirectly affected by KJE Phase 1.
National Water and Sewerage Corporation (NWSC)	The mandate of the Corporation as defined in the National Water & Sewerage Corporation Statute Section 5 (1), is to operate and provide Water and Sewerage Services in Areas entrusted to it on a sound commercial and viable basis. The Corporation will be key in determining the water pipeline system along the proposed route and undertaking mitigation measures for impacts on the water/sewage pipeline system that will be directly and indirectly affected.
Uganda Police	The Uganda Police under the Police Act, Cap 303, is mandated to keep law and order in Uganda. It is responsible to ensuring security of property and life in the country. The Police will be responsible for enforcing law and order in the project area. Child protection, crime control among others.
Directorate of Fisheries – Ministry of Agriculture Animal Industry and Fisheries.	The Ministry is mandated to: Formulate, review and implement national policies, plans, strategies, regulations and standards and enforce laws, regulations and standards along the value chain of crops, livestock and fisheries; Support the development of infrastructure and use of water for agricultural production along livestock, crop and fisheries value chains; Monitor, inspect, evaluate and harmonise activities in the agricultural sector including local governments; and Develop and promote collaborative mechanisms nationally, regionally and internationally on issues pertaining to the sector. The Ministry and

Institution / Agency	Mandate and relevance to the proposed Project
	directorate will be a key player in ensuring that the proposed Project activities do not interfere with aspects of fish as it traverses through fresh water ecosystems.
Uganda Wildlife Authority	UWA role is to conserve, economically develop and sustainably manage the wildlife and protected areas of Uganda in partnership with neighbouring communities and other stakeholders for the benefit of the people of Uganda and the global community. The Authority will be involved since the proposed Project will be traversing natural habitats for wildlife.
Ministry of Local Government	The ministry is responsible for guidance and overall vision of Government in local Governments (LGs). The proposed Project will traverse districts of Kampala, Wakiso and Mukono which districts have LGs that are monitored and coordinated by this Ministry.
Uganda Electricity Transmission Company Limited (UETCL)	The company is responsible for transmission of electricity and related activities in Uganda. Since the project will traverse electricity lines, the company is key in determining the electricity lining system along the proposed route and undertaking mitigation measures for impacts on the electricity line system in place that will be directly and indirectly affected.
Uganda Tourism Board	The board is a government organisation that is responsible for promoting the tourism sector to the outside world. The Board is key to the proposed project since the proposed Project will play a role in boosting the transport and communication links that are a key pillar to a successful tourism sector..
Ministry of Trade, Industry and Cooperatives (MTIC)	The mandate of the Ministry is to formulate, review and support policies, strategies, plans and programs that promote and ensure expansion and diversification of trade, cooperatives, environmentally sustainable industrialisation, appropriate technology development and transfer to generate wealth for poverty eradication and benefit the country socially and economically. The proposed Project is within the Northern Economic Corridor of Uganda that is meant to boast trade within the country and region at large and as such, the ministry will be involved.
National Housing and Construction Company Limited (NHCC)	The Company's mandate is to increase the housing stock in the country, rehabilitate the housing industry and encourage Ugandans to own homes in an organised estate. The proposed Project will traverse the area of Kasokoso where NHCC owns vast tracts of land that it intends to develop into a well organised development that will also involve slum upgrading will undertake developments for housing estate.
Uganda Investment Authority (UIA)	The Uganda Investment Authority (UIA) is a semi-autonomous government agency established by the Investment Code Act, Cap 92. It operates in partnership with the private sector and Government of Uganda to drive national economic growth and development. It issues investment licenses to investors and promotes investments such as the proposed Project that are aimed at bringing about socio-economic transformation of the country.
Ministry of Justice and Constitutional Affairs	This is the Ministry responsible for legal matters within Uganda including those relating to the land acquisition. This Ministry provides legal advice and legal services to Government, its allied institutions and to the general public and supports the machinery that provides the legal framework for good governance. It thus important in providing legal advice to the project proponents in areas where there are land conflicts and ongoing court cases.
Ministry of Finance, Planning and Economic Development	This Ministry is responsible for macroeconomic stability, which includes prudent fiscal management and ensuring appropriate distribution of Government funds to provide efficient and effective delivery of services. The Ministry plays a pivotal role in the co-ordination of development planning; mobilisation of public resources; and ensuring effective accountability for the use of such resources for the benefit of all

Institution / Agency	Mandate and relevance to the proposed Project
	Ugandans. The Ministry will be a critical role in securing of funds for project implementation in line with the country's Public Private Partnership framework.
Kampala Capital City Authority (KCCA)	KCCA was established under the Act of Parliament to perform a number of functions including construction and maintain in roads, organizing and managing traffic, constructing and maintaining major drains, and monitoring the delivery of services within its area of jurisdiction among others. Section 2 of KJE Phase 1 is located within KCCA jurisdiction and thus KCCA will play a monitoring role especially on this section.

2.2.3.2 District Local Government

The District Local Government is defined as one of the lead agencies under the National Environment Act and is mandated to establish a District Environment Committee that coordinates with NEMA on all issues relating to environment management. Environment Officers in particular play an active role in monitoring of environmental aspects, and liaise with the NEMA on all matters relating to the environment. Environmental Officers from Kampala, Wakiso and Mukono districts will be engaged by the project since the proposed Project will traverse through these areas.

The LCV council, with representatives from the sub-counties and technical staff in the district, will play a key role in decision making at the District level where required for the Project. Additionally, the Physical Planner, Community Development Officer, District Director of Health Services, Wetlands Officer, Forestry Sector Manager, Agricultural Officer, District Water Officer, District Engineer, and r Labour Officer, HIV and AIDS focal person, and District Land Board of the respective districts will also be involved during the development of the proposed Project.

2.2.3.3 Lower Local Government

In accordance with the Local Governments Act, Cap 243, there are administrative units based on county, parish, and villages in rural areas; and administrative units based on parishes or wards, and villages for urban areas. Each district also has lower local government councils, whose functions include among others: presiding over executive committee meetings and monitoring the general administration of the area under their jurisdiction. The lower local government councils also comprise of sub-county councils (LC III) that incorporate representatives from parishes (LC II), as well as youth, women and people with disabilities (s.23).

The National Environment Act provides for the establishment of Local Environment Committees that may be appointed to monitor all activities within their local jurisdiction to ensure that such activities do not have any significant impact on the environment, and to report any events or activities which have or are likely to have significant impacts on the environment to the District Environment Officer (s.16). The Act further assigns the Local Environment Committees with roles such as identification of vulnerable riverbanks and lakeshores; assistance in identification of wetlands of local, national and international importance; and assistance in identification of hilly and mountainous areas. According to the Act, the Local Environment Committees may be appointed at any of the lower levels of local government including municipal, town and division, county and sub-county councils. Lower local government areas that are involved in the proposed Project include:

- Makindye Ssabagabo Municipal Council;
- Makindye Division;
- Nakawa Division;

- Kira Municipality;
- Goma Division;
- Mukono Central Division; and
- Nakisunga Sub county.

2.2.3.4 Non-Governmental Organisations and Civil Society Organisations

These organisations play a role in the road sector development through advocacy, mobilisation and dialogue with communities. They may also be contracted in the delivery of various services, especially in the communities where the activities are to be undertaken. Non-governmental organisations (NGOs) and Civil Society Organisations (CSOs) can contribute to holding the different players accountable with regard to development issues, and participate in getting the voices of the poor into designing, monitoring and implementation of programmes. UNRA will work with NGOs (e.g. those providing services such as child protection, HIV/AIDS, gender mainstreaming, road safety, water and sanitation, community livelihoods, environmental advocacy and conservation, professional boards, human rights among others) to streamline the project activities within the Project area of influence.

2.3 International Conventions and Agreements

In addition to compliance with Ugandan regulatory requirements, the Project will also adhere to the international conventions ratified by Uganda. Key conventions and treaties potentially relevant to the Project are outlined in Table 2-4. Other important international instruments relevant to the Project are also outlined in Table 2-5.

Table 2-4 International Treaties, Conventions or Agreements relevant to the Project

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the proposed Project
Convention on the Conservation of Migratory Species of Wild Animals. (Bonn Convention) 1979	It aims to conserve terrestrial, marine and avian migratory species throughout their range.	1/8/2000	Project planning should ensure that impacts on biodiversity arising from development of the proposed Project are minimised.
African Convention on the Conservation of Nature and Natural Resources-1982	This convention was signed by the Heads of State and Governments of independent African States, assembled at Algiers, Algeria on 15th September 1968. Under this convention in Article II, the contracting States shall undertake to adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and faunal resources in accordance with scientific principles and with due regard to the best interests of the people.	15/9/1982	The Project should adopt appropriate measures to avoid and minimise impacts on soil, water, flora and faunal resources.
Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA), 1995	The Agreement provides for co-ordinated and concerted actions to be taken by the Range states throughout the migration systems of the water birds to which it applies. It also requires them to investigate problems that are posed or are likely to be posed by human activities and endeavour to implement remedial measures, including habitat rehabilitation and restoration, and compensatory measures for loss of habitat.	12/2000	The proponent should mitigate any impacts on migratory birds.
Bamako Convention, 1991	Requires party states to use legal, administrative and other measures to prevent the import of hazardous waste into Africa from non-contracting parties. All signatories to the Convention are required to impose strict, unlimited liability as well as joint and several liabilities on hazardous waste generators; ensure that environmentally sound treatment and disposal facilities for hazardous wastes are located, to the extent possible, within its jurisdiction; and ensure that persons managing hazardous wastes take all actions necessary to prevent pollution arising from the management of such wastes.	1/10/1998	All the hazardous waste generated during the development of the proposed Project will comply with the requirements of this Convention.

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the proposed Project
Basel Convention, 1989	The objective is to protect human health and the environment against the adverse effects of hazardous wastes. Under article 4, it requires each state to take the appropriate measures to ensure that the generation of hazardous wastes and other wastes within it is reduced to a minimum, taking into account social, technological and economic aspects among other requirements.	11/3/1999	Any hazardous waste generated during the development of the proposed Project will be handled by a licensed waste handler.
Conservation of Nature and Natural Resources, 2003	The convention aims at enhancing environmental protection, conservation and sustainable use of natural resources. The convention further identifies water as a critical resource which need to be maintained at quantitative and qualitative levels		KJE Phase I right of way especially the KSB section traverses many wetlands which act as critical filter points for water in the southern section of Kampala= and as such, the ecological functionality of the wetlands traversed will have to be maintained.
Convention for the Safeguarding of the Intangible Cultural Heritage, 2003	The objectives include to: safeguard the intangible cultural heritage, ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned and raise awareness at the local, national and international levels of the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof.	13/05/2009	The communities along the KJE have a number of customs and beliefs that will have to be During the scoping exercise for KJE phase I, it was established that some individual had graves along the alignment. Such persons will be consulted on how best their graves can be relocated and the intangible cultural values maintained as the guided by the resettlement action plan.
Convention on Biological Diversity, (1992)	Its objectives are to conserve biological diversity, promote the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies, and by appropriate funding (Article 1).	8/9/1993	Project planning should ensure that the project takes appropriate measures to minimise potential impacts on biodiversity. Key biodiversity values potentially impacted by the Project include natural forests and wetlands.

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the proposed Project
International Labour Organization's Fundamental Conventions	Labour, working conditions, health and safety are the subject of numerous international agreements, conventions, policies and standards. Fundamental labour standards formulated by the International Labour Organisation (ILO) include forced labour, child labour and workmen's compensation among others. Uganda has signed all eight of the eight Fundamental Conventions of the ILO.	8 conventions signed between 1963 and 2005	Labour policies for the Project and ESIA mitigation measures for employment should be in accordance with the requirements of these Conventions.
Kyoto Protocol, 1997	Under Article 10 it requires all Parties to: take into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances and formulate, where relevant and to the extent possible, cost-effective national, and where appropriate, regional programmes to improve the quality of local emission factors, activity data and/or models which reflect the socio-economic conditions.	Enforced on 16/2/2005	The Proposed Project should minimise emissions during the development of the proposed Project.
Montreal Protocol, 1987	The Montreal Protocol on Substances that Deplete the Ozone Layer requires parties to comply with the freezed, phased out, and banned Ozone Depleting Substances (ODS).	15/9/1988	The proposed Project should ensure that ODS are not used and/or minimally used during the development of the proposed project.
Nile Basin Initiative, 1999	The Nile Council of Ministers (Nile-COM) agreed on a Shared Vision which states: 'to achieve sustainable socio-economic development through the equitable utilisation of and benefit from the common Nile Basin water resources'.	8/2002	The proponent should put measures in place to ensure that the streams and wetlands that drain into Lake Victoria are protected.
Ramsar Convention, 1971	The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".	4/3/1988	The proposed Project is in close proximity with Lutembe Ramsar site (approximately 10 Kms).
Stockholm Convention 2001	The Stockholm Convention deals with persistent organic pollutants (POPs) that are very stable, carbon-based chemical compounds and mixtures. These pollutants are classified as 'persistent' because they	20/07/2004	The proposed project will prohibit or take measures to eliminate the production and use or import or export of

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the proposed Project
	are not degraded easily in the environment by physical, chemical or biological processes. They also bioaccumulate in fatty tissue, are capable of trans boundary movement, and are toxic to humans.		chemicals listed in Annex A and restrict its production and use of chemicals in Annex B.
The Strategic Approach to International Chemicals Management (SAICM)	The Strategic Approach to International Chemicals Management (SAICM) is a landmark initiative in international cooperation to protect human health and the environment. Its development was endorsed by Heads of State and Governments at summits in Johannesburg in 2002 and in New York in 2005. Objectives are grouped under five themes: risk reduction; knowledge and information; governance; capacity-building and technical cooperation; and illegal international traffic.		For this road project, SAICM would predominantly apply to management of road marking paints and other hazardous chemicals to avoid risk to public and environmental health. Project management measures for the procurement and management of hazardous chemicals should be in accordance with the requirements of this convention.
The Lake Victoria Protocol, 2003	It requires the Party states to determine that a project is likely to have a significant trans-boundary effect on the resources of the Basin and such a State is required to avail to other Party States and the Secretariat, the environmental impact statement for comments and determine whether to approve an environmental impact statement for a project with trans boundary effects. The Party State in whose jurisdiction is the proposed Project, needs to take into account the comments of the other Party States.	November 2004	The proposed project will traverse wetlands that drain into Lake Victoria and as such, the Protocol will be complied with. Also the proposed project will be undertaken in districts of Kampala, Mukono, and Wakiso that are within the Lake Victoria basin.
The Treaty of the East African Community, (1999)	Articles 111 and 112 of the EAC Treaty provide for conservation and management of environmental and natural resources. They require member states to take measures to control trans-boundary air, land and water pollution arising from development activities and take necessary disaster preparedness, management, protection and mitigation measures especially for the control of natural and man-made disasters.	7/7/2000	The proposed Project will comply with the principles document in this treaty.
The World Heritage Convention, 1972	Requires each State Party to recognise the duty of ensuring the identification, protection, conservation, presentation and transmission	20/11/1987	No world heritage sites will be potentially impacted by the Project. Impacts on cultural and natural heritage sites that

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the proposed Project
	to future generations of the cultural and natural heritage, and to ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory.		will be traversed by and/or within the vicinity of the proposed Project will minimised.
United Nations Convention to Combat Desertification (UNCCD), 1994	Requires parties to take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods; for example impact assessments, formulated and determined nationally, with a view to minimising adverse effects on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change Article 4 (f).	15/6/1997	The proponent should minimise all negative impacts (vegetation clearance) as a result of developing the proposed Project.
United Nations Framework Convention on Climate Change 1992	Under Article 3 (3) parties are required to take precautionary measures to anticipate, prevent or minimise the causes of climate change and mitigate its adverse effects.	8/9/ 1993	The proponent should take appropriate measures to mitigate/minimise such greenhouse emissions when developing the proposed Project.
Vienna Convention on the Protection of the Ozone Layer, 1985	Parties should take appropriate measures to protect human health and the environment against adverse effects resulting or likely to result from destruction of the Ozone layer.	24/6/1988	The Proposed Project should undertake measures to minimise emissions that deplete the Ozone layer.
The Paris Agreement, 2015	An agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gases emissions mitigation, adaptation and finance starting in the year 2020. It sets a target of limiting Global warming to below 2 degrees Celsius by 2100 compared to pre-industrial levels. To date, 176 countries including Uganda have ratified it. In tandem with the agreement, Uganda has set a target of reducing its emissions by 22 per cent by 2030.	4/11/2016	The proponent should take appropriate measures to mitigate/minimise such greenhouse emissions when developing the proposed Project especially given that transport is a significant contributor of greenhouse gas emissions in Uganda.

Table 2-5 Other important international instruments relevant to the Project

Title	Description	Relevance to the Project
Africa Agenda 2063	This is Africa's transformation plan over the next 50 years and sets out a number of aspirations that are to be realised during that period. The Agenda has since been adopted by the African Union (AU).	The Agenda promotes the development of infrastructure which includes the transport sector which is in tandem with proposed Project.
The 2030 Sustainable Development Goals (SDGs)	The SDGs were formally adopted by Uganda and other member states in September 2015 as an integral part of the 2030 Agenda on Sustainable Development. SDG indicators and targets are to be integrated in the appropriate Sector and Local Government Plans and budgets coupled with implementation, monitoring and evaluation frameworks.	Development of the proposed project should comply with SDG 9 (Resilient infrastructure, sustainable industrialisation and innovation).

2.4 International Standards and Guidelines

As the Project is being financed by the AfDB, the European Union and the French Development Agency, it is expected that the Project will be developed in alignment with relevant international standards and guidelines as an example of international best practice in road development. Key applicable standards and guidelines for the ESIA and project development include:

- IFC/World Bank Performance Standards and Guidelines; and
- African Development Bank Operational Safeguards.

These are summarised in the sections below.

2.4.1 International Finance Corporation (IFC) Performance Standards

The World Bank and its private investment arm, the International Finance Corporation (IFC), are the largest multilateral source of loan and equity financing for private sector projects in developing nations. The environmental and social policies and procedures of the World Bank / IFC are commonly regarded as de facto international standards for the environmental and social management of resource development projects in countries with developing or absent regulatory frameworks.

The IFC Sustainability Framework outlines its strategic commitment to sustainable development and is an integral part of its approach to risk management. The framework consists of the revised 2012 Performance Standards, as well as a revised IFC Policy on Environmental and Social Sustainability and a newly introduced Access to Information Policy.

The IFC Performance Standards were introduced to provide guidance for project proponents to manage and improve their environmental and social performance through a risk and outcomes based approach. Direction on the application of the Performance Standards is provided in the IFC Guidance Notes, a companion document to the Policy on Environmental and Social Sustainability. The eight Performance Standards and their relevance to the Project are summarised in Table 2-6.

In addition to the eight Performance Standards summarised in Table 2-6, this ESIA has also taken into consideration the requirements of the new Environmental and Social Framework (ESF) developed by the World Bank which will apply to all new Bank investment projects when it launches later in 2018 (exact date to be determined). The new ESF includes:

- A Vision for Sustainable Development, which sets out the Bank's aspirations regarding environmental and social sustainability;
- The World Bank Environmental and Social Policy for Investment Project Financing, which sets out the mandatory requirements that apply to the Bank; and
- 10 Environmental and Social Standards, together with their Annexes, which set out the mandatory requirements that apply to the Borrower and projects.

Table 2-6: Key Objectives and relevance of IFC Performance Standards to the proposed Project

IFC Performance Standard	Key objectives	Relevance to the proposed Project
IFC Performance Standard 1: *Assessment and management of environmental and social risks and impacts*	► Identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence; ► Avoid, or where avoidance is not possible, minimise, mitigate or compensate for adverse impacts on workers, Project Affected Communities (PACs) and the environment; ► Ensure that PACs are appropriately engaged on issues that could potentially affect them; and ► Promote improved social and environmental performance of companies through the effective use of management systems.	The project proponent will conduct an Environmental and Social Impact Assessment (ESIA) of the proposed Project in an integrated manner to include key aspects such as: • Accurate Project description (including alternatives); • Appropriate environmental and social baseline data; • Consideration of all relevant environmental and social risks and impacts in the Project's area of influence during construction and operation; and • Appropriate stakeholder engagement through disclosure of the Project-related information and consultation on matters that directly affect stakeholders.
IFC Performance Standard 2: *Labour and working conditions*	► Establish, maintain, and improve the worker /management relationship; ► Promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws; ► Protect the workforce by addressing child labour and forced labour; ► Promote safe and healthy working conditions; and ► Protect and promote the health of workers.	Proposed labour and working conditions need to consider the requirements/key objectives of this PS.
IFC Performance Standard 3: *Resource efficiency and pollution prevention*	► Avoiding or minimising adverse impacts on human health and the environment by avoiding or minimising pollution from project activities; and ► Promoting the reduction of emissions that contribute to climate change.	The proposed Project aims to comply with national environmental laws related to pollution, wastes, hazardous materials, and resource use and greenhouse gas (GHG) emissions. The proposed Project will also consider the performance levels and measures in relevant technical guidance in the IFC EHS Guidelines.

IFC Performance Standard	Key objectives	Relevance to the proposed Project
IFC Performance Standard 4: *Community Health, Safety and Security*	► Anticipate and avoid adverse impacts on health and safety of Affected Communities during the project lifecycle; and ► Safeguard personnel and property in accordance with relevant human rights principles in a manner that avoids or minimises risks to the Affected Communities.	Evaluation of the risks and impacts to the health, safety and resources of the affected communities will be undertaken during all project stages and established appropriate measures favouring prevention and avoidance. Necessary measures to prevent major accidents and limit their consequences in major accident prevention / emergency preparedness policy and management system including internal and external emergency plan will be identified.
IFC Performance Standard 5: *Land Acquisition and Involuntary Resettlement*	► Avoid or at least minimise involuntary resettlement wherever feasible by exploring alternative project designs and layouts; ► Mitigate adverse social and economic impacts from land by: (i) Providing compensation for loss of assets at replacement cost; and (ii) Ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those affected; ► Improve or at least restore the livelihoods and standards of living of displaced persons; and ► Improve living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites.	The proposed Project will avoid, and when avoidance is not possible, minimise physical and economic displacement. In addition to the above, all relevant information will be disclosed, and inform participation of affected persons.
IFC Performance Standard 6: *Biodiversity Conservation and Sustainable Management of Living Natural Resources*	► Protect and conserve biodiversity; and ► Promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.	During the development of the proposed Project, the proponent will ensure that the potential risks and impacts to biodiversity, ecosystem services and sustainable management of living natural resources are evaluated and that the necessary appropriate measures are established as part of an appropriate mitigation hierarchy. A due diligence regarding natural habitats, critical habitats, legally protected and internationally recognised areas and invasive alien

IFC Performance Standard	Key objectives	Relevance to the proposed Project
		species, including establishment of measures as part of an appropriate mitigation hierarchy will also be carried out.
IFC Performance Standard 7: *Indigenous Peoples*	► Avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not feasible, to minimise, mitigate, or compensate for such impacts, and to provide opportunities for development benefits, in a culturally appropriate manner; ► Foster good faith negotiation with and informed participation of Indigenous Peoples when projects are to be located on traditional or customary lands under use by the Indigenous Peoples; and ► Respect and preserve the culture, knowledge and practices of Indigenous Peoples.	This PS will not be triggered as there are no indigenous peoples in the proposed Project area.
IFC Performance Standard 8: *Cultural Heritage*	► Protect cultural heritage from adverse impacts of project activities and support its preservation; and ► Promote the equitable sharing of benefits from the use of cultural heritage in business activities.	During the development of the proposed Project, cultural heritage will be evaluated and in addition, the affected communities will be consulted regarding any significant impacts to cultural heritage. Mitigation measures will be developed and implemented in accordance with national regulations and best international practice.

2.4.1.1 IFC Environmental Health and Safety Guidelines

General and industry-specific *Environmental Health and Safety (EHS) guidelines* have been developed by the IFC. The general guidelines provide examples of Good International Industry Practice (GIIP) with regards to road construction and development. General EHS guidelines relevant to the Project are presented in Table 2-6 below.

The IFC *Environmental Health and Safety Guidelines for Toll Roads (2007)* also provides specific guidance for the construction, operation and maintenance of large, sealed road projects including associated bridges and overpasses. Relevant aspects of this guideline have been incorporated into the ESIA. The IFC *Environmental Health and Safety Guidelines for Construction Materials Extraction (2007)* also provide further guidance relevant to construction materials extraction activities, such as quarrying and the use of borrow pits.

Table 2-7 IFC EHS Guidelines relevant to the Project

General EHS Guidelines	Aspects applicable to the proposed Project
Environmental	Air Emissions and Ambient Air Quality; Energy Conservation; Wastewater and Ambient Water Quality; Water Conservation; Hazardous Materials Management; Waste Management; Noise; and Contaminated Land.
Occupational Health and Safety	General Facility Design and Operation; Communication and Training; Physical Hazards; Chemical Hazards; Biological Hazards; Radiological Hazards; Personal Protective Equipment; Special Hazard Environments; and Monitoring.
Community Health and Safety	Water Quality and Availability; Structural Safety of Project Infrastructure; Life and Fire Safety; Traffic Safety; Transport of Hazardous Materials; Disease Prevention; and Emergency Preparedness and Response.
Construction and Decommissioning	Environment; Occupational Health & Safety; and Community Health & Safety.

2.4.1.2 IFC Social and Stakeholder Engagement Guidelines

The ESIA has been prepared with consideration of the best practices put forward in the following IFC guidelines:

- 2002 Handbook for Preparing a Resettlement Action Plan;
- 2007 Stakeholder Engagement Handbook;
- 2009 Good Practice Note Addressing Grievances from Project-Affected Communities;
- 2009 Handbook for Addressing Project-Induced In-Migration; and
- 2009 Health Impact Assessment.

2.4.2 African Development Bank

2.4.2.1 Operational Safeguards

The AfDB's Operational Safeguards (OS) form part of their Integrated Safeguards System (ISS) and aim to provide guidance to their clients to identify, assess, and manage the potential environmental and social risks and impacts of a project, including climate change issues. In addition, the Operational Safeguards provide requirements relating to different environmental and social issues, including gender and vulnerability issues that are triggered if the assessment process reveals that the project may present certain risks. The current AfDB OS (2013) are applicable to the proposed Project. These include:

- Operational Safeguard 1: Environmental and social assessment – this overarching safeguard governs the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements.
- Operational Safeguard 2: Involuntary resettlement land acquisition, population displacement and compensation – this safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement and incorporates a number of refinements designed to improve the operational effectiveness of those requirements.
- Operational Safeguard 3: Biodiversity and ecosystem services – this safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the commitments in the Bank's policy on integrated water resources management into operational requirements.
- Operational Safeguard 4: Pollution prevention and control, hazardous materials and resource efficiency – this safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow.
- Operational Safeguard 5: Labour conditions, health and safety – This safeguard establishes the Bank's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It also ensures greater harmonisation with most other multilateral development banks.

The AfDB's ISS requires that Bank-sponsored projects be screened and categorised to determine the specific type and level of environmental and social assessment. The screening is carried out in accordance with the Bank's Environmental and Social Assessment Procedures (ESAPs). Projects are classed as category 1, 2, 3 or 4 following the principle of using the appropriate type and level of environmental and social assessment for the type of operation. The current Project would be classed as a Category 1 project as it is likely to induce significant adverse environmental and social impacts, and has significant resettlement requirements. Category 1 investment projects

require an ESIA, as well as an ESMP. The requirement for an ESMP is coved by the ESMMP included in Volume D of this ESIA.

2.4.2.2 African Development Bank High 5s for Transforming Africa

The AfDB's High 5's for Transforming Africa are five priority areas for development that the AfDB plans to focus on to help accelerate Africa's economic transformation (AfDB, 2016). The Bank is responding to the challenge of providing supporting inclusive growth and the transition to green growth by scaling up investment and implementation of the Ten-Year Strategy (TYS) covering the period 2013-2022 by focusing on these five priority areas:

- **Light up and power Africa** —The demand for energy is rising rapidly. Through the New Deal on Energy for Africa, the AfDB is working to unify efforts to achieve universal access to energy. Its new Energy Strategy aims to increase energy production and access, and improve affordability, reliability and energy efficiency.
- **Feed Africa** —If agriculture's full potential were unlocked, it could vastly improve the lives of millions. The Bank is framing its agricultural operations within a business-oriented approach, based on a deeper understanding of the obstacles, potential and investment opportunities.
- **Industrialise Africa** — The Bank will invest through direct financing and leveraging to implement six flagship industrialisation programmes in areas where the AfDB can best leverage its experience, capabilities and finances.
- **Integrate Africa** — Through its Regional Integration Policy and Strategy, the Bank is focusing its integration efforts not just on movement of goods and services but also on mobility of people and investment.
- **Improve the quality of life for the people of Africa** —The Bank is committed to building up the availability of technical skills so that African economies can realise their full potential in high-technology sectors. Acknowledging the urgent need to address climate change, the Bank will nearly triple its annual climate financing to reach $5 billion a year by 2020.

These development priorities have been considered in the development of mitigation measures and livelihood development strategies as part of this ESIA.

2.4.3 Comparative Analysis

A comparative analysis between Ugandan laws and relevant international standards was conducted to determine potential requirements for complying with international standards as well as national legislation.

Table 2-8 Comparison between Ugandan Laws, International Finance Corporation (IFC), Performance Standards and African Development Bank Operational Safeguards

Requirement	IFC Performance Standards	AfDB requirements	Relevant Uganda Legislation / Guidelines	Action taken to meet the requirement
Environmental & Social Impact Assessment (ESIA)	IFC Performance Standard 1 Requires borrowers to incorporate an environmental and social management system (ESMS) to identify environmental and social risks in a project; establish an overarching environmental and social policy, management programs, emergency preparedness and response and organizational capacity and competency; enable stakeholder engagement; and coordinate monitoring and review.	Operational Safeguard 1 Similar requirements to IFC with minor differences such as: • EA and EMP must be in full compliance with country laws and regulations (as well as a country's international obligations) • more explicit reference to socio-economic impacts, including vulnerable groups, gender issues, surrounding communities and poverty conditions • Grievance redress mechanism (GRM) required during the entire project cycle	Comprehensively covered by the National Environment Act, Cap 153 and Environmental Impact Assessment Regulations, 1998 Further guidance is provided in the Guidelines for Environmental Impact Assessment in Uganda, 1997 and the Environmental Impact Assessment Guidelines for Road Projects (2008).	An ESIA has been undertaken for the proposed Project and the Project proponent is committed to establishing and maintaining an appropriate Environmental and Social Management System (ESMS) that meets requirements of relevant legislation and international standards. The ESMS includes the management plans produced as part of this ESIA (see Volume D).
Public Consultation and Information Disclosure	IFC Performance Standard 1 and 5 Requires effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them. Provides specific requirements for Stakeholder Analysis and Engagement Planning, Disclosure of Information, Consultation and Indigenous Peoples.	Operational Safeguard 1 Similar to IFC. The borrower or client is responsible for conducting and providing evidence of meaningful consultation (i.e., consultation that is free, prior and informed) with communities likely to be affected by environmental and social impacts, and with local stakeholders, and also for ensuring broad community support.	Covered within National Environment Act, 1995; EIA Regulations, 1998; Resettlement Policy Framework (RFP) for Uganda 2016; The Constitution of Uganda 1995; Land Act of 1998 and Land Acquisition Act, 1965. Guidelines for consultation are also provided in the Guidelines for Environmental Impact Assessment in Uganda, 1997; Environmental Impact	Stakeholders and PAPs have been consulted in both English and local languages as appropriate. Additionally, project information will continue to be made available locally and nationally so that stake holders can easily access the information. A Stakeholder Engagement Plan (SEP) has also been prepared (refer Volume D).

Requirement	IFC Performance Standards	AfDB requirements	Relevant Uganda Legislation / Guidelines	Action taken to meet the requirement
			Assessment Guidelines for Road Projects (2008).	
Pollution Prevention and Abatement	IFC Performance Standard 3 Requires borrowers to refer to the World Bank Environmental Health and Safety (EHS) Guidelines or other internationally recognized sources, when adopting resource efficiency and pollution prevention techniques.	Operational Safeguard 4 Provides a range of requirements for management of a range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow.	The National Environment Regulations (Waste Management, 1999; Standards for Discharge of Effluent into Water or on Land, 1999; Noise Pollution, 2004	Requirements of international standards and guidelines including the World Bank EHS Guidelines have been considered in developing mitigation measures throughout the ESIA. The proposed Project will comply with the mitigation measures that have been developed in the ESMMP.
Labour and Workers OHS and Security	IFC Performance Standard 2 and 4 IFC PS2 Aims to promote fair treatment of workers, improve worker management relationships and promote compliance with national employment laws. IFC PS4 requires borrowers to evaluate health and safety risks including infrastructure and equipment design and safety, hazardous materials management and safety, ecosystem services, community exposure to disease, and emergency preparedness and response.	Operational Safeguard 1 and 5 Similar to IFC. However with regards to subcontracted workers, the AfDB policy has firmer requirements regarding contracts and specifically instructs that the borrower or client incorporate the requirements of the safeguard in contractual agreements with its contractors, subcontractors and intermediaries.	Community health covered by the Public Health Act, Cap 281 Employee health, safety and security by the Occupational Safety and Health Act, 2006 The Employment Act, Cap. 219 mandates labour officers to regularly inspect the working conditions of the workers to ascertain the rights of workers and ensures that their provisions are provided for as well as their welfare.	The proposed Project proponent will ensure that workers and general public are not exposed to vector borne diseases, STDs and construction and operation related safety hazards as indicated in the ESMMP. Labour and working conditions will be in accordance with national legislation as well as IFC and AfDB requirements (refer Chapter 3). Emergency preparedness and response measures are considered in the ESMMP.

Requirement	IFC Performance Standards	AfDB requirements	Relevant Uganda Legislation / Guidelines	Action taken to meet the requirement
Involuntary Resettlement and Compensation	IFC Performance Standard 5 (Refer Table 2-9 for further details)	Operational Safeguard 2 (Refer Table 2-9 for further details)	Resettlement Policy Framework (RFP) for Uganda 2016; The Constitution of Uganda 1995; Land Act of 1998, and Land Acquisition Act, 1965.	The proposed Project proponent will implement the updated Resettlement and Livelihood Restoration Plan prepared (refer Volume D).
Natural Habitats and Forests	IFC Performance Standard 6 Requires borrowers to not significantly convert or degrade natural habitats, unless certain conditions are met. In areas of natural habitat, mitigation measures will be designed to achieve no net loss of biodiversity where feasible. Potential impacts on critical habitats are to be assessed. For impacts on critical habitats the project's mitigation strategy will be described in a Biodiversity Action Plan and will be designed to achieve net gains. Where a project is likely to adversely impact ecosystem services, as determined by the risks and impacts identification process, the client will conduct a systematic review to identify priority ecosystem services	Operational Safeguard 3 Similar to IFC with minor differences including: • Authorization to support projects in areas of "critical habitat" if specified conditions are met. • Broader definition of "critical habitats" • Where offsets are proposed, a separate Offset Implementation and Management Plan to be developed • "Net benefit" or "no net loss" of biodiversity as criteria for offsets	Covered under the National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2001 and the Uganda Wildlife Act, Cap 200 Relevant provisions for forest protection contained in the Forest Act and National Forest and Tree Planting Act Project to comply with The Fish (Amendment) Act, Cap 197, 2011 with regards to sensitive ecosystems such as wetlands.	Assessment of potential impacts on biodiversity have been conducted (refer Chapter 16). A number of wetlands and natural vegetation will be affected during the development of the proposed Project. The Project proponent will commit to relevant mitigation measures included in the ESMMP and Biodiversity Action Plan (refer Volume D). One forest reserve (Namanve CFR) will be traversed by the proposed Project. Much of the CFR is degraded and over-harvested, but it is protected and includes high-quality wetland (refer Chapter 16). Appropriate mitigation measures are included in the ESMMP and Biodiversity Action Plan (refer Volume D). A Biodiversity Action Plan has been prepared which follows the mitigation hierarchy and details the mitigation measures to be implemented to avoid and minimise impacts on biodiversity (refer Volume D). This Plan aims to achieve net gains

Requirement	IFC Performance Standards	AfDB requirements	Relevant Uganda Legislation / Guidelines	Action taken to meet the requirement
				for cases where critical habitats are potentially impacted.
Indigenous Peoples	IFC Performance Standard 7 Requires parties to avoid adverse impacts on communities of indigenous peoples and to engage with affected communities to ensure they have given their Free Prior and Informed Consent.	Operational Safeguard 1 Similar to IFC however less detailed requirements. Indigenous Peoples are considered under requirements for vulnerable groups.	No Specific law but right to belong to an entity covered by 1995 Constitution	No indigenous peoples as defined by the IFC Performance Standard are within the proposed Project area and as such, this requirement is not relevant for the proposed Project.
Cultural Heritage	IFC Performance Standard 8 Aims to protect cultural heritage through consultation procedures, community access and removal of replicable cultural heritage. Provides specific requirements for chance finds, consultation, community access, removal of replicable and non-replicable cultural heritage, as well as critical cultural heritage.	Operational Safeguard 1 Similar to IFC however less detailed requirements. The borrower or client is responsible for ensuring that project sites and designs avoid significant damage to cultural heritage, including both tangible and intangible cultural heritage. When the project is likely to have adverse impacts on cultural heritage, the borrower or client identifies appropriate measures for avoiding or mitigating these impacts. Critical cultural heritage is not defined by AfDB.	Comprehensively covered by the Historical and Monuments Act, 1967	During the development of the proposed Project, cultural heritage will be evaluated and in addition, the affected communities will be consulted regarding any significant impacts to cultural heritage. The Project proponent will commit to relevant mitigation measures outlined in the ESMMP which have been developed and implemented in accordance with national regulations and best international practice.

2.4.4 Gap Analysis for Compensation and Resettlement

In order to ensure that the socio-economic aspects of the proposed Project and RLRP meet the relevant international standards, a gap analysis was undertaken between relevant Ugandan legislation and the IFC PS and AfDB Safeguard. Key findings of the gap analysis include:

- Under the Ugandan laws, the project affected persons are compensated but they (project affected persons) are only eligible for compensation if they have legally recognised rights to the said land. However, the IFC PS 5 requires that all affected persons should be compensated, regardless of their occupancy status;
- IFC PS 5 provides for alternative land where compensation is on a land for land basis, compensation in kind, and goes beyond monetary compensation by specifying that income must be restored at full replacement cost; however, Ugandan laws do not specify the kind of compensation required to be provided, and the most common approach for large development projects in the country is to pay cash compensation rather than prioritise in-kind provisions;
- Under Ugandan laws, there is no requirement for the provision of supplementary assistance for vulnerable individuals and groups;
- Under Ugandan laws, there is no requirement for livelihood restoration/improvement and managing resettlement as a development initiative; and
- In addition, perennial crops must be compensated for in cash at an established rate and annual crops shall be compensated in accordance to IFC PS 5.

Table 2-9 provides an analysis of relevant Ugandan policies and regulations with IFC Performance Standard 5 and African Development Bank Operational Safeguard 2, and how the gaps will be addressed during the socio-economic surveys and in the ESIA and Resettlement and Livelihood Restoration Plan. Since these requirements stipulate adoption of the more beneficial measures for the PAPs, the proposed Project will deploy these to ensure all needs are included. The IFC requirements are more favourable to PAPs than the Ugandan Laws. Where there is discrepancy, the IFC requirements will take precedence. To bridge the gap, uplift will be used to ensure compensation complies with the IFC requirements.

Table 2-9 An analysis between Ugandan Laws, International Finance Corporation (IFC), Performance Standard 5 and African Development Bank Operational Safeguard 2

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
Project Design	Under Ugandan law, the Constitution (1995) and the Land Act (1998) gives the government and local authorities the power to compulsorily acquire land, but only if the taking of land is necessary for public use or interest. Ugandan legislation does not mention the need to avoid or minimise displacement by exploring alternative project designs.	The project should consider feasible alternative project designs, including re-siting and re-routing, to avoid or minimise physical or economic displacement, while balancing environmental, social, and financial costs and benefits. When the resettlement implications of a project would appear to be particularly severe, the Project should consider either downsizing the project to reduce resettlement or finding other alternatives that can reasonably replace the project.	Feasible alternative project designs to avoid or minimise physical and economic displacement while balancing environmental, social and financial costs and benefits will be considered. Where this is not feasible, PAPs who are to be resettled must be assisted to improve or at least restore their livelihoods compared to conditions that existed before a project is implemented.	In order to follow international guidelines, alternative project designs must be considered to try and minimise the need for displacement.
Census and Asset Inventory	Ugandan legislation does not mention the need for a census of PAPs or an asset inventory.	Census (baseline survey includes gender- and age-disaggregated information pertaining to the economic, social and cultural conditions of the affected population) will be carried out to determine the eligible and ineligible persons.	A census and asset inventory will be carried out in order to collect appropriate socio-economic baseline information, to identify the persons who will be displaced by the project, determine who will be eligible for compensation and assistance, and prevent ineligible persons such as opportunistic settlers from claiming benefits.	International guidelines require that a full census of PAPs is carried out. This will allow the development of a detailed socio-economic baseline, help determine impacts of the Project and provide a baseline level to monitor against. PAP census and asset inventory should consider all PAP's affected economically or physically, including those that do not reside or have assets directly within the Right of Way, but which will nevertheless experience displacement.

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
Land Owners	Under the constitution of Uganda (1995) every person in Uganda has the right to own property. Ugandan law recognises 4 land tenure systems: customary tenure, freehold tenure, leasehold tenure, and mailo tenure. Compensation is an entitlement to customary land holders based on the market value of their unimproved land.	The policy recommends payment for compensation be land for-land or at replacement cost	Compensation must be based on full replacement costs	Under national Uganda law, the right to resettlement is only valid to those with a proprietary interest in land affected by a project. Property and ownership is provided by customary land. Compensation payments will be based on Ugandan law on legal user/occupancy rights and right of ownership.
Tenants/Licenses (occupation or use rights)	Licensees are granted authority to use land for agricultural production (usually limited to annual crops). They have no legal security of tenure or any propriety right in the land. The Land Act, section 29(5) clearly states that for the avoidance of doubt, a licensee shall not be taken to be a lawful or bonafide occupant. The value of standing crops on the land, excluding annual crops which could be harvested during the period of notice given to the tenant will be compensated.	The policy recommends payment for compensation be land-for-land or at replacement cost	Identify and address impacts also if they result from other activities that are: (a) directly and significantly related to the proposed project, (b) necessary to achieve its objectives, and (c) carried out or planned to be carried out contemporaneously with the project.	This ESIA adopts UNRA's approach in its updated RAP methodology (January 2017) which stipulates compensation for rights that the Tenant/Licensee holds such as improvement on the land, and up to 6 months' rent-free period from date of payment of the landlord by UNRA.
Squatters	No accommodation is made concerning the resettlement and compensation measures for squatters and illegal settlers under	Provides for compensation (at replacement cost)/assistance	PAPs to be displaced cannot be denied assistance with resettlement and compensation as a result of their lack of legal titles to the land. This will be of	Under Ugandan Law, those without formal land titles are not entitled to compensation as compensation measures are based entirely on the legal occupancy of land.

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
	Ugandan National Law. Compensation is based on legal occupancy of land.		particular importance to the Project in wetland areas in the Project Area that have been heavily encroached on by squatters. A project must provide assistance in lieu of compensation for land to such people (e.g. income restoration, crop loss, building loss). The aim is to at least restore or better, improve livelihoods of these people.	In order to follow international requirements, a project must provide compensation measures for those PAPs displaced without formal legal occupancy of the land. This ESIA adopts UNRA's approach in its updated RAP methodology (January 2017) which provides for assessment of the land improvement value and any equitable rights that may be attached to the land. Compensation does not include land. However, additional compensation or livelihood restoration must be considered for squatters without equitable rights beyond permission to salvage their belongings.
Vulnerable Groups	Ugandan legislation does not specifically identify vulnerable groups and therefore does not have provisions for targeted assistance for vulnerable groups.	The Project will be responsible for protecting the physical, social and economic integrity of vulnerable groups and for paying particular attention to health needs, particularly for women, including access to female health care providers and to such services as reproductive health care and appropriate counselling for sexual and other abuses.	International guidelines set out that particular attention should be paid to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, the elderly, women and children, indigenous people, ethnic minorities, or other displaced persons who may not be protected through national land compensation legislation.	International guidelines set out that vulnerable groups should be considered at all stages of the resettlement process. This ESIA adopts UNRA's approach in the updated RAP (January 2017) methodology allows for identification and customisation of assistance specific to vulnerable PAPs.
Owners of non-permanent buildings	Under Ugandan law, owners of non-permanent buildings are entitled to	Provides for compensation (at replacement cost) /assistance	PAPs to be displaced cannot be denied assistance with resettlement and	Under Ugandan Law, those without formal legal rights or claims to land/semi-

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
	compensation with rates set by District land boards. Under the Uganda agreement of 1900, Mailo land tenure was established which permits the separation of land ownership from the development of structures on the land (by a lawful occupant).		compensation as a result of their lack of legal titles to the land or assets. This will be of particular importance to the project in wetland areas in the Project Area.	permanent structures are not entitled to compensation or resettlement assistance. In order to follow international requirements, a project must provide compensation measures for those PAPs displaced without formal legal ownership of structures.
Owners of permanent buildings	Under Ugandan law, valuation of buildings in urban areas is based on open market value. In rural areas, it is based on depreciated replacement costs.	Provides for compensation (at replacement cost)/assistance	Under international guidelines, PAPs are entitled to compensation (in-kind or cash) at full replacement costs including labour and relocation expenses incurred prior to displacement.	Under Ugandan law, some valuation is based on depreciated replacement costs. This may not reflect full replacement costs and values.
Timing of Compensation Payments	According to the land acquisition act, after the assessment office takes possession of land it immediately becomes property of the land commission. However, the Land Act Cap 227 outlines that compulsory land acquisition must be in line with the constitution. If the PAPs are given less than six months to vacate the land, they receive a disturbance allowance of 30 percent of total compensation value and if they are given more than six months to vacate the land	Affected people are compensated for all their losses at full replacement costs before their actual move; before land and related assets are taken; and, if the project is implemented in phases, before project activities begin for each particular phase.	All resettlement plans should be implemented before project completion. Resettlement entitlements should be provided before displacement occurs or restriction of access.	Under international guidelines resettlement entitlements must be given before displacement or the restriction of access occurs.

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
	receive a disturbance allowance of 15 percent.			
Calculation of compensation and valuation	According to the Land Act, Cap 227 (section 77), and the value of customary land shall be the current market value of the unimproved land. Value of the buildings shall be at open market value for urban areas and depreciated replacement cost for rural areas. The crops and buildings of a nonpermanent nature are compensated at rates set by District Land Boards.	The operational safeguard requires prompt compensation at replacement cost including transport assistance to move locations	Bank policy requires: (a) prompt compensation at full replacement cost for loss of assets attributable to the project; (b) if there is relocation, assistance during relocation, and residential housing, or housing sites, or agricultural sites of equivalent productive potential, as required; (c) transitional support and development assistance, such as land preparation, credit facilities, training or job opportunities as required, in addition to compensation measures; (d) cash compensation for land when the impact of land acquisition on livelihoods is minor; and (e) provision of civic infrastructure and community services as required.	Under international guidelines compensation must consider full replacements costs which includes improvements made on the land. Under Ugandan law, no compensation is provided to squatters, tenants or licensees. This ESIA adopts UNRA's approach in the updated RAP methodology (January 2017) which stipulates that a special supplementary report will be prepared. This document must outline how PAPs will be compensated for improvements on the land and those who sustain losses across all tenure categories.
Completion of Resettlement and Compensation	The value of privately owned land must be negotiated between the owner and the developer. In rural areas, land is valued at open market value and buildings at replacement costs. If the PAPs are given less than six months to vacate the land, they receive a	Affected people are compensated for all their losses at full replacement costs before their actual move; before land and related assets are taken; and, if the project is implemented in phases, before project activities begin for each particular phase.	Guidelines outline that all plans regarding resettlement and livelihoods should be implemented before project completion. Resettlement entitlements should be provided before displacement occurs.	International guidelines outline that all resettlement plans should be implemented before project completion. Compensation and resettlement entitlements must be provided before displacement.

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
	disturbance allowance of 30 percent of total compensation value and if they are given more than six months to vacate the land receive a disturbance allowance of 15 percent.		For projects involving restrictions of access, impose the restrictions in accordance with the timetable in the plan of actions.	Under Ugandan law, amount of notice given to displaced persons will determine compensation value. This ESIA adopts UNRA's approach in the updated RAP methodology (January 2017) which allows PAPs for up to 6 months to restore their livelihood through measures such as the disturbance allowance and salvage of materials (e.g. crops, trees, fixtures, fittings and installations from the affected land)
Livelihood Restoration and Assistance	In Ugandan law, there are no explicit provisions regarding resettlement or relocation livelihood assistance.	The Project will provide a detailed and rigorous set of commitments and requirements involving Population displacement, relocation, compensation and restoration of living standards.	Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of Project implementation.	Under international guidelines a RAP should be developed detailing extensive Livelihood Restoration measures that aim to restore or improve the livelihoods of PAPs. This ESIA adopts UNRA's approach in the updated RAP methodology (January 2017), where UNRA has committed to considering approaches such as disturbance payments, adaptive training, assistance exploring new income sources to improve the livelihoods of PAPs.
Consultation and Disclosure	Ugandan legislation does not mention the need for stakeholder consultation and participation in the resettlement process.	Appropriate notice to all potentially affected persons that resettlement is being considered and that there will be public	International guidelines aim to ensure that resettlement activities are implemented with appropriate disclosure of information,	Under international guidelines, PAPs should be properly consulted as part of the

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
		hearings on the proposed plans and alternatives.	consultation and informed participation of the affected persons.	resettlement process and all appropriate information should be shared.
Grievance mechanism and dispute mechanisms	In line with Ugandan legislation, all grievances and disputes should be reported to the Local Council before engaging with other responsible authorities.	Appropriate and accessible grievance mechanisms should be in place and fully documented to settle any disputes before commencement of any resettlement.	Appropriate and accessible grievance mechanisms should be established. Some displaced persons will have complaints about aspects of their change in circumstances. Prior to the initiation of displacement, procedures should be in place for recording and processing grievances.	Under international guidelines appropriate grievance mechanisms should be developed and followed on the receipt of complaints. Any complaints should be well recorded and processed. This may well include involvement of the local council, as required under Ugandan law.
Resettlement Assistance and Transitional Allowances	Ugandan legislation does not identify any need for resettlement assistance and transition allowances. Although a disturbance allowance is provided (described above).	The project will consult with the affected people about their preferences pertaining to resettlement and give them genuine choices among technically, economically, and socially feasible resettlement options. In particular, they are given the opportunity to participate in the negotiation of compensation packages, and in decisions on resettlement assistance and how standards of living, income-earning capacity, production levels and overall means of livelihood might be improved through the Resettlement Action Plan.	Provide appropriate resettlement assistance and transitional support based on reasonable estimates of the time required to restore income earning capacity, productivity levels and associated livelihoods and standards of living.	International guidelines require that assistance and transitional support be given with resettlement procedures. See above "Livelihood Restoration and Assistance"
Cut-Off Date	Ugandan legislation does not identify any need for a cut-off date.	A cut-off date for eligibility that is acceptable to the Bank should be established. The	A cut-off date for eligibility should be established. Information regarding the cut-	Under international guidelines a cut-off date must be established.

Aspect/Type of Affected Persons/Lost Assets	Ugandan law	AfDB requirement	IFC requirements	Project Mitigation Measures
		proponent will document the cut-off date(s) and disseminates information about it (them) throughout the project area of influence in a culturally appropriate and accessible manner, before taking any action on clearing land or restricting local community access to land.	off date will be well documented and disseminated throughout the Project area. The Project is not required to compensate or assist those who encroach on the Project area after the cut-off date for eligibility, provided the cut-off date has been clearly established and made public.	UNRA's approach in the updated RAP methodology (January 2017) stipulates that the Project will adopt IFC recommendations. The project to date has considered the cut-off date as the date compensation is made.
Monitoring and Evaluation	Ugandan legislation does not identify any need for monitoring and evaluation.	The Project will be responsible for the implementation, monitoring and evaluation of the activities set out in the Resettlement Action Plan.	The Project will be responsible for adequate monitoring and evaluation of the activities set forth in the Resettlement Action Plan/Livelihood Restoration Plan. Upon completion of the Project, the Project will be required to undertake an assessment to determine whether the objectives of the Resettlement Action Plan/Livelihood Restoration Plan have been achieved. The assessment should take into account the baseline conditions and the results of resettlement operation. If the assessment reveals that the objectives of the Resettlement Action Plan/Livelihood Restoration Plan have not been realised, the Project should propose follow-up measures.	Under international guidelines effective monitoring and evaluation of resettlement actions will be required after the implementation of the RAP. This ESIA adopts UNRA's approach in the updated RAP methodology (January 2017) which indicates that the project will establish a RAP monitoring and Evaluation Committee with key performance indicators to ensure compliance is achieved as per IFC PS 5.

2.5 UNRA Policies

UNRA is committed to international standards of good practice in the areas of environmental protection, social development, and health safety and security. In support of this commitment, UNRA has developed an Environmental and Social Safeguards Policy (2016), as part of its Environmental and Social Management System, which governs UNRA's operations. The ESIA has been developed consistent with this policy.

Specifically, UNRA is committed to:

- Avoiding, preventing, reducing and mitigating environmental and social impacts of its activities, including road development, maintenance, and rehabilitation activities and wherever possible, to enhancing the positive impact, to the environment and people; and
- Integration of Good International Industry Practice with respect to the environment and social requirements in all its operation, including in the planning, design, construction, and maintenance of roads, bridges and ferries. The Authority will seek to involve communities in project activities to enhance sustainable development, including activities such as tree planting, wetlands restoration and environment awareness campaigns for communities.

The Environmental and Social Safeguards Policy (2016) focuses on:

- Assessment and management of environmental and social impacts;
- Occupational and community health and safety;
- Gender, vulnerable people (including those with disabilities;
- HIV/ AIDS awareness and prevention;
- Stakeholder engagement and disclosure of information;
- Grievance redress mechanism;
- Labour and working conditions;
- Sensitive ecosystems and the sustainable development of the environment;
- Climate change;
- Land acquisition and involuntary resettlement; and
- Cultural resources.

The ESIA has been also developed in accordance with the procedures and guidelines outlined in UNRA's recently developed *Environmental and Social Management System - First And Priority Set Of Procedures* (2017). This ESMS procedural document covers:

- Identification and management of environmental and social risks, including development of an Environmental and Social Risk Register;
- Specific environmental and social management procedures and guidelines (see below)
- Internal monitoring and audit systems.

2.6 Project Discharge and Emissions Targets

In developing an environmental and social management and monitoring programme for the Project, it was necessary to consider:

- Discharge / emissions guidelines for off-site releases of water, waste and potential airborne contaminants; and
- Ambient guidelines for the protection of beneficial uses and environmental values (e.g. aquatic fauna / fisheries protection, drinking water protection, etc.).

Applicable standards are provided in Table 2-9 below, including Ugandan and international standards. Where standards or limits do not exist in Ugandan Law, guidelines, standards or limits used by other countries (e.g. EU, USEPA, UK, Australia) or organisations (e.g. IFC, WHO) are adopted in lieu.

Table 2-10: Relevant air quality, noise and water quality standards and guidelines

Source	Relevant Guidelines	Year
WASTE / WASTEWATER DISCHARGE AND MONITORING		
Uganda	National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations	1999
	National Environment (Waste Management) Regulations	1999
IFC	Environmental Health and Safety Guidelines – General – Environmental	2007
	General EHS Guidelines: Wastewater and Ambient Water Quality.	2007
AIR QUALITY		
Uganda	Draft Ambient Air Quality Standards (UNRA)	2006 (draft)
IFC	General EHS Guidelines: Air Emissions and Ambient Air Quality.	2007
WHO	Air Quality Guidelines – Global Update	2005
SOIL QUALITY		
UK	Soil Guideline Value	2009
AQUATIC FAUNA / FRESH WATERS		
United States	National recommended water quality criteria; republication. United States Environmental Protection Agency (USEPA)	2009
European Union	Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council.	2008
European Union	Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (E.U., 2006).	2006
DRINKING WATER		
Uganda	Potable water — Specification (US EAS 12)	2014
WHO	Guidelines for Drinking Water Quality, fourth edition incorporating the first addendum	2017
European Union	Council directive 9883/EC of November 1998 on the quality of water intended for human consumption.	1998
NOISE AND VIBRATION		
Uganda	Uganda National Environment (Noise Standards and Control) Regulations	2003
Australia	Australian Standard (AS 2187.2 App. J Ground Vibration and Airblast Overpressure) based on the US Bureau of Mines USBM RI-8507 and British Standards (vibration) BS 6472:2008, 4866:2010 and 7385-2:1993	2006
WHO	Guidelines for community noise	1999
IFC	Environmental Health and Safety Guidelines for Toll Roads	2007
	Environmental Health and Safety Guidelines: Noise Management	2007

KJE PPP Project Phase 1 ESIA

CHAPTER 3 Project Description

3. PROJECT DESCRIPTION

3.1 Project Overview

UNRA is proposing to construct a limited access 76 km tolled expressway between Kampala and Jinja to relieve the current congestion and reliance issues on the radial routes out of Kampala city and on the existing Kampala to Jinja highway to cater for future growth. This infrastructure development is part of the Northern Corridor – a vital international highway connecting the port of Mombasa in Kenya to the landlocked countries of Uganda, Rwanda, Burundi and the Democratic Republic of Congo.

The Project also includes the Kampala Southern Bypass which will provide a bypass to the capital city of Kampala, linking to the Kampala Entebbe expressway and the Northern Bypass to form a complete ring road around the city. The overall KJE Project is planned to be undertaken in two phases as follows (Figure 3-1):

- **Phase 1 –** development of the first section (35 km) of the Kampala-Jinja Expressway (KJE) from Kampala to Namagunga and the Kampala Southern Bypass (KSB) (18 km) which is expected to be completed by 2023; and
- **Phase 2** - development of the second section of the Kampala-Jinja Expressway (KJE) from Namagunga to Njeru (41 km) at the new Nile bridge. Works for the second phase are anticipated to be completed by 2030.

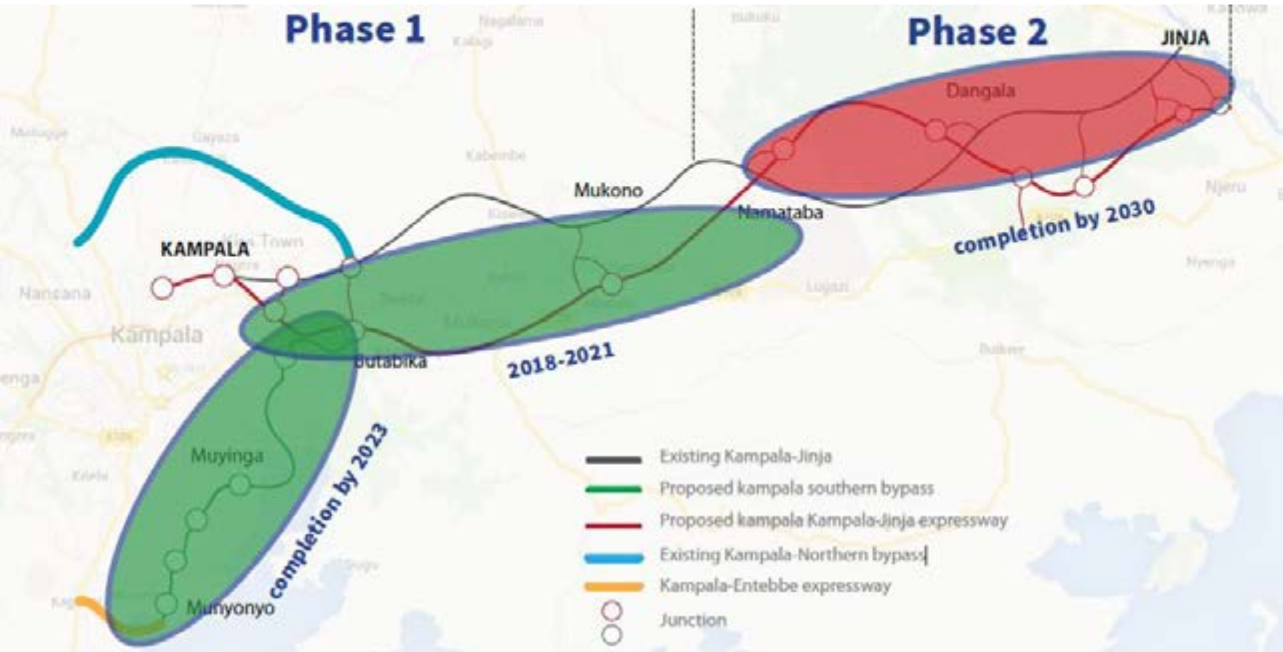


Figure 3-1: Kampala-Jinja Expressway Project Phases with indicative construction schedules (UNRA 2016c).

The KJE Project is currently planned for a 30-year term, based on a Design, Build, Finance, Operate and Transfer (DBFOT) model that will form the basis of the concession agreement between the Government of Uganda and the successful private sector concessionaire. The period is inclusive of the construction period, after which Project facilities will be transferred back to UNRA. The KJE Project is expected to generate approximately 1,500 jobs during construction and 250 jobs during operations, most of which will be taken up by Ugandans. Once operational, the expressway is expected to save up to 70 minutes of journey time between Kampala and Jinja.

The KJE Project Phase 1 traverses Kampala City as well as three administrative districts of Wakiso, Mukono and Buikwe. The first section of the proposed mainline alignment is approximately 35 km with a number of

interconnectors to join major towns near the expressway (Figure 3-2). The majority of the Project road, therefore, adopts a new alignment, entirely different from that of the existing main road from Kampala to Jinja.

However, the first section of the road corridor does follow the route of the existing main road, commencing at the location of the junction with the Lugogo Bypass, and passing along the existing road as far as Kyambogo (Km 2.5). It then diverges to the south side of the existing main road via an existing drainage reserve in a gap between the rear sides of two rows of factories. It emerges from the gap (Km 3.0) into a swampy area which it traverses, then crosses the existing Ugandan Railway line and Kinawataka Road (Km 3.6).

From the Kinawataka Road the corridor continues in a generally south-easterly direction passing along the valley between the Mbuya and Kireka hills to Butabika Interchange (Km 6.5), where it connects to the route of the Kampala Southern Bypass (KSB) section of the Project. East of Butabika Interchange the corridor traverses the fringe of an extensive swamp area then strikes through the Bukasa peninsula, passing through the ridge at a point north of the town of Bukasa (Km 8.6).

The part of the KJE mainline corridor thus far described is the only element of the Project that passes through densely urbanised areas. Having crossed the Bukasa ridge, the alignment, travelling generally easterly, crosses another extensive zone of swamp. The new road in this section will be carried by a viaduct of approximately 2 km in length, circumventing the southern extent of the future Namanve business park and dry port located to the south side of the existing main road between Bweyogerere and Seeta After leaving the city boundaries, the route crosses mainly greenfield land comprising a mix of agricultural land, plantations, wetlands and other areas of natural habitat, with Phase 1 ending at Namagunga. During Phase 2, the road is then planned to continue to Jinja where it will join with the new bridge being constructed across the River Nile.

The KSB section of the Project connects with the Kampala Northern Bypass at Nambole Junction, the KJE mainline alignment at Butabika and with the new Kampala-Entebbe highway in Munyonyo currently under construction. After joining the KJE, it runs south for approximately 1.8 km through Wakiso District, then passes mostly through the Kampala City administrative area covering the divisions of Nakawa and Makindye.

This alignment has been selected based on detailed engineering design, feasibility and environmental and social studies conducted thus far which date back to 2011. After all the proposed road infrastructure projects in and around Kampala have been completed it is hoped that Kampala will have a robust, interconnected, road network allowing for easy and quick transport around Kampala, and between Entebbe, Kampala and Jinja.

Key design features of the Project are shown in Table 1-1.

Table 3-1: Key design features of the Project, including the KJE mainline alignment (Phase 1) and Kampala Southern Bypass

Design features	KJE Mainline to Namagunga (Phase 1)	Kampala Southern Bypass
Total length	35 km - Greenfield (3km brownfield)	18 km - Greenfield
Design speed (urban)	85 km/hr (first 10 km)	100 km/hr
Design speed (rural)	120 km/hr	Not applicable
Lanes	4+4(3km); 3+3 (32km);	2+2 (18km)
Lane width	3.5 m (main line – urban), 3.7 m (main line – rural) and 3.65 m for link/connector roads	3.5 m (main line)
Median	2-5m with 0.5 m hard strip	2-5 m with 0.5 m hard strip
Shoulder width	3.5 m	3.0 m
Grade separated junctions	9	5

Design features	KJE Mainline to Namagunga (Phase 1)	Kampala Southern Bypass
Potential length of viaducts	Approx. 2000 m at km 9+100 – km 10+640	Approx. 2700 m mainly over swamps
Nominal Right of Way width	90 m	60 m
Minimum vertical clearance	5.2 m	5.2 m
Maximum vertical gradient	6% (urban) and 4% (rural)	6 (urban) and 4% (rural)
Vehicular under/overpasses	23(+16 underpasses)	4 (+12 underpasses)
Tunnels	None	None
Pavement type	Asphalt	Asphalt

Source: UNRA, KJE 2017 Feasibility Study Report.

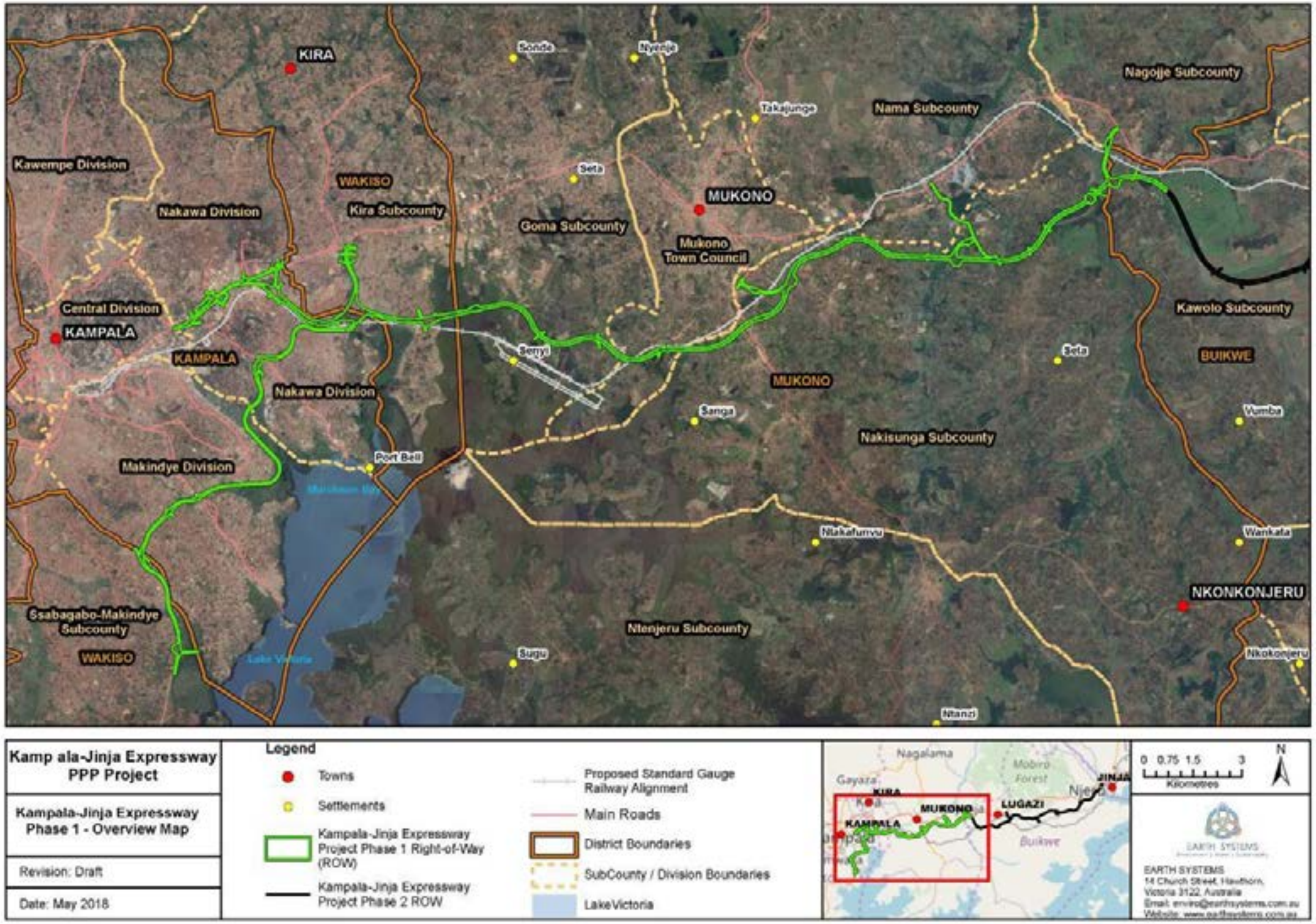


Figure 3-2: Overview of the Phase 1 Project Footprint

3.2 Phase 1 of the KJE

3.2.1 Phase 1 Right of Way

The Project Right of Way (ROW) consists of the main road body from one embankment to another as well as associated infrastructure including junctions, slip roads and bridges. It also includes a road reserve area on either side of the expressway. The width of the ROW varies from 45-90m along the alignment and will require full clearance of all structures and vegetation within these boundaries.

3.2.1.1 Phase 1 - Kampala Jinja Expressway Mainline

An overview of the Project ROW is shown in Figure 3-2. Detailed maps showing the alignment with chainages are provided in Section 7.2. General descriptions and maps of each section of the alignment are provided below.

KJE 0 + 000 → 2 + 400 Lugogo to Nakawa/Kyambogo

The first section of the road from KJE Chainage 0+000 to KJE Chainage 2+500 will be an expansion of the existing Kampala-Jinja Road (Plate 3-2; Plate 3-3). The road here will consist of four lanes in each direction. There will also be two access lanes in each direction which will serve the junctions also planned along the section. Grade separated junctions are planned to allow for easy access from the New Port Bell Road, Naguru Road, Ntinda Road and Kinawataka Road to the expressway but also to allow vehicle users to bypass the expressway if required. The expansion of the road in this location will pass over businesses and settlements surrounding the current Kampala-Jinja road (e.g. Plate 3-1).

Plate 3-1: Shell Fuel station along the existing Kampala-Jinja Road near Nakawa.

Plate 3-2: The markets, pedestrian access and signage along the existing Kampala-Jinja Road at Nakawa.

Plate 3-3: Traffic and drainage infrastructure on the existing Kampala-Jinja Road.

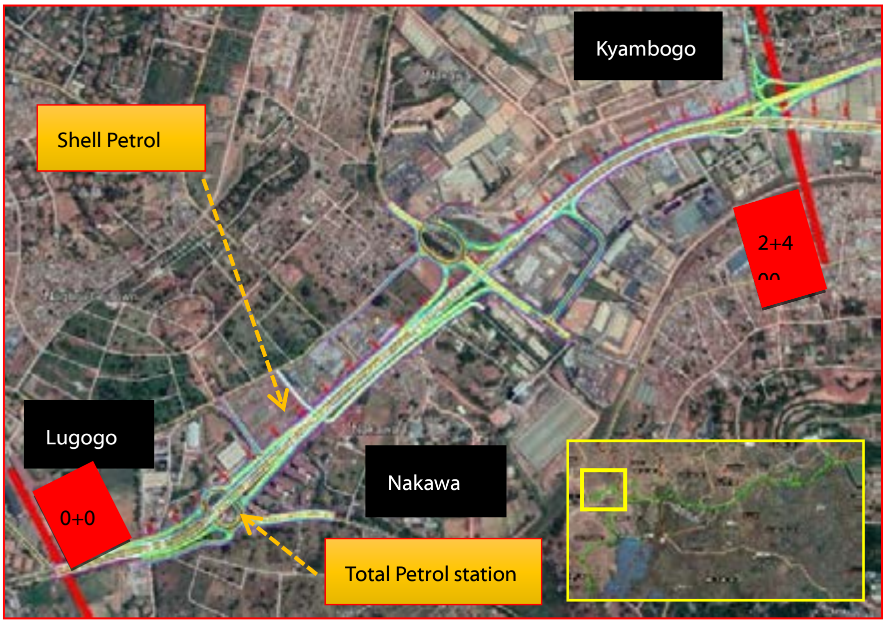


Figure 3-3: KJE 0 + 000 → 2 + 400 Lugogo to Nakawa/Kyambogo

KJE 2 + 400 → 4 + 500 Nakawa/Kyambogo to Kinawataka

At KJE Chainage 2 + 400, the road veers south from the existing Kampala-Jinja road to cross the industrial area in Kinawataka. The Project then crosses an area of degraded wetland (Plate 3-5), the Uganda railways corporation metre gauge line (Plate 3-5) and enters into Kinawataka informal housing area (Plate 3-4). The Project Footprint at this location will consist of three lanes of traffic flowing in each direction. This area was previously wetland habitat but in recent years, urbanisation and encroachment of settlement areas means some of the Project Footprint in this location is heavily settled. A large roundabout (radius 125m) has also been planned in this area allowing links to Kireka Rd, Kinawataka Rd and a link to the existing Kampala-Jinja road. At this location, the Project also plans to upgrade a small section of the existing Kampala-Jinja road, adding a new junction to enter the expressway near the current turn-off for Kyambogo road.

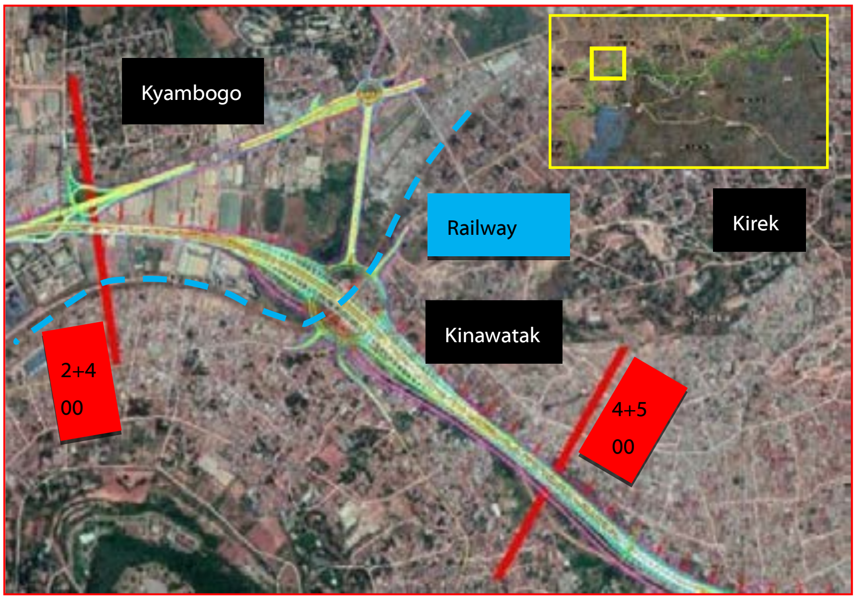


Figure 3-4: KJE 2 + 400 → 4 + 500 Nakawa/Kyambogo to Kinawataka

KJE 4 + 500 → 9 + 200 Kasokoso & Butabika

The ROW then follows the topography of the landscape intersecting some areas of the informal settlement at Kasokoso. At approximately chainage KJE 6 + 400, the Butabika systems interchange is planned which will link the KJE mainline to the KSB development that will terminate at the Munyoyo spur. This interchange will also link to the existing grade separated roundabout at Namboole which connects to both the Northern Bypass and the Mandela National Stadium. The ROW in this location will be vary between 40-60m wide depending on the edge of earthworks. There will be three lanes of traffic flowing in each direction. The ROW then continues across settlement areas near Butabika before entering the Namanve wetland (Plate 3-6) at approximately KJE Chainage 9 + 200. A grade separated roundabout is also planned at this location to link the expressway to Kirinya-Bukasa road and to accommodate future linkages that may be required to the Kampala Industrial Business Park at Namanve, SGR station and Bukasa port development.

Plate 3-4: Kinawataka Informal Housing area

Plate 3-5: Uganda's metre gauge National Railway line to be passed by the Project surrounded by settlements and degraded wetland.

Plate 3-6: Smallholder agriculture near a settlement area with Namanve wetland in the background.

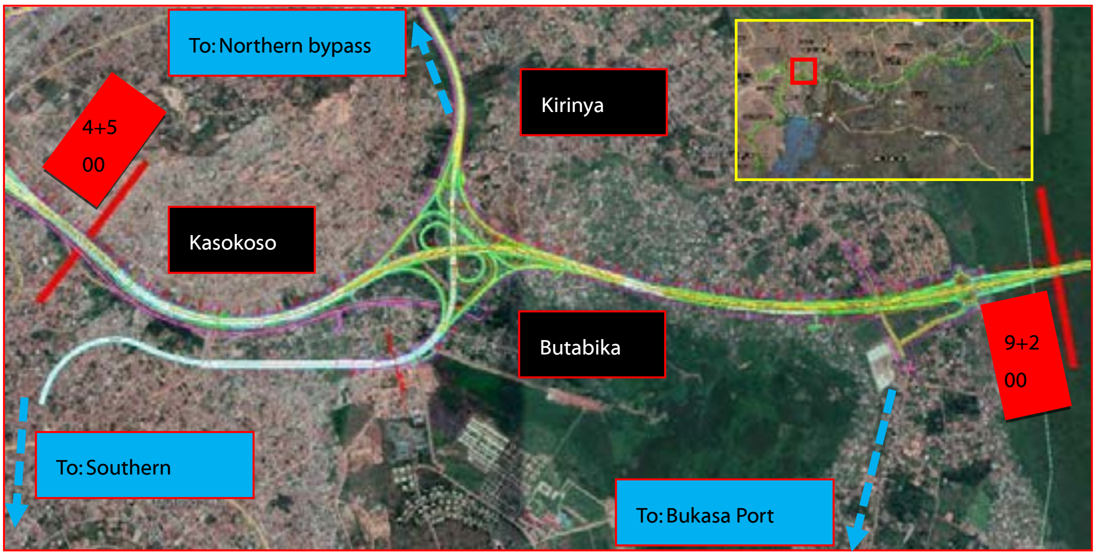


Figure 3-5: KJE 4 + 500 → 9 + 200 Kasokoso & Butabika

KJE 9 + 200 → 11+ 000 Namanve wetland and industrial park

At KJE Chainage 9 + 200, the road enters Namanve wetland running approximately 1-2 km south of the Namanve Industrial Park which borders the existing Kampala-Jinja road. The ROW is still 90m in width and consists of three lanes of traffic in each direction. The ROW section passing over the wetland will be constructed on a viaduct raised approximately 2m above the water level. The viaduct will be from KJE Chainage 9 + 100 to 10 + 640.

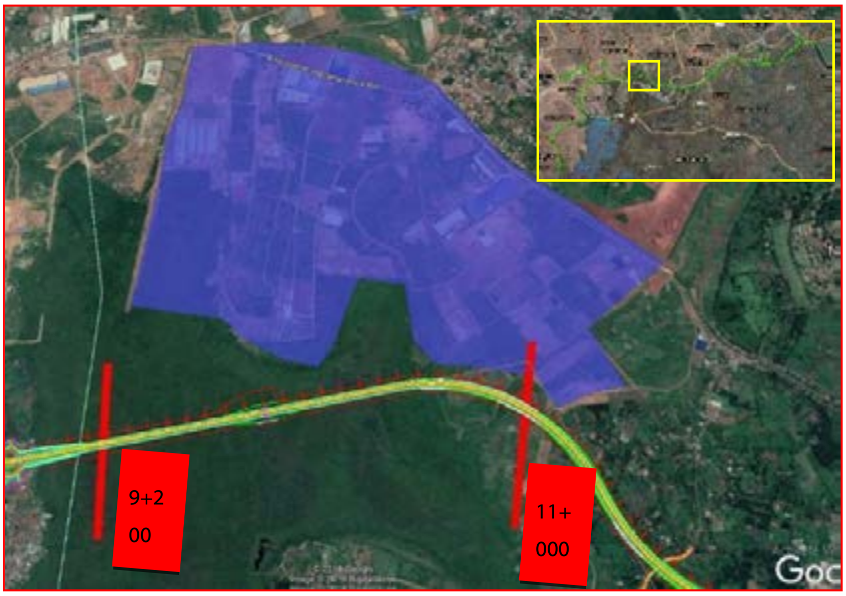


Figure 3-6: KJE 9 + 200 → 11+ 000 Namanve wetland and industrial park

KJE 11 + 000→ 33 + 500 Namanve to Namagunga

From KJE Chainage 11 + 000, the ROW exits the wetland area and crosses patches of degraded forest habitat, subsistence agriculture, wetlands and small settlement areas. At KJE Chainage 14 + 700, the ROW crosses the existing Namilyango-Kitale road and heads east towards Lofumwe. At approximately KJE Chainage 19 + 700, the road crosses the existing road linking Mukono-Katosi . A grade separated junction is also planned in this section linking the expressway to Mukono town. The link from the Mukono-Katosi road to the proposed grade separated roundabout is dual carriageway to absorb the future forecasted traffic from Mukono town. After this grade separated roundabout, the ROW is maintained at a clearance of 90m as the road has 3 lanes in either direction.

The road then continues eastwards, south of the existing Kampala-Jinja road, crossing mainly agricultural land and degraded habitat (Plate 3-8) until KJE Chainage 35+000. At this location a grade separated junction is planned to link the KJE to the existing Kampala-Jinja road and to provide access to and from Namataba and Namagunga. A few other small roads and developments are within the ROW area (Plate 3-7; Plate 3-9).

The road then continues in an easterly direction towards Jinja. The remaining section of the KJE mainline comprises Phase 2 of the Project which is considered in a separate ESIA process.

Plate 3-7: Large greenhouse development to be affected by the Project ROW.

Plate 3-8: Degraded forest / grassland habitat near the Project Area.

Plate 3-9: Gravel road within the Project Area

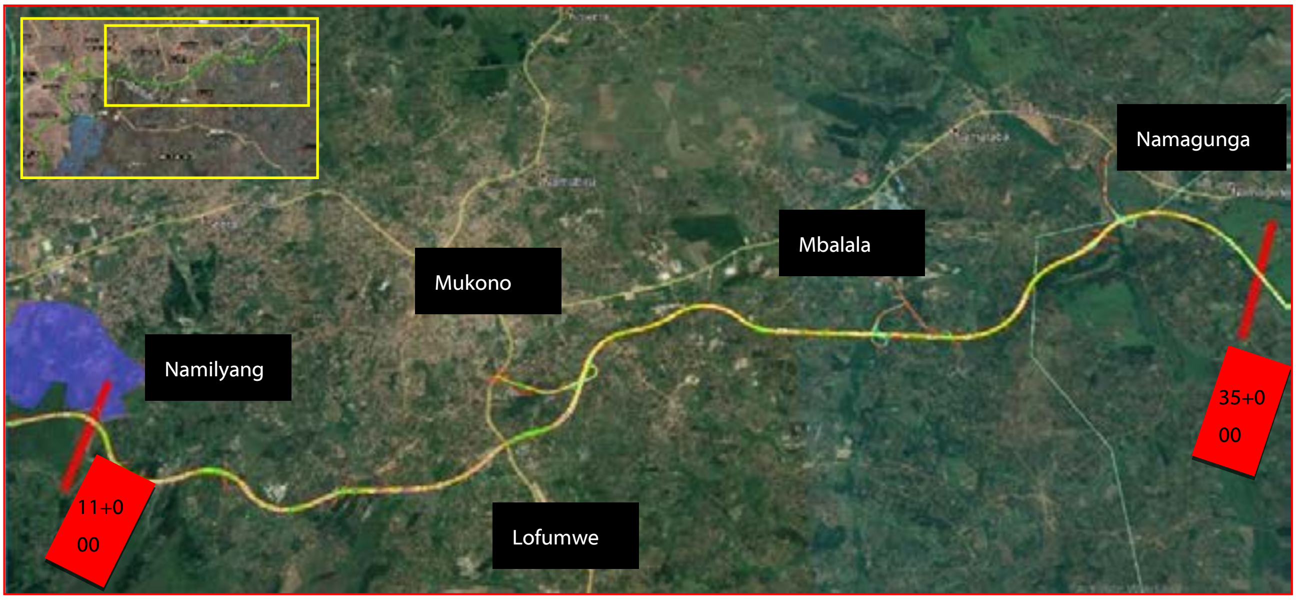


Figure 3-7: KJE 11 + 000→ 33 + 500 Namanve to Namagunga

3.2.1.2 Phase 1 - Kampala Southern Bypass

Detailed maps showing the alignment with chainages are provided in Section 7.2. General descriptions of each section of the alignment are provided below.

KSB 0 + 000 → 4 + 000 Butabika to Mutungo Hill

The Kampala Southern Bypass (KSB) starts at its most northerly point at the Butabika systems interchange where the KSB will join the KJE Mainline alignment. The ROW crosses settled areas near Mutungo Hill and runs parallel

to the KJE alignment until approximately KSB Chainage 2 + 300 where the ROW veers south and passes over Old Butabika Road at KSB Chainage 3 + 200. The ROW of the KSB is 60m in width and will accommodate two lanes of traffic flowing in each direction.

The road then continues in a south-westerly direction crossing Kitintale Road at KSB Chainage 3 + 800 and crosses heavily settled areas and businesses.

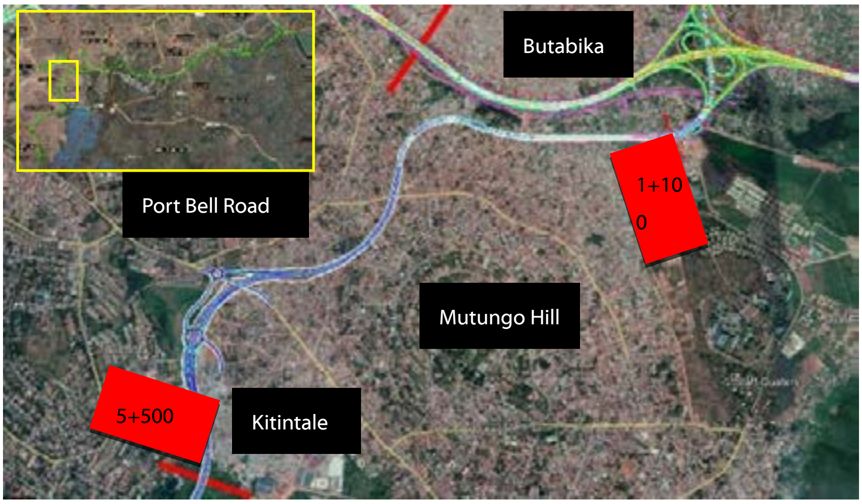


Figure 3-8: Showing KSB 1+100 – 4+500 Mutngo Hill and Kitintale

KSB 4 + 000 → 5 + 500 Bugolobi and Kitintale

The ROW then enters land between Bugolobi and Kitintale and crosses Port Bell Road at KSB Chainage 4 + 300. An interchange is planned at this location to connect Port Bell Road and surrounding residential areas to the KSB alignment.

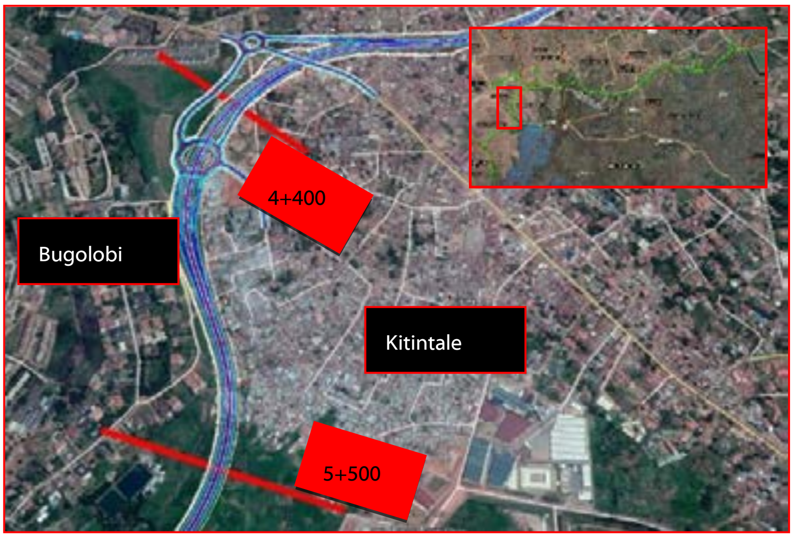


Figure 3-9: KSB 4 + 000 → 5 + 500 Bugolobi and Kitintale

KSB 5 + 500 → 11 + 100 Nakivubo Channel, Katongole, Kyeitabya and Ggaba Road

The ROW then crosses a low-lying wetland area (Nakivubo wetland) and intersects the Nakivubo channel. At KSB Chainage 6 +700, the ROW crosses the existing railway line running to Kampala city centre and has been designed to follow the base of Kyeitabya hill (Plate 3-11) before the ROW passes over settlement areas near chainage KSB 10 + 300. The ROW then crosses the Ggaba Road at KSB Chainage 11 + 100. A grade separated roundabout will be developed here to link existing Gaba Road to the expressway.

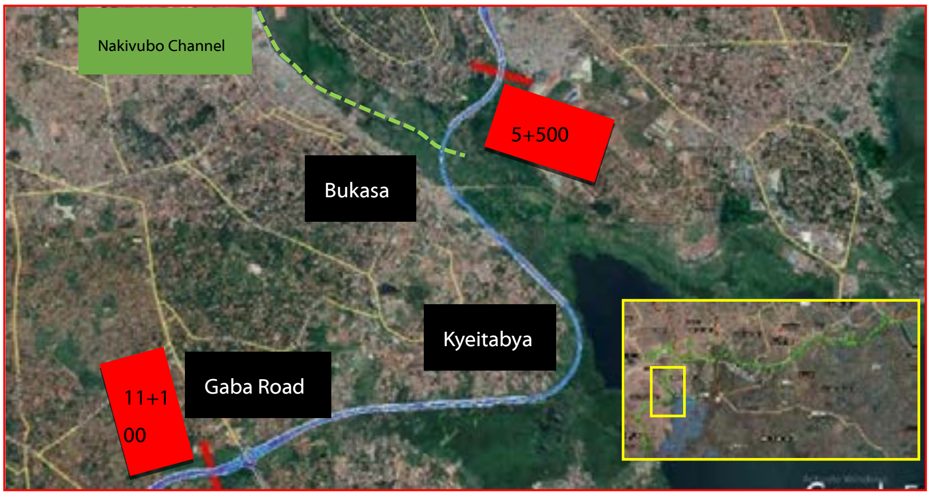


Figure 3-10: KSB 5 + 500 → 11 + 100 Nakivubo Channel, Katongole, Kyeitabya and Gaba Road

KSB 11 + 100 → 13 + 800 Ggaba Road to Salama Road

Between KSB Chainage 11 + 100 and 12 + 200, the road passes settlement areas surrounding Lukuli road. Here the ROW is still approximately 60 m wide and two lanes of traffic are flowing in each direction. At KSB Chainage 12 + 200, a grade separated roundabout will link Lukuli Road to the expressway allowing access to the expressway for people in the southern suburbs of Kampala. The ROW then continues in a westerly direction around Konge Hill, over a heavily settled area, towards Salama Road at KSB Chainage 13 + 800. A grade separated roundabout is planned as part of the development to link Salama Road to the KSB and to allow vehicles to bypass the expressway if desired.

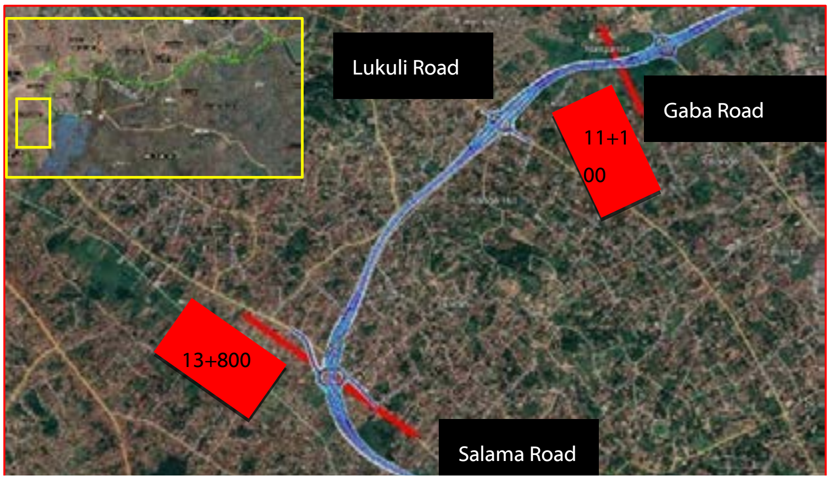


Figure 3-11: Map showing KSB 11 + 100 → 13 + 800 Ggaba Road to Salama Road

KSB 13 + 800 → 17 + 787 Salama Road to Munyonyo

The ROW then runs in a southerly direction parallel to the existing Salama Road until approximately KSB Chainage 15 + 500. The ROW then crosses an area of degraded low-lying land (Mayanja wetland) and crosses Kibira-A to Salama Rd (Figure 3-12) and surrounding settled areas (Plate 3-10) before coming to an end near Munyonyo. A large junction is planned for this final section of the ROW to link the KSB to the Kampala-Entebbe Expressway which is currently under construction and to provide access to Munyonyo.

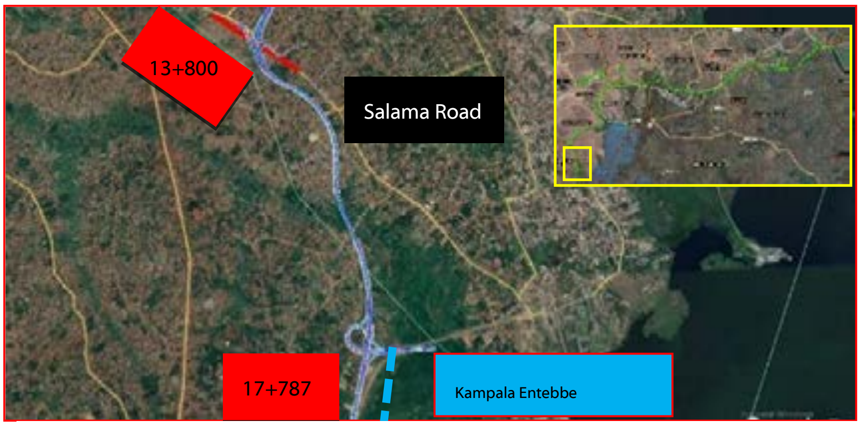


Figure 3-12: KSB 13 + 800 → 17 + 787 Salama Road to Munyonyo

Plate 3-10: Settlement area near the southern end of the KSB.

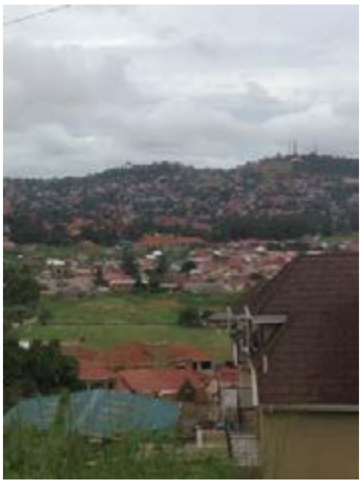


Plate 3-11: View of an area crossed by the ROW from Kyeitabya Hill

3.2.2 Area of Influence

The area of land that is likely to be influenced by the construction and operation of the Project are considered as the Area of Influence. This includes not just the direct Project Footprint but also the surrounding land and neighbourhoods which will be impacted by the Project – either directly or indirectly.

The area of influence will vary depending on the specific environmental and social aspect being considered. The Study Area discussed for each environmental and social aspect is based on the likely extent of Project impacts,

the surrounding receptors and other activities with the potential to interact with the Project. For more information see the Study Area section in each respective chapter of the ESIA.

3.3 Project Components

Descriptions of each of the Project components are provided below. Refer to Section 7.2 for detailed maps of each of the alignment sections with specific chainages referred to in the sections below.

3.3.1 Right of Way (ROW)

The Project Right of Way (ROW) consists of the area of expressway components/infrastructure that have been confirmed, where land will need to be cleared and purchased. This includes: the main road body (mainline) from one embankment to another, flyovers, junctions, tunnels, viaducts, accessory/connector roads, and vehicular bridges/underpasses. Other expressway infrastructure such as pedestrian crossings, service stations/rest areas and workers accommodation camps have not yet been finalised, but their establishment and management are discussed in subsequent sections and chapters (refer Chapter 8 – Vol. B).

The width of the ROW generally varies from 45-90m along the alignment and will require full clearance of all structures and vegetation within these boundaries. The ROW will include a road reserve area adjacent to the expressway. However, the width of this will vary at different chainage locations.

Along some sections, the road corridor will reach up to 90m in width (inclusive of toll gates, slip-roads, embankments etc.) and at interchanges the ROW will exceed 100m in multiple locations. From KJE Chainage 0 + 000 to KJE Chainage 2 + 500 the ROW has been reduced to 3m from the earthworks extent to reduce impacts on businesses, settlements and structures surrounding the Project ROW.

Plate 3-12: Design images of the Project (UNRA 2016c)

Plate 3-13: Project footprint of the newly constructed Kampala-Entebbe Expressway

3.3.2 Flyovers, Tunnels and Viaducts

Flyovers - A flyover is defined as where the mainline road crosses over another road or railway development at an elevated height for a substantial distance. The majority of flyovers constructed for the Project will be located at the junctions associated with the main ROW. These flyovers will allow the traffic on the mainline to cross the traffic associated with the road being intersected, without the traffic flows coming into direct contact.

Tunnels - No tunnels are planned in the current development, although they were considered during the design and planning of the Kampala-Southern Bypass.

Viaducts – Viaducts are planned to cross major wetland areas passed by the Project ROW. One viaduct is planned to cross the Namanve wetland area between chainage KJE 9 + 100 to km 10 + 640. This viaduct will elevate the road approximately 2m above the water level and utilise concrete pylons driven down into hard rock beneath the wetland sediment and soils. Another set of viaducts are planned for the KSB to cross the Nakivubo, Kasanga and Mayanja wetlands from KSB Chainages 6 + 140 to 7 + 440, 7 + 980 to 8 + 980 and 15 + 640 to 16 + 107 respectively.

Plate 3-14 shows a similar structure that has been built across a wetland area for the Kampala-Entebbe Expressway project.

Plate 3-14: Viaduct constructed over a wetland area for the Kampala-Entebbe Expressway

3.3.3 Interchanges

Fourteen interchanges are planned as part of Phase 1 of the KJE Project – nine on the KJE mainline and five on the KSB alignment. Interchanges are grade-separated road junctions that separate the traffic that continues along the main alignment from the traffic which wishes to enter and exit the expressway at the junctions. This allows the traffic on the main highway to pass directly through the junction without having to cross the traffic stream from the road that is being intersected. These junctions differ in design and connect to a varying number of existing and new roads. An example is provided in Plate 3-16. A list of interchanges planned for the KJE Phase 1 alignment is provided in Table 3-2 - split between the Kampala-Jinja Expressway Mainline and the Kampala Southern Bypass.

Plate 3-15: Design image of the Project (UNRA 2016c)

Table 3-2: Interchanges planned as part of the KJE Project (Phase 1)

Interchange / Junction	Approx. GPS (UTM) Co-ordinates	Approx. Chainage	Comments	Description
Phase 1 - Kampala-Jinja Expressway Mainline				
Nakawa Interchange (J1)	456700 E, 36170 N	KJE 0 + 520	This junction allows access from New Port Bell Rd. and Naguru Rd. from and onto the expressway.	Grade-separated, roundabout, 2 bridges
Ntinda Interchange (J2)	457480 E, 36880 N	KJE 1 + 560	Provides access to the expressway from Ntinda Rd. and provides access to Kinawataka Rd via Nakawa-Jinja Rd.	Grade-separated, single bridge
Kyambogo Interchange (J3)	458150 E, 37330 N	KJE 2 + 600	This junction provides a route from the existing Kampala-Jinja Rd onto the expressway. It also provides access to Kyambogo Rd.	Flyover
Kinawataka Interchange (J4)	459316 E, 37000 N	KJE 3 + 600	Provides access to the expressway from Kireka Rd. and Kinawataka Rd. It also provides a link to the existing Kampala-Jinja Rd.	Large radius grade-separated roundabout, 2 bridges
Butabika Interchange (J5)	461785 E, 36500 N	KJE 6 + 500 / KSB 0 + 300	This interchange will form the major link between the KJE Mainline, Kampala Northern bypass and the KSB Alignment.	Systems interchange with future Southern Bypass

Interchange / Junction	Approx. GPS (UTM) Co-ordinates	Approx. Chainage	Comments	Description
Bukasa Interchange (J6)	464254 E, 36300 N	KJE 9 + 030	This will provide access to the expressway from surrounding residential areas. It will allow access to the Namanve business park as well as the SGR station and Bukasa port which are both currently under development.	Grade-separated, roundabout, 1 bridge.
Mukono Interchange (J7)	474766 E, 36622 N	KJE 20 + 720	This junction provides access to an existing road leading to Mukono.	Trumpet interchange , 1 bridge.
Mbalala Interchange	480170 E 38281 N	KJE 23+700	This junction provides access to an existing road leading to Mbalala town	Trumpet interchange, 1 bridge.
Namagunga Interchange (J8)	485207 E, 40550 N	KJE 33 + 600	This junction provides access to the expressway from the existing Kampala-Jinja Rd. near Namagunga.	Trumpet interchange, 1 bridge.
Phase 1 – Kampala Southern Bypass				
Butabika Systems Interchange (J5)	Connects the KJE mainline to the KSB alignment.			
Port Bell Road Interchange	458995 E, 35035 N	KSB 4 + 300	This junction will link Port Bell Road and the surrounding residential areas to the expressway	at-grade roundabout and vehicular underpass on Port bell road and a grade-separated roundabout under the Expressway offset approximately 100m from Port bell Road.
Ggaba Road Interchange	456975 E, 30845 N	KSB 11 + 100	These three junctions will link Ggaba Rd, Lukuli Rd and Salama Rd. to the expressway. This will provide a radial link between the three large roads.	Grade separated roundabout, 2 bridges.
Lukuli Road Interchange	456070 E, 30390 N	KSB 12 + 200		Grade separated roundabout, 2 bridges.
Selama Road Interchange	455230 E, 29050 N	KSB 13 + 800		Grade separated roundabout, 2 bridges.
Munyonyo Interchange	456360 E, 26130 N	KSB 17 + 100	This interchange will form the major link between the KSB and the Kampala Entebbe Expressway (KEE) - (currently under construction.)	Trumpet interchange, 1 bridge.

Source: URS (2016); UNRA (2017)

The KJE mainline and KSB alignment will merge at the Butabika Interchange allowing traffic to continue along either alignment or switch to the other expressway without the two traffic streams crossing each other directly. This interchange will act solely as a way of transferring traffic between the KJE and KSB and not as a point of entry to the expressway from the external road system.

The Munyonyo trumpet interchange will allow seamless connectivity to the Kampala-Entebbe Expressway (KEE) which is currently under construction. The KEE Project already has a trumpet interchange at Kajjansi which will be similar to most of the trumpets interchanges proposed on the Kampala-Jinja Expressway as shown in Project (Plate 3-16).

Plate 3-16: New trumpet interchange constructed for the Kampala-Entebbe Expressway at Kajjansi

3.3.4 Accessory/Connector Roads

As well as the KJE mainline and KSB alignment, several accessory roads are being developed as part of the Project to allow easy access to the main KJE alignment and associated junctions. This for example includes the upgrade of small sections of the existing Kampala-Jinja road and new roads linking the KJE ROW to existing roads around Kampala. Table 3-3 outlines the major accessory/connector road structures that are being built/upgraded as part of the Project. Many of these roads are being developed in association with interchanges/junctions attached to the mainline (see Section 3.3.3).

Table 3-3: Major Accessory Roads and Upgrades planned as part of the KJE Project.

Accessory Road	Upgrade / New Road	Links to Junction/Chainage:	Further Details
Phase 1 - Kampala-Jinja Expressway Mainline			
New Port Bell Road	Upgrade	J1: Nakawa Interchange	A small section of Port Bell Road (~300m) will be upgraded as part of the Nakawa Junction.
Link to Naguru Road from KJE	Upgrade	J1: Nakawa Interchange	The road linking Naguru road to the existing Kampala-Jinja Rd. (~200m) will be upgraded as part of the Nakawa junction.
Link from Naguru Road across the KJE mainline.	New	Passes over Chainage KJE 0 + 950	A road will be constructed to link Naguru Rd. to an industrial area the other side of the expressway.
Nakawa-Jinja Road	Upgrade	J2: Ntinda Interchange	The Nakawa-Jinja Rd. will be upgraded (~420m) as part of the Ntinda junction.
Link from Nakawa-Jinja Road to the KJE	New	J2: Ntinda Interchange	A new road linking Nakawa-Jinja Road to the KJE alignment will be developed.
College Avenue to Nakawa Interchange.	Upgrade	J2: Ntinda Interchange	An ~370m section of College Rd. will be upgraded as part of the Ntinda junction.
Kyambogo Road	Upgrade	J3: Kyambogo Interchange	A small section of Kyambogo road (~200m) will be upgraded and widened as part of the Kyambogo junction.
Existing Kampala-Jinja Road	Upgrade	J3: Kyambogo Interchange / J4: Kinawataka Interchange	A 1.2km stretch of the existing Kampala-Jinja Rd. will be upgraded between Kyambogo Rd. and Nabisunsa Close as part of the proposed Kinawataka Junction
Kireka Road	Upgrade	J4: Kinawataka Interchange	A small section of Kireka Rd. will be modified as part of the Kinawataka interchange.

Accessory Road	Upgrade / New Road	Links to Junction/Chainage:	Further Details
Link from Kinawataka Junction to existing Kampala-Jinja Road	New	J4: Kinawataka Interchange	A road linking the Kinawataka interchange to the existing Kampala-Jinja Rd. at the current turn off for Nabisunsa Close will be constructed.
Link from Butabika Interchange to existing Kampala-Jinja Road and the Mandela National Stadium.	New	J5: Butabika Interchange	A road linking the Butabika Interchange to the existing Kampala-Jinja road next to the Mandela National Stadium will be constructed. This will also involve an extension of the existing junction adjacent to the national stadium. This will allow the Project to link to the Kampala-Northern bypass.
Kirinya-Bukasa Rd.	Upgrade	J6: Bukasa Interchange	A small section of the Kirinya-Bukasa Rd. will be upgraded as part of the Bukasa interchange.
Link from Mukono junction to existing road.	New	J7: Mukono Interchange	A small road (~1.2km) linking the Mukono junction to a road leading to Mukono will be developed.
Link from Nanagunga junction to existing Kampala-Jinja Road.	New	J8: Namagunga Interchange	A small road linking the Namataba Junction to the existing Kampala-Jinja Rd. will be developed.
Phase 1 – Kampala Southern Bypass			
Port Bell Road.	Upgrade	Port Bell Rd. Interchange	A small section (~450m) of Port Bell Rd. will be upgraded as part of the Port Bell Rd. interchange. New roads will also be developed as part of the junction to link the expressway to Port Bell Rd.
Salama Road	Upgrade	Salama Rd. Interchange	Small sections of Salama Rd. (~550m) will be upgraded in association with the Salama Rd. Interchange.

3.3.5 Bridges and Underpasses

Several bridges and underpasses have been designed as part of the Project. These have been designed to allow existing roads to interface with the expressway without interrupting the flow of traffic. In other locations, they have been designed as part of interchanges to allow traffic entering and exiting the expressway to access surrounding roads and both sides of the Project Footprint without disrupting traffic flow along the main expressway.

Plate 3-17: New bridge constructed at St. Andrew Kaggwa road on the Kampala-Entebbe Expressway

The locations of proposed bridges and underpasses are outlined in Table 3-4.

Table 3-4: Bridges and underpasses planned as part of the KJE Project (Phase 1)

No.	Chainage	Type of Structure	Remark
Kampala Jinja Mainline Expressway			
1	KJE Chainage 0+492.408	Vehicular Overbridge	Nakawa Roundabout 1
2	KJE Chainage 0+572.405	Vehicular Overbridge	Nakawa Roundabout 2
3	KJE Chainage 0+931.404	Vehicular Underbridge	Nakawa Market Underbridge
4	KJE Chainage 1+590.703	Vehicular Underbridge	Ntinda Underbridge
5	KJE Chainage 2+598.159	Vehicular Overbridge	Kyambogo flyover
6	KJE Chainage 3+500.470	Vehicular Underbridge	Kinawataka Roundabout 1
7	KJE Chainage 3+743.374	Vehicular Underbridge	Kinawataka Roundabout 2
8	KJE Chainage 4+819.000	Pedestrian Underpass	
9	KJE Chainage 5+306.003	Vehicular Overbridge	Lana Rd.
10	KJE Chainage 5+948.448	Vehicular Overbridge	Road to Kasokoso
11	KJE Chainage 7+070.071	Vehicular Overbridge	
12	KJE Chainage 8+584.907	Vehicular Overbridge	Kirinya-Bukasa Road
13	KJE Chainage 12+649.816	Vehicular Overbridge	Road to Namilyango
14	KJE Chainage 13+801.214	Vehicular Underpass	
15	KJE Chainage 14+539.920	Vehicular Overbridge	Namilyango-Kitale Road.
16	KJE Chainage 16+759.669	Vehicular Overbridge	
17	KJE Chainage 17+010.923	Vehicular Overbridge	
18	KJE Chainage 19+003.330	Vehicular Underpass	
19	KJE Chainage 19+639.399	Roundabout	Road to Mukono.
20	KJE Chainage 19+632.910	Vehicular Overbridge	Road to. Lufumvwe
21	KJE Chainage 20+680.000	Vehicular Underpass	Mukono Junction 1
22	KJE Chainage 20+780.000	Vehicular Underpass	Mukono Junction 2
23	KJE Chainage 22+379.797	Vehicular Overbridge	

No.	Chainage	Type of Structure	Remark
24	KJE Chainage 23+881.373	Vehicular Overbridge	
25	KJE Chainage 25+241.017	Vehicular Overbridge	
26	KJE Chainage 26+490.537	Vehicular Overbridge	
27	KJE Chainage 28+639.217	Vehicular Overbridge	
28	KJE Chainage 29+680.408	Vehicular Overbridge	
29	KJE Chainage 30+578.966	Vehicular Overbridge	
30	KJE Chainage 32+481.800	Vehicular Underpass	
31	KJE Chainage 33+296.026	Vehicular Overbridge	Namataba Junction 1
32	KJE Chainage 33+648.976	Namataba Link	Namataba Junction 2
Kampala Southern Bypass			
1	KSB Chainage 0+720	Vehicular Overbridge	Kasokoso bridge
2	KSB Chainage 1 + 900	Vehicular Overbridge	Lana Road
3	KSB Chainage 2 + 538	Vehicular Overbridge	Wabwire Road
4	KSB Chainage 3 + 189	Vehicular Overbridge	Old Butabika road
5	KSB Chainage 3 + 821	Vehicular Underpass	Kitintale Road
6	KSB Chainage 4 + 290	Vehicular Underpass	Portbell Road
7	KSB Chainage 4 + 636 / 4 + 736	Vehicular Underpass	Portbell-Ringotho
8	KSB Chainage 5 + 100	Pedestrian Underpass	Existing footpath
9	KSB Chainage 10 + 710	Pedestrian Underpass	Existing footpath
10	KSB Chainage 11 + 087 / 11 + 163	Vehicular Underpass	Ggaba Road
11	KSB Chainage 11 + 780	Pedestrian Underpass	Existing footpath
12	KSB Chainage 12 + 153 / 11+ 230	Vehicular Overbridge	Lukuli Road
13	KSB Chainage 12 + 750	Vehicular Overbridge	
14	KSB Chainage 13 + 152	Vehicular Overbridge	Lukyamuzi Road
15	KSB Chainage 13 + 773 / 13 + 850	Vehicular Underpass	Salama Road
16	KSB Chainage 14 + 340	Vehicular Overbridge	Kyamula

No.	Chainage	Type of Structure	Remark
17	KSB Chainage 14 + 900	Vehicular Overbridge	Kyamula-Salama
18	KSB Chainage 15 + 252	Vehicular Overbridge	Lwasa
19	KSB Chainage 17 + 133	Vehicular Overbridge	Munyunyo interchange

3.3.6 Pedestrian Crossings

Dedicated pedestrian crossings are also being planned to allow pedestrian access from one side of the ROW to another (see Table 3-4). Pedestrians will also have the option to use 2m walkways located on the overpasses and underpasses. The main expressway will however be completely cut-off from pedestrian access with barriers and fencing to enable increased traffic flow and to protect the health and safety of community members.

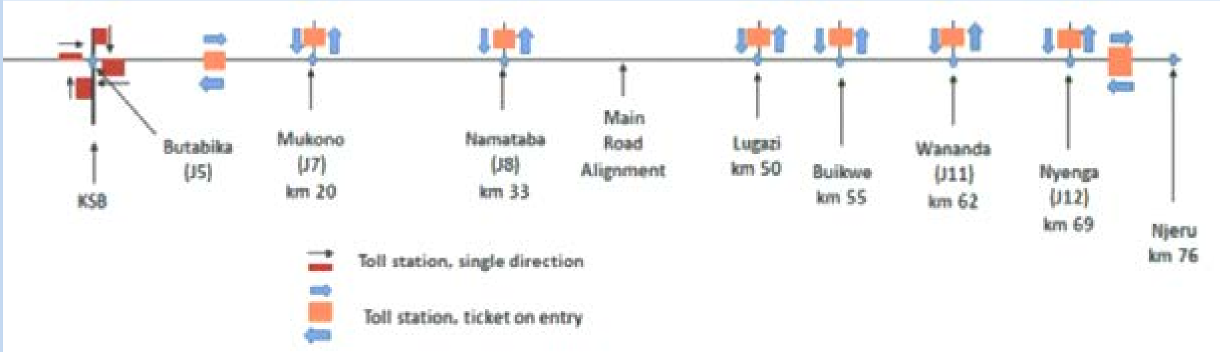
The locations of most of these pedestrian crossings have not been finalised. Consequently, recommendations are made in this ESIA documentation suggesting locations for extra pedestrian access routes.

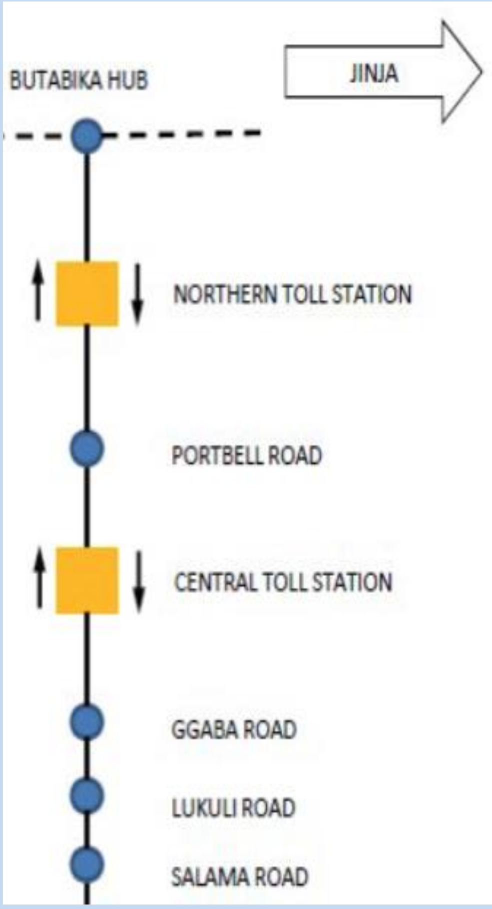
3.3.7 Toll Gates and Traffic Usage

The Kampala-Jinja Expressway will be a limited access tolled expressway. This will involve the development of tolling infrastructure at multiple locations along the length of the line. Where this infrastructure is developed, it may lead to widening of the roads at tolling locations. Specific details about the type of toll infrastructure and the locations of tolling booths are outlined in Box 1.

The majority of the KJE road will consist of an expressway which will have restricted access to certain types of traffic. However, the main road alignment between the start point (KJE 0 + 000) and Butabika junction will not be tolled and will be part of the all-purpose road network in Kampala.

Box 1: Planned Toll Gate Locations along the KJE Mainline and KSB Alignment





For the mainline running from Kampala to Jinja the current design anticipates 62 toll booths with stations at all junctions east of J5: Butabika interchange (J6 - Bukasa interchange, J7 - Mukono interchange, J8 - Namataba/Namagunga interchange). There will also be several tolling booths located at the Butabika interchange where the KSB and KJE mainline meet (see diagram above). To the west of Butabika interchange the road will be free to use and part of the all access road network.

The KJE mainline alignment is proposed to utilise a closed toll collection system, however a current study on type of tolling system to adopt is still on-going. For a driver to use the expressway, a toll must be paid on entry or exit depending on the exact system deployed. It is thought that toll points will be a combination of manual and electronic tolls.

The KSB alignment is proposed to utilise an open toll system. It is thought that the KSB will be used by mainly local traffic that will travel through only one or two junctions along the road. It is thought that due to these short trips and the few toll plazas proposed, a closed system would be more complicated and difficult to manage on this road. The current design proposes that 36 toll booths are installed at three locations along the road – a northern toll station, a central toll station and a southern toll station (see diagram to the left).

3.3.8 Drainage Design

A detailed design of drainage infrastructure has been developed for the alignment. This includes drainage ditches, culverts, channels and grates. The majority of this infrastructure is expected to fall within the Project ROW. Detailed designs are outlined in *ICS (2015) Kampala – Jinja Road Capacity Improvement Study Drawings Book 3 – Drainage & Fencing*. However, recent alignment changes have been made along some of the alignment. As a consequence drainage designs need to be updated in these locations.

Any drainage channels outside the ROW will need to undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of NEMA and in accordance with international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible.

3.3.9 Gantries, Fencing, Signage and Lighting

Gantries and signs will be constructed along the ROW to provide directions, information and guidance to expressway users. Signs are also beneficial to highway authorities who depend on them for traffic control, enhancing road safety and to enforce traffic laws/regulations. Signs will be located along the entire length of the ROW but may be particularly concentrated in areas approaching junctions and/or toll gates. The signs will include information on speed limits, lane usage, junctions, slip roads, turns in the road etc. Detailed information on traffic signs and road markings is provided in ICS (2015) Engineering Report Volume 2E Traffic Signs and Road Markings.

Fencing will be provided along the entire mainline alignment preventing access to the expressway for vehicles and pedestrians.

Lighting will be provided along the entire Project Footprint mainly through the installation of lampposts at the side of the road. The exact nature of the lighting (e.g. solar/mains electricity) will be finalised by the construction contractors.

Plate 3-18: Signs for the KJE Project. Left: all-access road; Right: motorway/expressway section. Source: ICS (2015)

3.3.10 Service Stations / Rest Areas

Service stations / rest areas will be developed in association with the KJE Project. These will require the acquisition of additional land for the Project which can then be utilised by private enterprises. As the locations of these service stations are not confirmed and not part of the main Project alignment, they are not considered as part of this ESIA. However, since this infrastructure development is closely associated with the KJE Project, the infrastructure will need to undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of UNRA before submission to NEMA for approval in accordance with national and international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible. Service stations will be required to adhere to IFC's EHS Guidelines for Retail Petroleum Networks (2007).

A rest area location is proposed is at KJE Chainage 27 + 000 (Figure 3-13). The land for this rest area is included in the current Project Footprint assessed in this ESIA.

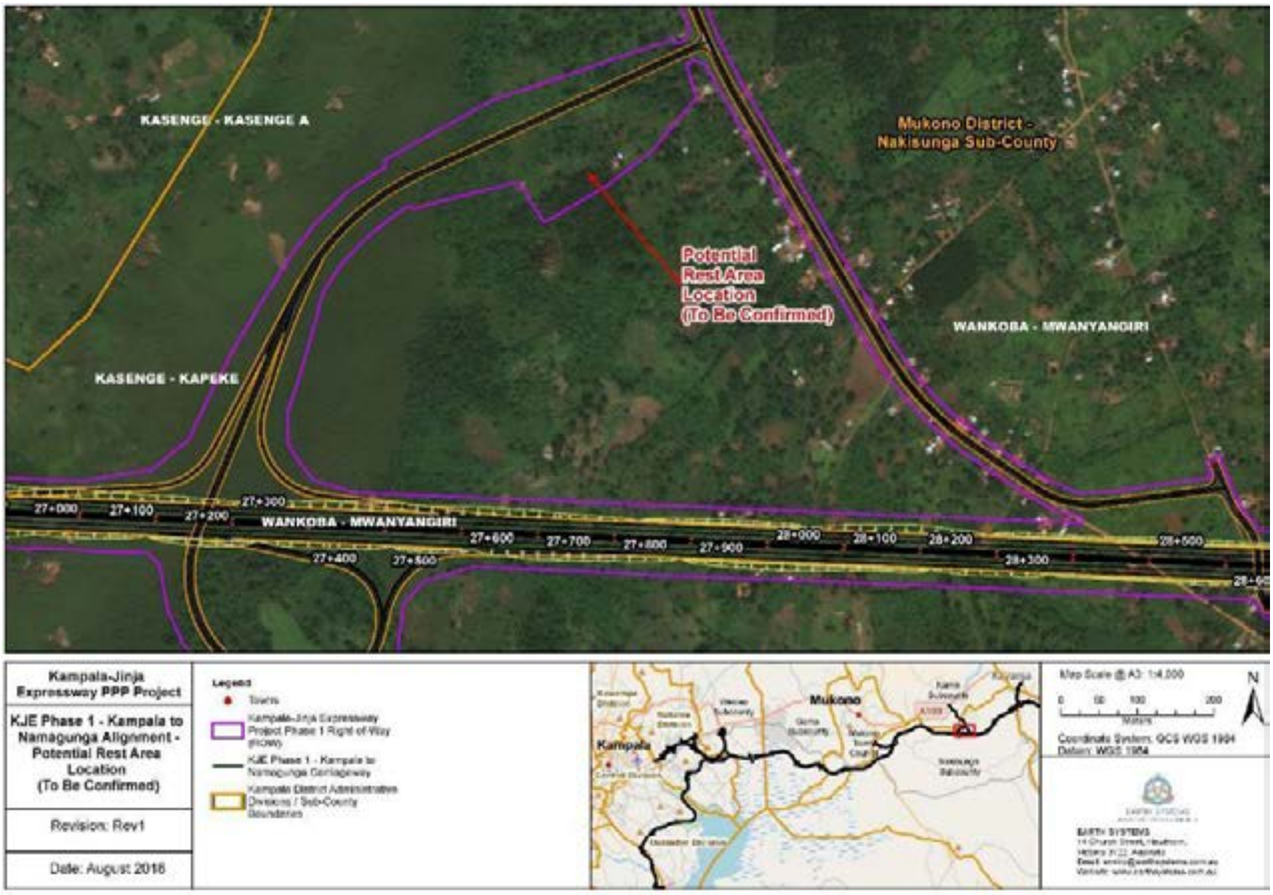


Figure 3-13: Proposed location of rest area at KJE Chainage 27 + 000

3.3.11 Construction Infrastructure

All construction infrastructure that forms part of the Project will be developed and implemented in accordance with the *IFC General Environmental Health and Safety (EHS) Guidelines* (2007). The IFC *Environmental Health and Safety Guidelines for Construction Materials Extraction* (2007) will also be applied to the quarries and borrow pits. Additional measures to avoid and minimise impacts of these components are also discussed throughout the ESIA and ESMMP.

3.3.11.1 Plant Equipment Storage and Accommodation Camps

Sites will be required for the accommodation of workers and storage of plant equipment during the Construction Phase. Accommodation camps will include housing areas, catering areas and waste disposal facilities. The locations of these sites have not been finalised. The plant equipment and accommodation camp sites will need to undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of NEMA and in accordance with international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible.

It is expected that plant equipment storage areas will also be used for storage of other construction materials, including raw materials, chemicals and cement. Measures regarding the transport, storage and handling of hazardous materials are discussed in the ESMMP (Volume D). Storage locations for hazardous materials and technical plant equipment such as the cement plant and asphalt plant will be carefully selected in consultation with NEMA.

As there is generally fuel available in existing service stations close to work areas, limited fuel storage will be required for the Project. However some fuel may be stored in appropriately bunded tanks or containers at the areas used to store plant equipment.

Appropriate security measures will be applied to the equipment storages areas and accommodation camps where required (e.g. fencing, restrictions on access).

3.3.11.2 Quarries and Borrow Pits

Several quarries and borrow pits will be required to obtain the materials necessary for the construction of the Project. These will be spread out at locations within and surrounding the entire length of the Project ROW. The potential locations of these sites and the type of material that could be extracted are shown in Table 3-5 and Figure 3-14. The actual sites used will depend on the cost and availability of materials from the sites at the time of construction. Existing sites that meet national legislative requirements and standards will be preferentially used where practicable. As per the plant equipment and accommodation camp sites discussed above, any new quarries and borrow pits established for the Project will need to undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of UNRA before submission to NEMA for approval in accordance with national and international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible.

Table 3-5: Potential construction material sites for the KJE Project (Phase 1 & 2)

Site Number	Type of Material	Chainage	GPS - E	GPS – N
Phase 1 & 2 – Kampala-Jinja Mainline				
KJE B1	Borrow Material	13+900, LHS and RHS	468859	35697
KJE B2		20+000, LHS and RHS	473580	37300
KJE B3		26+048, LHS and RHS	479293	39104
KJE B4		29+837, LHS and RHS	481935	41483
KJE B5		44+900, LHS and RHS	495244	44523
KJE B6		49+360, LHS and RHS	499052	43456
KJE B7		54+860, LHS and RHS	503245	40681
KJE B8		60+335, LHS and RHS	507936	42827
KJE B9		66+9850, LHS and RHS	514108	42562
KJE B10		72+835, LHS and RHS	518398	45982
KJE CR1	Hard Core Rock Fill	6+300, LHS	451198	37191
KJE CR2		15+640, RHS	470438	34127
KJE CR3		16+140, RHS	471293	35214
KJE CR4		17+000, LHS	472032	35913

Site Number	Type of Material	Chainage	GPS - E	GPS – N
KJE CR5		17+500, LHS	472156	36057
KJE CR6		27+170 LHS	479723	39740
KJE CR7		36+900, LHS,	485655	44977
KJE NG1	Natural Gravel	3+340, LHS,	459955	37171
KJE NG2		9+840, LHS,	464297	34851
KJE NG3		17+500, LHS,	472156	36057
KJE NG4		27+170, LHS,	479723	39740
KJE NG5		36+900, LHS,	485660	44874
KJE NG6		40+500, RHS,	492707	43204
KJE NG7		42+800, LHS,	492661	44650
KJE NG8		53+000, LHS,	502085	41959
KJE NG9		54+100, LHS,	502518	41427
KJE NG10		62+000, RHS,	509606	40942
KJE NG11		70+500, RHS	516351	42955
KJE NG12		72+335, LHS,	517230	46741
KJE QR1	Aggregate Rocks	6+300, RHS	457884	32030
KJE QR2		21+700, RHS,	479511	36057
KJE QR3		28+660, RHS	481058	39321
KJE QR4		76+000, LHS	518061	49192
KJE S1	Sand	10+100, LHS,	465635	35961
KJE S2		19+300, RHS,	478588	17803
KJE S3		62+200, RHS,	506310	26736
Phase 1 – Kampala Southern Bypass				
KSB NG1	Natural Gravel / Borrow Material	0 + 000, LHS,	No co-ordinates given	
KSB NG2		1 + 000, RHS	No co-ordinates given	
KSB NG3		6 + 500, LHS (300m)	No co-ordinates given	

Site Number	Type of Material	Chainage	GPS - E	GPS – N
KSB NG4		6 + 500, LHS (500m)	No co-ordinates given	
KSB NG5		17 + 500, RHS	No co-ordinates given	
KSB S1	Sand	0 + 000, LHS (46km)	478588	17803
KSB S2		1 + 000, LHS (5.2km)	465635	35961
KSB QR1	Aggregate Rocks	8 + 000, RHS (600m)	458071	31987

Table modified from ICS (2015, 2016) and URS (2014)

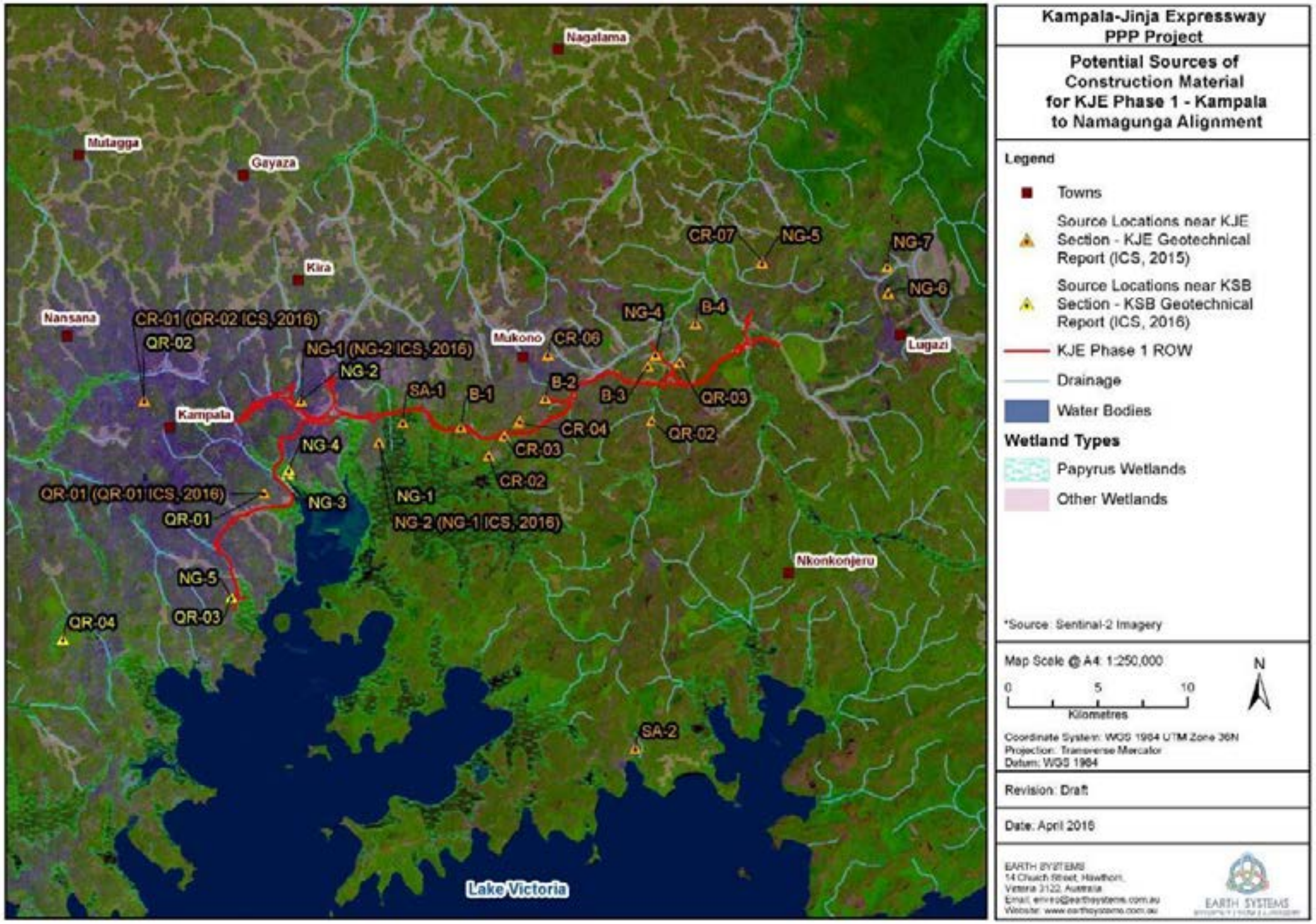


Figure 3-14**: Potential construction material sites for the Project (Site locations source: ICS 2015, 2016)**

3.3.11.3 Access roads/bridges

The construction of the Project will require the creation of access routes for transportation vehicles and machinery to access the Project Area. The locations of these access routes are not currently defined. However, general impacts associated with their development and required mitigation measures are discussed in the respective ESIA reports.

In some areas, the construction of bridges and viaducts may require the construction of temporary bridges and structures to facilitate the construction process. For example, during the construction of the viaduct over Namanve wetland, it is likely that a temporary bridge will need to be constructed to allow construction machinery to access the wetland area.

3.3.11.4 Material stockpile areas

During the construction process, it is likely that materials will be temporarily stockpiled in locations close to the main construction sites. This will include stockpiles of soil, sand, rocks and gravel. Although the locations of these material stockpiles are not currently known, general impacts associated with their development are discussed in this ESIA report and relevant monitoring and management measures outlined in the ESMMP.

3.3.11.5 Water supplies

The Project has not yet applied to establish boreholes in the Project Area. Consequently, water supplies for construction processes are currently planned to be drawn from surface water resources e.g. rivers, swamps among others. Nonetheless abstraction of surface and ground water will be subjected to permission from Directorate of Water Resources Management. Potential water supply sites for Phase 1 of the KJE Project are outlined in Table 3-6.

Table 3-6: Potential water supply sites identified for use as part of the KJE Project (Phase 1)

Water Source	Chainage	GPS Coordinates (E)	GPS Coordinates (N)
Kampala Jinja Mainline Expressway			
Kinawataka River	KJE 3 + 240, RHS	459302	37046
Kasokoso River	KJE 5 + 840, RHS	461330	36248
Mola River	KJE 21 + 600	474242	37880
Sezibwa River	KJE 32 + 100, 300m LHS	483171	42985
Kampala Southern Bypass			
Kinawataka wetland	KSB 0+900, RHS	461330,	36248
Bugolobi	KSB 11+660, LHS 100m	456680,	30750
Near end of KSB road	KSB 16+000	456079,	27416

Source: ICS (2015); URS (2014)

3.3.11.6 Asphalt plant

A temporary asphalt plant will be developed as part of the Project. The location of this plant is yet to be confirmed. The asphalt plant will likely contain a crushing plant, batching plant and associated machinery, as well as vehicles

for the transport of materials around the site. The site will also provide an area for aggregate materials (e.g. gravel, sand, bitumen) to be stockpiled, warehouses, as well as waste disposal facilities.

It is recommended the manufacture, storage and use of bitumen is conducted in accordance with the Bitumen Safety Code (Energy Institute, 2005). Bitumen is to be stored in tanks specifically designed for the purpose.

As there is generally fuel available in existing service stations close to work areas, limited fuel storage will be required for the Project. However some fuel may be stored in appropriately bunded tanks at the asphalt plant for refuelling Project vehicles and equipment.

The asphalt plant site will need to undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of NEMA and in accordance with international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible. Appropriate security measures will be applied to the plant (e.g. fencing, restrictions on access).

Plate 3-19: Example of infrastructure at the asphalt plant built for the Kampala-Entebbe Expressway Project

Plate 3-20: Example of stockpile of gravel materials at the asphalt plant built for the Kampala-Entebbe Expressway Project

3.4 Public-Private Partnership Funding Scheme

The Project is to be funded through a Public-Private Partnership (PPP) scheme - the first such scheme to exist in Uganda. Under this scheme a private contractor will be brought in to build, finance and operate the Project which they will run for 30 years following the Project's construction. The private contractor will earn back the initial costs of construction through the road tolling scheme proposed as part of the expressway. This system is expected to have several advantages including the optimisation and minimisation of construction costs.

At the end of the 30 year PPP scheme period, the ownership of the Project will revert back to UNRA to provide ongoing maintenance of the road. It is expected that the handover process will be overseen by UNRA and the Project financiers. Environmental audits would be conducted to ensure that appropriate environmental management is maintained following the handover.

3.5 Project Phases

The implementation of the Project is split into several phases which are described in more detail below. These phases are the:

- Pre-Construction phase;
- Construction phase; and

- Operations phase.

The 'Decommissioning Phase' is not covered by the ESIA as the overall Project is not expected to be decommissioned.

3.5.1 Pre-Construction Phase

3.5.1.1 Activities

Design and Feasibility Studies

A detailed Project design has been developed from a combination of desk-based research and on the ground feasibility studies. A finalised design has now been produced by UNRA because of these studies which take into account engineering, economic, environmental and social considerations. Studies conducted included: traffic modelling, geotechnical reports, detailed design drawings, environmental surveys, topographical surveys and hydrology and drainage studies. This ESIA documentation is produced as part of these studies during the Pre-Construction phase.

Construction material investigations

Material investigations involve field visits and collection of intended construction material samples for laboratory tests. During the investigations, sub-grade soils, base material and sub-base materials under the Existing Road as well as along the two alternative new alignments are tested.

The investigations also involve identification and collection of material samples from laterite gravel borrow pits and quarry sites, excavation and collection of materials from test pits along the three road alignments, collection and testing of materials in swamps, among other activities.

In the investigations of construction materials and their sources, the primary project objective was to aid the implementation of technically and financially feasible and cost-effective measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on areas that are considered core business activities.

Such measures were tasked with integrating the principles of cleaner production into product design and production processes with the objective of conserving raw materials, energy, and water. This has been done and was the basis of selecting potential source areas for the construction materials.

Inventory of Loss

An Inventory of Loss (IOL) has been conducted documenting all land, assets, crops and people affected by the Project's development. This included a full census of people affected by the Project. The Inventory of Loss for Phase 1 of the Project is outlined in more detail in the *Resettlement and Livelihood Restoration Plan (RLRP,* Volume D*)*. The IOL informed the calculation of compensation and resettlement costs required for the Project in line with the conditions set under IFC Performance Standard 5.

Traffic and other data collection

This activity involves collection of all traffic data, patterns, loads and movements on the existing road(s) that would directly impact on the traffic along the proposed road. It also includes cross sectional traffic count (CSC), junction counts (TJC), origin - destination studies (O&D) and axle load surveys.

Resettlement Action Plan

This Project will displace a sizeable number of people meaning that the development of a full Resettlement Action Plan is mandatory under national law and international guidelines. A *Resettlement and Livelihood Restoration Plan (RLRP,* Volume D*)* has been prepared outlining procedures and methodologies to follow to ensure the Project meets requirements set by the IFC Performance standards and AfDB Operational Safeguards. The plan outlines the necessary resettlement and compensation measures, the size of the affected population, implementation timetable, consultations conducted and stakeholder opinions, and an estimate of the expected financial costs for resettlement and compensation.

Land acquisition

The land to be acquired includes all land within the ROW. This will include land required for the widening of the existing road between Lugogo and Kyambogo junction and the land required for the new ROW development represented by the rest of the Project. The amount of land acquisition will vary depending on location along the ROW. For example, at interchanges much larger areas of land will have to be acquired. Additional land will be required to accommodate borrow areas, quarry and blasting sites, access roads and storage sites.

This activity can only be conducted once the IOL work and relevant resettlement activities have been completed.

Resettlement

Where resettlement has been deemed necessary, the Project will assist the displaced persons throughout the resettlement process ensuring that there is no loss of livelihood as a result of the Project in accordance with IFC Performance Standards and AFDB Operational Safeguards. Resettlement measures are outlined in more detail in the RLRP (see Volume D).

Recruitment of labour force

Before the start of the Construction phase, the contractors and workforce will need to be recruited to carry out the construction works. At the peak of the works it is expected that up to 1500 people will be employed by the Project. Staffing for the Construction phase is outlined in Section 4.5.2.1.

Project employment will be consistent with UNRA employment policies and relevant international standards including:

- IFC Performance Standard 2: Labour and working conditions; and
- AfDB Operational Safeguard 5: Labour conditions, health and safety.

3.5.2 Construction Phase

3.5.2.1 Activities

Land clearance

Once construction of the Project has begun, the land that has been acquired will need clearing of all trees, bushes, structures and other obstacles in the path of the ROW. All material that is cleared will have to be disposed of in approved disposal areas or within the ROW itself. Impacted people/communities may be given the chance to salvage any materials generated as a result of this process.

Topsoil removal

Top soil will be removed within the Project Footprint. This activity will involve the excavation and transportation of top soils (and other materials not suitable for construction) away from the main footprint. This material will be stockpiled and utilised for revegetating the embankments and slopes created by the Project.

Quarry operations

The operations of quarries and borrow pits in the Construction phase will require the excavation of material, the use of heavy machinery and if necessary, the use of explosives to extract the rock material. The sites will also provide facilities for the crushing of rocks and the sorting/piling of crushed aggregates.

Further details regarding environmental and social assessment requirements for quarries are provided in Section 3.3.11.

Blasting operations

At some locations along the ROW, rock blasting may be required to allow the creation of the desired road level and surface. This will require the use of drilling and explosives to blast the rock as well as heavy machinery to remove the rock from the site after the blasting process. Appropriate safety measures will be implemented for blasting activities. Explosives are to be transported, stored, handled and used in accordance with the requirements of the national Explosives Act, Cap. 298.

Staff mobilisation

At the peak of the construction works, it is thought that up to 1500 people will be employed by the Project during construction and up to 250 during the Operations Phase (UNRA, 2017). These staff will need to be mobilised and managed as appropriate for the specific construction works taking place over the duration of the Construction Phase. This will also require the development of accommodation camps to house the construction workers near to the construction sites. The camps will need to be equipped with adequate power supply, catering and sanitation facilities to provide construction workers with satisfactory living standards whilst housed at the accommodation camps.

Plant set-up

During the construction phase, all facilities and plants associated with the Project will require preparation and/or construction. This will include the setup of asphalt plants, accommodation camps and material and equipment storage areas.

Construction of access roads

For quarries, borrow areas and construction camps not served by existing road infrastructure, temporary access roads may have to be constructed to allow access to these sites for Project staff and machinery. Access roads may also need to be developed at more remote locations along the ROW, or in wetland areas currently inaccessible to construction machinery. It is likely that the Project ROW itself will be used for access wherever possible.

Drainage works

Drainage works will be undertaken as part of the Project and will be a vital component of road design and construction. This will include the construction of bridges, viaducts, culverts, catch water drains, kerb drains, mitre drains and cut-off drains as well as the excavation of soil and rock materials required for their construction.

General earthworks

The general earth works required for the Project will include:

- Clearing of vegetation and stripping of topsoil over the corridors where the carriageway(s) will be accommodated, over the borrow/quarry areas to be used for acquisition of construction materials and over areas that may be used for construction of workshops and workers camps;
- Excavating the road formation in cuts and then using the material if suitable to form the compacted embankments layers;
- Excavating spoil material that is unsuitable to form the road bed and replacing it with suitable materials from cuts or borrow areas;
- Filling of low areas and flat plains such as swamp beds;
- Excavating side drains, catch water drains, offshoots, outfall drains and foundations of other drainage structures; and
- Scarifying and compacting the existing material if suitable to form the sub-grade in cuts or laying and compacting selected sub-grade materials.

Borrow pit operations

Borrow material is used where the amount of material obtained from cuts cannot cover sections of fills, and low-lying areas such as swamps. Consequently, many of the borrow pits have been identified during the Project design and will be confirmed during construction.

Borrow pit operations include clearance of vegetation and stripping of topsoil at the identified sites, excavation of materials from borrow pits, and stock-piling of materials, among other activities. It's anticipated that there will also be routine monitoring and sampling of the excavated materials by government archaeologists to determine the presence of any archaeological artefacts worthy of conservation or studying. Further details regarding environmental and social assessment requirements for borrow pits are provided in Section 3.3.11.

Surfacing

This involves laying of an Asphaltic Concrete (AC) wearing course or surface dressing of both the carriageway and the shoulders. Prior to application of the AC surfacing, a bituminous binder course may be required on top of the primed base layer. The application of a binder course and an AC surfacing involves spraying a thin film of tar coat followed by the laying of a hot mixture of aggregates, filler, and bituminous binder prepared at predetermined proportions mostly in a stationary plant.

Ancillary works

After the majority of construction is complete, ancillary works will still be required. These other activities may include the laying of road markings, placing of road signs, installation of fencing and guardrails, installations of street lights and electrical works etc.

Restoration of disturbed sites

After the bulk of the construction process is complete, it will be necessary to restore some sites that have been degraded during the construction process. This may include revegetation work along embankments, removal of waste rock and other building materials and the removal of excess sediment from watercourses, wetlands and drains.

Waste management

Extensive amounts of construction waste will be produced during the construction process. This will include large amounts of filling material, borrow material, sand, packaging and hazardous materials. The waste will need to be adequately disposed of in accordance with the ESMMP and will be addressed within contractors' erosion and sedimentation control specifications.

3.5.2.2 Construction Materials

The construction of the Project will require the use of large amounts of construction materials including crushed rock, bituminous materials, cement, water, sand, fencing and signposts. An estimate of equipment and material costs for both Phase 1 and 2 of the KJE mainline has been developed (ICS, 2015) and is provided in Table 4-8 (this does not include the material required for the KSB).

Table 3-7: Approximate Equipment and Material Requirements for Phase 1 and 2 of the KJE Mainline.

Material type	Amount	Source	
Materials			
Lateritic material	1.014 million cubic metres	Identified borrow pits	Approximate quantities only
Quartzitic and granolithic crushed stones	740,000 cubic metres	Identified quarries	
Bituminous materials	408,500 cubic metres	Imported bituminous materials	
Cement	144,000 metric tonnes	Imported and locally (Tororo) produced	
Water	Greater than 360 million litres	Swamps, wetlands, rivers.	
Equipment			
Dozers	5	Contractor	Approximate quantities based on similar scope of works.
Graders	8	Contractor	
Pavers	3	Contractor	
Heavy Compaction Equipment	6	Contractor	
Loading buckets (wheel and track loaders, etc)	5	Contractor	
Excavators (back hoes, back actors, etc)	5	Contractor	
Dump trucks	20	Contractor	
Water and fuel tankers	6	Contractor	

Table modified from: ICS (2015) Kampala-Jinja Expressway ESIA.

3.5.3 Operations Phase

3.5.3.1 Activities

Construction Decommissioning

Since the Project will result in core infrastructure that is maintained indefinitely, a detailed ESIA on decommissioning to IFC EHS guidelines is not necessary. However, after the completion of the Construction phase, decommissioning of several ancillary Project components will be required including the rehabilitation of borrow

pits, quarries, temporary access roads and the deconstruction of asphalt plants and accommodation camps. Degraded land areas resulting from construction works will be rehabilitated and revegetated where required to ensure stable landforms.

Activities such as the restoration of degraded areas and waste management during construction decommissioning are to be addressed in the contractors' Environmental and Social (E&S) specifications.

Road Operation and Maintenance

During the operations phase, substantial levels of operations and maintenance work will be required to enable the continued functioning of the road and toll system. This work may include, but will not be limited to:

- Pothole patching;
- Cleaning of drainage facilities;
- Repairs of broken road items;
- Resurfacing;
- Revegetation activities;
- Maintenance of street lights and signs;
- Installation of additional signs;
- Collection of toll charges and repairs to the tolling system where required; and
- Response to road accidents in collaboration with the emergency services.

Enforcement of Traffic Rules

The operations phase will also require the enforcement of local traffic laws on the expressway including:

- Enforcement of speed limits;
- Enforcement of pedestrian access; and
- Enforcement of cleared areas surrounding the ROW.

Waste management

Waste management activities will be required to continue into the operations phase of the Project, although the amount of waste produced is likely to substantially reduce. This will include the management of domestic wastes, hydrocarbon spills and waste produced during any repair or upgrade works.

Staffing

It is estimated that 250 staff will be employed during the operations phase (UNRA, 2017). These staff will be required for road maintenance activities as well as manning the toll booths. Other staff may be required for management and logistics associated with the operation of the Project.

As per the Construction Phase, Project employment during Operations will be consistent with UNRA employment policies and relevant international standards including IFC Performance Standard 2 and AfDB Operational Safeguard 5.

Environmental and Social Monitoring

Ongoing environmental and social monitoring will be required throughout the life of the Project. For example, this may include regular inspections of drainage infrastructure, erosion levels and responding to community grievance issues. The approach to environmental and social management is summarised in Chapter 22 and recommended monitoring measures are outlined in the *Environmental and Social Management and Monitoring Plan* provided as part of this ESIA (refer to Volume D).

3.5.4 Decommissioning

The 'Decommissioning Phase' is not covered by the ESIA as the overall Project is not expected to be decommissioned. As per Section 3.5.3.1, 'construction decommissioning' will occur as part of the Operations phase.

3.5.5 Project Schedule

The length of the construction phase is expected to be 5 years. An indicative project schedule up to financial close is provided below (UNRA, 2017):

Table 3-8: Project Schedule

Milestone:	Indicative date(s):
Issue of Request for Prequalification	June 17
Return of RFQ documentation	August 17
Issue of RFP and bid documents	September 17
Dialogue and bid preparation	December 17 – May 18
Final bid submission	June 18
MoFPED Confirmation of VfM and cabinet approval	September 18
Announcement of preferred bidder	November 18
Signing of concession agreement with the GoU	March 19
Financial close achieved by:	September 19

Source: UNRA (2017).

KJE PPP Project Phase 1 ESIA

CHAPTER 4 Project Alternatives

4. PROJECT ALTERNATIVES

4.1 Overview

A detailed analysis of Project alternative alignments considered during the Project design and pre-construction phase are provided in *UNRA (2017) Design, Build, Finance, Operate and Transfer of The Kampala-Jinja Expressway PPP Project (KJE) Draft Final Feasibility Study Report.*

As outlined in the feasibility study, an analysis of Project alternatives is required to ensure that the road meets UNRA's objectives and complies with Ugandan legislation and international guidelines. UNRA require the analysis of alternatives to be conducted to assess the suitability of each alignment in meeting the following stated objectives (UNRA, 2017):

- To improve the capacity of the northern corridor to cope with any planned or unplanned incidents;
- To improve the national road network and its performance;
- Improve safety conditions of the national road network (e.g. elimination of black spots);
- To support economic growth in the country;
- To minimise any adverse effects on the environment;
- To ensure where possible that any proposals are acceptable in principle to key stakeholders; and
- To achieve value for money.

An analysis of alternatives is also required under AFDB and IFC Guidelines. Under the AFDB OS1 an environmental and social impact assessment's scope includes "*the Project's Area of Influence, a comprehensive scoping of the project's components, consideration of alternatives, and assessment of cumulative impacts where relevant*" (AFDB, 2013). IFC Performance Standard 1 also outlines similar criteria stating that "*for greenfield developments or large expansions with specifically identified physical elements, aspects, and facilities that are likely to generate potential significant environmental or social impacts, the client will conduct a comprehensive Environmental and Social Impact Assessment, including an examination of alternatives, where appropriate*" (IFC, 2012).

At the early stages of both the KJE and KSB alignment design, several alternatives were outlined for both of the road alignments. These alternatives were assessed in detail with regard to their economic, environmental and social feasibility and changes made to the alignment to avoid unnecessary costs. In keeping with national and international guidelines, an assessment of alternatives is summarised below.

Although this ESIA document covers Phase 1 of the KJE Project, at the time of the original feasibility studies the Kampala – Jinja mainline expressway was considered as one project and the Kampala-Southern Bypass considered as a completely separate entity. For this reason, the assessment of alternatives is separated into the two road alignments. Phase 2 is also discussed in this Chapter as recent changes to the alignment in Phase 2 of the KJE Project have had knock on effects to the alignment for Phase 1.

4.2 Kampala – Jinja Mainline Expressway

4.2.1 Business as Usual vs Road Development

A 'Business as Usual' option was considered during the inception of the Project. This would involve leaving the existing Kampala-Jinja highway as it is currently – continuing to conduct maintenance activities routinely to ensure the road functions as smoothly as possible. However, with the current system, traffic levels are very high

along much of the Kampala-Jinja road's length. Heavy congestion occurs throughout Kampala on a daily basis as well as traffic jams near Mukono and Seeta. During peak traffic hours, the road's capacity is already exceeded. Under this option, there would be no investment in road capacity improvements between Kampala and Jinja (UNRA, 2017).

Traffic levels are expected to continue increasing in the future and it is likely that under this scenario congestion levels along the alignment will get worse. Traffic has been growing at approximately 3.6% annually and already up to 70,000 vehicles a day use the stretch of road between Kampala and Mukono (UNRA, 2017). The increased use of the road has also been accompanied by development of roadside settlements and commerce and increased use of this major transport link by pedestrians and slow moving vehicles, the latter of which has become a hazard to personnel and community health and safety.

The 'business as usual' approach would likely lead to increased congestion levels between the two major cities and therefore increased transportation costs and less efficient journey times, which will be detrimental to economic growth in Uganda. It is likely that if traffic levels continue to increase the current road will be completely unusable by 2027 (UNRA, 2017).

From an environmental and social perspective the increased use of this small road will lead to increased urban air pollution, noise pollution and present a severe risk to community health and safety. It has therefore been realised that something must be done but it was also recognised that new infrastructure developments can have large economic, social and environmental consequences. An analysis of alternative project designs for an improved road link between Kampala and Jinja is provided below.

4.2.2 Alignment Options

4.2.2.1 Identification of future need

An analysis of future traffic levels conducted by UNRA (2017) on the Kampala-Jinja Mainline Expressway looked at specific areas of the line and compared 2010 traffic levels to those likely to occur in 2035. They identified that traffic levels along most of the alignment would more than double in some sections, and in some cases triple – particularly along areas of the line that are currently less accessible. Highest traffic levels are thought to occur in the city centre, so the minimum number of lanes required at the start of the line was four lanes of traffic in each direction, reducing to three after the Spear Motors showroom/service centre in Nakawa and to two after Seeta. This highlights the need for a new road development and limits the road designs that can be considered in the alternatives analysis (UNRA, 2017).

4.2.2.2 Corridor Selection

As outlined in the feasibility study (UNRA, 2017), the initial assessment of suitable corridor options for the Project was undertaken between September and December 2010. Following the identification of the corridors, stakeholder consultation was conducted to discuss the different alignment options. These consultations highlighted the high level of urban encroachment, high number of businesses and privately owned housing in the verges of the existing Kampala-Jinja road. This led the consultants to conclude that:

"*the major road widening which would be necessary for the anticipated heavy flows of traffic which will utilize the road in the years to come, particularly, but far from exclusively, within the Greater Kampala Metropolitan area, would result in major impact on such installations, and the consequent cost of compensation/ relocation would be prodigious. This realization greatly increased the impetus to find realistic alternative alignment corridors which would entail such impacts to a very much lesser extent. In all, and with the minimizing of such impacts as a prime consideration, five alternative corridor options were developed*" (UNRA, 2017).

Five options were developed for consideration for the KJE Mainline Project alignment. All new alignments shared a stretch of the alignment for approximately 5.7km from the start of the KJE mainline at Lugogo to the proposed Butabika interchange. Option 1 involved the complete upgrade of the existing road whereas Options 2,3,4 and 5 are new alignments and would require development to be undertaken in greenfield areas. These alignments are displayed in Figure 4-1 and listed below.

- **Option 1**: Upgrading of the Existing Road;
- **Option 2**: New Northern Corridor;
- **Option 3:** New Southern Corridor (Southern Variant);
- **Option 4**: New Southern Corridor (Northern variant); and
- **Option 5**: Bypasses and Existing Road Upgrade.

A brief outline of each of these Options and key environmental and social considerations are provided in Table 4-1.

Table 4-1: Description of the initial five alignment options for the Kampala-Jinja Mainline (Modified from UNRA, 2017).

Option	Description	Key Environmental and Social Considerations:	Other factors:
Option 1: Upgrading of the Existing Road	The existing road between Kampala and Jinja is approximately 75km long and is a Class 1 asphalt concrete road (UNRA, 2017). The road has a width of approximately 7m for most of its length. The road passes directly through urban areas between Kampala and Jinja, which are now characterised by heavy traffic, high levels of pedestrians crossing the road and urbanisation at the sides of the road. The shoulder of the road is also used in these locations for the parking of vehicles.	The existing road is flanked by areas of settlement and businesses for most of the first 9km which also coincide with the heaviest areas of traffic. Roadside areas have also become urbanised in the surrounding towns of Seeta and Mukono. Widening the road in these locations would have large social impacts including extensive loss of land, residential and commercial assets and income. Several schools and sites of cultural significance (such as churches) are present along the existing road. These would also be affected by the widening of the road. Pedestrians regularly use the road, especially in urban areas and will cross the road alignment. If the road was improved, there could be an extreme risk to community health and safety due to vehicle related accidents. The existing road passes through approximately 10.8km of the Mabira CFR. The forest surrounding the road is in good condition and provides habitat for several threatened species (e.g. Nahan's francolin). The expansion of the road in this location would lead to habitat loss where the road is widened but would not lead to a new road corridor into the CFR. The expansion of the existing road will mean no (or minimal) new areas of wetland are reclaimed or degraded as a result of the road's upgrade as the embankments and infrastructure already exist in these locations.	Other factors taken into account during the assessment of alternatives were: Several sharp horizontal and vertical curves present along the alignment making it unsuitable for fast moving traffic. Due to the settlement and urbanised areas along the ROW, the cost of land acquisition would be the highest of all the alignments. There would be a high level of utilities relocation required. Money would be saved on embankment creation.
Option 2: New Northern Corridor	Option 2 utilises the same section from Lugogo to the Butabika interchange as the other alignments. However, the line then commences from the Northern Bypass approximately 1.25 km N of the existing Namboole interchange. The road passes north of Bweyogerere, Kazinga, Seeta & Mukono. After Mukono it goes through mainly agricultural land and passes North of Lugazi (UNRA, 2017). From this location it joins the same alignment as Option 4, affecting the perimeter of Mabira forest before crossing the main road near Kasinya. It then remains south of the existing Kampala-Jinja Road and eventually ends up in Jinja.	The road would pass through the southern edge of Mabira CFR creating a new corridor through the forested landscape The road would still have large social impacts especially in areas near Kampala, Seeta and Mukono. The start of the alignment between Lugogo and Butabika (shared with all new alignments proposed) would have substantial social impacts on a large number of residential and commercial structures. Areas of settlement within Kampala would experience problems of severance, air and noise pollution.	Other factors taken into account during the assessment of alternatives were: Lowest estimated total cost of implementation. Due to the settlement and urbanised areas along the ROW, the cost of land acquisition was still high but less than the upgrade of the existing road.
Option 3: New Southern Corridor (Southern Variant)	Alignment option 3 begins at the start of the future Kampala Southern Bypass at Butabika interchange. The road goes through wetland areas (Namanve wetland) and around the southern suburbs of Mukono town. It joins Option 2 south of Mabira forest and follows the same route to Jinja.	Unlike the other options, the road would not pass through the Mabira Forest and so would not create a new corridor into this protected area. The alignment would still cross areas of wetland habitat at the start of the alignment.	Other factors taken into account during the assessment of alternatives were: Accessibility to the road was not as good as for other alignments considered.

Option	Description	Key Environmental and Social Considerations:	Other factors:
		Large areas of agricultural land (commercial and subsistence) would be affected by the alignment. There were still likely to be very high costs of land acquisition and significant social impacts.	There was still a very high cost of land acquisition, but less than the upgrade of existing road.
Option 4: New Southern Corridor (Northern variant)	From the proposed location of the Butabika interchange, Option 4 passes through swampy areas on the outskirts of Kampala (e.g. Namanve). The road crosses the southern outskirts of Mukono. The road then runs in a north-easterly direction in parallel with the existing Kampala-Jinja road. It then crosses the Kampala-Jinja Road at Namataba before retracing the same alignment as Option 2 to Jinja.	The road would pass through the southern edge of Mabira forest reserve creating a new corridor through the forested landscape The start of the alignment between Lugogo and Butabika (shared with all new alignments proposed) has substantial social impacts on a large number of residential and commercial structures. The alignment still crosses areas of wetland habitat at the start of the alignment. Wetlands are on land around hills, and generally have a lower population density, although large settlements do exist in these areas.	Other factors taken into account during the assessment of alternatives were: Second best total cost. Still very high cost of land acquisition, but less than the upgrade of the existing road. Good connectivity to Mukono and Namataba near the existing road.
Option 5: Bypasses and Existing Road Upgrade.	Option 5 is a combination of upgrading the existing Kampala-Jinja Road and the establishment of new bypasses to avoid urban areas along the current road. Under this option, several bypasses were proposed. The towns of Bweyogerere, Kazinga, Seeta and Mukono were bypassed as one entity. Under this scheme, approximately 53% of the alignment would be newly built bypasses. Lugazi, Mbiko and Njeru were also considered as a single entity and bypass options were investigated to both the north and the south (UNRA, 2017).	Lesser environmental impacts. Although 53% of alignment will be a bypass so a new road would still be developed in these locations. Bypasses would vary in environmental and social impact. For example, one alternative bypass around Mukono was considered utilising the start of the Option 2 alignment. Another alignment passing Mukono was proposed passing Mabira forest, and another passing just south of the town which would have had resettlement impacts associated with it. This alignment would have likely had lesser effects on wetland habitat than the new alignments (2, 3 and 4).	Other factors taken into account during the assessment of alternatives were: The high land acquisition cost. Disruption of existing traffic streams during construction. Saving costs on embankment creation.

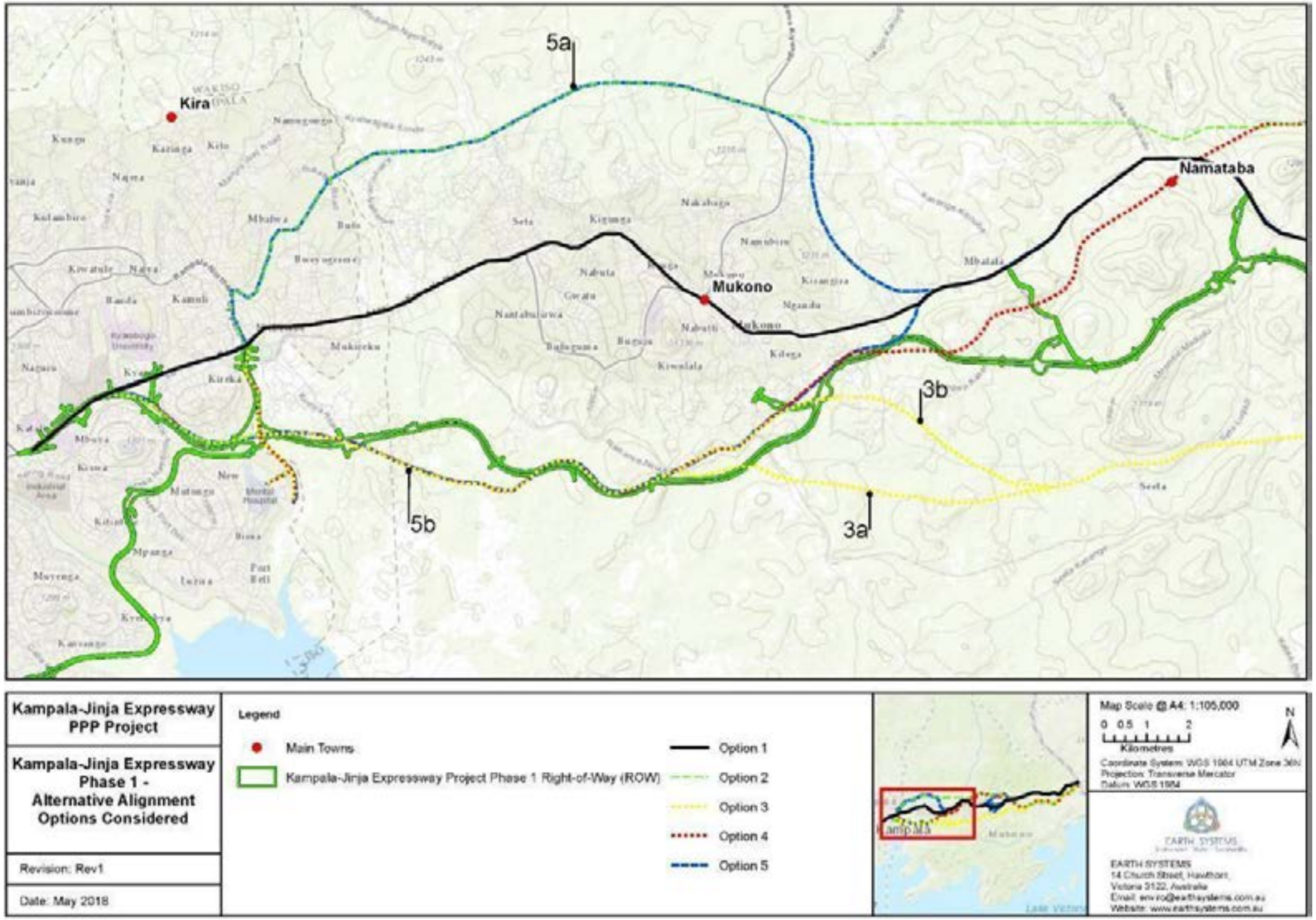


Figure 4-1: Original KJE Mainline Project Alternatives for Phase 1 (Adapted from UNRA, 2017).

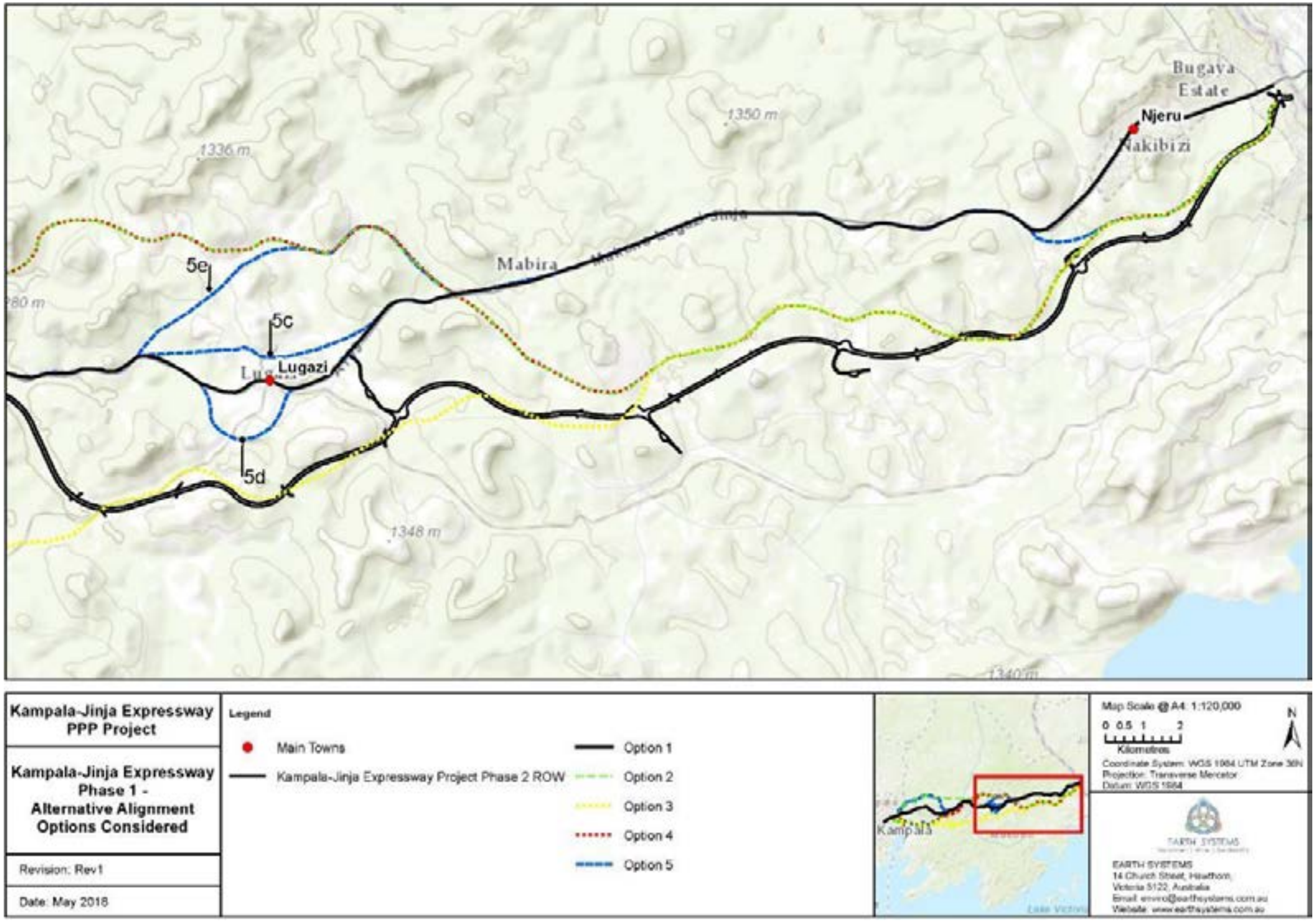


Figure 4-2: Original KJE Mainline Project Alternatives for Phase 2 (Adapted from UNRA, 2017).

4.2.2.3 Initial comparison of Alignment Options

The five different options for the road alignments were previously ranked out of five for several aspects of project design including construction costs (see Table 4-2), separation of local / transit traffic and environmental issues (see Table 4-3). These different factors were weighted as to their importance with the most important issues being construction costs, followed by right of way / utilities relocation and the adequate separation of local / transit traffic. Table 4-2 shows an estimation of costings for the proposed alignments which was fed into the initial analysis (Table 4-3).

Table 4-2: Cost Estimates of the five initial alignment options (Source: UNRA, 2017)

Project Component	Estimated Cost of each Alignment Option (Million USD)				
	Existing Road	New Road Corridor			
	1 (72.2km)	2 (74.5km)	3 (76.9km)	4 (75.1km)	5 (74.9km)
Main and Link Roads	808	826	877	858	831
Land Acquisition	263	95	98	105	116
Utilities Relocation	16	8	8	8	11
Time delivery costs	119	0	0	0	48
Embankment cost savings	-35	0	0	0	-15
Total Project Costs	1171	929	983	971	991

Source: UNRA, 2017

Table 4-3: Analysis of the original five options for the KJE Mainline alignment (Source: UNRA, 2017)

Category		Comparison of Options (Ranking)									
		Option 1 (72.2 km)		Option 2 (74.5 km)		Option 3 (76.9 km)		Option 4 (75.1km)		Option 5 (74.9km)	
Description	Weighting	Category Ranking	Weighted Ranking	Category Ranking	Weighted Ranking	Category Ranking	Weighted Ranking	Category Ranking	Weighted Ranking	Category Ranking	Weighted Ranking
Construction costs	5	1	5	5	25	3	15	4	20	2	10
Right of way / utilities relocation	4	1	4	4	16	4	16	4	16	3	12
Separation of local / transit traffic	4	1	4	5	20	5	20	5	20	3	12
Servicing of major towns enroute	3	5	15	3	9	1	3	3	9	4	12
Construction complications	3	1	3	4	12	3	9	3	9	2	6
Servicing new major developments	3	3	9	3	9	5	15	5	15	4	12
Environmental issues	3	2	6	4	12	4	12	4	12	2	6
Safety	3	2	6	5	15	5	15	5	15	3	9
Tolling	2	1	2	5	10	5	10	5	10	2	4
Total Weighted Ranking	-	-	54	-	128	-	115	-	126	-	83

Ranking: 'Weighting' – relative importance of each category to project 'Category Ranking' – relative positive contribution of category to individual option; 1 to 5: low to high.

As is outlined in the feasibility study (UNRA, 2017), Options 2 and 4 were selected for further analysis based on the results of the analysis shown above (Table 4-3). A detailed feasibility study was to be undertaken on these two alignments. Following public consultations conducted by UNRA, it was also established that the upgrade of the existing road (Option 1) should be considered for the feasibility stage, where a more detailed options analysis would be undertaken.

Therefore the three remaining corridor options were:

- **Option 1**: Upgrade of the Existing Kampala-Jinja Road;
- **Option 2**: New Northern Corridor; and
- **Option 4**: New Southern Corridor (Northern Variant).

A range of detailed feasibility studies were then conducted on these three alignment options (UNRA, 2017) including:

- Traffic studies;
- Preliminary geometric design;
- Preliminary hydrological/ hydraulic assessment;
- Preliminary pavement design;
- Preliminary structures design;
- Ancillary matters;
- Risk analysis;
- Environmental assessment;
- Social impact assessment;
- Evaluation of affected property;
- Assessment of relocation of existing utilities;
- Preliminary cost estimation; and
- Preliminary economic evaluation.

4.2.2.4 Analysis and further refinement of Alignment Options

The feasibility study (UNRA, 2017) outlines the multicriteria analysis that was conducted on the remaining alignment options. This included a qualitative comparison between the two new alignments (Option 2 and 4) and the upgrade of the existing road (Option 1) based on feasibility studies undertaken by URS Scott Wilson. The following text from the UNRA feasibility study outlines a quantitative multi-criteria assessment that was conducted in combination with the qualitative analysis mentioned above to whittle down the three options to one finalised alignment:

"a multi-criteria analysis that was capable of combining qualitative and quantitative data into a single analytical framework was used to narrow down the three options to one. The methodology for the multi-criteria analysis was based on the New Approach to Transport Appraisal (NATA) and on the UK DfT (Department for Transport) document 'Delivering a Sustainable Transport System' (DaSTS)."

*Proposed objectives (Primary criteria) on which the assessment was based are detailed in [*Table 4-4*]. The weightings of the different criteria were determined using a Pair Wise weighting system based on an analytical hierarchy process (AHP) developed by Dr. Thomas Saaty in the 1970's."*

Environmental and social considerations were factored into the qualitative and quantitative analyses. For example it was realised that the social impact of the widening and upgrading of the existing road would be severe, with the development of a new alignment still having large, but lesser social impacts (e.g. disruption of businesses, land acquisition, resettlement, severance). Safety issues associated with the existing road upgrade would also be high compared to the development of a new alignment. On the other hand, the development of a new alignment would have larger effects on forested habitat (e.g. Mabira forest) and this would be a major environmental impact. Considerations around putting greater value on minimizing river crossings were included here. Other factors considered in the qualitative analysis included economic aspects such as the separation of local and regional traffic and costings (UNRA, 2017).

The weighting criteria and results from the quantitative multi-criteria analysis are provided in Table 4-4 and Table 4-5 respectively. They highlight the environmental and social considerations that were fed into the analysis and how much weighting was given to each aspect.

Table 4-4: Weighting criteria for the Multi-Criteria analysis (Source: UNRA, 2017)

Primary Criteria	Weights	Percentage weights	Secondary Criteria	Weights	Percentage weights	Tertiary Criteria	Weights	Proportionate Weight Percentage
Economic viability	0.3014	30.14%	Affordability (Opportunity cost)	0.39				11.69%
			Transport Economic Efficiency	0.21				6.43%
			Economic Indicators such as IRR and BCR	0.26				7.73%
			Wider Economic Impacts	0.14				4.30%
Total 1				1				30.14%
Strategic transport objectives	0.1763	17.63%	Capacity improvement in the local network	0.65				11.51%
			Facilitating traffic segregation	0.16				2.87%
			Promoting transport integration	0.13				2.30%
			Providing accessibility and mobility	0.05				0.96%
Total 2				1				17.63%
Commercial/ financial viability	0.2076	20.76%	Feasibility for tolling (Payback period)	0.41				8.44%
			Supporting the Procurement strategy i.e. PPP	0.23				4.69%
			Life Cycle Costs NPV/RAC	0.19				3.97%
			Financial indicators, CAPEX, NPV/CAP	0.12				2.43%
			Encouraging bilateral support	0.06				1.23%
Total 3				1				20.76%
Sustainability	0.2429	24.29%	Protecting and enhancing the environment	0.54	13.13%	Noise	0.16	2.11%
						Local air quality	0.15	1.96%
						Greenhouse gases and wetlands	0.18	2.35%
						Landscape	0.09	1.19%
						Townscape	0.09	1.22%

Primary Criteria	Weights	Percentage weights	Secondary Criteria	Weights	Percentage weights	Tertiary Criteria	Weights	Proportionate Weight Percentage
						Heritage	0.05	0.63%
						Flora and fauna	0.14	1.88%
						Water environment	0.1	1.36%
						Physical fitness i.e. green modes of transport	0.02	0.25%
						Journey ambience	0.01	0.17%
			Sub-Total 4.1				1	13.33%
			Social impact assessment and severity	0.33	8.08%	Displacement of people	0.27	2.19%
						Access to social services	0.13	1.01%
						Access to portable water	0.1	0.79%
						Disease incidence	0.12	0.98%
						Option values	0.03	0.26%
						Social inclusion and cohesion	0.14	1.11%
						Distribution and equity of impacts	0.09	0.69%
						Community severance	0.13	1.05%
			Sub-Total 4.2				1	8.08%
			Acceptability	0.07	1.68%	Public acceptability	0.6	1.01%
						Stakeholder acceptability	0.4	0.67%
			Sub-Total 4.3				1	1.68%
			Safety	0.06	1.40%	Accidents	0.75	1.05%
						Highway infrastructure security and emergency management	0.25	0.35%

Primary Criteria	Weights	Percentage weights	Secondary Criteria	Weights	Percentage weights	Tertiary Criteria	Weights	Proportionate Weight Percentage
			Sub-Total 4.4				1	1.40%
Total 4				1				24.29%
Constructability and Buildability	0.0717	7.17%	Buildability and engineering feasibility	0.73				5.24%
			Complementarity and conflicts with planned and existing infrastructure	0.21				1.48%
			Costs of utility diversions and protection	0.06				0.46%
Total 5				1				7.17%
Grand Total	1	100%	Grand Total (1 to 5)					100%

Table 4-5: Multi-Criteria Analysis results for three alignments for the KJE mainline (Source: UNRA, 2017).

Factor	Criteria Total Weighted Scores		
	Option 1	Option 2	Option 4
Economic viability	3.92	-2.695	-1.838
Strategic Transport Objectives	6.8	9.64	10.34
Commercial Viability	-0.675	4.32	4.68
Sustainability	-0.86	0.48	0.047
Constructability and Buildability	-0.25	0.27	0.3
Total Score	8.935	12.015	13.53

Following the multi-criteria assessment (Table 4-5), Option 4 was taken as the most feasible of the three options with regards to economic viability, strategic transport objectives, commercial viability, sustainability criteria, and construction and buildability (UNRA, 2017). As a consequence Option 4 was taken to be the finalised design for the alignment. However, recent changes have been made to the alignment which are outlined in Section 4.4.

The previous ESIA documentation (part of the feasibility studies) produced by ICS in 2015 made three main recommendations based on an analysis of these alternative alignments (ICS, 2015).

- *"All sections cutting across forests especially Mabira should be re-aligned to pass some distance away from forests, if possible;*
- *Sections of the alternative alignment should be re-aligned to reduce on the number of rivers/streams cut across by the alignment, to the minimum number possible; and*
- *If the section of the alignment cutting across Mabira between coordinates 493125E 47900N and 493500E 47900N, cannot avoid the forest totally then it should be moved further south towards the tip of Mabira (493415E 46786N) as the southern area was noted to be in a degraded* state."

Although the existing Kampala-Jinja road alignment passes through a greater length of the Mabira forest, it would only require the widening of an existing corridor. The new alignment would require a new corridor to be established through the reserve which would lead to both habitat loss and increased fragmentation of the protected area leading to large impacts on the protected area.

4.2.3 KJE Mainline Alignment / Overview of Option 4

Option 4 followed a very similar alignment for the KJE Phase 1 as outlined in Chapter 3 (Project Description), although several modifications have been made recently to avoid key biodiversity areas (such as Kasenge forest) and business areas (refer to Section 4.4). An overview of the Option 4 route is provided below.

The road would start in Lugogo and follow the current Kampala-Jinja Road up until Kyambogo (KJE Chainage 2 + 500). It then diverged in a southerly direction from the road crossing Kinawataka wetland and heavy settled areas adjacent to the wetland habitats. These wetland areas are less densely populated than the surrounding urban areas but are more prone to flooding events. The wetlands also provide important ecosystem services for Kampala's urban areas including the mediation of flood events and the maintenance of water quality, helping remove pollutants from the water before it enters Lake Victoria. In the densely populated areas within Kampala,

major environmental and social impacts associated with this alignment would include the displacement of people, the severance of communities, noise and air quality impacts on local residents, the removal of remaining wetland habitat and potential changes in hydrological flows. This alignment was however chosen as a result of a multi-criteria analysis which aims to maximise economic viability, meet objectives, maximise commercial and engineering viability whilst considering environmental and social parameters. Many of the alignments also considered (e.g. Option 1, 2 and 3) would have had similar levels of impact.

After exiting Kampala, the road alignment then crosses another extensive swampy area (Namanve wetland) before entering less densely populated areas to the east of Kampala. In the Namanve CFR, the alignment will pass an area of high quality Papyrus wetland but the impact on this habitat is likely to be reduced due to the provision of a viaduct in this area. After passing the Kampala Industrial business park at Namanve, the alignment crosses ridges and small wetland areas south of Seeta and Mukono. The alignment then crossed Kasenge forest (an area of high quality forest vegetation), directly impacted two large factories (Global Paper and Kampala Cement) before reaching Namataba. After Namataba, the alignment was planned to cross both commercial and subsistence farming land and intersect with the Mabira central forest reserve. It then continued through agricultural land towards Jinja. Therefore, the alignment still had detrimental effects on potential critical habitat and large businesses along the ROW.

The Option 4 alignment would also have large social impacts. However, all options considered would have had large resettlement impacts associated with their development due to the highly urbanised nature of the Project Footprint. The multi-criteria analysis tried to reduce these costs and factor them into project design. To try and reduce social impacts, the alignment has been planned to traverse wetland areas on the outskirts of the city as these are less densely populated than the surrounding landscape. These wetlands are severely degraded, especially in Kampala but they still provide important ecosystem services to the city.

4.3 Kampala Southern Bypass

4.3.1 Business as Usual vs Road Development

Currently the road network in Kampala is extremely congested due to continued increase in traffic across the city over recent years. The existing road system is radial in nature meaning that traffic is funnelled into the city centre causing the majority of traffic travelling through Kampala to enter the city centre. In the southern divisions of Kampala, people have little option but to use the existing small roads (e.g. Salama Road, Port Bell Road) to get to the city centre or to move out of the city. If traffic levels continue to increase, these roads will become completely overcrowded and unsuitable for use.

It was therefore recognised that something needed to be done. Kampala Southern Bypass (KSB) was planned as a separate project to link the Kampala Northern Bypass (already constructed) with the Kampala-Entebbe Expressway (currently under consideration) across the southern parts of Kampala to complete a ring road network around the city.

4.3.2 Alignment Considerations

The following text from the KSB Feasibility study (2016) outlines the approach taken during the initial assessment of alternatives to select the preferred KSB Alignment:

"As KSB is an entirely new alignment for which no corridor had been identified previously, the first step in the design process was to identify potential route corridors. Initial identification of potential corridors was through a combination of examining satellite imagery and walkover surveys.

Key issues considered in the process were the availability of undeveloped areas and potential requirements for land and property acquisition of the various corridor options to minimise social and environmental impacts on communities. Other constraints identified related to land use, social, hydrological, technical and economic perspectives.

The process resulted in initial route options for KSB being developed as shown in [Figure 4-3]. *The options considered included the upgrading of some existing roads (e.g. Mutungo road, Salama Road) in addition to entirely new alignments which, in addition to completing the ring road, the intention of the alignments selected was to link suburban areas in the southern part of the city, permitting traffic to avoid using the existing major radial roads and reducing the traffic congestion in central Kampala."*

Due to the high population density of the landscape in Kampala, it was realised that the displacement of some people would be an inevitable consequence of the Project. A decision to minimise displacement by placing the alignment through wetlands was made - provided that adequate environmental mitigation measures were employed that prevented further degradation of these ecosystems (URS, 2013).

After an initial analysis of the route options it was decided that the route would be an entirely new alignment of expressway standard with no upgrading of existing roads (e.g. Salama road) being part of the Project (URS, 2013). It was suggested that the use of tunnels be investigated to go through Mutungo, Muyenga and Makindye hills as these could potentially provide a shorter route and raise fewer environmental and social concerns (URS, 2013).

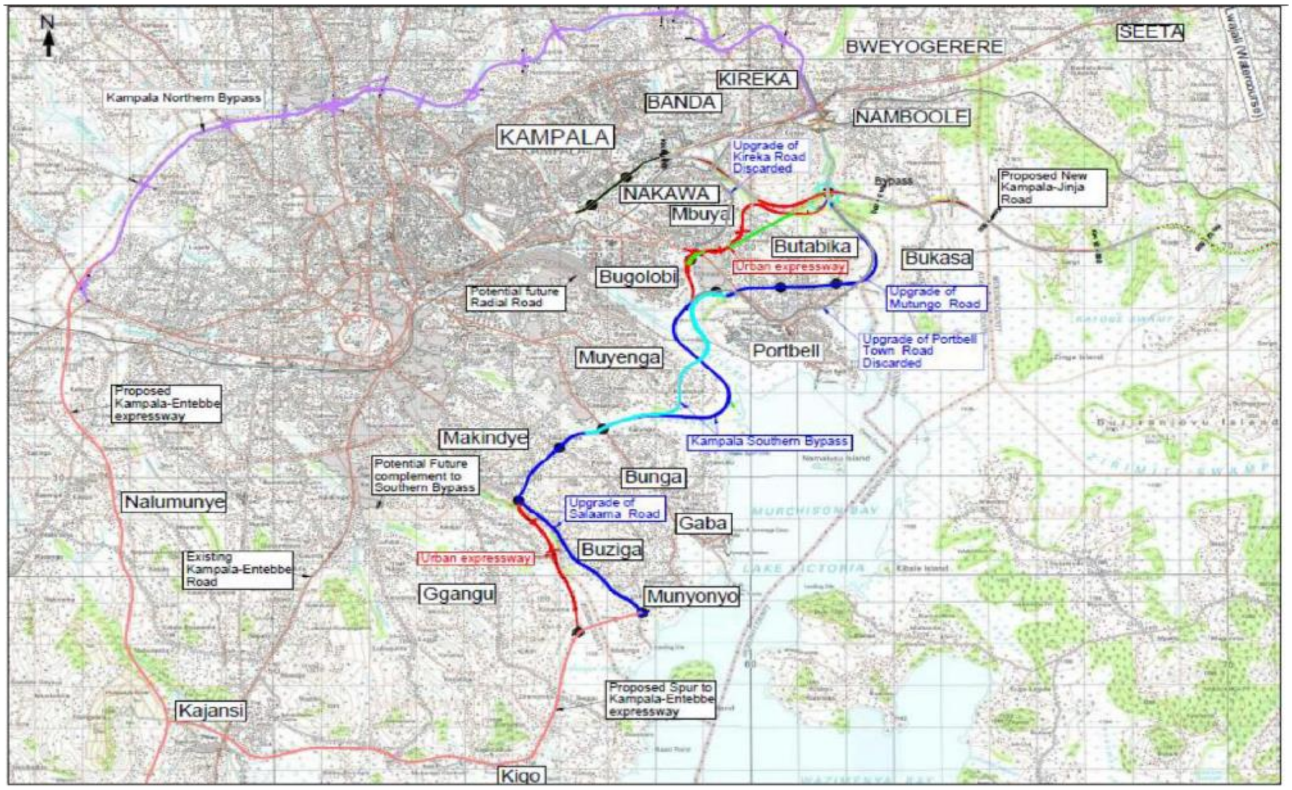


Figure 4-3: Map of alternatives proposed for the Kampala Southern Bypass (UNRA, 2017).

4.3.3 Project Sections

The KSB was planned to complete the ring road around Kampala linking the Kampala-Entebbe Expressway (KEE) to the Kampala-Jinja Expressway mainline. It would be approximately 18km long and link the Butabika Interchange to the KEE at Munyonyo – passing through Mutungo, Muyenga and Bunga. For the assessment of potential alternatives conducted by URS (2013) the alignment was split into four different sections. The following

text from the previous ESIA outlines these different sections and the alternatives considered along each section (URS, 2013):

- *“**Section 1** - Northern Section; From the project start point at the proposed Butabika Interchange to Portbell Road. This section had two main variants, one in open cut across Mutungo Hill and a second in tunnel through the hill, but having substantially the same horizontal alignment.*
- ***Section 2** - Central Section 1; From Portbell Road to Gaba Road. This section also has two main variants, one mostly on embankment following the wetland shoreline around Muyenga Hill with the second variant on a different horizontal alignment and in tunnel through Muyenga hill.*
- ***Section 3** - Central Section 2; From Gaba Road to Salama Road. This section again has two main variants one in open cut across Makindye hill and a second in tunnel through the hill, but having substantially the same horizontal alignment.*
- ***Section 4** - Southern Section. Between Salama Road and the project terminus at its intersection with Munyonyo Spur Road. This section has no variant.”*

4.3.4 Analysis of KSB Alternatives

Based on the sections described above, alternative alignments were assessed in Section 1, Section 2 and Section 3. In each of these sections there would be a tunnelled option and an embankment option following the wetland around the hilly areas. This gave rise to four main alternative alignments (URS, 2013):

- **Alternative A (Open Cut)** – Every section being open cut and embankment or viaduct. There would be no tunnels associated with this alternative. This aligns with Option 1 in Table 4-6.
- **Alternative B (Tunnelled)** – Section 1, Section 2 and Section 3 would be tunnelled through the ridges. This aligns with Option 2 in Table 4-6.
- **Alternative C (Open Cut with small alignment change)** – Every section being open and cut as in Alternative 1. A small change to alignment was proposed around Muyenga hill to move the alignment away from permanently inundated wetland.
- **Alternative D (Business as Usual)** – No new route is developed and the existing road is not upgraded.

Options A-D have very different alignments, however within these main alternatives there are several other options which investigate all the possible combinations of each of the sections being tunnelled and/or open cut through the landscape. These options that were considered by URS (2013) are shown in Table 4-6 with “C” representing open cut (i.e. no tunnels) and “T” representing tunnelled infrastructure in each of the different road sections.

Table 4-6: Alternatives route options assessed for the KSB (URS, 2013).

Option	Corridor Section				Remarks
	Section 1	Section 2	Section 3	Section 4	
1	C	C	C	C	Alternative A / C
2	T	T	T	C	Alternative B
3	T	C	C	C	
4	C	T	C	C	

Option	Corridor Section				Remarks
	Section 1	Section 2	Section 3	Section 4	
5	C	C	T	C	
6	T	T	C	C	
7	T	C	T	C	
7a	T	C	T	C	The same as option 7 but with road in Section 2 shifted landwards.
8	C	T	T	C	
9	Business as Usual				Alternative D

C = open cut, T = tunnel.

The Open cut designs (e.g. Alternative A) made much greater use of wetland edges surrounding the ridges and areas of settlement than the tunnelled options (e.g. Alternative B). As the tunnels allow the alignment to pass directly through the ridges, the tunnelled alignment (Alternative B) is marginally shorter than the open cut designs. These tunnels would probably have substantially reduced the impact on property and land associated with the Project – as well as reducing the need for resettlement along the tunnelled sections (URS, 2013).

A multicriteria analysis was carried out for the different alignment Options (1-9) by URS (2013), including Option 7a where the alignment going around Muyenga hill was modified slightly to avoid deep wetland areas in this section and the need for a viaduct. The results from this multi-criteria analysis are displayed in Table 4-8. The following text from the previous ESIA documentation outlines the approach that was taken:

"Negative impacts were estimated on a scale from 0 to 1, and then summed. The higher the score, the higher the negative impact (hence less favourable). A comparison of the total score provided the ranking of options. A two step approach to the analysis was used. In Step 1 the environmental and social impacts of [the tunnelled (T) and open cut (C) options] *were analysed for Sections 1, 2 and 3 of the corridor. Step 2 considered the whole range of alignment options by combining the scores for the three sections from* [the tunnelled (T) and open cut (C) options] *according to the different alignment combinations described in Table 4-8. The rankings from this analysis generated the preferred alternative."* (URS, 2013).

The results of Step 1 and 2 of the Multicriteria analysis conducted by URS (2013) are displayed in Table 4-7 and 4-8 respectively. All of the environmental and social factors listed were given equal weighting in the analysis, however the number of factors listed for each general topic influenced the result as all results were summed for each option.

Table 4-7: Step one of the multicriteria analysis for the Kampala-Southern Bypass comparing tunnelled and open road options for Sections 1, 2 and 3. (Source: URS, 2013)

Environmental / Social factor	Weighting		
	Tunnelled (T)	Open Road (C)	Open road with in Section 2 shifted landwards.
Section 1			
Removal of High value Buildings / Structures	0.4	0.8	

Environmental / Social factor	Weighting		
	Tunnelled (T)	Open Road (C)	Open road with road in Section 2 shifted landwards.
Disruption of National Infrastructure (Water / Power /etc.)	0.2	0.2	same as Open Road (C) for Section 1
Impact on Aesthetics (Visual Impacts)	0.3	0.6	
Increase in Total Distance Travelled	0	0	
Likelihood of Soil Erosion and Subsequent Silting	0.4	0.8	
Generation of Spoil and Requirements for its Disposal	0.5	0.8	
Disruption of Water Reservoirs (Aquifers)	0.6	0.5	
Loss of Flood Storage Capacity In Wetlands	0.4	0.5	
Increased Likelihood of upstream flooding	0.2	0.2	
KSB Serving as a Barrier to the Wetlands	0.3	0.3	
Disruption of Fishing Activities	0.1	0.1	
Crossing High Flow Points (5No.)	0.2	0.2	
Disruption of Habitats for Aquatic Wildlife	0.3	0.2	
Disruption of endemic species	0.1	0.1	
Relocation of Graves/ Graveyards/Burial Grounds	0.2	0.2	
Relocation of Shrines / Cultural Heritage	0.2	0.2	
Impact on Churches and Mosques	0.3	0.4	
Direct Impact on Schools	0.3	0.7	
Water Sources to be Directly Impacted	0.3	0.3	
Severance in Respect of Water Sources & Service	0.4	0.5	
Severance in Respect of Schools and Churches	0.4	0.7	
Provision of NMT lanes for increased community access	0.3	0.3	
Land Take to Provide for Corridor	0.4	0.7	
Number of Landlords to Deal with	0.4	0.6	
Likely Disruption of Other Roads and Road Users	0.5	0.6	
Disruption of Economic activities (farms and Businesses)	0.6	0.6	
Sub Total	8.3	11.1	11.1
Section 2 (Central Section 1)			
Removal of High value Buildings / Structures	0.5	0.3	0.35
Disruption of National Infrastructure (Water / Power /etc.)	0.4	0.4	0.4
Impact on Aesthetics (Visual Impacts)	0.5	0.3	0.33
Increase in Total Distance Travelled	0.3	0.5	0.4

Environmental / Social factor	Weighting		
	Tunnelled (T)	Open Road (C)	Open road with road in Section 2 shifted landwards.
Likelihood of Soil Erosion and Subsequent Silting	0.4	0.2	0.25
Generation of Spoil and Requirements for its Disposal	0.7	0.5	0.55
Disruption of Water Reservoirs (Aquifers)	0.6	0.3	0.35
Loss of Flood Storage Capacity In Wetlands	0.5	0.4	0.4
Increased Likelihood of upstream flooding	0.2	0.2	0.3
KSB Serving as a Barrier to the Wetlands	0.4	0.2	0.15
Disruption of Fishing Activities	0.1	0.1	0.1
Crossing High Flow Points (5No.)	0.3	0.3	0.3
Disruption of Habitats for Aquatic Wildlife	0.3	0.4	0.3
Disruption of endemic species	0.2	0.3	0.2
Relocation of Graves/ Graveyards/Burial Grounds	0.5	0.3	0.3
Relocation of Shrines / Cultural Heritage	0.2	0.2	0.2
Impact on Churches and Mosques	0.4	0.3	0.3
Direct Impact on Schools	0.3	0.3	0.3
Severance in Respect of Water Sources & Services	0.4	0.2	0.25
Severance in Respect of Schools and Churches	0.4	0.2	0.2
Provision of NMT lanes for increased community access	0.3	0.3	0.3
Land Take to Provide for Corridor	0.4	0.2	0.2
Number of Landlords to Deal with	0.4	0.2	0.3
Likely Disruption of Other Roads and Road Users	0.4	0.2	0.2
Land Mine area	0.4	0.4	0.4
Disruption of Economic activities (farms and Businesses)	0.3	0.5	0.5
Sub Total	9.8	7.7	7.83
Section 3 (Central Section 2)			
Removal of High value Buildings / Structures	0.5		same as Open Road (C) for Section 3
Disruption of National Infrastructure (Water / Power /etc.)	0.4		
Impact on Aesthetics (Visual Impacts)	0.4	0.6	
Increase in Total Distance Travelled	0.4	0.4	
Likelihood of Soil Erosion and Subsequent Silting	0.4	0.6	
Generation of Spoil and Requirements for its Disposal	0.5	0.8	
Disruption of Water Reservoirs (Aquifers)	0.5	0.5	

Environmental / Social factor	Weighting		
	Tunnelled (T)	Open Road (C)	Open road with road in Section 2 shifted landwards.
Loss of Flood Storage Capacity In Wetlands	0.2	0.2	
Increased Likelihood of upstream flooding	0.3	0.4	
KSB Serving as a Barrier to the Wetlands	0.3	0.5	
Disruption of Fishing Activities	0.01	0.01	
Crossing High Flow Points (5No.)	0.2	0.2	
Disruption of Habitats for Aquatic Wildlife	0.2	0.2	
Disruption of endemic species	0.1	0.1	
Relocation of Graves/ Graveyards/Burial Grounds	0.5	0.7	
Relocation of Shrines / Cultural Heritage	0.3	0.4	
Impact on Churches and Mosques	0.4	0.5	
Direct Impact on Schools	0.5	0.5	
Severance in Respect of Water Sources & Services	0.4	0.5	
Severance in Respect of Schools and Churches	0.4	0.6	
Increased Access to Divided Communities (NMT)	0.4	0.4	
Land Take to Provide for Corridor	0.4	0.6	
Number of Landlords to Deal with	0.4	0.6	
Likely Disruption of Other Roads and Road Users	0.4	0.5	
Disruption of Economic activities (farms and Businesses)	0.6	0.6	
Sub Total	9.11	11.41	11.41
Section 4			
same for all alignments			

Table 4-8: Step 2 of the multicriteria analysis of the Kampala Southern Bypass options (Source: URS, 2013).

Option	Preliminary MCA Score	Ranking
Option 7	6.74	1
Option 7a	6.75	1a
Option 2	6.76	2
Option 8	6.78	3
Option 6	6.80	4
Option 3	7.06	5
Option 5	7.16	6
Option 4	7.36	7
Option 1	8.13	8
Option 9	8.57	9

The multi-criteria analysis indicated that Option 7 was the preferred alignment based on environmental and social factors inputted into the analysis (Table 4-8) with tunnels passing through Sections 1 and 3 of the road (Table 4-7). Option 7a also scored highly and was highlighted by URS (2013) as preferable due to the high cost of viaducts in Option 7. It should be noted that this analysis focused on environmental and social considerations, and did not take into account economic costs of Project construction.

4.3.5 KSB Alignment

Despite the findings of the previous environmental and social study (URS, 2013), the feasibility study (UNRA, 2017) indicates that a further review of route options concluded that tunnel options were not viable for the Project and recommendations were made for an alignment avoiding the use of tunnels. This is partly due to the large economic costs of developing tunnelling infrastructure in Uganda.

The KSB Alignment identified at this stage in the process took into account the findings of the previous alternative analyses, and was very similar to the alignment shown in Chapter 3 (Project Description) apart from some small changes made during 2017 that are described in Section 4.4 to avoid conflict with the Standard Gauge Railway (SGR) Project alignment and other issues.

4.4 Recent Changes

The finalised alignments of the KSB and KJE Mainline were assessed again in 2017 after a review of the alignments in the context of newly available information, reviews of ESIA and RAP documentation and discussions with potential project financiers. Changes were made to both the KSB and KJE Mainline alignments with the following objectives:

- To avoid conflict of the alignment with the Standard Gauge Railway Project which is being planned to follow a similar alignment to the KJE mainline between Kampala and Jinja;
- To avoid impacts on businesses along the ROW (e.g. Kampala Cement, Global Paper); and
- To avoid impacts on critical habitat wherever possible, focussing particularly on the Kasenge and Mabira Forests.

Option 4 (see Section 4.2.3) was reviewed to try and reduce these potential environmental and social impacts. The Mabira forest was highlighted as an area of potentially critical habitat providing a habitat for species threatened internationally (IUCN, 2017) and in Uganda (WCS, 2016). It also provides habitat for endemic species unique to Uganda and it is one of the last remaining large blocks of forest left in Central Uganda. Mabira Forest forms part of the Kalagala Offset Management Plan which was agreed to during the financing of the 250MW Bujagali Hydropower Project. Option 4 of the alignment crossed through the Mabira Forest CFR for approximately 5.3 km. If this alignment was used, it would cause direct loss of potential critical habitat and the formation of a new corridor through the protected landscape.

Four alternative alignments to Option 4 were assessed to reduce the likely impacts on Mabira forest (Figure 4-4). These were:

- Option M1;
- Option M2;
- Option M3; and
- Option M4.

These options looked at realigning Option 4 after KJE Chainage 25 + 000. Although the Mabira Forest is located in Phase 2 of the alignment, the changes at this location have knock on effects to the alignment within Phase 1 of the Project. All four of the proposed alignments (M1 – M4) bypassed the Mabira Forest ecosystem.

A comparison of the environmental and social considerations for the four options is provided in Table 4-9. Notably the social impacts of the M3 alignment would be particularly high as it intersects the south-western region of Lugazi which is comprised of medium to high density housing. Options M2, M3 and M4 avoid impacts on the Global Paper factory, Kampala Cement factory and the Kasenge Forest. The M3 and M4 options are also the furthest alignments from the Mabira forest, reducing potential for indirect impacts on the reserve.

As outlined in the Project feasibility study (UNRA, 2017), the alignment options identified "*were assessed in terms of project length, buildability, environmental and social impact as well as project costs and **Option M4** emerged the most preferred option*". Figure 4-4 shows the proposed alternative alignments (including Option M4) along this section of the ROW.

As well as this large change in alignment to avoid Mabira forest, smaller changes in alignment have been made to avoid conflict with the Standard Gauge Railway Project planned near to the location of the ROW. The Ugandan section of the line is planned to run from Kampala to Malaba via Tororo, Iganga and Jinja. The section from Kampala to Jinja via Mukono and Lugazi is of relevance to the Project as it follows a similar alignment to both Phases 1 and 2 of the KJE Project. The Kampala-Malaba railway will form part of the Mombasa-Kampala railway line planned to boost trade and transport links throughout east Africa. It is hoped that this upgrade will mean increasing the amount of goods flowing in and out of Kampala by rail from the current 7.5% to >30% (SGR, 2014).

Table 4-9 outlines changes recently made to Option 4 of the KJE Mainline alignment and the finalised alignment of the KSB to avoid areas of potential critical habitat and conflict with the Standard Gauge Railway.

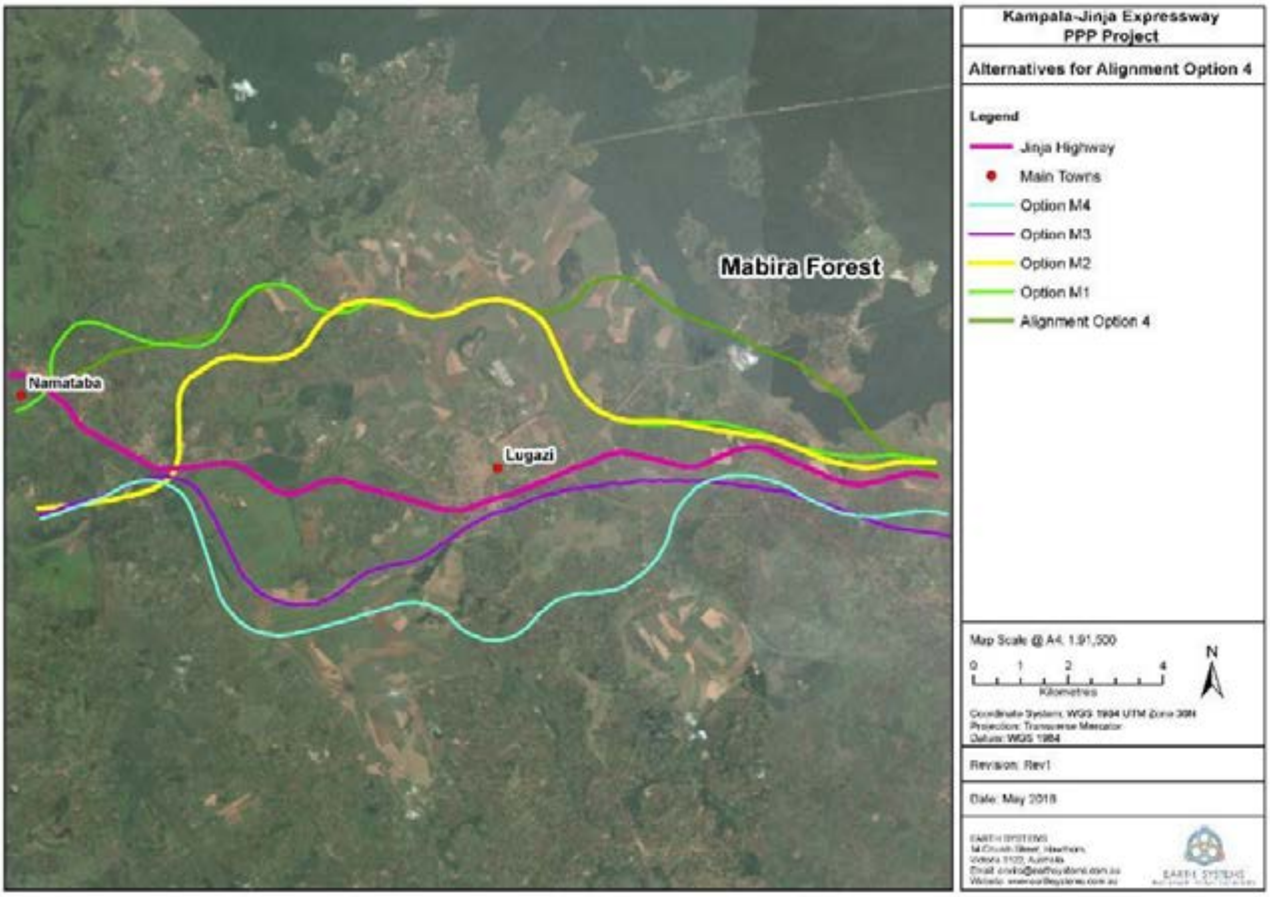
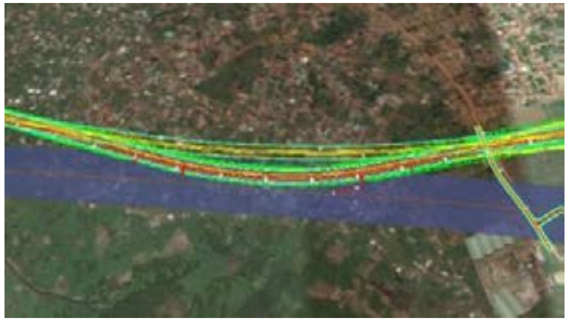


Figure 4-4: Map of alternatives proposed to avoid Mabira Forest (Adapted from UNRA, 2017).

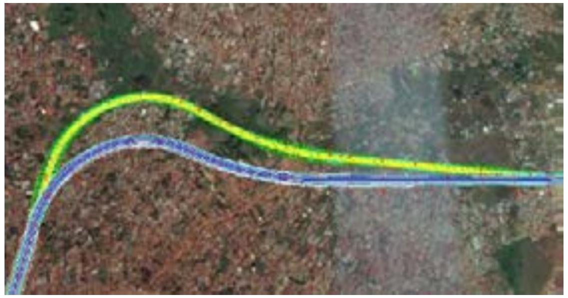
Table 4-9: Comparison of environmental and social variables for the four alternatives proposed to avoid Mabira Forest.

Option	Route Description	Key Environmental and Social Considerations
M1	Option M1 is approximately 34.4 km long. The M1 option originates slightly below the Kampala-Jinja highway and Namataba and is the northern most alternative. Option M1 diverged from Option 4 before it crossed the existing Kampala-Jinja Road near Namataba to avoid the Kampala cement factory. The line runs north east for 4.0 km through small scale agricultural and low density residential areas. The line then changes to an easterly direction for approximately 4 km. The line then continues through small scale agricultural and residential areas in a north easterly direction for 2.9 km. For the next 8.4 km the M1 option cuts east through commercial plantations and then diverts south east for 4.6 km. Finally, the M1 passes south of the Mabira forest in an easterly direction for 10.7 km.	The M1 option is the second longest alternative. The M1 option originates in a small scale agricultural region and then cuts through a wetland area for 280 m. Social impacts associated with the development of the M1 option include impacts on cleared land, small scale residential and agricultural areas, large scale plantations and a small industrial lot. Notably approximately 19 km of the alignment intersects with large scale plantations. The impact to small scale residential areas and small scale agricultural lands is also likely to be significant on this route, with 12.8 km of the line either intersecting or coming close to the small scale residential areas and small scale agricultural lands. The M1 and M2 lines are the two closest options to the Mabira forest which may increase indirect impacts on the protected area compared to the other options.
M2	Option M2 is approximately 34.4 km long. The M2 option originates approximately 2.4 km to the south of Namataba, 140m from the M3 origin and 230m from the M4 origin. Option M2 diverges from Option 4 at approximately KJE Chainage 24 + 900. The line runs east for approximately 2.7km before changing to a north easterly direction through small scale agricultural and residential areas for 9.4 km. The line continues east for 6.1 km through a commercial plantation before diverting in a south eastern direction for 4.4 km. The M2 line then runs in an eastern direction for 10.0 km to the south of the Mabira forest.	The M2 option is the second shortest alternative. Social impacts associated with the development of the M2 option are expected to include impacts on small scale residential and agricultural areas, large scale plantations and a small industrial lot. Approximately 16.7 km of the line intersects with large scale plantations, which is slightly less than the M1 option. Approximately 11 km of the line either intersects or comes close to the small scale residential areas and small scale agricultural lands. Option M2 avoids impacts on the Global Paper factory, Kampala Cement factory and the Kasenge Forest. However, the M1 and M2 lines are the two options closest to the Mabira forest which may result in higher levels of indirect impacts on the protected area compared to the other options.
M3	Option M3 is approximately 32.3 km long. The M3 option originates approximately 2.5 km to the south of Namataba, 140 m from the M2 origin and 90 m from the M4 origin. Option M3 diverges from Option 4 at approximately KJE Chainage 24 + 900. The line runs northeast for approximately 2.8 km before changing to a sharp south easterly direction for approximately 5.9 km through a plantation. The M3 option then continues north east through the plantation to Lugazi. After Lugazi the M3 continues to the east for approximately 14.4 km passing to the south of the Mabira forest.	The M3 option is the shortest alternative by approximately 3 km, and therefore would be expected to have the smallest area of direct ground impact. However, the social impacts of the M3 alignment would be particularly high as it intersects the south western region of Lugazi (a major town on the Jinja highway). The area affected is comprised of medium to high density housing and there is likely to be a direct impact on residential infrastructure for approximately 1.7 km of the alignment. Other sections of the M3 option intersect small scale residential and agricultural areas, large scale plantations and a small industrial lot. Approximately 16.5 km of the line intersects with large scale plantations, and about 8.5 km of the line either intersects or comes close to low density residential areas and small scale agricultural lands. Option M3 avoids impacts on the Global Paper factory, Kampala Cement factory and the Kasenge Forest. Approximately 1.4 km of the M3 option also intersects forested and wetland areas. The M3 option is one of the furthest alignments from the Mabira forest, thus reducing potential for indirect impacts on the reserve.
M4	Option M4 is approximately 34.9 km long. The M4 option originates approximately 2.6 km to the south of Namataba, 230 m from the M2 origin and 90 m from the M3 origin. Option M4 diverges from Option 4 at approximately KJE Chainage 24 + 900. The line runs north east for approximately 2.6 km before changing to a sharp south eastern direction for approximately 6.6 km through a plantation. The M4 option then continues east through the plantation for 7.4 km. The line the changes to a north eastern direction for 10.1 km before continuing east for 6.7 km south of the Mabira forest.	The M4 option is the longest alternative by approximately 400 m and would therefore have the highest direct ground impact. Social impacts associated with the development of the M4 option would include impacts on small scale residential and agricultural areas, large scale plantations and a small industrial lot. Similar to the M1 option, the alignment of M4 would intersect approximately 19 km of large scale plantations. Approximately 11 km of the line either intersecting or coming close to the small scale residential areas and small scale agricultural lands, which is similar to the M2 option. As with Options M2 and M3, the M4 option also avoids impacts on the Global Paper factory, Kampala Cement factory and the Kasenge Forest. The M4 option (along with M3) is one of the furthest alignments from the Mabira forest which is a significant biodiversity area, reducing potential for indirect impacts on the reserve.

Table 4-10: Modifications made to the Option 4 ROW for the KJE Mainline and the KSB Alignment in 2017 to avoid conflict with the Mabira CFR and the Standard Gauge Railway Project.

Chainage Location:	Modification to Alignment:	Reason:	Environmental and Social Considerations:	Map
Kampala – Jinja Expressway Mainline				
Approx. KJE Chainage 22 + 500 – 73 + 000	The entire alignment has been shifted in a Southerly direction, south of the existing Kampala-Jinja road. The distance between the previous (Option 4) and new alignment (M4) varies at different chainages of the ROW.	The Project was realigned to prevent direct impacts on habitat in the Mabira Forest CFR, the Kasenge Forest, Kampala Cement, Global Paper and sections of the SGR alignment. .	This is discussed in the text above.	
Approx. KJE Chainage 7 + 500 to 8 + 500	A small change of the alignment approximately 65m to the North from Option 4.	Avoiding conflict with the SGR Alignment	There will be minimal differences in environmental impacts associated with this small change in alignment. However, this alteration to the alignment has been made in a highly populated area. The assets, land and people affected within the ROW will have changed. The Project Footprint now avoids conflict with the SGR Alignment at this location.	

Chainage Location:	Modification to Alignment:	Reason:	Environmental and Social Considerations:	Map
Approx. KJE Chainage 9 + 500 – 14 + 000.	A large change to the alignment as it crosses Namanve wetland area. It now heads in a NE direction before turning SE and re-joining the previous alignment (Option 4).	Avoiding conflict with the SGR Alignment	The ROW now crosses a larger area of Namanve wetland which is a habitat of high quality *Papyrus* vegetation. However, in this section a viaduct is planned to minimise impacts on the wetland ecosystem allowing water to flow across the road ROW. The road also now avoids an area of Eucalyptus vegetation on the fringes of the wetland habitat. Between Chainage JE 11 + 500 and KJE 13 + 500 different land and assets will be affected by the new alignment which were not affected by the previous alignment. The Project footprint now avoids conflict with the SGR Alignment at this location.	
Approx. KJE Chainage 19 + 000 – 22+ 000	The alignment has been moved approximately 600m SE from the original design (Option 4).	Avoiding conflict with the SGR Alignment	The new alignment avoids an area of plantation and forest and cuts through areas cleared for settlement and subsistence agriculture. It is however important to note that these assets will still be affected by the SGR Project when it is implemented. The land, people and assets affected by the Project will have completely changed from the original design in this section. Level of social impact is likely to be similar with only a small number of settlements affected compared to urban areas along the ROW. The Project Footprint now avoids conflict with the SGR Alignment at this location.	

Chainage Location:	Modification to Alignment:	Reason:	Environmental and Social Considerations:	Map
Kampala-Southern Bypass				
Approx. KSB Chainage 1 + 100 – 2+ 800	The alignment has been moved between 150m and 50m south of the previous alignment (Option 4) depending on specific chainage location.	Avoiding conflict with the SGR Alignment	This small modification will cause large changes in socio-economic impacts along this portion of the ROW. The road has now been moved away from the less densely populated wetland areas and country club affected by the ROW and into a highly populated residential area. It is important to note that in this location the SGR Project will also have substantial socio-economic impacts. The land, assets and people affected by the Project Footprint will have changed since the previous alignment. The realigned section will have less impact on agricultural and wetland areas to the south of Kasokoso. The ROW now avoids conflict with the SGR Alignment at this location.	

4.5 KJE PPP Alignment

The finalised location of the alignments are displayed and described in detail in Chapter 3 (Project Description).

KJE PPP Project Phase 1 ESIA

CHAPTER 5 Community and Stakeholder Engagement

5. COMMUNITY AND STAKEHOLDER ENGAGEMENT

5.1 Introduction

Active and ongoing stakeholder engagement ensures the Project's development, potential impacts, and management measures are communicated to the public while ensuring an avenue for stakeholders to participate in the decision-making process through public meetings, feedback and via grievance mechanisms. Extensive consultations have been undertaken for Phase 1 of the KJE Project, and build on existing community and government relationships formed through the work completed by UNRA. Throughout the ESIA process, consultations and disclosure of Project information has been undertaken with government officials (at local and national levels), the local community, Affected Persons and a range of other key stakeholders.

Public consultation and information disclosure are core requirements of the ESIA process in Uganda. A participatory approach is also considered international best practice such as through the IFC Sustainability Framework (2012) and AfDB Integrated Safeguards Systems (2013).

The range of consultations undertaken included formal consultations such as workshops and meetings, as well as informal consultation such as regular discussions and the inclusion of local residents and government staff in studies and surveys. Project information has been disclosed through methods including public notices, workshops and meetings, village assemblies, and focus group discussions.

This chapter summarises the consultation and disclosure activities undertaken for the preparation of the ESIA. Strategies and responsibilities for ongoing consultation throughout the life of the Project, as well as a description of the proposed grievance mechanism, are also discussed. Further details of the approach to stakeholder engagement to support construction and operations of the Project is presented in the *Stakeholder Engagement Plan* (SEP, Volume D).

5.2 Purpose and Objectives

The overall goal of stakeholder engagement for the Project is to improve decision-making, build understanding to ensure the long-term viability of the Project, and to enhance potential Project benefits. The specific objectives of the stakeholder consultation for the Project are to:

5. Provide a structured means for the local community and government to have input into the ESIA and Project development process;
6. Ensure that stakeholders are informed of UNRA activities regarding the Project;
7. Actively seek community input into the assessment of potential environmental and social impacts of the proposed Project activities and identification of management/mitigation measures to ensure consideration of stakeholder interests in the planning and development of the Project; and
8. Reduce the potential for community disaffection that can result from a lack of understanding of the Project and the Project development process.

5.3 UNRA's Approach to Stakeholder Engagement

UNRA aims to meet the requirements of the IFC Sustainability Framework (2012) and AfDB Integrated Safeguards Systems (2013), which require that informed stakeholder consultation and participation should be conducted throughout each phase of the Project life cycle (IFC, 2007).

UNRA's approach to stakeholder engagement aims to fulfil the following core principles:

- Proactively engage to enable the early identification of potential issues and risks;
- Respect local culture and established political, social and economic relations; and
- Generate ideas and alternative solutions on early design questions.

5.3.1 Environmental and Social commitments

In line with legal obligations, UNRA is committed to stakeholder engagement and disclosure of information through its Environment and Social Safeguards Policy. This Policy specifies core commitments for environmental and social protection for all its activities and projects, including for stakeholder engagement, disclosure of information, and grievance redress mechanism. The Policy describes the overarching policy commitments, goals and objectives, and thematic policy statements in place as well as procedures for implementation.

The Environment and Social Safeguards Policy provides the basis of UNRA's Environment and Social Management System (ESMS). It requires that all employees, contractors, consultants and sub-contractors comply with the Policy while undertaking work for UNRA.

5.3.2 Stakeholder Data Management Systems

UNRA uses its Land Acquisition Management System (LAMS) and ROWMIS data management systems for recording and managing important stakeholder information to support the Project implementation.

The LAMS system provides guidance on the management of land acquisitions, including:

- A review of the legal and institutional framework, community consultations and surveys required, and compensation strategy as well as actual compensation estimates;
- Survey and valuation details, including how to define compensation principles and rates; and
- Compensation and expropriation, including necessary approvals, payment of compensation to Affected Persons and transferring of land titles together with deed plans to UNRA.

This system applies to all aspects of the acquisition process associated with road reserves, and defines the roles and responsibilities of all parties involved in the implementation process.

In support to this, ROWMIS is a tool that has capabilities for maintaining linked records of Affected Persons and aggrieved parties regarding information on their affected land / assets, compensation and entitlements (including delivery dates), stakeholder communications and notices, logged grievances, and any supporting documentation. It is the main tool for registering grievances for the Project and is linked to UNRA's public online Grievance Web Portal.

5.3.3 Broad Stakeholder Engagement Strategy

UNRA has outlined a broad stakeholder engagement strategy for the KJE PPP Project in the following documents:

- KJE Project Broad Stakeholder Engagement Plan (UNRA, version unspecified);
- Affected Persons Verification and Compensation Disclosure Plan (UNRA, February 2017b);
- Disclosure and Verification Report for KSB Vol 1 Compensation (UNRA, March 2017c); and
- UNRA Grievance Redress Mechanism.

The above documents have been considered in the development of the consultation approach for the ESIA, where applicable.

5.4 Stakeholder Identification and Analysis

5.4.1 Stakeholder Identification

Identifying key stakeholders and understanding their specific needs and expectations of the Project is critical for an effective consultation and engagement strategy. This information can then be used to tailor engagement to each type of stakeholder. As part of this, it is important to identify individuals and groups who may find it more difficult to participate, as well as those who may be differentially or disproportionately affected by the Project because of their marginalised or vulnerable status.

Key stakeholder groups for the Project can be broadly categorised as per Table 5-1.

Table 5-1: Categories of key stakeholders

Category	Group	Type of Stakeholders
Communities	Affected communities / persons	*Affected communities*: Defined as towns, villages, and wards affected by loss of land/assets (or access to land/assets), noise and dust impacts; surrounding villages; host communities for Project resettlement. *Affected Persons*: Consists of persons who would be affected by loss of land/assets/livelihoods (or access to land/assets/livelihoods) due to the Project. This includes displaced residents that will need to be relocated. *Villages or groups of households losing joint / community assets*: This consists of groups or individuals in villages with communal land affected by the Project. Examples of community assets expected to be disturbed by the Project include worship sites, burial sites, cemetery, etc. *Vulnerable groups*: This consists of vulnerable people potentially disadvantaged by the Project, potentially including minority groups, the elderly, disabled and sickly people, single mothers or widows with young children, etc.
	Host and surrounding communities	Surrounding towns, settlements and villages that may host relocated Affected Persons or have some interest or influence on the Project.
Businesses, community facilities and utility/infrastructure owners	Affected businesses	Small, medium or large businesses that will have an indirect or direct loss of land / assets or income due to the Project.
	Affected community infrastructure owners	Owners of community buildings or facilities including schools, churches, medical facilities, markets and recreational facilities which may be directly or indirectly affected by the Project.
	Affected utility/infrastructure owners	Government-owned or private utility/infrastructure owners directly or indirectly affected by the Project, including for railways, telecommunications, electricity and water distribution, power transmission, local roads, flyovers, and sewerage facilities.
	Nearby development proponents/owners/managers	Includes significant development proponents and operators in vicinity of the Project that may affect or be affected by the Project. Further detail on these projects is also provided in Chapter 21.

Category	Group	Type of Stakeholders
Government	Local Level Governments	Relevant government officials from affected districts (Kampala, Wakiso, Mukono and Buikwe) as well as the Kampala Capital City Authority (KCCA).
	Lower Local Governments	Sub counties, Divisions, Wards, Cells and Parishes.
	Regulatory Authorities	Regulatory authorities responsible for overseeing coordination and management of potentially affected utilities and infrastructure including railway, power transmission and distribution, and water supply and distribution, etc.
	National Government	Relevant national government authorities including lead agencies such as the National Environment Management Authority (NEMA) of Ministry of Water and Environment as well as other important/advisory agencies. The Buganda Land Board is also a professional body set up by His Majesty the Kabaka of Buganda to manage land and properties returned under the Restitution of Assets and Properties Act of 1993.
Committees	Committees for Grievances, Compensation and Resettlement	Committees involved in the resolution of Project related grievances, compensation and resettlement of Affected Persons. This should include key representative members from affected communities (including host communities), community leaders, local governments, community organisations, and NGOs.
Civil society organisations	Non-government organisations (NGOs)	Civil society organisations in Uganda actively operating in the environs of the Project, such as Nature Uganda and WCS. Other NGOs and aid projects working within the affected districts will be considered as necessary for consultation throughout the life of the Project.
	Mass organisations	Mass organisations with representatives at national, district and local levels across Uganda, such as Uganda Women's Union, Youth Union, etc.

A list of stakeholders for Phase 1 of the KJE Project is outlined in Table 5-2, derived from UNRA's broader stakeholder engagement strategy and ESIA/RAP work undertaken from 2011 to 2018. The list of stakeholders will continue to evolve over the life of the Project. UNRA will consider on a periodic basis surrounding villages that may be indirectly affected throughout the life of the Project.

Table 5-2: List of key Project stakeholders identified during the ESIA process

Institutional Stakeholders	Private Sector Stakeholders	Other Stakeholders
National Government: <u>Ministries and Agencies</u> Ministry of Water and Environment (MoWE) National Environment Management Authority (NEMA) Ministry of Tourism, Wildlife and Heritage (MTWH) (including Department of Museums and Monuments) Ministry of Gender, Labour and Social Developments (MoGLSD) Ministry of Local Government Department of Occupational Safety and Health Uganda Investment Authority Wetland Protection Unit National Forestry Authority (NFA) Ugandan Wildlife Authority (UWA) Directorate of Water Resources Management (DWRM) Ministry of Trade Minister for Culture, Disabled Persons, Antiquities, Social and Clan Affairs <u>Steering Committee for KJE PPP Project</u>	Affected Businesses: Shoprite Lugogo Shell Petrol Station, Nakawa Total Petrol Station, Nakawa Nakawa Market Vendors City Oil Petrol Station, Nakawa Spear Motors Nakawa Coin Car Bond, Nakawa (Coin Ltd) Jambo Car Bond, Nakawa Uganda Industrial Research Institute (UIRI) CONCORP Kyambogo Petrol Station Uganda Manufactories Association (UMA) Daks Couriers Kampala Cement Factory Used Car Dealers Association Uganda Industrial Park Tour operators (UTA) including Kasenge Forest, Rainforest Lodge in Mabira, and tour drivers, etc. Megha Industries Adman Source VIVO Energy MTAC	Affected Communities: Affected villages along the project in Makindye, Nakawa, Kiira, Mukono and Buikwe (including Kasokoso and other informal settlements) Affected Persons Vulnerable groups (including the elderly, sick and disabled people, female-headed households with young children, etc.) Host communities for relocation sites Surrounding communities Local Leaders: Traditional (Saza chiefs) leaders Religious (Pastors, Parish Priests, Lay Reader, Catechists, Mufti) leaders Community leaders Inter Religious Council of Uganda (IRCU) / Cultural Leaders International Organisations and NGOs:

Institutional Stakeholders	Private Sector Stakeholders	Other Stakeholders
Ministry of Justice and Constitutional Affairs (MOFCA) Ministry of Lands, Housing and Urban Development Ministry of Works and Transport (MoWT) Ministry of Finance, Planning and Economic Development (MoFPED) Other Members of parliament for Mukono, Kampala, Wakiso, Buikwe district Chief Government Valuer (CGV) Mukono District Technical Planning Committee Wakiso District Technical Planning Committee Kampala Capital City Technical Planning Committee Buganda Land Board (BLB) Regulatory Authorities: Electricity Regulatory Authority (ERA) Uganda Railways Corporation from Ministry of Works and Transport Directorate of Water Resources Management (DWRM) Local Governments: District Level Local Governments (Kampala, Wakiso, Mukono and Buikwe) Kampala Capital City Authority (KCCA) District Departments of Natural Resources and Community Development Departments Lower Local Governments: Division Level Governments (Nakawa, Makinkye) Local Council Level Local Governments (Wakiso, Mukono and Buikwe) Municipalities (Kiira) Affected wards, cells, sub counties, and parishes Committees Grievance Management Committee RLRP Implementation Advisory Committee Community Based Grievances Management Committees (CGBMCs) Road Committees Support Services: Uganda Police International Partners: Development Partners European Union (country office) Agence Française de Développement	Master Industries Kyadondo Rugby Club Uganda Small Scale Industries Association DFCU Group Shumuk Group HRNJ City Tyres Yoshino Rehman Car Retailers, including Auto City Kacita UG. Others to be confirmed Local businesses and service providers: Various businesses and service providers with a potential commercial interest Affected Utility/Infrastructure Owners: UNRA National Water and Sewerage Corporation (NWSC) Standard Gauge Railway Airtel (formerly Zain) Ministry of Information and Communications Technology (ICT) MTN Uganda UMEME / Rural Electrification Authority (REA) Warid Telecom Uganda Telecom Limited (UTL) Uganda Electricity Transmission Company Limited (UETCL) Uganda Railways Corporation Affected Social Infrastructure Owners: Lugogo Rugby Grounds Management Mandela National Stadium Namboole Nakawa Market Various Schools, Medical Facilities, Institutions and Churches / Mosques (including cemeteries) Uganda Museum UWRA National Council of Sports Nearby development proponents/owners of: National Housing and Construction Company Limited (NHCCL) / Kireka Estates Kampala-Entebbe Expressway Bukasa Inland Dry Port Luzira Industrial Park Project Pipeline for Tullow/Total	IUCN Nature Uganda Wildlife Conservation Society (WCS) Nile Basin Initiative Secretariat Nile Basin Discourse Civil Society Organisations: Safe Way Right Way, Uganda Youth Network, Uganda Youth Council (UNYC), Action for Youth with Disabilities Uganda, Uganda Network of AIDS Service Organisations (UNASO), Uganda AIDS Support Organisation, Advocates Coalition for Development and Environment, Green Watch Uganda, The Human Rights Network, Uganda Child Rights NGO Network, Uganda Land Alliance, Land Equity Movement of Uganda, Uganda Women's Network, Uganda Water and Sanitation NGO Network, ACODE, Uganda Road Accident Reduction Network Organisation, UPHSA / Uganda Medical Association, Balfour Beatty, Uganda Road Sector Support Initiative, Human Rights Network Uganda, TASO Uganda, Busoga Kingdom, Uganda Law Society, UIPE, UWASNET, International Accountability project, Safeway consulting, FIDA-U (Uganda Association of Women Lawyers), Uganda Land Alliance (ULA), Uganda Women's Network (UWONET), National Association of Professional Environmentalists (NAPE), CONDON, KLA, Uganda Association for Impact Assessment (UAIA), MK Advocates, Advocates Coalition for Development and Environment (ACODE), UWR, ICPA, etc. Support for Informal Settlement Upgrading: UN-Habitat ACTogether Uganda Other Key Stakeholders: General public Academic and research institutions Contractor/Design team Investors and financiers Project company UNRA staff and contractors Consultants Media press Uganda Association for Impact Assessment (UAIA)

Institutional Stakeholders	Private Sector Stakeholders	Other Stakeholders
African Development Bank (AFDB) Environmental and Social Advisor International Finance Corporation (IFC) National Mass Organisations: Women's Union Youth Union Uganda Aids Commission National Association of Professional Environmentalists (NAPE) National Association of Women Organisations Uganda Association of Women Lawyers (Federacion Internacionnal de Abogadas FIDA)		

Source: Adapted from KJE ESIA (ICS, 2015a) and KSB ESIA (ICS, 2015b).

5.4.2 Stakeholder Analysis

A preliminary stakeholder analysis conducted by UNRA in March 2017 is summarised in Table 5-3 below. The analysis is based on the broader stakeholder engagement strategy established for the KJE Project.

Table 5-3: Preliminary Stakeholder Analysis Register

No.	Group	Stakeholder(s)	Description and Key Attributes	Impact on Project	Impacted by Project	Current State	Desired State	Issues, Opportunities and Risks	Mitigation Strategies and Actions	Relevancy?	
										ESIA	RAP
1.	International level stakeholders	EU, AfDB, IFC, etc.	- Support in project financing - Mandated to ensure international environmental and social safeguard standards for the project	- May withhold funding if project is not compliant - Can lead to project delays	- Provide security for investors' funding - Liable for project impacts and risks	Moderately engaged	Fully Engaged	- Can offer technical support to project activities - Can act as a conduit between the project and international bodies	- Involve them in project implementation - Share project updates and documentation - Hold regular experience sharing meetings with them	✓	✓
2.	National level stakeholders	- Ministries - NEMA - UNRA - Uganda Museum - National Forest Authority - Media houses - Standard Gauge Railway - Inter Religious Council of Uganda / Cultural Leaders - MPs of affected areas	- Legally mandated to handle certain critical issues - Have direct stake in certain issues (cultural sites, forests, roads, environment) - Have a huge influence on the public - Disseminate critical information to relevant agencies and institutions	- Make decisions that may affect the project - Can be useful for partnerships - Can offer support and supervision	- Project may exacerbate some of their work in terms of activities and financing	Moderately engaged	Fully engaged	- Can offer technical advice - Can be used for sharing information - Can mobilise or demobilise for the project	- Hold workshops to inform them of their roles and responsibilities - Invite them to TV/radio talk shows to garner acceptance of the project - Sensitise them about environmental and social issues and risks from the project	✓	✓
3	Civil society organisations	Non-governmental organisations and mass organisations working in areas such as: - Child protection - HIV/AIDS - Environment and climate change - Livelihood related issues	- Have constant face to face interaction with local communities - Detailed understanding of ongoing issues and societal dynamics in the areas where they operate	- Can provide entry points for dialogue and participation with communities - Can offer partnerships - Can support the KJE team in information sharing - Can monitor and provide feedback	- Project may exacerbate some of their work in terms of activities and financing	Partly engaged	Fully engaged	- Can offer technical advice - Can provide financial or material support to communities - Can mobilise or demobilise for the project - Sensitise communities with accurate	- Hold workshops to inform them of their roles and responsibilities - Implement community based activities with them - Sensitise them about environmental and social issues and risks from the project	✓	✓

No.	Group	Stakeholder(s)	Description and Key Attributes	Impact on Project	Impacted by Project	Current State	Desired State	Issues, Opportunities and Risks	Mitigation Strategies and Actions	Relevancy?	
										ESIA	RAP
		- Biodiversity conservation - Gender equality - Youth promotion - Governance and capacity strengthening		on any issues transpiring				information about the project - Work closely with the project team to provide specific information in the areas they operate in			
4.	Local Governments	- KCCA - Mukono District - Wakiso District - Buikwe District	- In-charge of the day-to-day running of local governments - Have the mandate to implement critical activities (e.g. environmental permits, provide HIV/AIDS services, inspection of work places, etc.)	- Make decisions that may affect the project - Can be useful for partnerships - Can offer support supervision - Manage certain grievances and solve challenges that may be in their mandate	- The project may exacerbate some of their work in terms of activities and financing - The project may destabilise their normal work - The project may affect their local revenue base	Moderately engaged	Fully engaged	- Can offer technical advice - Can be used for sharing information - Can mobilise or demobilise for the project - Can provide support and supervision	- Hold workshops to inform them of their roles and responsibilities - Implement certain activities with them - Sensitise them about environmental and social issues and risks from the project - Invite them to TV/radio talk shows to garner support for the project	✓	✓
5.	Lower Local Governments	Affected: - Divisions - Wards - Cells - Sub counties - Parishes and Villages	- In-charge of the day-to-day running of the local governments - Have the mandate to implement certain critical activities - In charge of mobilising communities for government programmes - Facilitate bottom-up planning - Provide social justice to vulnerable communities	- Make decisions that may affect the project - Can be useful for partnerships - Can offer support and supervision - Manage certain grievances and resolve challenges within their mandate	- The project may exacerbate some of their work in terms of activities and financing - The project may affect their local revenue base - The project may destabilise their normal work	Moderately engaged	Fully engaged up to Namataba	- Can offer technical advice - Can be used for sharing information - Can mobilise or demobilise for the project - Can provide support and supervision	- Hold workshops to inform them of their roles and responsibilities - Sensitise them about environmental and social issues and risks from the project - Implement certain activities with them - Invite them to radio talk shows to garner support for the project	✓	✓

No.	Group	Stakeholder(s)	Description and Key Attributes	Impact on Project	Impacted by Project	Current State	Desired State	Issues, Opportunities and Risks	Mitigation Strategies and Actions	Relevancy?	
										ESIA	RAP
6.	Affected businesses	- All industries, factories, vendors, small businesses and farms affected along the project	- They provide significant economic activity and investments locally and regionally - They employ large numbers of people	- Can delay project activities - Can disagree with relocation and compensation process	- Loss of land, assets, property and livelihoods - Loss of employment/jobs for the communities	Not engaged	Fully engaged	- They can complement project activities as part of Corporate Social Responsibility - They can request large compensation	- Hold regular workshops with them to sensitise them about the project - Hold negotiation meetings with them		✓
7	Affected communities	- Affected villages and settlements - Affected Persons - Project Impacted Persons - Vulnerable groups	- They will be directly affected by the project - Will require relocation - May be exposed to various environmental and social issues due to the project - May experience loss of livelihoods, land and assets - May experience disruption in their day-to-day lives	- May delay project activities - Can threaten the project and staff - May destroy project property - May cause loss of funding to the project	- May suffer disruption in their day-to-day lives - May experience loss of services - May be exposed to various environmental and social issues due to the project - May experience loss of livelihoods, land and assets - May require relocation - May experience numerous grievances	Not engaged	Fully engaged up to Namataba	- Acceptance by affected communities is critical to the success of the project - Can provide key information into the project design and local contexts - They can provide feedback about project activities - They can provide input to developing solutions for challenges they are experiencing - Can threaten the project and staff	- Hold regular open community dialogues - Hold regular Radio talk shows to disseminate project information - Establish Grievance Management Committees - Clearly communicate grievance procedures - Sensitise them about environmental and social issues and risks from the project - Pay attention to issues of gender, HIV/AIDS, children, the elderly, poor households, and other vulnerable groups	✓	✓

Source: Adapted from the KJE Project Broad Stakeholder Engagement Plan (UNRA, October 2016 and updated March 2017).

5.5 Information Disclosure

UNRA has disclosed project information as part of formal and informal consultations with potentially affected communities, businesses and other stakeholders to assist them in understanding the Project before providing their inputs and feedback. This included providing information on: (i) the purpose, nature, and scale of the project; (ii) the duration of project activities; (iii) any risks to and potential impacts on concerned communities and proposed mitigation measures; (iv) the stakeholder engagement process in place; and (v) the grievance mechanism.

Methods for engaging stakeholders prior to the ESIA Update and which will continue include:

- Workshops
- Meetings with local leadership
- Community meetings
- Media sessions (e.g. radio, television)
- Billboards
- Posters, brochures and other information materials.

5.6 Stakeholder Consultation Completed to Date

Informal and formal consultations have been undertaken with relevant Government authorities, local community and stakeholders dating back to the 2011 feasibility and preliminary environmental and social investigations. These were undertaken in accordance with NEMA EIA Guidelines (1997, 2004) for seeking opinions and views on social and environmental aspects relating to the Project. The overall stakeholder consultation and engagement process focussed on:

9. Identifying and notifying stakeholders of the proposed project activities and the ESIA;
10. Establishing dialogue between the Project and stakeholders;
11. Collecting perceptions, concerns, and proposals from stakeholders relating to concerns with the development of the Project; and
12. Making provisions for incorporating stakeholder feedback into the planning and design of the Project.

Different stakeholders were identified based on whether they would be impacted or have an active/passive interest in the Project. A stakeholder was identified and categorised as an individual, group, or institution with a vested interest in the natural or productive resources of the Project area and/or who will potentially be affected by Project activities and have something to gain or lose if conditions change or stay the same. An attempt was made to identify all the primary and secondary stakeholders who have a vested interest in the KJE Project.

The scoping stage identified various stakeholders that were then consulted and engaged. Stakeholder consultations occurred in the affected districts of Kampala, Wakiso, Buikwe and Mukono; where engagements and consultations were conducted with Government (at national and local levels) and Local Council officials; religious, civil society and cultural leaders; potentially affected residents and businesses; and institutions.

The main purpose of these engagements was to identify and update concerns from earlier stakeholder engagements conducted, and to inform relevant stakeholders of the progress of the Project. The main method for consultations was consultation meetings and workshops as well as focus group discussions with major stakeholders along the proposed alignment (institutions/ manufacturers and selected individuals). Most of the

Affected Persons along the Project Footprint were given targeted questionnaires. Other methods included face-to-face and phone interviews.

In some instances, invited stakeholders declined participation in consultations. Efforts will be made to encourage important stakeholders to attend, including facilitation with transportation and meals. For institutions, some individuals raised concerns on an individual basis and not as the official stance of their institutions.

Table 5-4 summarises the main consultations undertaken for Phase 1 of the KJE Project with Government, private sector, affected communities and other stakeholders. Earlier consultations conducted by UNRA between 2011 and 2014 are described in Table 5-5. Full records of the consultations are provided in in the 'Consultation Records' technical appendix (Volume C).

Examples of consultative meetings with the various stakeholder groups are shown in Plates 5-1 to 5-6.

Table 5-4: Summary of consultations for Phase 1 of the KJE Project (including KJE Kampala – Namagunga, and KSB)

Consultation	Stakeholder	Period / Date	Purpose
Meeting with Division Leadership and NGOs	Nakawa Division, Kira Municipality, Mukono District, Makindye Division, Sabagado, Buikwe District	Oct 2016	Project sensitisation
Socio-economic survey	Nakawa Division, Kira Municipality, Mukono District, Makindye Division, Sabagado, Buikwe District	Nov – Dec 2016	Socio-economic surveys in affected communities
Community Consultation Meetings	Affected communities in the areas of: Kigaga Zone (21/11/2016) Masaja Kibira B Zone (23/11/2016) Mutungo Zone I and Zone III (24/11/2016) Mutungo Zone II and Zone VIII (24/11/2016) Kasenge A and Kasenge B community (29/12/2016) Nakaseeta Nagogye Sub-county Local Leadership (29/12/2016) Nakisungu Sub-county Local Leadership (29/12/2016)	Nov - Dec 2016	Inform stakeholder institutions about the project. Understand their perception of the project and main concerns / views. Seek their input on key aspects that the ESIA and RLRP should focus on.
Stakeholder Consultation Workshop with the Mukono Central Division Local Leadership	Mukono Central Division Local Leadership	Dec 2016	
Grievance Management	KCCA, Nakawa Division, Kira Municipality, Mukono District, Makindye Division, Sabagado, Buikwe District	Jan 2017	Select Grievance Management Committees and provide training
Disclosure consultations with villages for the 2.6 km KSB component	KSB: Upper Konge, Lower Konge, Lukuli zone 5, Nakinyuguzi, Kallus, Kigundu and Kigagga	Feb 2017	Disclosure and verification in selected villages along the KSB.
Stakeholder Consultation Workshop with Government Ministries, Departments and Agencies (MDAs)	Wetlands Management Department National Forestry Authority (NFA) Uganda Electricity Transmission Company Limited (UETCL) Chief Government Valuer (CGV) / Ministry of Lands, Housing and Urban Development National Environment Management Authority (NEMA) Standard Gauge Railway National Housing and Construction Company Limited (NHCCL) Ministry of Justice and Constitutional Affairs (MOJCA) Ministry of Water and Environment (MoWE) Ministry of Works and Transport (MoWT) Ministry of Lands, Housing & Urban Development (MLHUD) Ministry of Local Government (MLG) Ministry of Gender, Labor and Social Development (MGLSD)	May 2017-May 2018	Inform stakeholder institutions about the project. Understand their perception of the project and main concerns / views. Seek their input on key aspects that the ESIA and RLRP should focus on.

Consultation	Stakeholder	Period / Date	Purpose
	Ministry of Defence and Veteran Affairs (MODVA) National Water and Sewerage Corporation (NWSC) Buganda Land Board (BLB) Invited, but absent: Directorate of Water Resources Management Ministry of Trade, Industry and Cooperatives Ministry of Finance, Planning and Economic Development Ministry of Information and Communications Technology Ministry of Health Uganda Railways Corporation Uganda Wildlife Authority Uganda Police Workshop materials were subsequently shared with them.		
Stakeholder Consultation Workshop with Civil Society Organisations and NGOs	Civil Society Organisations included: Safe Way Right Way, Uganda Road Accident Reduction Network Organisation, UPHSA / Uganda Medical Association, Balfour Beatty, Uganda Road Sector Support Initiative, Human Rights Network Uganda, TASO Uganda, Wildlife Conservation Society (WCS), Busoga Kingdom, Uganda Law Society, UIPE, UWASNET, International Accountability project, Safeway consulting, FIDA-U (Uganda Association of Women Lawyers), Uganda Land Alliance (ULA), Uganda Women's Network (UWONET), National Association of Professional Environmentalists (NAPE), CONDON, KLA, Uganda Association for Impact Assessment (UAIA), MK Advocates, Advocates Coalition for Development and Environment (ACODE), UWR, ICPA, etc. Invited, but absent: Inter-Religious Council of Uganda (IRCU) Uganda Road Sector Support Initiative (URSSI) SGS Uganda Limited | SGS Automotive Uganda Limited, Uganda Youth Network (UYONET) National Youth Council Action for Youth with Disabilities Uganda (AYDU), Uganda Network of AIDS Service Organisations (UNASO) Uganda AIDS Commission Secretariat, Greenwatch Uganda Uganda Child Rights NGO Network Land and Equity Movement of Uganda (LEMU) Nature Uganda IUCN, Uganda Country Office Institution of Surveyors of Uganda Uganda Society of Architects Engineers' Registration Board (ERB) Uganda Association for Impact Assessment Minister for culture, heritage, Royal tombs and tourism National Association of Women Organisations in Uganda (NAWOU)	Jun 2017	Inform stakeholder institutions about the project. Understand their perception of the project and main concerns / views. Seek their input on key aspects that the ESIA and RLRP should focus on.
Stakeholder Consultation Workshop with District Technical Planning Committees	Wakiso District Technical Leadership Mukono District Technical Leadership Kampala Capital City Technical Leadership	Jun 2017	Inform stakeholder institutions about the project. Understand their perception of the project and main concerns / views. Seek their input on key aspects that the ESIA and
Stakeholder Consultation Workshop with the Private Sector	Businesses included: Megha Industries, Adman Source, VIVO Energy, MTAC, Nakawa Market Association, Master Industries, Kyadondo Rugby Club, Uganda Small Scale Industries Association, Uganda Manufacturers Association (UMA), DFCU Group, CONCORP, City Oil, Shumuk Group, HRNJ, City Tyres, Yoshino, Adman, TOTAL, Coin Ltd,	Jun 2017-Mar 2018	

Consultation	Stakeholder	Period / Date	Purpose
	Rehman, UWRA, National Council of Sports, Car Retailers, Auto City, Kacita UG, Sezibwa Sugar, Shoprite etc.		RLRP should focus on.

Table 5-5: Summary of earlier ESIA consultations undertaken (2011-2014)

Consultation	Stakeholder	Period / Date	Purpose
Kampala-Jinja Expressway Mainline (2011 – 2015)			
Preliminary community consultative and sensitisation meetings	Potentially affected communities in the areas of: Kiira, Seeta, Nakawa, Banda, Kireka, Mukono, Namagunga, Lugazi, Njeru, Kampala, Buikwe,	Aug-Sep 2011	Advise and inform potentially affected communities of the project and provide relevant information ESIA/RLRP processes
Preliminary consultative meetings with lead government agencies	Ministry of Gender, Labour, and Social Development (Occupational Safety and Health Department)	Sept 2011	Advise about the project Seek input for key aspects that the lead agency would be interested in highlighting during the ESIA study
Preliminary consultative meetings with potentially affected businesses	Potentially affected businesses, including: Shell Naguru, Nakawa Market Vendors Association, Nakawa Park/UTODA Coordination Office,	Aug 2011	Inform about the project Seek their input and concerns on key aspects
Preliminary consultative meetings with district and town council authorities	Officials from affected districts of Mukono, Buikwe Officials from Lugazi Town Council	Aug-Sep 2011	Inform about the project and obtain relevant information Seek their input and concerns on key aspects
Targeted questionnaires for institutions	Ministry of Water and Environment (Directorate of Environment Affairs) National Forest Authority (NFA) MTN Uganda Airtel Uganda Uganda Electricity Transmission Company Limited (UETCL) National Water & Sewerage Corporation Kampala City Council Authority (KCCA) Lugazi Town Council Njeru Town Council Mukono Town Council Makerere University (Department of Biological Sciences, regarding information on the protected bird species *Nahans Francolin*) NGOs such as Nature Uganda Potentially affected business: CMC Motors, Nile Breweries, Spear Motors, Uganda Manufacturers Association (UMA), Shell Uganda, Total Uganda, Coin Limited Inland Car Depot, YAUSA, Riley Packaging; Seeta High School, UNRA Training School Kyambogo, Mount St Mary Managunga, Stirling, Lugazi Sugar Corporation, Grow More Seeds Factory, Tian Tang Group,	Aug 2011-May 2014	Inform about the project and obtain relevant information Seek their input and concerns on key aspects
Preliminary consultative meetings for the ESIA/RLRP processes	National Forest Authority (NFA) NGOs including Nature Uganda	May 2014	Inform about the project and obtain relevant information Seek their input and concerns on key aspects

Consultation	Stakeholder	Period / Date	Purpose
Kampala Southern Bypass (2013 – 2015)			
Consultation meetings for the preliminary ESIA stage	Project affected communities National Forestry Authority, Ministry of Water and Environment (MWE) Ministry of Gender Labour and Social Development Department of Museum and Antiquities, Ministry of Tourism, Trade and Industry National Environment Management Authority (NEMA) Wetland Management Department, MWE Uganda National Roads Authority (UNRA) Kampala Capital City Authority (KCCA) Headquarters Nakawa Division Headquarters (Mayor and Technical people) Makindye Division Headquarters (Mayor and Technical people) Director Environment Affairs, Directorate of Environment – Ministry of Water and Environment Kiira Division Headquarters (Mayor and Technical people)	2013	Inform stakeholder institutions about the project and seek their input on key aspects that the ESIA should focus on.
Meeting with Sector Agencies	Wetlands Management Department staff Department of Museums and Monuments staff National Forestry Authority (NFA) Directorate of Water Resources Management (DWRM) ICS Design team UNRA staff	2013	Inform stakeholder institutions about the project and seek their input on key aspects that the ESIA should focus on. Through this meeting, a number of issues were discussed covering sectoral aspects such as wetlands, compensation framework, need to control community access to wetlands once the road is constructed, ensuring water flow in wetlands is guaranteed during and after road construction, management of cut to spoil which is sometimes indirectly used by the communities to reclaim wetlands amongst other considerations.
Preliminary sensitisation meeting during scoping stage	National Forestry Authority (NFA) Ministry of Water and Environment (MWE) Ministry of Gender Labour and Social Development Department of Museum and Antiquities Ministry of Tourism, Trade and Industry (MTTI) National Environment Management Authority (NEMA) Wetland Management Department, MWE Uganda National Roads Authority (UNRA) Kampala Capital City Authority (KCCA) Headquarters Nakawa Division Headquarters (Mayor and Technical people) Makindye Division Headquarters (Mayor and Technical people) Director Environment Affairs, Directorate of Environment – Ministry of Water and Environment Kiira Division Headquarters (Mayor and Technical people) Project Consultant team	Feb-Apr 2013	Obtain information related to Kampala Southern Bypass Inform stakeholder institutions about the project Seek their input on key aspects that the ESIA should focus on.

Consultation	Stakeholder	Period / Date	Purpose
Government consultations	Nakawa Division, Makindye Division and Kira Division (Wakiso District, Sabagabo)	Jul 2015	Sensitisation meetings

5.6.1 Information disclosure

UNRA has disclosed project information as part of formal and informal consultations with potentially affected communities, businesses and other stakeholders to assist them in understanding the Project before providing their inputs and feedback. This included providing information on: (i) the purpose, nature, and scale of the project; (ii) the duration of project activities; (iii) any risks to and potential impacts on concerned communities and proposed mitigation measures; (iv) the stakeholder engagement process in place; and (v) the grievance mechanism.

Methods for engaging stakeholders prior to the ESIA Update and which will continue include:

- Workshops
- Meetings with local leadership
- Community meetings
- Media sessions (e.g. radio, television)
- Billboards
- Posters, brochures and other information materials.

5.6.2 Outcomes of ESIA consultations

Key issues and concerns raised by the local community, private sector, government authorities (local and national), civil society organisations and institutions during ESIA consultations are discussed in detail in the Stakeholder Engagement Plan (Volume D). Full records of the consultations are also presented in the 'Consultation Records' technical appendix (Volume C).

In general, stakeholder feedback has been supportive of the Project provided fair compensation is paid to those who experience losses as a result of the land acquisition for the Project. Most stakeholder feedback and concerns related to ensuring that Affected Persons are adequately and promptly compensated. Both the local community and local leaders had expectations for employment opportunities to be created for local people during the construction phase. The private sector stakeholders were primarily concerned with ensuring compensation for businesses affected (including impacts on access) and the potential for disruption of utility services for businesses. Other stakeholders have identified the need for the wetlands in the vicinity of the Project to be protected. Consultations with villages and businesses affected by the Project have also allowed them to provide input into the development of livelihood restoration strategies for the Project through identifying key priorities.

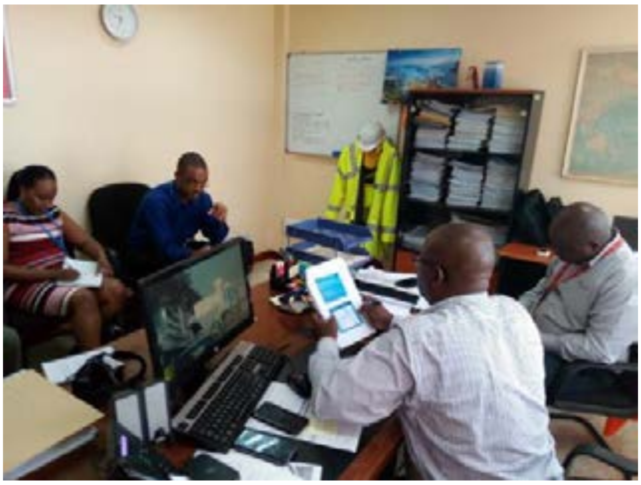


Plate 5-1: Consultation with Kampala Capital City Technical Planning Committee

Plate 5-2: Consultation Workshop with Government Ministries, Departments and Agencies

Plate 5-3: Stakeholder engagement with Wakiso District Leadership

Plate 5-4: Stakeholder engagement with Mutungo and Kasokoso community

Plate 5-5: Consultation with local leaders

Plate 5-6: Consultation with local leaders at boundary of Makindye and Nakawa Divisions along rail crossing of the KSB road component

5.7 Ongoing Stakeholder Engagement Program

5.7.1 Stakeholder Engagement Approach

Ongoing stakeholder engagement with authorities, Affected Persons, affected communities, and host communities during the Project development process will be critical.

As part of the finalisation of the Concession Agreement, an Operational Stakeholder Engagement Plan is to be developed detailing the ongoing engagement activities for the Project during the Concession Period. This operational plan should be developed by the construction contractor/concessionaire in collaboration with UNRA. The plan should provide a detailed schedule and responsibilities for the ongoing consultation activities, including planned meetings and implementation of information disclosure activities.

Once funding is in place for the acquisition of the concession, a Stakeholder Engagement Plan specific to the livelihood restoration program will also need to be developed (referred to herein as 'Initiatives SEP'). Targeted consultations for vulnerable groups should be specifically considered the planning process.

UNRA's approach to stakeholder engagement, consultation and disclosure will follow the methods of the IFC's Stakeholder Engagement Good Practice Handbook (IFC, 2007), including:

- **PLAN AHEAD AND INFORM** - provide the community with balanced and objective information to ensure they understand the nature of the project, any changes, and the likely impacts, benefits and long-term legacy of the project.
- **CONSULT USING BASIC PRINCIPLES OF GOOD PRACTICE** – engage the community by providing mechanisms for two-way information flows between UNRA and the local community.
- **INVOLVE** - work directly with the community throughout the process to ensure community issues and concerns are consistently understood and considered.
- **COLLABORATE** - foster partnerships with the community whereby input is sought during key decision-making processes.

In addition to fulfilling legislative obligations, a transparent, informative and two-sided communication process for stakeholder engagement will bring the following advantages to the Project:

- Local people can bring invaluable knowledge to the decision-making process. By seeking their ideas and inputs, the Project may have better, cost effective mitigation outcomes;
- By ensuring local people and stakeholders are fully informed, the risk of project delays is reduced;
- Good consultation builds productive and enduring relationships between the proponent and local communities;
- Reduce the potential for community disaffection that can result from a lack of understanding of the Project and the permitting process; and
- Unrealistic demands and expectations can be avoided to ensure long-term community relationships.

Stakeholder consultation fatigue and issues arising from sensitive stakeholders such as in the Kasokoso are a key risk to effective engagement and participation. These risks should be managed through:

- Ensuring all engagement activities are integrated to minimise the number of meetings required;
- Engaging with local leadership to help with communicating information and managing grievances;
- Improving the level of community support and participation through establishing committees on a local community level;

- Facilitating access to important project information and grievance mechanism by setting up Project offices and information centres in affected communities along the road alignment; and
- Communication of the grievance mechanism and conflict resolution process as per Section 5.9.

UNRA will continue ongoing engagements with stakeholders who need to be actively engaged on a regular basis throughout the pre-construction, construction and operations phases as appropriate. As well as meetings, a range of consultation and disclosure tools will be used as outlined in the following sections.

5.7.2 Consultation and Disclosure Tools

In addition to fulfilling legal obligations, UNRA is committed to ensuring stakeholder engagement is carried out in line with recognised international environmental and social standards such as the IFC Sustainability Framework (2012) and AfDB Integrated Safeguards Systems (2013). UNRA will include use of the various tools described below for effective engagement that is rooted in a transparent, participatory process. The tools will aim to enhance interest in the Project and develop productive relationships that lead to better project outcomes. Ongoing consultation will build off existing Government and stakeholder relationships established by UNRA.

Public disclosure will be undertaken in accordance with Section 7 of Ugandan EIA Guidelines for Road Projects (NEMA, 2004), AfDB Integrated Safeguard Systems (Operational Safeguard 1), and IFC Performance Standard 5. Information will be captured in a transparent, reliable and representative way. Key participants for public consultative meetings will include those most affected by the Project, including the disadvantaged and poor, women, responsible agencies for impact management, and the affected private sector.

General project information will be publicly disclosed by UNRA in a regular and consistent manner. Methods for disclosure will include:

- Notice Boards / Community Liaison Offices
- Website
- Toll-free Phone Line
- Mass media
- Open Days
- Newsletters and emails
- Formal and informal consultations with affected communities
- Household surveying and focus group meetings
- Annual public meetings
- Public hearings

An emphasis on accessibility is made, particularly around disclosure of ESIA documents for community review.

Various strategies will be employed to effectively engage and collaborate with stakeholders throughout the life of the Project, including:

Stakeholder Engagement Training for Project Staff (and Contractors)

Stakeholder engagement training should be provided to Project staff and contractors tasked with engaging directly with affected communities.

Formal Coordination with Government Agencies

UNRA will coordinate and work closely with relevant government agencies for the implementation of social and environmental mitigation activities, formal compensation and Grievance Management Committees, as well as for ongoing monitoring activities. Memorandums of Understanding (MoUs) will be developed between the Construction Contractor/Concessionaire and the relevant government agencies where required.

Participatory Livelihood Restoration and Social Initiatives

As part of the RLRP implementation process, Affected Persons will be actively engaged in their local language for input into the planning and decision-making regarding the implementation of social mitigation measures for resettlement, compensation and livelihood restoration. Suggestions and inputs will be sought through open dialogue and regular engagements with affected communities, and feedback incorporated into the Project design where practical. Where host communities are affected by resettlement decisions, representatives of these communities will be included in these consultations as per the IFC Handbook for Preparing a Resettlement Action Plan (2002). The participation of Community Based Grievances Management Committees (see Section 5.8.6) in the decision-making process will play an important role between the local community and the Project for negotiating resettlement compensation options and designing strategies for restoration and development of livelihood restoration strategies. UNRA will also collaborate with local governments and city authorities for the planning of community development in vicinity areas where people are resettled.

Engagement with other stakeholders

UNRA will consider entering into collaborative partnerships where mutually beneficial. Interested stakeholders such as active NGOs and community organisations operating in the affected areas will be engaged as appropriate. The RLRP Implementation Advisory Committee will include representative members from community organisations and NGOs involved in support of resettlement activities to ensure engagement and potential collaboration.

5.7.3 Reporting and Formal Information Disclosure

Formal reports for the GoU and other stakeholders are summarised below. UNRA will consult with relevant officials for the content required.

Project Environmental and Social Documentation

In accordance with Ugandan laws, the Updated ESIA and RLRP along with supporting Project documentation will be submitted to the GoU and publicly disclosed by UNRA. After the ESIA and RLRP studies have been completed, UNRA will submit copies of the Environmental and Social Impact Statement (ESIS) to NEMA for review and approval in consultation with other Lead Agencies. All project information will also be made available in strategic locations along the Project alignments for the local community, Affected Persons and other interested stakeholders. It may then be inspected by any person within a reasonable time. UNRA will also publicise the ESIS through various media for public comment.

External Reporting

Project stakeholder engagement activities should be publicly disclosed through regular reports distributed to the Government and interested Project stakeholders. This type of reporting will provide a transparent record of the relationship between the Project and its stakeholders. Project reporting could include:

- General Monthly Progress Reports;
- Environmental and Social Monthly Progress Reports; and
- Annual Sustainability Reports.

Internal Reporting

A review mechanism will be in place to monitor and evaluate stakeholder engagements and their effectiveness. A tracking sheet of the different engagements will be designed to input the different information arising from the engagements. This will involve details such as who is being engaged, who is engaging, when, how and when the next engagements will take place.

5.7.4 Future Stakeholder Engagement Activities for RLRP Implementation

5.7.4.1 Verification and Disclosure Process

For the ESIA, stakeholder engagement meetings, asset valuation and socio-economic baseline surveys have been conducted. Following this, the verification and disclosure stage will commence. This stage will be guided by a plan to be developed by UNRA which will detail the verification, disclosure and grievance management processes. The verification and disclosure strategy will mainly comprise the following steps:

13. Constituting the verification / disclosure team;
14. Verification / disclosure process;
15. Mobilisation and sensitisation;
16. Signing of the agreements;
17. Compensation payment; and
18. Grievances resolution.

Verification and disclosure centres will be established in central places easily accessed by all Affected Persons, with each centre serving at least two villages. The RLRP Implementation Advisory Committee will also be established to ensure the RLRP process is compliant with Ugandan legislation and international standard requirements.

5.7.4.2 Consultations for Livelihood Restoration

As described in the RLRP, seven key livelihood restoration initiatives will be implemented for the Project as follows:

1. KJE Large Business and Industry Transition Initiative
2. KJE Small Business Transition Initiative
3. KJE Agricultural Extension Initiative
4. KJE Community Assistance Initiative
5. KJE Corridor Low Cost Housing and Urban Renewal Initiative
6. KJE Kinawataka Sustainable Wetland Management Initiative
7. KJE Nakivubo Sustainable Wetland Management Initiative

Targeted consultation activities with the key stakeholders related to each of these initiatives will be conducted in the process of the detailed design and implementation of the livelihood restoration activities. It is expected that these consultations will be led by an appropriately experienced organisation employed to coordinate the livelihood restoration process, who will be engaged by UNRA. The consultations should include engagement with key NGOs active in the area such as ACTogether Uganda, Slum Dwellers International and Cities Alliance. Where appropriate, consultations should also be conducted with managers of other Projects that may interact with the KJE Project such as the SGR Project.

Once funding is in place for the acquisition of the concession, a Stakeholder Engagement Plan specific to the livelihood restoration program will need to be developed ('Initiatives SEP'). The Initiatives SEP should detail the specific consultation activities to be conducted for each of the seven livelihood restoration initiatives, as well as schedules and specific roles and responsibilities for each consultation activity. Working groups for each of the initiatives should be established were required to guide the development of the stakeholder consultation and engagement activities. Vulnerable groups will need to be specifically considered in the planning of stakeholder engagement, and specific consultations held for vulnerable groups where required.

5.8 Roles and Responsibilities for Ongoing Stakeholder Engagement

5.8.1 UNRA

UNRA is committed to continuing an open dialogue with its stakeholders as the Project progresses. The Consultant team will lead stakeholder engagement activities for the ESIA Update in which UNRA will actively participate. Following completion of the ESIA Update, UNRA's Head Department of Environment and Social Safeguards in coordination with the appointed RLRP Implementation Team will have the overarching responsibility for implementing the SEP and ensuring sufficient resources are available for ongoing stakeholder engagement activities.

UNRA will lead the stakeholder engagement activities, disclosure of information, resettlement and compensation process, community support programs, community grievance management, and continued improvements to the SEP (as appropriate). It will also be responsible for engaging with all levels of Government as well as require Contractors to develop and implement appropriate community engagement programs to complement UNRA's mechanisms. In particular, an external organisation/consultant will be needed to coordinate the consultations for the livelihood restoration initiatives to be implemented for the Project.

For ongoing engagement, UNRA should employ a Project Community Relations Officer or equivalent responsible for managing all project related stakeholder engagement activities on behalf of UNRA. The Community Relations Officer will be supported by a community relations team.

The Community Relations Team should act as a conduit for the local community to gain information about Project activities and air any concerns or grievances following the Grievance Procedure outlined in the SEP (Volume D). The Community Relations Team should ensure that stakeholder engagement involves a cross-section of Project affected people with different ethnicities, ages, gender, etc. to ensure opinions and concerns of all groups are adequately considered.

5.8.2 Construction Contractor/ Concessionaire

The main roles and responsibilities of the Construction Contractor / Concessionaire in relation to stakeholder consultation and engagement will include:

- Conduct consultations with key stakeholders regarding the detailed design of the Project and the methods of implementation of the mitigation measures outlined in the ESIA where required;
- Communicate grievances received regarding construction and operations activities to UNRA via the Grievance Mechanism (see Section 8); and
- Participate in key stakeholder engagement activities related to Project construction activities, and the operation of the Project, during the Concession Period.

5.8.3 Grievance Management Coordinator

UNRA's appointed Grievance Management Coordinator should be responsible for:

- Coordinating the work of Grievance Management Committees, CBGMCs, Resettlement Committees and CLOs towards the successful resolution of grievances;
- Ensuring grievances are logged and addressed following established grievance procedures;
- Responding to complex grievances and developing adequate solutions for issues that can be resolved;
- Reporting to the aggrieved parties about developments regarding their grievances and decisions taken;
- Monitoring and evaluating progress of ongoing grievances;
- Ensuring Project and Local Government staff engaged in grievance management are adequately trained in the grievance procedures; and
- Reporting on informal disputes and grievances to UNRA and the RLRP implementation unit on a regular basis.

5.8.4 Community Liaison Officers (CLOs)

The Community Liaison Officers (CLOs) will be in charge of addressing simple grievances from receipt of grievance to resolution. The CLO will also be responsible for monitoring and reporting of the resolution process, and disseminating results to the project team and Community Based Grievance Committee.

Day-to-day activities may include receiving, evaluating, resolving simple grievances, and assigning complex grievances. In instances of complex grievances, the CLO will assign grievance resolution to the technical Resettlement Implementation Unit, which will comprise a project sociologist, valuers, compensation accountant and legal team. To ensure all adequate representation and accessibility to the grievance mechanism, two CLOs will be deployed in Makindye.

5.8.5 Grievance Management Committee

To enable a culturally appropriate and accessible grievance mechanism, UNRA will establish locally constituted Grievance Management Committees (GMCs) in all affected communities comprising representatives from key stakeholder groups. The committees will serve to resolve any disputes arising from the resettlement and compensation process. UNRA will develop the team including providing necessary training and equipment.

Grievance Management Committees will sit within established institutional Grievance Management Mechanisms, however will serve as external mediators for Project grievances, including those associated with resettlement and compensation issues. Land committees at local levels (Local Council 1, Parish, District Land Committee) were considered inadequate due to capacity and resource issues.

5.8.6 Community Based Grievances Management Committees (CBGMCs)

The purpose of CBGMCs is to serve as a channel for grievances between affected communities and the Project on a local level by working jointly with the Project's Resettlement Offices and RLRP Implementation Team, local government and community leaders. The role of the CBGMCs will be to resolve site specific grievances relating to local property ownership and inform on the progress and status of outstanding grievances that are being handled

by the Project team. UNRA will work closely with these committees to resolve any resettlement, livelihood restoration and compensation issues from the Project.

The CBGMCs can play a key role in engaging with the local community for negotiating resettlement compensation options, designing strategies for restoration and development of livelihood strategies, and monitoring overall implementation of the RLRP.

5.8.7 RLRP Implementation Advisory Committee

Due to the length of the expressway and the different types of stakeholders and land uses that will be affected, a community NGO with experience in resettlement will be selected to provide legal aid and guidance on the resettlement and compensation process through establishment and coordination of a RLRP Implementation Advisory Committee. UNRA is in the process of identifying a suitable NGO. This committee will work to ensure the process is compliant with Ugandan legislation on land acquisition and expropriation as well as respecting the requirements of AfDB Integrated Safeguard Systems (Operational Safeguard 2) and IFC Performance Standard 5 on Land Acquisition and Involuntary Resettlement.

The guidelines set out in the IFC Handbook for Preparing a Resettlement Action Plan (2002) require the committee to have input from representative members of affected communities (including host communities), community leaders, UNRA and relevant governments, Project sponsors, community organisations and NGOs involved in support of resettlement activities.

Further details of external groups involved in the resettlement and compensation process are provided in the updated ***RLRP*** for the Project (Volume D).

5.9 Grievance and Conflict Resolution Mechanism

The Project will consider and address stakeholder concerns, complaints and grievances through a formal Grievance Mechanism to ensure an open and transparent dialogue between the community and UNRA throughout the life of the Project. Community participation is important in resolving disputes and helping the Grievance Management Committees to address such issues. In general, most grievances can be settled with additional explanation efforts and through adequate mediation using customary dispute settlement mechanisms as appropriate or locally assembled mediation committees.

A grievance redress procedure has already been established by UNRA, as summarised in Figure 5-1. The process aligns with UNRA's overarching grievance redress mechanism and Land and Asset Management Systems, but does not impede access to judicial or administrative remediation. UNRA's existing grievance submission portal will continue to be used while ROWMIS will be used as the primary tool for registering and tracking grievances. The tool will capture details of the aggrieved person, nature of grievance, actions taken in response and timeframes, responsibilities, and any supporting communications and documentation. The comprehensive nature of the ROWMIS tool should ensure grievances are continually tracked for evaluation and managed appropriately through to resolution.

The Project grievance redress procedure is further discussed in the ***SEP*** and ***RLRP*** (refer Volume D).

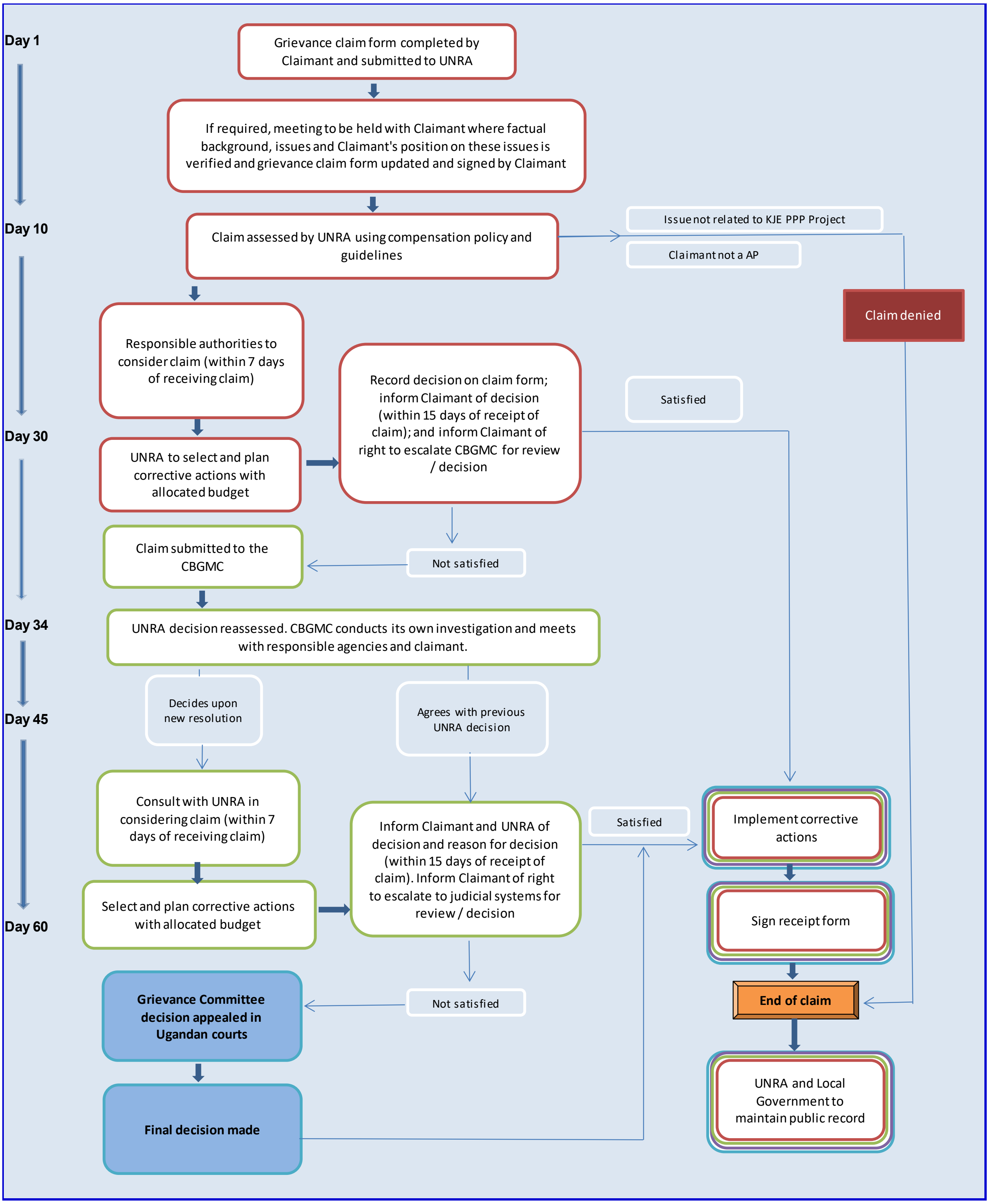


Figure 5-1: Project grievance resolution process

KJE PPP Project Phase 1 ESIA

CHAPTER 6 Risk Assessment

6. RISK ASSESSMENT

6.1 ESIA Risk Assessment Methodology

6.1.1 Methodology and Approach

This ESIA has utilised a risk-based approach to identify and assess the potential impacts of the Project. The outcomes of the risk assessment have also informed the technical studies conducted for the ESIA, and the development of management and mitigation measures for the Project. The methodology for this risk assessment is based upon ISO 31000 Risk management – Principles and Guidelines, 2009 and ISO 31010 Risk Management – Risk Assessment Techniques, 2009. This assessment also takes into consideration the requirements of IFC Performance Standard 1 - *Assessment and Management of Environmental and Social Risks and Impacts* (2012).

The risk assessment has been conducted prior to consideration of management and mitigation to identify the most significant potential risks. These risks are assigned rankings in order of magnitude / probability, in the absence of mitigation. Once initial risks have been assessed and ranked, proposed controls are identified to avoid or reduce the anticipated impacts. Control measures focus on either reducing the likelihood of occurrence or on decreasing the magnitude of the consequence to reduce the residual risk ranking to acceptable levels. The expected residual risks are generally lower than the initial risk ranking by one or two orders of magnitude.

Risks associated with the Project have been assessed for the following phases:

- Pre-Construction;
- Construction; and
- Operation.

The decommissioning phase has not been considered as the Project is not expected to be decommissioned (refer Chapter 3).

In addition, risks have been classified by thematic areas (i.e. physical, biological and social). The risk assessment focuses on the potential impacts of the Project as per the current design assessed in the ESIA and does not assess alternatives that are no longer being considered.

6.1.2 Risk Assessment Criteria

The criteria matrix used for the assessment is provided in Table 6-1 below and is based on standard ISO 31000 risk criteria (2009).

6.1.2.1 Likelihood

As per ISO 31000, Likelihood is defined as 'the chance of occurrence'. In risk management terminology, the word 'likelihood' is used to refer to the chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (such as a probability or a frequency over a given time period). Further definition of Likelihood rankings is provided in Table 6-1 and Table 6-2.

6.1.2.2 Consequence

As per ISO 31000, Consequence is defined as 'the outcome of an event affecting objectives'. As outlined in the ISO standards: an event can lead to a range of consequences; consequence can be certain or uncertain and can have

positive or negative effects on objectives; consequences can be expressed qualitatively or quantitatively; and the initial consequences can escalate through knock-on effects (refer to Table 6-3).

Table 6-1: Risk assessment criteria matrix with Likelihood and Consequence rankings

Likelihood		Consequence				
Level		1	2	3	4	5
		Very low Very minor risk	Low Minor risk with short-term consequences	Medium Medium risk requiring ongoing management	High Major risk / high financial, environmental and/or human loss	Extreme Major risk / long-term, very high financial, environmental and/or human loss
5	Constant Is expected to occur in most circumstances	5 Moderate	10 Moderate - High	15 Moderate - High	20 High	25 High
4	Frequent Will probably occur in most circumstances	4 Moderate	8 Moderate	12 Moderate - High	16 Moderate - High	20 High
3	Occasional Might occur at some time	3 Low	6 Moderate	9 Moderate	12 Moderate - High	15 Moderate – High
2	Rare Could occur at some time	2 Low	4 Moderate	6 Moderate	8 Moderate	10 Moderate - High
1	Improbable May occur in very exceptional circumstances	1 Low	2 Low	3 Low	4 Moderate	5 Moderate

Table 6-2: Summarised descriptions of Likelihood rankings

Likelihood Description		
Likelihood		**Summary**
1	**Improbable**	Doubt it could happen in present or even in a changing environment. Conceivable but highly improbable. The aspect / event may occur in very exceptional circumstances.
2	**Rare**	Very low likelihood of happening in present or even in a changing environment. The impact could occur at some time. The aspect / event has happened elsewhere under slightly similar circumstances.
3	**Occasional**	It could happen in present or even in a changing environment. Would not be surprised to see it happen. The aspect / event has occurred before here or in similar circumstances elsewhere.
4	**Frequent**	It probably will happen in present or even in a changing environment. The aspect / event is expected to occur. The aspect / event occurs during normal operations.
5	**Constant**	Happens frequently in present or even in a changing environment. The event occurs in most circumstances.

Each of the consequence rankings used are described in Table 6-3 in their respective environmental, social and health contexts along with rankings for monetary costs and schedule delays.

Table 6-3: Consequence descriptions

Consequence		Environmental	Social	Health
1	Very low	Slight / temporary impact on environment. Any amount contained within design requirements without additional impact. Or minor < 50 litre non-acutely hazardous spill or emission on or off site. Corrected < 1 day.	Slight impact on community well-being. Written / verbal complaint from community. Immediately rectifiable.	No immediate health effects but if prolonged causes health effects to one or more persons requiring first-aid treatment or having low-level impacts on quality of life or well-being. Immediately rectifiable.
2	Low	Low impacts on biophysical environment. Affects a small proportion of a non-endangered flora / fauna (including aquatic life) population but does not substantially affect other species dependent on it. Any amount contained within secondary containment, no additional impacts. Or < 500 litres of non-acutely hazardous spill or equivalent emission on site. Minor non-compliance resolved within one week.	Low but ongoing impact on community health / wellbeing. Attracts stakeholder concern at local level. Takes some time to resolve.	Health effects to one or more persons requiring first-aid treatment or having low-level impacts on quality of life or well-being.
3	**Medium**	Non-compliance(s). Impacts on biophysical environment, managed locally. Loss of >1 hectare of non-endangered flora or reversible impacts on non-endangered fauna. Any amount > 500 litres contained within area already impacted by mining. Quickly contained & corrected hazardous spills or emission on or off site. Requires < 2 weeks remediation.	Attracts stakeholder concern at prefecture/regional level but recovered quickly and without significant lasting reputational or relationship impacts.	Health effects to one or more persons requiring medical treatment and/or hospitalisation, exacerbating illness or causing quality of life impacts with respect to physical and mental health.
4	**High**	Significant non-compliance (against local or recognised international standards.) High local impacts on biophysical environment resolvable but up to $5M. Loss of endangered / highly regarded flora / fauna (including aquatic life). Significant contaminant outside containment but on mine site. Non-acutely hazardous spill (5000– 15,000 litres) / or equivalent emission off site.	National and international concerns. Sustained NGO / stakeholder activism resulting in reputational damage. Difficult to resolve quickly.	One or more human deaths, incapacitation or similar.
5	**Extreme**	Severe impacts on biophysical environment. Very difficult to resolve and remediation > $5M. Significant loss of endangered / highly regarded flora / fauna (including aquatic life). Acutely hazardous spill or equivalent emission on or off site.	Complete breakdown of relationship with key stakeholders. Sustained negative media coverage on a national and international level. Cessation or severe restriction of operations. Public outrage.	Multiple human deaths.

6.1.3 Risk Assessment Process

The methodology used for each step in the risk assessment process for the ESIA is outlined below. Figure 6-1 shows how the risk assessment process fits within the overall Risk Management Process.

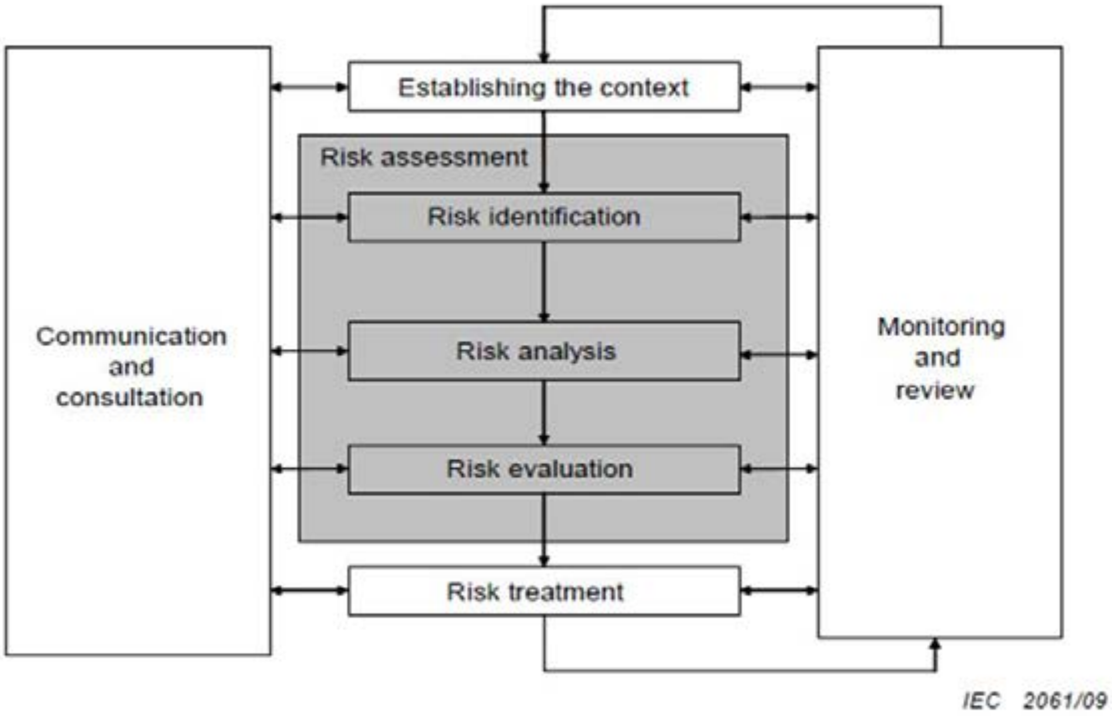


Figure 6-1: Risk Assessment Process (shaded) with the overall Risk Management Framework (ISO 31010)

6.1.3.1 Establishing the Context

ISO 31000
"Before starting the design and implementation of the framework for managing risk, it is important to evaluate and understand both the external and internal context of the organisation, since these can significantly influence the design of the framework."

Within the context of ISO 31000, a comprehensive review of internal and external factors was undertaken for this risk assessment. This included internal factors that will be under the control of UNRA (e.g. OHS) and external factors that are beyond UNRA's control to manage (e.g. natural disasters). The analysis of risk included collecting information from:

- Field and site visits;
- Consultations with relevant stakeholders (refer to ESIA Chapter 5);
- Available Project information, including:
    - URS (2011) and ICS (2015) feasibility and engineering studies;

- ESIAs and associated plans for the KJE and KSB (revisions 2011, 2013, 2014 and 2015)
- Existing KJE and KSB RAPs and appendices (revisions June 2015, December 2016);
- Relevant policy, legislative and regulatory documents;
- UNRA Environmental and Social Management Systems including the Environmental and Social Safeguards Policy (August 2016), and grievance mechanism (UNRA online Grievance Web Portal);
- GIS / CAD data pertaining to KJE Phase 1 and KSB alignments, engineering design, and environmental and social features; and
- Relevant WB/IFC guidelines and performance standards.

6.1.3.2 Communication and Consultation

ISO 31010

"Communication and consultation with external and internal stakeholders should take place during all stages of the risk management process.

Therefore, plans for communication and consultation should be developed at an early stage. These should address issues relating to the risk itself, its causes, its consequences (if known), and the measures being taken to treat it. Effective external and internal communication and consultation should take place to ensure that those accountable for implementing the risk management process and stakeholders understand the basis on which decisions are made, and the reasons why particular actions are required."

A key part of the communication and engagement process for the risk assessment was undertaking a Risk Assessment Workshop for the Project with UNRA. The workshop took place on the 7th of June 2017, at Uganda National Roads Authority Office (Plot 3-5 New Port Bell Road, UAP Nakawa Business Park, P.O. Box 28487 Kampala).

Engagement and consultation with the affected communities and stakeholders was also conducted throughout the ESIA process, which has informed the completion of the risk assessment. This included discussion with various stakeholder groups including:

- Affected communities (including communities directly impacted by the Project and those who will host displaced people);
- Government (from all relevant levels including central government Ministries, Departments and Agencies (MDAs); local level governments, and lower local governments);
- Businesses, community facilities and utility/infrastructure owners (including both private and government ownership); and
- Civil society organisations (including NGOs such as Nature Uganda and mass organisations like Uganda Women's Union).

These stakeholders and consultations are described in ESIA Chapter 5, as well as the SEP (refer to Volume C).

6.1.3.3 Risk Identification

ISO 31010
"The purpose of risk identification is to identify what might happen or what situations might exist that might affect the achievement of the objectives of the system or organisation. Once a risk is identified, the organisation should identify any existing controls such as design features, people, processes and systems. *The risk identification process includes identifying the causes and source of the risk (hazard in the context of physical harm), events, situations or circumstances which could have a material impact upon objectives and the nature of that impact"*

The risk identification process involved the generation of a comprehensive list of potentially significant environmental and social risks based on events that might create, enhance, prevent, degrade, accelerate or delay the achievement of Project objectives. For the current risk assessment, this process included:

- A review of risks previously identified in:
  - Consultations with relevant stakeholders;
  - ESIA Scoping Study and Terms of Reference for the Project;
  - URS (2011) and ICS (2015) feasibility and engineering studies;
  - ESIAs and associated plans for the KJE and KSB (revisions 2011, 2013, 2014 and 2015); and
  - Relevant WB/IFC and AfDB guidelines and performance standards.
- Review of risks and impacts in ESIAs for similar projects; and
- Benchmarking against international standards.

The identified risks were reviewed and updated at the Risk Assessment Workshop. As part of this process, existing controls and design measures relevant to the risks were also identified. These included design modifications and studies that have already been implemented to reduce the environmental and social risks of the Project.

6.1.3.4 Risk Analysis

ISO 31010
"Risk analysis consists of determining the consequences and their probabilities for identified risk events, taking into account the presence (or not) and the effectiveness of any existing controls. The consequences and their probabilities are then combined to determine a level of risk. *Risk analysis involves consideration of the causes and sources of risk, their consequences and the probability that those consequences can occur. Factors that affect consequences and probability should be identified. An event can have multiple consequences and can affect multiple objectives."*

The risk analysis was conducted based on available Project information and based on consultation with the various stakeholders. Physical and biological risks tended to be more quantifiable and assessed more objectively than social risks. The risk analysis followed ISO standards for anticipating the consequence of risks (as per .

Table 6-3) in order of magnitude. Likelihood was assessed as the probability of those consequences occurring, and was considered independently of consequence. Likelihood and consequence classification of risk required a thorough understanding of:

- Project environmental and social baseline;
- Presence/absence of existing controls and design measures;
- Predictions based upon common risks experienced by other similar projects; and
- Potential impacts of Project implementation, as well as the likely effectiveness of mitigation measures.

This process was used to inform risk evaluation and guide the treatment of risks.

6.1.3.5 Risk Evaluation

ISO 31010

"Risk evaluation involves comparing estimated levels of risk with risk criteria defined when the context was established, in order to determine the significance of the level and type of risk.

Risk evaluation uses the understanding of risk obtained during risk analysis to make decisions about future actions. Ethical, legal, financial and other considerations, including perceptions of risk, are also inputs to the decision."

Risk Exposure = Level of Likelihood x Level of Consequence

In accordance with ISO 31010, the initial risk exposure for each risk was calculated as the multiple of the likelihood ranking and the consequence ranking.

6.1.3.6 Treatment

ISO 31010

"Having completed a risk assessment, risk treatment involves selecting and agreeing to one or more relevant options for changing the probability of occurrence, the effect of risks, or both, and implementing these options.

This is followed by a cyclical process of reassessing the new level of risk, with a view to determining its tolerability against the criteria previously set, in order to decide whether further treatment is required."

For this part of the risk assessment process, additional controls/management measures have been identified for the mitigation and/or reduction of risk, after careful evaluation of anticipated Project risks from a 'business as usual' scenario. The identification of controls was conducted in consultation with UNRA and other key Project stakeholders and took into consideration national and international standards and guidelines, as well as the Consultant's experience with industry best practice. Upon implementation of these controls, the consequences and likelihood of the risk have been re-evaluated to assess the anticipated residual level of overall risk exposure.

Risks and their mitigation measures have been incorporated into the management and mitigation measures as per the ESMMP.

6.2 Risk Assessment Results

The findings of the risk assessment are presented below for the physical, biological and social risks in Table 6-4 to 6-6. The implementation of the proposed management and mitigation measures is expected to reduce the anticipated residual level of overall risk exposure for almost all of the identified risks. No residual risks were identified as 'High' based on the criteria listed in Table 6-1. Table 6-7 summarises the 'Moderate-high' residual risks that remain if mitigation and monitoring measures are effectively implemented as per the ESMMP.

Table 6-4: Physical Risk Assessment

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
Physical Risks and Proposed Management Measures														
Hydrogeology	Raised or lowered water table				Excavation or creation of embankments affecting groundwater flow	Local population; Terrestrial and aquatic ecology; flooding	N/A	5	4	20	Modelling of waterflow; viaducts in wetlands; surface drainage	4	4	16
Hydrology	Modification of surface water flow				Road alignment passes through watercourses	Upstream flooding/reduced water downstream impacting on terrestrial and aquatic ecology; Adverse impacts on local population e.g. farms, houses, institutions, water points	Hydrological studies/modelling; Construction of bridges or viaducts across major watercourses/wetlands; Construction of culverts; Adequate drainage	5	4	20	Ensure drainage is designed appropriately to account for potential floods; Reduce the speed of road-surface water, regular hydrological re-modelling	4	3	12
Hydrology	Decreased water volume in creeks/rivers and wetlands				Water (required for construction and road-watering) abstracted from creeks/rivers and wetlands	Terrestrial and aquatic ecology; Local population	N/A	4	4	16	Minimise water usage; Vary water sources along the alignment; Limit water abstraction from wetlands to wet season	4	2	8

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
Water quality	Erosion and sediment input to watercourses				Vegetation clearing; cut and fill/earthworks during wet season; Increased impermeable surface area	Sediment input affecting aquatic and terrestrial ecology; Local population	N/A	4	5	20	Minimise the amount of exposed, erodible surfaces; Limit earthworks to dry season; Erosion and sediment control structures (e.g. stormwater drainage that slows runoff flow); Management of stockpiles; Progressive revegetation of batters once road section complete; Maintenance of drainage	3	3	9
Water quality	Contaminated stormwater				Leakage from vehicles carrying hazardous materials; Vehicle collision / overturn	Contamination of surface water impacting terrestrial and aquatic ecology; Local population	N/A	4	3	12	Reduced speed limits for construction vehicles; Emergency spill procedures; Spill kits; Maintenance of road	4	2	8
Water quality	Contaminated stormwater				Oils and grease, metals, particulate matter and other pollutants released by vehicles on the road; fertilisers and herbicides used for management of vegetation in ROW	Contamination of surface water impacting terrestrial and aquatic ecology; Local population	N/A	4	4	16	Water quality monitoring during construction; Spill kits; Maintenance of construction vehicles.	4	3	12

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
Water quality	Contaminated stormwater				Paving/Asphalting in wet weather; Road maintenance works conducted without using proper staging techniques to reduce spillage of paving materials	Contamination of surface water impacting terrestrial and aquatic ecology; Local population	N/A	4	4	16	Limit asphalting/concreting works to dry weather/season; Use of staging techniques prior to maintenance works (e.g. covering storm drain inlets; use of drip pans and absorbent material on paving machines)	4	2	8
Water quality	Asphalt production, storage and handling				Asphalt or bitumen spillage (at plant or adjacent to road)	Contamination of surface water impacting terrestrial and aquatic ecology; Local population	Situate asphalt production appropriately	4	4	16	Appropriate storage and handling of bitumen and asphalt according to procedures (bunding etc.)	4	2	8
Water quality	Discharge of untreated wastewater				Wastewater discharge from maintenance facilities, rest areas	Contamination of surface water impacting terrestrial and aquatic ecology; Local population	N/A	4	4	16	Wastewater treatment prior to discharge; Water quality monitoring	3	2	6
Air Quality	Dust generation				Earthworks; Stockpiles of aggregate etc.; Blasting	Local population; flora and fauna adjacent to ROW or quarry sites; Construction staff	Minimise the Project footprint; Road-watering near receptors in dry seasons.	4	4	16	Progressive rehabilitation of cleared areas; stabilisation or covering of stockpiles where required; best practice blasting procedures	3	3	9
Air Quality	Air emissions				Vehicle emissions of CO, SOx, NOx, particulates	Local population; flora and fauna adjacent to ROW or quarry sites		3	5	20	Control vehicle emissions; improve vehicle emission standards	2	5	10

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
Noise	Noise generation				Construction machinery; quarry blasting; hardrock blasting/drilling in alignment	Local population and fauna adjacent to ROW or quarry sites; Construction staff	Grievance mechanism	4	4	16	Limit construction work to daylight hours; Use of noise reduction technology on machinery; Erect noise barriers; Conduct blasting at consistent times; PPE for construction staff;	3	3	9
Soil	Soil contamination				Vehicle collision / overturn; Leakage from vehicles carrying hazardous materials; Asphalt or bitumen spillage	Contamination of soil and/or agricultural land	N/A	3	4	12	Reduced speed limits for construction vehicles; Emergency spill procedures; Spill kits; Hazardous materials transport and handling procedures; Maintenance of road	3	3	9
Noise	Noise generation				Vehicle traffic	Local population and fauna adjacent to ROW	Wearing course to be made of asphalt	4	5	20	Erect noise barriers in sensitive areas; Construct road below or above the level of surrounding land near sensitive receptors; Maintain road condition.	3	5	15
Blasting	Fly-rocks				Quarry blasting; hardrock blasting/drilling in alignment	Injury/death of local population, construction staff and fauna adjacent to ROW or quarry sites; Damage to buildings	N/A	5	4	20	500m exclusion zone around blasting area; avoid open-cut blasting, Warnings prior to blasting; Temporary relocation, use	5	1	5

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
											NEMA approved quarry sites			
Landscape	Slope destabilisation				Cutting/blasting etc. on steep slopes	Landslide impacting local population, construction staff, fauna and flora; Damage to buildings	Engineering design	5	3	15	Engineering design	4	2	8
Landscape	Abandoned quarries / borrow pits / pit lakes				Failure to close/rehabilitate/stabilise	Erosion, contamination of downstream waterways, visual amenity	N/A	5	3	15	Conservation of topsoil for rehabilitation works; Rehabilitation of quarries and borrow pits at decommissioning	5	2	10
Waste	Waste materials				Mismanagement of general and hazardous wastes	Soil and water contamination affecting local population, flora and fauna	N/A	5	4	20	Develop and implement an adequate waste management Plan; Transfer of wastes to appropriate waste facility	3	2	6
Natural hazards	Floods				High rainfall	Injury/death of local population; Impacts to agricultural land/market gardens etc.	Hydrological studies/modelling; Construction of bridges or viaducts across major watercourses/wetlands; construction of culverts; adequate drainage	5	2	10	Development of Emergency Preparedness and Response Plan	5	2	10

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
Natural hazards	Fire				High temperatures, lightening, earthquakes	Injury/death of local population; Impacts to agricultural land/market gardens etc.; Road damage	Design for seismic risk	5	1	5	Development of Emergency Preparedness and Response Plan	5	1	5
Visual Amenity	Modification of visual landscapes				Road construction	Local population	Planting of trees along road	2	3	6	Ongoing monitoring and maintenance of trees and vegetated areas	2	3	6

NB: Color coding of risk rankings consists of Low, Moderate, Moderate-High and High

Table 6-5: Biological Risk Assessment

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequences	Likelihood	Risk Ranking		Residual Consequences	Residual Likelihood	Residual Risk Ranking
Biological Risks and Proposed Management Measures														
Ecology	Habitat loss		●	●	Vegetation clearing; excavation and compaction, alteration of water flow pathways and levels	Terrestrial and aquatic ecology; Ecosystem services	Minimise ROW where possible; Road re-alignment near sensitive habitats	4	5	20	Rehabilitation and revegetation of disturbed areas where possible (especially temporary work/camp sites); no net biodiversity loss; Ensure no-go zones established in sensitive	3	5	15

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequences	Likelihood	Risk Ranking		Residual Consequences	Residual Likelihood	Residual Risk Ranking
											biodiversity areas near construction sites			
Ecology	Fragmentation of habitat		●	●	Vegetation clearing; excavation and compaction, alteration of water flow pathways and levels	Terrestrial and aquatic ecology	Construction of bridges or viaducts across major watercourses/wetlands; culverts	3	5	15	Rehabilitation and revegetation of disturbed areas where possible (especially temporary roads and work/camp sites)	2	5	10
Aquatic ecology	Sedimentation of watercourses/ wetlands		●	●	Vegetation clearing; cut and fill/earthworks during wet season; Increased impermeable surface area leading to increased runoff	Terrestrial and aquatic ecology; Ecosystem services	N/A	4	4	16	Minimise the amount of exposed, erodible surfaces; Limit earthworks to dry season; Erosion and sediment control structures (e.g. stormwater drainage that slows runoff flow); Management of stockpiles; Progressive revegetation of batters once road sections are complete; Maintenance of drainage	3	4	12

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequences	Likelihood	Risk Ranking		Residual Consequences	Residual Likelihood	Residual Risk Ranking
Ecology	Hazardous material spillage on highway		●	●	Vehicle collision / overturn	Impacts on aquatic ecology and ecosystem services	N/A	5	4	20	Emergency spill procedures; Spill kits; Hazardous materials transport and handling procedures; Install active or passive drainage systems; Maintain road condition	5	2	10
Invasive species	Propagation of invasive plant species		●		Introduction or spread of invasive plants on vehicle tyres, workers boots etc.	Displacement/invasion of native vegetation and/or fauna habitat and increased spread of weed species or pathogens. Impacts on ecosystem services	N/A	3	4	12	A weed management and control program to control invasions to be implemented for 2 years following construction	3	2	6
Traffic collisions with fauna	Traffic accidents		●	●	Traffic along the expressway (construction and operations)	Fauna adjacent to Project alignment; Road users	Speed limits; Restrict pedestrian/non-motorised vehicle access to completed road with external fencing and vegetation planting and internal barriers on the road; Maintain road condition	5	3	15	Restrict vehicle access to road and construction areas during construction phase	5	2	10

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequences	Likelihood	Risk Ranking		Residual Consequences	Residual Likelihood	Residual Risk Ranking
Noise impacts on biodiversity	Noise or vibration disturbance to native fauna		●	●	Construction works (daytime) and traffic (especially in operation phase)	Fauna adjacent to Project alignment	N/A	4	4	16	Limit construction work to daylight hours; Use of noise reduction technology on machinery; Conduct blasting at consistent times	3	4	12
Light spill impacts on biodiversity	Light disturbance to native fauna		●	●	Artificial light from street lights, vehicle lights	Fauna adjacent to Project footprint	Direct lighting to where it is needed. Limit intensity.	3	4	12	Noise barriers can reduce light impacts	3	4	12
Air quality impacts on biodiversity	Dust generation		●		Earthworks; Stockpiles of aggregate etc.; Blasting	Flora and fauna adjacent to ROW or quarry sites; Ecosystem services	Minimise and respect the Project footprint; Road-watering near receptors in dry seasons	3	4	12	Minimise the Project footprint; Road-watering near receptors in dry seasons; Progressive rehabilitation of cleared areas; Stabilisation of soil stockpiles	3	3	9
Ecology	Poaching		●		Hunting/poaching by construction workers	Flora and fauna adjacent to ROW / quarry sites / accommodation camps	N/A	3	4	12	Prohibition of hunting/poaching; Ensure accommodation camps not within or near areas with high biodiversity values; Minimise new temporary construction tracks near sensitive biodiversity areas; Monitoring	3	2	6

NB: Colour coding of risk rankings consists of Low, Moderate, Moderate-High and High

Table 6-6: Social Risk Assessment

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
Social Risks and Proposed Management Measures														
Land acquisition	Resettlement risks	●			Inadequate resettlement planning	Poor acceptability of Project by key stakeholders	Avoidance of settled areas where possible; Identify vulnerable people who may require resettlement	4	3	12	Consultations with vulnerable people to work out solutions that will work best for all individuals; Ensure development of an adequate resettlement plan	3	2	6
Land acquisition	Resettlement risks	●			Inadequate resettlement implementation	Poor acceptability of Project by key stakeholders	N/A	5	4	20	Ensure implementation of an adequate resettlement plan	3	3	9
Land acquisition	Compensation risks	●			Disputes over correct compensation payments	Poor acceptability of Project; Project delays	Utilising market values; disturbance allowance; full replacement cost; changes to design to minimise payment.	4	5	20	Transparent process; strong RAP planning and implementation	3	4	12
Land acquisition	Displacement of informal settlers - inadequate livelihood restoration	●			Disputes between Ugandan law and international guidelines	Poor acceptability of Project; Project delays	Avoidance of settled areas during design phase.	5	5	25	Livelihood restoration package for informal settlers in keeping with	4	4	16

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
											Government's position.			
Land acquisition (cumulative impacts)	Accessibility impacts due to land acquisition by multiple projects	●			SGR/KJE cumulative impacts (e.g. access)	Poor acceptability of Project; Project delays	Acquire land between the two projects if close. Ongoing communication with relevant projects	4	5	20	Ongoing consultation with SGR and other stakeholders to ensure a strong working relationship	3	3	9
Land acquisition	Disputed land ownership	●			Complexity of legal ownership and land titling systems in Uganda	High levels of disputes regarding compensation; Poor acceptability of Project; Project delays	UNRA support mechanism. Swift compensation payments after valuation.	5	5	25	Transparent process; strong documentation; funds held in trust for disputed ownership	3	4	12
Land Acquisition	Loss of assets (structures, land)	●			Alignment passes through assets belonging to local population and businesses	Local population and local businesses within or adjacent to ROW	Compensation / Resettlement / Livelihood restoration	5	5	25	Upgrade of Compensation / Resettlement / Livelihood restoration process to international standard	3	5	15
Land Acquisition	Impact on livelihoods	●			Alignment passes through agricultural land, pastoral land, community water resources (surface water or wells), natural	Local population within or adjacent to ROW lose livelihood sources	Compensation / Resettlement / Livelihood restoration	5	4	20	Implement an upgraded Compensation / Resettlement / Livelihood restoration plan	4	3	12

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
					resources (fruit trees etc.)						to international standards			
Land Acquisition	Impact on public utilities	●	●		Existing or planned public utilities not identified during Project design	Damage to existing utilities (e.g. pipelines, transmission lines); Delays to Project construction	Consultation workshop with government agencies	5	3	15	Individual meetings with each relevant government agency	5	2	10
Land Acquisition	Reduced Accessibility		●	●	Alignment cuts through settlements; Crossing of the road is restricted	Local population adjacent to Project unable to access population/land/natural resources/businesses/social services on other side of road	Pedestrian footbridges; Vehicle underpasses; Grievance mechanism	4	4	16	Detailed analysis of access issues; provision of alternative access and/or compensation where necessary	3	3	9
Land Acquisition	Reduced Accessibility		●	●	Alignment cuts residents/businesses off from their main access route	Local population adjacent to Project unable to access their residences/businesses	Pedestrian footbridges; Vehicle underpasses; Grievance mechanism	4	4	16	Detailed analysis of access issues and compensation / resettlement / provision of alternative access where necessary	4	3	12
Local economy	Reduced economic opportunities		●	●	Displacement of customers, alignment cuts residents/businesses off from main roads	Businesses lose access to customers ; Reduced visibility of businesses leading to reduced economic opportunities	Pedestrian footbridges; Vehicle underpasses; Grievance mechanism, Survey of businesses adjacent to	4	4	16	Ongoing consultation Grievance Redress Mechanism	4	4	16

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
							(but not within) ROW; Compensation							
Land Acquisition	Reduced Accessibility		●	●	Crossing of the KJE and SGR is restricted	Community disruptions, Isolation of local population resident between the Project and SGR; Population unable to access population/land/natural resources/businesses/social services on other side of road	Pedestrian footbridges; Vehicle underpasses; Traffic crossings along SGR; Grievance Redress mechanism (GRM)	4	5	20	Detailed analysis of access issues; provision of alternative access where necessary	4	4	16
Traffic	Traffic accidents		●	●	Increased traffic due to; increased speeds; Potholes and poor road condition on roads shared by the project and public and non-authorities pedestrian access/non-motorised vehicle access to expressway	Road users; Local population adjacent to Project	Restrict pedestrian/non-motorised vehicle access to completed road with external fencing and vegetation planting and internal barriers on the road	5	4	20	Restrict vehicle access to road during construction phase; Road maintenance factored in Project concession	5	3	15
Traffic	Traffic accidents			●	Visual obstruction by growth of existing trees and plants covering signals and signs, restrict motorist visibility and/or fall onto	Road users	General maintenance provisions	5	4	20	Implementation of UNRA's Green Right of Way (GROW) Programme; Regular maintenance of	5	2	10

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
					the road or overhead power lines						ROW (pruning etc.)			
Archaeology	Loss of significant archaeological sites		●		Alignment could pass through sites of archaeological importance	Damage/destruction of archaeological sites	Scoping Study; Archaeology baseline surveys and consultations; Grievance mechanism	4	3	12	Realignment of road where possible; Relocation of sites where possible prior to works; Archaeologist on call during construction works; Chance Find Procedure	3	2	6
Cultural Heritage	Loss of significant cultural heritage sites		●		Alignment passes through sites of cultural heritage importance	Damage/destruction of cultural heritage sites and grave sites/cemeteries	Cultural heritage baseline surveys and consultations; Grievance mechanism	4	3	12	Realignment of road where possible; Relocation of sites where possible prior to works; Cultural heritage specialist involvement during site relocations construction activities; Chance Find Procedure	4	1	4

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
Project acceptance	Lack of social licence for Project		●		Limited local employment; lack of/poor consultation; mismanaged land acquisition and resettlement process	Social unrest; Refusal to resettle	Recruit workers locally; Resettlement and livelihood restoration planning; Ongoing stakeholder consultation; Grievance mechanism	5	3	15	Ensure construction contractors comply with the "Local content" requirements governing employment i.e. implementing a 'locals first' hiring policy	5	2	10
OHS	Health and safety risks to construction staff		●		Operating machinery, vehicle accidents etc	Construction staff	N/A	4	3	12	Provide occupational health and safety training for workers; Supply protective wear for those involved in road construction; Develop, maintain and disseminate an OHS Plan for the Project including measures to reduce accidents; Provision for monitoring adherence to	3	2	6

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
											safety rules; Incident reporting			
OHS	Health and safety risks to construction staff		●		Poor hygiene and sanitation	Construction staff	Provision of mobile toilets; Hygienic accommodation; Waste management	4	3	12	Training; Monitoring	2	2	4
Health	Health risks for local populations		●	●	Influx of Project workers	Increased rates of HIV/AIDS, STDs etc. amongst local population. Increases in gender based violence (GBV).	Recruit workers locally; Grievance mechanism	4	4	16	Awareness programmes for construction workers and communities in the Project areas; Measures to lower GBV risks.	4	3	12

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
UXO	Health risks from UXO (unexploded ordnance)		●	●	Construction activities may detonate or uncover UXOs	Construction staff, local population	N/A	3	2	6	Prior to construction, any UXO risk areas on the alignment should be identified and mitigation measures implemented where required	3	1	12
Traffic	Increased risk of road traffic accidents		●	●	Greater number of vehicles and/or higher speed	Local population adjacent to Project	Restrict pedestrian/non-motorised vehicle access to KJE with external fencing and internal barriers on the road	5	3	15	Speed limits clearly displayed along 'high risk' sections of the road (when close to a settlement or school); Provide traffic awareness and road safety training sessions for populations adjacent to Project	5	2	10
Economic	Reduced economic opportunities			●	Traffic reduced along existing Kampala-Jinja Road	Local population along existing Kampala-Jinja Road	N/A	3	3	9	Continue maintenance works along the existing Kampala-Jinja Road; Increase marketing of	2	3	6

Environmental / Social Aspect	Risk/Hazard	Development Phase: Pre-Construction	Development Phase: Construction	Development Phase: Operation	Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk: Consequence	Initial Risk: Likelihood	Initial Risk: Risk Ranking	Key Additional Mitigation/ Management Measures	Residual Risk: Residual Consequence	Residual Risk: Residual Likelihood	Residual Risk: Residual Risk Ranking
											tourist attractions along the road e.g. Sezibwa Falls; Grievance mechanism			
Air Quality	Dust generation		●		Earthworks; Stockpiles of aggregate etc.; Blasting	Local population adjacent to ROW or quarry sites; Construction staff	Road-watering near receptors in dry seasons	4	4	16	Air quality monitoring; stabilisation or covering of stockpiles where required; best practice blasting methods	4	4	16
Air Quality	Air emissions				Vehicle emissions of CO, SOx, Nox; Traffic jams at intersections/junctions	Local population adjacent to ROW and in particular adjacent to intersections/junctions	Appropriate dimensions for intersections/junctions to avoid traffic jams	3	5	15	Maintain construction vehicles and equipment; Select machinery and vehicles with low emissions	3	5	15
Noise	Construction noise		●		Construction machinery, quarry blasting, hardrock blasting/drilling in alignment	Local population adjacent to ROW or quarry sites; Construction staff	Grievance mechanism	4	4	16	Limit construction work to daylight hours; Use of noise reduction technology on machinery; Erect sound barriers; Conduct blasting	4	3	12

Environmental / Social Aspect	Risk/Hazard	Development Phase			Likely Primary Causes	Potential Consequences / Receptors	Existing Design Measures	Initial Risk			Key Additional Mitigation/ Management Measures	Residual Risk		
		Pre-Construction	Construction	Operation				Consequence	Likelihood	Risk Ranking		Residual Consequence	Residual Likelihood	Residual Risk Ranking
											at consistent times; PPE for construction staff			
Noise	Traffic noise			●	Vehicle traffic	Local population adjacent to ROW	Wearing course to be made of asphalt	5	5	25	Erect sound barriers in sensitive areas; Speed limits; Consider constructing road below or above the level of surrounding land near sensitive receptors; Maintain road condition; Insulation of nearby building structures (e.g. window replacements) where required	3	5	15

NB: Colour coding of risk rankings consists of Low, Moderate, Moderate-High and High

6.3 Risk Management Summary

6.3.1 Summary of Key Risks Prior to Mitigation

The findings indicate that, prior to mitigation, it is anticipated that out of the 59 key risks identified for the Project, there would be 19 High, 34 Moderate-High, and six Moderate risks.

Prior to mitigation, key risks at the Pre-Construction Phase of the project will include social risks associated with the potential for disputes regarding land acquisition and resettlement, as well as potential cumulative on access for local communities in conjunction with the SGR project. These risks can be reduced through measures such as careful planning, implementation of international best practice approaches to resettlement and compensation, as well as ongoing consultation with Affected Peoples and other Project stakeholders.

The majority of the highest risks of the Project prior to mitigation will occur during the Construction Phase. Key physical risks during this phase will include hydrology and water quality impacts associated with construction activities, which will need to be minimised through measures such as ensuring appropriate design of drainage structures and diligent implementation of erosion control measures during earthworks. Prior to mitigation there are also very high risks associated with noise from construction vehicles/equipment, as well as potential for soil contamination associated due to spills or leakage of hazardous materials.

Key biological risks during the Construction Phase are primarily related to the clearing of the Project Footprint which will result in the loss of vegetation and wetland areas. The initial biological risks during Construction have been reduced through design measures such as reducing the size of the Project Footprint where possible, as well as consideration of alignment alternatives to ensure the alignment selected avoids and minimises impacts on sensitive areas where possible (refer Chapter 4). Prior to mitigation, there is also a high risk of impact on aquatic biodiversity from spillages of hazardous chemicals into wetlands and other waterways. This risk will need to be managed through implementation of best practice measures for the transport, storage and use of hazardous materials.

Key social risks during Construction will relate to the impact of the Project on accessibility, and risks associated with traffic accidents from construction activities. The construction of pedestrian footbridges and vehicle underpasses will be key measures to reduce risks associated with loss of access, and fencing of construction areas will greatly assist in reducing safety risks from the use of construction vehicles and equipment. Prior to mitigation, key social risks during Operations are expected to result from continued impacts on accessibility from the Project, as well as safety risks associated with road accidents (both for road users and pedestrians/non-motorised vehicles). A variety of measures will be required to ensure safety risks are minimised. In the absence of mitigation, noise from road use during Operations also presents a high risk to local communities living directly adjacent to the ROW. There is potential to reduce ongoing noise risks through measures such as erecting sound barriers and implementing speed restrictions in sensitive areas. Noise risks are assessed in Chapter 11 and required management measures are identified.

During Operations there is a risk that the impacts on surface and groundwater hydrology/hydrogeology will continue due to the major changes in landforms and drainage brought about by the Project. As will the construction phase this can be minimised by ensuring drainage design meets best practice standards and is informed by appropriate hydrological studies/modelling. Ongoing management of erosion and sedimentation will also be required to ensure downstream ecology and agricultural land uses are not impacted. Prior to mitigation, there will be numerous high risks associated with the use of the expressway by vehicles, including air quality and noise impacts. Significant risks of soil or water contamination will also be present due to the potential for accidents involving vehicles transporting hazardous materials. These risks can be reduced via establishment of emergency spill procedures and ongoing road maintenance. The risks to ecology from vegetation and wetland clearing during

construction will continue into the Operations phase, but will be minimised via ongoing rehabilitation and revegetation of disturbed areas, and potentially via the implementation of a biodiversity offsets program (if implemented).

6.3.2 Approach to Risk Management in the ESIA

Management and mitigation measures for each key risk associated with the Project have been proposed and are summarised in Tables 6.4, 6.5 and 6.6 and are described in further detail in the *'Avoidance, Management and Mitigation and Residual Risk'* sections of Chapters 6 to 21, as well as in the ***Environmental and Social Management and Monitoring Plan*** (ESMMP) (refer to Volume D). The management and mitigation measures have been developed in accordance with the level of risk exposure and with due consideration of the nature and scale of the potential impacts.

6.3.3 Key Residual Risks

The implementation of the proposed management and mitigation measures is expected to reduce the anticipated residual level of overall risk exposure for the majority of the identified risks. No residual risks were identified as High based on the criteria listed in Table 6-1 after the implementation of proposed controls. The highest residual risk category was "Moderate-High". Table 6-7 summarises the 26 residual risks rated as Moderate-High. The residual "Moderate-High" risks consist of 6 physical risks, 7 biological risks and 13 social risks. The majority of the residual social risks relate to land acquisition and resettlement. Residual risks related to community safety will also be important to manage carefully during both construction and operations. Risks to terrestrial and ecological values will remain post-mitigation due to the unavoidable impacts of the Project on terrestrial habitats and wetlands, although many of the potential risks have been reduced via the design of the alignment to avoid the most sensitive areas. A biodiversity offset program will be required to achieve no net loss of biodiversity. It is also notable that even following implementation of management measures, moderate-high residual air quality and noise risks are expected to remain which will potentially affect sensitive receptors close to the alignment. Permanent noise barriers will be a key measure to reduce noise impacts for local communities in sensitive areas. The key Project risks and associated management measures are assessed in detail in Chapters 7 to 21 of this ESIA Report, and residual impacts / risks are summarised in Chapter 23.

Table 6-7: Summary of 'Moderate-High' residual risks after mitigation

Aspect	Risk/Hazard	Likely Primary Causes	Potential Consequences / Receptors
Physical Risks			
Hydrogeology	Raised or lowered water table	Excavation or creation of embankments affecting groundwater flow	Local population; Terrestrial and aquatic ecology; flooding
Hydrology	Modification of surface water flow	Road alignment passes through watercourses	Upstream flooding/reduced water downstream impacting on terrestrial and aquatic ecology; Local population
Water quality	Contaminated stormwater	Oils and grease, metals, particulate matter and other pollutants released by vehicles on the road; fertilisers and herbicides used for management of vegetation in ROW	Contamination of surface water impacting terrestrial and aquatic ecology; Local population
Noise	Noise generation	Vehicle traffic	Local population and fauna adjacent to ROW
Landscape	Abandoned quarries/borrow pits / pit lakes	Failure to close/rehabilitate/stabilise	Erosion, contamination of downstream waterways, visual amenity

Aspect	Risk/Hazard	Likely Primary Causes	Potential Consequences / Receptors
Natural hazards	Floods	High rainfall	Injury/death of local population; Impacts to agricultural land/market gardens etc.
Biological Risks			
Terrestrial Ecology	Loss of habitat	Vegetation clearing; noise pollution	Terrestrial and aquatic ecology; Ecosystem services
	Fragmentation of habitat	Vegetation clearing; noise pollution	Terrestrial and aquatic ecology
Aquatic ecology	Sedimentation of watercourses/ wetlands	Vegetation clearing; cut and fill/earthworks during wet season; Increased impermeable surface area leading to increased runoff	Terrestrial and aquatic ecology; Ecosystem services
General Ecology	Hazardous material spillage on highway	Vehicle collision / overturn	Impacts on aquatic ecology and ecosystem services
Traffic collisions with fauna	Traffic accidents	Traffic along the expressway (construction and operations)	Fauna adjacent to Project alignment; Road users
Noise impacts on biodiversity	Noise or vibration disturbance to native fauna	Construction works (daytime) and traffic (especially in operation phase)	Fauna adjacent to Project alignment
Light spill impacts on biodiversity	Light disturbance to native fauna	Artificial light from street lights, vehicle lights	Fauna adjacent to Project footprint
Social Risks			
Land acquisition	Displacement of Illegal settlers - inadequate livelihood restoration	Disputes between Ugandan law and international guidelines	Poor acceptability of Project; Project delays
	Loss of assets (structures, land)	Alignment passes through assets belonging to local population and businesses	Local population and local businesses within or adjacent to ROW
	Reduced Accessibility	Alignment cuts residents/businesses off from their main access route	Local population adjacent to Project unable to access their residence/business
	Reduced Accessibility	Crossing of the KJE and SGR is restricted	Isolation of local population resident between the Project and SGR; Population unable to access population/land/natural resources/businesses/social services on other side of road
Project acceptance	Lack of social licence for Project	Limited local employment; lack of/poor consultation; mismanaged land acquisition and resettlement process	Social unrest; Refusal to resettle
Economy	Reduced economic opportunities	Alignment cuts residents/businesses off from main roads	Customers lose access to businesses; Reduced visibility of businesses leading to reduced economic opportunities
Traffic	Traffic accidents	Increased traffic and increased speeds; Potholes/poor road condition; Pedestrian/non-motorised vehicle access to expressway	Road users; Local population adjacent to Project
	Increased risk of road traffic accidents	Greater number of vehicles and/or higher speed	Local population adjacent to Project
Health	Health risks for local populations	Influx of Project workers	Increased rates of HIV/AIDS, STDs etc. amongst local population
Air Quality	Dust generation	Earthworks; Stockpiles of aggregate etc.; Blasting	Local population adjacent to ROW or quarry sites; Construction staff

Aspect	Risk/Hazard	Likely Primary Causes	Potential Consequences / Receptors
	Air emissions	Vehicle emissions of CO, SOx, NOx; Traffic jams at intersections/junctions	Local population adjacent to ROW and in particular adjacent to intersections/junctions
Noise	Construction noise	Construction machinery, quarry blasting, hardrock blasting/drilling along alignment	Local population adjacent to ROW or quarry sites; Construction staff
	Traffic noise	Vehicle traffic	Local population adjacent to ROW

6.3.4 Risk Monitoring and Review

ISO 31010

'As part of the risk management process, risks and controls should be monitored and reviewed on a regular basis to verify that:

- *Assumptions about risks remain valid;*
- *Assumptions on which the risk assessment is based, including the external and internal context, remain valid;*
- *Expected results are being achieved;*
- *Results of risk assessment are in line with actual experience;*
- *Risk assessment techniques are being properly applied; and*
- *Risk treatments are effective.*

Accountability for monitoring and performing reviews should be established.'

In accordance with the requirements of IFC Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts (2012), UNRA is required to "establish and maintain a process for identifying the environmental and social risks and impacts of the project".

Periodic risk monitoring and review are critical to managing environmental and social risks effectively over the Project life, and feed into all steps in the risk management process (refer Figure 6-1).

UNRA is committed to developing a risk management system for the Project consistent with ISO 31000 Risk Management — Principles and Guidelines (2009). This will need to include:

- Ensuring there is accountability, authority and appropriate competence for managing risk;
- Development of an organisation-wide Risk Management Plan to ensure that risk management is embedded in all of the Authority's practices and processes;
- Allocation of appropriate resources for risk management;
- Establishment of appropriate internal and external communication and reporting mechanisms; and
- Monitoring and review of the risk management framework.

6.3.5 Risk Management Framework

Based on the ISO 31000 Risk Management — Principles and Guidelines (2009), key elements of the risk management framework will consist of:

- Risk hierarchy;
- Risk governance and accountabilities; and
- Risk system.

To ensure that the risk management framework is effective and continues to support the improvement of environmental and social management for the Project, it is recommended that UNRA:

- Regularly assess the quality of risk management processes to identify opportunities for improvement;
- Measure risk management performance for the Project against indicators, which are periodically reviewed for appropriateness;
- Periodically measure progress against, and deviation from, a Project-specific risk management plan;
- Periodically review whether the risk management framework, policy and plan are still appropriate for the Project, given the organisations' external and internal context;
- Report on risk, progress with the risk management plan and how well the risk management policy is being followed; and
- Review the effectiveness of the risk management framework.

Decisions relating to the improvement of the risk management framework, policy and plans need to be based on the results of monitoring and reviews. These decisions will aim to improve the organisation's management of risk and its risk management culture.

UNRA should periodically monitor and review the risk assessment conducted for the Project to:

- Ensure controls are effective and efficient in both design and operation;
- Obtain further information to improve risk assessment;
- Analyse and learn lessons from events (including near-misses), changes, trends, successes and failures;
- Detect changes in the external and internal context, including changes to risk criteria and the risk itself which can require revision of risk treatments and priorities; and
- Identify emerging risks.

Progress in implementing risk treatment measures and plans provides a performance measure. The results of the monitoring and review processes need to be incorporated into the overall performance management, measurement and external and internal reporting activities.

The results of monitoring and review need to be recorded and reported internally and externally as appropriate, and also be used as an input to the review of the risk management framework.

6.3.6 Risk Management Records

ISO 31010
'Risk management activities should be traceable. In the risk management process, records provide the foundation for improvement in methods and tools, as well as in the overall process.'

Recording risk information that is concise, accurate and timely enables reports to be generated that build corporate knowledge and contribute significantly to informed discussion on risk and uncertainty.

In accordance with ISO 31000 Risk management – Principles and Guidelines (2009), UNRA will need to ensure that "Systems are in place to ensure that sustainability related records are established and maintained, accurate, legible, identifiable, securely stored, and have established retention times based on legal requirements."

All environmental and social risk assessments conducted, and associated documentation need to be recorded and stored in the UNRA Project environmental and community files. These records may include:

- Internal risk assessments;
- External risk assessments;
- Risk and Opportunity Register;
- Relevant Company procedures, standards, policies and plans;
- Relevant international guidelines and standards;
- Audit results; and
- Incident reports.

KJE PPP Project Phase 1 ESIA

CHAPTER 7 Land, Assets and Infrastructure

7. LAND, ASSETS AND INFRASTRUCTURE

7.1 Study Area and Methodology

The Study Area for the land, asset and infrastructure assessment includes the Project Right of Way (ROW) and adjacent areas that serve as construction buffers.

7.1.1.1 Review of Previous Information

A detailed desktop review of available information relevant to the land, asset and infrastructure assessment was undertaken:

- URS (2011) and ICS (2015) feasibility and engineering studies;
- ESIAs and associated plans for the KJE and KSB (revisions 2011, 2013, 2014 and 2015);
- Existing KJE and KSB Resettlement and Livelihood Restoration Plans (RLRPs) and appendices (revisions June 2015, December 2016);
- Policy, Legislative and Regulatory documents pertaining to land acquisition;
- Socio-economic and census data collection tools;
- Land Asset Management Systems (LAMS) and ROWMIS data management systems for recording and managing the process;
- UNRA Environmental and Social Management Systems including the Environmental and Social Safeguards Policy (August 2016), and grievance mechanism (UNRA online Grievance Web Portal); and
- GIS / CAD data pertaining to KJE Phase 1 and KSB alignments, engineering design, and environmental and social features.

This review allowed for verification of available information on the environmental and social context of the Project and assisted in identifying data gaps arising from changes to the expressway alignment, changes in settlement and infrastructure, and where additional data must be collected to prepare a current social impact assessment and identification of affected people and assets.

7.1.1.2 Use of UNRA Compensation and Socio-Economic Assessment Data

Compensation assessment data of land and assets was collected by UNRA in 2017-2018 along the entire Project alignment. UNRA compensation data and maps were utilised to support the impact assessment contained herein. The UNRA compensation data focuses on identifying the asset owner and the value of the assets that will be impacted. UNRA has also collected socio-economic data along part of the KSB alignment.

7.1.1.3 Use of 2018 Earth Systems Census Survey Data

Data pertaining to households, businesses and public facilities located within the ROW were collected via a Census Survey (2018 census) conducted in March-April 2018 by Earth Systems and Atacama, in partnership with UNRA. Census data was analysed and incorporated with spatial analysis to assess and identify:

- Location of settlement areas;
- Location and estimation of displaced population and residences, including socio-economic data; and
- Location, number and type of businesses and public facilities, including main activities and size.

Estimation of Population within the ROW

The 2018 census, which targeted all household types, including: owner-occupied, tenanted, caretaker and squatted residences, was used to estimate the number of people potentially impacted by the loss of housing structures. The 2018 census was conducted along the entire KJE alignment ROW, and partially along the KSB alignment ROW (between chainages 1+000-5+300). The KSB chainages 5+400-17+800 were not covered within the 2018 census due to this section having been already surveyed as part of a UNRA socio-economic survey. The population and socio-economic status of residences along the remaining section of the KSB alignment was estimated based on the population density per structure (identified via satellite imagery - see 7.1.1.4) along sections of the alignment covered by the 2018 census. The total displaced within ROW population was derived from confirmed population data combined with estimates, and using the following key assumptions:

a) Where residential structures were partially located within the ROW, the entire structure was classified as being within the ROW as displacement of the entire household, or structure would potentially be required; and
b) Large structures with areas >0.016 ha (identified via satellite imagery) were not considered as residences and therefore not used to estimate population.

Identification of Businesses and Public Facilities within the Row

The 2018 Census Surveyed businesses and public facilities within the ROW, including small vendors and residences that operate informal businesses from residential premises to large businesses. Information pertaining to business activities, size, revenue and employment expenditure were captured within these surveys, as well as Information pertaining to user ship in the case of public facilities.

7.1.1.4 Interpretation of Recent Satellite Imagery

High-resolution satellite imagery was used to complement socio-economic field studies conducted from 2015-2018, Census Surveys conducted in 2018, and asset valuation conducted in 2016 and 2017. High-resolution Digital Globe WorldView-2 (September 2017) imagery with a resolution of 0.31 m to 0.6 m was used within spatial analyses.

This imagery was used to:

- Define the Project ROW;
- Identify changes in baseline conditions from studies previously undertaken for the Project;
- Identify structures/assets that will be partially or completely within the Project ROW and assess the primary impact to the business, such as whether a structure, access point or business grounds are within the ROW;
- Identify large and major businesses and public facilities not captured by the 2018 census;
- Categorise structures by size (footprint area of structure);
- Identify land use and proportion of different land cover that will be directly impacted; and
- Develop visual representation of the extent and magnitude of impacts within the Project ROW on a scale of 1:5000 (where 1cm = 50 metres).

Land Use Mapping

Land use and cover used within the Project ROW was digitised in 2018 based on visual interpretation of recent (2017) high-resolution imagery and data available in the ICS 2015 documents. Ground truthing of the land use

and cover mapping was conducted in 2017 and 2018 in unison with Census Surveys to verify the accuracy of the interpretation.

7.1.2 Stakeholder Consultations

The land, asset and infrastructure assessment also drew on the results of current and previous consultations conducted for the ESIA and RLRP to identify potentially impacted assets and people. The ESIA consultations covered directly, indirectly and interested stakeholders, while RLRP consultations focused on Affected Persons that would be economical or physically displaced by the expressway. The methodology for consultation is outlined in the RLRP and the SEP.

7.2 Baseline Conditions

7.2.1 Land Use

7.2.1.1 Kampala Jinja Mainline (Phase 1)

The KJE alignment from Kampala to Namagunga passes through the four Districts (administrative level LC5) of Kampala, Wakiso, Mukono and Buikwe. These Districts are further divided into 11 LC3 administrative units (referred to as Sub-counties in rural areas and divisions in urban areas), summarised in Table 7-1.

Table 7-1 Summary of LC5 and LC3 administrative areas traversed by the Project ROW

District (LC5)	Divisions/Sub-counties (LC3)
Buikwe District	Kawolo Sub-county
Kampala (City) District	Central Division; Makindye Division; Nakawa Division
Mukono District	Goma Sub-county; Nagojje Sub-county; Mukono Sub-county; Nakisunga Sub-county; Nama Sub-county
Wakiso District	Kira Municipality; Ssabagabo-Makindye Sub-county

Analysis of high-resolution satellite imagery and ground-truthing were undertaken to identify the current land cover and use of land resources within the KJE alignment (refer to Section 6.1). Land cover types within and adjacent to the Project ROW were classified using manual interpretation of the satellite images at a scale of approximately 1:10,000.

Most of the land cover of the KJE alignment has been modified by human activities, such as subsistence agriculture, the establishment of settlement areas and industrial activities, and commercial agriculture such as plantations. Land cover along the KJE alignment varies from the dense urban settlement areas in and around Kampala and Wakiso Districts, to agro-pastoral land, natural forest areas, plantations and smaller settlement areas where the alignment passes through Mukono District to Namagunga. The route also passes through several degraded wetlands and papyrus wetland areas. Key land cover features along the KJE alignment ROW include:

- The dominant land cover type within the KJE mainline alignment is agro-pastoral land (cultivated land / grazing pasture) which accounts for 138.0 ha (29%) of KJE mainline total land cover. The majority of agro-pastoral land along the alignment is located in Mukono District, followed by Wakiso District, with the section of the alignment in Kampala District having very little agro-pastoral land.
- After agro-pastoral land, settlement areas, cleared land and minor agriculture, and papyrus wetlands are the most common form of land use along the alignment covering 68.9 ha (14%), 34.2 ha (7%), and 31.4 ha (6.6%) respectively. The majority of settlement areas and industrial land along the alignment are located in Kampala and Wakiso Districts;

- Natural habitats areas are mainly present along the alignment through Mukono District, including shrubland, open forest/woodland, closed forest, grasslands and papyrus wetlands (e.g. Namanve wetland);
- Pockets of plantation land are also present in the alignment. The three main plantation types are tea plantation, tree plantation and sugar cane plantation comprising 28.9 ha (6%), 10.0 ha (12.1%) and 3.6 ha (0.7%) of overall land cover in the alignment respectively. These are located along the alignment in Mukono District; and
- The route also intersects sections of cleared land, fallow land, a number of roads and tracks (25.3 ha), and watercourses such as the Sezibwa River.

Land cover and land use activities along the KJE alignment is presented in further detail in the sections below, and in Table 7-4 and Figure 7-1 to Figure 7-15.

Agricultural Profile

Agricultural practices are important to both subsistence and employment to residences in the KJE Phase 1 ROW. Table 7-2 outlines the ROW agricultural business profile per alignment within the Phase 1 Project Area. 2018 Census Survey data and spatial analysis indicate that the sales per business per month are approximately 2,429,965 UGX and 2,400,000 UGX for KJE and KSB respectively. Of the different divisions/sub-counties that intersect the ROW Nakawa Division has the largest number of agricultural businesses and the smallest proportion is within Nagojje Sub-county. Nakawa Division generates the highest sales per business per month and the highest wages per workers per month. The number of agricultural businesses for each village range between 1 to 34 per village, with the highest number of workers employed in a single village in Kasokoso, with 62 workers employed.

Table 7-2 Census profile of agricultural businesses for the KJE Phase 1

Region	No of Agricultural Businesses	Cumulative Area (ha)	Sales per Business per Month (UGX)	No of workers
KJE / KSB				
KJE	163	1596.7	2,429,965	186
KSB	16	23.6	2,400,000	4
LC3 (Division/Sub-county)				
Kira	65	1088.2	1,779,836	108
Nagojje	1	15.0	2,000,000	12
Nakawa Division	99	308.4	3,011,785	56
Nakisunga	7	47.5	1,032,619	12
Nama	7	161.1	1,628,571	2
Village				
B 2	1	12.4	750,000	0
Bukasa	2	2.9	3,000,000	6
Butabika Zone	5	37.9	1,790,667	5
Central Zone	3	103.1	116,667	4
K 10	1	9.4	200,000	4

Region	No of Agricultural Businesses	Cumulative Area (ha)	Sales per Business per Month (UGX)	No of workers
Kasenge A	7	161.1	1,628,571	2
Kasokoso	34	386.8	847,255	62
Kinawataka	6	23.8	496,667	4
Kireka B	12	412.4	397,083	16
Kireka C	3	13.6	366,667	0
Kireka D	8	18.6	2,626,250	3
Kito	27	264.5	1,555,469	19
Kyawanvubu	1	15.0	2,000,000	12
Mwanyangiri	3	38.7	165,000	3
Namataba	13	20.2	4,246,41	15
Namuyenje	2	5.8	366,667	3
Ntinda Police Barracks	5	6.9	1,760,000	5
Prisons	4	9.6	717,500	1
Zone A	1	1.2	4,500,000	2
Zone G	8	8.8	11,200,000	5
Zone H	24	55.7	4,784,167	17
Zone I	2	1.9	2,975,000	1
Zone IX	7	9.6	3,028,571	1

Table 7-3 outlines the different land use between the Districts within the KJE Phase 1 ROW. Mukono District has the highest cumulative area within the ROW, with an area pf 176.8 ha, and is dominated by agro-pastoral land with an area of 130.3 ha and the least dominant area is plantations with and area of 7.1 ha. Buikwe District has the smallest cumulative agricultural area for the ROW with a total area of 24 ha.

Although the crops produced in these regions are relatively diverse, the dominant crops in production are broadly similar across the different villages. For example, within the Kyambogo village the two most dominant crops currently grown are yams and cassava and the least common crops are Irish potato, ground nut, pumpkin, pineapple and passion fruit. However, the most common crops produced within the Dandira Village are matooke and cassava and the least common crops are ground nut and passion fruit.

Table 7-3 Agricultural land use by district for KJE Phase 1

District	Land Use	Area (ha)
KJE		
Kampala	Cleared Land / Minor Agriculture	11.1
	Wetland - partially cultivated	8.1
	Total	19.1
Wakiso	Agro-pastoral Land	8.5
	Cleared Land / Minor Agriculture	10.4

District	Land Use	Area (ha)
	Wetland - partially cultivated	9.5
	Total	28.4
Mukono	Agro-pastoral Land	130.3
	Cleared Land / Minor Agriculture	12.6
	Fallow Land	17.9
	Plantation	7.1
	Tea Plantation	9.0
	Total	176.8
Buikwe	Agro-pastoral Land	1.1
	Plantation	2.9
	Tea Plantation	120.0
	Total	24.0
KSB		
Kampala	Cleared Land / Minor Agriculture	8.4
	Wetland - Cultivated	7.6
	Wetland - Partially Cultivated	21.6
	Total	37.6
Wakiso	Cleared Land / Minor Agriculture	6.4
	Wetland - Partially Cultivated	0.4
	Total	6.8

Agro-pastoralism

Agro-pastoral land is the dominant land cover type within the KJE alignment comprising 138.0 ha (29%) of total land cover. The majority (128.3 ha) of agro-pastoral land along the alignment is located in Mukono District. Much smaller amounts of agro-pastoral land are traversed by the alignment in Wakiso District (8.6 ha) very little (1.1 ha) is located along the alignment in Buikwe District, and no agro-pastoral land was identified within Kampala District. Common agricultural crops cultivated in the area include sweet potatoes, beans, cassava, tomatoes and onions.

Agro-pastoralism is carried out across both tendered plots, as well as in illegally in wetlands. Illegal wetland agriculture is typically conducted by people living in surrounding informal settlements where agricultural land is not available.

Detailed agricultural surveys were conducted in Dandira and Kyawambogo, where small scale farmers were interviewed on their plots and at the community centre. Observations indicated that the majority of these farmers utilised very small plots that were typically rented from land-owners who lived in other areas.

Livestock raising is generally not permitted in Kampala District, however raising of cattle, pigs, sheep and goats are common in Wakiso and Mukono Districts, where there is a larger availability of grazing pastures. Livestock raising is particularly common where the alignment passes through agro-pastoral areas in Mukono District such as at Chainage 14+000 (Goma Sub-county) and Chainage18+000 (Mukono Sub-county).

Settlement Areas and Roads

Settlement land within the alignment is the second most common land cover type, comprising 68.9 ha (14%) of total land cover in the KJE alignment. A key feature of the land use in the area surrounding the Project is the presence of Kampala City at the commencement of the KJE alignment. This area is dominated by highly populated areas in and around Kampala and Wakiso Districts, including several informal settlements (including Kinawataka and Kasokoso amongst others) and community infrastructure and areas of low, middle and high-income housing.

Settlement land within the KJE alignment comprises a mixture of settlement patterns. Both clustered and scattered settlements are presented along the Project area in Mukono District, whilst more clustered housing areas are present in Kampala District, especially in Kasokoso and Kinawataka. In Wakiso District, settlements are generally scattered, but in areas along the alignment, such as Bweyogerere where they are more clustered (Atacama, 2017).

In some urban areas with dense settlements, quarters are colloquially known by the 'community' that primarily resides there, i.e 'Banda 1 (Acholi Quarters)'. Given the proximity to Kampala City, however, most inner urban areas are mixed as most migrants have relocated for economic benefit.

A number of structures within settlements possess land titles, or are Kibanja holders with legal rights to the land. In some cases, in squatter settlements, no formal land title is held. This has been experienced predominantly within wetland areas.

There are a number of public roads intersecting the alignment, including both paved and unpaved roads. These comprise 25.3 ha (5%) of total land cover in the alignment. Roads intercepted by the alignment are covered in further details in Chapter 8 on Traffic, Transportation and Accessibility.

Industrial and Commercial Activities

Industrial land comprises 28.8 ha (6%) of total land cover within the alignment and is mainly concentrated in the urban areas within the first 3.5 km of the alignment in the Nakawa Division of Kampala District, although some pockets of dispersed industrial areas are also located in the more rural sections of the alignment within Mukono District.

In particular, several existing and proposed business parks, industrial areas, markets, warehouses and small to large independent businesses are present in the first part of the alignment, particularly along the existing Kampala Jinja Road (e.g. Nakawa Business Park, Nakawa Market etc.).

In the rural areas of Mukono District in the Goma, Mukuno Central and Nakisunga Sub-counties, industrial activities scattered along the alignment include brick manufacturing (Chainages 14+800 and 19+000-19+500), fishponds and associated factories (Chainage 18+500) and land from a newly developed coffee factory (Chainage 19+500). A few small commercial shops are found along some roadside areas, such as at Chainage 12+500.

Plantations

Plantation areas form a relatively small proportion of land use along the KJE alignment. The three main plantation types are tea plantation, tree plantation and sugar cane plantation comprising 28.9 ha (6%), 10.0 ha (2%) and 3.6 ha (0.7%) of overall land cover in the alignment respectively. Approximately 11 areas of plantation land are intersected by the alignment in Mukono District (Chainages 13+000, 17+800, 20+00, 20+500, 26+000, 26+500, 28+500, 31+500). A further two areas of tea plantations are located in Nakisunga Sub-county around Chainage 33+500, in the vicinity of Namagunga.

Small areas of spice plantations (black pepper, cardamom) are expected to be affected in the vicinity of Namagunga. The spice plantation is a small site located within a tea plantation.

Within tea plantations, tea growers are typically either employed by the tea plantation or operating as outgrowers with agreements to sell produce to a particular tea or sugar processor.

Natural Habitats

Natural habitats areas are mainly present along the alignment through Mukono District, including shrubland, open forest/woodland, closed forest, grasslands and papyrus wetlands (e.g. Namanve wetland). Some of the natural forest vegetation, particularly around Chainage 16+500 – 17+800 in the Mukono Central Sub-county, is potentially privately owned or possible NFA land.

Table 7-4 Land cover types within the KJE Alignment (by hectare)

Figure	Km	Agro-pastoral Land	Settlement Area	Industrial Area	Roads / Tracks	Cleared Land / Minor	Degraded Wetland	Drainage	Fallow Land	Open Forest / Woodland	Plantation	Recreational Area	Scrubland	Closed Forest	Tea Plantation	Urban Forest	Wetland - Papyrus	Wetland - Cultivated	Total
7-1	00-01		0.0	3.5	4.0	2.6						0.1							10.1
	01-02		0.2	6.4	3.5	3.7						0.7							14.5
	02-03		0.0	6.9	1.6	0.1		0.4											9.0
7-2	03-04		7.3	2.1	3.3	2.3	8.2	0.5								0.1			23.7
7-2; 7-3; 7-4	04-05		4.6		0.0		4.5	0.5											9.7
	05-06		8.2		0.5	0.7	0.1	0.2								0.1		1.2	11.0
	06-07		25.4		2.6	7.4	1.0	0.4								0.3		16.3	53.5
7-3	06-10-Ramp		1.3		0.3	0.1	0.5												2.2
7-5	07-08	1.1	7.6		0.4	0.1													9.2
	08-09	7.4	6.2	0.4	1.4	4.4													19.7
	09-10		1.2	0.2	0.1	0.2	0.3										9.6		11.5
7-6	10-11		0.0														11.2		11.2
	11-12	7.1	0.1		0.2								0.2				1.5		9.0
	12-13	6.9	0.1		0.3								2.4						9.7
7-7	13-14	3.4	0.0	2.4	0.1	1.0					0.3		0.5	1.3					9.1
	14-15	8.2	0.1		0.2		0.6						0.8						9.9
7-8	15-16	4.5	0.0		0.1		2.9	0.0					1.5						9.0
	16-17	7.4	0.1		0.2			0.0		1.9	0.1			0.6					10.3
	17-18	4.9	0.1	1.0	0.0			0.0		0.1	2.6		0.4						9.0
7-9	18-19	3.2	0.0	1.8	0.1				2.4				1.5						9.0
	19-20	1.9	0.1	3.2	0.3	1.9					0.7		1.2						9.3
	20-21	4.3	0.2		0.5	1.9					0.4		2.6						9.9
7-10	21-22	19.4	1.9		0.0	0.4			5.9	2.4									30.0

Figure	Km	Agro-pastoral Land	Settlement Area	Industrial Area	Roads / Tracks	Cleared Land / Minor	Degraded Wetland	Drainage	Fallow Land	Open Forest / Woodland	Plantation	Recreational Area	Scrubland	Closed Forest	Tea Plantation	Urban Forest	Wetland - Papyrus	Wetland - Cultivated	Total
7-11	22-23	6.8	0.2	0.1	0.1				0.6				1.6						9.5
	23-24	3.3	0.4		0.1	1.5							3.3	0.6					9.2
7-12	24-25	2.8	0.0		0.0		5.2			0.3			0.6						9.0
	25-26	3.1	0.2	0.3	0.2	0.3	0.7		0.1				4.5						9.2
	26-27	2.1	0.2		0.1	0.6	1.0		2.6		1.3		1.3						9.2
7-12, 7-13	27-28	2.3	0.1		0.0	0.6	0.8			3.7			1.2				9.1		17.9
	28-29	13.1	2.3	0.3	4.4	1.2			1.1	1.5	0.1		0.7	0.5					25.1
	29-30	5.4	0.0		0.1	0.2			0.8	1.0			2.0						9.5
7-14	30-31	4.7	0.0			0.8			2.0	0.4				1.6					9.5
	31-32	3.9	0.0			0.1			2.0	2.5	0.5								9.0
7-15	32-33	7.3	0.2		0.3	2.1		0.1	0.5	1.8	1.1		0.1		2.9				16.4
7-16	33-34	2.5	0.8		0.5										22.5				26.3
	34-35	1.1	0.0								2.9				3.5				7.5
	Total	138.0	68.9	28.8	25.3	34.2	25.7	2.2	17.9	15.7	10.0	0.7	26.4	4.6	28.9	0.6	31.4	17.6	476.9

*On-ramp from KSB to KJE is situated at chainage 0+600-0+7000, shown in figure 7-3.

Plate 7-1: Kinawataka informal settlement

Plate 7-2: The Nakawa markets, pedestrian access and signage along the existing Kampala-Jinja Road, Nakawa

Plate 7-3: Smallholder agriculture, sweet potatoes

Plate 7-4: Example of wetland agriculture (near Namanve Business Park)

Plate 7-5: Brick manufacturing within degraded wetland

Plate 7-6: Tea plantation

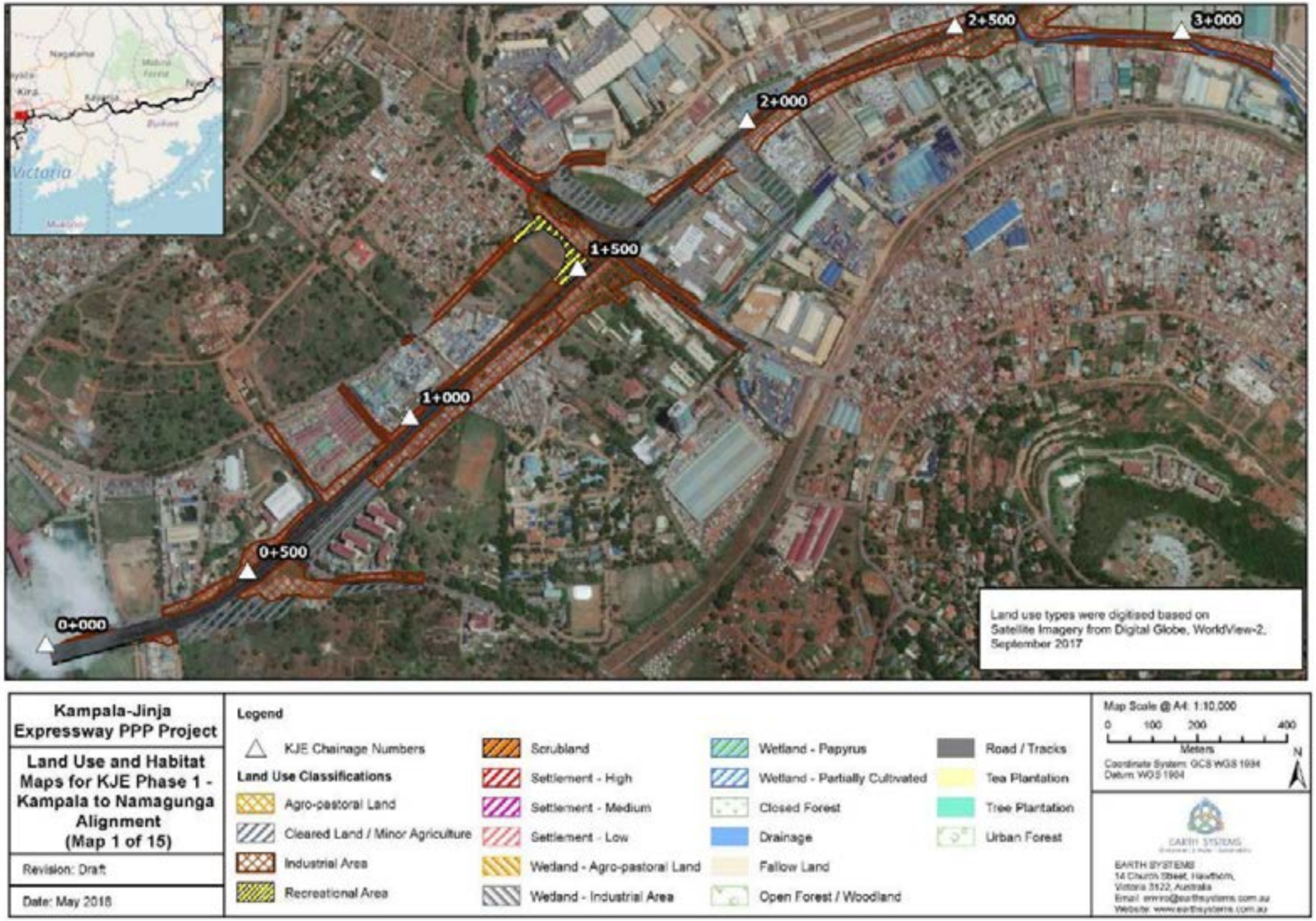


Figure 7-1 Land and habitat types within the KJE alignment – Chainage 0+000 to 3+000 (Map 1 of 16)

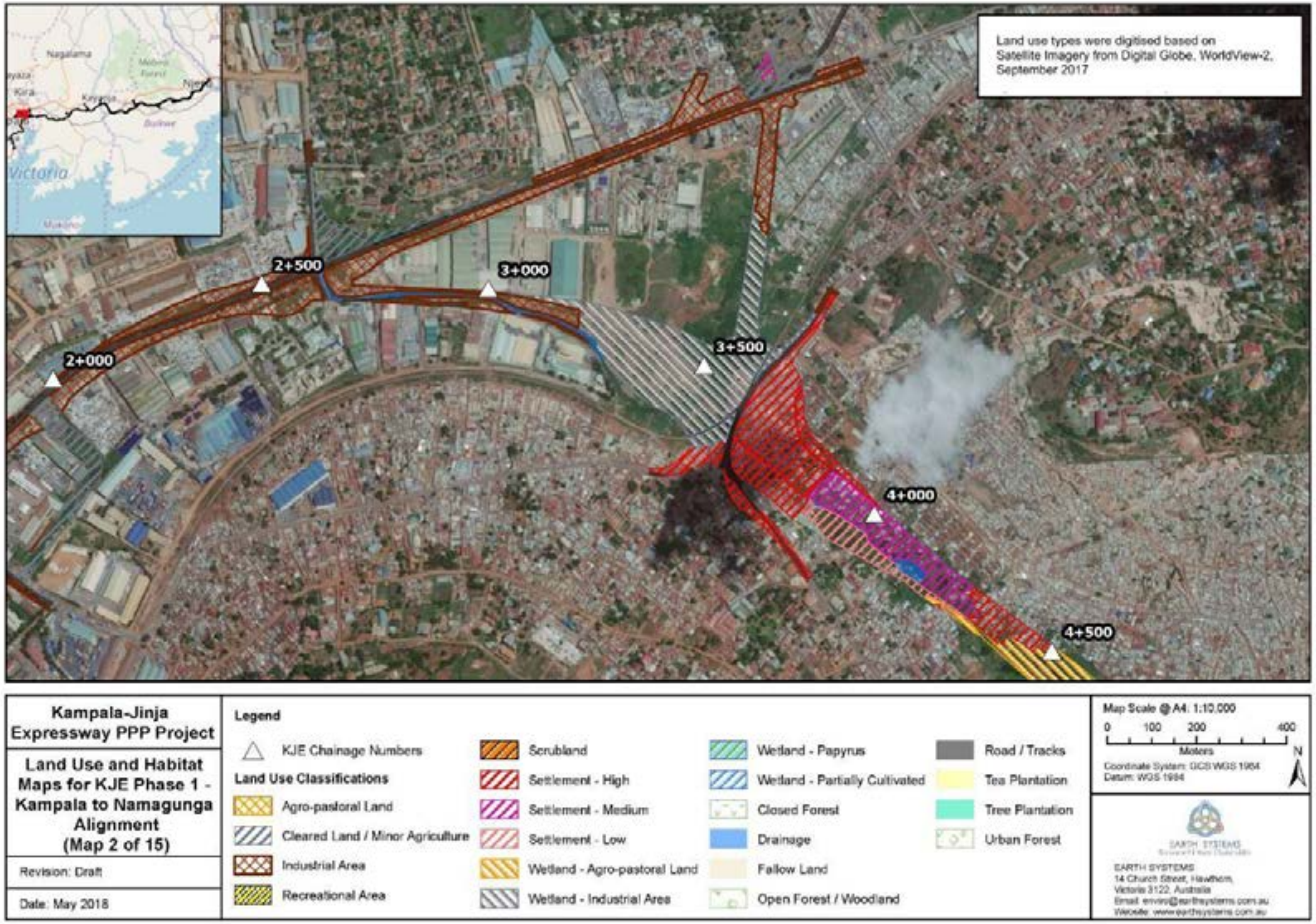


Figure 7-2 Land types and habitat within the KJE alignment – Chainage 2+000 to 4+500 (Map 2 of 16)

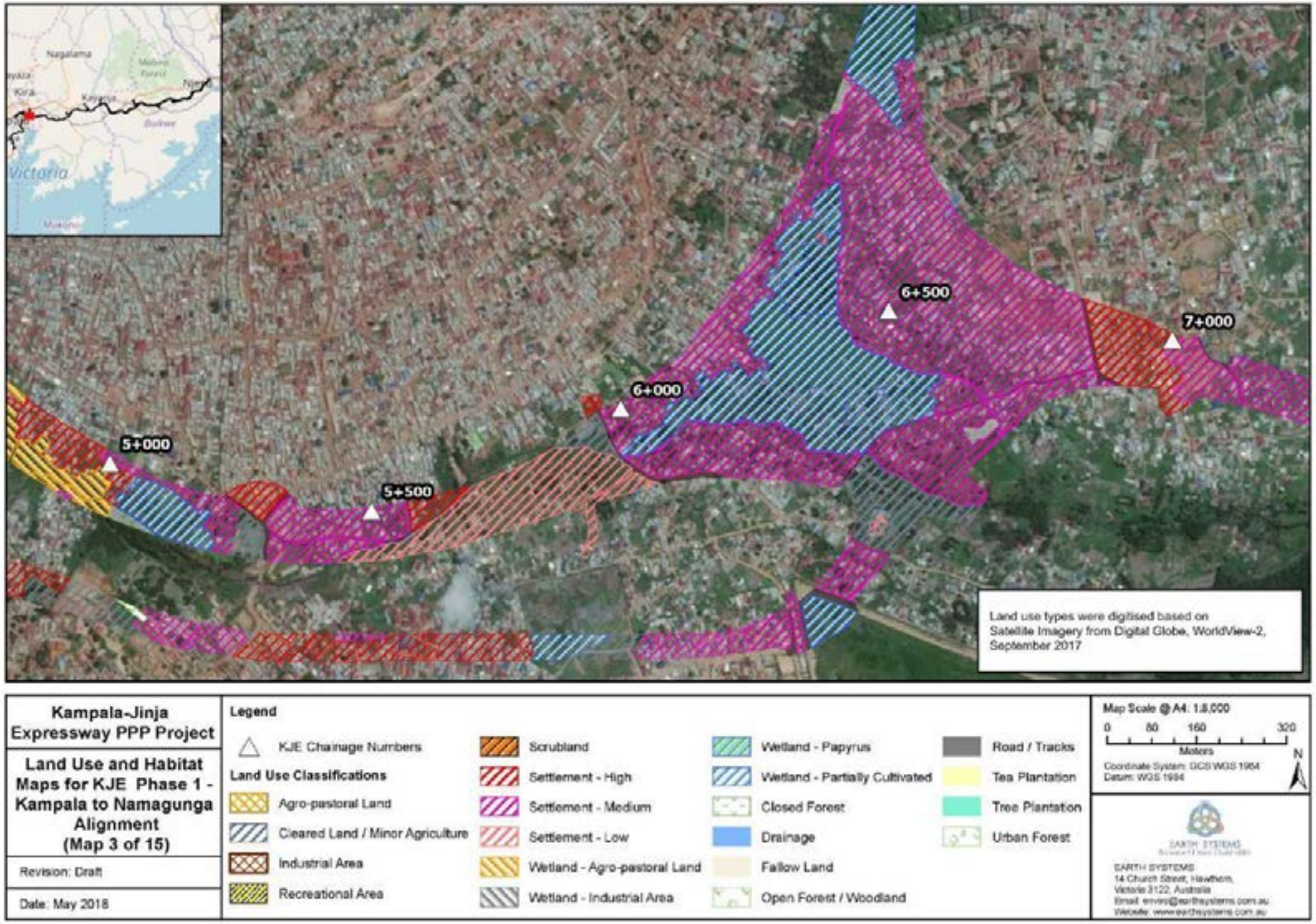


Figure 7-3 Land types and habitat within the KJE alignment – Chainage 5+000 to 7+000 (Map 3 of 16)

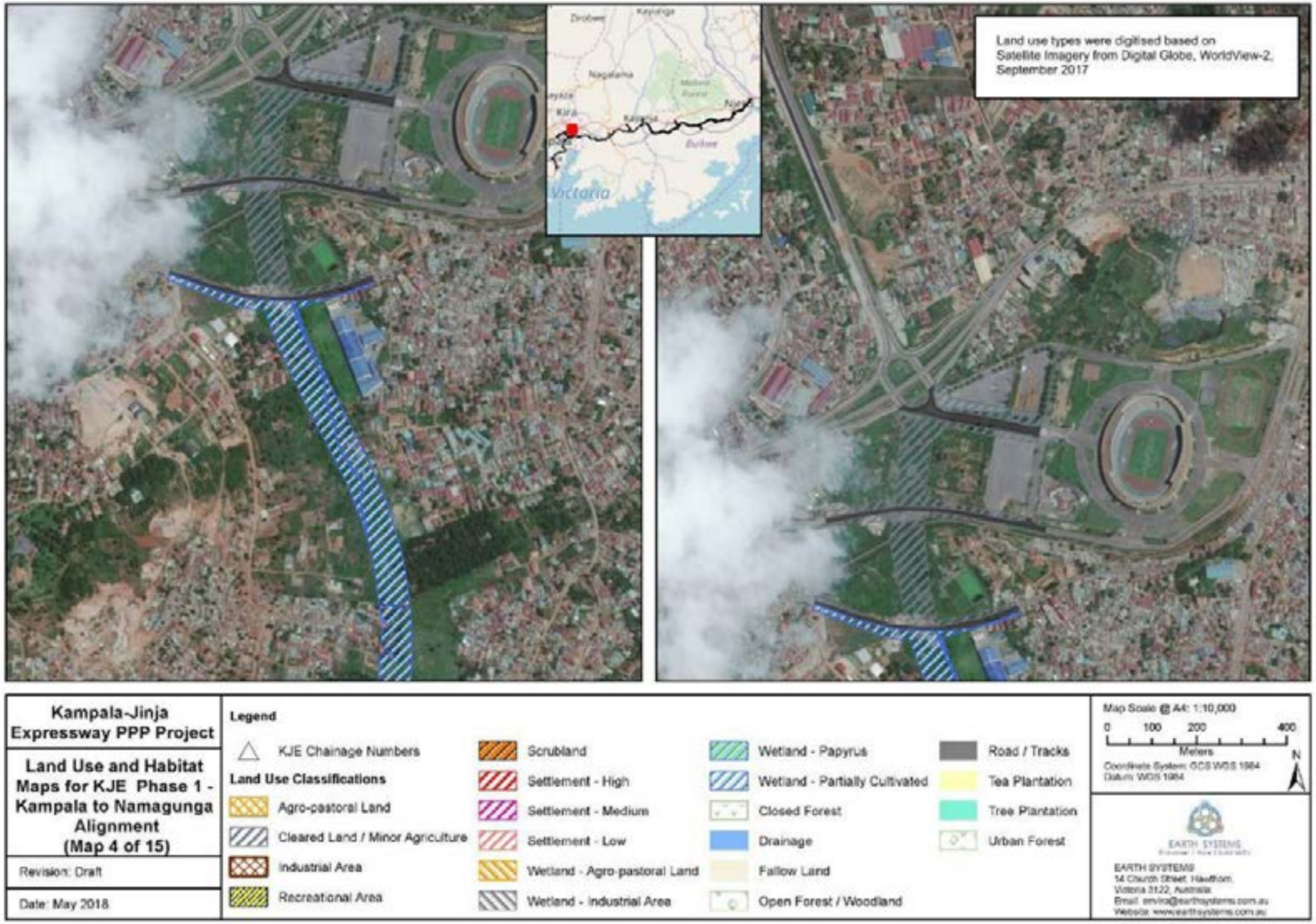


Figure 7-4 Land types and habitat within the KJE alignment – Chainage 6+500 to 6+600 (Map 4 of 16)

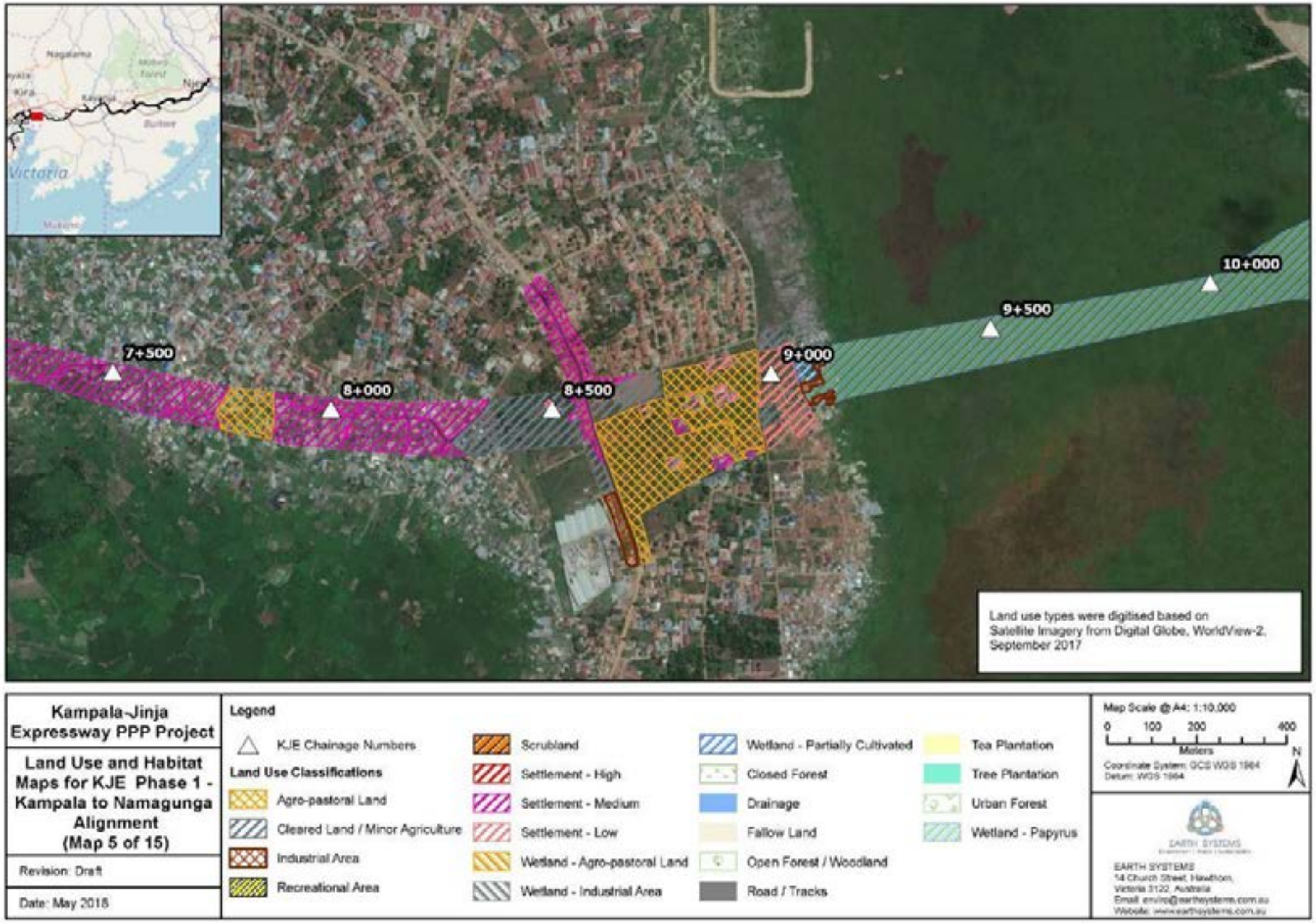


Figure 7-5 Land types and habitat within the KJE alignment – Chainage 7+500 to 10+000 (Map 5 of 16)

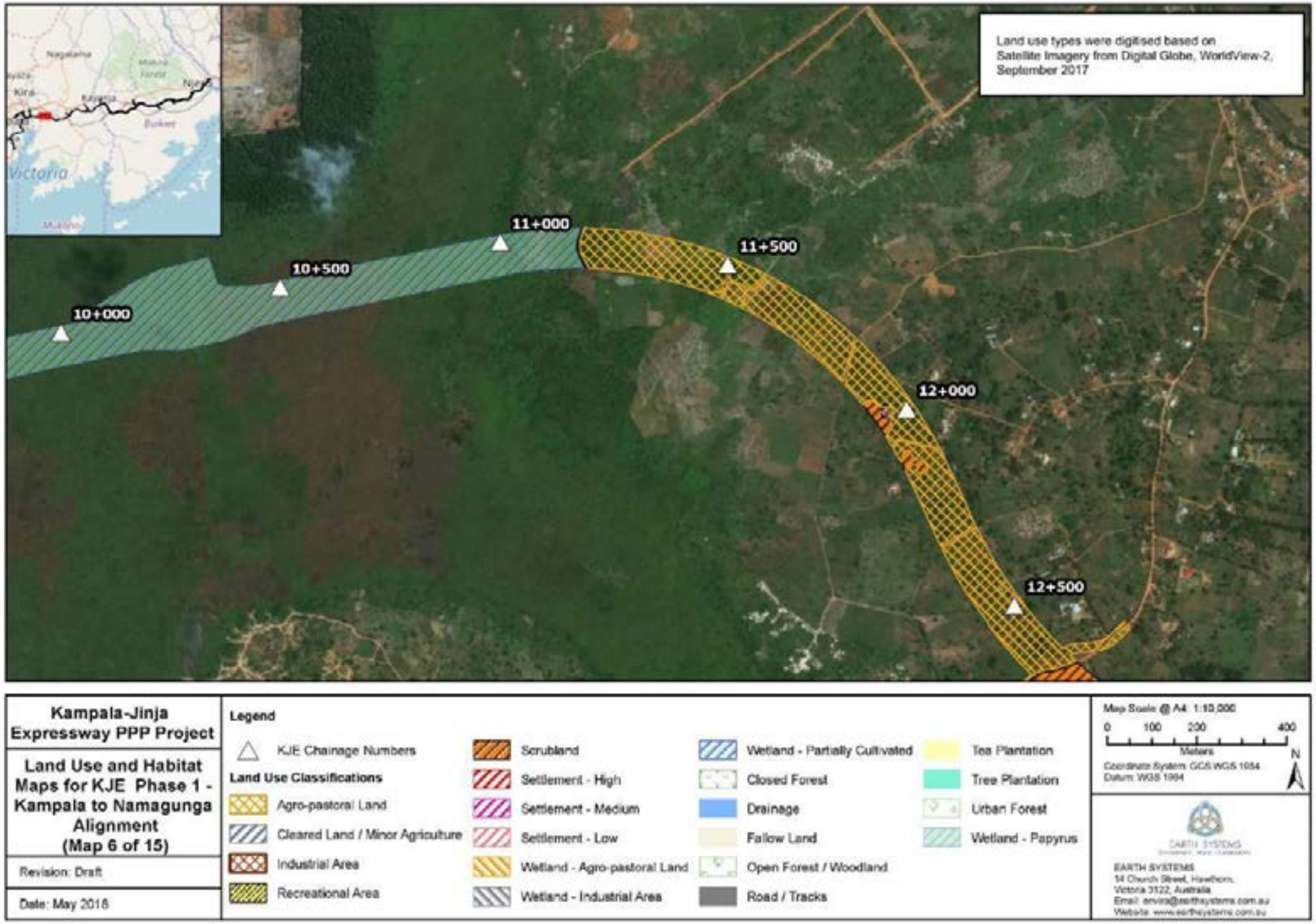


Figure 7-6 Land types and habitat within the KJE alignment – Chainage 10+000 to 12+500 (Map 6 of 16)

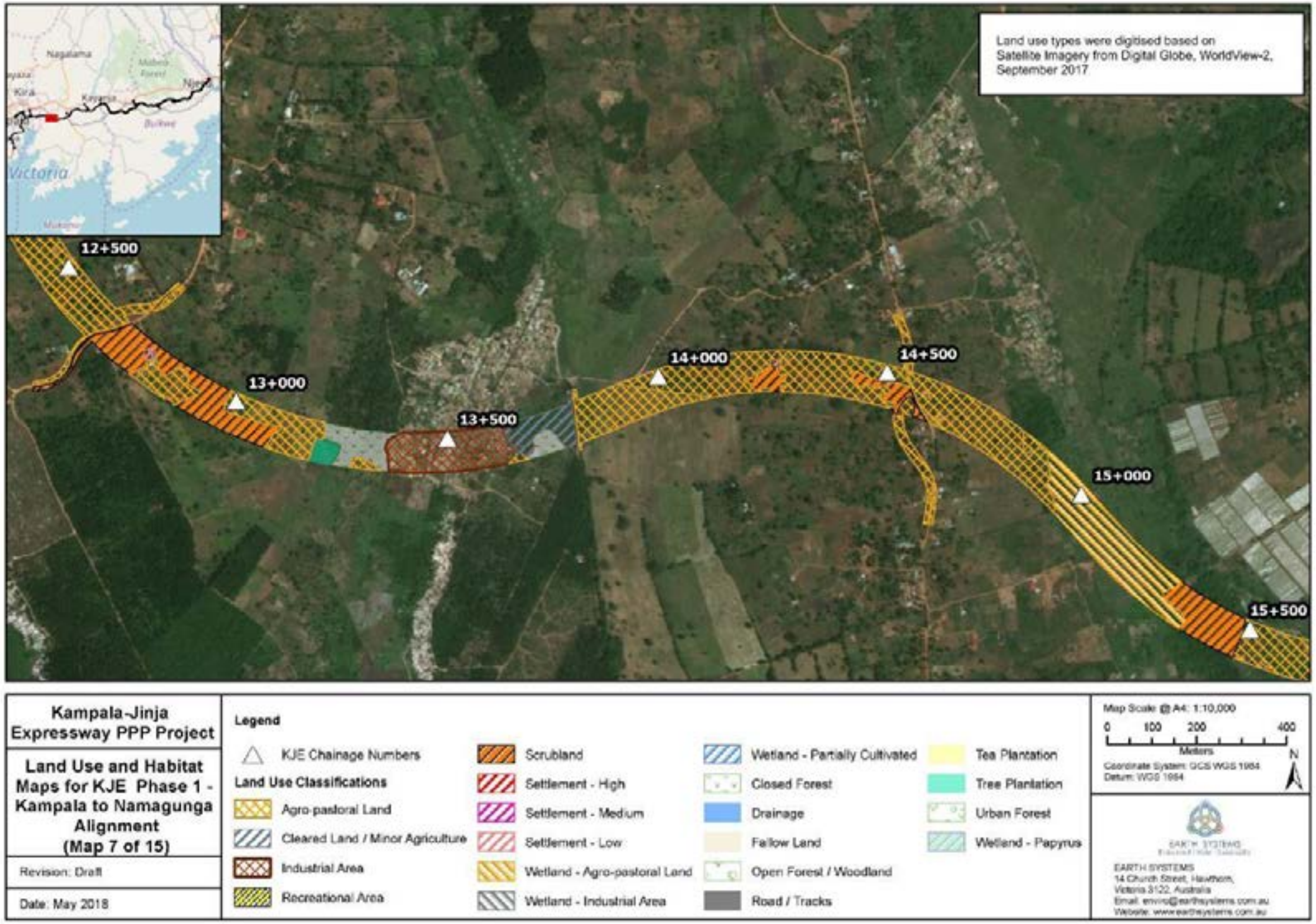


Figure 7-7 Land types and habitat within the KJE alignment – Chainage 12+500 to 15+500 (Map 7 of 16)

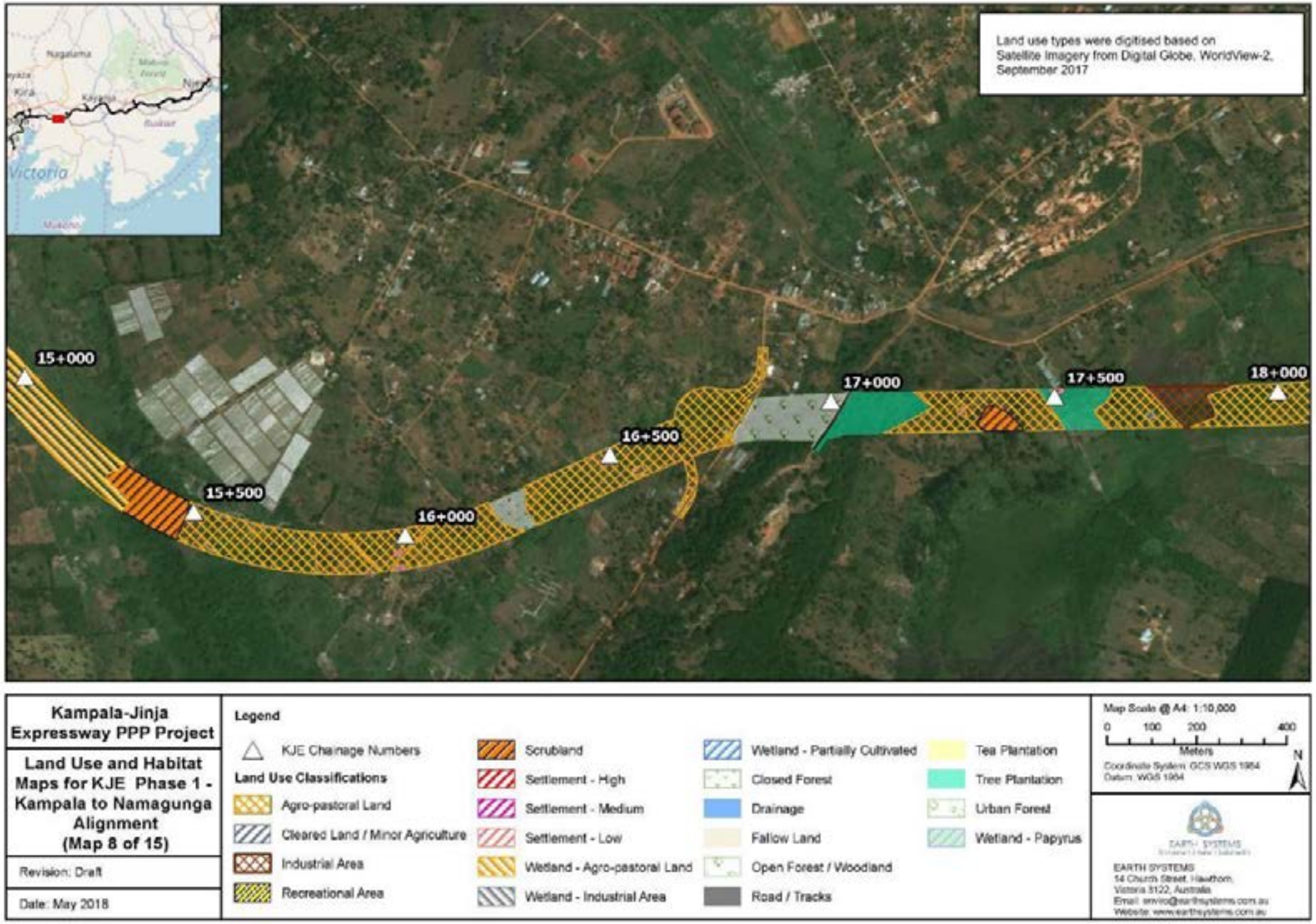


Figure 7-8 Land types and habitat within the KJE alignment – Chainage 15+000 to 18+000 (Map 8 of 16)

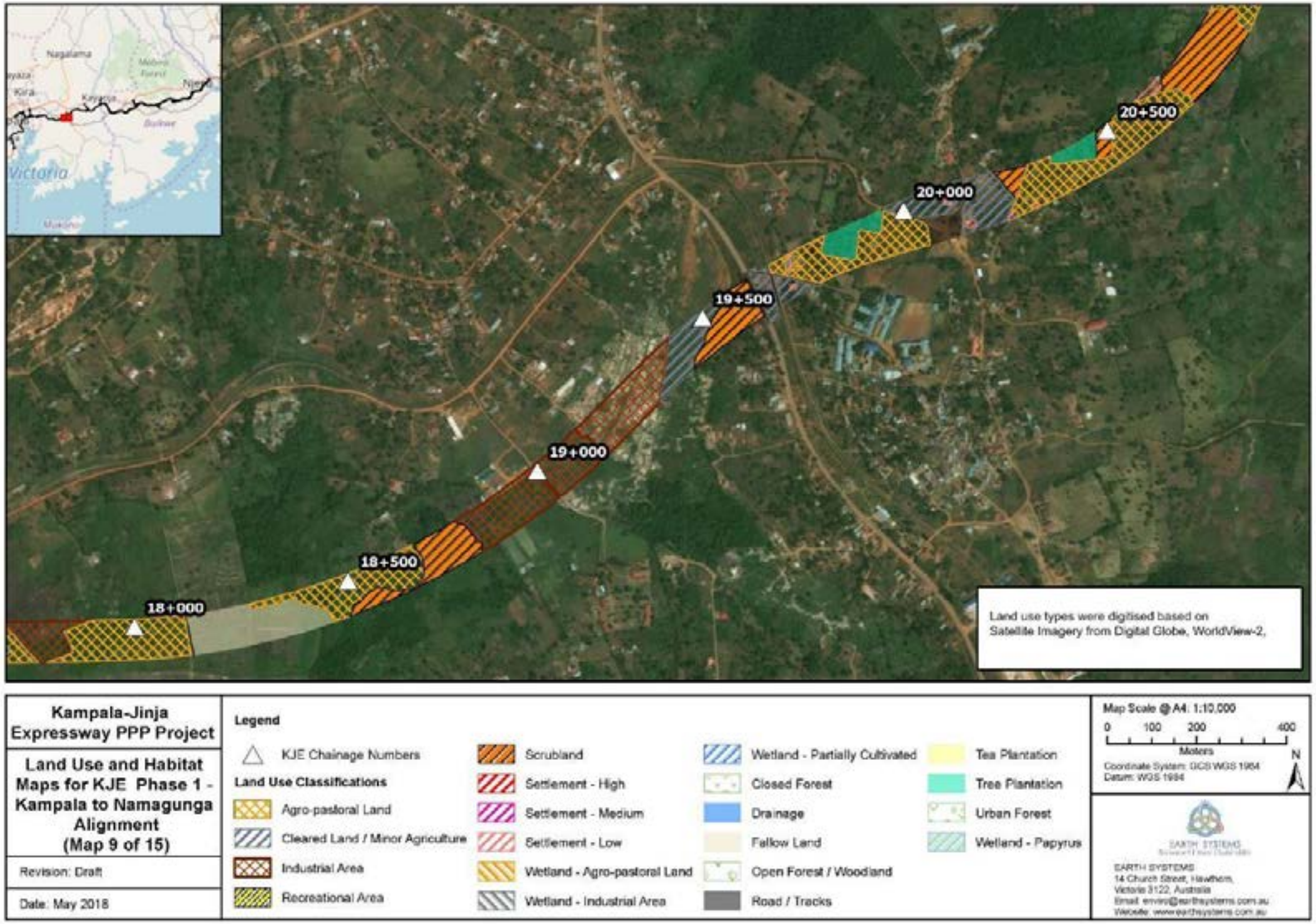


Figure 7-9 Land types and habitat within the KJE alignment – Chainage 18+000 to 20+500 (Map 9 of 16)

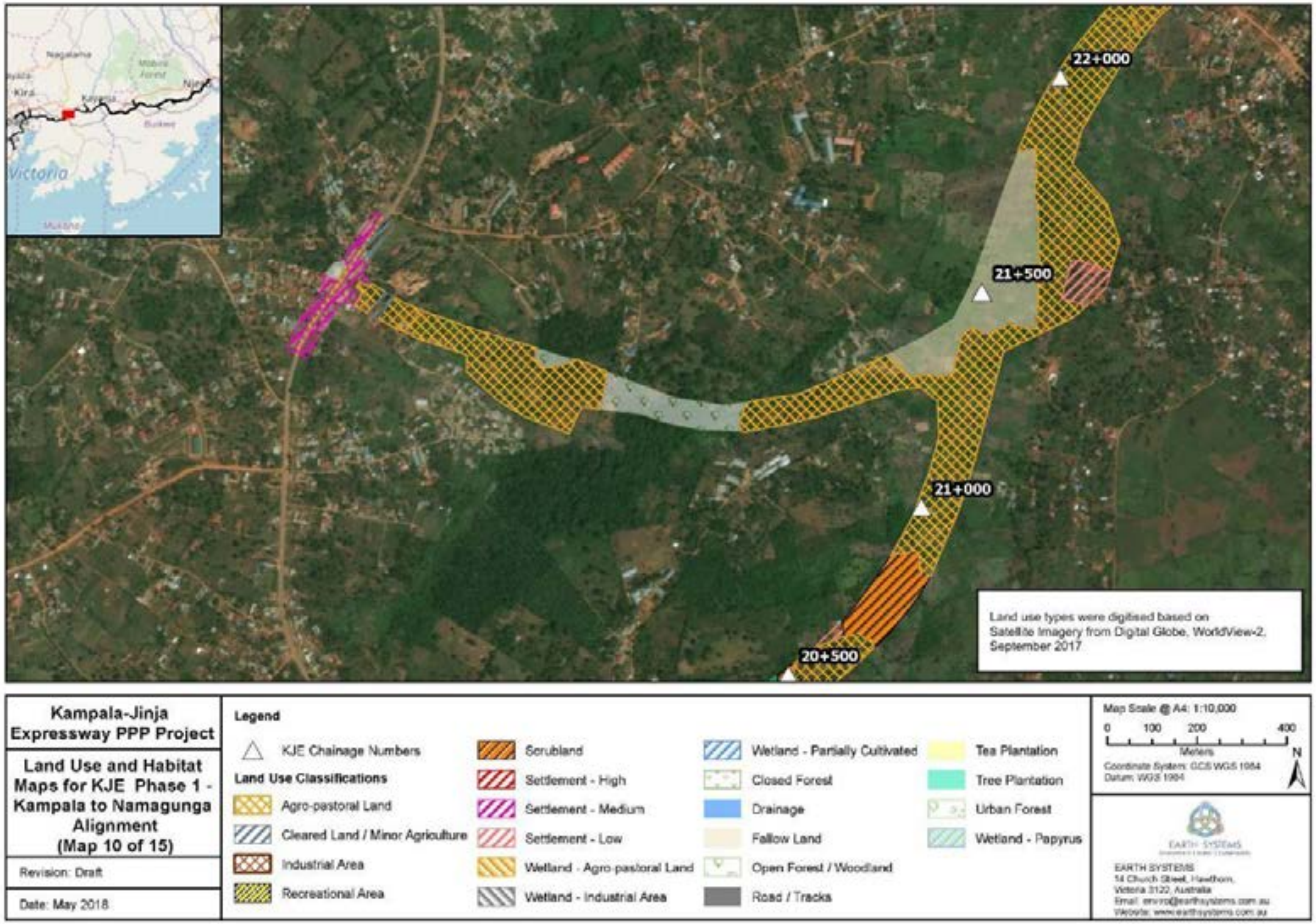


Figure 7-10 Land types and habitat within the KJE alignment – Chainage 20+500 to 22+000 (Map 10 of 16)

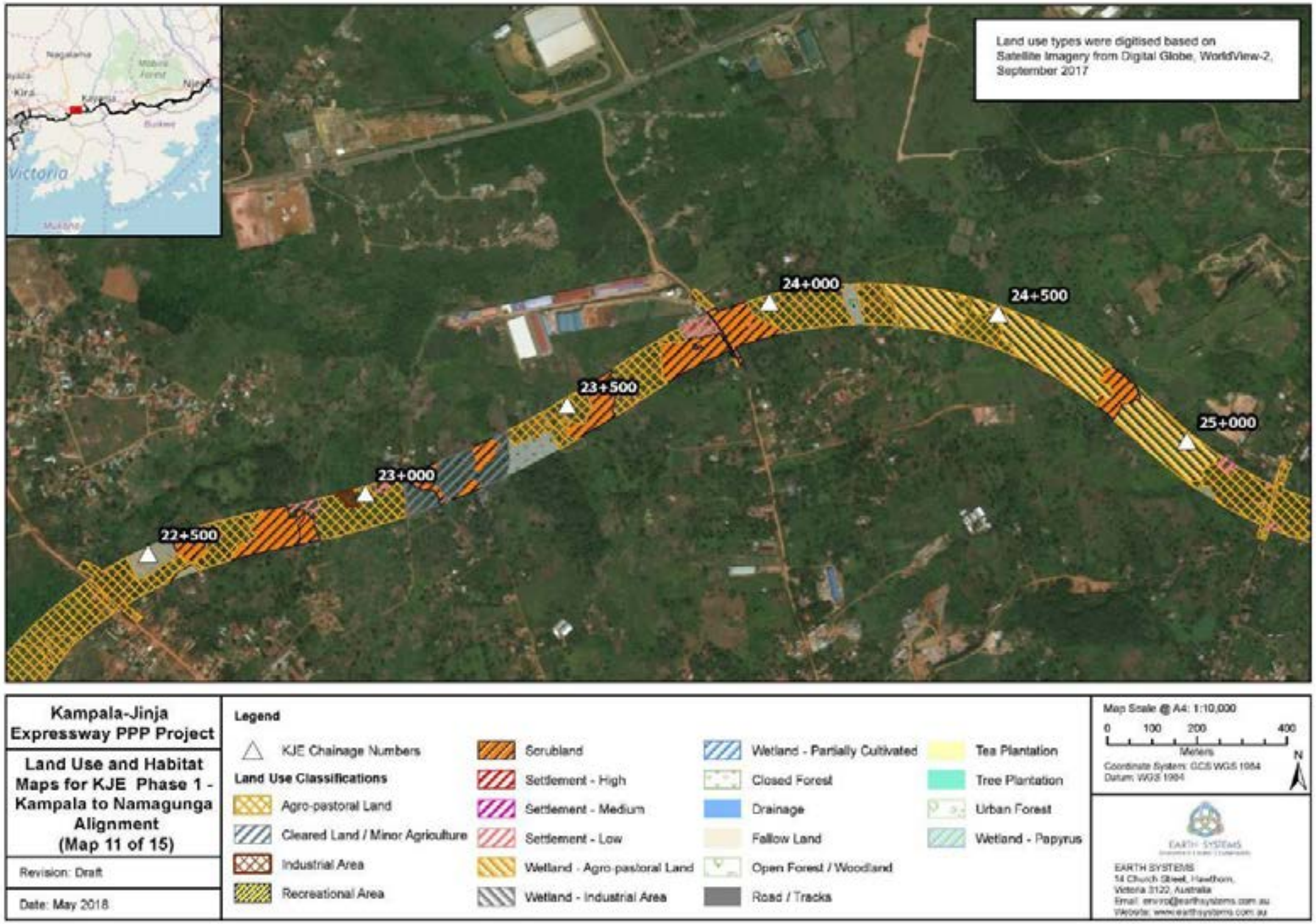


Figure 7-11 Land types and habitat within the KJE alignment – Chainage 22+500 to 25+000 (Map 11 of 16)

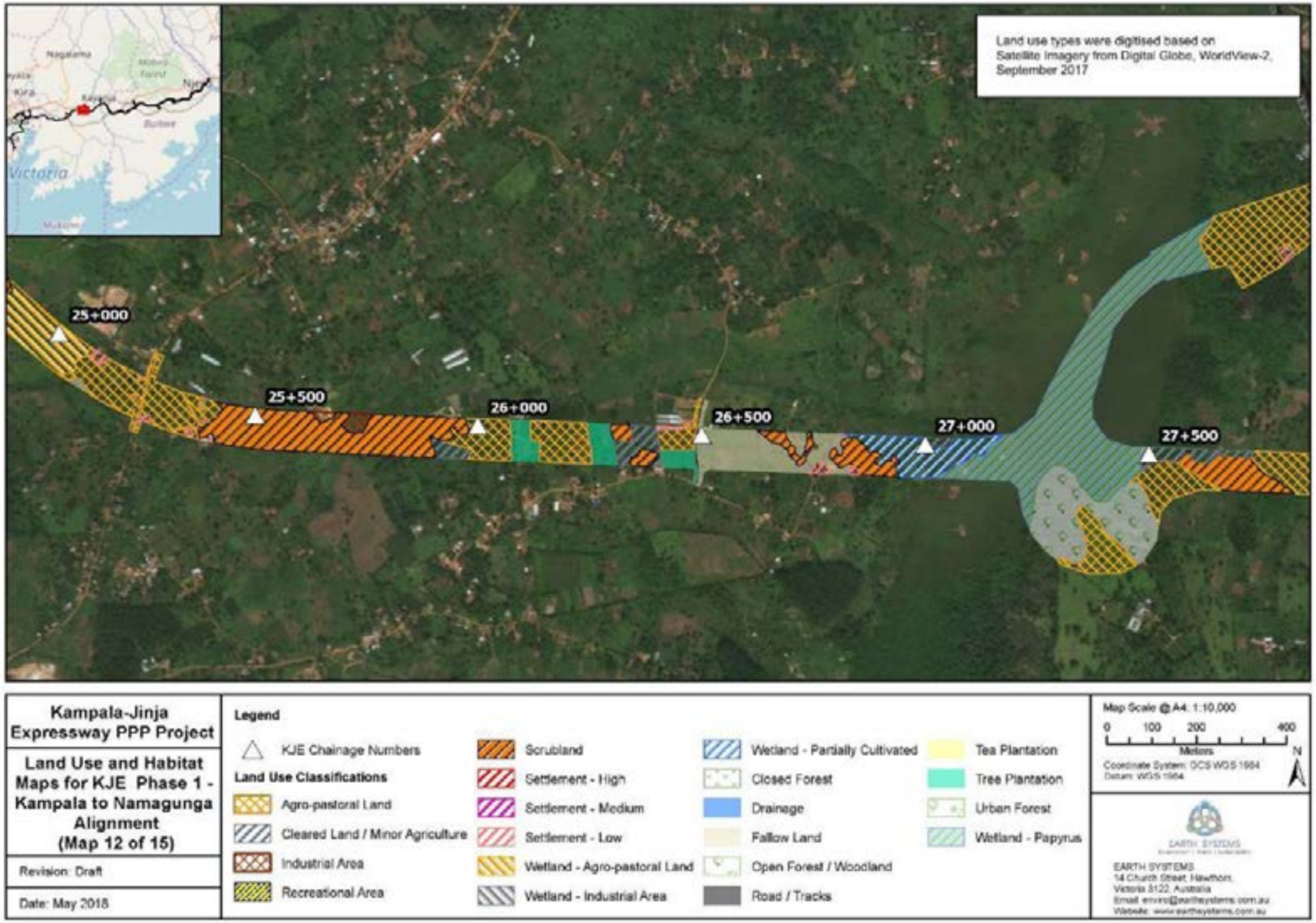


Figure 7-12 Land types and habitat within the KJE alignment – Chainage 25+000 to 27+500 (Map 12 of 16)

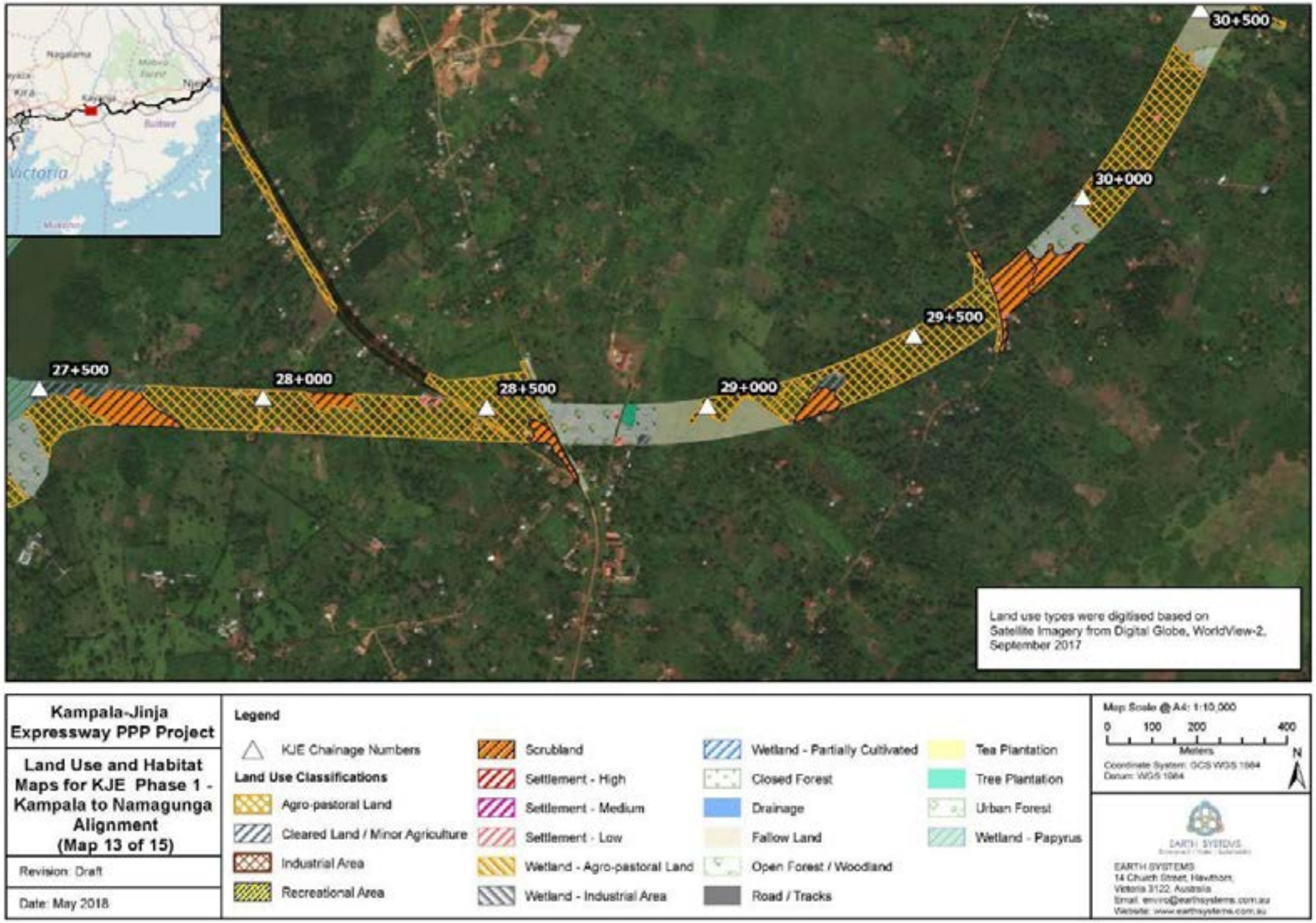


Figure 7-13 Land types and habitat within the KJE alignment – Chainage 27+500 to 30+500 (Map 13 of 16)

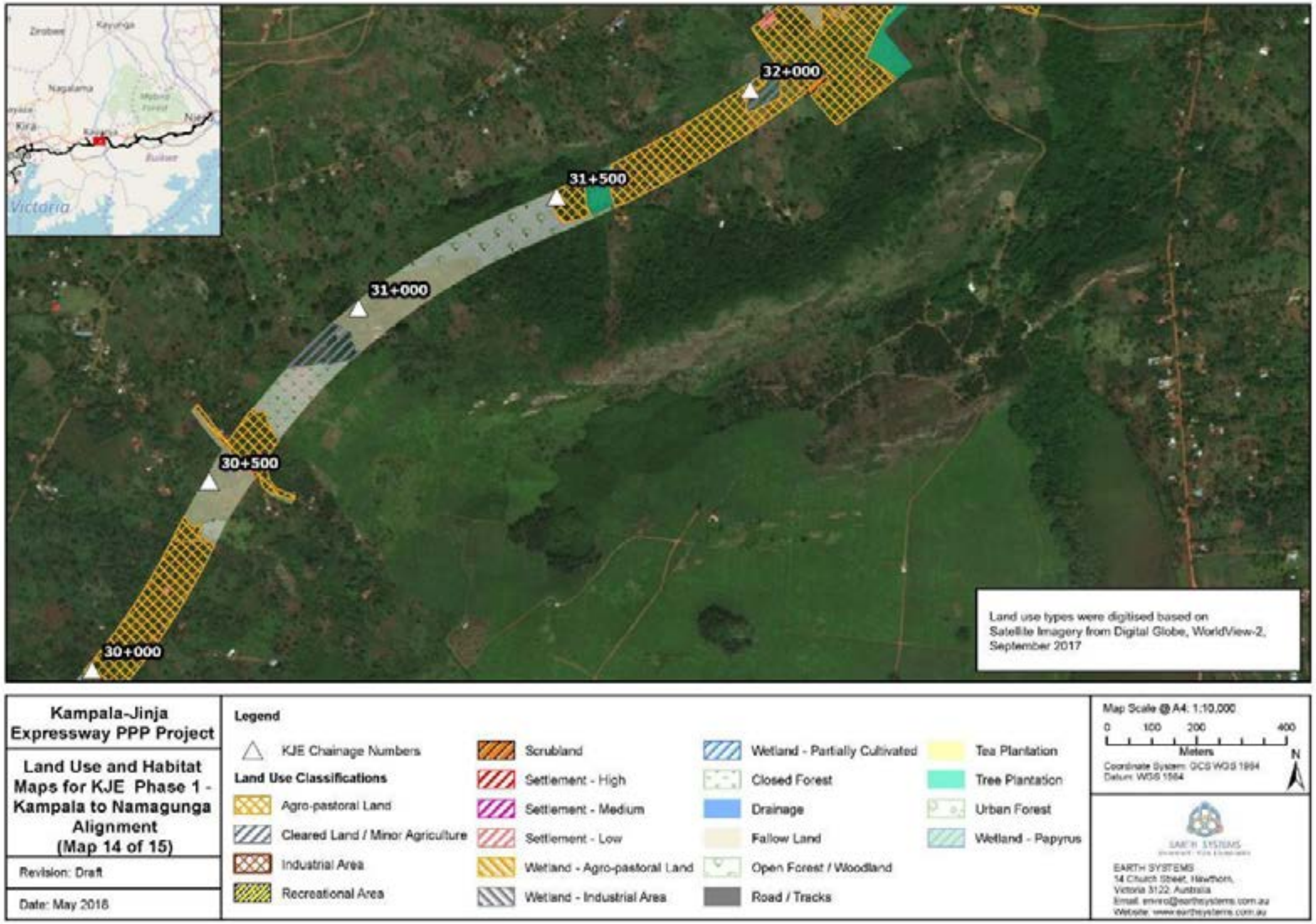


Figure 7-14 Land types and habitat within the KJE alignment – Chainage 30+000 to 32+000 (Map 14 of 16)

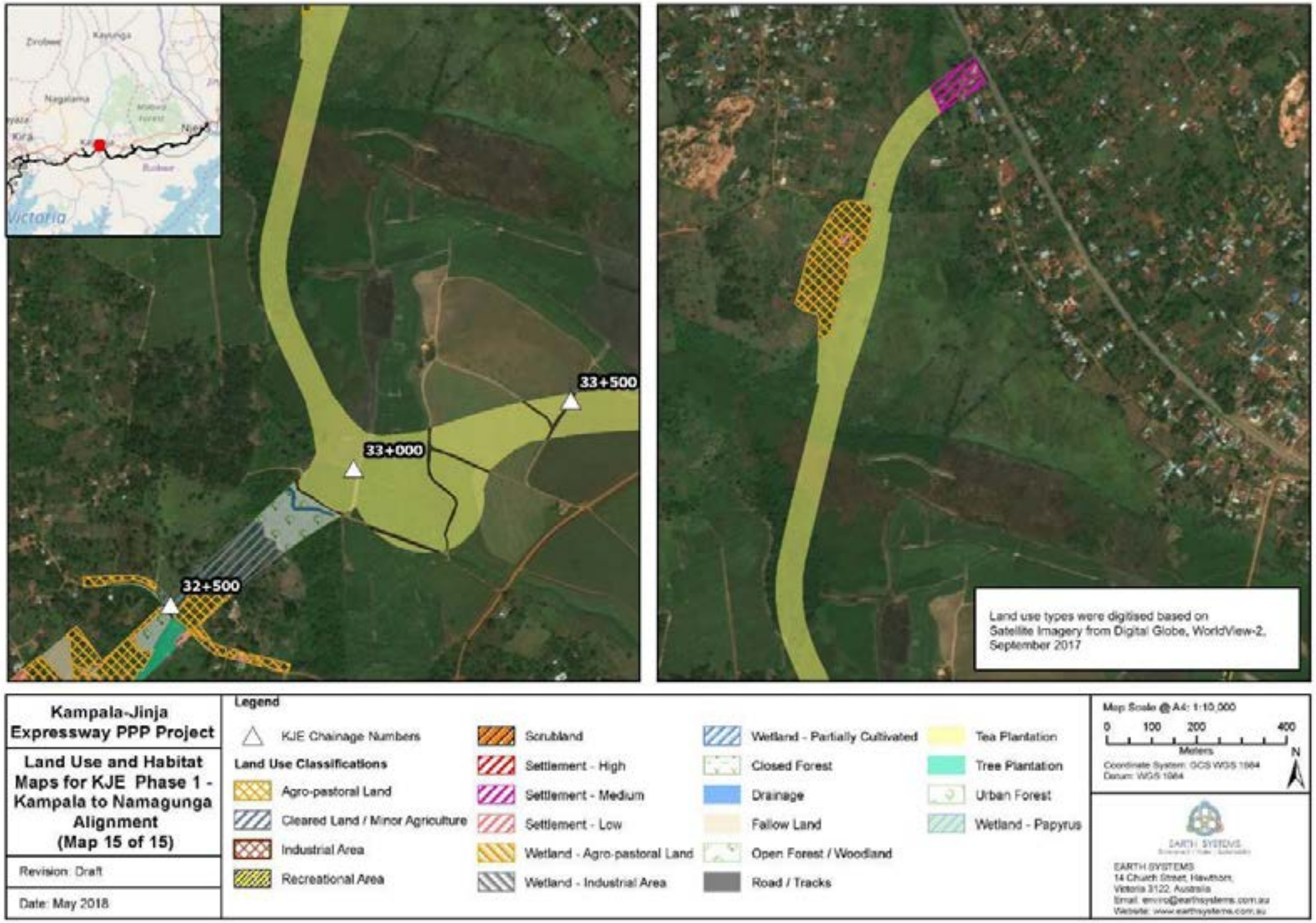


Figure 7-15 Land types and habitat within the KJE alignment – Chainage 32+500 to 33+500 (Map 15 of 16)

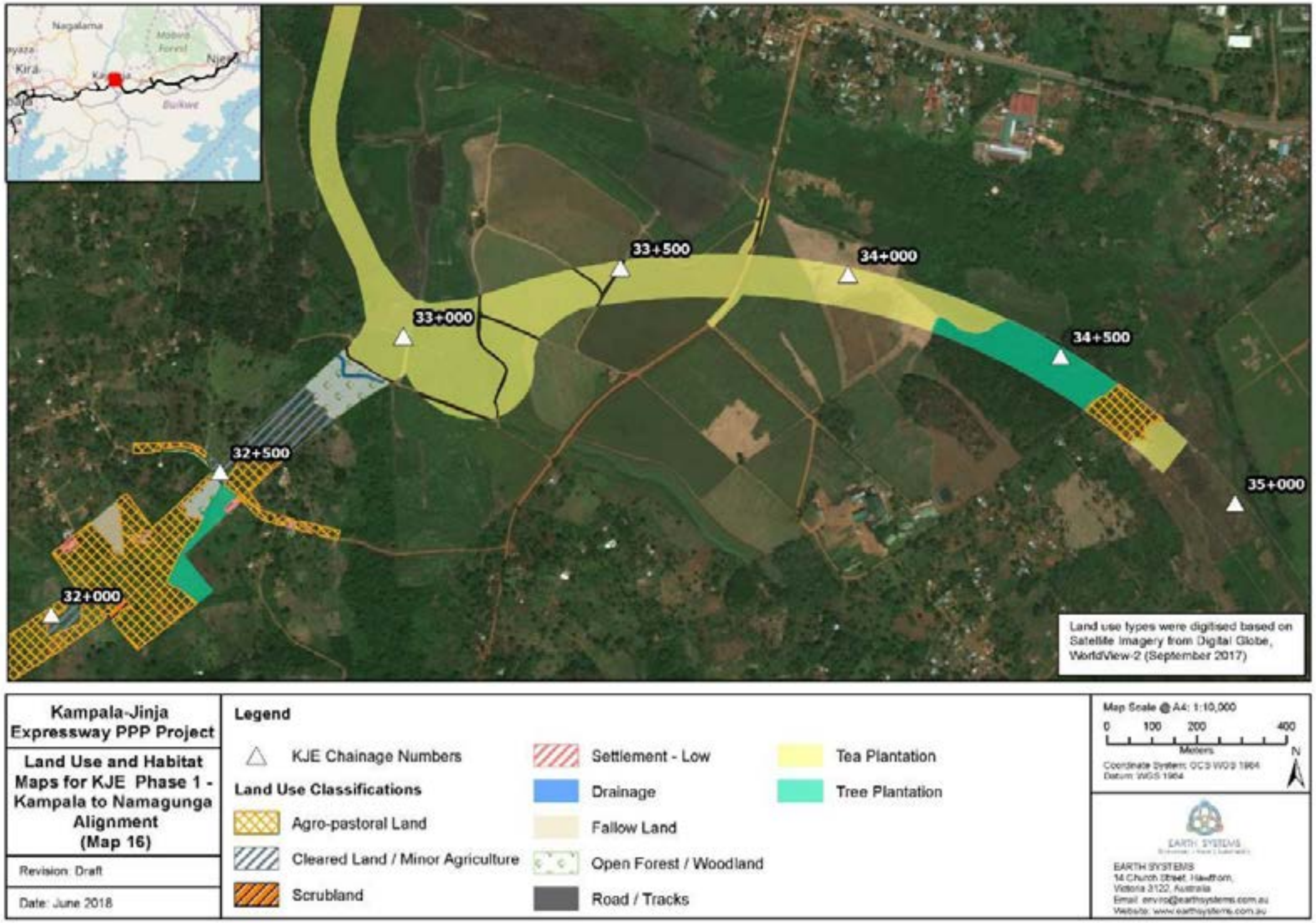


Figure 7-16 **Land types and habitat within the KJE alignment – Chainage 32+000 to 35+000 (Map 16 of 16)**

7.2.1.2 Kampala Southern Bypass

Analysis of high-resolution satellite imagery and ground-truthing were undertaken to identify the current land cover and use of land resources within the KSB alignment (refer to Section 7.2). Land cover types in the vicinity of the Project area were classified using manual interpretation of the satellite images at a scale of approximately 1:10,000.

Most of the land cover within the KSB alignment has been modified by human activities such as settlement areas, subsistence and intensive agriculture, and industrial activities.

The KSB alignment traverses the Nakawa and Makindye divisions in Kampala District, and the Kira Municipality and Ssabagabo-Makindye Sub-County in the Wakiso District.

A key feature of the land use in the area surrounding the Project is the presence of Kampala City where a large proportion of the KSB alignment is located. In contrast to the KJE alignment, the dominant land cover in the KSB alignment is settlement areas, comprising 51.4 ha (44%) of total land cover in the alignment. Cleared and minor agricultural land, and cultivated wetland is also common, comprising 14.9 ha (13%) and 29.8 ha (26%) respectively of land cover.

Papyrus wetlands were identified along the alignment comprising 2.1 ha (2%) of land cover. Natural habitats such as closed forest and scrubland were not identified within the alignment although small pockets of urban forest are present, particularly where the alignment passes through Kampala District.

Spatial analysis and fieldwork reconnaissance indicated that a relatively significant amount of land use is sugar cane farming. These areas are intersected by the alignment where it traverses through the Bogolobi swamp. Roads and tracks comprised 8.8 ha (8%), and industrial land comprised relatively little (2.4 ha; 2%) of total land cover. Other minor land cover types include drainage areas and watercourses, and recreational areas.

Land cover and land use activities along the KSB alignment is presented in further detail in the sections below, in Table 7-5 and from Figure 7-17 to Figure 7-23.

Settlement Areas

Settlement areas are the most common land cover within the KSB alignment. The largest amount of settlement land within the alignment occurs within Kampala district.

Housing types within the settlement areas traversed by the alignment are generally low to middle income housing areas, although the neighbourhoods of Muyenga Hill, Bukasa Hill and Makindye Hill are upmarket residential areas (UNRA, 2017). Informal settlement areas are also intercepted by the alignment including the Kitintale informal settlement.

Agriculture

Cleared and minor agricultural land is a relatively common land use activity along the KSB, although is mainly practiced towards the Makindye Division around KSB Chainage 7+500 – 11+000, and at the end of the KSB alignment, particularly in the vicinity of wetland areas, such as the Nakivubo and Kasanga wetland areas. During the November 2016 site visit, it was observed that local communities in Munyonyo and Bukasa areas engage in small-scale farming and gardens with crops grown, including cassava, maize and bananas (Atacama, 2017). Agro-pastoralism was not identified directly within the ROW of the KSB alignment.

Sugar Cane Plantations

The area between KSB Chainage 5+500 and 7+000 where the alignment passes through the Bogolobi swamp and Nakivubo wetland in Kampala District is dominated by sugar cane farming.

Table 7-5 Land cover types within the KSB Alignment (by hectare)

Figure	Km	Settlement Area	Industrial Area	Roads / Tracks	Cleared Land / Minor Agriculture	Drainage	Recreational Area	Urban Forest	Wetland - Papyrus	Wetland - Cultivated	Total
7-16	1 - 2	3.4		0.5	0.3	>0.1				0.5	4.7
	2 - 3	3.7		0.3	0.9			0.1		0	5
	3 - 4	5.1		0.8		>0.1				0	5.9
7-17	4 - 5	5.9	1.3	1.2	4.1	0.5	0.3	0.1		0	13.4
	5 - 6	1.2		0.3	1.2	0.2		0.1		3.2	6.2
7-17; 7-18	6 - 7	0.4		>0.1		0.1				5	5.5
7-18; 7-19	7 - 8	0.7		0.2		>0.1			0.2	4.7	5.8
	8 - 9	0.2		>0.1		>0.1			1.1	3.2	4.5
	9 - 10	0.7		0.1	0.2	>0.1		0.7		3.6	5.3
7-19; 7-20	10 - 11	2.3		0.2	0.5	0.2				2.8	6
	11 - 12	0.7	0.0	0.4	0.1	>0.1		0.4		6.4	8
	12 - 13	6.4		1.2	0.5			0.8		0	8.9
7-21	13 - 14	6.5		1.2	1.2			0.5		0	9.4
	14 - 15	1.9	0.2	0.2	1.8	0.2		1.0		0	5.3
7-22	15 - 16	3.4	0.1	0.4	1.0	0.1	0.1	0.3		0	5.4
	16 - 17	5.0		0.5	1.9			0.2		0	7.6
	17 – 17.8	3.9	0.8	1.3	1.2	0.1		1.3	0.8	0.4	9.7
	Total	51.4	2.4	8.8	14.9	1.4	0.4	5.5	2.1	29.8	116.6

**KSB alignment begins at chainage 1+1000*

Plate 7-7: Small-scale farming / gardens

Plate 7-8: Small-scale farming / gardens

Plate 7-9: Wetland, railway and settlements near Bukasa

Plate 7-10: Kyeitabya Hill

Plate 7-11: Structures near Mutungo Hill

Plate 7-12: Brickmaking in wetland edges at end of KSB

ISC, 2015

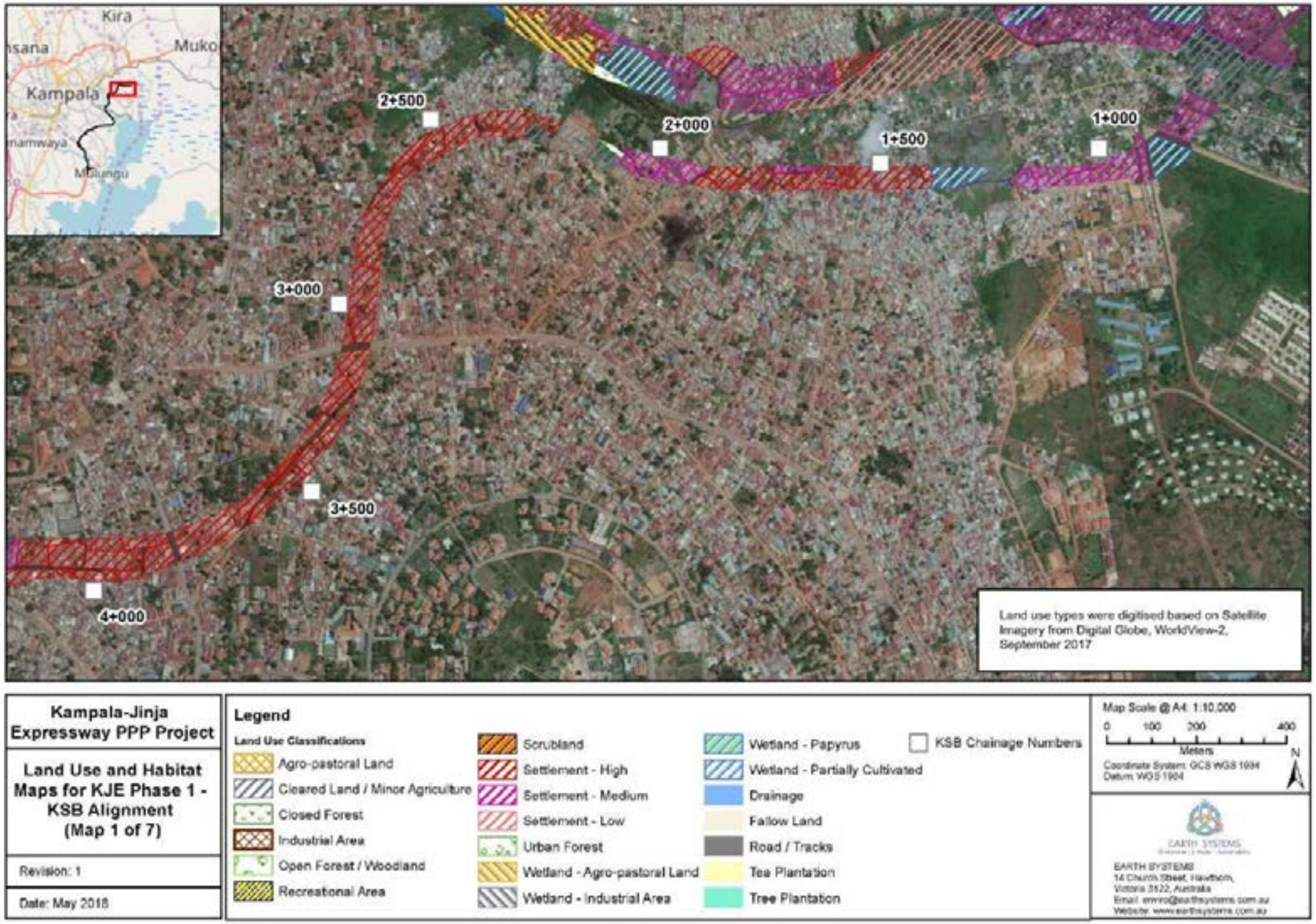


Figure 7-17 Land and habitat types within the KSB alignment –Chainage 1+000 to 4+000 (Map 1 of 7)

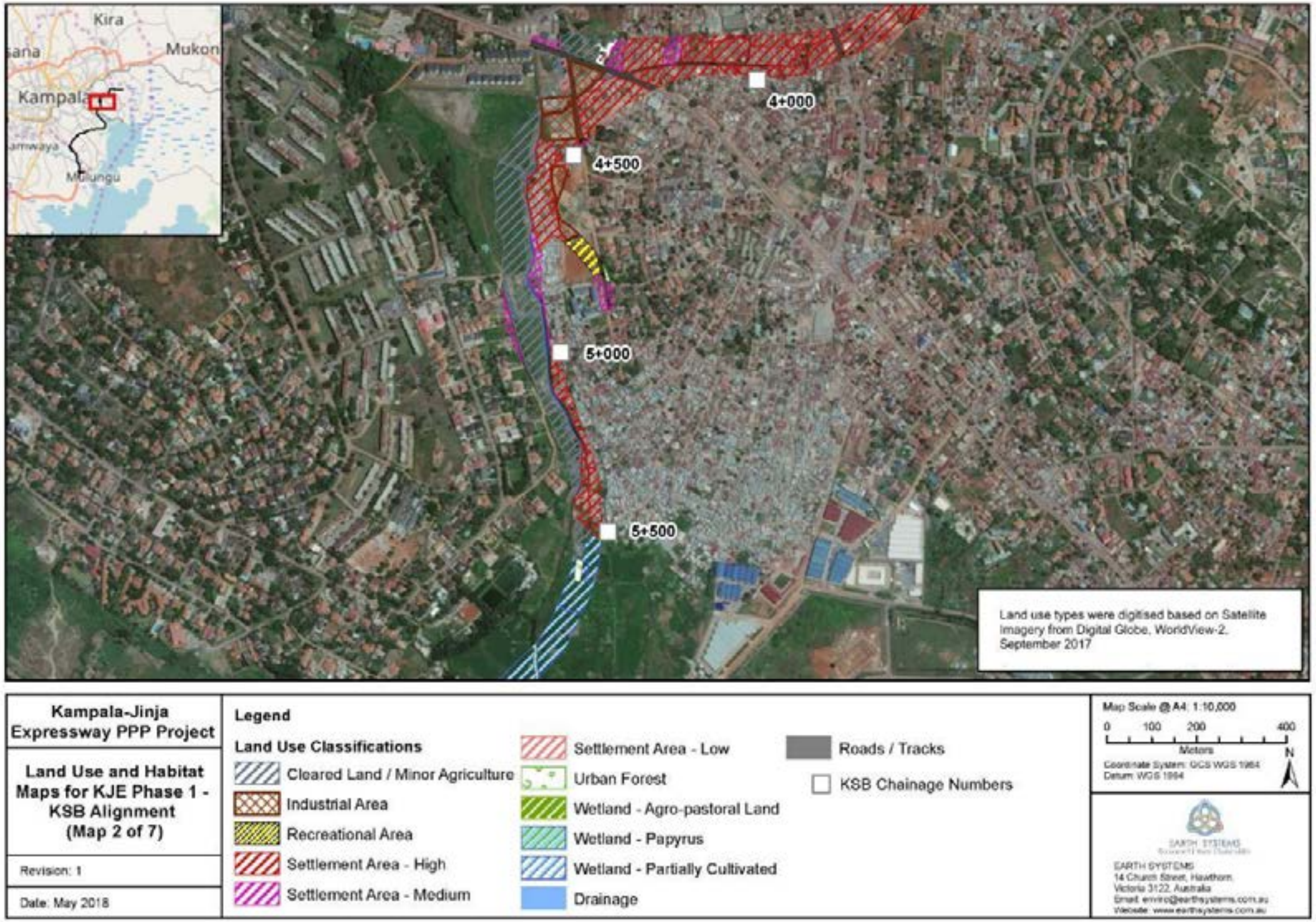


Figure 7-18 Land types and habitat within the KSB alignment – Chainage 4+000 to 5+500 (Map 2 of 7)

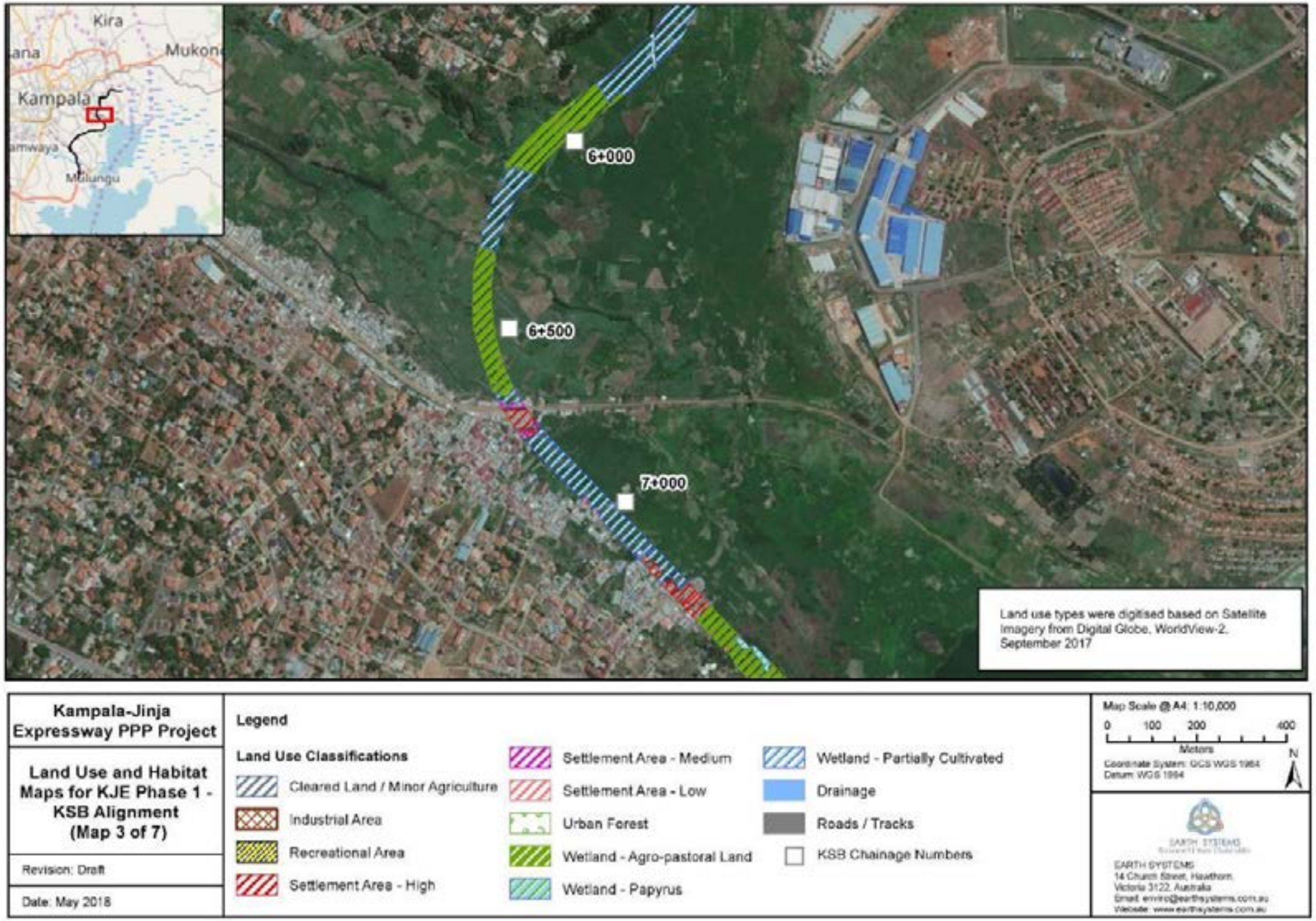


Figure 7-19 Land types and habitat within the KSB alignment – Chainage 6+000 to 7+000 (Map 3 of 7)

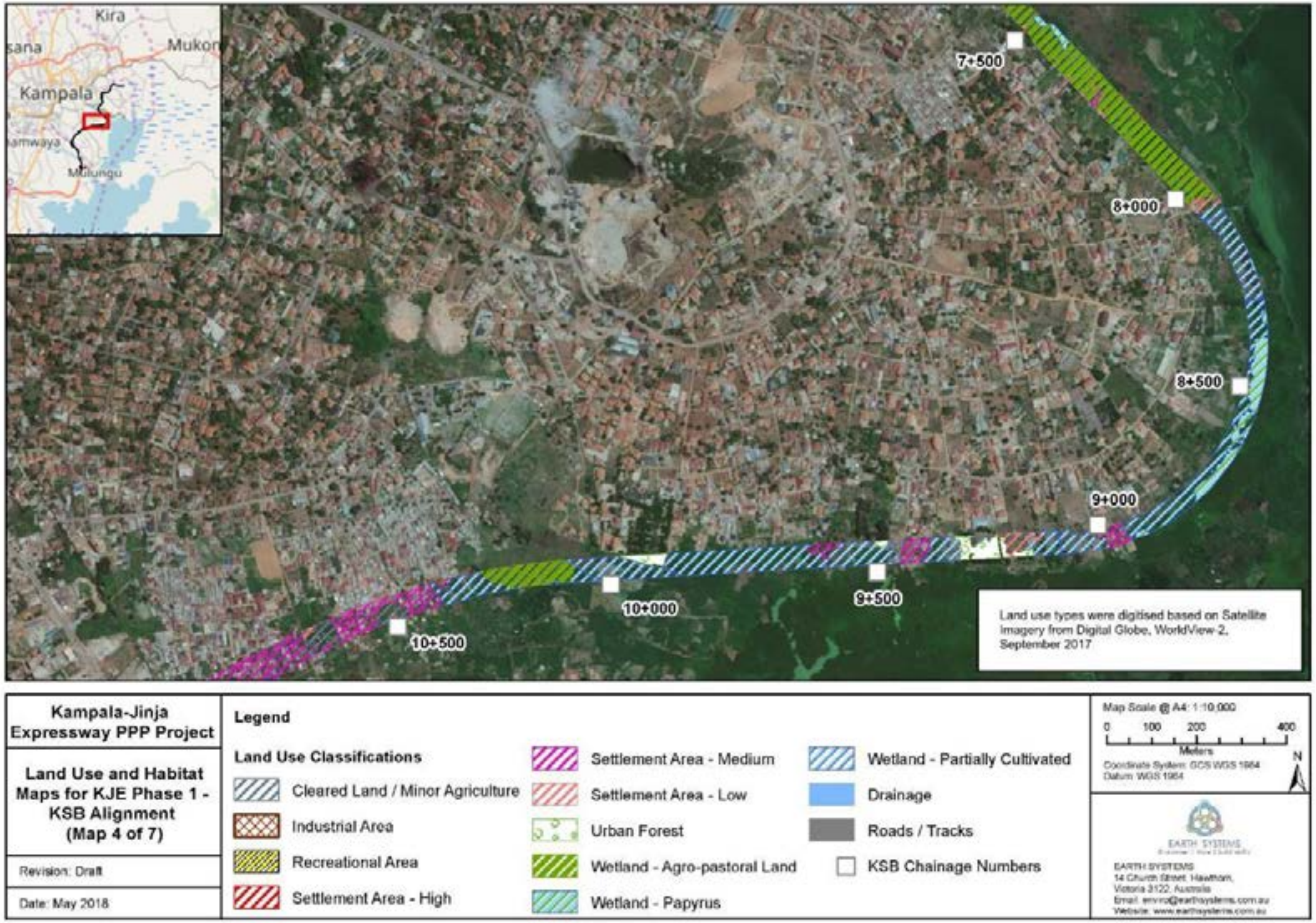


Figure 7-20 Land types and habitat within the KSB alignment – Chainage 7+500 to 10+500 (Map 4 of 7)

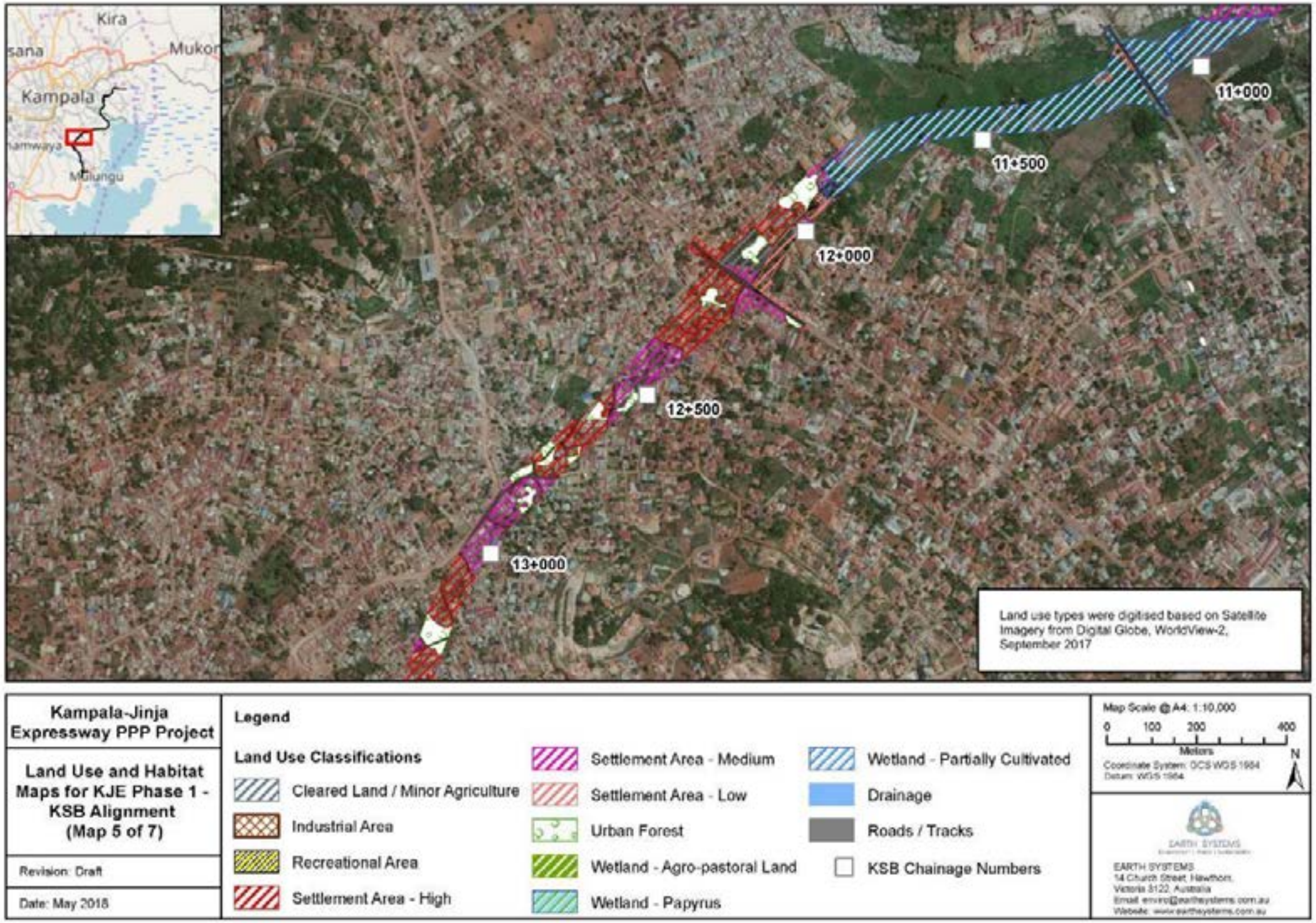


Figure 7-21 Land types and habitat within the KSB alignment – Chainage 11+000 to 13+000 (Map 5 of 7)

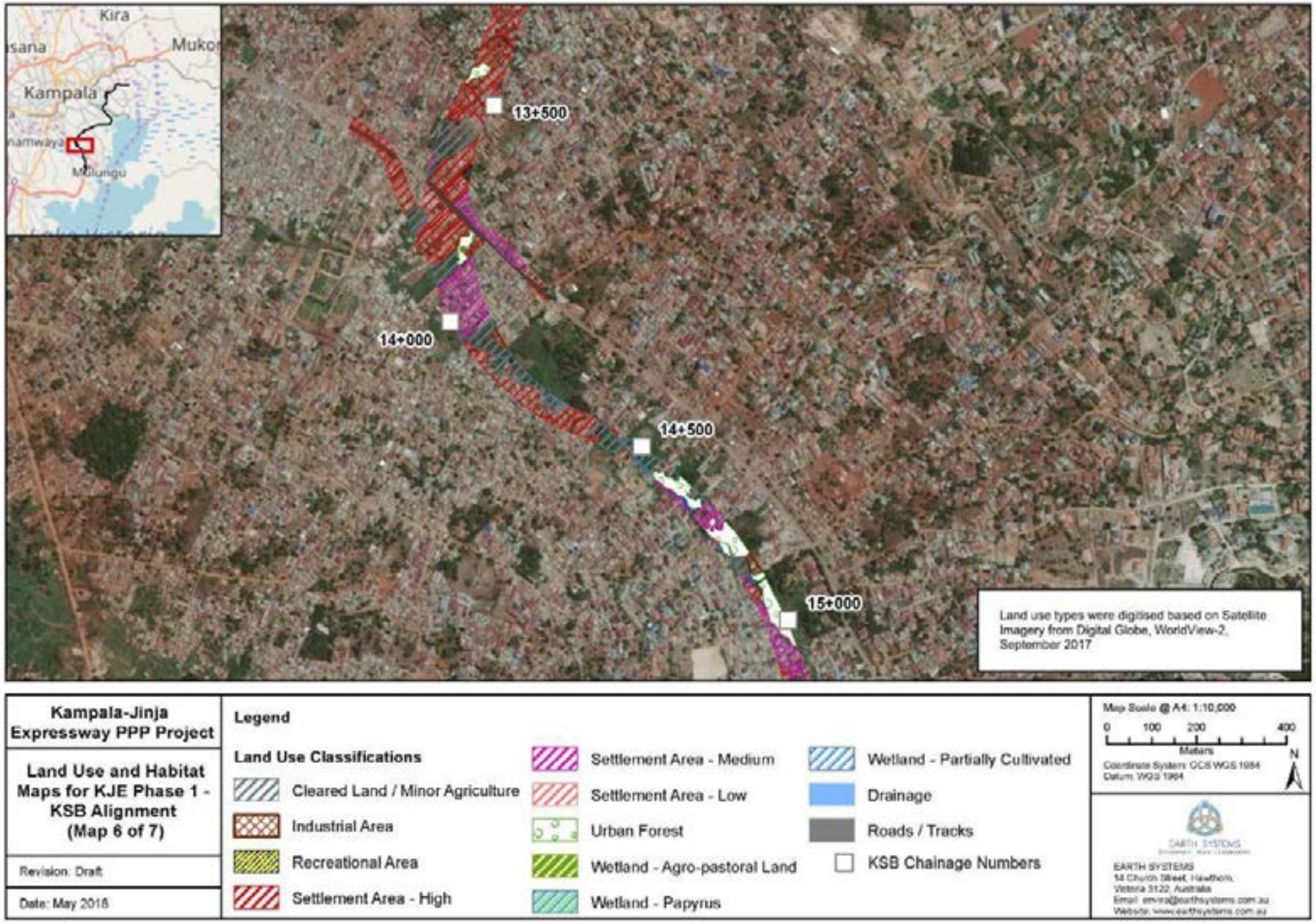


Figure 7-22 Land types and habitat within the KSB alignment – Chainage 13+500 to 15+000 (Map 6 of 7)

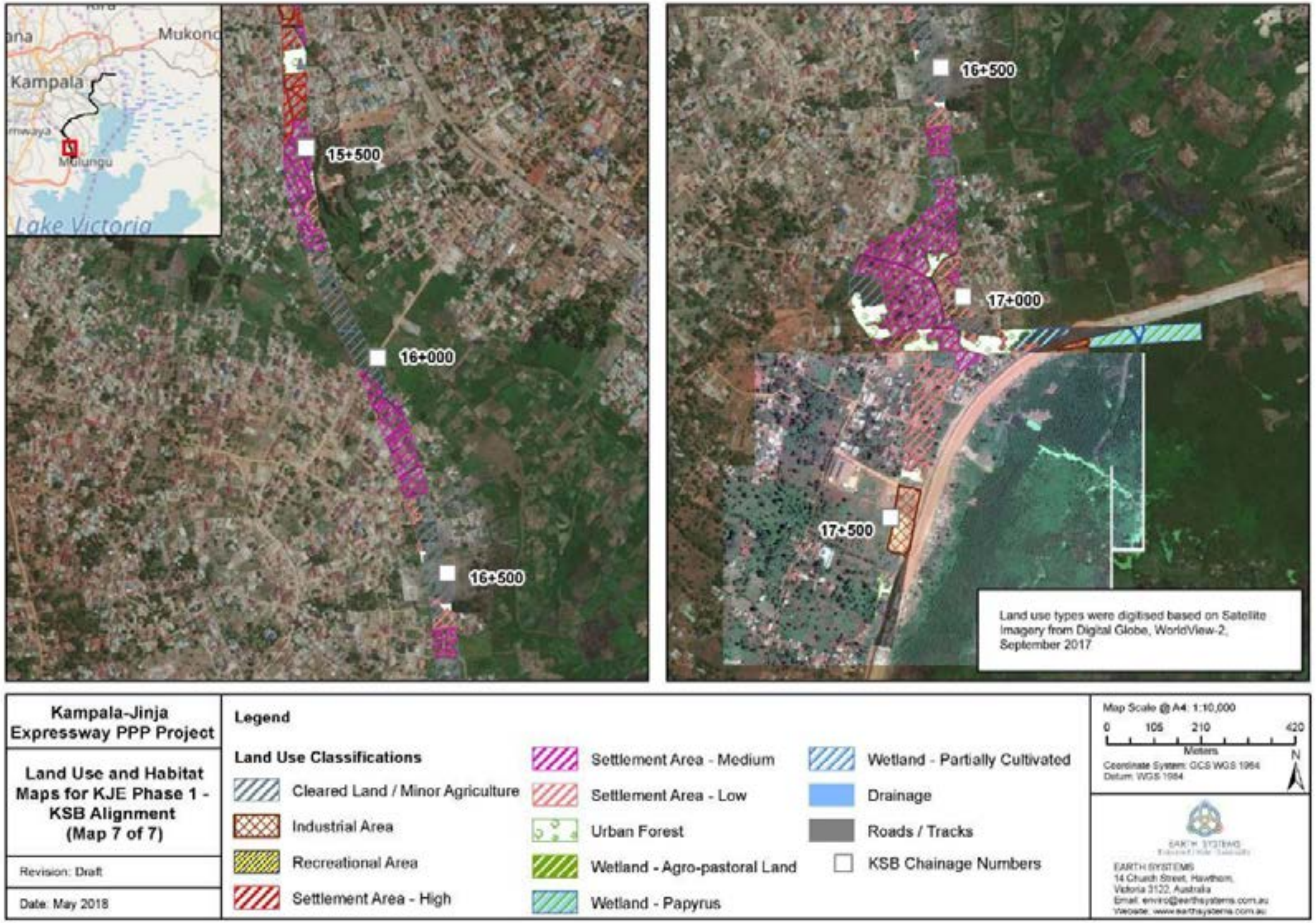


Figure 7-23 Land types and habitat within the KSB alignment – Chainage 15+500 to 17+800 (Map 7 of 7)

7.2.2 Assets and Infrastructure

7.2.2.1 Kampala Jinja Mainline

Table 7-6 presents the number and area of identifiable structures within the KJE ROW. In total, 4,488 structures covering an area of 20.9 ha were identified via geospatial analysis of high-resolution September 2017 satellite imagery, including:

- 2,706 (5.2 ha) small structures that had areas <0.004 ha;
- 1,131 (6.4 ha) small-medium structures that had areas 0.004 – 0.008 ha;
- 367 (3.5 ha) medium structures that had areas 0.008 – 0.012 ha;
- 132 (1.8 ha) medium-large structures that had areas 0.012 – 0.016 ha; and
- 152 (4.0 ha) large structures that had areas >0.016 ha.

Residential Structures and Households

The KJE alignment traverses both informal residential, and legal and tenured residential settlement-area zones. These zones are characterised by:

Informal residential settlement areas- These are informal settlement areas in which rates of household owner-occupancy and title over assets is low. Within these areas, population density is relatively high, and households are predominantly low-income. Due to the lack of legal title over their assets, many households within these areas are not legitimate claimants under Ugandan Law and so are not entitled to compensation for their displacement.

Legal and tenured residential settlement areas – These are formal settlement zones in which the rate of owner-occupancy is higher, with lower population density and a relatively higher average household income. The households within these areas are more likely to possess legitimate title over their assets and therefore likely to be adequately compensated during displacement.

2018 Census data and spatial analysis indicates that approximately 80% (3,505) of all non-industrial sized structures (with areas <0.016 ha) within the KJE alignment are estimated to be residential (Table 7-4). 74% these residential structures are situated between KJE Chainage 3+000-6+300 in Nakawa Division, and KJE Chainage 6+400-8+300 in Kira Municipality. The residential structures within these areas are predominantly small to small-medium sized residences. Within Nakawa Division, the alignment traverses densely-populated informal residential areas of Kinawataka and Kasokoso, in which small permanent and semi-permanent structures are built on marginal land including wetlands. Within Kira Municipality between Chainage 6+400-8+300, the alignment intersects predominantly formal legal settlement areas of Bweyogerere.

Following this section of the alignment, the ROW from Mukono District to Namagunga intersects mainly areas of subsistence agriculture and forested areas, where fewer structures and assets are located amongst smaller dispersed settlements.

Table 7-6 Structures identified within the KJE alignment

Km	Small (<0.004 ha)		Small-medium (0.004-0.-008 ha)		Medium (0.008-0.-012 ha)		Medium-large (0.012-0.-016 ha)		Large (>0.016 ha)		Total structures		Resid-ences
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.
0-1	85	0.2	59	0.3	22	0.2	8	0.1	14	0.3	188	1.2	66
1-2	78	0.1	43	0.2	21	0.2	10	0.1	11	0.7	163	1.4	74
2-3	8	<0.1	5	<0.1	4	<0.1	4	0.1	8	0.2	29	0.4	0
3-4	911	1.6	282	1.6	66	0.6	20	0.3	18	0.4	1,297	4.4	1,054

Km	Small (<0.004 ha)		Small-medium (0.004-0.-008 ha)		Medium (0.008-0.-012 ha)		Medium-large (0.012-0.-016 ha)		Large (>0.016 ha)		Total structures		Resid-ences
4-5	234	0.5	70	0.4	11	0.1	2	<0.1	5	0.1	322	1.1	305
5-6	278	0.5	140	0.8	36	0.4	11	0.2	11	0.3	476	2.1	326
6-7	771	1.5	322	1.8	99	1.0	35	0.5	20	0.4	1,247	5.2	1,111
7-8	129	0.3	62	0.4	24	0.2	14	0.2	5	0.1	234	1.1	216
8-9	105	0.2	59	0.3	30	0.3	14	0.2	36	0.8	244	1.9	139
9-10	37	0.1	1	<0.1	0		0		0		38	0.1	34
10-11	0		0		0		0		0		0		0
11-12	5	<0.1	3	<0.1	0		0		0		8	<0.1	0
12-13	1	<0.1	3	<0.1	4	<0.1	1	<0.1	1	<0.1	10	0.1	0
13-14	0		0		0		0		0		0		0
14-15	4	<0.1	4	<0.1	2	<0.1	1	<0.1	0		11	0.1	7
15-16	0		1	<0.1	2	<0.1	0		0		3	<0.1	0
16-17	3	<0.1	5	<0.1	1	<0.1	0		1	<0.1	10	0.1	7
17-18	2	<0.1	1	<0.1	1	<0.1	0		1	<0.1	5	<0.1	0
18-19	2	<0.1	0		0		0		0		2	<0.1	0
19-20	3	<0.1	2	<0.1	5	<0.1	1	<0.1	0		11	0.1	6
20-21	3	<0.1	1	<0.1	3	<0.1	0		3	0.1	10	0.1	8
21-22	4	<0.1	2	<0.1	2	<0.1	1	<0.1	0		9	0.1	22
22-23	3	<0.1	4	<0.1	1	<0.1	0		1	<0.1	9	0.1	9
23-24	5	<0.1	2	<0.1	3	<0.1	0		0		10	0.1	10
24-25	0		2	<0.1	0		0		0		2	<0.1	2
25-26	3	<0.1	6	<0.1	2	<0.1	2	<0.1	0		13	0.1	5
26-27	1	<0.1	5	<0.1	0		0	<0.1	3	0.1	9	0.1	9
27-28	2	<0.1	0		0		0	<0.1	0		2	<0.1	1
28-29	14	<0.1	31	0.2	17	0.2	5	0.1	9	0.2	76	0.7	65
29-30	1	<0.1	3	<0.1	2	<0.1	0	<0.1	1	<0.1	7	0.1	4
30-31	6	<0.1	4	<0.1	0		0	<0.1	0		10	<0.1	10
31-32	3	<0.1	0	<0.1	0	<0.1	0	<0.1	0		3	<0.1	1
32-33	0		2	<0.1	1	<0.1	1	<0.1	2	0.1	6	0.1	1
33-34	2	<0.1	6	<0.1	8	0.1	2	<0.1	2	<0.1	20	0.2	13
34-34.8	3	<0.1	1	<0.1	0		0	<0.1	0		4	<0.1	0
Total KJE	2,706	5.2	1,131	6.4	367	3.5	132	1.8	152	4.0	4,488	20.9	3,505

Population

2018 Census Surveys indicates that 17,137 people are located within the KJE alignment ROW, approximately 90% of whom are situated within in urban and peri-urban areas between KJE chainages: 3+000-9+000, in high-density settlement areas. These peoples are predominantly low-income, with an assessment of the average monthly income per person/householder (calculated based on the total household income averaged over all members within a household) finding that:

- 72% (12,346) of the population belonging to 68% of households within the KJE ROW are low-income and living below the International Poverty Line of USD$1.90/day, which is approximately equivalent to 216,000UGX per month;

- 47% (8,038) have an average income of 0-100k UGX/month;
- 7% (1,154) are relatively middle income (501-10,000k UGX/month); and
- <1% (14) are relatively high-income (>10M UGX/month).

Owner-Occupancy and Land-Title

2,044 (58%) of households claimed to be owner-occupied, 1,875 of which claimed to have legitimate title over their land. 1,461 households were not owner-occupied and therefore are not considered as eligible claimants of compensation under Ugandan Law for the structures or land in which they reside. These households are either tenanted, caretaker or squatted residences (Table 7-7).

Table 7-7 Summary of monthly income (per person), population, households and owner/title status within KJE alignment.

Av. Income (k UGX/ person/ month)	Population	% Population	Residences	Owner-occupied residences	Owners with Title	Non-owner-residences
0-100k	8,038	47%	1489	855	775	633
101-215k	4,308	25%	907	520	483	387
216-500k	2837	17%	676	380	351	296
501-1,000k	643	4%	154	103	99	51
1,001-10,000k	511	3%	107	83	80	24
>10M	14	>1%	2	2	2	0
Other	786	5%	170	101	85	70
Total	17,137	100%	3,505	2,044	1,875	1,461

*Other income brackets are household that omitted income information within the 2018 Census.

Large / Industrial Structures

152 large and industrial-sized structures (area > 0.016 ha) were identified within the KJE alignment ROW (Table 7-6), 124 (84%) of which are situated within the first 9 km of the alignment in Kampala and Wakiso Districts within built-up and industrial areas, notably along the existing Jinja Road in Nakawa Division and within Bweyogerere in Kira Municipality.

Businesses

2018 Census survey data indicated that 3,693 businesses (Table 7-6) were situated within the KJE alignment ROW, including:

- 2,255 (61%) businesses were small sole-traders, such as vendors and informal rental businesses;
- 1,225 (33%) businesses were small to small-medium sized, employing 1-5 staff per business;
- 212 (6%) businesses were medium to medium-large sized, employing 6-20 staff per business; and
- 4 (<1%) businesses were large, employing more than 20 staff per business.

50% of businesses within the KJE ROW are situated at 3-9 km along the alignment, and 39% are situated over a 1 km section that runs adjacent to the Nakawa Market (KJE Chainage 0+500-1+500).

Table 7-7 presents the predominant business activities within the ROW, including:

- 39% of all businesses were rental businesses, predominantly sole-traders renting residential rooms to tenants, particularly in Nakawa Division;
- 25% of businesses were retail outlets and vendors of ready-made food and raw produce;
- 8% of businesses reported agriculture to be their primary business activity;
- 7% of businesses were identified as a restaurant, bar, hotel or entertainment venue; and
- 4% of businesses specialised in the sale and repair of electronics and mobile related accessories.

Based on 2018 Census data and the number of structures identified via spatial analysis, most business premises are situated within a residential structure. The dual-use of residential structures as business premises accounts for the high proportion of informal rental activities identified within the 2018 Census.

Table 7-8 Summary of businesses by size (number of employees) per LC3 s within KJE alignment

LC3	Sole-trader (0)	Small (1-2)	Sml-Med (3-5)	Med (6-10)	Med-Lge (11-20)	Large (>20)	Other	Total
Central	0	0	0	0	0	0	0	0
Goma	1	3	1	0	0	0	0	5
Kawolo	0	0	1	0	0	0	1	2
Kira	456	145	47	16	5	2	0	671
Mukono	1	0	0	0	0	0	0	1
Nagojje	5	1	0	0	1	0	0	7
Nakawa	1,682	677	240	61	71	12	1	2,744
Nakisunga	48	36	34	27	9	1	2	157
Nama	62	31	9	3	0	1	0	106
Total	2,255	893	332	107	86	16	4	3,693

Table 7-9 Summary of businesses activities within KJE alignment

Business Activities	Count
Retail	652
Rental (Residential and Commercial)	1,459
Hotels, Eating Places, Bars and Entertainment Venues	248
Petrol station/garage/parking/auto-repairs	70
Car yard	17
School	2
Health facility	10
Drugstore, Healers	16
Agricultural Produce and Livestock	277
Community Centres	3
Furniture	38
Electronics (sales and repairs) and Stationery	148
Banking and Financial Services	16
Hardware and construction	288
Industrial Manufacturing	14

Business Activities	Count
Wholesalers	12
Ready-Made Food, Drinks, Groceries and Charcoal	247
Beauty Salon	71
Business Services	8
Other (*not disclosed*)	98
Total	3,693

Major Businesses

Table 7-10 presents a summary of 86 major and prominent businesses were identified as situated completely or partially within the ROW. An assessment of the primary impact to each major business found that:

- 25 major businesses were identified as having a structure intersected by the ROW;
- 56 businesses were identified as having major access restrictions by the ROW; and
- 5 businesses were identified as having their business grounds intersected by the ROW.

74 (86%) of these major businesses are located within the first 3 km of the KJE alignment along the existing Jinja Road in Nakawa Division between KJE chainages 0+000-3+500.

Table 7-10 Major businesses, commercial, industrial facilities located within the KJE ROW

Business Name	X	Y	Structure	Access	Grounds	Primary Impact
3WM Uganda Ltd.	456458	36027		X	X	Access
Adachi Auto Ltd.	458004	37210		X	X	Access
Bollore Africa Logistics (U) Ltd.	457286	37102		X	X	Access
Chatha Investment (U) Ltd.	457526	37056		X	X	Access
Chatha Motors (U) Ltd.	457710	37037		X	X	Access
City Oil Service Station	457795	37193	X	X	X	Structure
City Tyre and Auto Service	457762	37168		X	X	Access
Cosmos (U) Ltd.	459008	37685		X		Access
Crane Bank Ltd.	458523	37434	X	X	X	Structure
Decity Courts Hostel	459416	38098		X	X	Access
Defaf Motors (U) Ltd.	458208	37442		X		Access
Doc-T Motors (U) Ltd.	458282	37426		X	X	Access
Euro Foam Mattresses	458561	37446		X		Access
Euroflex Factory	461687	37973		X		Access
Factory /Warehouse – Unknown (i)	479252	38204	X			Structure
Factory /Warehouse – Unknown (ii)	480677	38852	X	X		Structure
Factory /Warehouse – Unknown (iii)	480477	39190		X		Access
Factory /Warehouse – Unknown (iv)	480354	39232	X	X		Structure
Factory /Warehouse – Unknown (v)	480411	39263	X	X		Structure
Factory /Warehouse – Unknown (vi)	471904	35412	X			Grounds
Fine Things	457386	36915	X	X	X	Structure

Business Name	X	Y	Structure	Access	Grounds	Primary Impact
Galen Holdings Pharmacy	459580	37892		X	X	Access
Glorious Electrical Centre	459422	38081	X	X	X	Structure
Hass Petroleum Station	459537	37885		X		Access
Hayat International (U) Ltd.	457819	37081	X	X	X	Structure
Hotel Elizabeth	459160	37684		X	X	Access
Internet Cafe	459520	37968		X		Access
Jambo Auto Mart	458322	37504		X	X	Access
Jan Japan Uganda Ltd	458210	37462		X		Access
Jatala Auto Ltd.	458089	37232		X	X	Access
Kazi Food Logistics Ltd.	458320	37548		X		Access
Kijungu Hill	461360	36411	X			Structure
Kingstone Enterprises Cement Depot	458966	37676		X		Access
Kiwa Industries	458727	37322	X			Structure
Kuehne Nagel Ltd.	456962	36162		X	X	Access
Kyadondo Rugby Club	456408	36007		X	X	Access
Lakhani Auto Centre	459145	37731		X	X	Access
Lakhani Motors	459088	37704		X		Access
Longhorn Publishers (U) Ltd.	458010	37350		X	X	Access
Lugogo Shopping Mart	456252	36053		X	X	Access
Maks packaging Industries Ltd.	458525	37330	X			Structure
Master Industries (U) Ltd.	459194	37768	X	X	X	Structure
Mogas Uganda Ltd Depot	459480	37773		X	X	Access
Mogas Uganda Ltd Parking	459419	37787		X	X	Access
Moil Petroleum Service Station	459006	37616		X		Access
Noor Auto Ltd.	457799	37103	X	X	X	Structure
Nyang Computers Ltd.	458198	37299		X		Access
Pacinos Restaurant & Grill	456810	36105		X		Access
Petrol Service Station	463930	35921	X	X	X	Structure
Petroleum Service Station	458479	37423		X	X	Access
Plantation (Unnamed)	479271	38160			X	Grounds
Plantation Factory (Unnamed)	484540	40094	X		X	Structure
Premier Complex Building	457688	37116		X	X	Access
Rehman Motors Ltd.	458898	37577		X	X	Access
Rio Insurance Company Ltd.	458157	37358		X	X	Access
Roofings Ltd.	458848	37533		X		Access
Royal Foam Furniture	458332	37487		X	X	Access
Samurai Auto Japan Ltd.	458256	37423	X	X	X	Structure

Business Name	X	Y	Structure	Access	Grounds	Primary Impact
Shamin Motors	458286	37361		X	X	Access
Shell Petrol Station Nakawa	456875	36364	X	X	X	Structure
Shell Petroleum Service Station	459044	37701	X	X	X	Structure
Shumuk Group	457745	37055		X	X	Access
Smart Chef	459522	37940		X		Access
Spear Motors (U) Ltd.	457640	36889		X	X	Access
Spedag Interfreight Uganda	457784	36648		X		Access
SSEWAH Investment Ltd.	459571	38044		X		Access
Star Auto Paradise	456445	35989		X	X	Access
Star Bell International (U) Ltd.	456462	35999		X	X	Access
Steel and Tube Industries Ltd.	458135	37244		X	X	Access
Strip mall of furniture shops (Unnamed)	459122	37719			X	Grounds
Sugar Plantation area (Unnamed)	484889	40503			X	Grounds
Super Furniture Shop	459253	37726			X	Grounds
Syan Cars Limited Uganda	458424	37403			X	Grounds
Total Nakawa Petrol Service Station	456719	36125	X	X	X	Structure
Uganda Fish Packers Ltd.	457737	36672	X	X	X	Structure
Uganda Manufacturers Association	456486	36087		X		Access
Husky Outdoor Equipment Ltd.	456495	36107	X			Structure
My Maka	456483	36142		X	X	Access
Main Hall	456555	36143		X	X	Access
Uganda Clays Show Room	456553	36127	X			Structure
Wonder Cosmetics	456571	36135	X			Structure
Unknown - Trucks parking	457751	36721		X	X	Access
Warehouses renting area	458734	37459		X		Access
Wavah Books (U) Ltd.	457544	36875		X	X	Access
Yoshino Trading Co. Ltd.	458907	37631		X	X	Access
Yuasa Investments Ltd.	457169	36727		X	X	Access

Community Infrastructure

80 community infrastructures were identified within the KJE alignment via Census Survey data, inspection of satellite imagery and other ground-level reconnaissance. A summary of these assets is presented in Table 7-11.

46 places of worship including three shrines, 17 education facilities, three gravesites, and 10 health centres were identified with the KJE alignment. Other community infrastructure included three community groups, two recreational centres and a police post. The majority of community infrastructure was identified within Nakawa Division and Kira Municipality.

An assessment of the primary impact to each community infrastructure found that:

- 69 community infrastructures had a structure within the ROW as a primary impact;

- 6 had major access restrictions by the ROW as a primary impact; and
- 4 had grounds within the ROW as a primary impact.

The majority of community infrastructure within the KJE alignment ROW is situated within Nakawa Division and Kira Municipality, with some infrastructures situated intermittently within Nakisunga and Nagojje Sub-counties.

Table 7-11 Community infrastructure within the KJE Alignment ROW

Name	X	Y	Chainage	LC3	Structure/ Asset	Access	Grounds	Primary Impact
Overpass								
Footbridge Across Jinja Rd	456944	36402	0+800-0+900	Nakawa	X	X		Structure
Places of Worship								
Agape Sanctuary Ministry	461616	36389	6+200-6+300	Nakawa	X	X	X	Structure
Anointed Power Ministries	459285	36941	3+700-3+800	Nakawa	X	X	X	Structure
Bilaali Mosque	462272	36397	7+000-7+100	Kira	X		X	Structure
Born Again Church	459477	36931	3+800-3+900	Nakawa	X	X	X	Structure
Born Again Family Ministries	459195	36970	3+600-3+700	Nakawa		X		Access
Christ Carriers Church	461743	36597	6+400-6+500	Kira	X	X	X	Structure
Christ Deliverance Mission Church	461380	36344	6+000-6+100	Nakawa	X	X	X	Structure
Devine Call Ministries	461872	36531	6+500-6+600	Kira	X	X	X	Structure
Divine Delivering Church	461841	36309	6+500-6+600	Nakawa	X	X	X	Structure
Everlasting Life Church	461628	36745	6+300-6+400	Kira	X	X	X	Structure
Exploit of Faith	461496	36408	6+100-6+200	Nakawa	X	X	X	Structure
Faith Foundation Church	462046	36589	6+700-6+800	Kira	X	X	X	Structure
Focus Christianity Centre	461658	36248	6+200-6+300	Nakawa	X	X	X	Structure
God's Mercy Deliverance Church	461909	36666	6+600-6+700	Kira	X	X	X	Structure
Good Steward Healing Centre	459385	37076	3+600-3+700	Nakawa	X	X	X	Structure
Grace Church Ministry International	462091	36541	6+700-6+800	Kira	X	X	X	Structure
Jaja Mukasa Shrine	461839	36677	6+500-6+600	Kira	X	X	X	Structure
Jesus Christ of Latter-day Saints	461452	36458	6+100-6+200	Nakawa	X	X	X	Structure
Jesus Is Able	463195	36189	7+900-8+000	Kira	X	X	X	Structure
Life Power of God	460565	36204	5+100-5+200	Nakawa	X		X	Structure
Life Power of God Ministries	460567	36206	5+100-5+200	Nakawa	X		X	Structure
Living Faith Church	459916	36633	4+300-4+400	Nakawa	X	X	X	Structure
Marjid Rahma Mosque	461660	36697	6+400-6+500	Kira	X	X	X	Structure

Name	X	Y	Chainage	LC3	Structure/ Asset	Access	Grounds	Primary Impact
Masjid Noor Namataba Mosque	463496	36182	8+200-8+300	Kira	X	X	X	Structure
Masjid Taqua Mosque	459351	37106	3+600-3+700	Nakawa	X	X	X	Structure
Masjid Tawfiq Mosque	462728	36358	7+400-7+500	Kira	X	X	X	Structure
Miracle Centre International Ministries	462131	36481	6+800-6+900	Kira	X	X	X	Structure
Olubiri Lwa Kiwanuka (Shrine)	483843	39633	31+600-31+700	Nakisunga			X	Grounds
Palm Village Miracle Centre	461592	36350	6+200-6+300	Nakawa	X	X	X	Structure
Peace Church of All Nations for God	459447	37028	3+700-3+800	Nakawa	X	X	X	Structure
Pool of Life	462238	36421	6+900-7+000	Kira	X	X	X	Structure
Pool of Siloam Church	463821	36226	8+500-8+600	Kira	X	X	X	Structure
Power of Redeemer	461700	36843	6+400-6+500	Kira	X	X	X	Structure
Prayer Valley Living Gospel Church	461816	36649	6+500-6+600	Kira	X	X	X	Structure
Seventh-Day Adventist Church	462049	36569	6+700-6+800	Kira	X	X		Structure
Shrine (unnamed)	484925	41838	33+000-33+100	Nagojje			X	Grounds
Small Gate Masjid Noor Mosque	457296	36682	1+300-1+400	Nakawa	X	X	X	Structure
St Mary & Apostles Church	481549	37923	28+600-28+700	Nakisunga		X	X	Access
Streams of Life Church International	460004	36580	4+400-4+500	Nakawa	X	X		Structure
Universal Apostle Fellowship Church	461494	36258	6+100-6+200	Nakawa	X	X	X	Structure
Way of Life Church	461581	36625	6+300-6+400	Kira	X	X	X	Structure
Yesu Akwagala Uganda Christian Out Reach Ministries	462305	36379	7+000-7+100	Kira	X	X	X	Structure
Community Group								
FDC Office Nakawa Division	456912	36531	0+900-1+000	Nakawa				
Friends of Friends Community Organization	463847	36282	8+500-8+600	Kira	X	X	X	Structure
Revelation Life Dream Centre	459465	36837	3+900-4+000	Nakawa	X	X	X	Structure
Gravesites								
Islamic Cemetery	463967	36246	8+700-8+800	Kira	X	X	X	Structure
KCCA Cemetery	463770	36223	8+500-8+600	Kira	X	X	X	Structure
Mukwano Graveyard	459404	37092	3+600-3+700	Nakawa			X	Grounds
Health Centres								

Name	X	Y	Chainage	LC3	Structure/ Asset	Access	Grounds	Primary Impact
276 Medical Centre (KCCA)	459314	37060	3+600-3+700	Nakawa	X	X		Structure
Allied Life Care Clinic	457067	36494	1+000-1+100	Nakawa	X	X		Structure
Don Ken - Dental Clinic Kampala	457069	36481	1+000-1+100	Nakawa	X	X		Structure
Dr. Kilama Moro Dental Surgery	456964	36376	0+800-0+900	Nakawa				
God Care Medical Clinic	459500	36981	3+800-3+900	Nakawa	X	X		Structure
GV Medical Centre	456997	36416	0+900-1+000	Nakawa	X	X		Structure
Kukaanya Clinic	461888	36729	6+500-6+600	Kira	X	X		Structure
Market Street Medical Clinic	456976	36397	0+800-0+900	Nakawa	X	X		Structure
Nakawa Medical Clinic	457036	36466	0+900-1+000	Nakawa	X	X		Structure
S&B Clinic	456921	36500	0+900-1+000	Nakawa		X		Access
Police and Governance								
Nakawa Police Post	457164	36582	1+100-1+200	Nakawa	X	X	X	Structure
Recreational Centres								
Kirinya Playground	461367	36407	6+000-6+100	Nakawa			X	Grounds
Kito Playground	461976	36597	6+600-6+700	Kira			X	Grounds
School and Nurseries								
Arise Junior Academy	461999	36516	6+700-6+800	Kira	X	X	X	Structure
Devine Glory Nursey School	461790	36788	6+500-6+600	Kira	X	X	X	Structure
Eden Education Centre	459333	37092	3+600-3+700	Nakawa	X	X	X	Structure
Goseta 2018 Day Care & Infant School	462070	36471	6+700-6+800	Kira	X	X	X	Structure
Green Valley International Academy	480468	39222	28+400-28+500	Nakisunga		X		Access
Happy Days Junior School	461515	36301	6+100-6+200	Nakawa	X	X	X	Structure
Hilton High School	474006	36180	19+800-19+900	Nakisunga		X	X	Access
Infant Joy Education Centre	461483	36520	6+200-6+300	Nakawa	X	X	X	Structure
London Standard Primary School	460697	36210	5+300-5+400	Nakawa	X	X	X	Structure
Mirimbe Primary School	460151	36461	4+600-4+700	Nakawa	X	X	X	Structure
Nakawa Vocational Training Institute	457454	36788	1+500-1+600	Nakawa		X	X	Access
Precious College School	460702	36110	5+300-5+400	Nakawa	X	X	X	Structure
Royal Kinder Care	463044	36226	7+700-7+800	Kira	X	X	X	Structure
Shepherds' Vineyard Pre-School	461970	36630	6+600-6+700	Kira	X	X	X	Structure

Name	X	Y	Chainage	LC3	Structure/ Asset	Access	Grounds	Primary Impact
St Mary Secondary School	460381	36254	4+900-5+000	Nakawa	X	X	X	Structure
Uncle Byamungu Primary School	463559	36261	8+300-8+400	Kira	X	X	X	Structure
Young Elite Nursery & Primary School	461905	36412	6+600-6+700	Nakawa	X	X	X	Structure

Water and Sanitation Infrastructure

2018 Census Survey and other ground-level reconnaissance conducted within the KJE alignment, identified four community toilets and 18 community water sources within the alignment (Table 7-12), servicing a total of approximately 6,000 and 4,000 users respectively per day. All infrastructure identified has a structure or main use asset (such as a water tap of well) directly within the ROW as a primary impact. The majority of water and sanitation infrastructure identified was within Nakawa Division.

Table 7-12 Community water and sanitation infrastructure within the KJE alignment

Name	X	Y	Chainage	LC3	Structure / Asset	Access	Grounds	Primary Impact
Toilet								
Banda B2 Public Toilet	459346	37540	3+500-3+600	Nakawa	X			Structure
Katogo Toilet	459381	37163	3+600-3+700	Nakawa	X			Structure
Public Toilet (i)	456951	36360	0+800-0+900	Nakawa	X			Structure
Public Toilet (ii)	456993	36471	0+900-1+000	Nakawa	X			Structure
Water Source								
Kituuka Water Spring	463500	36173	8+200-8+300	Kira	X			Structure
Kyedinganya Water Source	481083	38062	28+200-28+300	Nakisunga	X			Structure
Mama Esther Natural Spring Well	459588	36893	3+900-4+000	Nakawa	X			Structure
Mama Lydia Spring	459529	36944	3+800-3+900	Nakawa	X			Structure
Masjid Rahma Borhole	461656	36709	6+400-6+500	Kira	X			Structure
Namumira	473323	35765	19+000-19+100	Nakisunga	X			Structure
Protected Spring	462032	36437	6+700-6+800	Kira	X			Structure
Public Tap (i)	459375	37691	3+500-3+600	Nakawa	X			Structure
Public Tap (ii)	459355	37154	3+600-3+700	Nakawa	X			Structure
Spring Well of Damyano	486576	40240	33+000-33+100	Nagojje	X			Structure
Stand Pipe Tap Water	459350	37617	3+500-3+600	Nakawa	X			Structure
Wankoba Borehole	480970	38384	28+400-28+500	Nakisunga	X			Structure
Water Point	459368	37545	3+500-3+600	Nakawa	X			Structure
Water Source (i)	459355	37090	3+600-3+700	Nakawa	X			Structure
Water Source (ii)	462208	36406	6+900-7+000	Kira	X			Structure
Watersource - Communal	459346	37094	3+600-3+700	Nakawa	X			Structure
Well	459483	36985	3+800-3+900	Nakawa	X			Structure

Figure 7-24 Assets and infrastructure in the KJE ROW, Chainage 0+000 - 1+00 (Map 1 of 24)

Figure 7-25 Assets and infrastructure in the KJE ROW, Chainage 1+000 - 2+000 (Map 2 of 24)

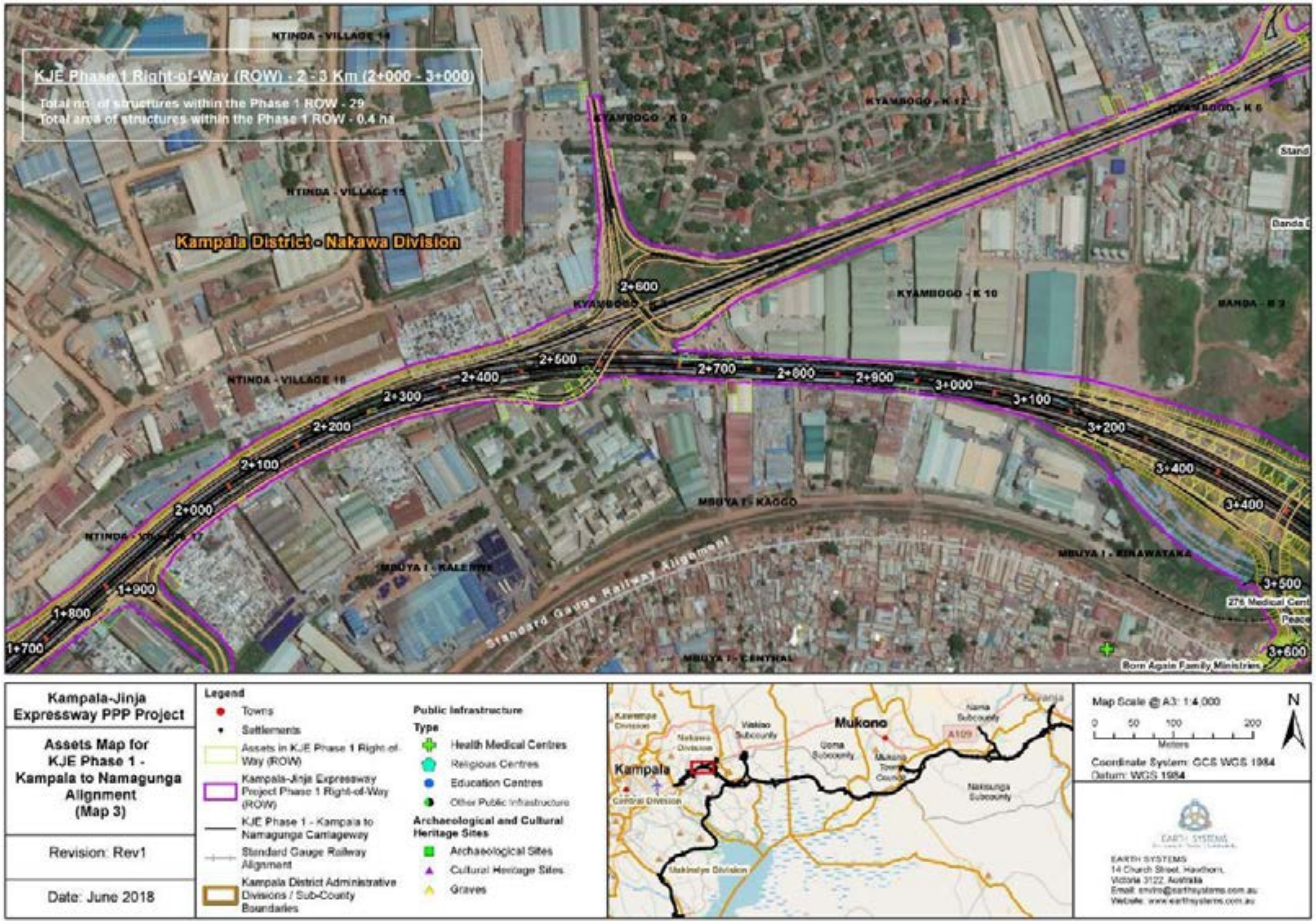


Figure 7-26 Assets and infrastructure in the KJE ROW, Chainage 2+000 - 3+000 (Map 3 of 24)

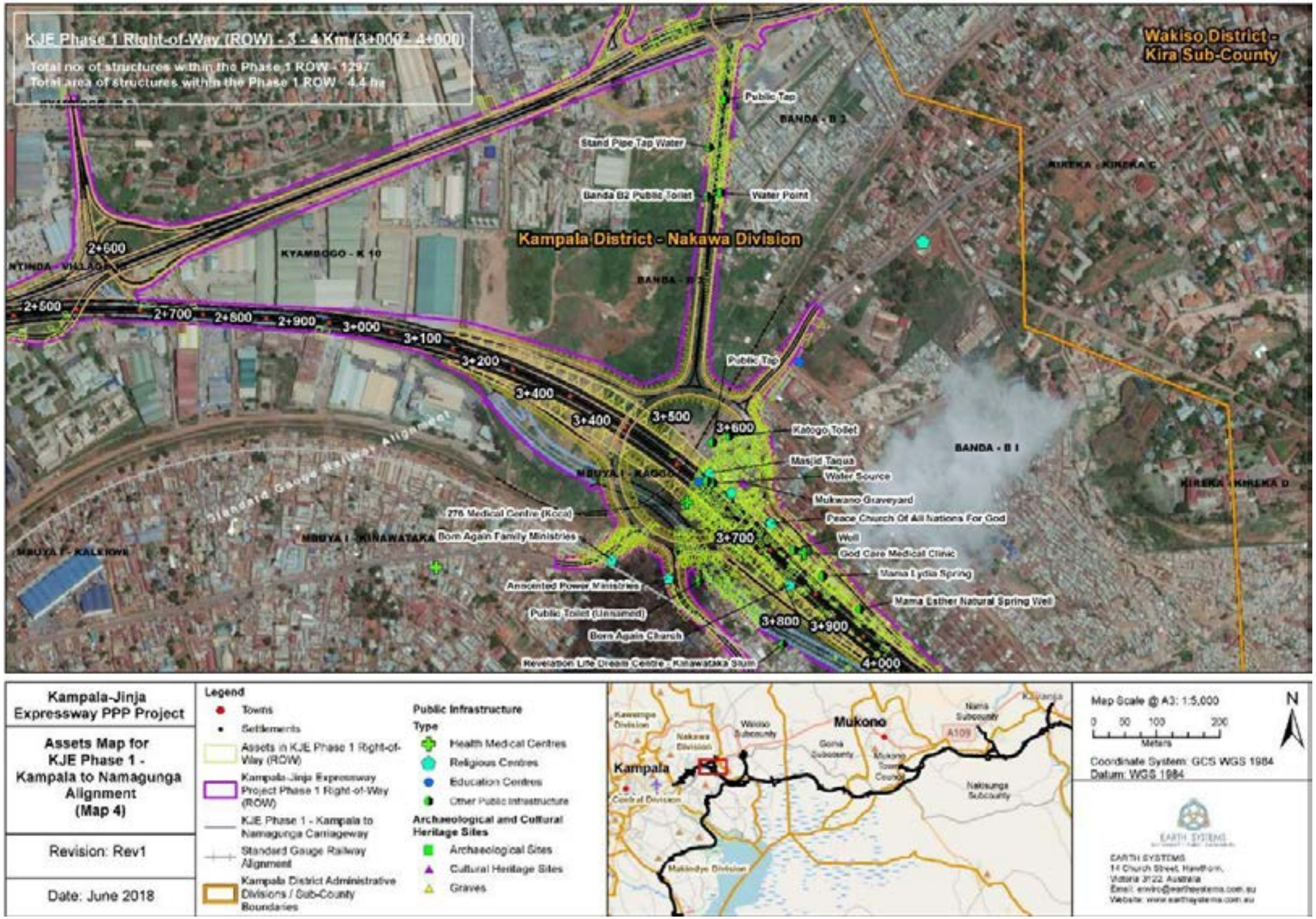


Figure 7-27 Assets and infrastructure in the KJE ROW, Chainage 3+000 - 4+000 (Map 4 of 24)

Figure 7-28 Assets and infrastructure in the KJE ROW, Chainage 4+000 - 5+000 (Map 5 of 24)

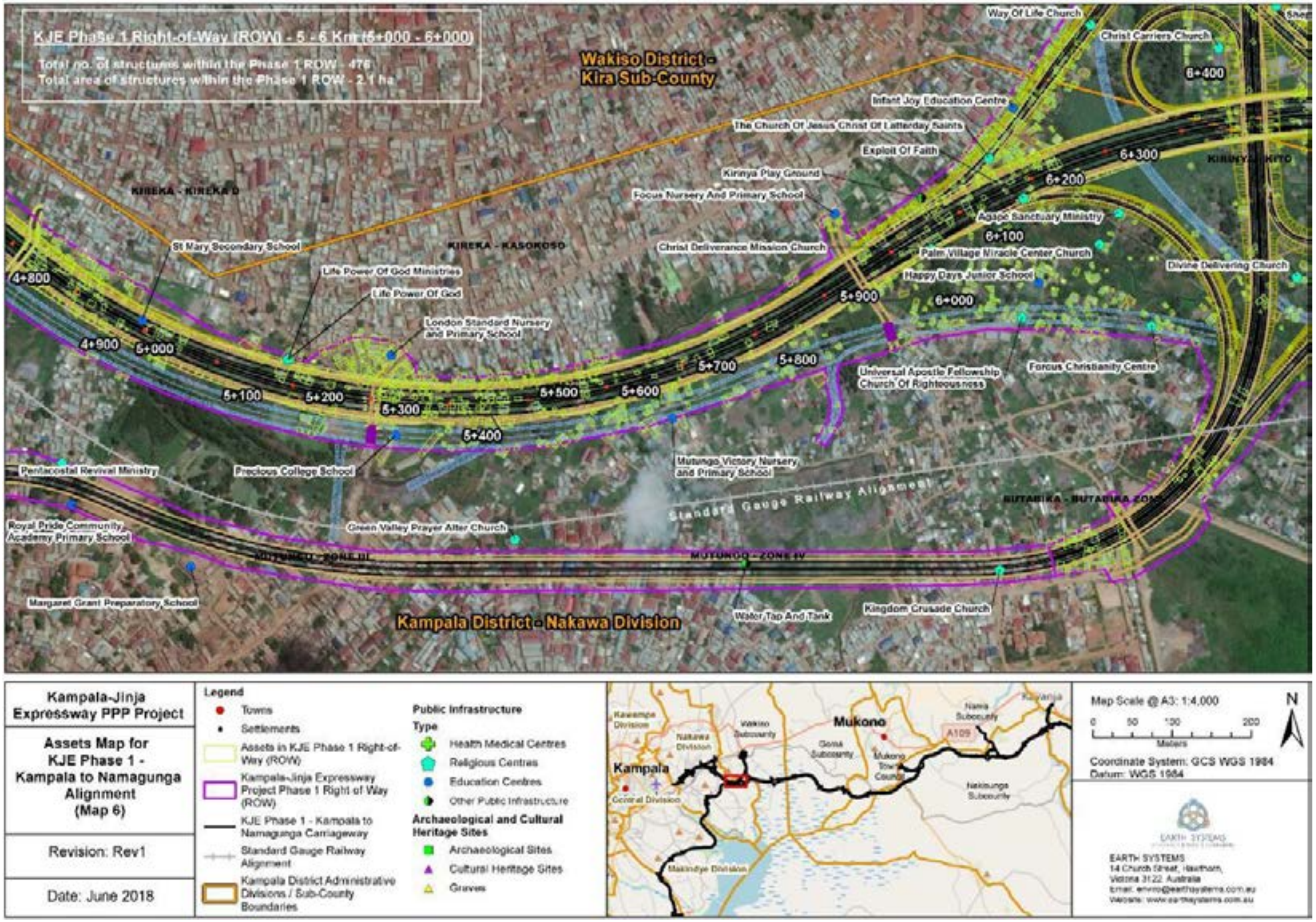


Figure 7-29 Assets and infrastructure in the KJE ROW, Chainage 5+000 - 6+000 (Map 6 of 24)

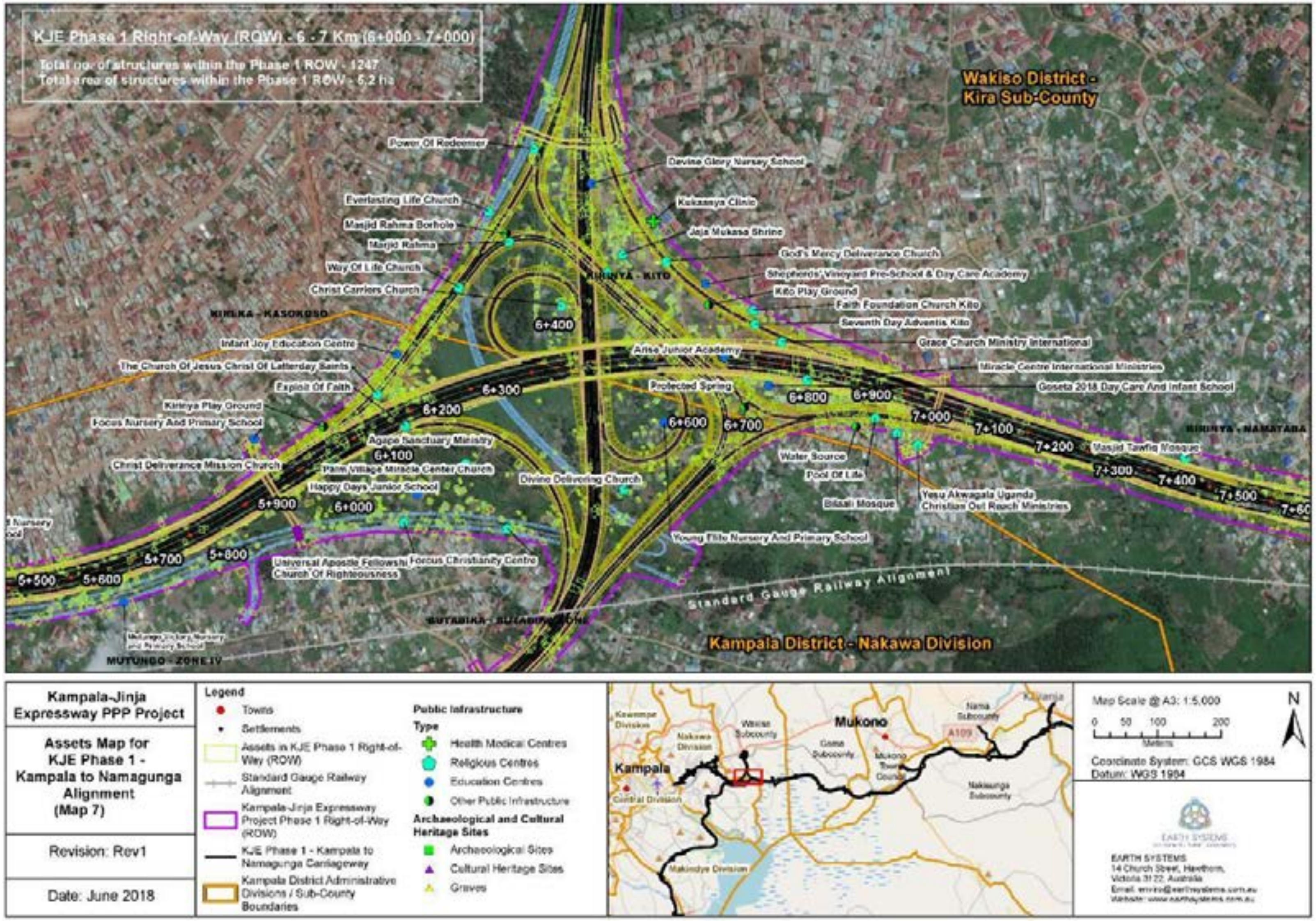


Figure 7-30 Assets and infrastructure in the KJE ROW, Chainage 6+000 - 7+000 (Map 7 of 24)

Figure 7-31 Assets and infrastructure in the KJE ROW, Chainage 7+000 - 8+000 (Map 8 of 24)

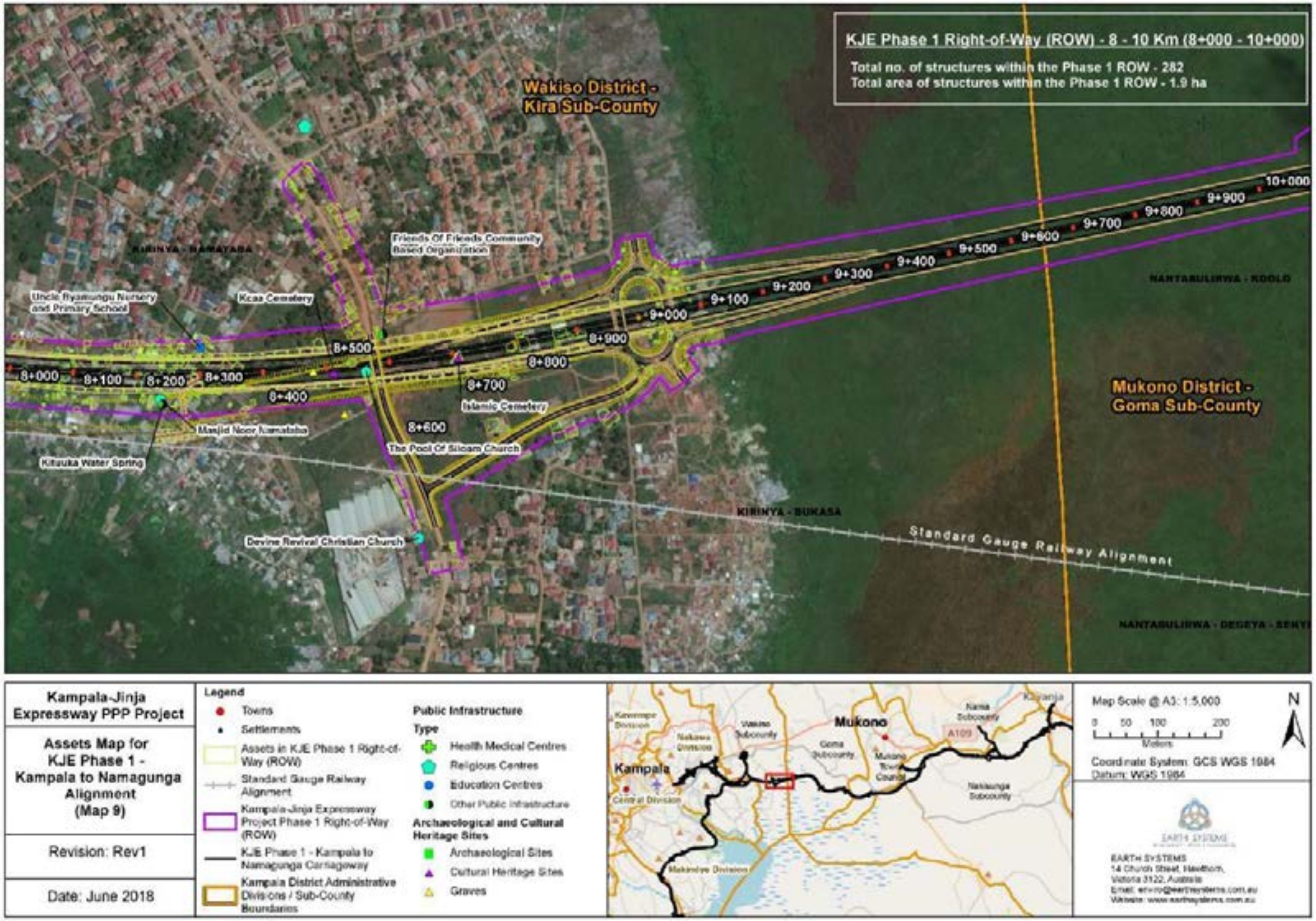


Figure 7-32 Assets and infrastructure in the KJE ROW, Chainage 8+000 - 10+000 (Map 9 of 24)

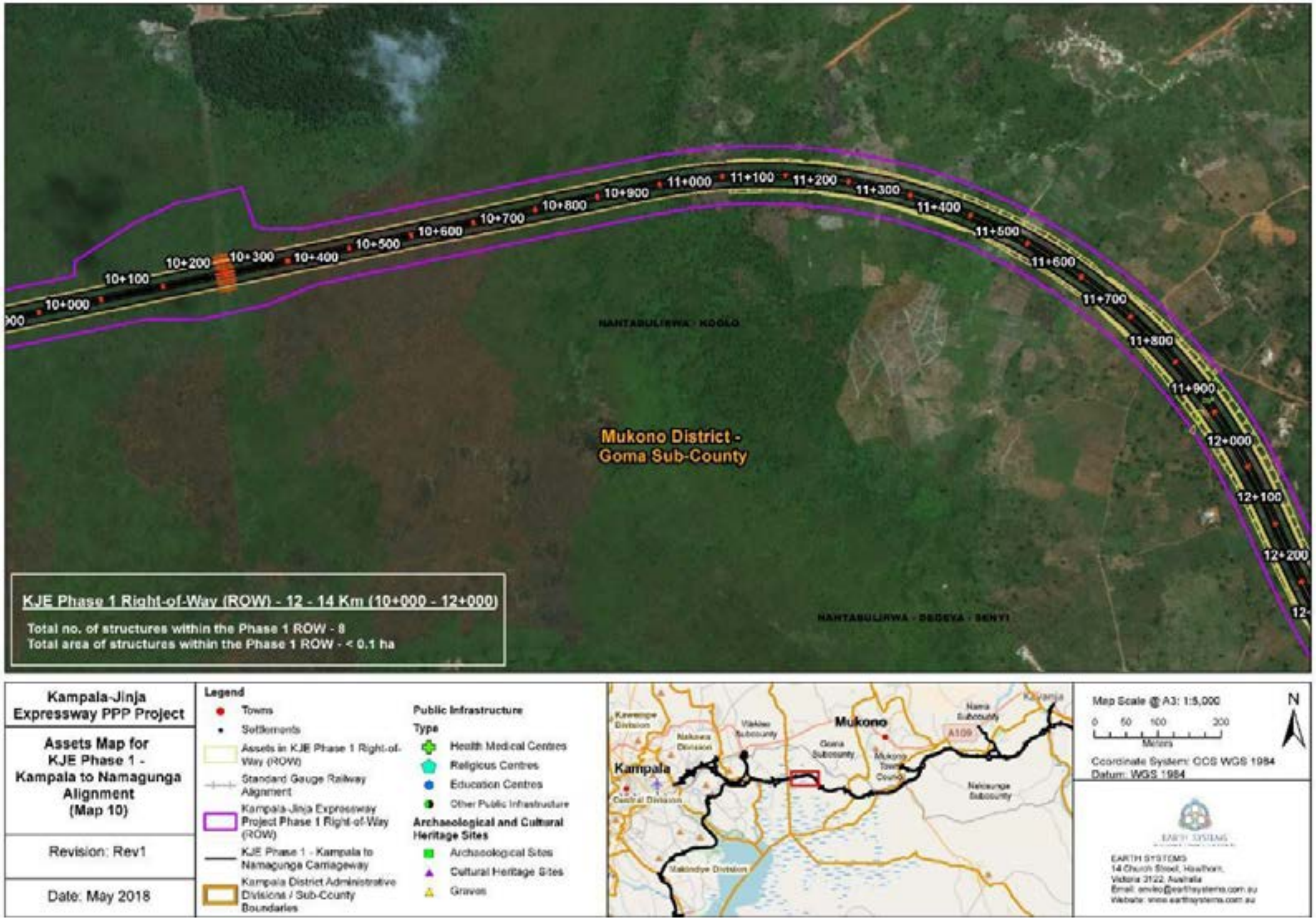


Figure 7-33 Assets and infrastructure in the KJE ROW, Chainage 10+000 - 12+000 (Map 10 of 24)

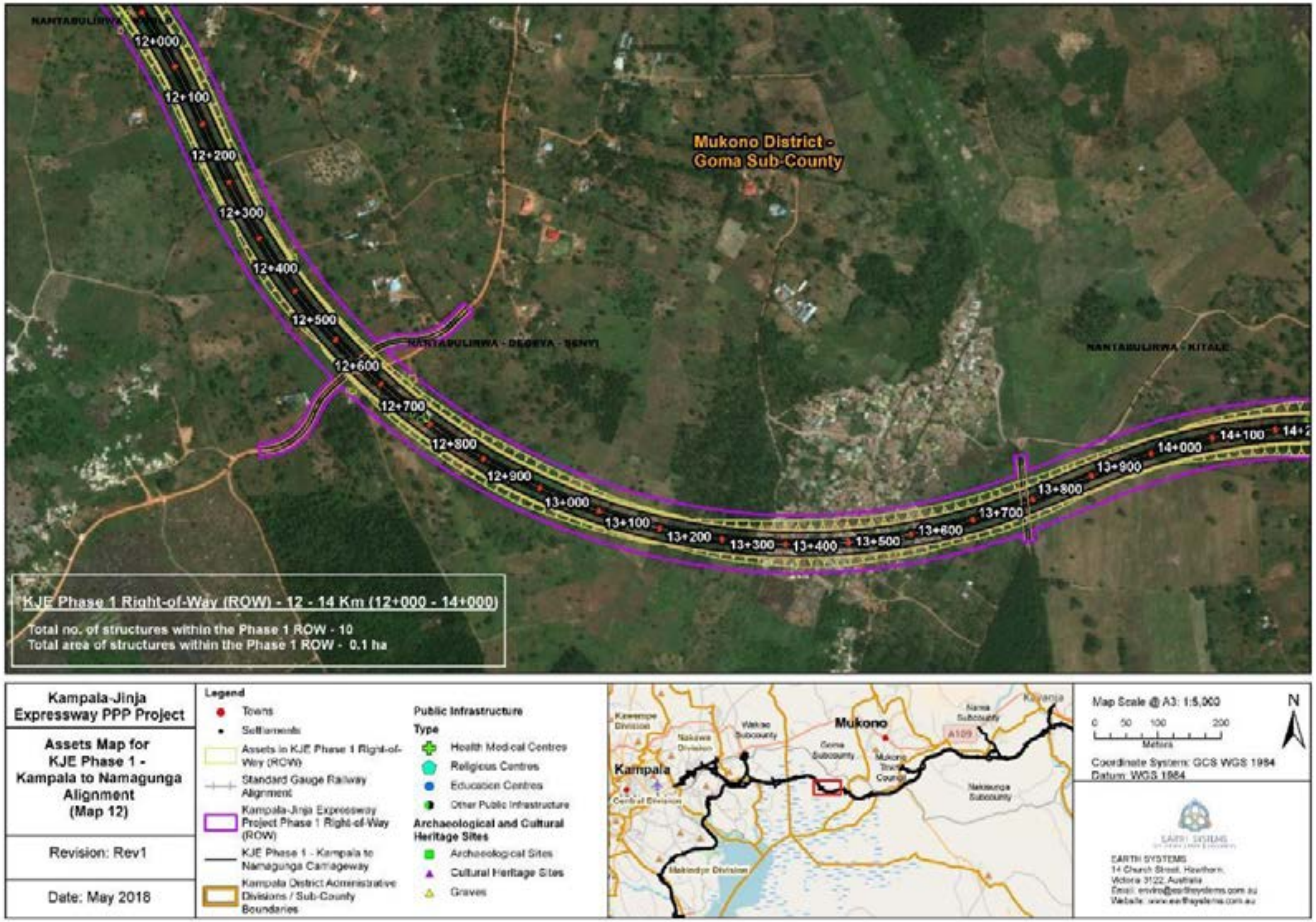


Figure 7-34 Assets and infrastructure in the KJE ROW, Chainage 12+000 - 14+000 (Map 11 of 24)

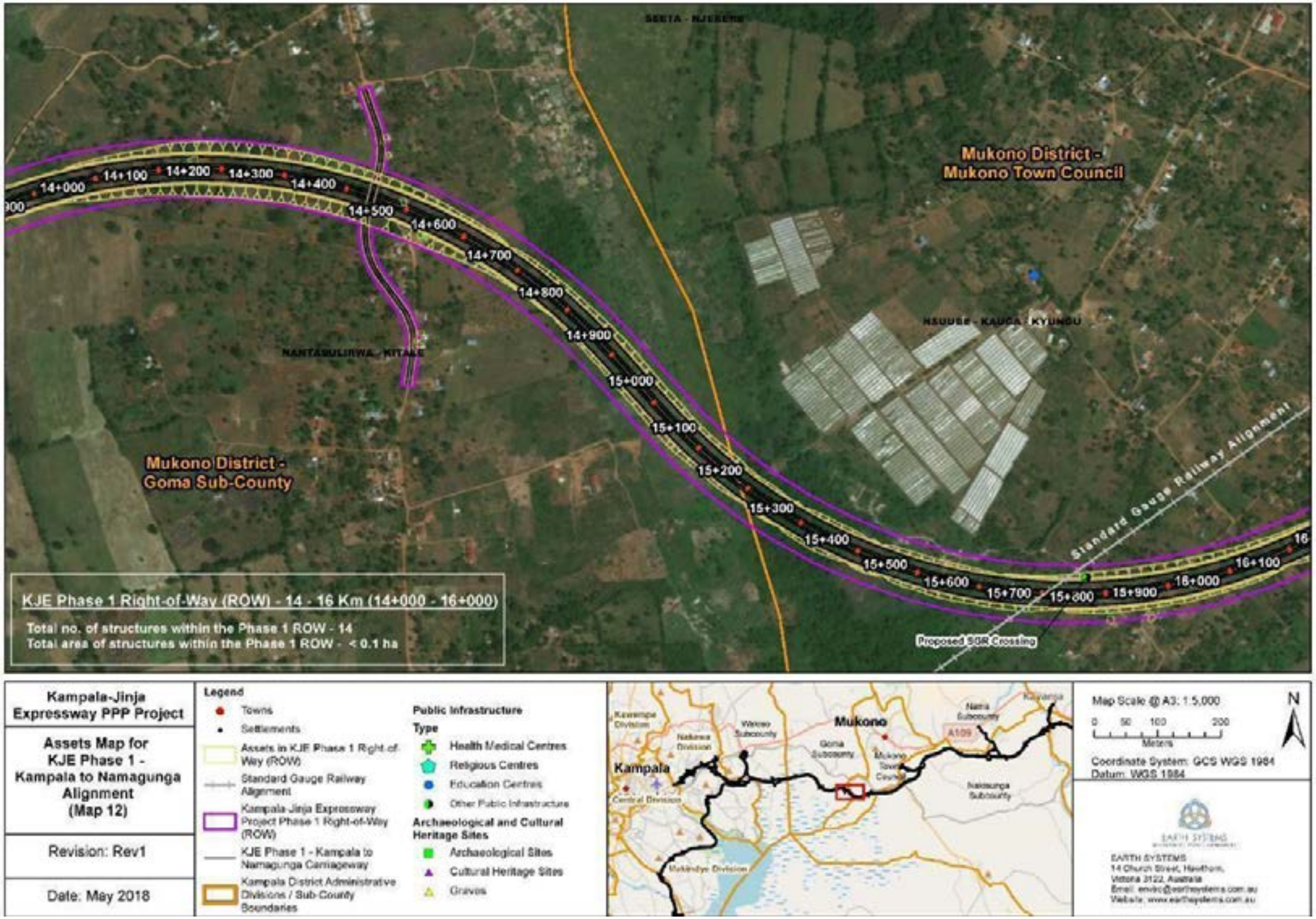


Figure 7-35 Assets and infrastructure in the KJE ROW, Chainage 14+000 - 16+000 (Map 12 of 24)

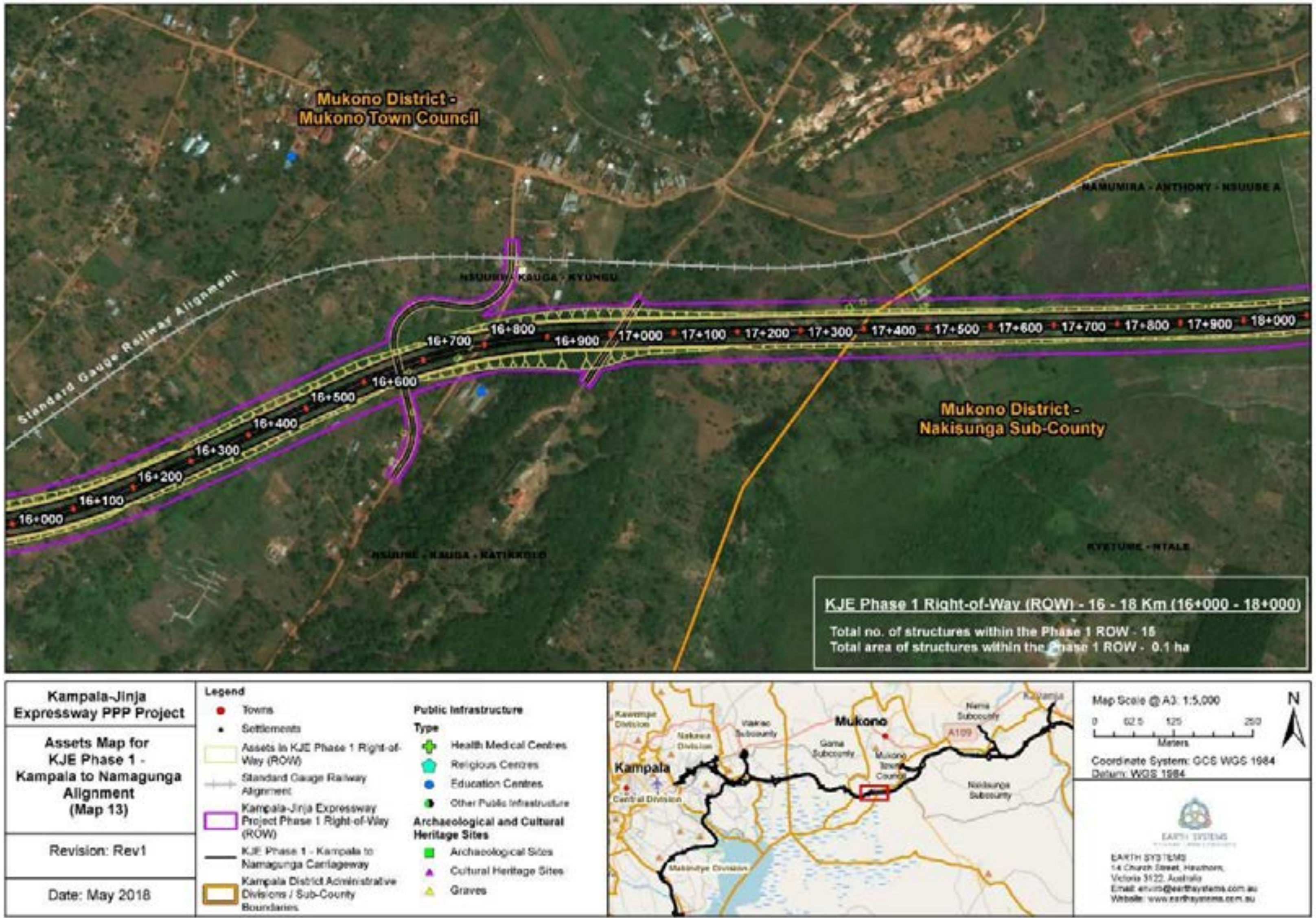


Figure 7-36 Assets and infrastructure in the KJE ROW, Chainage 16+000 - 18+000 (Map 13 of 24)

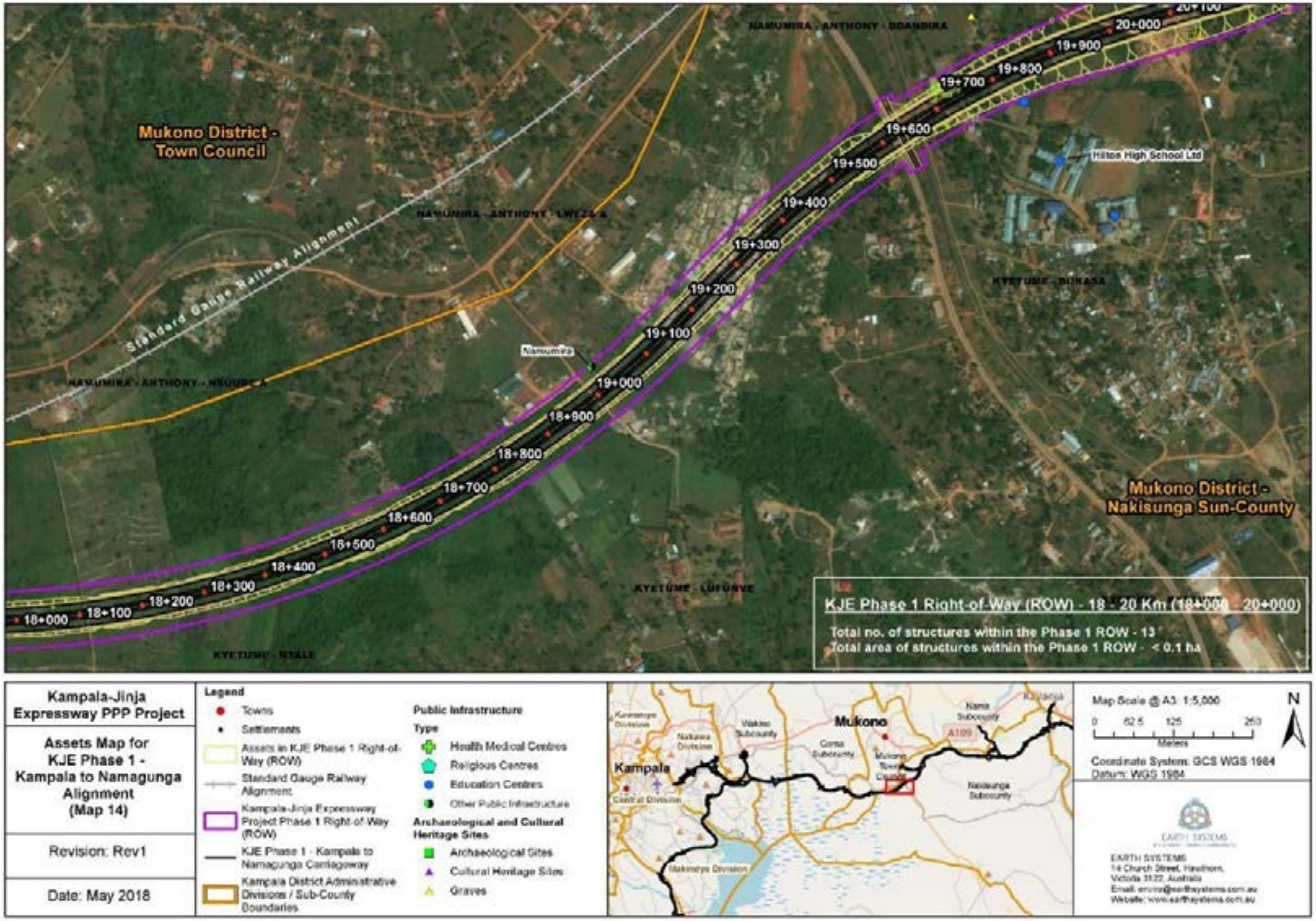


Figure 7-37 Assets and infrastructure in the KJE ROW, Chainage 18+000 - 20+000 (Map 14 of 24)

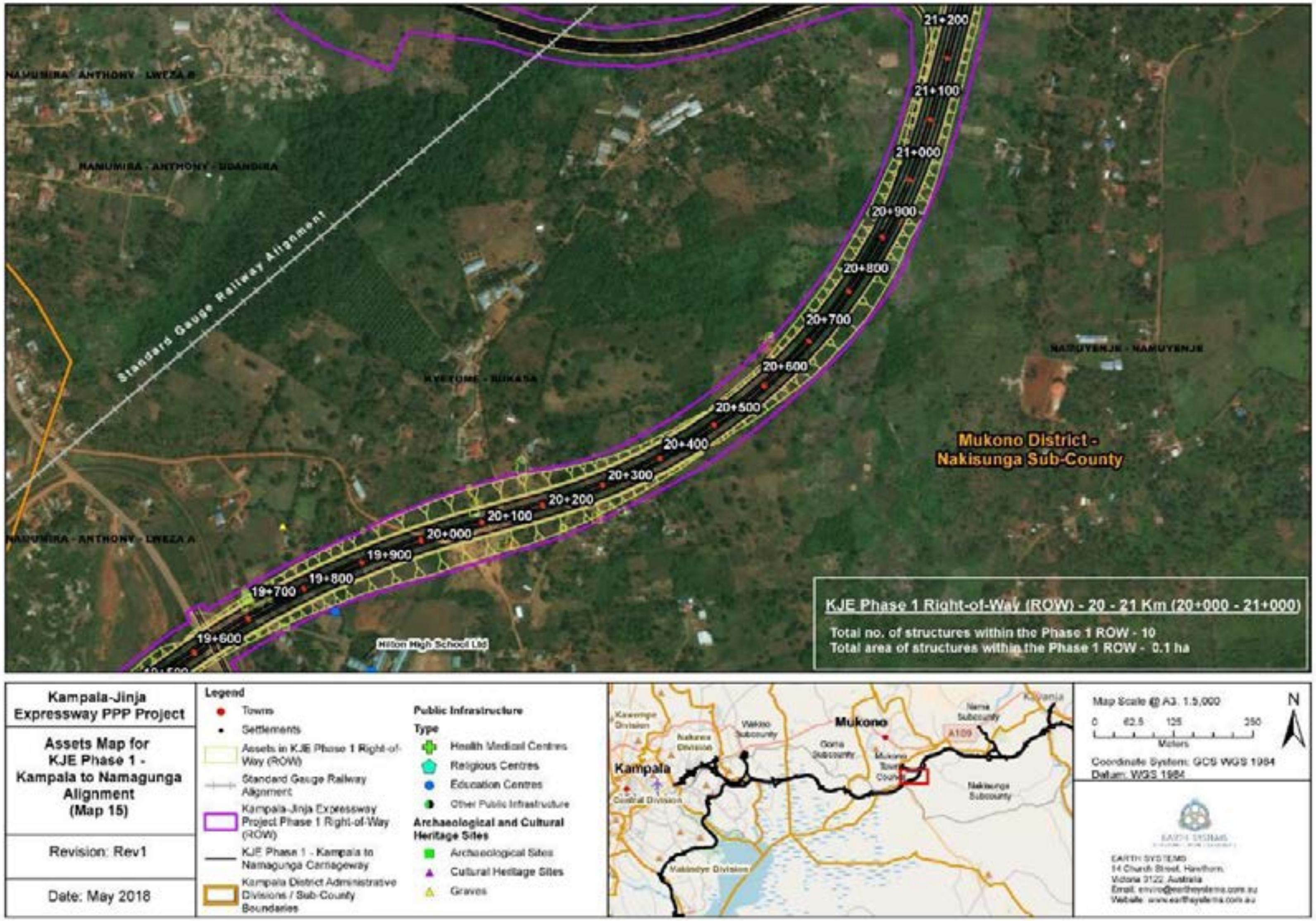


Figure 7-38 Assets and infrastructure in the KJE ROW, Chainage 20+000 - 21+000 (Map 15 of 24)

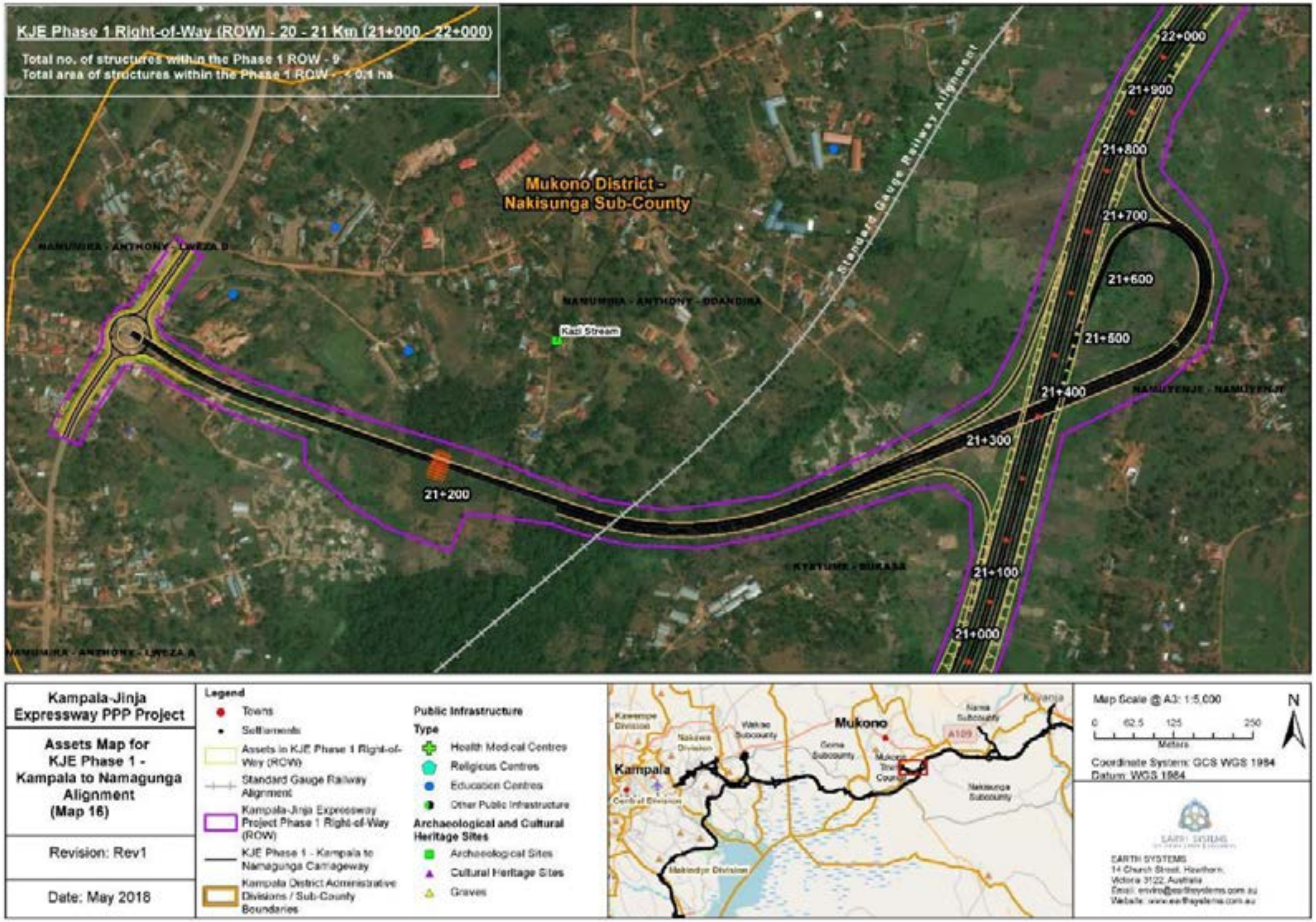


Figure 7-39 Assets and infrastructure in the KJE ROW, Chainage 21+000 - 22+000 (Map 16 of 24)

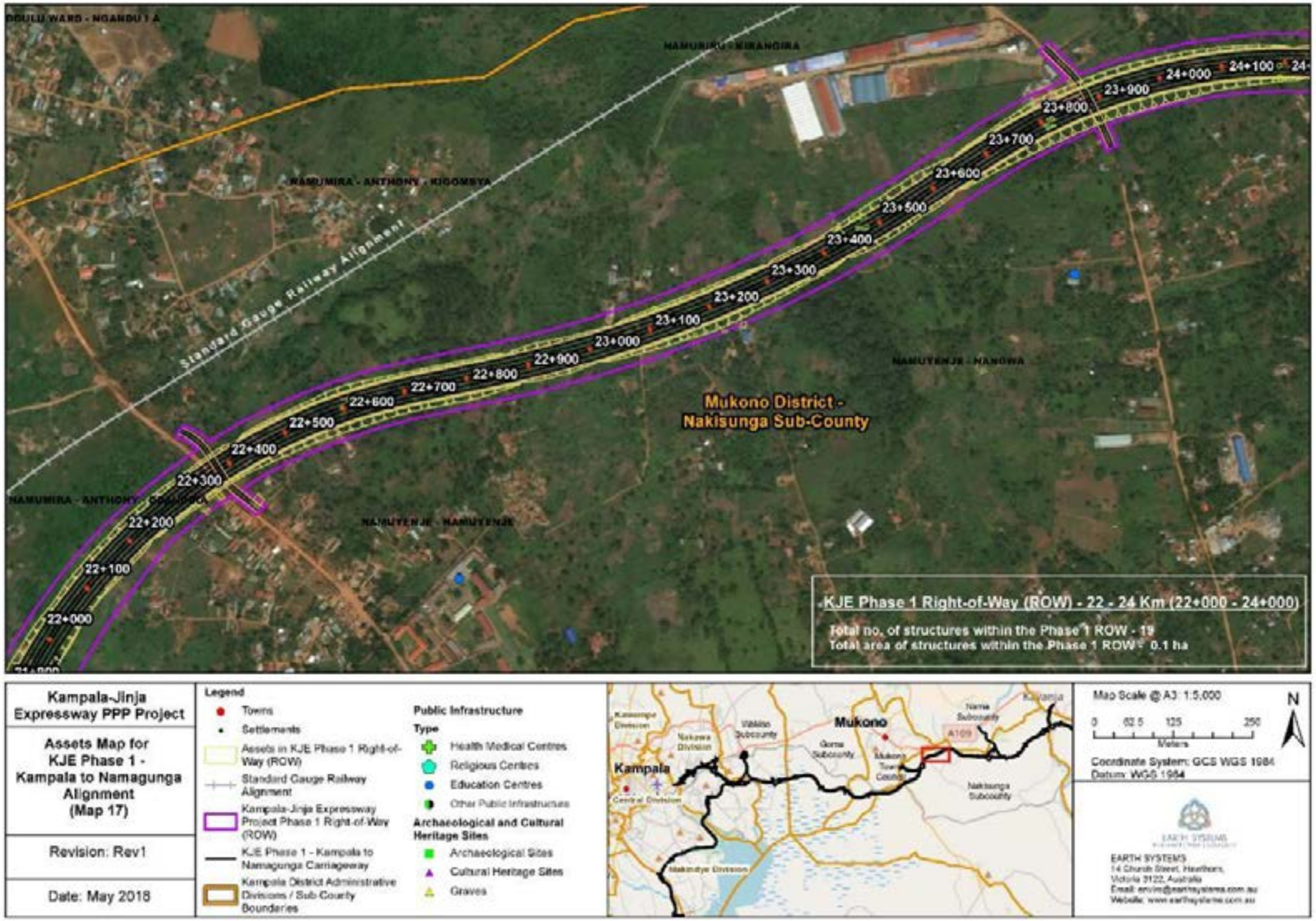


Figure 7-40 Assets and infrastructure in the KJE ROW, Chainage 22+000 - 24+000 (Map 17 of 24)

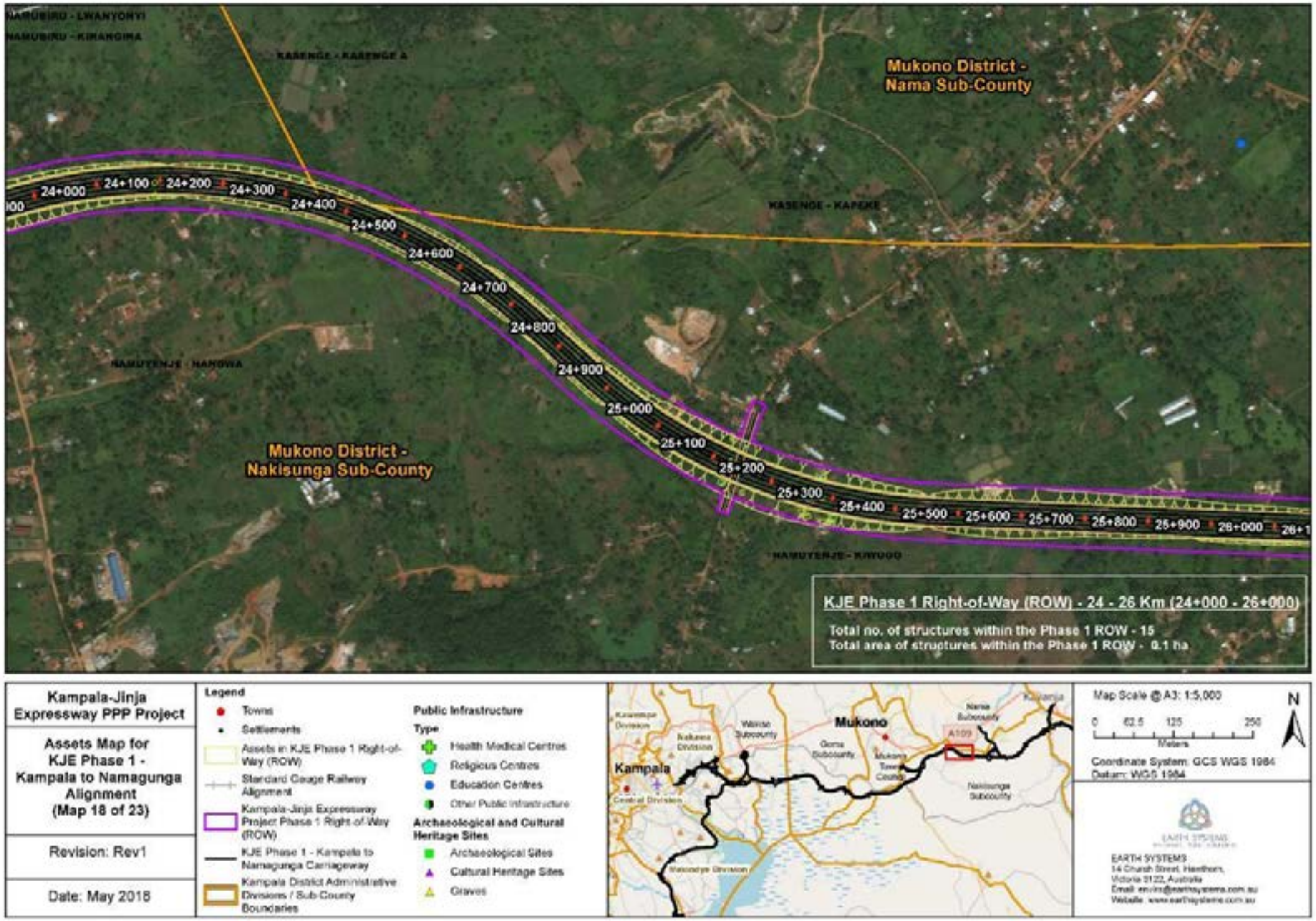


Figure 7-41 Assets and infrastructure in the KJE ROW, Chainage 24+000 - 26+000 (Map 18 of 24)

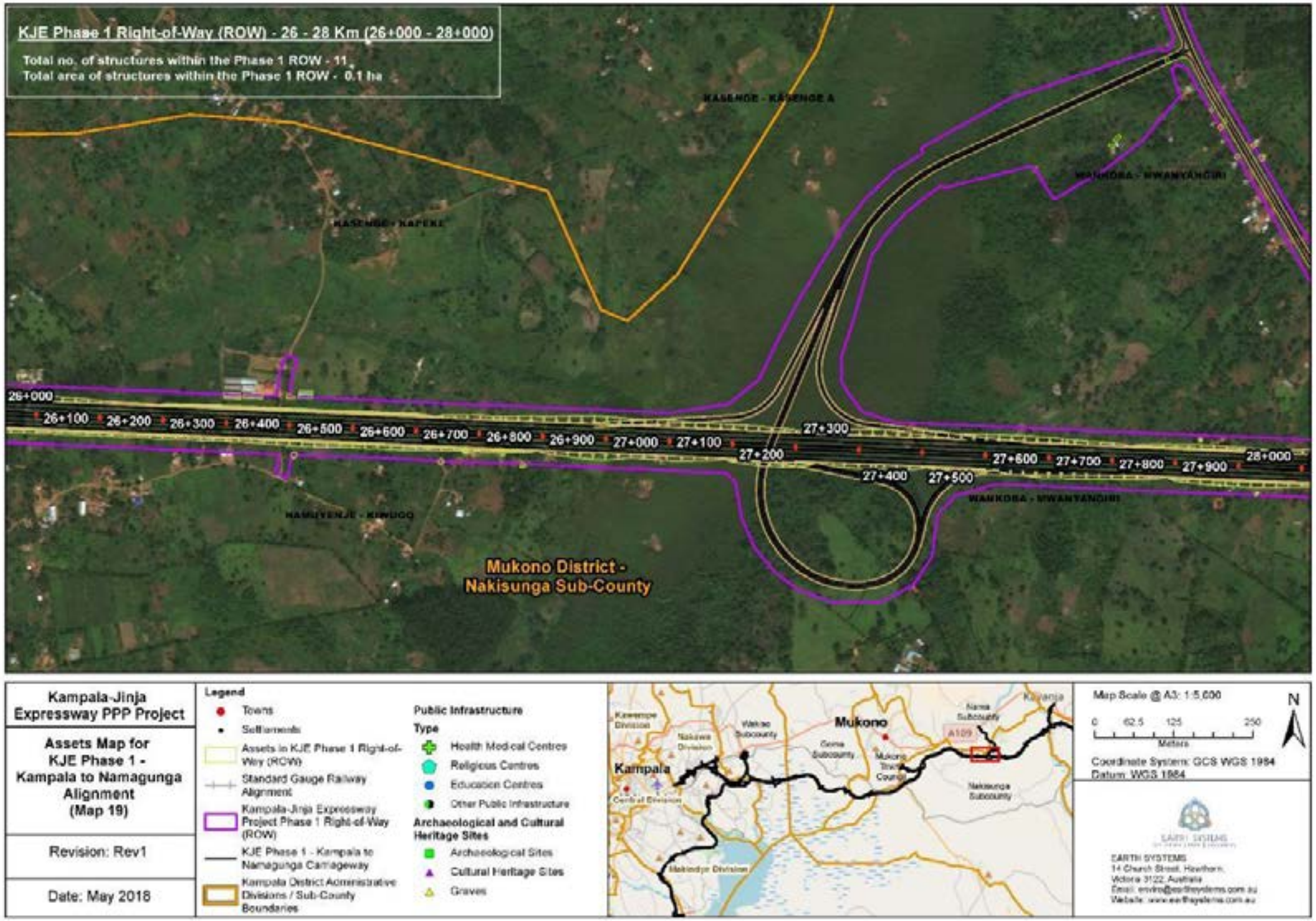


Figure 7-42 Assets and infrastructure in the KJE ROW, Chainage 26+000 - 28+000 (Map 19 of 24)

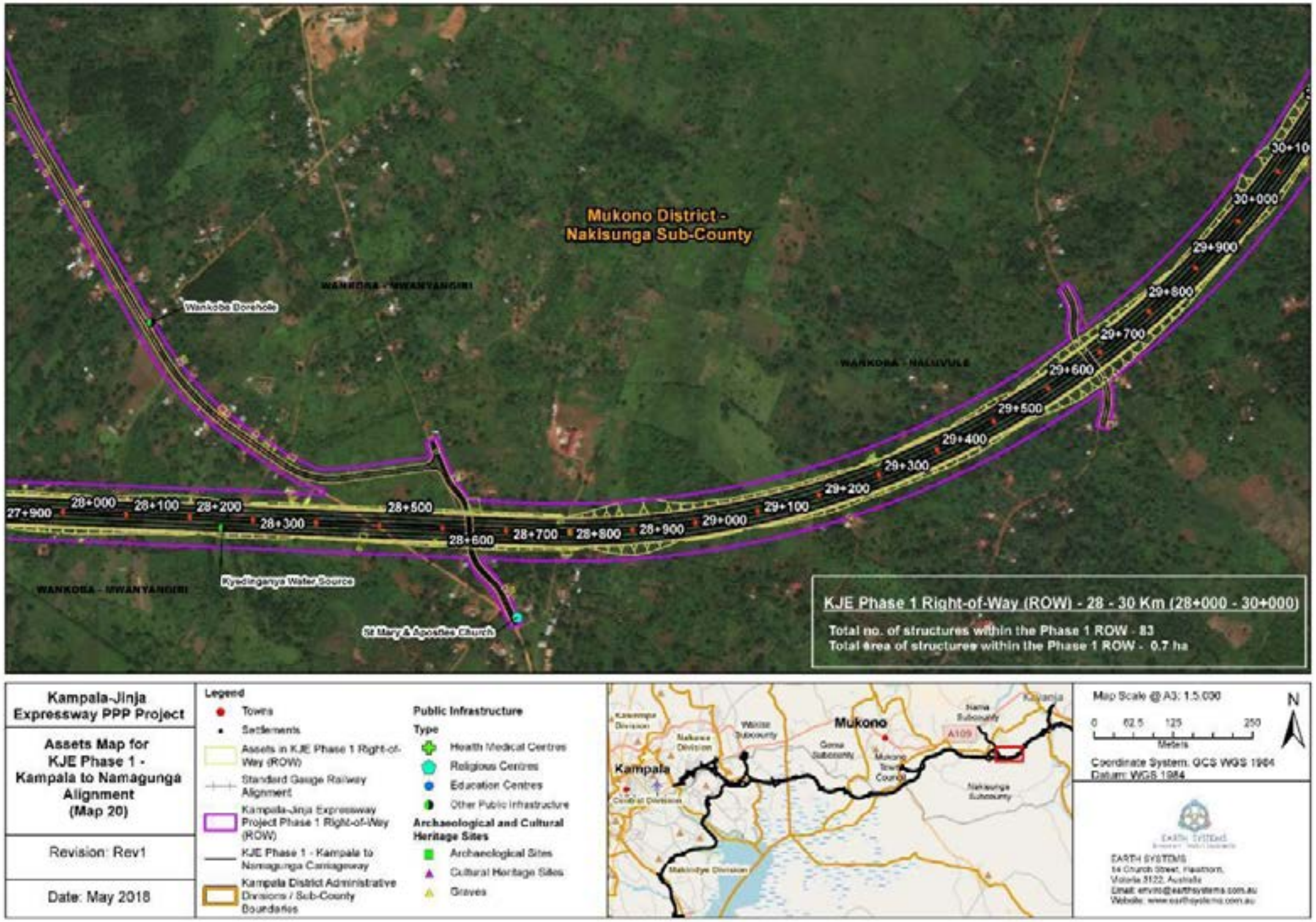


Figure 7-43 Assets and infrastructure in the KJE ROW, Chainage 28+000 - 30+000 (Map 20 of 24)

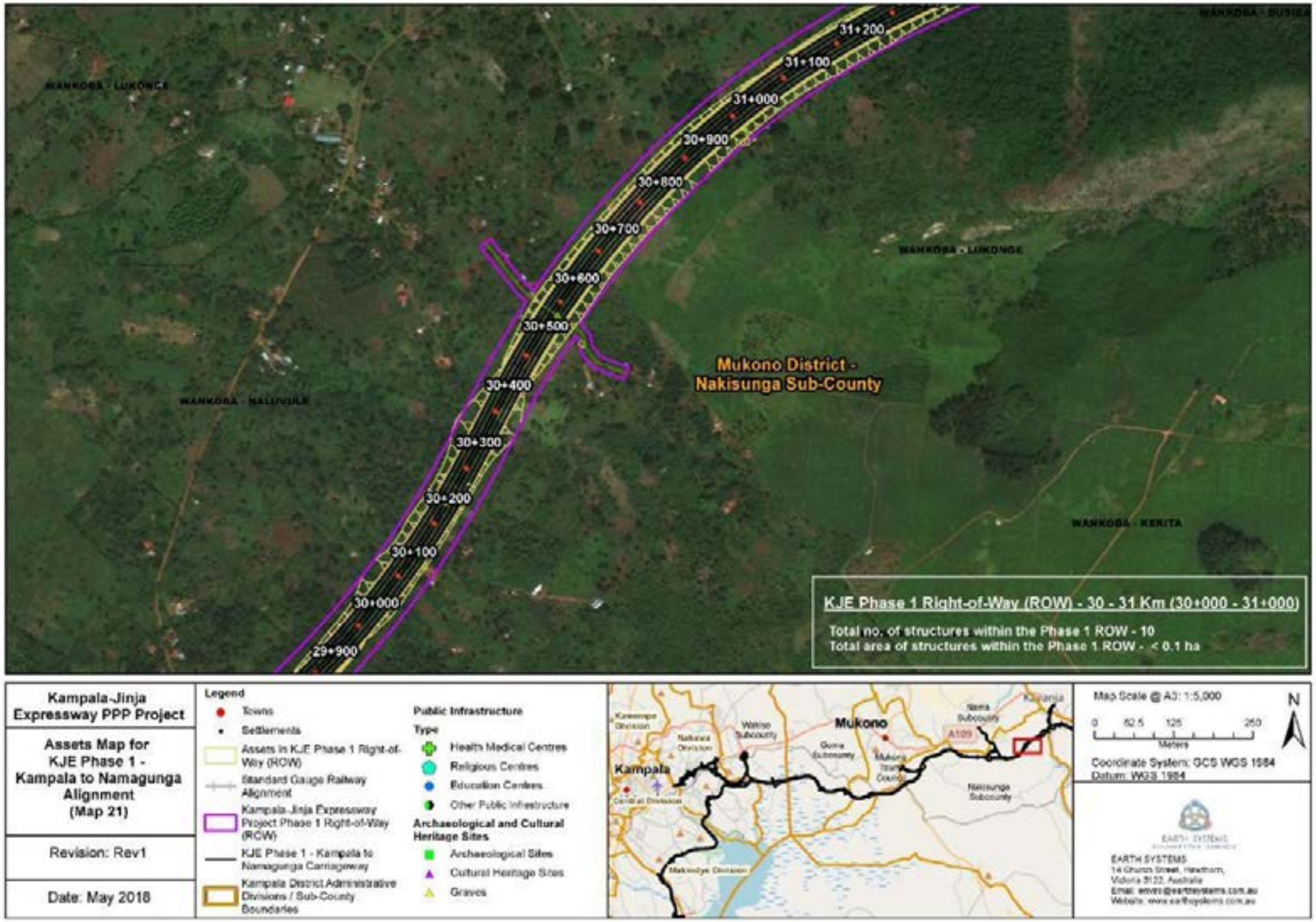


Figure 7-44 Assets and infrastructure in the KJE ROW, Chainage 30+000 - 31+000 (Map 21 of 24)

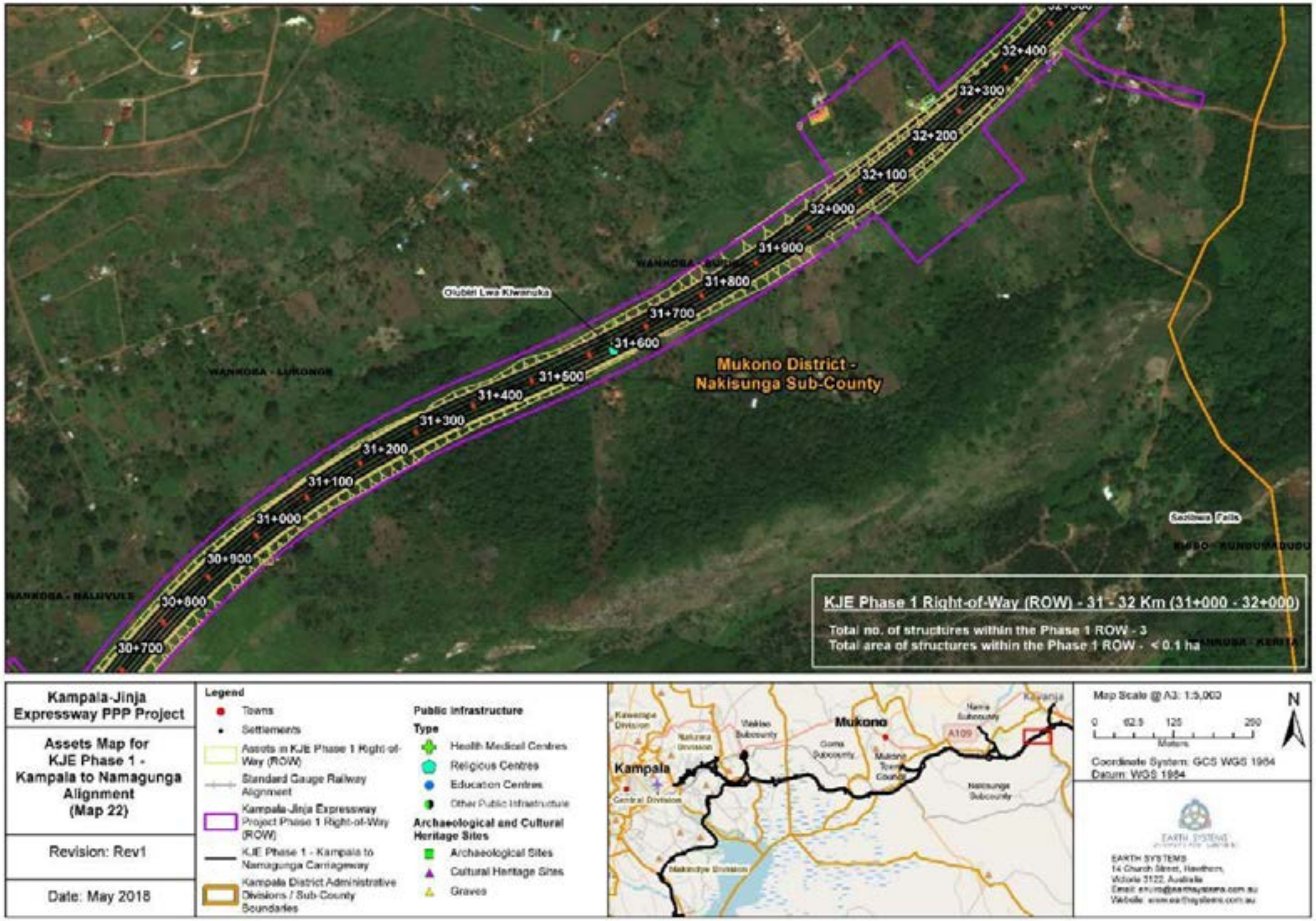


Figure 7-45 Assets and infrastructure in the KJE ROW, Chainage 31+000 - 32+000 (Map 22 of 24)

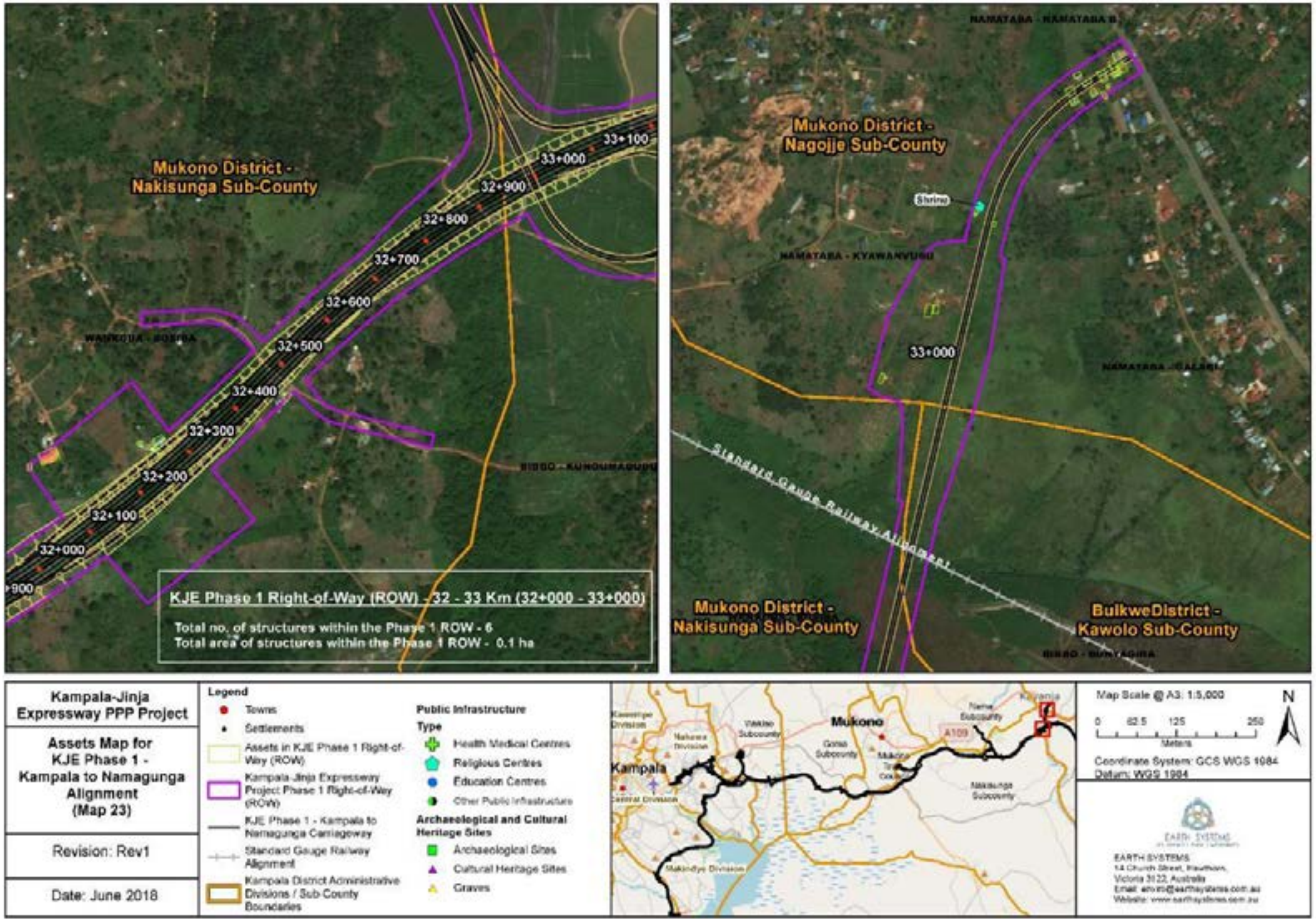


Figure 7-46 Assets and infrastructure in the KJE ROW, Chainage 32+000 - 33+000 (Map 23 of 24)

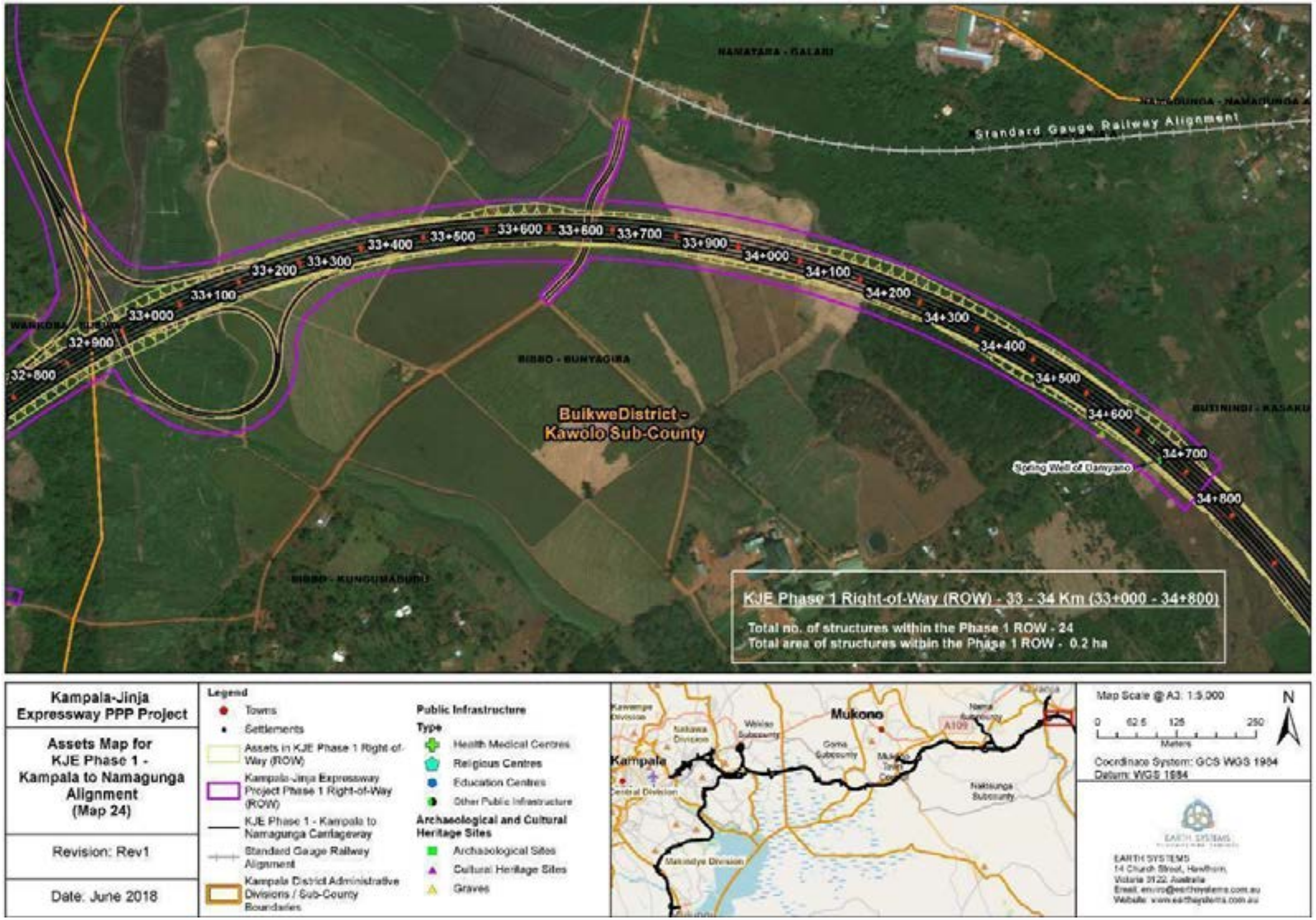


Figure 7-47 Assets and infrastructure in the KJE ROW, Chainage 33+000 - 34+800 (Map 24 of 24)

Plate 7-13: Spear Motors, Nakawa, affected by KJE alignment within first 2.5 km

Plate 7-14: City Oil, Nakawa, affected by KJE alignment, within first 2.5 km

Plate 7-15: Coffee factory

7.2.2.2 Kampala Southern Bypass

Structures

Table 7-13 presents the number and area of identifiable structures within the KSB ROW. In total, 3,617 structures covering an area of 23.0 ha were identified via geospatial analysis of high-resolution satellite imagery from September 2017, including:

- 1,472 (3.5 ha) small structures that had areas <<0.104 ha;
- 1,160 (6.7 ha) small-medium structures that had areas <0.104 – <0.108 ha;
- 560 (5.5 ha) medium structures that had areas <0.108 – <0.112 ha;
- 233 (3.2 ha) medium-large structures that had areas <0.112 – <0.116 ha; and
- 192 (4.2 ha) large structures that had areas ><0.116 ha.

Residential Structures and Households

The KSB alignment traverses both informal residential, and legal and tenured residential settlement-area zones. These zones are characterised above in *7.2.2.1 - Population and households*.

2018 Census data and spatial analysis indicates that approximately 78% (2,672) of all non-industrial sized structures (with areas <0.016 ha) within the KSB alignment are residential (Table 7-13). The first kilometre of the bypass cuts through relatively undeveloped land, resulting in low levels of housing affected. The KSB then intersects high-density residential areas for the proceeding 4 km, traversing Mutungo and Kitintale, located in Nakawa Division where 50% these residential structures are situated. Following this section, the alignment passes through wetland area before running adjacent to settlement areas that fringe the wetland in Bukasa of Makindye Division. Few structures will be displaced within this section (KSB Chainage 5+600-7+500) of the alignment due to the ROW tracing along the marginal areas of these settlements. However, it Is likely that the ROW will intersect wetland area that is utilised for informal agriculture. Following this, the alignment intersects settlement areas of Makindye Division and Ssabagabo-Makindye Sub-county, within which, approximately 44% of residential structures within the KSB alignment are estimated to be situated.

Large / Industrial Structures

192 large and industrial-sized structures (area >0.016 ha) were identified within the KSB alignment ROW, 64 (33%) of which are situated within the first 4 km of the alignment in traversing Mutungo and Kitintale of Nakawa Division. From 5-12 km of the alignment proceeding this, there is a low density of large industrial structures within the ROW, except for between 12-14 km along the alignment within Ssabagabo-Makindye, where the alignment traverses built-up settlement and industrial areas where 50% of all large industrial structures are situated.

Table 7-13 Number of structures and structure area located in the KSB alignment

Km	Small (<0.004 ha)		Small-med (<0.004-0.008 ha)		Medium (<0.008-0.-012 ha)		Medium-lge (<0.012-0.-016 ha)		Large (>0.016 ha)		Total		Resid-ences
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	
1-2	81	0.2	104	0.6	52	0.5	23	0.3	13	0.3	273	1.9	240
2-3	119	0.3	128	0.7	59	0.6	20	0.3	19	0.4	345	2.3	245
3-4	205	0.5	141	0.8	86	0.8	39	0.5	22	0.5	493	3.2	325
4-5	333	0.7	166	0.9	73	0.7	22	0.3	10	0.3	604	3.0	432
5-6	59	0.1	44	0.3	13	0.1	4	0.1	1	<0.1	121	0.6	105
6-7	61	0.1	13	0.1	2	<0.1	0		0		76	0.2	*61
7-8	50	0.1	25	0.2	7	0.1	3	<0.1	2	0.1	87	0.4	*68
8-9	5	<0.1	1	<0.1	3	<0.1	2	<0.1	3	0.1	14	0.1	*9
9-10	13	<0.1	4	<0.1	0		3	<0.1	2	<0.1	22	0.1	*16
10-11	71	0.2	69	0.4	14	0.1	0		2	<0.1	156	0.7	*123
11-12	12	<0.1	8	<0.1	5	<0.1	3	<0.1	4	0.1	32	0.3	*22
12-13	59	0.2	59	0.3	48	0.5	38	0.5	56	1.2	260	2.7	*164
13-14	133	0.3	149	0.9	67	0.6	33	0.5	29	0.6	411	2.9	*306
14-15	44	0.1	55	0.3	28	0.3	9	0.1	4	0.1	140	0.9	*109
15-16	109	0.3	81	0.4	41	0.4	13	0.2	7	0.2	251	1.4	*196
16-17	72	0.2	67	0.4	43	0.4	18	0.2	12	0.2	212	1.5	*160
17-18	46	0.1	46	0.3	19	0.2	3	<0.1	6	0.1	120	0.7	*91
Total KSB	1,472	3.5	1,160	6.7	560	5.5	233	3.2	192	4.2	3,617	23.0	2,672

*Estimated based on 2018 Census Survey and identified structures.

Population and households

2018 Census data and spatial analysis were used to estimate the population and number of residences with the KSB alignment ROW (

Table 7-15). Estimates concluded that approximately 12,846 occupants belonging to 2,672 households are situated within the ROW, comprising:

- 6,482 occupants within 1,348 households identified within 2018 Census Surveys situated within KSB Chainage 1+000-5+300; and
- 6,364 occupants within 1,326 households estimated using the population density per structure of KSB 2018 Census Survey data extrapolated over the remaining residential-type structures identified between KSB Chainage 5+400-17+800.

Estimates of average income per occupant were derived from 2018 Census Survey data of households between KSB Chainage 1+00-5+300, which found:

- 61% (7,844) of the population belonging to 1,581 households within the KJE ROW are low-income and living below the International Poverty Line of USD$1.90/day, which is approximately equivalent to 216,000UGX per month;
- 38% (4,883) have an average income of 0-100k UGX/month;
- 11% (1,395) are relatively middle income (501-10,000k UGX/month); and
- <1% (1) are relatively high-income (>10M UGX/month).

The distribution of the population and associated average incomes correspond to settlement zones.

Owner-Occupancy and Land-Title

It is estimated that 952 (36%) of households are owner-occupied, 907 of which have legitimate title over their land (

Table 7-15). 1,720 households are estimated to be non-owner-occupied and not considered as eligible claimants of compensation under Ugandan Law for the structures or land in which they reside. These households are either tenanted, caretaker or squatted residences.

Table 7-14 Summary of monthly income (per person), population, households and owner/title status within KSB alignment.

Av. Income (k UGX/ person/month)	Population	% Population	Residences	Owner-occupied residences	Owners with Title	Non-owner occupied
0-100k	4,883	38%	980	264	250	716
101-215k	2,961	23%	599	214	202	385
216-500k	2,184	17%	490	204	198	286
501-1,000k	881	7%	175	97	95	77
1,001-10,000k	514	4%	95	58	54	38
>10M	1	<1%	2	0	0	2
Other	1,422	11%	331	115	107	216
Total	12,846	100%	2,672	952	907	1,720

*Non-owner-occupied residences include residences that are renting, caretaking or squatting.
**Other income brackets are household that omitted income information within the 2018 Census Survey.

Businesses

Using 2018 Census Survey data from KSB Chainage 1+000-5+300, it is estimated that 1,685 businesses are situated within the KSB alignment ROW, including:

- 1,227 (73%) businesses were small sole-traders, such as vendors and informal rental businesses;
- 384 (23%) businesses were small to small-medium sized, employing 1-5 staff per business;
- 62 (4%) businesses were medium to medium-large sized, employing 6-20 staff per business; and
- 12 (<1%) businesses were large, employing more than 20 staff per business.

843 (50%) of these businesses are situated along the first 5km of the KSB alignment within populated areas of Nakawa Division.

The predominant business activities included:

- 39% of all businesses were rental businesses, predominantly sole-traders renting residential rooms to tenants, particularly in Nakawa Division;
- 25% of businesses were retail outlets and vendors of ready-made food and raw produce;
- 7% of businesses reported agriculture to be their primary business activity;
- 7% of businesses were identified as a restaurant, bar, hotel or entertainment venue; and
- 5% of businesses specialised in the sale and repair of electronics and mobile related accessories.

Based on 2018 Census data and the number of structures identified via spatial analysis, many businesses are situated within dual-use residential-business premises. The dual-use of residential structures as business premises accounts for the high proportion of informal rental activities identified within the 2018 Census.

Table 7-15 Summary of businesses by size per LC3 s within KSB alignment

LC3	Sole-trader	Small	Sml-Med	Med	Med-Lge	Large	Other	Total
Nakawa	619	150	44	22	9	6	0	850
Makindye	317	76	22	11	5	3	0	434
Ssabagabo-M	291	71	21	11	4	3	0	401
Total	1,227	297	87	44	18	12	0	1,685

Major Businesses

Based on 2018 Census Survey data, ground-level reconnaissance, and spatial analysis, 17 major business were identified within the KSB ROW (Table 7-16).

Table 7-16 Major businesses / commercial / industrial facilities located within the KSB alignment

Business Name	X	Y	Structure	Access	Grounds
2/3 general stores	456209	30308		X	
Canopy Country Club/Gardens Kasokoso	460498	35993	X	X	
Ezra Apartments	458887	34573		X	X
Gaz Petrol Station	458804	35132		X	
General store (i)	455081	29221		X	X
General Store (i)	455254	29076	X		

General store (ii)	456072	30408	X	X	
Ham Shopping Centre	455098	29255			X
Kalong Shoppers Super Market	455936	30487	X	X	
Mirage Plaza	459048	34994		X	
Motor/Mechanic shops, General store	455240	29131	X		
Munyonyo Hardware and Woodworks	455239	29086	X		
Pastora Stationary	455603	29939	X		
Pontius Building	455499	29827	X	X	
PTC 24/7 Club	455396	28985	X		
Senga Restaurant	455611	29941	X		
Sharom House shops	455087	29216		X	X

Community Infrastructure

Community infrastructure located within the KJE alignment was identified via Census Survey data, spatial analysis and other reconnaissance; a summary of these assets is presented in Table 7-17. 13 places of worship, 15 education facilities, three gravesites, and three health centres were identified with the KSB alignment. Other community infrastructure included a pedestrian overpass.

Table 7-17 Community infrastructure within the KSB Alignment ROW

Name	X	Y	Chainage	LC3
Overpass				
Pedestrian Overpass	458493	32955	6+600-6+700	Nakawa
Church, Mosque and Places of Worship				
Anointed Church of Jesus Christ Kitintale	458890	35046	4+300-4+400	Nakawa
Glory of Christ Church Mutungo	459807	35442	3+300-3+400	Nakawa
Grace Healing Centre Church	459926	35848	2+700-2+800	Nakawa
Green Valley Prayer Alter Church	460853	35980	1+600-1+700	Nakawa
Kingdom Crusade Church	461466	35941	1+000-1+100	Nakawa
Life Changing Church	459289	35061	3+800-3+900	Nakawa
Masjid Kausara	456386	26179	17+000-17+100	Ssabagabo-M.
Masjid Tauhiid	456026	27544	15+600-15+700	Ssabagabo-M.
Pentacostal Revival Ministry	460280	36076	2+200-2+300	Nakawa
Rehoboth Revival Centre Church	456263	27029	16+100-16+200	Ssabagabo-M.
United Worship Church	460196	36079	2+300-2+400	Nakawa
World Wide Gospel Centre	455179	29026	13+800-13+900	Makindye
Worldwide Apostolic Church	458868	34887	4+400-4+500	Nakawa
Gravesites				
10 Graves of Kavuma Family	456101	30454	12+100-12+200	Makindye
9 Graves of The Kajoba Family	456144	30407	12+100-12+200	Makindye
Multiple Graves from Two Families	456270	30588	11+800-11+900	Makindye
Health Centres				
Mutungo Clinic and Maternity Centre	459834	35399	3+300-3+400	Nakawa

Name	X	Y	Chainage	LC3
S&K Medical Clinic	459769	35366	3+400-3+500	Nakawa
St Louis Medical Centre	455282	29081	13+800-13+900	Makindye
School and Nurseries				
All Saints Junior School	460197	36078	2+300-2+400	Nakawa
Amka Classic School	459834	35448	3+300-3+400	Nakawa
Bright Lillies Nursery	459712	35318	3+400-3+500	Nakawa
Bright Futures Primary School	456052	27608	15+500-15+600	Ssabagabo-M.
Clevers Origin Primary School	459629	35197	3+600-3+700	Nakawa
Divine Mission Junior School	455101	29180	13+700-13+800	Ssabagabo-M.
Hope Kindergarten School	458824	34431	5+000-5+100	Nakawa
Jowan Brights Angels Memerid School	459366	35132	3+800-3+900	Nakawa
Margaret Grant Preparatory School	460443	35945	3+900-4+000	Nakawa
Nakinyuguzi High School	455664	29943	12+700-12+800	Makindye
Royal Pride Community Academy Primary	460292	36023	2+200-2+300	Nakawa
St Agnes Junior School	456359	26671	16+500-16+600	Ssabagabo-M.
St Anthony Nursery School	459726	35342	3+400-3+500	Nakawa
St Mark Nursery and Primary School	459891	35865	2+700-2+800	Nakawa
True Hearts Nursery and Primary School	456024	27956	15+200-15+300	Ssabagabo-M.

Water and Sanitation Infrastructure

From the 2015 ESIA (ICS, 2015), 2018 Census Survey and other reconnaissance conducted within the KSB alignment, one community toilet and 8 community water sources were identified within the alignment (Table 7-18), servicing a total of approximately 250 and 2,400 users per day respectively. Other water and sanitation infrastructure includes:

- Water mains – This includes the main line from Gaba 1 and Gaba II that feeds Kampala's water supply; and
- Sewerage lines – a sewerage line in the vicinity of the Nakivubo wetland will be intersected by the alignment.

Table 7-18 Community water and sanitation infrastructure within the KSB ROW

Name	X	Y	Chainage	LC3	Structure /	Access	Grounds
Toilet							
Public Toilet	456951	36360	4+800-4+900	Nakawa	X		
Water Pipes and Drainage							
Lukuli Road Drainage	456029	30426	12+100-12+200	Makindye	X		
Kitintale Channel	458979	35048	4+100-4+200	Nakawa	X		
St Marks Drainage	459936	35937	2+600-2+700	Nakawa	X		
Water Pipe to Muyenga Tank Hill	456955	30875	11+100-11+200	Makindye	X		
Water Source							
Public Tap for NWSC	459370	35053	3+800-3+900	Kira	X		
Sauda Water Source	458908	34207	5+200-5+300	Nakisunga	X		

Name	X	Y	Chainage	LC3	Structure /	Access	Grounds
Water Point (Stand-by-pipe)	459045	35093	4+200-4+300	Nakawa	X		
Water Point (Well)	459046	35134	4+200-4+300	Nakawa	X		
Water Source (i)	458831	34765	4+600-4+700	Kira	X		
Water Source (ii)	458781	34766	4+600-4+700	Nakisunga	X		
Water Tap	459938	35881	2+600-2+700	Kira	X		
Water Tap and Tank	459375	37691	3+500-3+600	Nakawa	X		

Public Infrastructure

The 2015 ESIA, and 2018 Census Survey for the KSB alignment (ICS, 2015) identified 5 public infrastructure assets within the KSB alignment, including:

- Railway line – the railway line crossing Nakivubo channel;
- Power lines and telecommunication towers and cables; these exist at a number of points along the KSB, including a 33 KV line; and
- Land mine area within Makindye Division.

These are presented below in

Table 7-19.

Table 7-19 Public infrastructure within the KSB ROW

Name	X	Y	Chainage	LC3	Structure
33KV powerline	458943	232420	7+300-7+300	Makindye	X
Electric Pole	459936	35923	2+600-2+700	Nakawa	X
Electric Pole	458943	35495	3+200-3+300	Nakawa	X
Land Mine Area (Special case)	458988	32398	7+400-7+400	Makindye	Other
Railway Line	458470	32953	6+600-6+700	Makindye	X

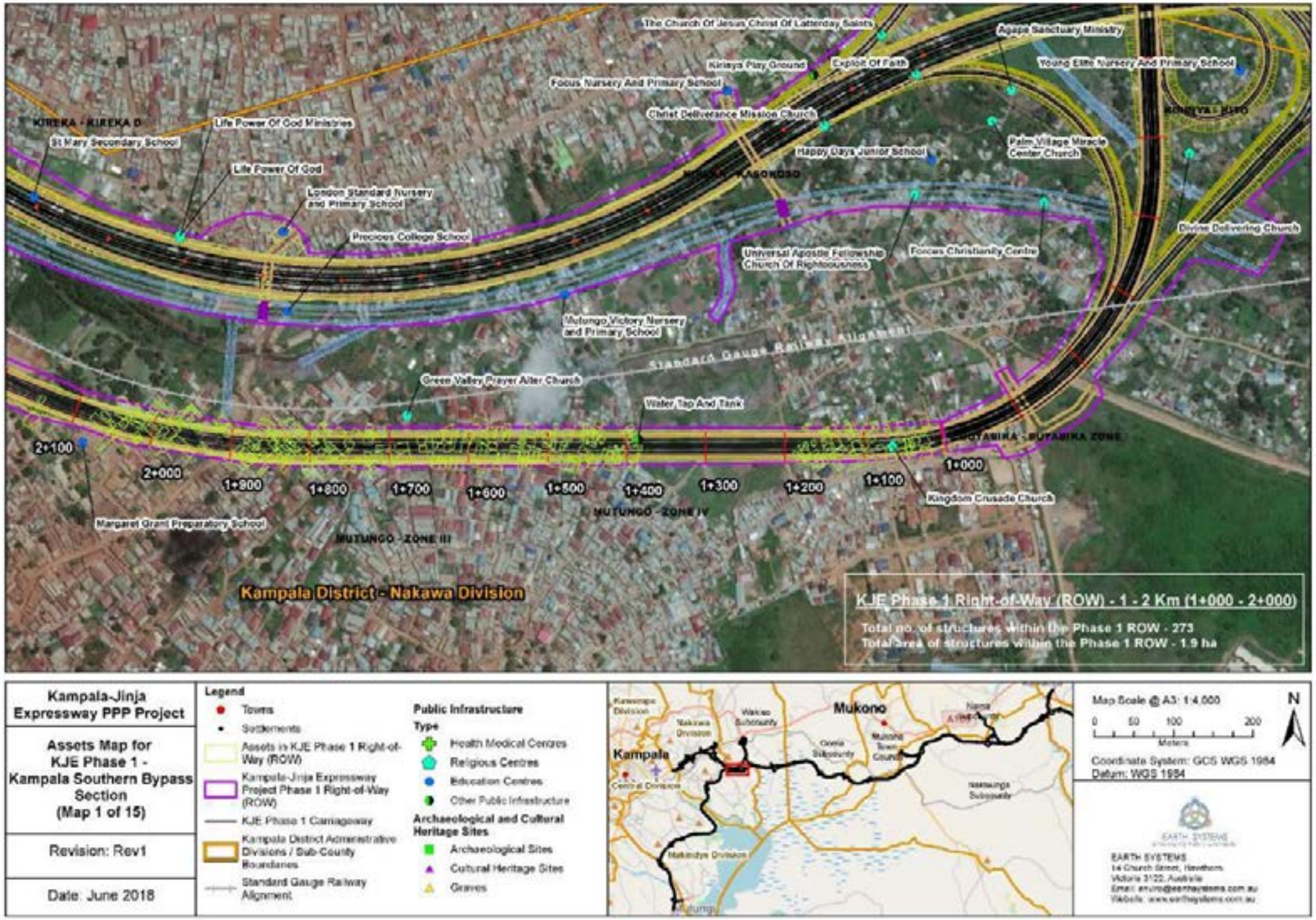


Figure 7-48 Assets and infrastructure in the KSB ROW, Chainage 1+000 – 2+000 (Map 1 of 12)

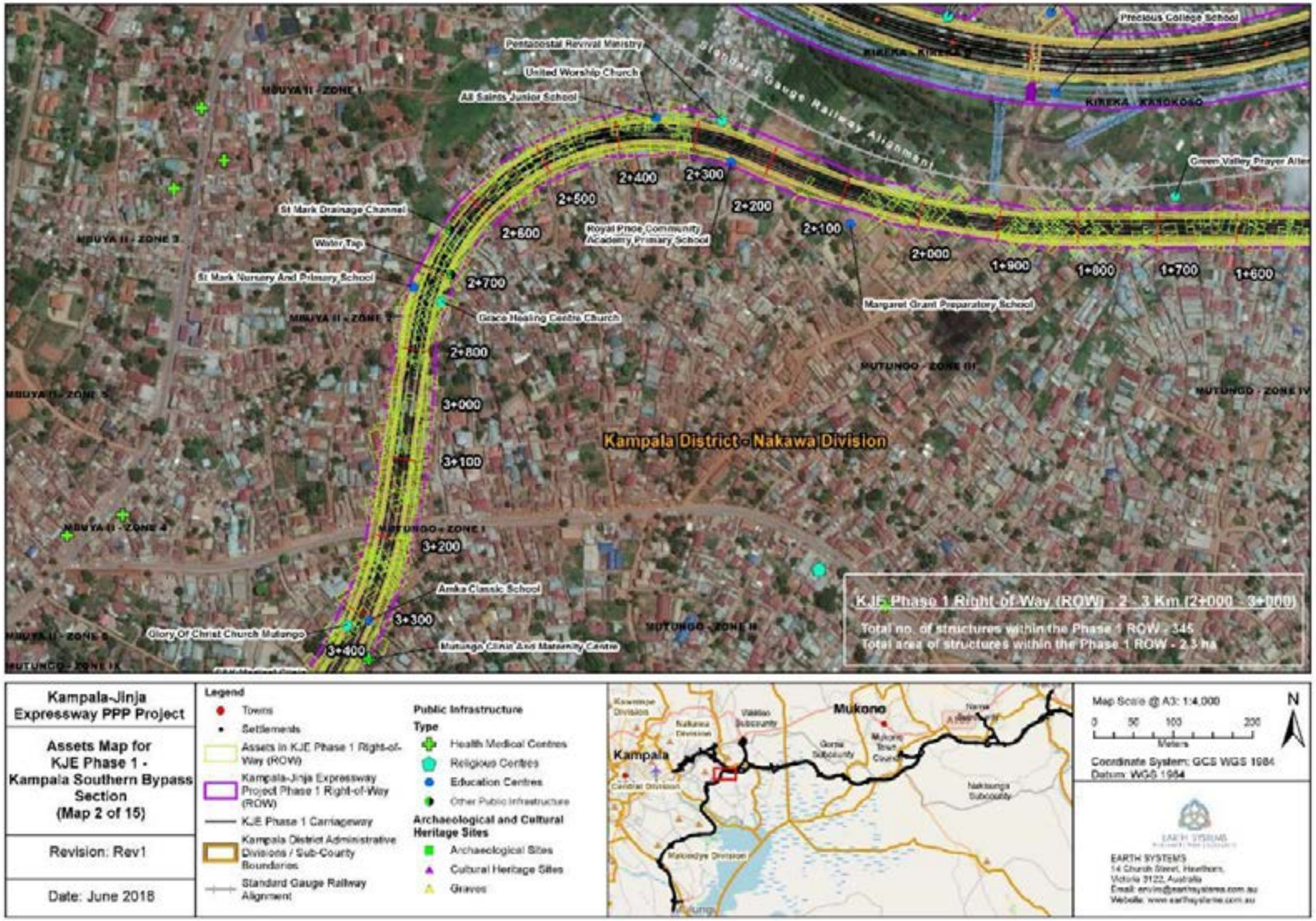


Figure 7-49 Assets and infrastructure in the KSB ROW, Chainage 2+000 - 3+000 (Map 2 of 15)

Figure 7-50 Assets and infrastructure in the KSB ROW, Chainage 3+000 – 4+000 (Map 3 of 15)

Figure 7-51 Assets and infrastructure in the KSB ROW, Chainage 4+000 – 5+000 (Map 4 of 15)

Figure 7-52 Assets and infrastructure in the KSB ROW, Chainage 5+000 – 6+000 (Map 5 of 15)

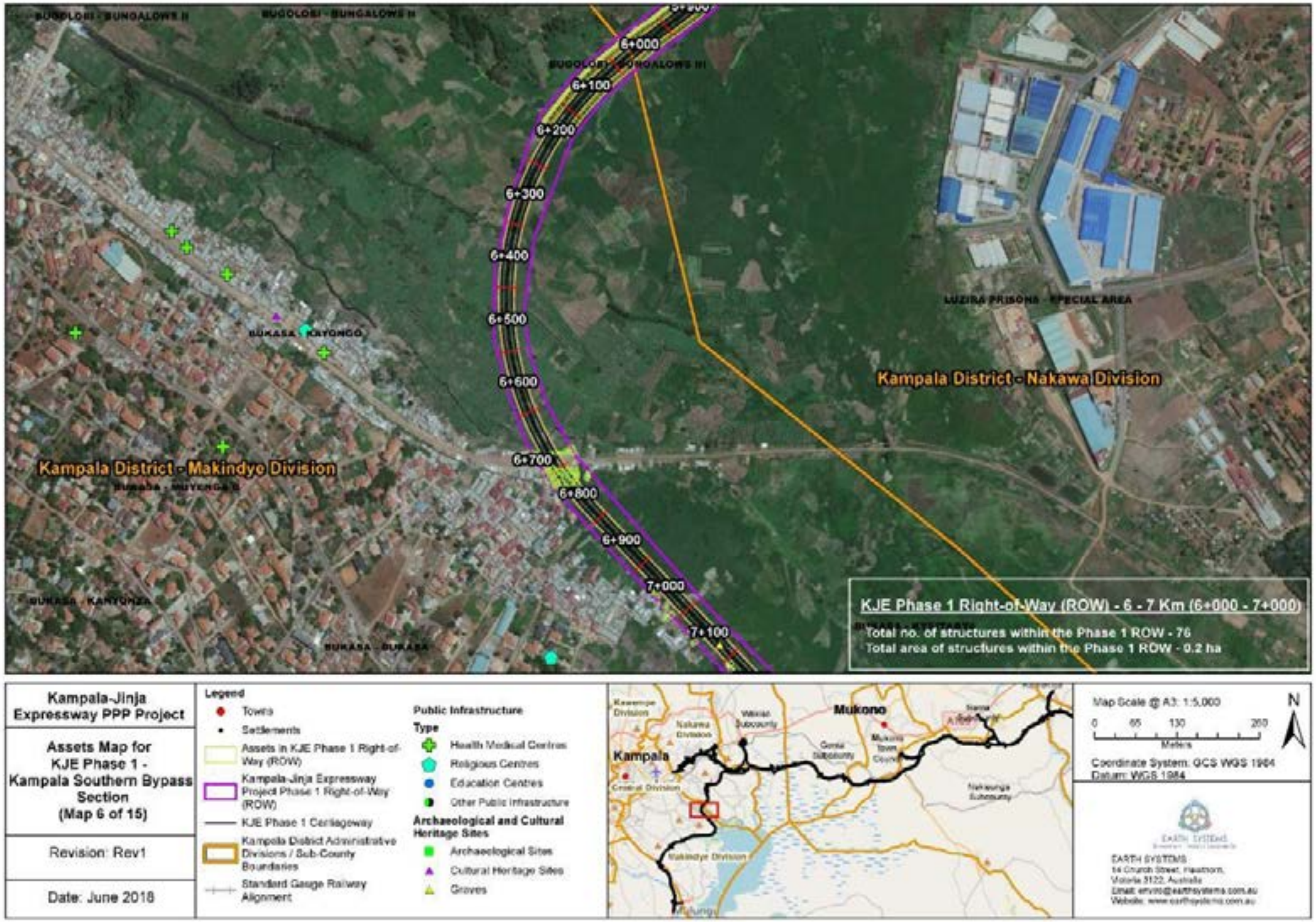


Figure 7-53 Assets and infrastructure in the KSB ROWr, Chainage 6+000 – 7+000 (Map 6 of 15)

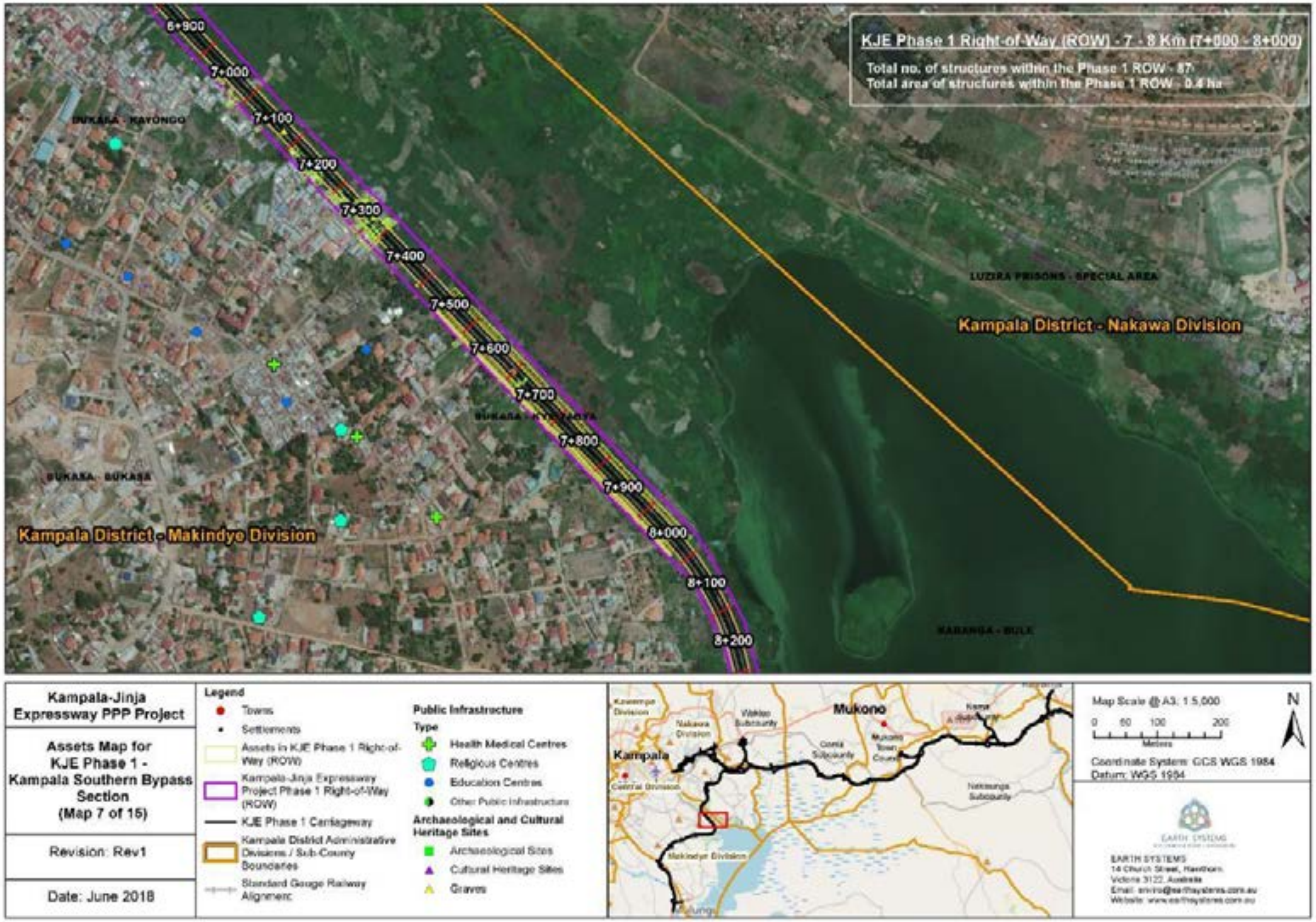


Figure 7-54 Assets and infrastructure in the KSB ROW, Chainage 7+000 – 8+000 (Map 7 of 15)

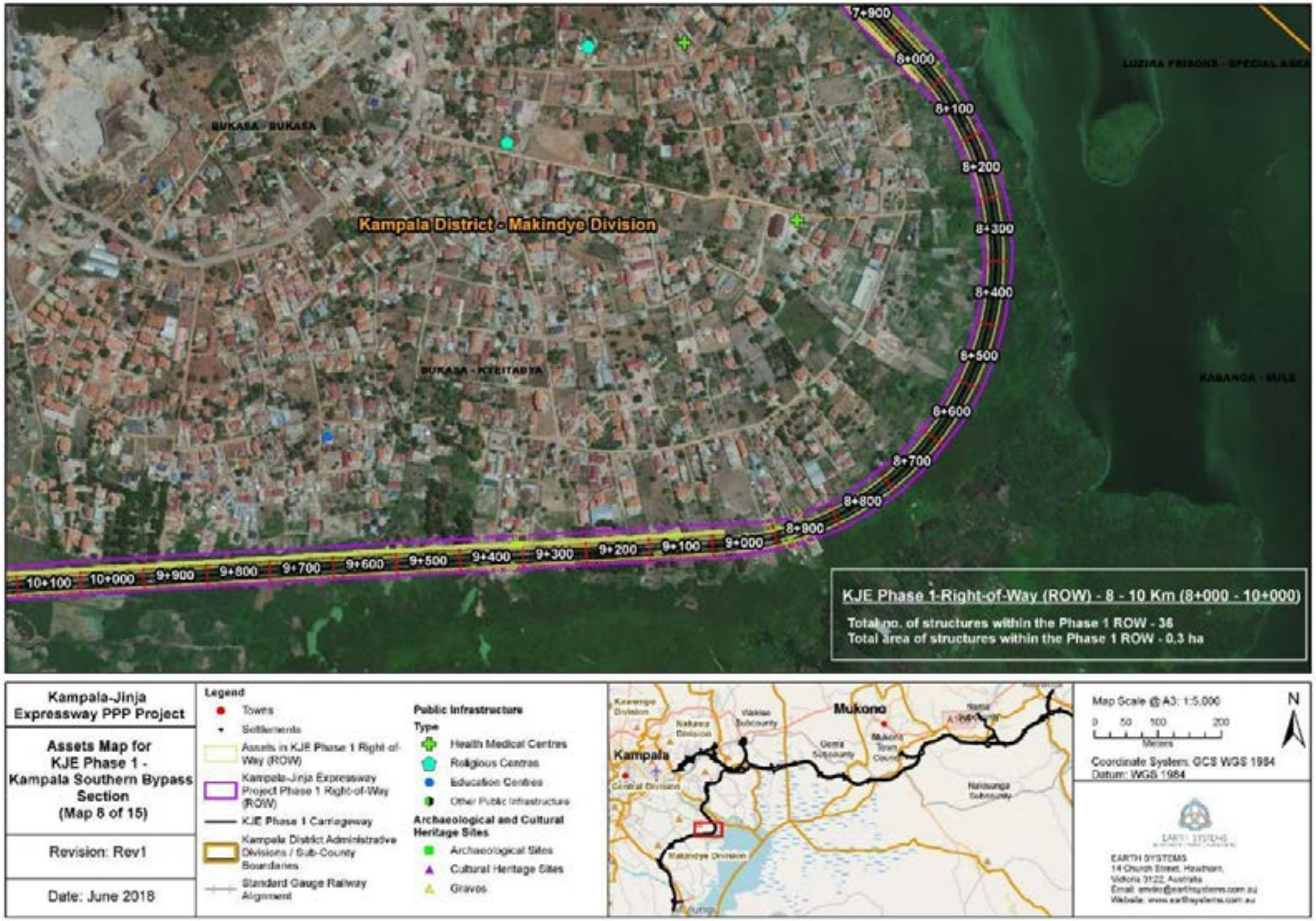


Figure 7-55 Assets and infrastructure in the KSB ROW, Chainage 8+000 – 10+000 (Map 8 of 15)

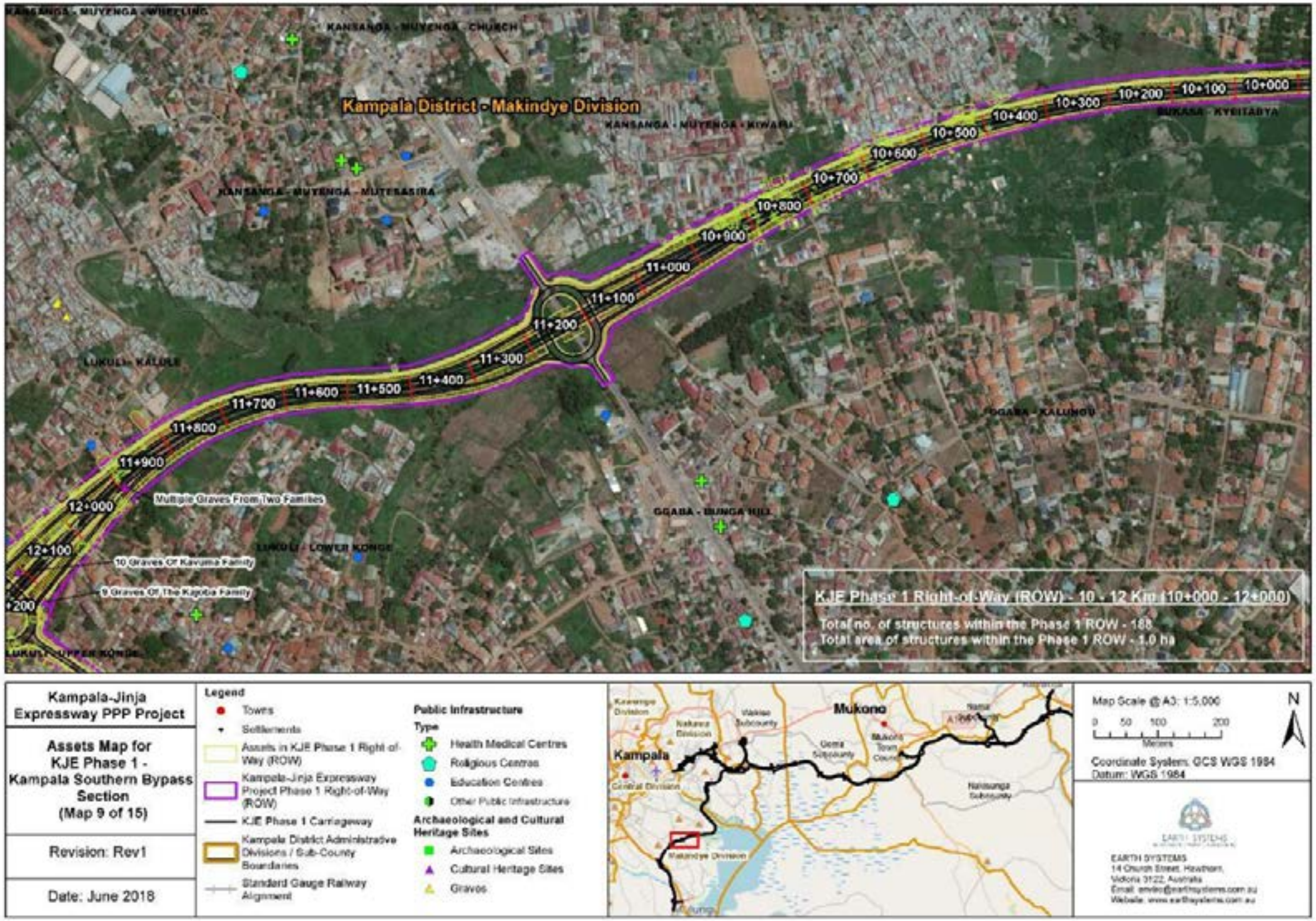


Figure 7-56 Assets and infrastructure in the KSB ROW, Chainage 10+000 – 12+000 (Map 9 of 15)

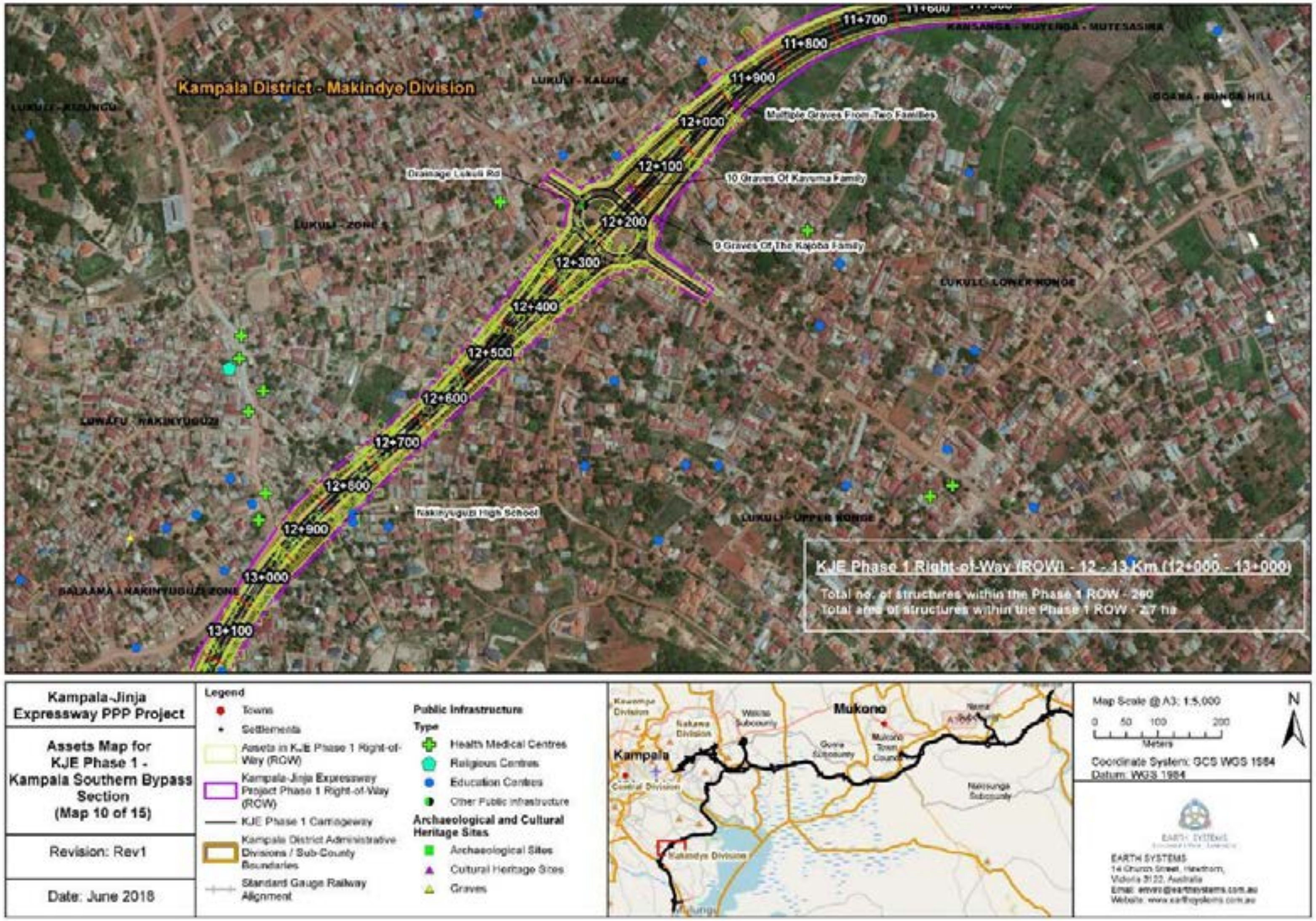


Figure 7-57 Assets and infrastructure in the KSB ROW, Chainage 12+000 – 13+000 (Map 10 of 15)

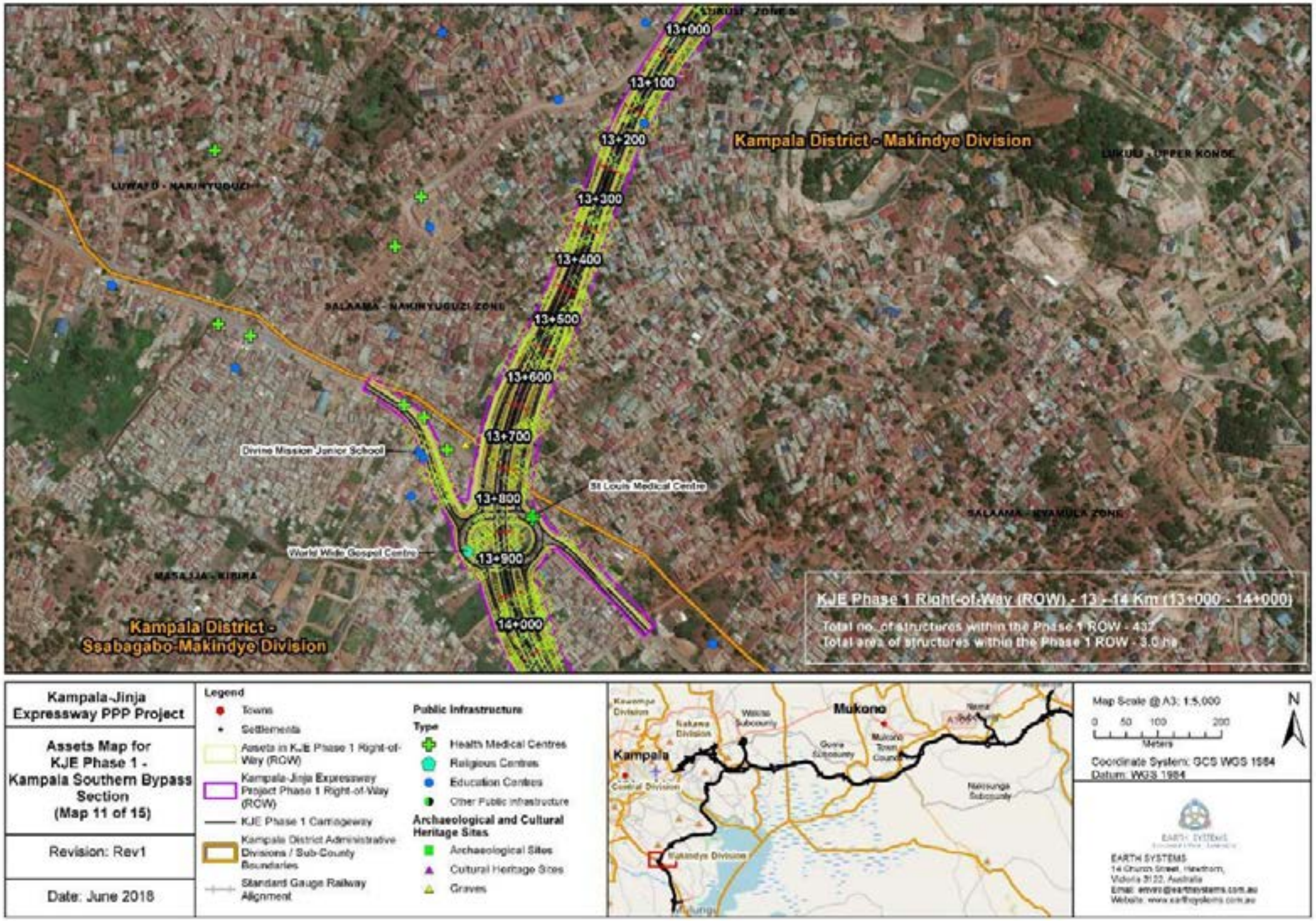


Figure 7-58 Assets and infrastructure in the KSB ROW, Chainage 13+000 – 14+000 (Map 11 of 15)

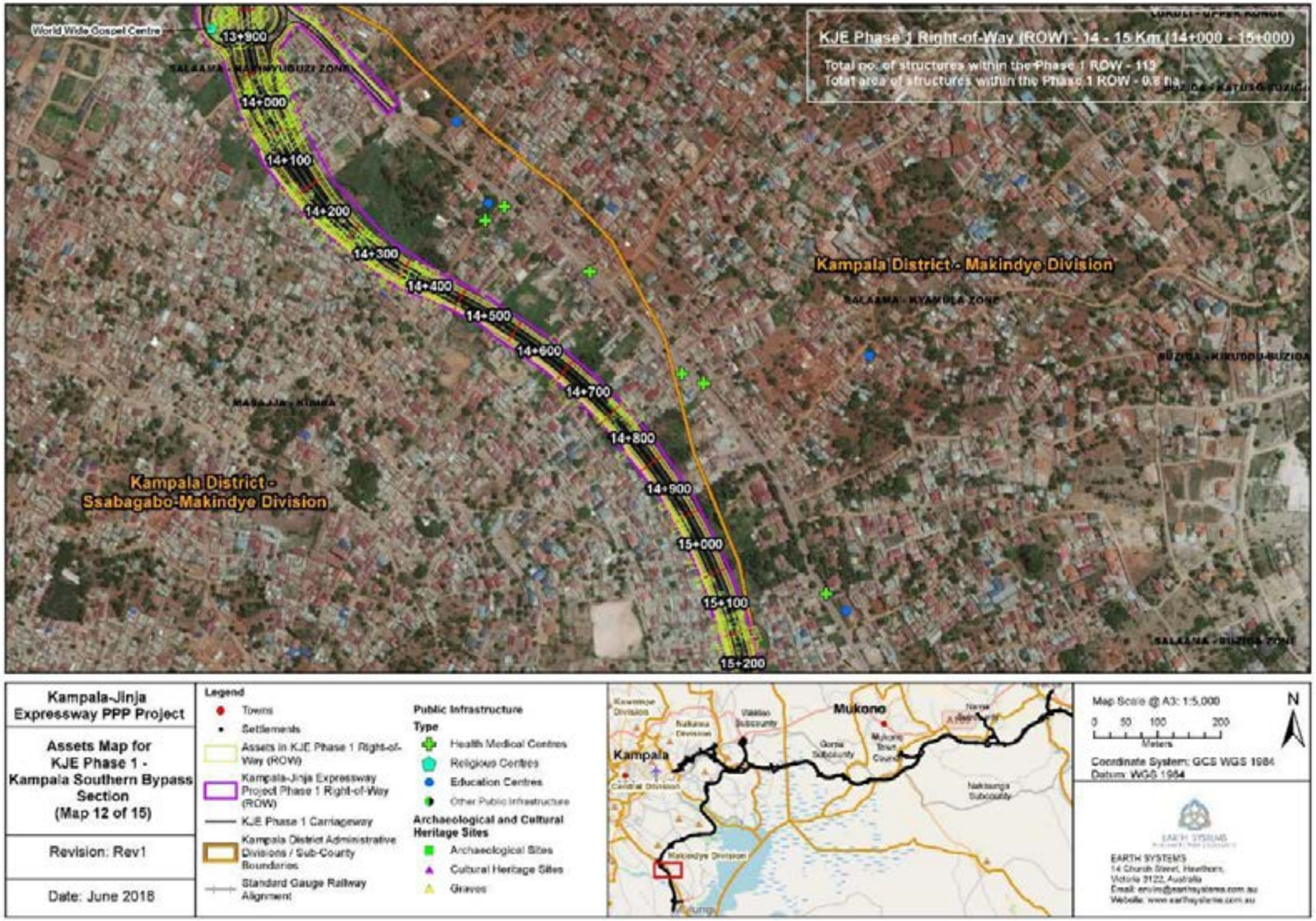


Figure 7-59 Assets and infrastructure in the KSB ROW, Chainage 14+000 – 15+000 (Map 12 of 15)

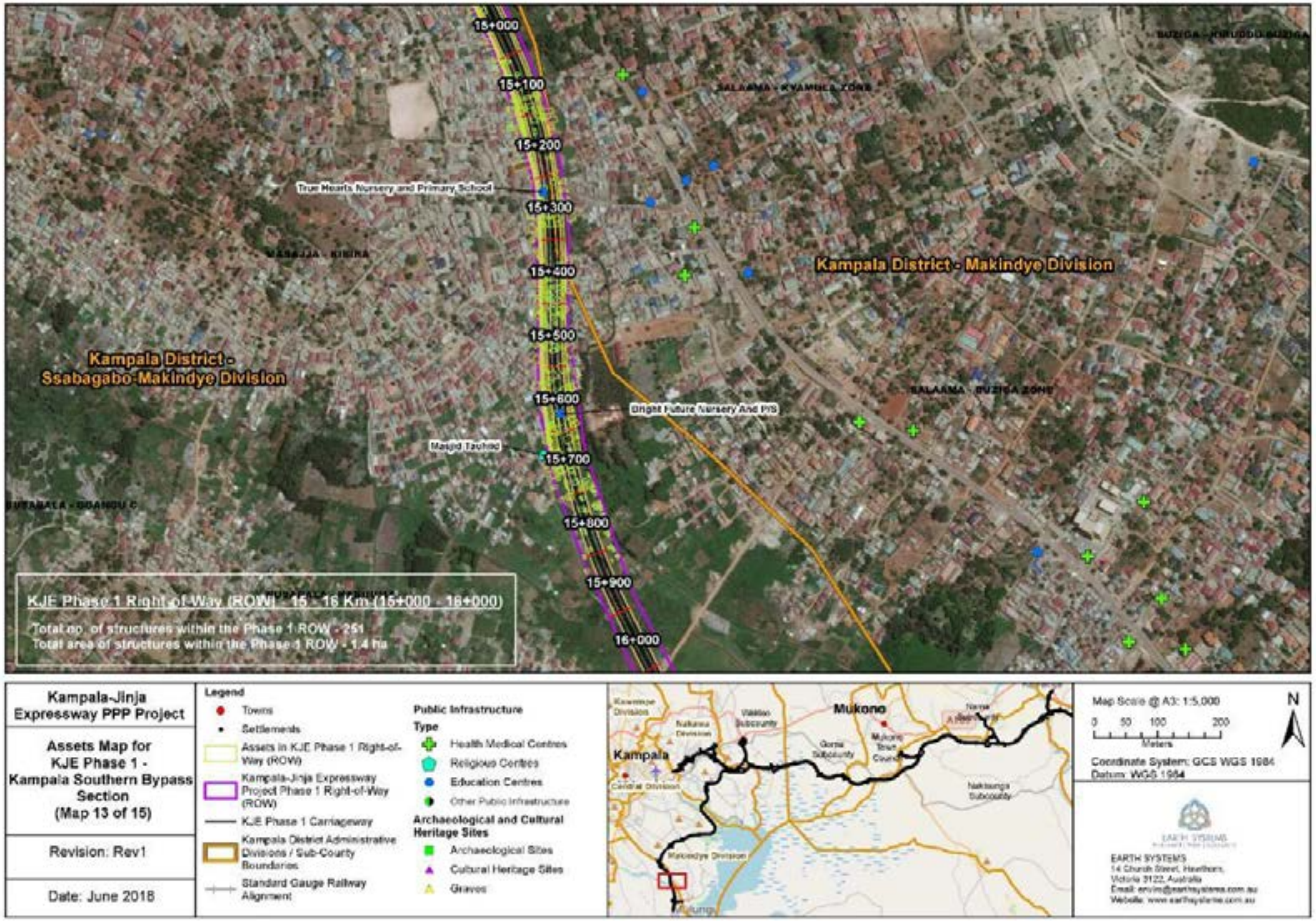


Figure 7-60 Assets and infrastructure in the KSB ROW, Chainage 15+000 – 16+000 (Map 13 of 15)

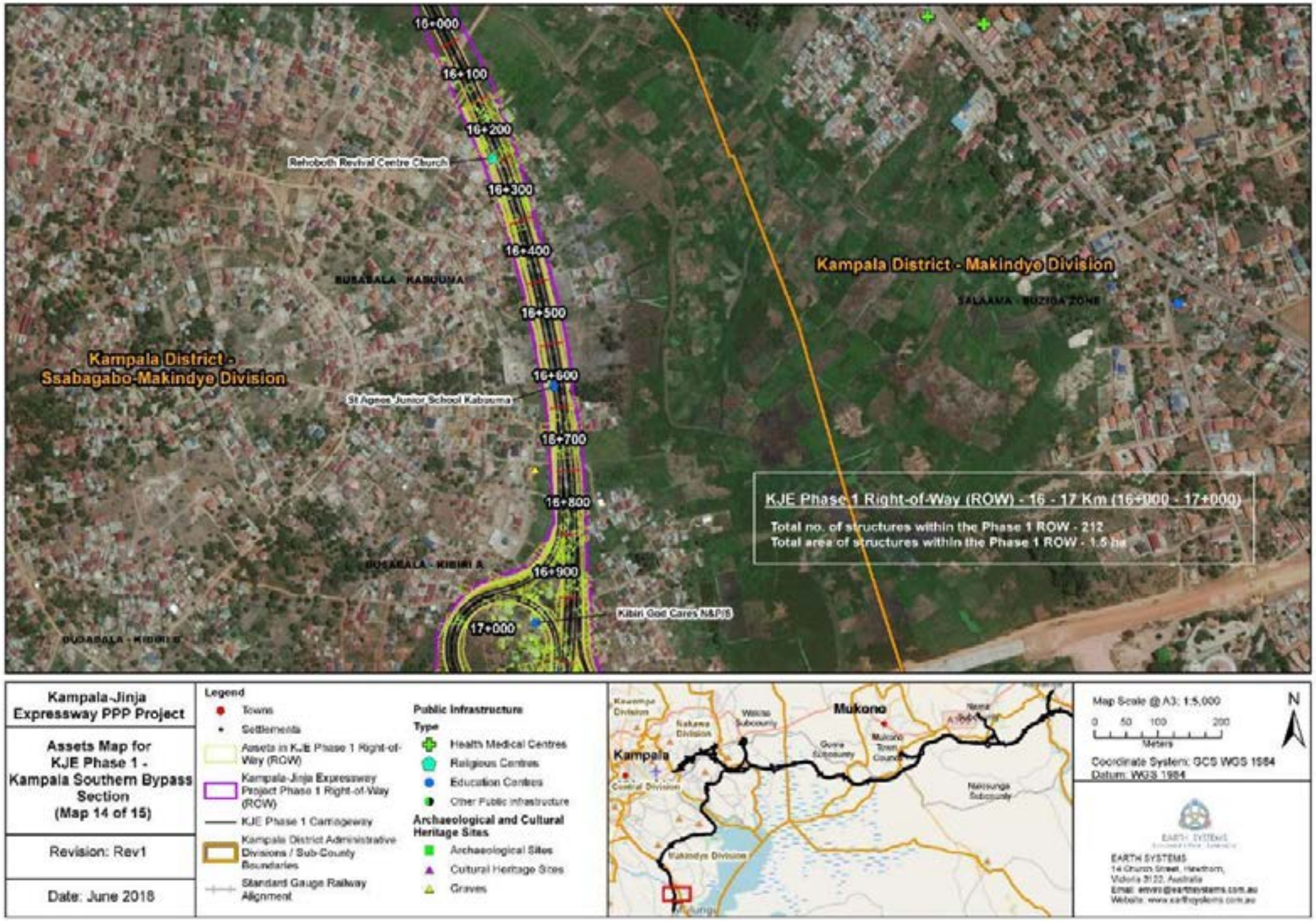


Figure 7-61 Assets and infrastructure in the KSB ROW, Chainage 16+000 – 17+000 (Map 14 of 15)

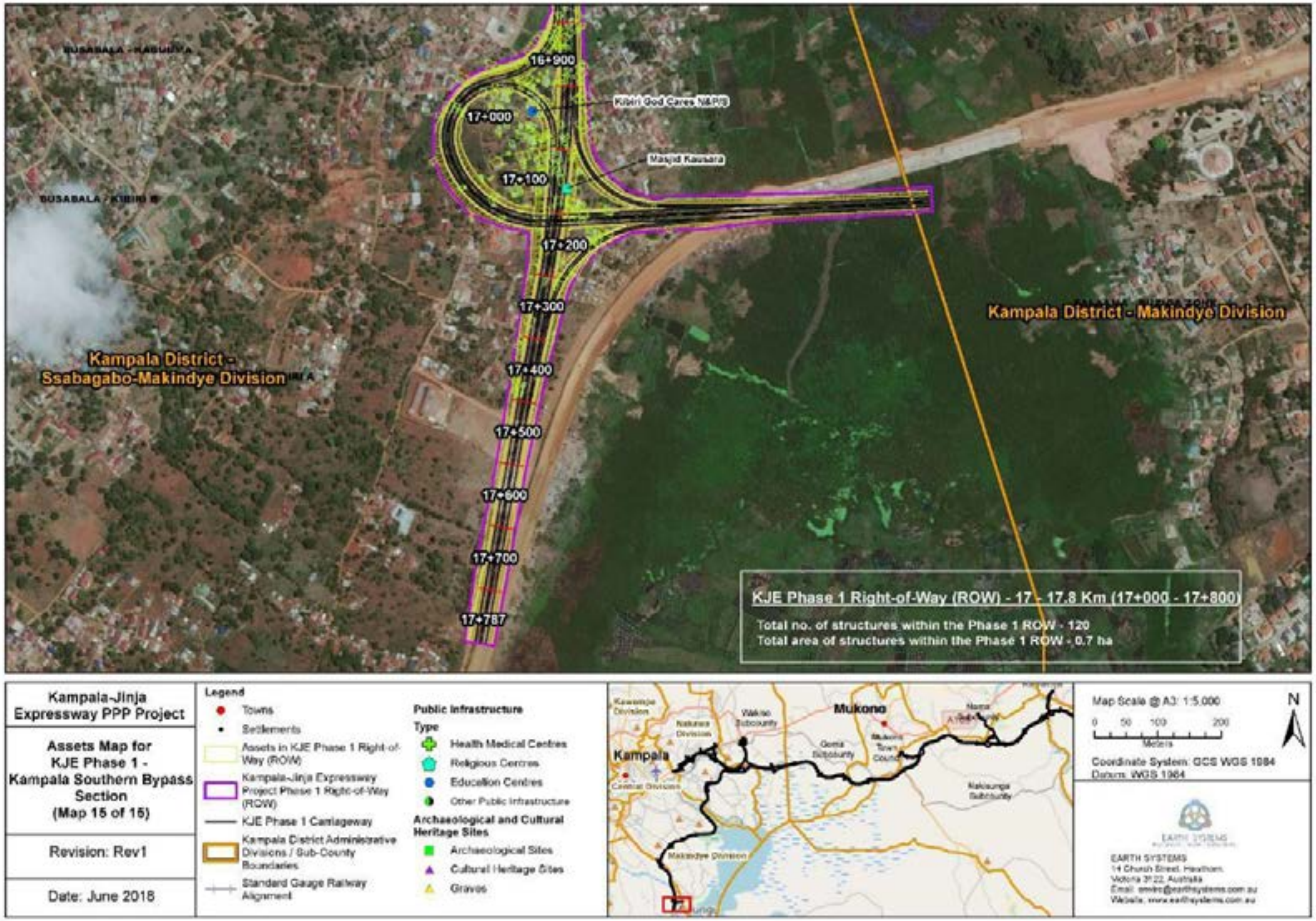


Figure 7-62 Assets and infrastructure in the KSB ROW, Chainage 17+000 – 17+800 (Map 15 of 15)

7.3 Impact Assessment

7.3.1 Loss of Land

Land impacts due to the Project will primarily be associated with the acquisition of land for the Project ROW, construction of new access routes, and siting of construction infrastructure and ancillary facilities. This will include both temporary and permanent loss of access to land. Potential indirect impacts may also result through a loss of access to land, associated livelihood and economic impacts, fragmentation of land areas and severance of existing access routes and roads.

Visual interpretation of high-spatial resolution satellite imagery was conducted to estimate the amount of different land cover types likely to be affected by the Project. Land use mapping of alignment was intersected with a digital layer of the Project ROW, allowing accurate identification of land resources within each Project component (refer to Section 6.1 for methodology).

Potential land use impacts associated with the Project ROW are presented in Table 7-20. Land acquisition for the Project ROW will result in a land loss of approximately 593.5 ha of land, including 476.9 ha as a result of the KJE alignment from Kampala to Namagunga, and 116.6 ha as a result of the KSB alignment.

The main type of land affected by the Project is agro-pastoral land (138.0 ha; 23%), all of which is located along the KJE alignment, largely in within Mukono District (128.3 ha), and to a lesser extent, in Buikwe and Wakiso Districts. Loss of agro-pastoral land is likely to have associated impacts on local livelihoods through the loss of land for subsistence agriculture and livestock grazing (refer to Chapter 19 on Socio-economics and Livelihoods).

The most significant impacts of land loss are expected to occur as a result of the loss of settlement land during Project land acquisition. Approximately 120.2 ha (20%) of land cover is settlement land which will be impacted as a result of the Project ROW; 68.9 ha in KJE, and 51.1 ha in KSB.

Overall, a smaller proportion of industrial land (31.2 ha; 5%) will be affected by the Project footprint and buffer, with the majority of this land located along the KJE alignment (28.8 ha). Due to the concentration of industrial and commercial activity within this land type, particularity along the existing Kampala Jinja Road at the commencement of the KJE alignment, potential socio-economic impacts are likely to be high (refer to Section 6.3.3 and Chapter 19 on Socio-economic and Livelihoods).

Approximately 34.1 ha of roads and tracks will be impacted by the Project, the majority of these will be from the KJE alignment (25.3 ha). If left unmitigated, the loss of roads and tracks will have potential impacts on local accessibility. These are further detailed in Chapter 8 on Traffic, Transport and Accessibility.

Forested areas impacted by the Project ROW include approximately 4.6 ha of closed forest, open forest and shrubland, all of which is within the KJE alignment in Mukono District. Potential impacts associated with the loss of forested areas are detailed in Chapter 16 on Ecology and Biodiversity.

Table 7-20 Land cover potentially impacted by the KSB and KJE alignments

Habitat Classifications	KJE Area (ha)	% of KJE	KSB Area (ha)	% of KSB	Total Area (ha)	% of Total
Agro-pastoral Land	138.0	29%			138.0	23%
Cleared Land / Minor Agriculture	34.2	7%	14.9	13%	49.1	8%
Degraded Wetland	25.7	5%			25.7	4%
Drainage	2.2	<1%	1.4	1%	3.6	1%
Fallow Land	17.9	4%			17.9	3%
Industrial Area	28.8	6%	2.4	2%	31.2	5%
Open Forest / Woodland	15.7	3%			15.7	3%

Habitat Classifications	KJE Area (ha)	% of KJE	KSB Area (ha)	% of KSB	Total Area (ha)	% of Total
Plantation	10.0	2%			10.0	2%
Recreational Area	0.7	<1%	0.4	<1%	1.1	0%
Roads / Tracks	25.3	5%	8.8	8%	34.1	6%
Scrubland	26.4	6%			26.4	4%
Closed Forest	4.6	1%			4.6	1%
Settlement Area	68.9	14%	51.4	44%	120.2	20%
Tea Plantation	28.9	6%			28.9	5%
Urban Forest	0.6	<1%	5.4	5%	6.0	1%
Wetland - Cultivated	17.6	4%	29.8	26%	47.4	8%
Wetland - Papyrus	31.4	7%	2.1	2%	33.5	6%
Total:	476.9	100%	116.6	100%	593.5	100%

7.3.2 Impact on Structures and Affected Population

7.3.2.1 Impacted Structures

Based on spatial analysis, 8,105 (KJE: 4,488; KSB: 3,617) structures covering 43.84 ha (KJE: 20.94; KSB: 22.9 ha) were identified as within the Project ROW in the KJE and KSB alignments (Table 7-21). The majority of these structures are relatively small with areas <0.008 ha, and located on urban and peri-urban land in Nakawa District.

Large / Industrial Structures

344 large industrial-sized structures (with areas >0.016), covering a total area of 8.2 ha were identified as directly within and impacted by the Project ROW (Table 7-21). 128 (38%) of all large structures, are situated along the first 9 km of the KJE alignment in both residential and industrial areas. 25% (85) of all large structures are situated between KSB chainages: 12+000 to 14+000 in Makindye Division and Ssabagabo-Makindye Sub-county.

Table 7-21 Number of structures identified within Project ROW

Structures	KJE	KSB	Total
Small (<0.004 ha)	2,706	1,472	4,178
Small-medium (0.004-0.008 ha)	1,131	1,160	2,291
Medium (0.008-0.012 ha)	367	560	927
Medium-large (0.012-0.016 ha)	132	233	365
Large (>0.016 ha)	152	192	344
Total	4,488	3,617	8,105

7.3.2.2 Affected Population and Residences

It is estimated that 6,177 structures (75%) of all non-industrial sized structures are residential. These structures are either completely or partially within the ROW and would require removal or relocation for the Project. It is estimated that a population of 29,985 (KJE: 17,137; KSB: 12,848) reside within these residences, and that many are dual-use business premises also. 55% (3,396) of residences were estimated to be non-owner occupied based on 2018 Census Survey data (Table 7-22). These residences have no land assets or claim for compensation for the residences in which they reside under Ugandan Law. Population densities were greatest within urban and peri-urban areas (Figure 7-63), particularly within informal settlement areas of Kinawataka and Kasokoso.

Of the identified affected population, the 20,190 (67%) were estimated to be of low-income, living below the International Poverty Line of USD$1.90 per day, which equates to 216,000 UGX per month. The second largest portion of the population (17%) have slightly higher incomes, living on less than 500,000 UGX per month.

Due to the large population residing within the ROW, the high rate of low-income households and that the majority of these households are not entitled to compensation for their displacement indicates that the potential impact to the affected population is significant. This is especially considering that the 2018 Census Survey data indicates that many households operate businesses within the same premises, particularly those involved in informal rental businesses. The impacts in these cases are likely to be compounded by the loss of primary income sources to these households. Further details are presented in Chapter 19 on Socio-Economic and Livelihoods.

Households within informal settlements and that have no legitimate land assets may require special consideration to ensure appropriate compensation and resettlement. Unless properly mitigated against, relocation will affect established production systems, livelihood and social cohesion, existing assets and community infrastructure. Implementation of the *Resettlement and Livelihood Restoration Plan* (refer Volume D) and ongoing consultation will be required to help minimise potential impacts.

Table 7-22 Population and residences identified within Project ROW

Alignment	Population	Households	Owner-occupied with Title	Non-owner-occupied
KJE	17,137	3,505	1,875	1,630
KSB	12,846	2,672	954	1,767
Total	29,985	6,177	2,829	3,397

7.3.3 Businesses

2018 Survey Census data and spatial analysis indicated that an estimated 5,378 businesses are situated either partially or completely within the ROW and will be affected by the Project. 65% of these businesses are small-sole traders or vendors, predominantly involved in residential rentals and to a lesser extent, sale of ready-made and raw foods. These businesses are concentrated in urban and peri-urban areas, particularly in Nakawa Division and Kira Municipality. As many of these businesses are residential rentals, they rely exclusively on the existing premises to operate, rendering their relocation difficult. In some cases, such as small roadside vendors, the relocation of business premises is less problematic and impactful.

7.3.3.1 Major Businesses and Industrial Facilities

Based on the 2018 Census Survey and inspection of September 2017 satellite imagery, 103 major businesses were identified within the ROW. These businesses were concentrated along sections of the alignment that intersect existing major roads including Jinja Road and Port Bell Road in Nakawa Division. It is likely that most major businesses identified will be impacted by significant access restrictions. 35 major businesses however were identified as having a structure or facility directly impacted by the ROW. Close consultation between major businesses and UNRA should guide the broader impact to the business and whether relocation is necessary. It is expected that the loss of a structural asset or restrictions to customer access will necessitate the relocation of a number of businesses, whereas others major businesses such as manufacturers, business activities may well proceed as normal with the provision of alternative access. Further details are presented on businesses in Chapter 19 on Socio-Economic and Livelihoods.

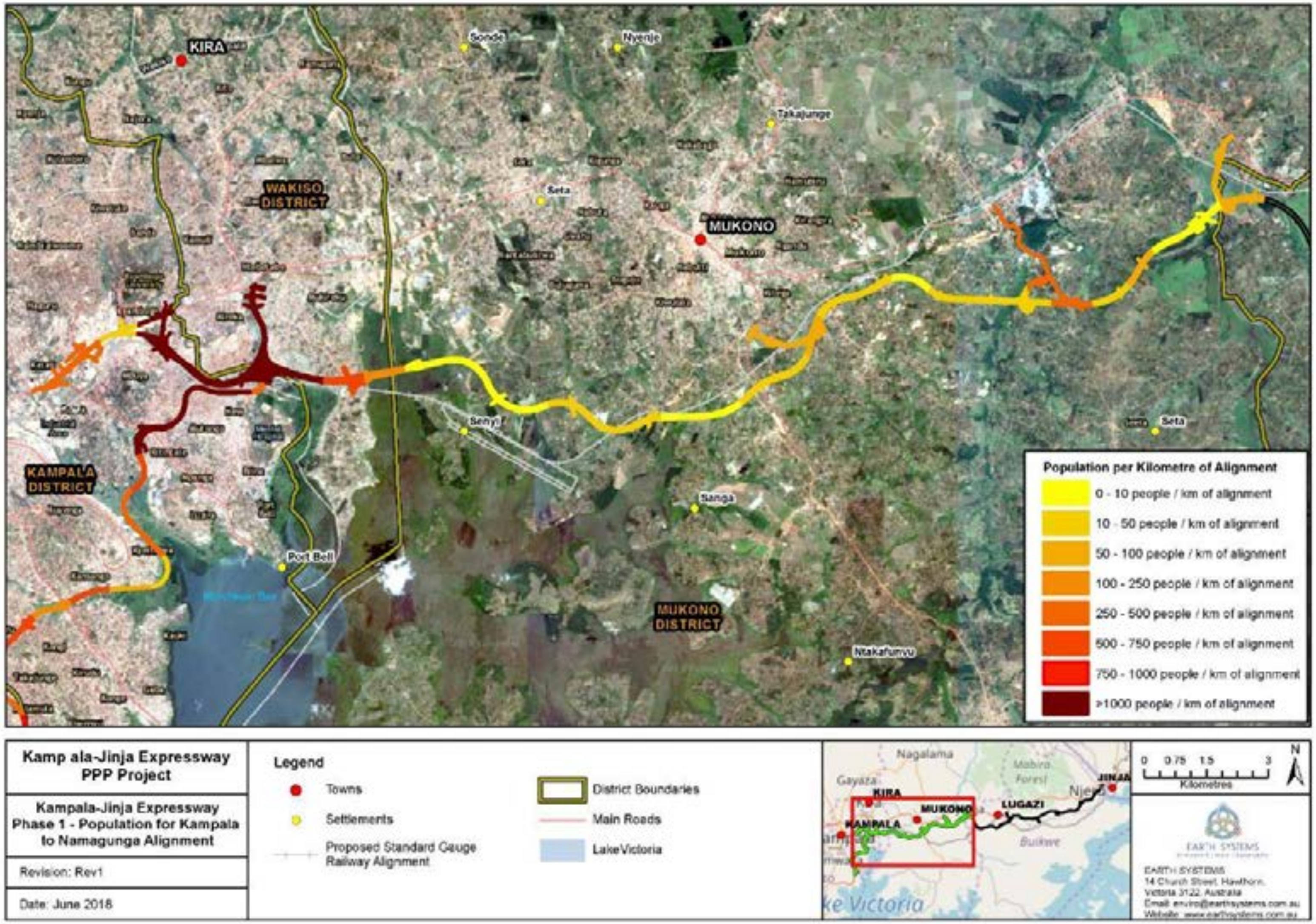


Figure 7-63 Density of population affected by the Project ROW along the KJE alignment

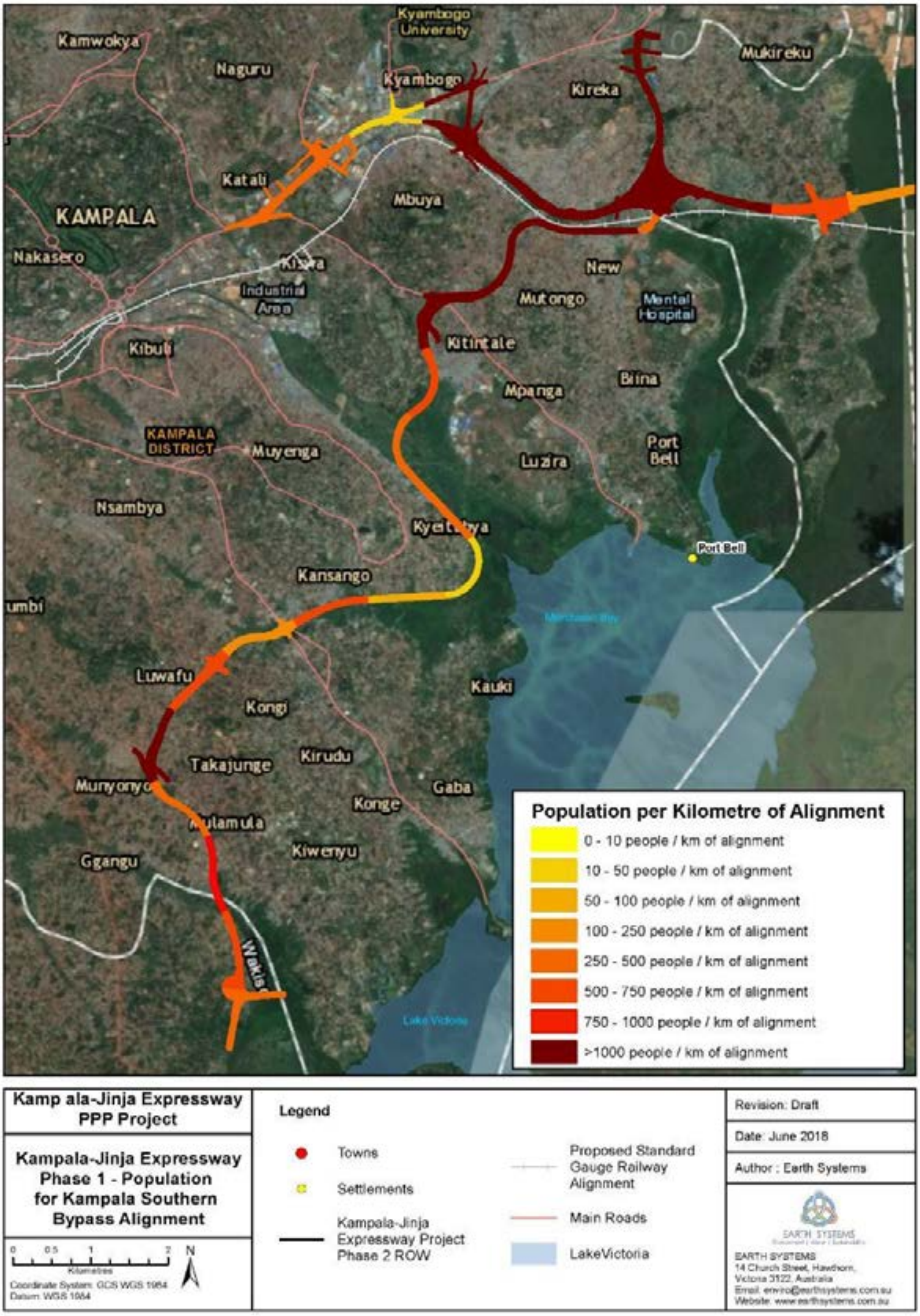


Figure 7-64 Density of population affected by the Project ROW along the KSB alignment

7.3.4 Community Infrastructure

Spatial analysis, 2018 Census Survey data and other ground-level reconnaissance identified a number of community infrastructure that will be impacted by the Project. These included 2 major pedestrian access points; 55 places of worship, 32 schools, 10 health centres, 3 community groups, 3 gravesites, 2 recreation centres and 1 police post. Many of these assets are likely to directly and completely impacted by the ROW, and a number will have significant restrictions to access. It is expected that impacts will be greater in informal settlement areas such as Kinawataka and Kasokoso, where population density is greatest and where fewer community infrastructures are present per capita. A number of larger schools were identified as having only access, grounds or minor buildings directly impacted by the ROW, such as Hilton High School, Amka Classic School and Green Valley International Academy. In these cases, close consultation with UNRA should guide the provision of alternative access or facilities to enable the school to continue running at capacity. Smaller infrastructures such as places of worship and health centres, the loss of a structure or facility will likely necessitate the relocation or closure of the infrastructure. In these cases, adequate compensation and support should be given to ensure that these infrastructures remain, and preferably within the local vicinity. Further details are presented in Chapter 19 on Socio-Economic and Livelihoods.

7.3.5 Water and Sanitation Infrastructure

Spatial analysis, 2018 Census Survey data and other ground-level reconnaissance identified 5 public toilets facilities, 25 public water points and 4 water pipes within the ROW. The displacement of these facilities will significantly impact communities adjacent to the ROW for which these facilities additionally service. These services are essential to public health, particularly considering the low rate of households within the study area that were found to water and sewage connected to their homes. These services would need to be replaced on either side of the alignment or accessible via crossings to maintain demand in these communities. Further details are presented in Chapter 19 on Socio-Economic and Livelihoods.

7.3.6 Public Infrastructure

The Project is expected to also impact a number of infrastructure and utilities across the Project ROW, including electricity distribution and transmission lines, water pipe line infrastructure (especially within Kampala and Wakiso Districts) and telecommunications infrastructure such as fibre optic cables.

This would require adjustments to existing services, relocation of some services that cross the alignment and the implementation of protection measures. This impact is expected to be higher in urban areas, particularly in Kampala District where there is a greater concentration of these utilities, for example from the UMA grounds to the Kyambogo Junction in the first few kilometres of the KJE alignment.

The Project will also directly impact part of the roadside market infrastructure at Nakawa markets through the upgrading of the existing Kampala Jinja Highway in that section.

No impacts on infrastructure or utilities are expected outside of the Project ROW.

7.3.7 Compensation Estimates

Compensation estimates are provided in the *Resettlement and Livelihood Restoration Plan* prepared for the Project (refer Volume D).

7.4 Avoidance, Management and Mitigation Measures and Residual Impacts

Management and mitigation measures to minimise land, asset and infrastructure impacts posed by Project activities during construction and operation are presented in the *Resettlement and Livelihood Restoration Plan* (RLRP, Volume D) and summarised in Table 7-23 below. Residual risks and impacts are also outlined.

An *Environmental and Social Management and Monitoring Plan* (ESMMP) for the Project has also been prepared which includes further management and mitigation measures for land impacts (refer Volume D).

Table 7-23 Land, Assets and Infrastructure - Key Avoidance, Management and Mitigation Measures and Residual Impacts / Risks

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction and Construction Phases			
Loss of housing and residential areas, industrial facilities, businesses and community infrastructure	► Provide compensation to affected people as per the RLRP. This should include special measures to assist vulnerable persons. ► Lack of formal legal rights to assets lost will not deprive any Affected Person from receiving compensation and entitlements. Distinctions will not be made between Affected Persons "with" and "without" formal legal land titles. ► For severely impacted residences where it is not feasible to establish pedestrian or vehicle crossings, provide compensation as per the RLRP.	Negative	Major It is estimated that 6,024 assets and structures (including residential, outbuilding and industrial structures) will be impacted by the Project Footprint and that approximately 11,485 people will be displaced. Even with compensation, the impact of this scale of loss of land, assets and infrastructure is considered a Major impact.
Loss of infrastructure and utilities	Measures recommended to avoid potential impacts on infrastructure and utilities include (ICS, 2015): ► Carefully conduct construction activities to ensure existing infrastructure and utilities are not unnecessarily disturbed. ► Where removal / relocation is inevitable, consult and collaborate with service provider during the removal/relocation process and provide advance notice (at least a few months). Provide compensation as per the RLRP (in advance and in a phased manner to reduce potential impacts on end users avoid disruption to civil works and service provision). ► Where possible, ensure road design accounts for major infrastructure (such as transmission lines) to avoid the requirement for relocation. ► To avoid damage to signposts and road furniture, work with the contractor and owners to ensure their carefully removal, storage and relocation to a safe site. ► Compensate and assist Nakawa market vendors as per the RLRP. This includes assistance for the relocation of stalls or the provision of alternative livelihood opportunities, where relocation is not possible. Consider working with authorities to temporarily waiver market related taxes during the time of relocation, to avoid further impacts on livelihoods.	Negative	Moderate Several community infrastructure buildings (including churches and shrines) and utilities are expected to be lost as a result of the establishment of the Project Footprint. This impact will be largely unavoidable within the ROW.
Loss of agricultural land	► Inform PAPs before the beginning of the cropping season (likely January) about the scheduled plans for	Negative	Moderate A large amount of agro-pastoral land (107.2ha) will be lost as a result of the establishment of the

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	disturbance of agricultural areas, to facilitate their cultivation choices ▶ Provide compensation for loss of land agricultural land ▶ Minimise the disturbance associated with land clearance through: • Restrict clearance of land to only the land required for Project components. Clearance of buffer zones around Project infrastructure will need to be minimized, where possible • Implement appropriate erosion control and drainage management measures to minimise the potential land and water quality impacts associated with land clearance (as per Chapter 15)		Project Footprint as well as smaller areas of commercial plantation crop.
Loss or severance of access routes	Implement the measures outlined in Chapter 8 on Traffic, Transportation and Accessibility	Negative	Moderate Establishment of Project Footprint will result in residual impacts on accessibility due to severance of access routes, although impact will be mitigated through the appropriate provision of overpasses and underpasses.
Operations Phase			
Loss of land and infrastructure (continuing from previous phases)	▶ Implement measures from Pre-Construction and Construction Phases, where applicable	Neutral	Negligible No additional land or access loss is expected during the Operations Phase.
Community complaints / Resettlement Impacts	▶ Establish and implement a grievance mechanism to manage community complaints. ▶ Continued monitoring of compensation for land acquisition and livelihood restoration and improvement measures for Project affected villages and individuals. ▶ Implement the measures outlined in RLRP and SEP (Volume D).	Negative	Minor As with any major development Project, some community complaints are expected. An appropriate implementation of a grievance mechanism and continued social monitoring will reduce these impacts.

7.5 Conclusions

The Project ROW will acquire 593.5 ha of land, comprising 476.9 ha within the KJE alignment and 116.6 ha within the KSB alignment. Specifically, land losses from the establishment of the ROW will include:

- Settlement: 120.2 ha of residential/business areas; 31.2 ha of industrial areas; 34.1 ha of roads and tracks;
- Agricultural land: 138.0 ha of agro-pastoral land, 49.1 ha of cleared/minor agricultural land;
- Wetlands and drainage areas: 106.6 ha of wetland and 3.6 ha of drainage areas;
- Forests: 20.3 ha of closed forest, 6.0 ha of urban forest, 10.0 ha of timber plantation; and
- Scrubland: 17.9 ha of fallowed land, 26.4 ha of scrubland.

Most of the land to be acquired is currently used as agro-pastoral land in Mukono District; and settlement areas in Kampala District.

Within settlement areas, 8,105 structures were identified within the Project ROW; 4,888 within the KJE, and 3,617 within KSB. It is estimated that 76% of all non-industrial structures identified are residential.

It is estimated that 29,983 occupants belonging to 6,177 households are currently residing within these residences and will be displaced by the Project. The vast majority (79%) of the population are located within the metropolitan and peri-urban areas of Nakawa Division and Kira Municipality. 20,190 (67%) of the population were estimated to be low-income and living below the International Poverty Line of USD$1.90/day, which is equivalent to 216,000k UGX per month.

It is difficult to categorically identify all legally occupied households within the alignment as Census responses are not always accurate. However, Census data indicates that 2,781 (45%) of households are owner-occupied with legitimate land title, with 3,396 households remaining within the ROW have no land title where they reside or legitimate claim to compensation for assets. These households were either tenanting, caretaking or squatting a residence.

5,378 businesses were identified as directly within the Project ROW. 3,482 (65%) of businesses were informal small-sole-trader or vendor businesses, with primary business activities focussed on residential rentals and retail of ready-made or raw food. Many rental businesses shared residential premises, however other businesses including retail and salons also operated out of multi-use residential-business premises.

103 major and prominent businesses were identified in or proximal to the alignment, 16 of which were considered large, with each respectively employing more than 20 staff. 35 major and prominent businesses had a structure or facility directly within the ROW, and 63 had major access restrictions to the business. The majority of major businesses are situated within urban and industrial areas of Nakawa Division—particularly along the existing Jinja Road, and Kira Municipality.

A number of community facilities were identified within the alignment, many of which have a structure or access significantly impacted by the ROW. These facilities included: 2 major pedestrian access points; 55 places of worship, 32 schools, 10 health centres, 3 community groups, 3 gravesites, 2 recreation centres and 1 police post. Again, these facilities were concentrated around urban and peri-urban areas in Nakawa Division and Kira Municipality.

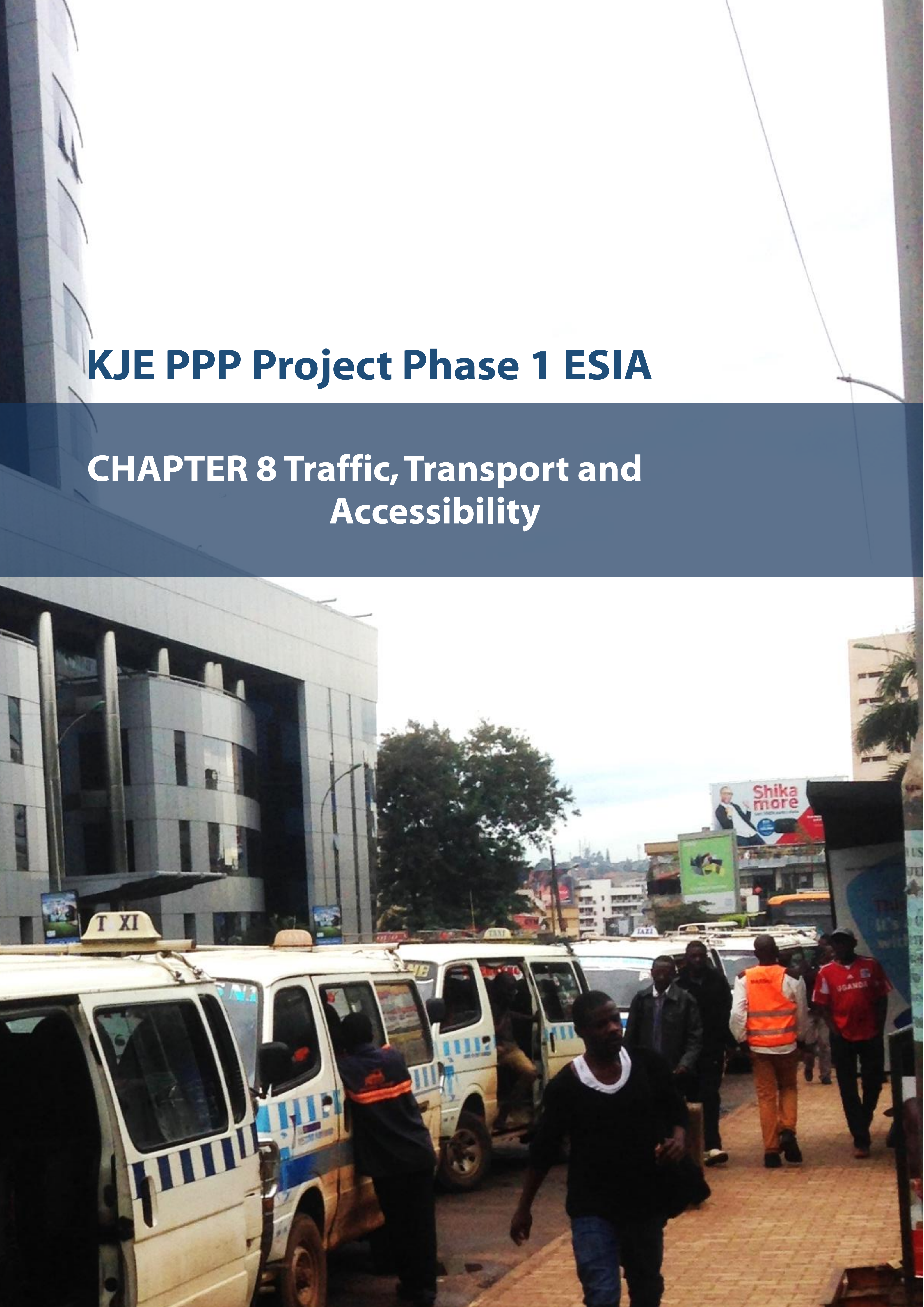
34 public water and sanitation facilities were identified as within the ROW, including: 5 toilets, 25 water points and 4 water pipes connecting water services.

Based on the population, assets and land use identified within this assessment, the KJE Project will have a major impact on assets and livelihood. To mitigate losses to livelihood, and to meet Ugandan requirements and international standards (refer Volume D), a *Resettlement and Livelihood Restoration Plan* (RLRP) for the Project has been prepared. The RLRP provides the necessary strategic framework for the social planning of the Project and encompasses resettlement, livelihood restoration and compensation strategies. The RLRP identifies compensation and livelihood restoration requirements resulting from the loss of land, assets and the displacement of people. It also provided the proposed institutional arrangements and cost estimates for the implementation of these measures.

Extensive and transparent consultation with affected households, the local community and Government authorities will be critical to the success of the RLRP implementation as well as the overall development of the Project.

KJE PPP Project Phase 1 ESIA

CHAPTER 8 Traffic, Transport and Accessibility



8. TRAFFIC, TRANSPORT AND ACCESSIBILITY

8.1 Study Area and Methodology

The study area for the traffic, transport and accessibility assessment includes:

- The land, roads and communities living within and adjacent to the Project Right of Way and the existing Kampala-Jinja road and the towns bypassed by the expressway.

The methodology for the assessment included:

- A review of current expressway projects during construction and operations to identify potential traffic, transport and accessibility impacts and benefits;
- A review of work undertaken in the previous ESIAs by URS (2013, 2014) and ICS (2015) and previous Project feasibility studies. Specifically this included review of:
- Traffic modelling reports; and
    - Baseline information on existing traffic conditions, vehicle types and public transport systems;
    - Review of recently updated Project information (e.g. 2017 Feasibility Study) and related traffic surveys;
    - Analysis of safety issues associated with roadways and review of key road traffic incident data from Ugandan Police reports; and
    - Spatial analysis of the Project alignment to assess potential accessibility issues and model the level of impact.

8.2 Baseline Conditions

8.2.1 Road Network

8.2.1.1 Existing Kampala-Jinja Road

The existing road Kampala-Jinja road consists of an all-weather tarmac single carriageway road in fairly good condition. The road is part of an international highway, the Northern Corridor that connects Uganda to the port of Mombasa on the Kenyan coast. This international highway is also the primary transit corridor for the transportation of imports via Kenya and Uganda to other land-locked countries west of Uganda, such as the Democratic Republic of Congo, Rwanda, Burundi and Southern Sudan.

The existing road commences in Lugogo, Kampala where the road transitions from a dual carriageway to single carriageway, and extends to Owen Falls dam (approx 77 km) just outside Jinja, on the western side of the Nile River. The road is characterised by (URS Scott Wilson, 2011):

- Significant encroachment of the right-of-way by vendors and small businesses right up to the edge of carriageway;
- Utility services, most notably fibre optic cables and electricity transmission lines;
- Extensive use of the shoulder for parking of vehicles and collection points for buses especially in the built up busy areas;
- Numerous side roads (both formal and informal);

- A noticeable conflict between pedestrian movements and vehicular movements with a lack of formally demarcated pedestrian rights of way and generally few formalized pedestrian crossing points;
- A typical single carriageway without any form of physical separation between opposing traffic flows; and
- A visible encroachment on the road reserve through the urban sections.

The existing alignment (both horizontal and vertical) ranges from fairly straight/gentle curves to some sharp horizontal and vertical curves, reflective of the flat to rolling terrain in which the road passes through. Although an intervention project was conducted in 2008/09 to improve selected black spots along the road, some sharp curves still remain along the road.

Between Kampala and Namagunga, the Kampala-Jinja road provides access to regional centres and towns including Bweyogerere, Seeta, Mukuno, and Mbalala. With consistent economic growth in the country, Mukuno town has become a flourishing business hub and clusters of specialist activities have emerged along the existing road, including financial services and industrial parks that would have traditionally have been located in central Kampala. This has generated increased traffic in the region, resulting in pressures on the capacity of the road network. A number of interchanges along the existing road from Kampala to Namagunga provide access to the surrounding road network.

8.2.1.2 Road Network in Southern Kampala

Currently, the primary road network in southern Kampala consists mainly of radial roads connecting the central city area with the main outlying suburbs, and the intermediate localities. There are virtually no contiguous sections of reasonable quality roadway for lateral traffic between the outer suburbs and the city centre. The current network is poor, with lateral traffic being required to pass through residential areas or well into the central part of the city in order to make use of the radial roads. This has exacerbated traffic congestion in the Study area.

Plate 8-1: Traffic congestion in Kampala

Plate 8-2: Traffic congestion in Mukono

8.2.2 Traffic Volumes and Capacity

8.2.2.1 Current Traffic

The existing Kampala-Jinja highway is the most heavily utilised national road in Uganda with some sections experiencing up to 70,000 vehicles per day in a single direction (EDF, 2016). The road also carries a high percentage of international cargo traffic in transit to Eastern Congo, Rwanda, Burundi, and Kenya and other countries.

Although the Greater Kampala Metropolitan city has a population of 2.3 million, it is estimated that 3.5 million people enter the city for work on a daily basis. Traffic volumes on the highly congested section between Kampala and Mukono hardly vary by direction and time of day. Traffic surveys undertaken in 2014 established that on average during the day, about 60,000 vehicles use the section from Kampala to Mukono (UNRA, 2017). There is also a small difference between the peak and interpeak periods (UNRA, 2016). High levels of congestion from Mukono to Kampala are due to a variety of factors including: demand significantly exceeding capacity at peak periods, traffic interruptions from numerous developments and access points along the road, and maintenance issues. The capacity issues on the road network are such that if improvements are not implemented, the reliability of the transport network is forecasted to be severely affected by 2037 (UNRA, 2017).

A series of traffic surveys along the existing road Kampala-Jinja road were conducted by URS Scott Wilson from 29 September to 10 November 2010 as part of the 2011 Feasibility Studies. Manual and automated traffic counts plus junction turning surveys were conducted at ten stations along the existing road. These were further updated in 2014. Figure 8-1 shows the 24-hour average daily traffic (ADT) counts for each section of the existing Kampala-Jinja Road in 2014.

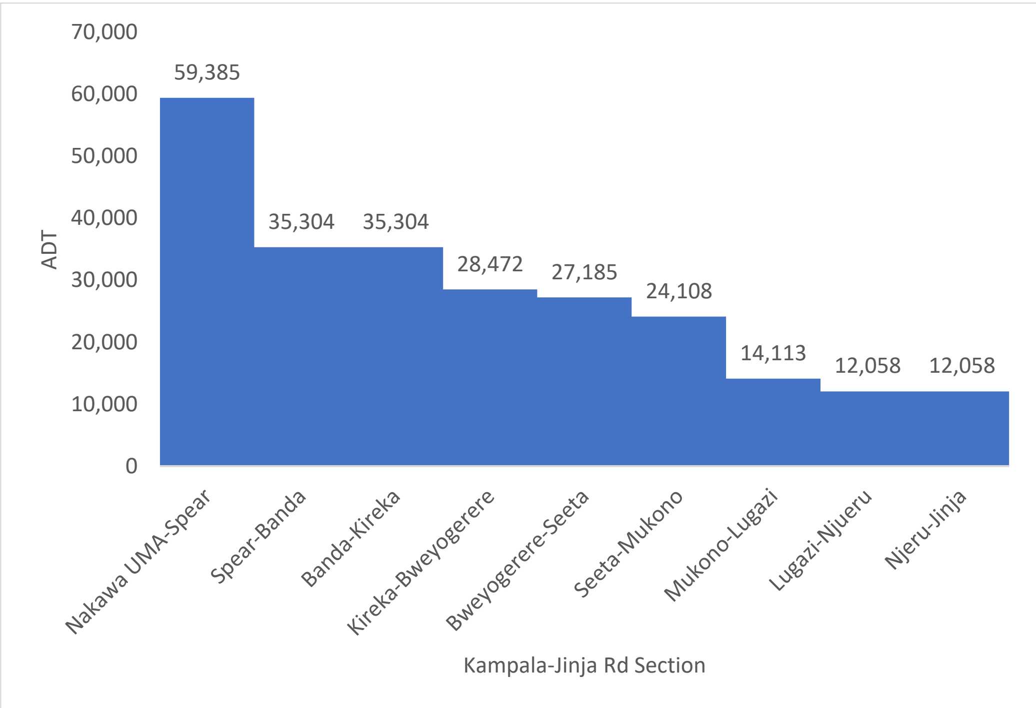


Figure 8-1: Average Daily Traffic (ADT) along Kampala–Jinja Road in 2014 (UNRA, 2017)

8.2.2.2 Future Traffic

The region between Kampala and Jinja is expected to experience significant levels of residential and commercial development in the next 20 – 30 years. Between Kampala and Namagunga, this development is mainly expected to occur between Kampala and the Mukono. Development of this scale would result in significant volumes of additional traffic on the existing highway, with a threefold increase in traffic predicted between 2011 – 2037 (URS Scott Wilson, 2011).

Historically traffic has grown at 3.6% annually along the existing highway and network capacity is exceeded during the peak traffic hours which is constraining further growth and developments along the corridor (UNRA, 2017). Traffic forecasting for a medium growth scenario estimates that by 2022, the traffic would have reached 100,000 vehicles per day and would have reached 120,000 by 2032 as shown in Figure 8-2 (UNRA, 2017).

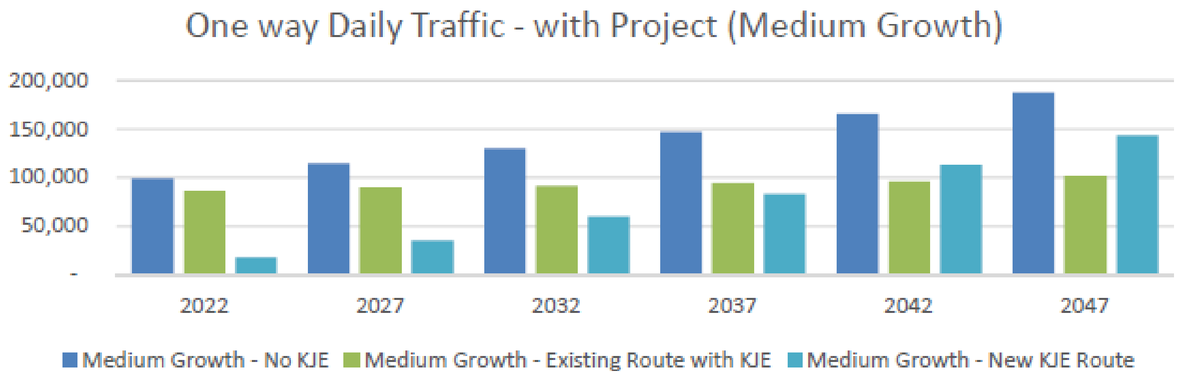


Figure 8-2 Traffic projections with and without the KJE project.

Source: UNRA 2017

8.2.3 Travel Times

The section of the existing road between Kampala and Namagunga is one of the most heavily affected parts of the road in terms of traffic congestion. Road users experience long transit times and high vehicle operating costs. Journey time surveys have been undertaken in 2011, 2014 and 2017. These indicate that average speed along the Kampala Jinja road has been decreasing over this period. Results of the 2017 survey are presented below, showing an average journey time of 90 mins between Kampala and Namataba.

Table 8-1: 2017 Journey time results

Date	Section	Start Time	End Time	Travel Time	Distance	Av Speed
East Bound						
16/03/2017	Kampala-Namataba	2pm	3:30pm	90mins	30km	20 km/hr
21/03/2017		8:10am	9:40am	90mins	30km	20 km/hr
West Bound						
16/03/2017	Namataba-Jinja	5:40pm	7:15pm	95mins	30km	18km/hr
21/03/2017		2:50pm	4pm	70mins	30km	25km/hr

Source: UNRA, 2017

8.2.4 Vehicle Types

8.2.4.1 Existing Kampala-Jinja Road

Vehicle types identified along the current section of the Kampala-Jinja road and along key points in the surrounding network are presented in Table 8-2. Cars, 4WD and minibuses were the most common vehicle types identified.

The number of cars, pick up trucks and four-wheel drives has increased dramatically on Kampala's road in the past few years. The increasing number of cars is likely the predominant reason for the severe traffic issues along the existing Kampala-Jinja Road and in the surrounding road network.

Public transport infrastructure along the existing Kampala-Jinja Road is poor with only a few buses running along this route. Minibuses are however a common form of transport stopping along the route of the Kampala-Jinja Road (and throughout the road network in Kampala) to pick up people. These minibuses are often tightly filled with people and are used as a transport to and from the workplace.

Motorbikes (boda bodas) are a major source of transportation in Kampala and in the surrounding towns being cheaper to purchase and maintain than a car or 4WD. They are less susceptible to being held up in traffic congestion but are also less safe than other modes of transport.

Table 8-2: Percentages of vehicles on Kampala-Jinja Road (UNRA 2017)

Year	Class I	Class II	Class III	Class IV
	Cars	Pick-up, 4WD & Minibuses (Matatu)	Medium trucks & Buses	Trucks Trailer
2010	19.6%	54.1%	18.6%	7.7%
2014	25.1%	50.2%	17.2%	7.5%
Growth	46.4%	6.6%	6.3%	11.9%

Plate 8-3: Boda bodas (motorcycle), Kampala

Plate 8-4: Matatus (minibus taxis), Kampala

8.2.5 Traffic Related Incidents

Road traffic incidents are a serious concern in Uganda, with the country's rate of road traffic incidents being one of the highest in the African region (WHO, 2015). Currently, the country experiences 28.9 road traffic related deaths per 100,000 people, a figure which exceeds that of the African region (24.1) and the global average (18.0) (WHO, 2015). In 2014, there were 17,848 reported casualties from traffic related incidents, with 2,845 reported deaths

(UPF, 2014). Pedestrians and passengers are the most vulnerable category of road users, comprising 41% and 26% respectively of those killed in 2014. The main causes of accidents were through human factors (such as careless or reckless driving and careless pedestrians) (UPF, 2014). Vehicle conditions (e.g break failure) and road conditions (e.g potholes) contributed to a small minority of incidents. The main vehicle types involved in crashes were cars, motorcycles (boda bodas) and omni-buses.

Data on road traffic related incidents from the Ugandan Police Force are presented in the tables below. The existing Kampala-Jinja road has one of the highest accident rates in the country (UNRA, 2017). Key factors contributing to road traffic incidents along the existing road include poor road geometry (sharp curves, steep gradients and minimal climbing lanes), narrow road width, high percentage of trucks and agricultural vehicles and difficulty overtaking (UNRA, 2017). These factors lead to motorists taking higher risks to overtake and thus result in accidents. Locations of accident blackspots are shown in Figure 8-3.

Table 8-3 Road traffic related incidents in the Kampala region in 2014

	Fatal	Serious	Minor	Total
Kampala Metropolitan East	177	1292	990	2459
Kampala Metropolitan South	163	2234	2519	4917
Kampala Metropolitan North	209	1099	1011	2319

Source: UPF, 2014

Table 8-4 Summary of road traffic incidents along the Kampala-Jinja Road, 2013-2015

	2015	2014	2013
Fatal	211	186	214
Serious	1222	1174	1199
Minor	958	1001	879
Total	2392	2361	2292

Source: UPF in UNRA, 2017

Figure 8-3 Location of accident blackspots along the existing Kampala Jinja road from Kampala to Namataba.

Source: UNRA, 2017

The social surveys conducted as part of the 2011 ESIA included community perceptions of the causes of road traffic incidents along the Kampala-Jinja road. Nearly half of the respondents believed that trailers were the main cause of accidents, while others believed that taxis or agricultural vehicles were the main cause. Few respondents indicated that motorcycles (boda bodas) or buses were the main cause of accidents.

8.3 Impact Assessment

The Project is expected to create a number of transport and accessibility benefits that will help facilitate economic growth and development in the region, including:

- Decongestion of the existing road network by diverting traffic to the proposed expressway;
- Increasing road capacity, which will enable the region to accommodate the expected future traffic volumes;
- Facilitating greater accessibility to areas serviced by the expressway, as well as improving regional and international connectivity;
- The generation of travel time savings through continuous overtaking opportunities, a reduction in the number of intersections and removing the need to reduce speed through townships;
- Increased road safety through providing a new route with improved alignment, more overtaking opportunities, controlled access via interchanges and treatment of road hazards; and
- Improved efficiency and safety for freight.

Unmanaged, the Project is expected to create some adverse impacts including:

- Loss of local accessibility to properties and services as a result of land acquisition for the Project alignment; and

- Temporary localised impacts on road network as a result of construction activities and additional construction traffic.

These impacts are presented in detail below.

8.3.1 Traffic Volumes and Road Network

8.3.2 Pre-Construction

No impacts associated with traffic and transportation are expected to occur during the Pre-Construction Phase as no significant transport activities for the Project will occur during this phase.

8.3.2.1 Construction

Traffic generated by the construction of the Project will predominately be associated with the transport of construction machinery, equipment and materials to site. Traffic will also be generated by worksite contractors accessing the site during the period of work. It is expected that the construction of the Project would be staged to minimise disruptions and maintain traffic flow.

Overall, the addition of construction traffic to the road network as a result of Kampala Jinja expressway to Namagunga is expected to have a minor impact on the network as the majority of the Project comprises of a new alignment where road construction activities would be closed off to minimise any disruptions.

Some higher localised, but temporary impacts on the road network may occur as a result of changed road conditions in the vicinity of access routes and construction sites.

Potential changes in the road environment include Project heavy vehicles entering or existing access routes, and additional road hazards, variable speed limits and unfamiliar conditions in the vicinity of construction areas. This may impact road users by changing trip patterns and increasing travel times, leading to temporary disruptions and delays in accessibility during the construction period. Road users that may be potentially impacted include private vehicles, public transport vehicles, two or three wheeled motorised vehicles, non-motorised vehicles and pedestrians.

The communities most likely to be affected are expected to be those adjacent to the alignment and planned interchanges in heavily urbanised areas including:

- Road users in the vicinity of the first 2.5 km of the KJE Mainline from Kampala, as this involves the upgrade of the existing Kampala-Jinja road, and associated junction areas planned at New Port Bell Road, Naguru Road, Ntinda Road and Kinawataka Road. Potential impacts include disruptions during construction, temporary loss of frontage access to properties on existing road.
- Road users at Nakawa Interchange Ntinda Interchange, Kyambogo interchange, Kinawataka interchange and Butabika Interchange on the KJE Mainline;
- Road users at most of the interchanges on the KSB Mainline.

Unmanaged, the addition of construction vehicles to these areas may exacerbate the existing high density of traffic and result in reduce travel efficiency and road safety risks. The development and implementation of Traffic Management Plans (TMPs) with measures such as speed controls and secure working areas will help minimise these impacts.

8.3.2.2 Operations

The Project is expected to have a significant positive impact on relieving traffic congestion between Kampala and Namagunga, through the diversion of traffic to the proposed expressway, resulting in decongestion of the existing road and surrounding network.

Traffic flow modelling for the main Kampala-Jinja road was conducted by URS Scott Wilson in 2011. This has shown that a significant amount of traffic will be diverted from the existing road to the Expressway, on average between 40% and 65% of traffic, depending on the section of the road (URS Scott Wilson 2011).

Table 8-5: Traffic Flow modelling for Kampala-Jinja road (URS Scott Wilson 2011)

Kampala-Jinja Road Link	Traffic Flow 2010		With Expressway	
	AM Peak Traffic	PM Peak Traffic	AM Peak Traffic	PM Peak Traffic
UMA to Nakawa Jnc	3137	3983	4698	5424
Nakawa Jnc to Ntinda Jnc	3487	2534	4926	6251
Ntinda Jnc to Kyambogo	2734	2432	6698	6134
Kyambogo to Kireka	2387	1752	2335	2188
Kireka to Bweyogerere	2896	3945	2298	2952
Bweyogerere to Namanve	3321	3093	1750	2169
Namanve to Seeta	3303	2336	1844	1189
Seeta to Mukono	2831	3116	971	1075
Mukono to Katosi Road	2387	2251	1498	1226
Katosi Road to Mbalala	797	704	455	410
Mbalala to Namataba	371	499	25	23

Decongestion of the road network is expected to be achieved through:

- Management of traffic demand during peak times, through additional road capacity and road tolls;
- Reduction of hazards associated with the existing road that contribute to the current congestion such poor road conditions and maintenance issues;
- Improving the reliability of journey times across the network;
- Avoiding the side friction that occurs from having numerous developments and access points along the existing road, through having limited access points on the expressway and encouraging the free flow of traffic.

The areas expected to benefit from decongestion include Kampala city and towns on the existing Kampala Jinja road that will be bypassed by the expressway including Seeta, Mukuno and Namagunga.

This is expected to significantly improve traffic flow in the region. Traffic on the expressway would be unimpeded by entering or departing traffic and the controlled interchanges would facilitate easier access to the surrounding road network for traffic existing the expressway.

8.3.3 Regional Accessibility and Connectivity

8.3.3.1 Improved Regional Access and Connectivity

One of the key benefits of the proposed Project is that it is expected facilitate greater accessibility to areas serviced by the expressway, as well as improve regional and international connectivity, thus facilitating economic development.

Transport infrastructure development is a critical element in the economic development policy of Uganda. The Project will support the Government's goals of improving transport connectivity, effectiveness and efficiency to stimulate economic development, urbanisation and the reduction of transport cost (Uganda Vision 2040). Through the decongestion of traffic, particularly between the most heavily affected stretch between Kampala and Namagunga, and an improved road service that can accommodate increased traffic volumes in the future, the Project is expected to have a significant positive impact on:

- Inter-urban connectivity within Northern Corridor axis; and
- Intra-urban transport and accessibility within the Kampala Metropolitan Area.

The Project will form a critical part of the Northern Corridor, replacing the use of the existing all purpose road with a limited access expressway. This is expected to significantly improve traffic flows along the Ugandan part of the corridor which will help facilitate the movement of traffic to other East African countries and result in more efficient transportation of imports and exports.

The Project will also facilitate greater accessibility to the industrial and economic hubs in Kampala, Namanve, and Mukono. This is expected to have a positive impact on the economy through the reduction of costs arising from the delay of drivers caught in congestion and the longer than expected delivery times for goods and services. The Project will also facilitate access to the planned port of Bukasa, which is likely to enhance regional job opportunities. Mukono will gain far better access to Kampala city which will likely promote economic development in this up and coming commercial / industrial area.

Improved opportunities for access and connectivity for pedestrians, non-motorised vehicles, motorcycles and other vehicles are also expected in towns bypassed by the Project such as Seeta, Mukuno and Namagunga, through the diversion of a proportion of cars and heavy vehicles to the expressway.

Through its status as a limited access expressway, slow-moving vehicles such as non-motorised transport and agricultural vehicles are expected to be restricted from using the expressway. Whilst this may result in minor accessibility issues for these road users, current use and accessibility of the existing Kampala-Jinja road and surrounding network is expected to be improved, through the diversion of traffic, particularly heavy vehicles to the expressway. However, this may present problems for buses utilising the expressway, which are often slow moving and a major form of transport around the city. It may be possible that a bus lane is provided in some locations to allow these vehicles to use the road.

8.3.3.2 Loss of Local Accessibility

Unmitigated, the development of the KJE and KSB alignment will lead to localised accessibility issues for a number of residents and businesses through disruption or severance of local access routes that traverse through the proposed Project Footprint. The level of impact on settlement areas and residences will depend on whether alternative routes are available and the location of pedestrian crossings and vehicle overpasses and underpasses. and whether it is feasible for the Project to establish, as well as where these will be located.

The development of vehicular overpasses and underpasses on all major roads passed by the line will substantially reduce the potential severance impacts of the Project. The Project description stipulates that all vehicular overpasses and underpasses will include a 2-metre-wide walkway which pedestrians can utilise to improve local

pedestrian access. The proposed locations of all vehicular overpasses and underpasses are highlighted in Chapter 3 – Project Description.

However there will be remaining severance issues associated with the ROW cutting across highly settled areas and preventing access to community resources, shops, health centres, schools, religious buildings etc. An analysis of GIS imagery was conducted to identify potential areas where severance impacts are not currently mitigated by the provision of vehicular underpasses and/or pedestrian crossings.

For example some rural areas towards the easterly sections of the Phase 1 KJE alignment, may be located more than 2 km from the nearest bridge or underpass and so the development of the road may lead to substantial increases in pedestrian journey times to areas that were previously only a few hundred meters away. Despite the greater provision of overpasses and underpasses within settlement areas, this may also be an important impact in highly populated areas passed by the line where the number of people affected by such severance impacts will be higher than in more rural areas to the east of the KJE alignment.

A small number of proposed pedestrian crossing locations have been provided for the Kampala-Southern Bypass but locations have not yet been finalised for the KJE Mainline between Kampala and Namagunga. It is recommended that further pedestrian crossings be established to help mitigate severance impacts caused by the alignment (see Section 8.3.6).

Accessibility impacts as a result land acquisition for the ROW along different parts on the KJE and KSB alignments are presented in Table 8-6 and include:

- **Moderate to high impact on accessibility** – little or no alternative routes exist in the road network for communities to access areas on the other side of the ROW and it is not feasible to establish crossings;
- **Minor impact on accessibility** – some alternative routes exist in the road network enabling communities to access areas on the other side of the ROW, although this may result in increased travel times and changed trip patterns for affected communities;
- **Very minor impact on accessibility** – the presence of the ROW does not significantly impact access to areas on the other side of the ROW, as a number of alternative routes are available;

High potential impacts on accessibility are presented in Table 8-6. The most significant impacts on local accessibility are expected to occur for dwellings outside the ROW where it is unlikely to be feasible to provide road or pedestrian accessibility. These residences are likely to require acquisition.

Areas of high severance impact identified are briefly described below. In many of these areas the provision of pedestrian crossings has been recommended in Section 8.3.6.

- **KJE - Nakawa Market** – In this location access to the existing market will be severely disrupted. Access to other larger businesses between KJE Chainage 0 + 000 and 3 + 000 will also be affected along the existing Kampala-Jinja Road, although many businesses are able to access the road network through other means.
- **KJE - Kinawataka and Kasokoso** – As the KJE alignment passes through Kinawataka wetland it will also cross over some highly settled areas. It is therefore likely that the Project will cause severance impacts to communities living in this area.
- **KJE - South of Kirinya** - Areas to the south of the road section between KJE Chainage 7 +500 and KJE Chainage 8 + 000 will be completely cut off from settlement areas to the north of the line. Although overpasses have been provided in some locations, some settlements will still be almost 1km from these alternative access routes that are proposed.
- **KJE - Rural areas** – Rural areas to the east of Phase 1 of the KJE alignment have less dramatic severance impacts as all major roads are provided with an overpass over the proposed alignment. However, access

to agricultural land and settlements may be disrupted in some sections and individuals may have to travel over 1km to get to the proposed crossing points.

- **KSB – Butabika to Nakivubo wetland** - Some areas of dense settlement exist between the Butabika interchange and the Nakivubo wetland near the Project Footprint. As a consequence, severance impacts are likely to be substantial in these sections, even with the provision of overpasses that have been proposed. Due to the large narrow strip of residential areas between the KJE and KSB alignments, this area is likely to experience some of the most significant severance impacts from the Project.
- **KSB - Kasanga wetland –** The KSB alignment skirts the edges of Nakivubo and Kasanga wetlands between KSB Chainage 6 + 600 and 10 + 500. Along some of this section, the alignment will cut of access to settlements and agricultural land on the wetland facing side of the alignment and no bridges or underpasses are currently planned in this section. For example at KSB Chainage 10 + 500 a settlement area is likely to be completely cut off with a water channel on one side and the road alignment on the other.
- **KSB – Ggaba Rd. to Salama Rd.** - Some areas of dense settlement exist between Ggaba Road and Salama Road near the Project Footprint. There are also religious structures, health centres and schools that surround the road in these areas. As a consequence, severance impacts are likely to be substantial in these sections, even with the provision of overpasses that has been proposed.
- **KSB – Munyonyo Spur –** Wetland areas to the east of the alignment from KSB Chainage 15 + 600 to KSB Chainage 17 + 787 will be completely cut off from other settlement areas on the other side of the Project ROW. This could be a significant severance impact.

Table 8-6 Summary of accessibility impacts on the KSB and KJE alignments due to land acquisition for the ROW

Chainage / Section	Summary of Accessibility impacts
KJE Alignment	
Lugogo to Kinawataka	From Lugogo to Kinawataka the alignment passes areas of business and industrial activity. Severance impacts will vary at different sections of the line with some businesses being able to access other roads near the KJE alignment and other businesses being impacted to a greater extent. Of particular significance is the Nakawa market which currently borders the existing road and is a crossing point for many pedestrians. The development of a fenced expressway in this location will have large severance impacts.
Kinawataka to Namanve wetland	Accessibility impacts will occur along some of this section as the alignment is likely to cross several routes used for travelling between settlement areas and community infrastructure in Kinawataka and Kasokoso. The Butabika interchange will also likely cause the disruption of access routes across the wetland. Areas south of KJE Chainage 7 +500 to 8 + 000 will be cut off from settlement areas to the north of the road, although impacts will be mitigated by the provision of an underpass on the Kirinya-Bukasa Road.
Namanve wetland to Namagunga	Severance impacts are likely to be minimal along much of this Section of the KJE alignment as overpasses are being provided at all major road locations crossed by the alignment. However severance impacts are still likely to occur at specific locations where there may be loss of access to agricultural land or settlements. Vehicular overpasses are located approximately every 2km in this section.
KSB Alignment	
Start of KSB to Port Bell Rd Junction	Cutting is required through Mutungo hill. This may also affect connectivity of existing road networks as a number of roads will be discontinued or turned into dead ends. However, several vehicle crossings are being planned in this area. In densely populated areas further away from the vehicular overpasses/underpasses where pedestrians will be able to cross the ROW, community severance issues are likely to be more severe. At Port Bell road junction, access to community infrastructure may be impaired.
Port Bell Road Junction to Ggaba Road Junction	Severance impacts along this section will differ depending on the specific chainage locations. Between KSB Chainage 6 + 500 and 8 + 900 the ROW passes through areas of degraded wetland so severance impacts are likely to be minimal. However at some

Chainage / Section	Summary of Accessibility impacts
	locations, this may cut off access to settlements closer to the wetland and access to areas of agricultural land. At approximately KSB Chainage 10 + 500 there is a small area of settlements that may be completely cut off by the road alignment and surrounded by a water channel on all their other sides.
Gaba Road Junction to Lukuli Road Junction	Deep cutting is required through Makindye Hill. This may also affect connectivity of existing road networks as a number of roads will be discontinued or turned into dead ends. Around junctions at Ggaba road and Lukuli road, severance impacts may be more severe due to the denser population in these areas and the existence of community infrastructure (e.g. schools, daycare centres) in the surrounding area.
Lukuli Road Junction to Salama Road Junction	Neighbourhood severance is likely to occur in this densely populated area, which may affect access to residences and community services. Although a vehicular overpass is planned in this section, neighbourhood severance is still likely to occur.
Salama Rd. to Munyonyo Interchange.	From KSB Chainage 13 + 800 to KSB Chainage 15 + 300 several vehicular overpasses are planned which will substantially reduce potential severance impacts of the Project in this location. However minor levels of community severance may still occur. Between KSB Chainage 15 + 600 and 17 + 787 there will be more extreme severance impacts. Settlements to the east of the alignment may be completely cut off from existing access routes and surrounded by wetland on all other sides. Access to agricultural land on the wetland fringes will also be reduced.

Plate 8-5: Roadside market near Nakawa, KJE alignment, Mukono District

Plate 8-6: Blocked community access, Munyonyo spur, KSB alignment

8.3.3.3 Cumulative Accessibility Impacts

Several projects are being planned near the Project Footprint which will produce impacts that act synergistically or antagonistically with the Project. These cumulative impacts are discussed in Chapter 21. A fundamental cumulative impact is the impact on accessibility.

The proposed Standard Gauge Railway (SGR) runs generally parallel to the proposed KJE route. The two routes diverge and converge many times between Kampala to Jinja, and their distance apart varies from 50 m to several kilometres.

The impacts of KJE on accessibility discussed above (8.3.2.2) will be exacerbated by the presence of SGR. In areas where both KJE and SGR disrupt or sever local access routes, the area in between the two alignments can become isolated. For Phase 1, there are particularly significant potential impacts in urban Kampala (KJE Chainage 0 + 000

to 9 + 000), at Kyungu where KJE and SGR cross paths and run in close proximity (KJE Chainage 15 + 000 to 24 + 500), and at Namagunga (KJE Chainage 33 + 000 to 33 + 600).

To assess this in detail, the area between the KJE and the SGR is segregated into areas with different Cumulative Impact on Accessibility Ratings, where 1 is the lowest impact and 5 is the highest (Table 8-7). There are three key factors:

1. Distance between the KJE and SGR alignments
2. Land use
3. Provision of vehicle and pedestrian crossings, primarily in relation to KJE crossings

Table 8-7: Criteria for Impact on Accessibility Ratings

Cumulative Impact on Accessibility Rating	Description
1	Very low impact. Rural, sparsely populated and/or agricultural land where there is > 500 m between KJE and SGR, or there is some restriction (< 500 m between KJE and SGR) but the area is a wetland, reserve, or otherwise undeveloped. Access to the area between the KJE and SGR will be maintained through existing infrastructure and/or planned KJE crossings, although travel times might increase and trip patterns might change.
2	Low impact. Urban, densely populated and/or industrial land where there is > 500 m between KJE and SGR. Access to the area between the KJE and SGR will be maintained through existing infrastructure and/or planned KJE crossings, although travel times might increase and trip patterns might change.
3	Moderate impact. Predominantly rural land where KJE and SGR are generally 100-500 m apart (maximum 700 m), or small areas where KJE and SGR are less than 100 m apart but the land is undeveloped. Local access routes are disrupted or severed, although KJE crossings may be planned. Sections of land, particularly agricultural, might be isolated in the area between KJE and SGR.
4	High impact. Predominantly urban land where KJE and SGR are generally 100-500 m apart (maximum 700 m) and any planned crossings might be insufficient (based on number of crossings and/or distance between crossings). Access is likely to be significantly affected for a high number of people.
5	Very high impact. Any land used for housing, farming or business where there is < 100 m between KJE and SGR for > 0.5 km of the KJE alignment. Land accessibility, usability and/or habitability are severely affected. Few or no alternative routes exist, and any planned crossings are likely to be inadequate to maintain functionality.

Cumulative Impact on Accessibility Ratings for the Project are described for each section of the alignment in Table 8-8 (urban Kampala) and Table 8 9 (Namanve wetland to Namagunga). As is the case for KJE on its own, the number of people affected by cumulative access issues will be higher in urban areas, particularly in Kampala. Nonetheless, accessibility in rural areas is also significantly affected, and access to agricultural land might be lost in some cases.

Table 8-8: Description of Impact on Accessibility Rating areas for KJE Phase 1 and SGR – urban Kampala

KJE Chainage (to nearest 500)	Cumulative Impact on Accessibility Rating	Description
0+000 to 3+500	4	For 3.5 km starting at Lugogo, there is a moderate distance between KJE and SGR to its south (up to 600 m apart), which gradually reduces to 100 m at Kinawataka. This is an urbanized and industrial area in Kampala with potential severance issues. Apart from businesses and industry, there are religious buildings, many educational institutions, the Uganda Revenue Authority headquarters, and low-income housing. While there is potential for severe disruption, KJE follows the existing Jinja Road for most of this area and potentially has a positive impact on vehicle access, given its access lanes, associated road upgrades, proposed bridges, and the first three KJE interchanges; Nakawa (J1), Ntinda (J2) and Kyambogo (J3). However, provisions must be made to ensure pedestrian access and safety, particularly around Nakawa Market. The market is immediately north of KJE (outside the area between KJE and SGR) and it is an important crossing point on the existing road.
3+500 to 5+000	5	Space becomes very constrained (< 100 m) for 1.5 km. This area, much of which is former wetland habitat, includes some dense, low-income housing and informal settlement along the Kinawataka stream, although most of the land appears undeveloped. Routes used for travelling between settlement areas and community infrastructure will be disrupted, and the proposed pedestrian underpass at KJE Chainage 4+819 will be insufficient. At the north-western end of the area, access will be further hindered by the Kinawataka Interchange (J4). At the south-eastern end of this area, the presence of KSB potentially exacerbates loss of accessibility caused by SGR.
5+000 to 7+500	4	A less constrained, 2.4 km-long space with three KJE crossings provided, but it is highly urban and severance issues are likely, particularly as this area is split by the Butabika Interchange (J5) at Chainage 6+500. Owing to the junction, a small, 140 m-long part of this area is very constrained (<100 m) between KJE and SGR. The area includes low-income housing and reclaimed wetland, and access routes across the wetland will be disrupted. Immediately south of this area (and west of the interchange), KSB runs parallel to SGR, mostly with little or no gap between them, and the likely outcome is complete loss of existing southern access routes (refer Table 3).
7+500 to 8+500	5	A densely populated, 1 km-long area south of Kirinya with low- and middle-income housing. Space will be highly constrained (<100 m) and no KJE crossings are planned. At least some parts of the area between KJE and SGR are likely to be completely cut off from the area north of KJE, and potentially from the area south of SGR.
8+500 to 9+000	4	For just over half a kilometre, the space opens up to some extent (> 100 m) and accessibility impacts will be mitigated by the provision of an underpass on the Kirinya-Bukasa Road. However, severance issues are still highly likely, particularly in the east of the area which is bounded by the Namanve wetland and which has existing roads that will be severed by the combined effects of KJE and SGR (but some road access would be provided by the proposed Bukasa Interchange, J6). It is the last densely populated area as KJE and SGR leave Kampala.

Table 8-9: Description of Impact on Accessibility Rating areas for KJE Phase 1 and SGR – Namanve wetland to Namagunga

KJE Chainage (to nearest 500)	Cumulative Impact on Accessibility Rating	Description
9+000 to 15+500	1	KJE and SGR enter the Namanve wetland (where KJE will be constructed on a 2 m-high viaduct for 2 km) and then degraded forest and agricultural land. It is a sparsely populated area. The space is initially constrained (<500 m) but significantly widens as the two alignments diverge to up to 1.5 km apart over a 5.8 km stretch. The three KJE crossings that are planned for existing roads, including the Namilyango-Kitale Road crossing) are likely to maintain good access to agricultural land. Severance impacts are likely to be minimal.
15+500 to 16+500	3	Space becomes constrained for just over a kilometre as KJE and SGR cross paths (from this point, KJE runs south of SGR). Space is particularly constrained immediately west and east of the crossover point, where the land is relatively undeveloped but access to property may be affected, particularly on the east side. West of the crossover point, there is no KJE crossing for approximately 1 km along the KJE alignment (the Namilyango-Kitale road crossing).
16+500 to 17+500	5	The space between KJE and SGR narrows to less than 100 m, and 50 m at its narrowest, for a 0.9 km stretch. Two KJE crossings are planned that maintain existing road routes, but the functionality of the land in this space will be severely affected.
17+500 to 24+500	3	For almost 7 km, the space between KJE and SGR opens up (> 100 m) but is always less than 500 m, with the exception of a 0.7 km stretch where they are 500-600 m apart. The area is predominantly rural with mixed land use including livestock farming, shrubland, a factory, brick manufacturing, and newly developed coffee production. The eastern half of the area includes a KJE junction (Mukono Interchange, J7) and two KJE crossings (one across the existing Mukono-Nakisunga road), maintaining existing major road routes.
24+500 to 33+000	2	Space opens up to more than 3 km between the KJE and SGR, for approximately 8 km. This large area has a mix of densely and sparsely populated parts. It includes Kasenege forest, a large portion of the urban centre Mbalala, and the town Namataba (both Mbalala and Namataba are closer to the SGR than the KJE). There are many KJE crossings.
33+000 to 35+000	3	KJE and SGR then converge (<500 m) for almost 2 km, through mainly agricultural land just south of Namagunga. There is a single KJE crossing and access to property may be restricted. This area also includes the proposed Namagunga Interchange (J8) at KJE Chainage 33+600, which is the last interchange of KJE Phase 1.

The cumulative impact of KJE and SGR is further exacerbated by the presence of KSB, particularly as the three alignments run parallel to each other for 1.7 km at the Butabika Interchange (J5) at Kasokoso. Depending on the provision of vehicular and pedestrian crossing points on the railway alignment, this could cause severe accessibility impacts. Using the same criteria Table 8-7, areas affected by the cumulative accessibility impacts of KSB and SGR are described in Table 8-10.

Table 8-10: Description of Impact on Accessibility Rating areas for KSB and SGR

KJE Chainage (approx.)	Cumulative Impact on Accessibility Rating	Description
0+000 to 0+300	2	KSB begins at its most northerly point, at its junction with KJE (Butabika Interchange, J5). This interchange acts solely to transfer traffic between KJE and KSB and has no point of entry. The proximity of KSB, KJE and SGR to each other will alter accessibility in this area, and associated infrastructure may lead to the isolation of communities or services in this first 300 m of KSB. The area is dominated by low- and middle-income housing.
0+300 to 0+800	4	KSB crosses paths with KJE, SGR and the 0.3 km-wide area in between them. This will cause significant disruption to west-east movement within the area between KJE and SGR.
0+800 to 2+500	5	For approximately 1.7 km of its route, KSB runs parallel to SGR and KJE. The three routes are less than 300 m apart for some of this section, and the area between KSB and SGR varies from almost zero (no gap) to approximately 90 m. Most of this small area between KSB and SGR, which is mainly occupied by low- and middle-income housing, will be isolated and inaccessible unless new access is provided into and through it. The KSB also blocks the access road for a high-end residential estate (Royal Palms) and restricts access to the residential area immediately southeast of where SGR and KSB cross paths.
2+500 to 6+100	2	KSB and SGR then diverge to run up to 3 km apart. The area in between the two routes is highly urban, with housing, industry, religious buildings, government buildings, and other land use. Access to this area is unlikely to be adversely impacted (the likely overall impact of KSB here is positive), although it is also bounded to the south by the Nakivubo Channel and its wetland.
6+100 to 17+787	-	South of the Nakivubo wetland, KSB and SGR have no cumulative impact on accessibility.

8.3.4 Capacity and Improved Travel Times

A key benefit of the Project is expected to be the alleviation of current and future capacity constraints on the existing all-purpose highway to Namagunga (particularly between Kampala and Mukono) and alleviation of the resulting reliability issues on the surrounding road network, particularly within the Greater Kampala Metropolitan Area.

Implementation of the Project is expected to result in improved transit times and reduced vehicle operating costs for regional and national traffic. Once operational, the expressway is expected to save up to 70 minutes of journey time from Kampala to Jinja. These time savings would be achieved through:

- Increasing speed limits to a maximum of 80 km / hr on the expressway section (which is not normally permitted on all-purpose roads in urban zones) and to a maximum of 120 km/hr on the motorway section. The KSB will have a speed limit of 100 km.
- Limiting the types of vehicles permitted to use the expressway – vehicle types that would disrupt or slow down traffic or be at risk from fast-moving traffic (e.g non-motorised vehicles, low powered motorcycles, agricultural vehicles etc) are expected to be prohibited from entering the expressway.
- Limited access points to the expressway to facilitate 'free-flowing' traffic.
- Removing the need to slow down through township areas.

This is expected to result in improved travel times and traffic flow, creating more creating more consistent travel speeds and reliable journey times which will benefit road freight, passenger transportation and general road users.

8.3.5 Road Safety

One of the primary benefits of the Project is expected to be an improvement in road safety and a potential reduction in crash rates. The Project would improve road safety by providing an alternative to the existing undivided roads in Kampala and the Kampala-Jinja road with a six lane dual carriageway, with improved alignment, more overtaking opportunities and controlled access via interchanges. Specifically this includes:

- Provision of central medians to reduce occurrence of head-on collisions;
- Ability for vehicles to safely overtake along the length of expressway;
- Improved horizontal and vertical alignments;
- Reduced number of entry points to the expressway;
- Avoidance of black spots on the existing road.

These features are expected to eliminate a proportion of existing road safety risks and provide a higher standard of road safety compared to current levels. Road safety is covered further in Chapter 20 on Community Health and Safety.

8.3.6 Pedestrian Access Routes – Preliminary Identification of crossing locations

An analysis of the Project footprint identified areas that are likely to be of high risk of accessibility impacts, whilst considering the underpasses and overpasses already proposed as part of the alignment. The majority of these proposed crossings are located where the line crosses roads and pedestrian tracks areas along both the KJE and KSB alignments (see Chapter 3), although no pedestrian crossings have yet been identified for the KJE Lugogo – Namagunga section. The severance impacts will need to be further mitigated through the provision of pedestrian crossings along the alignment. Potential chainage locations where pedestrian crossings may reduce impacts are outlined below (Figure 8-4). These locations are preliminary and finalised locations (including, if necessary, other potential sites not listed below) should be discussed with all relevant communities before construction of the road begins. Figure 8-4 represents potential sites for pedestrian crossings along the Phase 1 alignment. The pedestrian crossings are located in the highly dense regions of the Phase 1 Right of Way approximately 1 km apart. However, in cases of existing road connections between urban regions that would be affected by the alignment or in locations where access to churches, medical facilities or schools would be affected by the Right of Way additional pedestrian crossings were added. Notably, the design of pedestrian crossings should consider expectations for people with difficulties to walk (ramps to be provided where possible).

Table 8-11 Potential Locations for Pedestrian Access Routes along the Alignment.

Potential Chainage Location(s)	Location	Justification
KSB Chainage 1 + 000 – 2 + 000	North of Mutungo Hill	A densely populated settlement area is passed by the line at this location. Pedestrian access would reduce severance impacts along this section.
KSB Chainage 2 + 000 – 3 + 000	North of Mutungo Hill	A densely populated settlement area is passed by the line at this location. Pedestrian access would reduce severance impacts along this section.
KSB Chainage 6 + 500 – 7 + 000	Bukasa / Nakivubo wetland	The ROW in this location crosses a railway line and cuts off several settlements and access to agricultural land. A pedestrian crossing in this location would reduce severance impacts.
KSB Chainage 8 + 700 – 8 + 900	Agricultural land near Kasanga	The road will cut off access to agricultural land from settlements near Muyenga hill in this section.
KSB Chainage 10 + 500	Makindye (near Ggaba Road)	Settlements to the immediate south of the alignment in this section will be cut off from other settlement areas to the North. To the south they will

Potential Chainage Location(s)	Location	Justification
		be bordered by wetland and a river channel. A pedestrian bridge in this location could reduce some severance impacts.
KSB Chainage 11 + 900 – 12 + 500	Lukuli Rd	Between these locations, the ROW crosses a densely populated settlement area and is surrounded by schools, commercial buildings etc. A pedestrian crossing in this location would reduce severance impacts.
KSB Chainage 12 + 500 – 13 + 700	Konge Hill + Salama Rd,	Between these locations, the ROW crosses a densely populated settlement area and is surrounded by schools, commercial buildings, health clinics etc. Several pedestrian crossing in this location would reduce severance impacts.
KSB Chainage 16 + 000 – 17 + 000	Munyonyo Spur	Settlements to the East of the proposed ROW will be completely cut off by the Project. These settlements will be surrounded by wetland areas and agricultural land on all other sides. A pedestrian crossing in this location would reduce severance impacts.
KJE Chainage 1 + 000	Nakawa	A market is located along the current Kampala-Jinja Road. Pedestrians regularly cross the road to access utilities on both sides of the alignment.
KJE Chainage 3 + 700 – 4 + 500	Kinawataka	Kinawataka settlement area is cut across by the alignment and few overpasses/underpasses are planned in this section. Pedestrian access would reduce severance impacts along this section.
KJE Chainage 4 + 800	Kinawataka	An existing track is present at the location.
KJE Chainage 5 + 600	Kasokoso	Although vehicular crossings are provided in this location, there are a large number of settlements cut off by the line. A pedestrian bridge would improve access to this area.
KJE Chainage 6 + 200	Kasokoso	A small area of settlements south of the proposed Butabika junction will be cut off as they are surrounded by the Kinawataka Channel on one side and the KJE alignment on the other. Pedestrian access would reduce severance impacts.
KJE Chainage 7 + 500 – 8 + 300	South of Kirinya	An area of settlements is completely cut off south of the road alignment. The road alignment also crosses through several existing tracks. These settlements are surrounded by wetland areas on all other sides. Although crossings for vehicles are planned in this section, they are a large distance from some of the settlements (approx. 1km), a pedestrian crossing between the chainage locations would reduce severance impacts.
KJE Chainage 11 + 500	East of Namanve wetland area.	Small tracks are crossed by the alignment in this location, although a crossing is being planned at KJE Chainage 12 + 650 which may mitigate this impact.
KJE Chainage 20 + 100	Near the Mukono Interchange.	Small tracks are crossed by the alignment in this location and settlements and their access may be cut off due to the Project.

Plate 8-7: Pedestrian footbridge on the existing Kampala-Jinja Road.

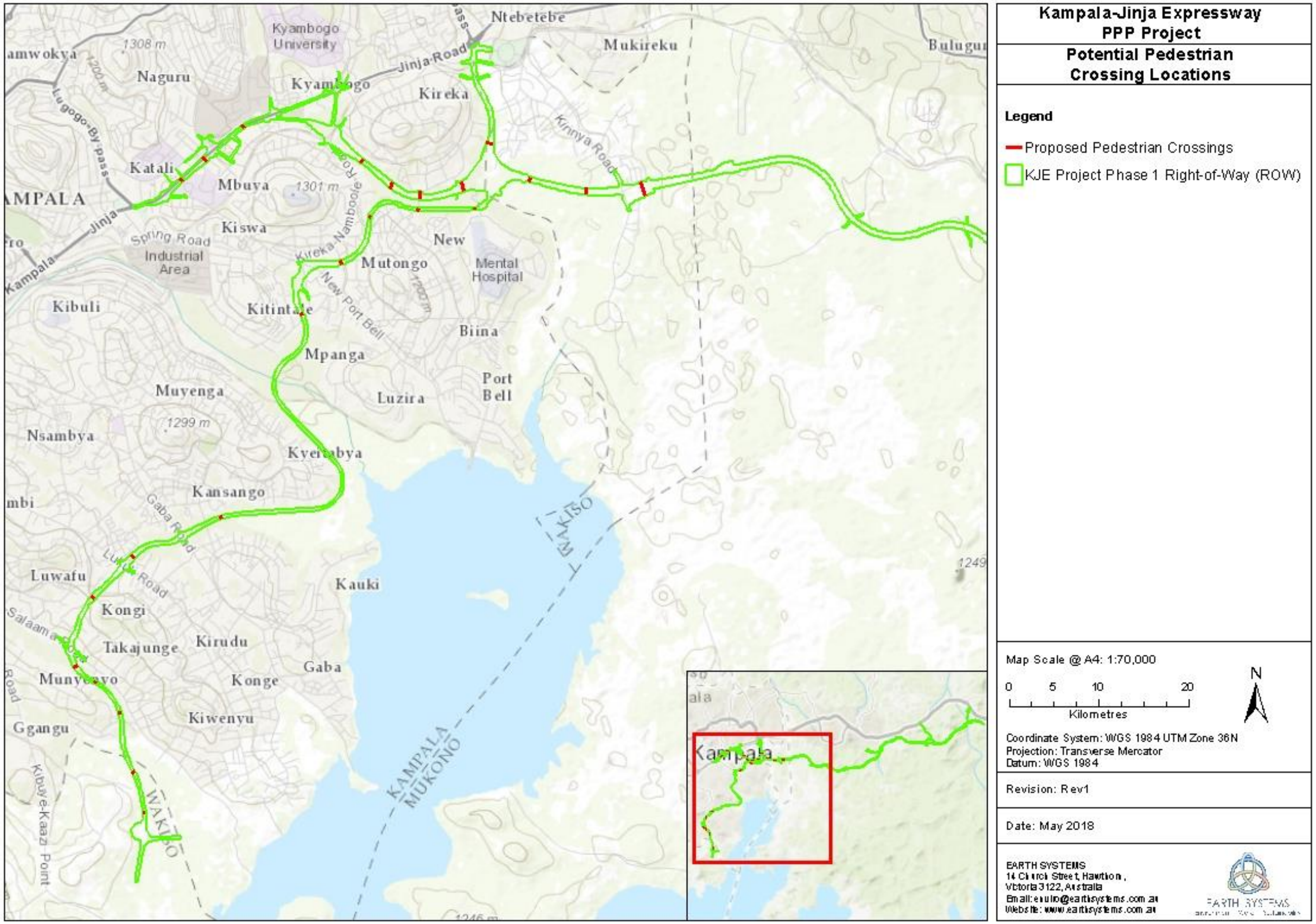


Figure 8-4 Potential pedestrian crossing locations for the Project

8.4 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management measures for potential traffic, transport and accessibility impacts and risks (refer Volume D).

Management and mitigation measures to minimise community health and safety risks posed by Project activities during construction and operation are summarised in Table 8-12 below. The Project will result in an overall benefit to traffic, transport and accessibility in the region. However, the development of a road will have large consequences on community access to either side of the alignment. This impact will be mitigated by the provision of overpasses and underpasses but moderate residual impacts will remain.

Table 8-12 Traffic, Transport and Accessibility - Key Avoidance, Management and Mitigation Measures and Residual Impacts and Risks

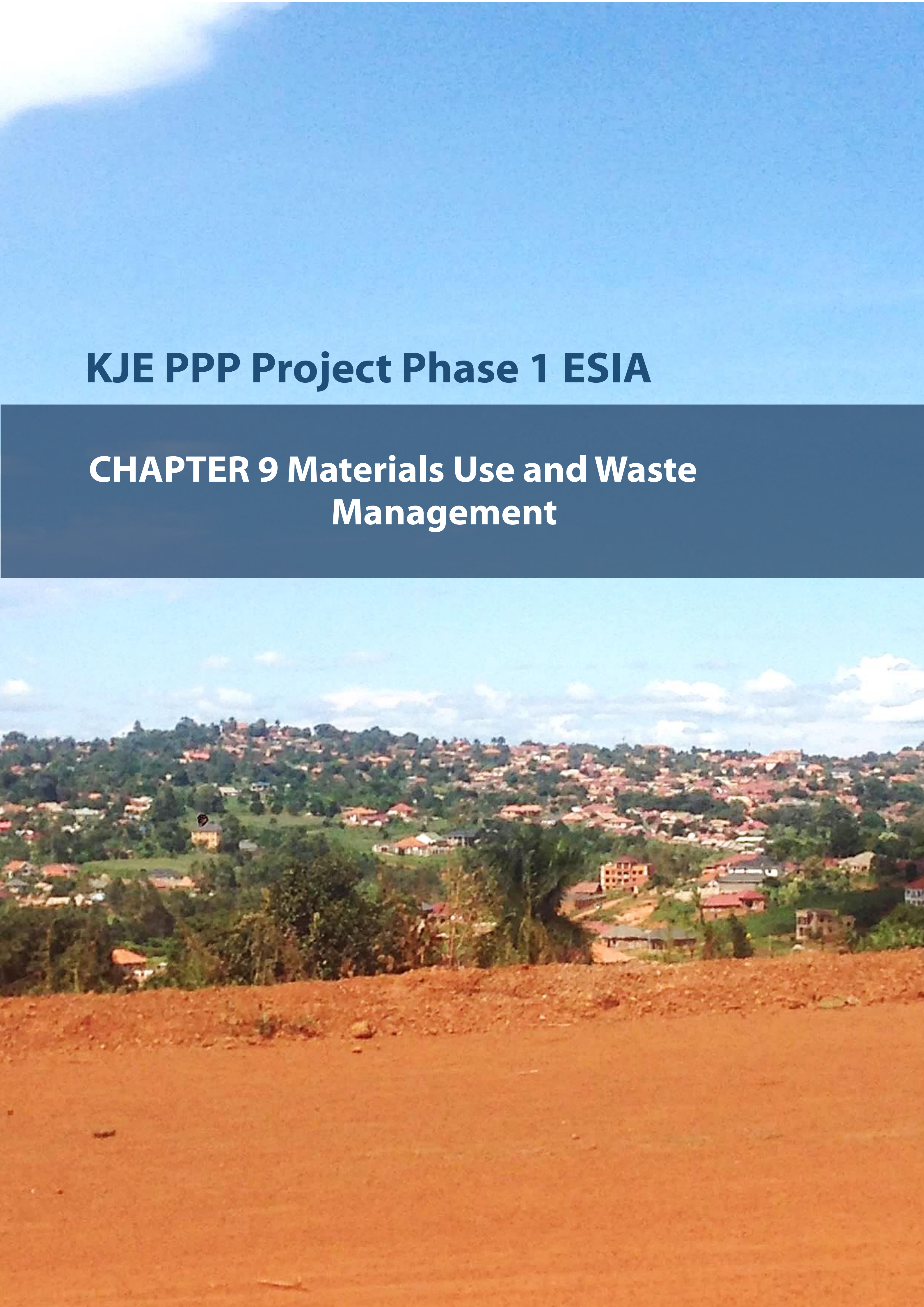
Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction and Construction Phase			
Disruption of local access routes as a result of land acquisition for the Project alignment (including current vehicle access routes and pedestrian footpaths).	► Incorporate design measures to maintain access to side roads and properties where feasible including 1) the construction of vehicular overbridges and underpasses and 2) the construction of pedestrian bridges where appropriate (see Section 8.3.6). ► Conduct ongoing consultation and engagement with affected communities. ► For severely impacted residences where it is not feasible to establish pedestrian or vehicle crossings, provide compensation as per the RLRP.	Negative	Moderate Moderate overall impacts on local accessibility will remain as local access for vehicles and pedestrians will be restricted by the establishment of the Project Footprint along much of the alignment. This will result in use of alternative routes and increased travel times for some people. However the level of impact will depend on distance from a crossing area.
Temporary changes to local accessibility around construction sites and access routes during the construction period.	► Conduct early consultation with affected communities during construction to allow planning for potential changes in trip patterns. ► Ensure appropriate signage is installed regarding diversions or alternative access routes.	Negative	Minor Temporary impacts on accessibility for road users and pedestrians in the vicinity of construction sites are expected due to construction works.
Changed road conditions during construction impacting on efficiency of travel modes and potential road safety	Develop and implement Traffic Management Plans (TMPs) and the measures outlined in Chapter 20 on Community Health and Safety.	Negative	Low Risk Though risks from transportation cannot be entirely avoided, risks to community health and safety are expected to be Low with the implementation of Transport Management Plans and the other safety measures outlined in the ESIA.
Operations Phase			
Decongestion of the existing road network	Beneficial impact, therefore no management measures are proposed.	Positive	Major Major reductions in congestion are expected due to diverting traffic to the proposed expressway and the improved road features of the Project such as limited access points and provision of additional road capacity.

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Improvement in regional accessibility and connectivity	▸ Implement appropriate signage on the expressway for towns bypassed by the Project to identify these towns as stop-overs for fuel supplies, accommodation etc and to support the demand for goods and services in these areas.	Positive	Major Access to regional centres along the alignment will be improved mainly as a result of improved travel times, unimpeded traffic flow
Time travel reductions	Beneficial impact, therefore no management measures are proposed.	Positive	Moderate Travel times will be reduced mainly as a result of the design features of the Project including increased speed limits, limited access points and bypassing of township areas.
Disruption of local access routes as a result of land acquisition for the Project alignment (including current vehicle access routes and pedestrian footpaths)	Implement measures from Pre-Construction and Construction Phases, where applicable	Negative	Moderate Severance impacts from the Construction phase will continue into the Operations phase. These will be partly mitigated through the appropriate design and development of crossing areas along the alignment. The level of impact will depend on distance from a crossing area.

8.5 Conclusion

The KJE and KSB project are considered necessary by the Ugandan government to relieve current congestion and cater for future growth within the city of Kampala and to improve the transportation of materials between Kenya and Uganda. This will relieve traffic congestion on the Kampala-Jinja road and facilitate greater access to towns serviced by the expressway.

In some areas, the KSB and KJE alignment will disrupt or cut off local access routes for motorised vehicles and pedestrians, resulting in a change in accessibility around the expressway. Provision of motorised vehicle and pedestrian crossings in over passes and under passes will be critical to mitigating this impact. UNRA has committed to providing vehicle access where significant roads cross the alignment. A number of pedestrian crossings will also need to be developed as part of the Project design to ensure accessibility is not severely impacted. For residences where it is not feasible to provide crossing areas, compensation and relocation as per the *Resettlement and Livelihood Restoration Plan* (refer Volume D) may be required to minimise potential impacts on livelihoods associated with a loss in accessibility to local areas and services cut off by the Project footprint and buffer areas. Further losses will be associated with agricultural land holdings where land titles are bisected by the KJE alignment.



KJE PPP Project Phase 1 ESIA

CHAPTER 9 Materials Use and Waste Management

9. MATERIALS USE AND WASTE MANAGEMENT

9.1 Study Area and Methodology

The Study Area regarding materials and waste management included the Project Footprint and surrounding areas potentially impacted by waste pollution, as well as transportation routes used by the Project. This section also considers the likely impacts from material sourcing sites including quarry pits, borrow pits, water sourcing sites and sand pits that have been preliminarily identified for the Project and waste produced as a result of these operations.

The methodology for the assessment included:

- Review of current expressway projects during construction and operations to identify potential waste streams and waste management issues;
- Review of work undertaken in the previous ESIAs by URS (2013, 2014) and ICS (2015) and previous Project feasibility studies (2011 and 2017 studies);
- Spatial analysis of the Project alignment to assess potential waste management impacts; and
- Identification of potential opportunities for the re-use and recycling of waste from the project based on other expressway projects and best practice management.

9.2 Material Sourcing Sites

The material sourcing sites outlined for the Project are described in Chapter 3 – Project Description. These include sites for the sourcing of natural gravels, rock aggregate, water, borrow material and sand materials for construction. These sites are a combination of existing and new sites. Many of the sites preliminarily identified for potential utilisation are located close to the Project Footprint, although other already existing sites are located further afield.

As per Chapter 3, any new quarries and borrow pits established for the Project will need to undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of UNRA before submission to NEMA for approval. The sites should be assessed and managed in accordance with national and international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible.

9.3 Materials and Equipment Required for Construction

9.3.1 Construction Materials

The construction of the Project will require the use of large amounts of construction materials including but not limited to:

- Earthworks materials, such as topsoil, granular materials, and rock fill;
- Aggregates for asphalt base, concrete and masonry works
- Sand for drainage construction and concrete /asphalt production
- Cement for concrete production;
- Road base for pavement construction;

- Bitumen for spray seals and asphalt production;
- Precast concrete elements for drainage construction (culverts, pits and headwalls), bridge construction (bridge piles, girders and parapets) and miscellaneous work;
- Steel for bridges, barrier railings and reinforcement in concrete; and
- Traffic signs and guard rails.

Other materials requirements for construction include:

- Hydrocarbons (fuels, oils etc);
- Paints / solvents;
- Batteries;
- Explosives (for blasting);
- Medical supplies;
- Water sources; and
- Energy and power sources.

Depending on project staging, earthworks management would require materials and equipment to be stored and / or stockpiled at ancillary sites close to construction activities. An estimate of the main material requirements for both Phase 1 and 2 of the KJE mainline has been developed by ICS (2015) and is provided in Table 8-1. Requirements for materials for the KSB alignment will be identified prior to construction.

Table 9-1: Key Estimated Material Requirements for Phase 1 and 2 of the KJE Mainline.

Material type	Amount	Source	Notes
Materials			
Lateritic material	1.014 million cubic metres	Identified borrow pits	Approximate quantities only
Quartzitic and granolithic crushed stones	740,000 cubic metres	Identified quarries	
Bituminous materials	408,500 cubic metres	Imported bituminous materials	
Cement	144,000 metric tonnes	Imported and locally (Tororo) produced	
Water	Greater than 360 million litres	Swamps, wetlands, rivers.	

Table modified from: ICS (2015) Kampala-Jinja Expressway ESIA.

Plate 9-1: Gravel and bitumen storage at the Asphalt plant utilised for the Kampala-Entebbe Expressway Project.

9.3.2 Construction Equipment

Preliminary estimates of the construction equipment required for the Project (KJE alignment, Phase 1 and 2) are presented below (Table 9-2), however the final quantities of equipment required will be finalised by the contractors. Requirements for equipment for the KSB alignment will also be identified prior to construction. Equipment required will include a range of heavy machinery including bull dozers, graders, pavers, heavy compaction equipment and dumper trucks, with some examples shown in Plate 9-2.

Table 9-2: Approximate Equipment Requirements for Phase 1 and 2 of the KJE Mainline.

Equipment type	Amount	Source	Notes
Equipment			
Dozers	5	Contractor	Approximate quantities based on similar scope of works.
Graders	8	Contractor	
Pavers	3	Contractor	
Heavy Compaction Equipment	6	Contractor	
Loading buckets (wheel and track loaders, etc)	5	Contractor	
Excavators (back hoes, back actors, etc)	5	Contractor	
Dump trucks	20	Contractor	
Water and fuel tankers	6	Contractor	

Table modified from: ICS (2015) Kampala-Jinja Expressway ESIA.

The majority of equipment utilised for construction will be removed by the contractor after the final design has been completed. However smaller amounts of construction equipment will be required for the routine maintenance and upgrades of the road during the Operation's phase.

Plate 9-2: Construction equipment being utilised for the construction of the Kampala-Entebbe Expressway Project.

9.4 Project Activities Generating Waste

Key Project activities that will generate waste are presented below.

9.4.1 Quarry Operations and Borrow Pits

The Project will require gravel, fill, rock and sand as construction material for the road. The materials that will be required to be sourced locally for road construction include:

- Natural granular material for possible application as subbase;
- Borrow materials for embankment fill (typically obtained from nearby KJE cuttings but from virgin borrow areas in some cases);
- Quarry stone for production of aggregates for asphalt, crushed stone base, concrete and masonry works; and
- Sand for concrete and mortar.

Where possible, fill materials will be obtained from 'cutting' operations as part of the road earthworks. Where additional fill and other aggregate material is required, this will be preferentially sourced from existing borrow areas and quarries in proximity to the Project.

UNRA has undertaken an initial site evaluation and preliminary testing of a number of existing and potential borrow pits and quarry sites situated near the Project footprint (ISC, 2015) (also refer to Chapter 14 on Geology, Geomorphology and Soils for further details). UNRA will conduct further investigations of the raw materials required and suitability of materials available.

Where possible existing borrow pits and quarries will be used by the Project. Any new quarries and borrow pits required to be established for the Project will need to undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of NEMA and in accordance with international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible. To meet the requirements of national legislation, a project brief would need to be prepared for new borrow areas, whereas an ESIA may be required for developing new quarry areas.

A list and map of potential quarry and borrow pit locations is provided in Chapter 3 – Project Description.

9.4.1.1 Quarry Operations

The operations of quarries in the Construction phase will involve the excavation of material, the use of heavy machinery and if necessary, the use of explosives to extract the rock material. The sites will also provide facilities for the crushing of rocks and the sorting/piling of crushed aggregates. The main wastes generated by quarry operations will include excavated materials not required for construction works (e.g. overburden).

9.4.1.2 Borrow Pits

Borrow material is used where the amount of material obtained from cuts cannot cover sections of fills, and in low-lying areas such as swamps. Waste generated by borrow pit operations is likely to include: green waste and timber from vegetation clearance, topsoil from soil stripping, excavated materials and stockpiled waste.

9.4.2 Land Clearance and Demolition of Structures

Establishment of the Project will require land acquisition and the clearance of structures, vegetation and topsoil within the Project footprint. This is likely to be a key source of waste from the Project, resulting mainly in demolition waste and green waste. All material that is cleared will have to be disposed of in approved disposal areas or within the Project Footprint itself. Management and re-use of demolition waste will depend on the particular type of waste, the level of recovery and market demand in the area (refer to Section 9.5 on the different waste streams). Impacted people/communities may be given the chance to salvage any materials generated by this process.

9.4.3 Groundworks and Road Construction

The groundworks required for the Project may generate significant waste streams including stockpiles of excess borrow materials, topsoil and vegetation.

The construction of the road infrastructure will also generate waste streams including excess steel, concrete (solids and washouts) and asphalt as well as packaging materials, metals and electrical cabling and solvents (e.g. paints) among others.

9.4.4 Accommodation Camps

The location of accommodation camps will be determined by the preferred construction contractor during the detailed design stage for the project. However, these sites will produce several waste streams including sewage waste, food waste and general refuse waste. Detailed measures for the management of waste from accommodation camps have been included in the ESMMP (Volume D).

9.4.5 Vehicles and Equipment

The Project will require a number of heavy and light vehicles, plant and mobile equipment for construction and operations. These can generate hazardous waste such as through old tyres and oil traps used in refuelling/maintenance areas.

9.5 Project Waste Streams

Construction of the Project and maintenance activities during operations will require or generate hazardous and non-hazardous materials. The Project has been designed to specifically address potential risks associated with hazardous / non-hazardous materials during transport, storage, handling and disposal.

Potentially hazardous materials that will be stored and handled by the Project during construction and operations include:

- Oils, solvents, diesel and tyres from Project vehicles;
- Waste oil;
- Medical waste including sharps, bandages, etc;
- Sewage from construction compounds;
- Asbestos (if uncovered during demolition);
- Batteries; and
- Paint and solvents.

General (non-hazardous) and solid waste materials will be generated from Project construction activities, administration, procurement, accommodation camps and maintenance activities during operations include:

- Excavation waste (e.g. rock and soil);
- Demolition waste;
- Construction waste;
- Timber and green waste;
- Packaging materials; and
- General waste from office and camp compounds.

Potential Project waste streams are presented in Table 9-3.

Where possible the Project will encourage re-use and recycling of waste streams and recovered materials. Where waste cannot be re-used or recycled, district landfill sites will be used for the disposal of general Project wastes.

Hazardous wastes will be stored, transported and disposed of in the appropriate manner according to waste type, and in accordance with the MSDS (Material Safety Data Sheet) for the materials. Hazardous materials and wastes should be stored in an appropriately bunded and secured area (e.g. locked shipping container with bunding) prior to offsite disposal. NEMA licenced waste handlers will be used for transportation and disposal of hazardous wastes generated by the Project.

Transportation distances for wastes should be minimised to reduce greenhouse gas emissions from the Project, through selecting waste management sites close to the source of the wastes where practicable.

Almost all wastes generated by the Project are expected to be able to be managed at the local level. Some hazardous wastes such as chemicals and potentially contaminated soils will be required to be transported to licenced facilities in the country such as those in Hoima and Nakasongola Districts or any others that will have come on line when Project activities are underway (refer to Table 9-3). No waste is expected to require transport/disposal internationally.

Further details on the waste streams, potential impacts and management approaches are presented in Section 9.6.

Table 9-3 Potential waste streams associated with the Project and suggested methods for re-use, recycling and disposal

Area	Type of Waste	Classification	Suggested methods for re-use, recycling and disposal
Demolition/Site Clearing	Vegetation (logs, mulched timber, weeds)	General solid waste (non-putrescible)	Harvest millable timber for re-use offsite, use mulch for revegetation works, landscaping or erosion and sedimentation control Provide local communities with opportunity to salvage timber resources where practicable The NFA should oversee salvage of timber where appropriate.
	Concrete, asphalt and gravel	General solid waste (non-putrescible)	Crushed and used as backfill or as road base Concrete parts should be re-used to fill up used borrow pits.
	Asbestos	Special waste	Offsite disposal by NEMA licenced waste handlers
	Scrap metal	General solid waste (non-putrescible)	Re-use or send for offsite recycling (e.g. into steel products)
Earthworks	Excavated materials	General solid waste (non-putrescible) – if not contaminated	Beneficial reuse onsite (such as landscape and noise mounds) Balance cut and fill earthworks where possible, to optimise reuse on the Project
		Potentially contaminated soil (e.g. near service stations)	Method will depend on results of soil testing, and may include: • Offsite disposal by NEMA licensed hazardous waste handlers • Offsite reuse as engineering fill or used in earthworks • On site remediation
Road Construction	Steel	General solid waste (non-putrescible)	Offsite recycling such as at steel rolling mills
	Concrete (solids and washouts) and asphalt	General solid waste (non-putrescible)	Crushed and used as backfill or as road base or recycled offsite
	Packaging materials, including wood, plastic, cardboard and metals	General solid waste (non-putrescible)	Offsite recycling
	Metals and electrical cabling	General solid waste (non-putrescible)	Offsite recycling
	Pesticides, herbicides, spill clean ups, paints and other chemical	Hazardous waste	Offsite disposal by NEMA licenced waste handlers
Construction sites, workshops, camp compounds	Tyres	Special waste	Offsite disposal / recycling by NEMA licenced waste handlers. Where practicable, tyres can be taken for retreading at a facility in Kampala and the vehicle batteries can potentially be recycled by a battery manufacturer in Kampala.
	Oils, grease, fuel, chemicals and other fluids	Liquid waste	
	Batteries	Hazardous waste	
	Radiator fluid, hydraulic fluid	Hazardous waste	
	Domestic waste generated by workers	General solid waste (putrescible)	Offsite disposal at NEMA approved local landfill

Area	Type of Waste	Classification	Suggested methods for re-use, recycling and disposal
	Sewerage	General solid waste (putrescible)	Offsite disposal by NEMA licenced waste handlers and/or treated and reused on site
Office / Administration	Paper, cardboard and plastic	General solid waste (non-putrescible)	Offsite recycling
	Glass bottles and aluminium cans	General solid waste (non-putrescible)	Offsite recycling
	Food Waste	General solid waste (non-putrescible)	Offsite disposal at NEMA approved local landfill, or composting onsite (including the use of food composting equipment)
	Effluent	Liquid waste	Offsite disposal by NEMA licenced waste handlers, or treatment onsite

9.6 Impact Assessment

Waste that is improperly stored or disposed of may lead to adverse effects on human health, habitat, biodiversity and the receiving environment. Other potential impacts include excessive waste to landfill, incorrect disposal or misclassification of waste on site.

Further details on the waste stream, potential impacts and management approaches are presented in the sections below.

9.6.1 General and Solid Waste (Non-Hazardous)

9.6.1.1 Pre-Construction

No impacts associated with general and solid waste are expected to occur during the Pre-Construction Phase as no waste will be generated during this phase.

9.6.1.2 Construction

Timber and Green Waste

It is estimated that construction of the Project would require the clearing of approximately 138.0 ha of agro-pastoral land, 10.0 ha of plantation land, 106.3 ha of wetland (degraded, partially cultivated and papyrus) and 46.7 ha of forested habitat (closed forest, open forest/woodland and scrubland). Potential wastes from this land clearance include logs, processed timber, vegetation and weeds. Improper management of green waste physically impacts the environment through increased greenhouse gas emissions (if anaerobic decomposition or burning occurs), impaired visual amenity and could result in fire risk or spread of invasive weeds without management controls. The amount of vegetative waste and timber produced from land clearance activities will be greatest in forested areas along the alignment, as these areas will have the highest amounts of biomass.

Where possible, timber and green waste will be re-used through providing local communities with an opportunity to salvage useful timber, and utilisation of native vegetation waste for biodiversity measures such as fauna habitat. Weeds will need to be managed appropriately to prevent the spread of invasive species, though implementation

of the measures proposed in the Biodiversity Action Plan (Volume D). The National Forest Authority (NFA) will have a critical role in overseeing forest clearance to ensure proper management of timber and green waste.

Demolition Waste

A significant source of waste from the Project will be demolition waste produced as a result of land clearance activities and the removal of structures, road pavement and utilities within the Project footprint.

Based on the spatial analysis conducted for the Project, it is anticipated that 8,105 structures within the ROW will require removal and demolition (see Section 7.3.2). The ROW will also potentially impact public infrastructure such electricity distribution and transmission lines, water pipe line infrastructure (especially within Kampala and Wakiso Districts) and telecommunications infrastructure such as fibre optic cables.

The main demolition waste materials expected to be generated include:

- Concrete and bricks;
- Asphalt;
- Gravel;
- Scrap metal / cables;
- Processed timber; and
- Road base.

Where practicable, the deconstruction of structure and services, rather than their demolition, will assist in allowing as much material as possible to be salvaged for reuse offsite. Demolition waste is likely to be the most significant where the Project traverses through dense urban areas such as in Kampala and Wakiso districts and requires relocation of a larger number of structures and services.

During demolition, there is also the potential for asbestos to be uncovered which could result in potential health risks to workers and the local community if not appropriately managed (Orem, 2018). Any asbestos materials encountered would need to be removed by certified contractors and appropriately disposed of.

Unmanaged, demolition waste may result in significant amounts of waste being sent to landfill. Appropriate management and re-use of demolition waste will depend of the particular type of waste, the level of recovery and market demand in the area. Where possible re-use and recycling for recovered materials will be encouraged. For example:

- Concrete – can be reprocessed concrete into products that are commercially competitive with quarry products;
- Bricks and crushed concrete – can be used in all-weather applications (such as low-grade roads), and in pavement sub-bases (such as roads and non-structural applications) as a substitute for virgin crushed rock;
- Metals can be extracted and recycled; and
- Timber – can be salvaged and re-used for various applications. Impacted communities will be given an opportunity to salvage these materials. Infrastructure timber such as power poles may be able to bed used in landscaping applications.

Excavated Materials

Excavation wastes comprising of mainly inorganic material (primarily soil) will be generated from earthworks and quarry operations. Improperly managed, waste material generated from excavations has the potential to cause water pollution if not stockpiled and re-used effectively.

As far as practicable, earthworks material generated from the Project would be re-used for the construction of embankments, pavements and as verge material. Development of an earthworks balance will be important to help reduce the amount of materials unsuitable for road construction that may be generated during construction activities and to encourage the re-use of these materials in noise or visual barriers and landscaping.

Where excavated materials have not been subjected to potentially contaminated sources, it is expected that these will be reused within the road corridor. For excavated materials that are potentially contaminated (e.g. land near service stations, land within industrial areas, or showing visual signs of contamination) testing and classification of these materials will be required to ensure appropriate management.

During stakeholder consultations it was noted that excess materials (e.g. gravel, soil, etc.) excavated during the construction of the Kampala Northern Bypass was left on site for long time periods following the completion of construction. These stockpiled materials were observed to be utilised by local residents for the infilling of wetland areas and promoted the further degradation of the wetland habitats. Thus, careful management of the waste materials will be required to avoid detrimental effects on wetland habitats in the Project footprint (e.g. Nakivubo, Kasanga, Kinawataka, Kasala).

Construction Wastes

A number of different construction wastes will be generated from road construction activities. These include steel, concrete, asphalt, timber and piping, paints, scrap metal, electrical cabling and chemicals. Where possible these left-over materials should be re-used on the Project for another road section, or reprocessed for use as road base or backfill. Materials that are not suitable for re-use will need to be recycled or disposed of at a licensed waste facility.

The operation of concrete and asphalt plants have the potential for generating significant waste if quality specifications during the production process are not met for a particular batch. Where possible this material should be re-used for non-structural elements, minor roads or tracks in construction sites to avoid unnecessary waste from being sent to landfill.

Construction activities where the Project alignment traverses through swamps areas or wetlands are likely to generate large quantities of fine silty material, which, if not managed appropriately, have the potential of causing water pollution. Where suitable, the sediment and topsoil removed from these areas should be stockpiled and reused for wetland revegetation activities.

The construction of access roads into wetlands will require the use of large amounts of fill material. On completion of construction of viaducts, these access routes will then need to be decommissioned and the areas rehabilitated and restored to their original condition, to prevent this material being used for reclamation of wetlands for agriculture or other uses post construction.

Packaging Materials

Packaging waste will be generated from Project materials delivered to site. This includes cardboard, paper, plastic and glass.

Where possible, materials would be bought in bulk to minimise the amount of packaging required. Preferentially selecting products with recycled or recyclable packaging will also help reduce potential packaging waste. Packaging waste will need to be recycled where possible or disposed of at an approved facility.

Sewerage and General Waste from Construction and Workforce Facilities

Sewerage and general waste would be generated from construction camp facilities such as amenities and offices. Waste types include domestic waste from workers, sewage, office wastes (paper, cardboard, plastic, bottles, cans, paper) and food wastes. These will need to be reused and recycled where possible.

Sewage from accommodation camps may provide a potential source of nutrients and/or pathogens that may be released into receiving waters downstream in the absence of appropriate sewage treatment and management. Adequate provision of portable toilet facilities for project workers on construction sites will also be required to help prevent soil and water contamination from sewage.

For general wastes that cannot be recycled, leachate (potentially including heavy metals and persistent organic particles (PoP) / compounds) may discharge and accumulate. Also improper storage and disposal of the waste could lead to:

- Contamination of receiving surface water (e.g. due to inappropriate disposal of chemicals);
- An increase in populations of scavenging wildlife due to food wastes, including rats, birds and monkeys and other potential vectors for disease; and/or
- Impacts on visual amenity (e.g. from general littering).

9.6.1.3 Operations

During operations, waste generation would be much less significant than during the construction period and will result mainly from road maintenance activities and general use of the expressway by road used. Solid waste generation as a result of these activities may include road resurfacing waste (e.g. removal of the old road surface material), road litter, or general solid waste from rest areas, animal carcasses, vegetation waste from ROW maintenance, and sediment and sludge from stormwater drainage system maintenance.

Waste will also be produced by vehicle users along the road who may dispose of rubbish out of car windows. This waste may include food packaging, cigarettes, water bottles, plastic bags etc and can have a significant environmental impact if allowed to build up on road embankments. A smaller waste stream may be created from vehicles utilising the road where structural parts may accidently come off of the vehicles travelling at high speed. This may include shredded tyres, metal bumpers, rubber trim and hub caps.

9.6.2 Hazardous Materials and Special Waste

9.6.2.1 Pre-Construction

No impacts associated with hazardous materials and waste are expected to occur during the Pre-Construction Phase as no use of hazardous materials will occur during this phase.

9.6.2.2 Construction

The following hazardous materials are expected to be generated, stored or handled during Construction and/or Operations.

Hydrocarbons

Diesel fuel will be utilised for construction vehicles and equipment. Accidental release of hydrocarbons would potentially impact receiving environments such as waters (ground and surface water) and soil. Hydrocarbons are also a fire hazard which threatens occupational health and safety as well as air quality in general. Spills may be

most likely at refuelling stations, equipment servicing workshop, on active construction sites and at equipment storage areas.

Paints / Solvents

Paint waste may also be generated from road markings or painting of bridges and structures.

Medical Wastes

Sharps, bandages, etc. are potential vectors for the spread of disease. These wastes may occur during the demolition of some structures and during first aid / treatment activities on construction sites / accommodation camps.

Batteries

Improperly disposed of batteries can present a hazard to humans, domestic animals and wildlife. Batteries will be utilised by vehicles during the construction process and also in various equipment. Waste batteries may be produced on active construction sites and at equipment storage locations.

Asphalt / Bitumen

The Project will require a significant amount of asphalt and bitumen for roadway construction. Hot and ready to use liquid bitumen and asphalt coating present a number of health hazards including the risk of severe burns from skin contact. During preparation of asphalt mixes (at asphalt plants) there is also the risk of bitumen spills which could potentially result in local water quality impacts if it occurs near a waterway or wetland.

Bitumen spills may also occur during the transportation of asphalt between sites and on active sites where surfacing activities are being conducted.

Explosives

Explosives will be used to blast rocks during quarry operations. Ammonium nitrate (AN) products / explosives typically have three main hazards:

- Fire – AN products are not combustible but can facilitate the initiation of fires and can assist the combustion of other materials. AN products contaminated with oil or combustible materials (e.g. rags or wooden materials) can initiate a fire when hot.
- Decomposition with the formation of toxic gases – If AN products are heated, they may decompose and give off toxic gases. If heated sufficiently (such as in a fire) and combined with contamination, confinement (storage area) or both, AN may produce toxic nitrogen dioxide and the explosive sensitivity increases. Through self-accelerating reactions, the temperature may continue to rise and detonation may occur; and
- Explosion – AN products are potentially explosive if the oxidising nitrate ion comes into contact with the fuel element however explosions of solid AN products without a fire are very unlikely. Small amounts of contaminants are required to act as the catalyst. As a result of the decomposition reactions of AN, the risk of explosion increases with heating in combination with contaminants, confinement, or both.

Factory residues

Hazardous waste may be generated from demolition of factories and industrial facilities. These will require careful management during demolition to minimise potential impacts. Factory residues are only likely to occur in industrial areas passed by the ROW. The most predominant industrialised areas passed by Phase 1 of the line are between KJE Chainage 0 + 000 and KJE Chainage 3 + 500.

Asbestos

During demolition, there is also the potential for asbestos to be uncovered (from the demolition of settlement and commercial structures) which could result in potential health risks to workers and the local community if not appropriately managed (Orem, 2018). Any asbestos materials encountered would need to be removed by certified contractors and appropriately disposed of.

9.6.2.3 Operations

Waste generation during operations will be much less significant than during construction. Most waste is likely to be general solid waste from road maintenance activities and general use of the expressway by road users. The main hazardous waste that will be generated during operations is hydrocarbons from vehicle oils, grease and fuel used in maintenance vehicles.

Construction waste will also be produced during road maintenance work, especially during repair works on the road surface or embankments (e.g. asphalt, concrete, soils, solvents).

9.7 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management measures for material use and waste (refer to Volume D).

Management and mitigation measures to minimise impacts of hazardous materials and waste from the Project are summarised in Table 8-12 below. The residual risk or impact after implementation of the measures is also presented.

Table 9-4 Materials Use and Waste Management - Key Avoidance, Management and Mitigation Measures and Residual Impacts and Risks

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction Phase			
Hazardous Materials and Waste Management	None required	Neutral	Negligible No significant waste is expected to be generated in the Pre-Construction Phase.
Construction Phase			
General Waste Management	► Apply the waste management hierarchy (in decreasing order of preference): 1. Minimise the production of waste 2. Maximise waste recycling and reuse 3. Treatment of waste 4. Ensure safe waste disposal. ► Establish a waste management system and comprehensive waste inventory that identifies, tracks and quantifies major waste streams generated at the Project. ► Collect and segregate solid waste into different categories as per the ESMMP. ► Install colour-coded bins with weatherproof lids and appropriate signage at designated locations around the Project site (e.g. workforce accommodation camps,	Negative	Minor With diligent implementation of management measures only Minor general waste impacts are expected such as littering. The risks of these impacts will be highest in and around temporary workforce accommodation camps. Monitoring will be required to minimise impacts.

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	construction sites) for collection and segregation of waste. Waste collection to occur frequently to avoid overflowing of bins. ► Where waste needs to be moved, tarps will be used on trucks to prevent dust and debris on roads.		
Sustainable management of resources	Develop a resource management strategy. This can include measures such as: ► Develop an earthworks balance to minimise surplus spoil material. ► Use available project cutting material and verge material for the construction of embankments and verge within that section to the extent that it is suitable. ► Project sections with a deficit in material should import surplus material from other project sections in preference to external sources. ► Any unsuitable material for road construction should be used for rehabilitation/restoration, landscaping or disposed of within each project section, either for batter flattening or noise mounds or placed in stockpile. ► Transportation distances for wastes should be minimised to reduce greenhouse gas emissions from the Project, through selecting waste management sites close to the source of the wastes where practicable.	Positive	Moderate The successful implementation of strategies for the sustainable management of resources can provide significant benefits such as through the re-use of project resources, reduced requirement for waste disposal, and reduced need for additional resources from external sources.
Reduce impacts on landfill through minimisation of construction waste	Develop a strategy to minimise waste during construction including: ► Develop measures for each waste type to avoid, minimise, re-use, recycle, treat or dispose of waste streams during construction and address transport and disposal arrangements, such as: • Demolition waste – harvest millable timber for re-use offsite, use mulch for revegetation, landscaping or erosion and sedimentation control; Provide local communities with opportunity to salvage timber resources; liaise with recycling facilities for the recycling/re-processing of bricks, concrete, scrap metal etc. – Carefully dismantle and remove structures (in the urban section of the road) that they can be reused at smaller roads within Kampala and neighbouring districts. – Where metals recovered from these structures cannot be re-used, provide them to recycling companies for processing into steel productions – Remove metals within concrete culverts and send these for recycling. Concrete parts should be re-used to fill up used borrow pits. • Construction waste – left over materials should be re-used by Project where possible or re-processed. E.g use sediments onsite for landscaping etc, waste from asphalt production could be used for non-structural elements such as minor roads.	Positive	Moderate The successful implementation of strategies for the minimisation of construction waste is expected to provide environmental benefits through the re-use and recycling of recovered materials. It will also help reduce potential impacts associated with transporting excessive waste to landfill.
Construction Waste	► Materials to be stockpiled should be stored at designated material stockpile locations. ► Access roads into wetland areas should be dismantled after the completion of viaduct construction. ► Any waste construction materials (e.g. borrow / gravel / rocks) should be removed from the construction site following completion of the road section. The use of these materials by	Negative	Low Risk There is a low risk of impact on wetlands if excess construction materials are used by local communities for infilling of wetlands. These risks will be reduced by the management measures.

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	the local communities should be prohibited for the infilling of wetlands. ► Monitor construction areas to avoid community use of materials.		
Sewerage waste	► Install mobile pit toilets at construction sites. Pits to be backfilled and trees/vegetation planted on surface once three-quarters full.	Negative	Low Risk Some risks to downstream water quality from sewage waste will remain, particularly for temporary construction camps.
Hazardous Materials	► Hazardous materials will be managed in compliance with all relevant Ugandan statutory obligations, licenses and other requirements; ► An up-to-date register of hazardous materials and dangerous goods stored on site will be compiled and maintained on-site. The register will include the types, quantities, location and current Material Safety Data Sheets (MSDS). ► Provide and enforce use of appropriate personal protective clothing and equipment (i.e. gloves, plastic coveralls, safety glasses and self-contained respirators), emergency information posters, and clean-up spill kits at strategic locations where hazardous chemicals are handled. ► Develop work safety procedures, instructions and emergency response procedures on how to safely handle, store and dispose of hazardous materials as well as for adequate emergency communication capability with potentially impacted communities, governments and nominated emergency response teams within a timely manner. ► Manage hazardous wastes as per the ESMMP including separation of hazardous and non-hazardous wastes, prohibition of the disposal of hazardous wastes into general waste bins etc. ► Implement appropriate storage for hazardous materials as per the ESMMP. ► Use licensed contractors for the transportation of hazardous materials and waste. ► Explosives to be stored in a magazine that meets relevant national and international standards. ► Suitable drainage within and around long-term hazardous materials containment should be constructed including rainfall protection.	Negative	Low Risk While the risk of accidental spills of hazardous materials can never be completely avoided, implementation of the proposed mitigation, management and monitoring measures will ensure that the risks associated with the use, storage and transport of hazardous materials are minimised throughout the life of the Project.
General Waste Disposal	► Where waste cannot be re-used or recycled, district landfill sites will be used for the disposal of general Project wastes. Hazardous wastes will be disposed of in the appropriate manner according to waste type. ► Burial of hazardous wastes, liquid or semi-solid wastes (including sewage, medical waste, solvents, hydrocarbon products, hydrocarbon or chemical contaminated soils) will be prohibited. Disposal of these wastes will comply with statutory obligations and will not adversely impact human health or the environment. Licenced contractors will be used wherever possible. ► Monitor to ensure appropriate waste disposal.	Neutral	Negligible If mitigation measures are implemented successfully, there is not expected to be any significant environmental impacts associated with waste disposal.
Wastewater	► Infrastructure and procedures for the treatment and disposal of sewage to be in place. ► Sewage treatment system to be operational and include disinfection.	Negative	Low Risk While some risks to downstream water quality will remain due to wastewater discharge associated with the Project if contaminants are not effectively removed, the

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	▶ Relevant discharge requirements should be adhered to for all discharges off-site. ▶ Waste Log to be maintained to record waste management practices. ▶ Ensure other measures described in the Water Management Plan (Volume D) are adhered to.		successful implementation of the prescribed measures for wastewater management is expected to effectively reduce risks to low levels.
Operations			
Road Maintenance	▶ Provide appropriate waste and recycling facilities at rest areas and heavy vehicle checking stations. ▶ Install 'No littering' signs along roadway and provide waste bins at rest areas. ▶ Install drainage litter traps along the ROW	Negative	Minor Minor impacts on visual amenity and water quality are expected due to littering by road users. Maintenance works during Operations will also result in a low risk of impact on downstream water quality.
	▶ Collect green waste from highway maintenance activities and recycle where possible (e.g. for mulch within vegetation areas along the road) ▶ Conduct regular litter collection activities along the roadside and embankments to prevent the accumulation of domestic waste (e.g. water bottles, packaging, vehicle waste (e.g. tyre material, wheel hub caps)	Negative	
	The following road maintenance measures should be applied to minimise water quality impacts of spills from transport accidents or from contaminated run-off, as part of a regular program: ▶ Inspect barriers, fences, erosion and sediment control devices. ▶ Maintain retaining walls to minimise cracks and water damage. ▶ Repair pot-holes and shoulder erosion to minimise risk of vehicle accidents. ▶ Maintain stormwater energy dissipaters and velocity controls on open drains to lower runoff velocity and control soil erosion. ▶ Dispose of accumulated sediment collected from detention ponds, drainage systems, and pollution control structures, and any wastes generated during maintenance operations in accordance with appropriate government requirements. ▶ Use techniques during bridge maintenance such as suspended tarpaulins, vacuum collection or booms to prevent paint spills, solvents and scrapings from becoming waterborne pollutants. ▶ Keep drainage ditches free from accumulated debris.	Negative	

9.8 Conclusions

The Project will generate a number of different waste streams, with the most significant amount of waste expected to be generated during construction. The largest amounts of waste are likely to be demolition waste from land clearance and demolition activities during Project land acquisition and construction waste (e.g. concrete, asphalt, piping, scrap metal etc) from the production and sourcing of materials for road construction.

An opportunity exists to sustainably manage Project resources and minimise the amount of waste generated from the Project through the re-use and recycling of recovered materials either for Project activities of within the local industry and community. This is particularly the case for demolition and construction waste where a number of materials such as excavated material, timber, bricks, concrete, asphalt and steel can be recycled or reprocessed.

This is expected to help avoid excessive waste from going to landfill and reduce potential environmental and social impacts associated with waste generation.

With diligent implementation of management measures, no significant impacts are expected to result from the transportation, storage and use of hazardous wastes, however a low risk of soil and water contamination from spills of chemicals (e.g. fuels, paints) will remain for the Construction and Operations Phases. Risks will be minimised with the implementation of measures outlined in the ESMMP (Volume D).

KJE PPP Project Phase 1 ESIA

CHAPTER 10 Air Quality

10. AIR QUALITY

10.1 Study Area and Methodology

The study area for the air quality assessment was comprised of the Project area, which includes the 35 km Phase 1 section of the 77 km Kampala-Jinja Mainline Expressway (KJE) and the 18 km Kampala Southern Bypass (KSB). The study area also included a section of the existing Kampala-Jinja Road, which stretches from the UMA showgrounds (at Lugogo) in Kampala to Namagunga. The airshed surrounding the Project was also considered in this assessment.

10.1.1 Objectives

The key objectives of this assessment were to:

- Characterise existing air quality conditions in the Project region;
- Provide an assessment of potential air quality impacts associated with the Project;
- Provide comparison with national and international air quality criteria; and
- Identify management and mitigation measures relevant to air quality.

10.1.2 Overview

The air quality study involved the following components:

- Assessment of meteorology (temperature, wind, rainfall) for the Project area;
- Development of ambient baseline air quality for the Project area;
- Modelling of predicted dust and gases from the Project during operations;
- Assessment of potential impacts during operations; and
- Development of management measures to mitigate potential impacts.

Air quality was simulated using a set of standard procedures using the CALINE4 traffic air quality model, COPERT street level model and previous feasibility and traffic studies.

10.1.3 Legislation and Guidelines

10.1.3.1 Draft Ambient Air Quality Standards (2006)

There are no air quality standards specified for road projects Uganda. However, guideline ambient standards are provided in the draft ambient air quality standards (2006), as listed in Table 10-1. These standards have not been formally implemented and there is no national air quality monitoring network in Uganda.

Table 10-1 Draft ambient air quality standards for Uganda (from UNRA 2006)

Parameter	Averaging time	Examples to which standards are applicable	Standard for ambient air
Carbon dioxide (CO_2)	8 hr	Breweries, soft drink industries, burning processes	9 ppm
Carbon monoxide (CO)	8 hr	Combustion processes, boilers	9 ppm
Hydrocarbons	24 hr	Chemical stores and labs, fuel depots and stations	5 mg/m^3
Nitrogen oxides (NO_x)	24 hr, 1 yr mean	Combustion processes, welding	0.10 ppm
Smoke	Not to exceed 5 mins in any 1 hour	Industry, trade or any combustion process	Ringleman No2 or 40% at 6 m or more
Soot	24 hr	Combustion, charcoal and brick making, boilers	500 µg/Nm^3
Sulphur dioxide (SO_2)	24 hr	Combustion processes, boilers or any process involving sulphur burning	0.15 ppm
Sulphur trioxide (SO_3)	24 hr	Sulphur burning, sulphuric acid manufacture	200 □g/Nm^3

Note: ppm = parts per million, N in ug/Nm3 connotes normal atmospheric conditions (25C and 1 atmosphere)

10.1.3.2 WHO Ambient Air Quality Guidelines (2005)

There is no criteria for respirable particulate matter provided in the Ugandan air quality regulations. International health guidelines for respirable particulate matter (PM) of less than 10 µm in size (PM_{10}) and 2.5 µm in size ($PM_{2.5}$) are provided by the International Finance Corporation (IFC) and World Health Organization (WHO) as part of guidelines for ambient air quality (WHO, 2005). The applicable guidelines are summarised in Table 10-2.

Table 10-2 WHO ambient air quality guidelines (WHO 2005, IFC 2007)

Parameter	1 h average (µg/m^3)	8 h average (µg/m^3)	24 h average (µg/m^3)	1 yr average (µg/m^3)
Nitrogen dioxide (NO_2)	200	-	-	40
Sulphur dioxide (SO_2)	500 (10 min)	-	20	-
Ozone (O_3)	-	100	-	-
Particulate Matter PM_{10}	-	-	50	20
Particulate Matter $PM_{2.5}$	-	-	25	10

10.1.3.3 Draft Vehicle Standards

Emission standards for heavy duty diesel powered vehicles, light trucks, diesel passenger cars, petrol passenger cars and petrol gasoline vehicles were developed under the proposed Ugandan draft air quality standards as stated in Table 10-3.

Table 10-3 Draft vehicle standards for Uganda (from UNRA 2006, Kiggundu 2015)

Vehicle	Oxides of nitrogen (NOx)	Carbon monoxide (CO)	Particulate matter (PM)	Hydrocarbons (HC)	Volatile Organic Compounds
Heavy duty diesel (g/kWh)	7.0	4.5	0.15	1.23	-
Diesel passenger cars (g/km)	1.25	4.2	0.08	-	-
Petrol/gasoline cars (g/km)	0.08	1.2	-	0.10	-

Vehicle	Oxides of nitrogen (NOx)	Carbon monoxide (CO)	Particulate matter (PM)	Hydrocarbons (HC)	Volatile Organic Compounds
Diesel light duty trucks (g/km)	0.38	2.6	0.06	0.19	0.19
Petrol/gasoline light duty trucks (g/km)	0.6	2.1	-	0.3	-

10.1.3.4 Environmental Tax Levy on Motor Vehicles (2006)

An environmental tax levy on motor vehicles aged 8 years or older was introduced by Uganda in 2006. The tax levy aimed to reduce the use and importation of environmentally hazardous vehicles.

10.1.4 Modelling of Project Emissions

10.1.4.1 CALINE4

The impact of air quality with distance from a road was evaluated using the California Department of Transport (Caltrans) CALINE4 (v2.1) traffic air quality model, which is a screening model that estimates air quality near roadways by combining the contribution of the road traffic emissions together with the background air quality to arrive at a cumulative concentration. The road contribution to concentrations is calculated using emission factors, which take into consideration the amount of traffic and the emission factor for each pollutant. The model uses Gaussian plume dispersion to provide a conservative (worst case) assessment of air quality risk at distance from a single road for carbon monoxide (CO), nitrogen dioxide (NO_2) and particulate matter (PM). The model considers the following parameters;

- Run length (1 hr or 8 hr average);
- Land type (rural, suburban, city);
- Altitude (in m or feet);
- Atmospheric conditions (wind speed, direction, stability and ambient background);
- Road type (grade, depressed or bridge);
- Traffic (volume and emissions) *; and
- Receptors (distance from road).

* Weighted average emission rate of local vehicle fleet for cars, buses and trucks in grams/per mile (converted from g/km) per vehicle, for the pollutant selected was adopted from the Australian NSW TRAQ software. There is a potential of underestimation of exhaust emissions due to the average age and efficiency of vehicles in Uganda.

To examine the potential impact of the Project the CALINE4 model was employed to predict the concentrations of CO, NO_2 and Particulate Matter, assuming the following conditions;

- Southerly 180° winds at 1m/s (US EPA recommended wind speed);
- Wind standard deviation of 30° and stability class 3 (slightly unstable);
- No background ambient concentrations pollutants;
- No dissociative conversion of ambient NOx to NO_2;
- Assumed use of peak PM (afternoon) traffic flow;
- Vehicles assumed as cars (40%), buses and minibuses (30%) and trucks (30%) as per traffic survey; and
- Model receptors located across 100 m either side of road link mid-point.

Traffic flow modelling for the main Kampala-Jinja road was conducted by URS Scott Wilson in 2011. This data will be used to predict air quality impacts for corresponding sections of the Kampala-Jinja Mainline Expressway, using assumed vehicle percentages, and provided traffic data for each section as summarised in Table 10-4.

Table 10-4 Traffic Flow modelling for Kampala-Jinja road (URS Scott Wilson 2011)

Kampala-Jinja Road Link	Traffic Flow 2010		With Expressway	
	AM Peak Traffic	PM Peak Traffic	AM Peak Traffic	PM Peak Traffic
UMA to Nakawa Junction	3137	3983	4698	5424
Nakawa Junction to Ntinda Junction	3487	2534	4926	6251
Ntinda Junction to Kyambogo	2734	2432	6698	6134
Kyambogo to Kireka	2387	1752	2335	2188
Kireka to Bweyogerere	2896	3945	2298	2952
Bweyogerere to Namanve	3321	3093	1750	2169
Namanve to Seeta	3303	2336	1844	1189
Seeta to Mukono	2831	3116	971	1075
Mukono to Katosi Road	2387	2251	1498	1226
Katosi Road to Mbalala	797	704	455	410
Mbalala to Namagunga	371	499	25	23

10.1.4.2 COPERT Street Level

COPERT Street Level (v.2.3) is a modelling program created by Emisia SA, which is used to calculate the mass of hot exhaust emissions produced by road traffic per hour on the expressway. The direct hot exhaust emissions are modelled linearly per segment, and include CO, CO2, NOx, PM and VOCs.

The COPERT Street Level models are based on several parameters, including:

- Vehicle volume (based on traffic models produced by URS Scott Wilson, 2011);
- Segment length (500m);
- Vehicle speed (expected average traffic speed of 80km/h);
- Vehicle fleet age and size*;
- Vehicle type distributions (passenger cars, light commercial vehicles, trucks, buses and motorcycles);
- Fuel type distributions per vehicle type (unleaded petrol and diesel);
- Fuel technology; and
- Passenger Car Unit (PCU) weights.

***The vehicle fleet data of Cyprus was used as the baseline vehicle population for the program, as the age and size of its vehicle fleet is comparable to Uganda's vehicle fleet (see Section 12.1.2 for further details).**

The estimated traffic flows for Option 4 of the expressway alignment modelled by URS Scott Wilson in 2011 are used to calculate the hourly mass of the hot exhaust emissions produced by both roads. The data of Option 4 of the traffic flow study has been partially adapted to account for the changes in the new alignment of the Kampala-Jinja Expressway.

10.1.5 Sensitive Receptors

UNRA (2016) identified environmentally sensitive areas associated with the development of the Kampala-Jinja Mainline Expressway and Kampala Southern Bypass as summarised in Table 10-5 and Table 10-6. To assess

emission impacts in the air quality models, receptors were placed at 10 m intervals across 100 m either side of the mid-point of each road link.

Table 10-5 Mainline Expressway Phase 1 road sections

Name	Road Link	Section	Distance (km)	Lanes	Notes/ impacted area
KJXEP1	UMA to Nakawa Junction/Ntinda Junction	Start to Butabika Interchange	7.3	4-lane	Kampala city, Kinawataka swamp, flyover at Kyambogo. Increased traffic.
KJEXP2	Ntinda Junction to Kyambogo				
KJEXP3	Kyambogo to Kireka				
KJEXP4	Kireka to Butabika Interchange				
KJEXP5	Butabika to Namilyango	Butabika Interchange to Mukono South	14.6	3-lane	Kayobe swamp and virgin land area
KJEXP6	Namilyango to Mukono South				
KJEXP7	Mukono/Katosi Road to Mbalala	Mukono South to Namagunga	11.2	2-lane	Kasenge Forest and River Sezibwa. Flora and fauna.
KJEXP8	Mbalala to Namagunga Junction				

Table 10-6 Kampala Southern Bypass road sections

Name	Road Link	Distance (km)	Lanes	Notes/ impacted area
KSB1	Butabika to Portbell Road	4.3	2-lane	Mutungo Hill & Kinawataka wetland
KSB2	Portbell Road to Gaba Road	6.9	3-lane	Bukasa Hill and Nakivibo wetland
KSB3	Gaba Road to Lukuli Road	1.0	2-lane	Kasanga wetland
KSB4	Lukuli Road to Salama Road	1.7	2-lane	Makindye Hill cut
KSB5	Salama Road to End	3.9	2-lane	Floodplain with viaduct

10.1.6 Baseline Monitoring for ESIA

As outlined in Section 10.2.2, baseline monitoring data was available for numerous sites along the alignment previously monitored by UNRA (2014). Data from long term hourly monitoring of Particulate Matter PM2.5 is also available from the US Embassy in Kampala, which is located approximately 3 km from the Phase 1 section of the Mainline Expressway.

To supplement this existing data, field monitoring was conducted by Earth Systems/Atacama in March 2018 at three sites along the Mainline Expressway Phase 1 section of the alignment (Table 10-7). Monitoring sites were set up in consideration of access limitations and security. Monitoring was conducted using the following portable instrument:

- Aeroqual S500 handheld portable gas monitor with swappable heads for SO_2, NO_2, CO and O_3

Gases were monitored at high resolution for a period of 30 minutes, six times for each site (twice in morning and twice in consecutive afternoons). Locations for baseline monitoring are summarised in Table 10-7 and Figure 10-1.

Table 10-7 Receptor locations for baseline monitoring (2018)

Location ID	Receptor Locations	UTM Coordinates X	UTM Coordinates Y
KJEP1-1	Hilton High School	36065	473901
KJEP1-2	Kyawambgo	38159	475447
KJEP1-3	Sezibwa Falls	39345	484685

UTM: WGS 84, UTM Zone 36N

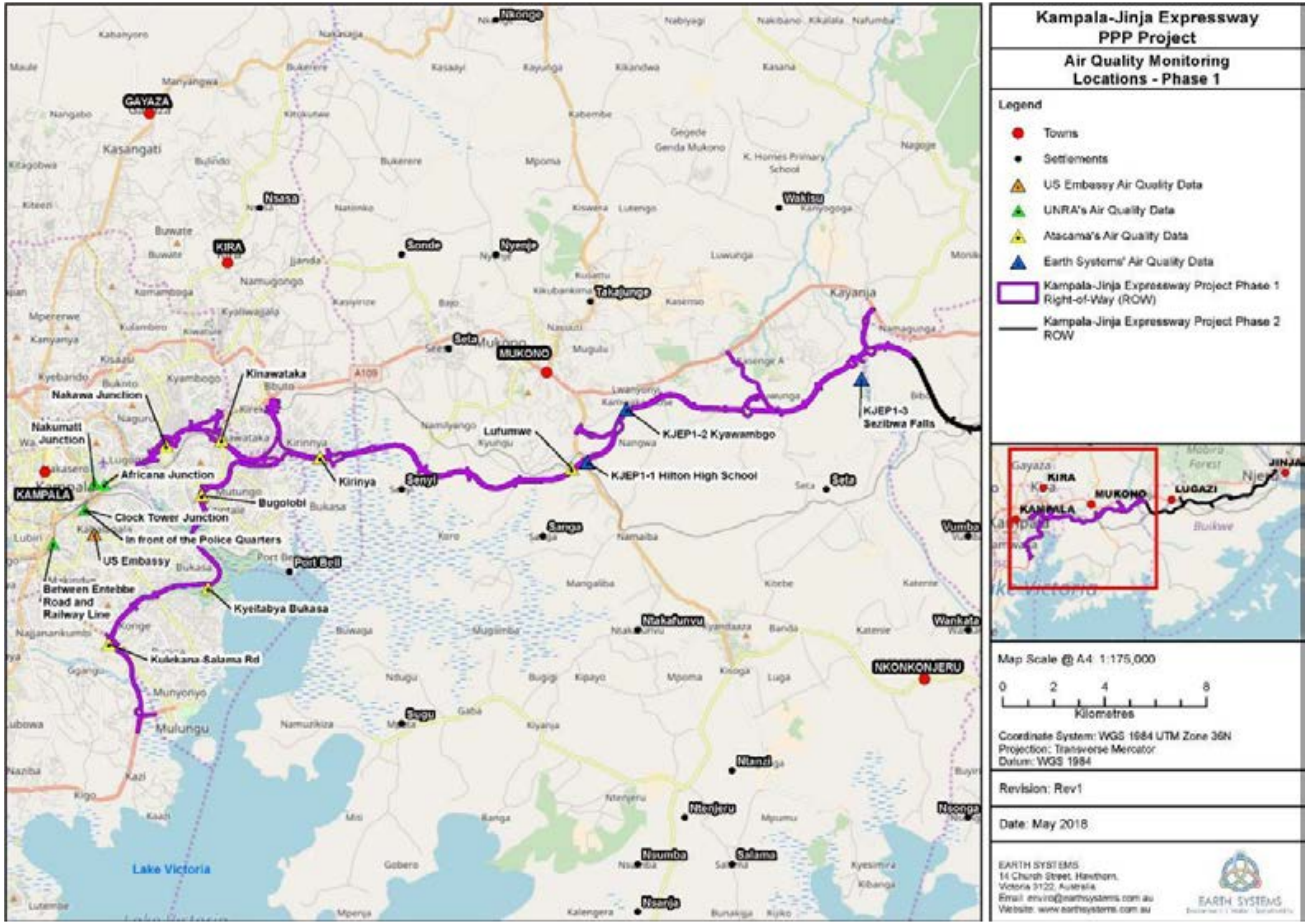


Figure 10-1 Air Quality Monitoring Locations – Phase 1

10.2 Baseline Conditions

10.2.1 Local Meteorology

Fluctuations in local weather can lead to either improved or declined air quality conditions. For example, calm conditions can result in poor air quality, while stronger winds can carry particulate matter and other emissions for longer distances, resulting in lower emissions concentrations at the source, but may therefore also affect a greater number of people further downwind. Rainfall can improve air quality by washing out particulates, but it may also decrease environmental quality by mixing with traffic emissions and producing acid rain. Therefore, to understand the impact of road construction and operation pollution, it is important to have a primary understanding of the baseline meteorological conditions of the local area.

The Uganda National Meteorological Authority (formerly Ugandan Department of Meteorology) has several meteorological monitoring stations in the Project region. Meteorological data from the following were used to demonstrate the meteorological conditions in the Project area (Table 10-8).

Table 10-8 Historical Meteorological data

Location	Data	Period	Data Source
Entebbe Airport	Mean rainfall, temperature, humidity, windspeed	1896-2000, 2012-2016	KNMI, Weatherbase
Kampala City	Mean rainfall, temperature, humidity, windspeed	1912-1992	KNMI, Weatherbase
Mukono	Mean rainfall, temperature, humidity, windspeed	1940-1985	KNMI, Weatherbase
Lugazi	Mean rainfall, temperature, humidity, windspeed	1900-2012	Weatherbase
Jinja	Mean rainfall, temperature, humidity, windspeed	1902-1992	KNMI, Weatherbase

10.2.1.1 Rainfall

Kampala borders Lake Victoria, which at 1134 m lies in a shallow basin between the eastern and western highlands of East Africa, a major orographic rainfall and pressure feature known as the Lake Victoria trough. Due to rapid cooling at night-time, this low-pressure feature produces pronounced nocturnal rainfall around the lake and the surrounding Kampala district.

Generally, Kampala and surrounding districts receive high and regular rainfall throughout the year, with January-February being drier than other months and rainfall highest in April. Annual rainfall is between 1750 mm and 2000 mm with an annual mean of 1212 mm in Kampala (weatherbase.com). Maximum 24-hour daily rainfall recorded at Entebbe over the last 30 years was 100.5 mm (ICS 2015).

10.2.1.2 Temperature

The Project area has high temperatures and a low mean annual range of only 2.4°C compared to the tropical savannah climate. Strong lake breezes, cloudiness and rainfall maintain Kampala's pleasant climate. The maximum and minimum temperatures recorded temperatures at Jinja are 36°C and 12°C respectively. Figure 10-2 shows that in-land locations of Mukono and Lugazi are approximately 1.5°C warmer than Kampala, being located further from the lake front.

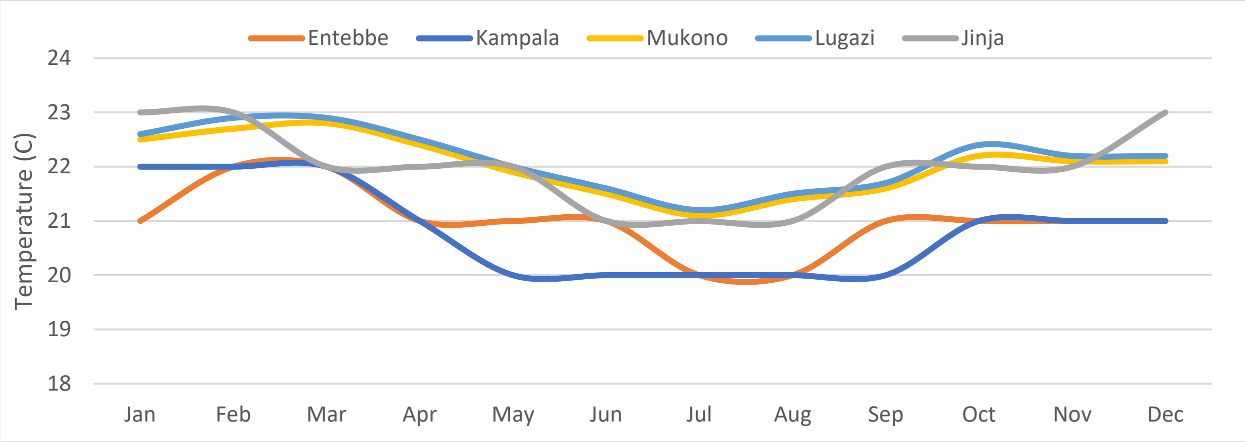


Figure 10-2 Monthly mean temperature in the Project are (adapted from Weatherbase.com)

10.2.1.3 Wind

The key characteristics of the wind field in the Project area are as follows:

- The prevailing annual wind field are lake breezes from the south;
- Mean wind speeds in Kampala are 3 m/s with gusts up to 20 m/s;
- The prevailing wind field during the height of the monsoonal wet season (March-May) is characterised by winds from the south-east;
- The prevailing wind field during the height of the second monsoonal wet season (September-November) is characterised by winds from the north-east;
- Northerly winds can be present in the afternoons which lead to potential fumigation conditions; and
- Wind speed is highest during the February and March dry period, when damaging gales can be present.

10.2.2 Ambient Air Quality

The Project area ranges from the highly-populated Kampala city to rural areas near Njeru. The current alignment traverses densely populated areas in and around Kampala and Wakiso Districts, including several informal settlements. Heading east from Kampala, the land use varies from agricultural land, sugarcane plantations, aquaculture and forest land, among others. Several existing and proposed business parks, industrial areas, markets and small to large independent businesses are also present along the alignment. Ambient air quality conditions therefore reflect both anthropogenic and natural sources in these areas. Naturally occurring particulates include dust, smoke particles, pollen grains and fungal spores.

Smoke due to burning activities regionally can be a major source of particulates. There has been a steady increase in the use of wood fuel in informal settlements, due to lack of other sources. Wood fuel is used by approximately 75% of households, 10% of commercial establishments and 5% of industry. Charcoal production meets 10% of Kampala's energy needs (World Bank 2015). Dust from unpaved roads also contributes to the prevailing air quality (World Bank 2015).

There is no established national ambient air quality monitoring network across Uganda, where air quality has been deteriorating with rapid economic development (Schwander 2014), although monitoring does occur at the US Embassy in Kampala (Figure 10-3). A large proportion of imported vehicles are old and re-conditioned coupled with the fact that they are poorly maintained (particularly taxis and small minibuses (matatus) (Kiggundu 2015)) and this results in a high degree of emissions. Another key contributor of emissions are the many motorcycles commonly known as boda-bodas (two stroke engines) whose fuel combustion efficiency is low (UNRA 2014).

The national economic strategy has also led to the growth of the industrial and manufacturing sectors within the city. There is a major industrial emission source at Mukwano industries which use a mixture of wood chips and coffee husks as fuel for the boiler. The factory mainly produces refined vegetable cooking oil from crude palm oil (UNRA 2014). In addition to the increasing road traffic and unregulated industrial emissions, unofficial waste burning to manage uncollected waste also contributes to the deterioration of air quality in Kampala (Schwander *et al.*, 2014). However, long-term data on air pollution in Uganda is limited (Kirenga *et al.,* 2015). An assessment of ambient particulate concentrations based on a review of relevant literature are listed in Table 10-9.

Table 10-9 Ambient particulates in Uganda (adapted from Schwander et al 2014, Kirenga et al 2015)

Location	Particulate Matter PM_{10} ug/m³	Particulate Matter $PM_{2.5}$ ug/m³	Maximum $PM_{2.5}$ ug/m³
Kampala Industrial area	-	156	384
Residential unpaved roads	-	153	535
Residential paved roads	-	88	254
Commercial areas	-	109	298
Mpererwe Neighbourhood, Kampala	170	104	-
WHO 24-hour Guideline	50	25	25

Hourly monitoring of Particulate Matter PM2.5 occurs at the US Embassy in Kampala, which is located approximately 3 km from the Phase 1 section of the Mainline Expressway. PM2.5 is not included in the draft Ugandan Air Quality Standards, but is an important indicator of air quality as signified by its inclusion in the WHO Air Quality Guidelines. For the period February 2017-January 2018, the PM2.5 Kampala dataset shows the following;

- Maximum PM2.5 was recorded at 407 µg/m3;
- Mean PM2.5 was 54 µg/m3 – over twice the WHO PM2.5 Guideline 25µg/m3;
- Maximum monthly PM2.5 concentrations are in December, February and July (dry season):
- Minimum monthly PM2.5 concentrations are in May (wet season); and
- PM2.5 concentrations peak at 8 am in the morning and 10 pm in the evening.

Annual and diurnal variation of PM2.5 are summarised in Figure 10-3 and Figure 10-4 (data from airnow.gov).

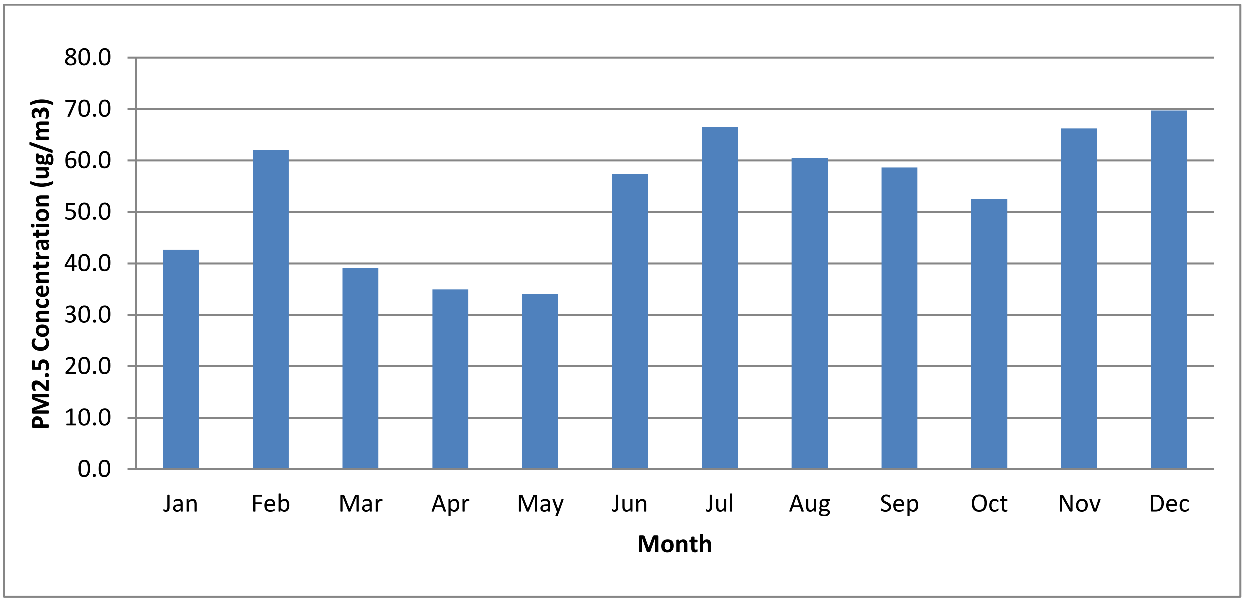


Figure 10-3 Monthly Mean Particulate Matter $PM_{2.5}$ at US Embassy Kampala, February 2017-January 2018

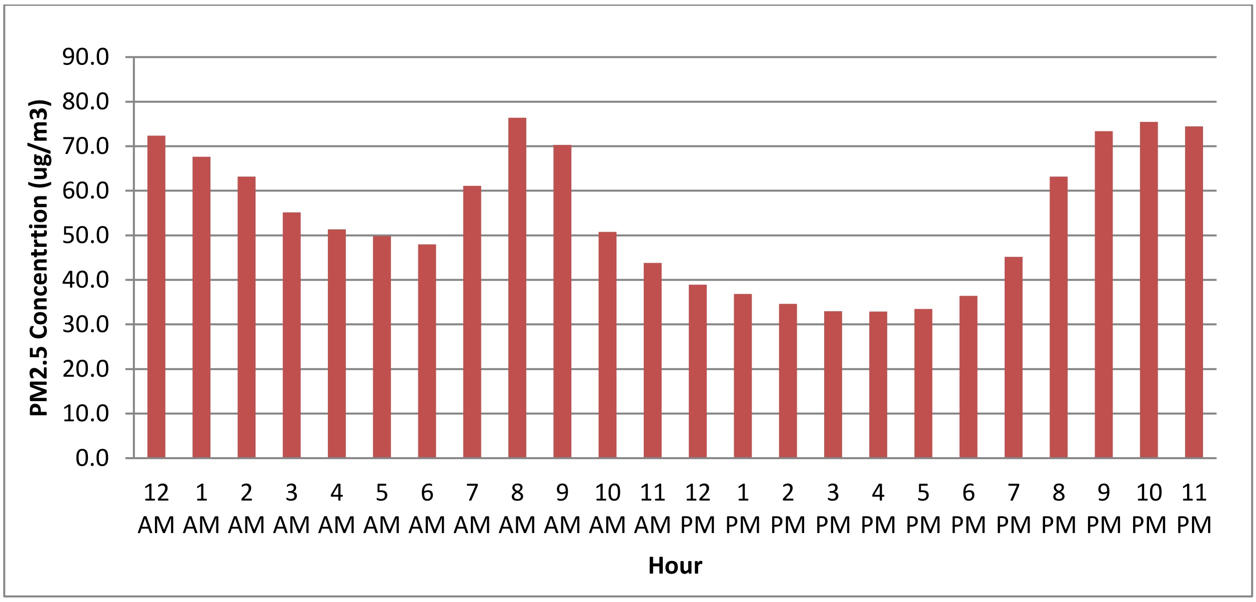


Figure 10-4 Hourly Mean Particulate Matter $PM_{2.5}$ at US Embassy Kampala, February 2017-January 2018

The key gases of concern with respect to potential impacts on health and the environment include:

- Sulphur dioxide (SO2): a common atmospheric pollutant derived from the combustion of fossil fuels (e.g. vehicle exhaust) and some industrial processes;
- Nitrogen oxide (NOx): a group of pollutants emitted by combustion but can also be produced by lightning (Bond et al., 2002) and by biogenic processes from tropical soils, particularly following rainfall (Vinken et al., 2014). NO2 can be formed by oxidation of NOx and explosives blasting, and is the main source of ground-level ozone and urban smog. NO2 can also be found in indoor air as a pollutant as a result household heating and cooking from biomass fuels;

- Carbon monoxide (CO): a gas produced through incomplete burning, particularly of firewood and fossil fuels. CO can be produced by open burning, cooking fires, bushfires, or poorly maintained vehicles or generators; and
- Ozone (O3): a pollutant gas associated with NOx, urban smog and biomass burning, and is naturally produced by lightning.

Air quality monitoring was conducted for three hours for each location in Kampala city by a JICA survey team on behalf of UNRA in September 2013, with maximum particulate concentrations commensurate with those measured by Schwander et al (2014) as summarised in Table 10-10 (UNRA 2014).

Table 10-10 Mean 3-hour sampled ambient air quality in Kampala in 2013 (UNRA 2014)

Location	Particulate Matter (PM10) ug/m3	Nitrogen dioxide (NO_2) ppm	Sulphur dioxide (SO_2) ug/m3
Clock Tower Junction	527.5	0.84	82.8
Between Entebbe Road and Railway	449.5	1.74	69.8
In front of Police Quarters	113.7	0.48	19.8
Nakumatt Junction	154	0.61	57.8
Hotel Africana Junction	174.8	0.7	89.7
WHO 24-hr Guideline	50	200 (1-hour)	20

The expected ambient gas concentrations used as an ambient baseline for assessment of potential Project impacts based on a review of relevant long-term sampling are listed in Table 10-11.

Table 10-11 Mean long-term sampled ambient gases in Uganda (adapted from Kirenga et al 2015)

Location	Nitrogen dioxide (NO_2) ug/m3	Nitrogen dioxide (NO_2) ppb	Sulphur dioxide (SO_2) ug/m3	Sulphur dioxide (SO_2) ppb
Residential area	18.4	11.4	3.65	1.37
Residential unpaved	20.1	11.6	2.34	0.88
Commercial Centre	32.2	16.8	3.17	1.19
Industrial area	22.7	11.8	7.31	2.74
WHO Guideline	200 (1-hour)	-	20 (24-hour)	-
Draft Ugandan Guideline	-	0.1 ppm (24-hour)	-	0.15 ppm (24-hour)

The Kirenga *et al.* (2015) study provides data on the ambient concentrations of four key air pollutants (PM2.5, NO_2, SO_2, and O_3) at various sites in Kampala and Jinja. Their study shows that high levels of particulate matter (PM) air pollution are prevalent in urban and suburban areas in Uganda, with PM2.5 concentrations above 100 µg/m^3 in multiple locations in Kampala (Table 10-9). The authors concluded that re-suspended dust and vehicular emissions are the primary sources of PM2.5 in Kampala and Jinja.

For the other pollutants in the Kirenga *et al.* (2015) study, concentrations of NO2, SO2 and O3 were below WHO guideline levels (200 µg/m^3 one-hour mean, 20 µg/m^3 24-hour mean and 100 µg/m3 eight-hour mean, respectively). The authors recognised that although their findings could not be directly compared with WHO air quality standards due to differences in averaging times, the findings were comparable to other gas phase pollutant studies in Africa (Schwela 2006, Petkova *et al.* 2013).

Monitoring of gases was also conducted at various sensitive receptors by Earth Systems/Atacama in March 2018 as summarised in Table 10-12.

Table 10-12 Gas monitoring results at sensitive receptors along Phase 1 section in March 2018 (Earth Systems/Atacama 2018)

Location Description	Carbon monoxide (CO) ug/m3	Nitrogen dioxide (NO_2) ug/m3	Sulphur dioxide (SO_2) ug/m3	Ozone (O_3) ug/m3
Hilton High School	0	94.8	17.7	10.9
Kyawambogo	0	98.5	22.9	11.1
Ssezibwa Falls	0	70.2	6.2	8.8
WHO Guideline	30,000 (1-hour)	200 (1-hour)	20 (24-hour)	100 (8-hour)
Draft Uganda Guideline	9 ppm (8-hour)	0.1 ppm (24-hour)	0.15 ppm (24-hour)	-

Gases were monitored for 30 minutes each morning and afternoon to provide an indication of daily mean.

- CO was not detected at any of the sites;
- NO_2 was detected at all sites at mean ambient concentrations below the WHO NO2 guideline;
- SO_2 was detected at all sites, with mean SO_2 concentrations exceeding the WHO 24-hour-average guideline at Kyawambogo, the SO_2 likely associated with diesel combustion from passing vehicles; and
- O_3 was detected at low ambient concentrations.

Existing vehicle emissions (SO_2, NOx, CO) and dust particulates from nearby roads are a primary factor affecting air quality in the vicinity of the Project. Windblown dust and burning of vegetation in the dry season also impacts on air quality in the Project area, which results in enhanced particulate concentrations from smoke and ash, above health criterion levels. Baseline particulate concentrations in the wet season are anticipated to be generally lower due to natural suppression by the regular rainfall and the reduced amount of biomass burning during this period.

10.3 Impact Assessment

The principal air emissions from the Project are anticipated to include Particulate Matter PM, NOx, SO_2 and CO. Other potential emissions include volatile organic compounds (VOCs) from fuels, laying of bituminous surface and other hydrocarbons. The expected emission sources for each stage of Project development are outlined below, and management measures with respect to each type of emission are provided in the following sections.

10.3.1 Pre-Construction

No significant air quality impacts are expected to occur during the Pre-Construction Phase as no major activities with air emissions will occur for the Project during this phase.

10.3.2 Construction

Sources of air quality impacts from the Project during construction are expected to include:

- Dust and vehicle exhaust emissions at construction sites;
- Emissions from power generation at work sites;
- Laying of bituminous surface (potential for (VOCs);

- Smoke from burning of cleared vegetation and wastes (if conducted); and
- Vehicle exhaust emissions from transport of construction materials and equipment.

The potential for greenhouse gas generation from the Project, and associated mitigation measures have been discussed in Chapter 12, including measures to minimise emissions from Project transportation.

The primary issue for air quality during construction is expected to be related to dust emissions from construction areas. Dust emissions from vehicles during construction of the Project roads were estimated using emission factors based on vehicle kilometres travelled (VKT) from the Australian National Pollutant Inventory (NPI 1999) and mitigation from the Western Region Air Partnership (WRAP 2006).

$$\text{Emission factor} = VKT \times [k \times (S/12)0.8 \times (AW/3)0.5 \times (M/0.2)0.4]$$

where VKT is vehicle kilometres travelled along roadway, k is an empirical factor for unpaved roads, S is silt content (= 6.4% for gravel or 11% for dirt), AW is average weight of vehicles, and M is the moisture content of silt.

Table 10-13 Particulate emission sources for Project Road construction per year (model estimate inputs)

Vehicle	TSP (kg/VKT)	PM_{10} (kg/VKT)	$PM_{2.5}$ (kg/VKT)	KJEXP VKT (km)	KSB VKT (km)
Grader	9.34	1.91	1.01	33	18
Roller	3.13	0.80	0.42	33	18
Dozer/Excavator	4.88	1.14	0.60	33	18
Utility vehicles	1.78	0.51	0.27	12,045	6,205
Haul Truck	8.14	1.71	0.91	12,045	6,205
Water Truck	3.80	0.93	0.49	33	18
Fuel Truck	7.51	1.61	0.85	1,721	52

Adapted from NPI (1999) and WRAP (2006).

10.3.2.1 Mainline Expressway Phase 1

The dispersal of dust emissions due to road construction will be dependent on factors such as the prevailing wind conditions and rainfall. Up to 90% of construction road dust typically impacts within 50 m of the road (Watson and Chow, 2000, WRAP 2006). Figure 10-5 summarises the estimated annual emissions (per km) from construction of the Mainline Expressway Phase 1. This estimation assumes an unpaved silt surface, road length of 33 km for Phase 1, and a typical construction fleet. Construction of the mainline expressway is anticipated to take less than three years (UNRA 2017).

The health impacts of construction road dust on nearby residents and workers depend greatly on the amount and size of the dust particles. Depending on the composition, visible particles can be inhaled without any health impacts. However, high levels of large suspended particles reduce visibility significantly, and may therefore become a safety hazard. Fine particle exposure (PM_{10}) may lead to short-term health impacts, including respiratory symptoms such as irritation of the lung way (Fann et al., 2016)

It can be seen in Figure 10-5 that the annual Total Suspended Particulates is reduced greatly with the use of a wetted surface or the addition of chemical surfactants (e.g. chloride solutions). These mitigation measures would greatly reduce the short-term near-field health impacts mentioned above, and thus should be employed to ensure the Air Quality Guideline (AQG) levels are not exceeded.

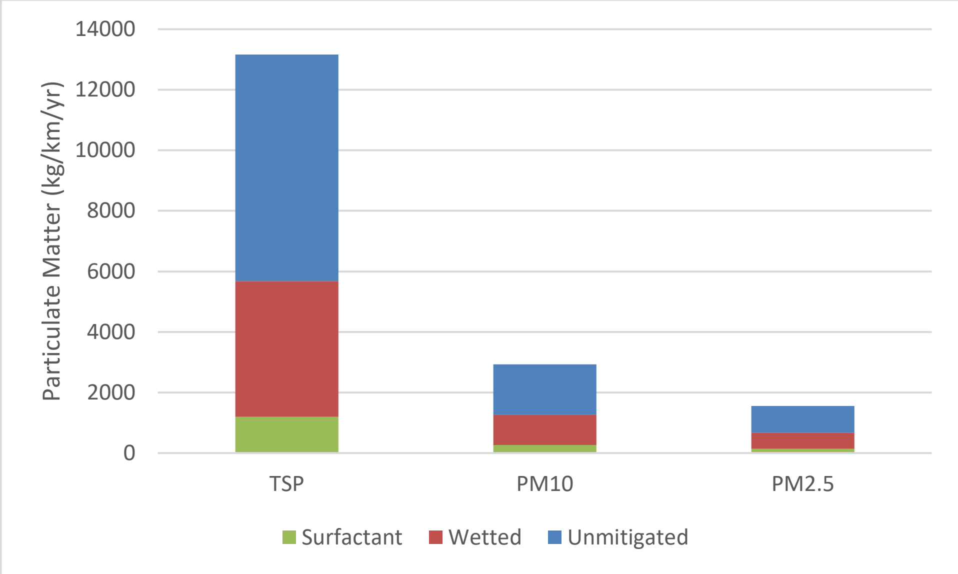


Figure 10-5 Estimated annual particulate emissions (per km) associated with construction traffic on Mainline Expressway Phase 1

10.3.2.2 Kampala Southern Bypass

Estimated construction emissions from the Kampala Southern Bypass (KSB) are summarised in Figure 10-6. This estimation assumes an unpaved silt surface, road length of 18 km, and a typical construction fleet. The results show an expected 50% lower amount in annual emissions during its two-year construction period when compared with the Mainline Expressway, due to its relative smaller size (UNRA 2017).

This indicates that the health impacts of particulates throughout construction will be limited. However, due to the road's close location to densely populated areas, in the absence of appropriate management there is the potential for more people with lower sensitivity thresholds to be affected negatively during periods of intense construction, or when air quality conditions are poor. As mentioned earlier, measures such as wetting the surface and adding chemical surfactants (e.g. chloride solutions) will decrease the annual TSP significantly, and thus greatly reduce the health impacts of particulates on the many nearby residents and construction workers by keeping the particulate levels below or near the WHO air quality guidance levels.

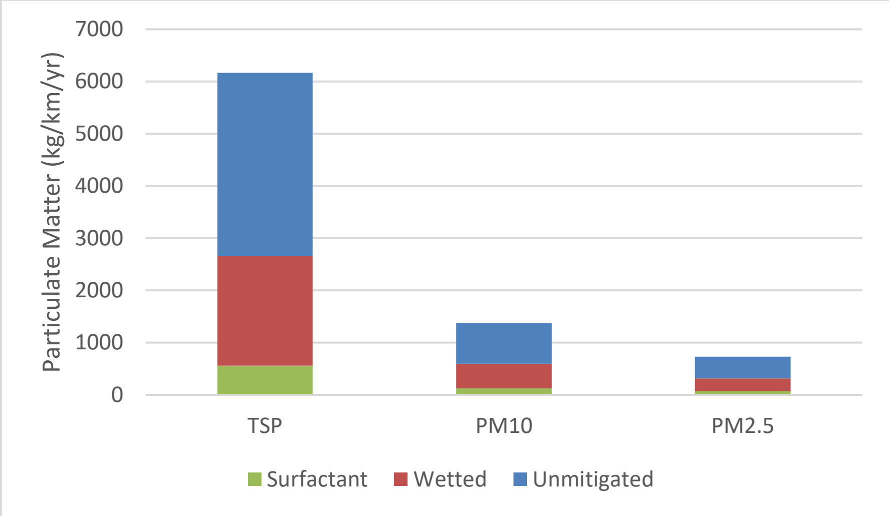


Figure 10-6 Estimated annual particulate emissions (per km) associated with construction traffic on Kampala Southern Bypass

10.3.3 Operation

During Operations, the primary air quality issue for the Project is expected to be vehicle emissions from road users. Vehicle emissions from the Project during operations were modelled using the CALINE4 traffic model for following;

- Vehicles emissions from trucks, buses, and cars;
- Assumed peak operation hours for worst-case emissions;
- Prevailing southerly (lake breeze) wind direction;
- US EPA recommended low wind speed 1 m/s; and
- Maximum roadside concentrations of CO, NO_2 and PM.

Operational emissions consist of vehicle exhaust emissions that impact near-field air quality where sensitive residential and ecological receptors are located. There is potential of underestimation of exhaust emissions due to age and efficiency of vehicles in Uganda. Note that model simulations do not include assumed ambient background, which is variable, to isolate vehicle emissions only. Model predicted emission impacts during operations are summarised in the following sections.

Vehicle emission concentrations were compared to the Air Quality Guidelines created by WHO (2005) to determine the impact of air pollution on health. The emissions concentrations and their health impacts are outlined in Table 10-14 below.

Table 10-14 WHO Air Quality Guidelines and health impacts

Emissions type	Time frame	Concentration	Interim target	Health impact
Particulate Matter (PM2.5 guideline values are preferred)	24-hour	25 ug/m^3	Air Quality Guideline (AQG)	No impact
		37.5 ug/m^3	Interim target-3 (IT-3)	1.2% increase in short-term mortality
		50 ug/m^3	Interim target-2 (IT-2)	2.5% increase in short-term mortality
		75 ug/m^3	Interim target-1 (IT-1)	5% increase in short-term mortality

Emissions type	Time frame	Concentration	Interim target	Health impact
	Annual	10 ug/m^3	Air Quality Guideline (AQG)	No impact
		15 ug/m^3	Interim target-3 (IT-3)	3% increase in mortality risk
		25 ug/m^3	Interim target-2 (IT-2)	9% increase in premature mortality risk
		35 ug/m^3	Interim target-1 (IT-1)	15% increase in long-term mortality risk
Nitrogen dioxide	1-hour	0.0987 ppm or 200 ug/m^3	Air Quality Guideline (AQG)	Lower concentrations may lead to respiratory symptoms among infants.
	Annual	0.0197 ppm or 40 ug/m^3	Air Quality Guideline (AQG)	Greater concentrations may lead to an increase in bronchitic symptoms of asthmatic children, as well reduced lung function growth in children.

Adapted from WHO (2005)

10.3.3.1 Kampala-Namagunga Road

To examine the potential impact of the Kampala-Namagunga section of the current Kampala-Jinja Road, the CALINE4 model was employed to predict the 1-hour concentrations of CO, NO_2 and Particulate Matter (PM) using the latest 2017 traffic flows for each road link section as summarised in Table 10-15.

Table 10-15 Summary of maximum predicted 1-hr concentrations from current Kampala-Namagunga Road

Name	Link section	CO ppm	NO_2 ppm	PM ug/m^3	Impact
KJRD1	UMA Show ground (Lugogo) to Nakawa /Ntinda Junction	1.2	0.04	28.6	Medium
KJRD2	Ntinda Junction to Kyambogo	0.7	0.02	16.8	Low
KJRD3	Kyambogo to Kireka	0.4	0.01	11.4	Low
KJRD4	Kireka to Bweyogerere	0.4	0.02	13.4	Low
KJRD5	Bweyogerere to Namanve	0.8	0.02	21.2	Medium
KJRD6	Namanve to Seeta	0.7	0.03	16.5	Low
KJRD7	Seeta to Mukono	1.0	0.03	24.7	Medium
KJRD8	Mukono to Katosi Road	0.9	0.03	21.2	Medium
KJRD9	Katosi Road to Mbalala	0.2	0.01	6.0	Low

Name	Link section	CO ppm	NO_2 ppm	PM ug/m^3	Impact
KJRD10	Mbalala to Namagunga	0.2	0.01	5.3	Low
	WHO Air Quality Guideline	-	0.1 (1-hr)	50 (24-hour)	
	Draft Ugandan Guideline	9 (8-hr)	0.1 (24-hr)	-	

The model simulations of the current Kampala-Namagunga Road predict the following:

- Maximum concentrations are lower than with the Expressway due to lower maximum traffic flows;
- Predicted concentrations do not exceed WHO/IFC or Ugandan air quality guidelines, which means that nearby residents and road users are unlikely to be affected in the short-term and long-term regarding their health;
- Predicted concentrations are higher for the Seeta to Mukono sections compared with the Mainline Expressway;
- Pollutants remain present throughout the length of the Kampala-Namagunga road, whereas pollutant concentrations on the Mainline Expressway fall more sharply with distance from Kampala city;
- Rural sections and roadside populations are more likely to be impacted on the current Kampala-Namagunga Road compared to the predictions for the Mainline Expressway;
- Cumulative dust deposition is a likely to impact the section between Kampala and Mbalala.

10.3.3.2 Mainline Expressway Phase 1

To examine the potential impact of the Mainline Expressway Phase 1, CALINE4 and COPERT model simulations were conducted for corresponding road traffic road links on the Expressway. However, it should be noted that potential cumulative concentrations from the Kampala Southern Bypass were not included in the model simulations. The CALINE4 1-hour concentration predictions are shown in Table 10-16, and emissions forecasts for the years 2027 and 2037 are shown in Figure 10-7 and Figure 10-8, respectively.

Table 10-16 Summary of maximum predicted 1-hr concentrations from Mainline Expressway Phase 1

Name	Link section	CO ppm	NO_2 ppm	PM ug/m^3	Impact
KJEXP1	UMA Show ground (Lugogo) to Nakawa Ntinda Junction	1.5	0.05	38.3	Medium
KJEXP2	Ntinda Junction to Kyambogo	1.6	0.05	41.4	Medium
KJEXP3	Kyambogo to Kireka	0.6	0.02	14.5	Low
KJEXP4	Kireka to Butabika Interchange	0.8	0.03	19.5	Low
KJEXP5	Butabika to Namilyango	0.6	0.02	6.4	Low
KJEXP6	Namilyango to Mukono South	0.3	0.01	6.5	Low
KJEXP7	Mukono South to Mbalala	0.1	<0.01	2.9	Negligible
KJEXP8	Mbalala to Namagunga Jnc	<0.1	<0.01	0.2	Negligible

Name	Link section	CO ppm	NO_2 ppm	PM ug/m^3	Impact
	WHO Air Quality Guideline	-	0.1 (1-hr)	50 (24-hour)	
	Draft Ugandan Guideline	9 (8-hr)	0.1 (24-hr)	-	

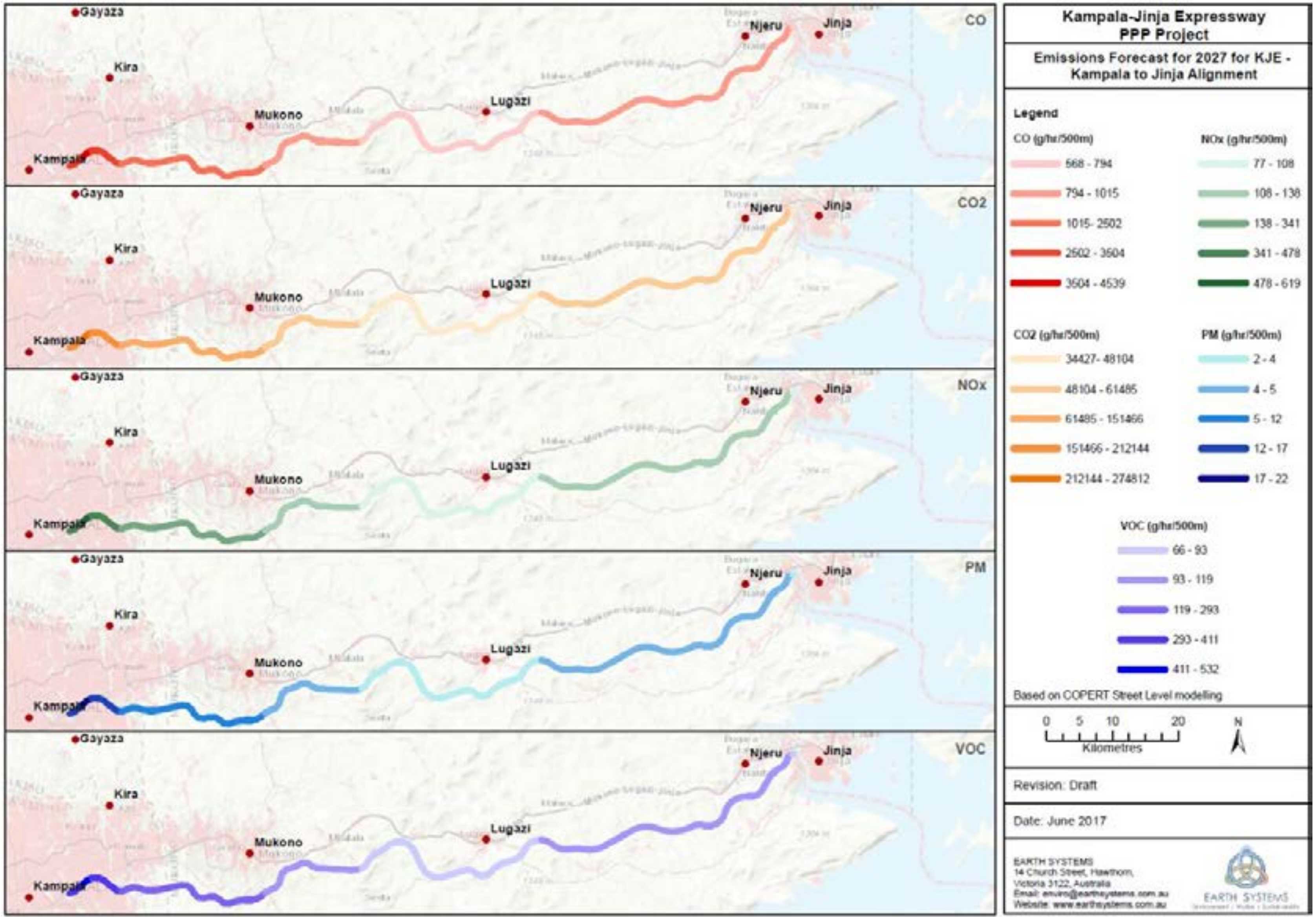


Figure 10-7 Emissions forecast for the Kampala-Jinja Mainline Expressway in 2027

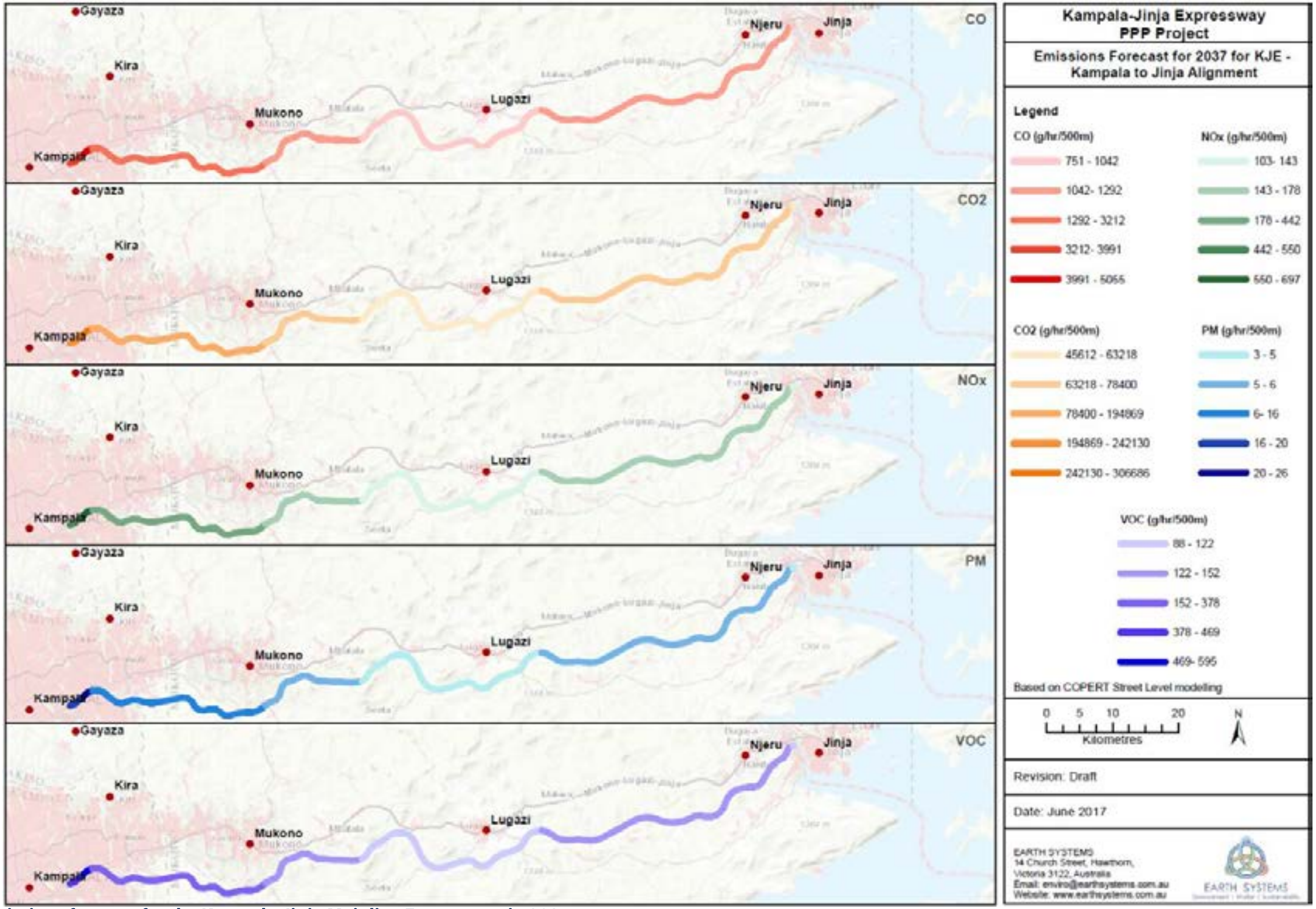


Figure 10-8 Emissions forecast for the Kampala-Jinja Mainline Expressway in 2037

The results of the models of the Mainline Expressway Phase 1 indicated the following:

- Calculated air pollutants, CO, NO_2 and particulate matter (PM_{10}) are not predicted to exceed WHO air quality guidelines;
- The predicted particulate matter emission concentrations do not exceed the WHO guidelines for PM_{10}, however, if assuming all particulates were fine particulates $PM_{2.5}$, they do exceed the $PM_{2.5}$ guidelines between UMA Show ground (in Lugogo) and Kyambogo, which could potentially result in increased health risk in this area in the absence of appropriate management;
- Maximum concentrations were predicted at the dispersion peak located typically within 30 m of the roadside due to the total width of the highway, which means that both commercial and sidewalk receptors would be impacted;
- The section of Mainline Expressway Phase 1 between Kyambogo to Namagunga junction is not predicted to exceed NO_2, $PM_{2.5}$ and PM_{10} guidelines, and therefore no significant adverse health impacts are expected;
- Elevated flyovers will disperse vehicle emissions over a greater distance at a lower concentration;
- All sections of the Mainline Expressway Phase 1 could cause community health concerns during poor ambient air quality conditions, such as calm conditions and high background smoke or haze;
- Due to the general east-west alignment of the Mainline Expressway Phase 1 sections relative to the prevailing southerly wind, the model-predicted concentrations displayed a bias for higher concentrations of pollutants for receptors northwards of the expressway;
- Low wind speeds would represent worst-case atmospheric conditions in combination with high ambient pollutant background. Typical wind speeds in the Project area (approximately 3 m/s) would increase dispersion and reduce predicted pollutant concentrations; and
- Ecosystems located next to or near the Mainline Expressway Phase 1, such as the Kinawataka Swamp, will be primarily affected by wind-blown cumulative particulate matter, which can deposit on surfaces and foliage affecting vegetation.

Benefits of the Mainline Expressway Phase 1 include reduced traffic congestion relative to the Kampala-Namagunga section of the expressway, decreased transit times and improvement of local air quality to the community.

10.3.3.3 Kampala Southern Bypass

The Kampala Southern Bypass was divided into five section links, as highlighted by UNRA (2016). Assuming maximum peak traffic of between 2400 vehicles per hour at Butabika Interchange, reducing to 1600 vehicles per hour at Salama Road, the following are predicted (Table 10-17).

Table 10-17 Summary of predicted 1-hr concentrations from Kampala Southern Bypass

Name	Link section	CO ppm	NO_2 ppm	PM ug/m^3	Impact
KSB1	Butabika to Portbell Road	0.9	0.03	19.4	Low
KSB2	Portbell Road to Gaba Road	0.9	0.03	26.0	Medium
KSB3	Gaba Road to Lukuli Road	0.7	0.02	15.6	Low
KSB4	Lukuli Road to Salama Road	0.7	0.02	14.3	Low

Name	Link section	CO ppm	NO_2 ppm	PM ug/m^3	Impact
KSB5	Salama Road to End	0.9	0.04	33.3	Medium
	WHO Air Quality Guideline	-	0.1 (1-hr)	50 (24-hour)	
	Draft Ugandan Guideline	9 (8-hr)	0.1 (24-hr)	-	

The CALINE4 models of the Kampala Southern Bypass predicted the following;

- Impacts are not symmetrical, but typically higher on the north side due to the prevailing southerly lake breeze;
- Maximum concentrations occur within 10 m of roadway, but can extend up to 100 m from the roadside;
- KSB Section 2 (3-lanes) has predicted emission peak further at 30 m, possibly due to width of roadway;
- Predicted impacts are relative to the angle of the highway to the southerly lake breeze;
- KSB Section 5 has highest predicted particulate matter impact, due to least angle relative to southerly wind;
- Predicted traffic flow and associated roadside concentrations of air pollutants, CO, NO_2 and particulate matter (PM) were not predicted to exceed air quality guidelines along the Bypass, although cumulative impacts from the Mainline Expressway were not included in the simulations;
- Although, the predicted particulate emission concentrations do not exceed the WHO guidelines for PM_{10}, they do exceed the $PM_{2.5}$ guidelines and therefore, a worst-case scenario may potentially result in an increase in health risks in the sections between Portbell Road to Gaba Road and Salama Road to Munyonyo Spur if not appropriately managed and mitigated. All other sections of the road are not predicted to experience any negative health impacts, unless wind and ambient air quality conditions are unfavourable; and
- The surrounding environment will be primarily affected by wind-blown cumulative particulate matter, which can deposit on surfaces and foliage affecting vegetation.

10.4 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management measures for air quality impacts (refer to Volume D). In order to minimise potential air quality impacts, a detailed Air Quality Management Plan is to be developed and implemented as part of standard operating procedures for the Project. The key management measures to be included in the Plan are listed in Table 10-18.

Table 10-18 Air Quality Avoidance, Management and Mitigation Measures and Residual Impacts and Risks

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction Phase			
Design	Consideration of design options for the reduction of traffic congestion, including:	Neutral	Negligible No impacts will occur during Project design.

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	► Automated toll charging systems; ► Availability of high-occupancy vehicle lanes, minimising grade changes; ► Design of roadway to shed water; and ► Design maintenance regimes of the road surface preserve surface characteristics (e.g. texture and roughness).		
Construction Phase			
Construction and clearing (Fugitive dust emissions)	► Disturb only the minimum area necessary for construction, or areas flagged for immediate use ► Tarps/covers to be used on trucks for all Project-related transport to avoid dust and debris on roads ► Apply water or chemical dust suppressants (e.g. chloride solutions) on exposed rock, soil and ground in construction areas ► Monitor PM10, PM2.5 and dust deposition ► Progressively rehabilitate/revegetate cleared areas as soon as practicable	Negative	Low Risk A low risk of air quality impacts at sensitive receptors due to fugitive dust emissions are expected for areas close to construction zones. Impacts are highly dependent on background air quality and local weather conditions. Where impacts occur, they are expected to be minor. In particular, WHO PM2.5 guidelines may be exceeded at several sections of each road, with maximum concentrations within 30m of the roadside.
Disposal of waste (Smoke and VOCs)	► Restrict open burning of cleared vegetation, waste and hydrocarbons – recycle, compost, re-use or remove wastes from site where available ► Hazardous waste to be disposed of according to manufacturer's specifications and be stored in sealed drums before transportation ► Separate bins for recyclable materials and implement recycling procedures ► Any burning of vegetation, if unavoidable, must be conducted at a small scale to limit smoke production	Negative	Negligible Negligible air quality impacts at sensitive receptors due to smoke and VOCs are expected if management and mitigation measures are implemented.
Quarries (Fugitive dust)	► Locate loading/dumping stations in areas sheltered from wind ► Maintain rock-handing in moist condition using water carts to prevent dust ► Prevent overloading of trucks	Negative	Low Risk Low risk of air quality impacts at sensitive receptors due to fugitive dust emissions are expected for areas close to quarries and associated transportation routes. Impacts for specific areas will be highly dependent on background air quality and local weather conditions. Where impacts occur, they are expected to be minor.
Site roads (Fugitive dust)	► All unsealed roads and trafficked areas to be watered using water carts to minimise the generation of dust – typically once per day (not use community water sources). ► Dust suppressants may be used to conserve water. ► All site roads to have edges clearly defined with marker posts or equivalent to control their locations, especially when crossing large emplacement areas.	Negative	Low Risk Low risk of air quality impacts at sensitive receptors due to fugitive dust from site roads are expected for areas directly adjacent to site roads. Impacts for specific areas will be highly dependent on background air quality and local weather conditions. Where impacts occur, they are expected to be minor.

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	► Define locations of and limit use of minor roads to local villages.		
Power generation and general equipment (PM, NOx, SO2, CO & VOCs)	► Use local electrical power where possible ► Place generators away from buildings to allow exhaust dispersion (reduce building wakes and near-source confluence) ► Source low-emission equipment where available and feasible ► Use low sulphur fuel where technically feasible ► Promote dispersion of emissions where practical	Negative	Low Risk A very low risk of air quality impacts at sensitive receptors due to emissions from equipment are expected. Impacts for specific areas will be highly dependent on background air quality and local weather conditions. If impacts occur they are expected to be minor and short term.
Laying of bituminous surface (VOCs)	► Restrict bitumen laying to daylight hours if feasible ► Inform local residents and schools of health impacts	Negative	Low Risk A very low risk of air quality impacts at sensitive receptors due to VOC from equipment are expected. Impacts for specific areas will be highly dependent on background air quality and local weather conditions. If impacts occur they are expected to be minor and short term.
Operations Phase			
Air emissions from traffic on expressway (PM, NOx, SO2, CO & VOCs, fugitive dust)	► Place highway at greater distance from sensitive receptors ► Use low emissions fuels ► Introduce/encourage use of modern, efficient vehicles ► Replace minibuses (matatus) with larger modern buses (eg; Bus Rapid Transit) ► Do not overload heavy trucks ► Maintain highway surface ► Maintain current Kampala-Jinja Road with speed limit ► Implement an air quality public liaison and complaints procedure ► Regularly monitor air quality	Negative	Moderate (Within Kampala) Moderate residual risks to sensitive receptors from traffic air emissions are expected for the Kampala region. Impacts are highly dependent on background air quality and local weather conditions. Low (Outside Kampala) Residual risks to sensitive receptors from traffic air emissions will be Low outside of the Kampala region.
Air emissions on existing Kampala-Namagunga Road	► None required (Beneficial impact)	Positive	Minor – Moderate The existence of the parallel expressway is expected to result in improvement of local air quality for the communities in areas where current traffic congestion is reduced.

10.5 Conclusions

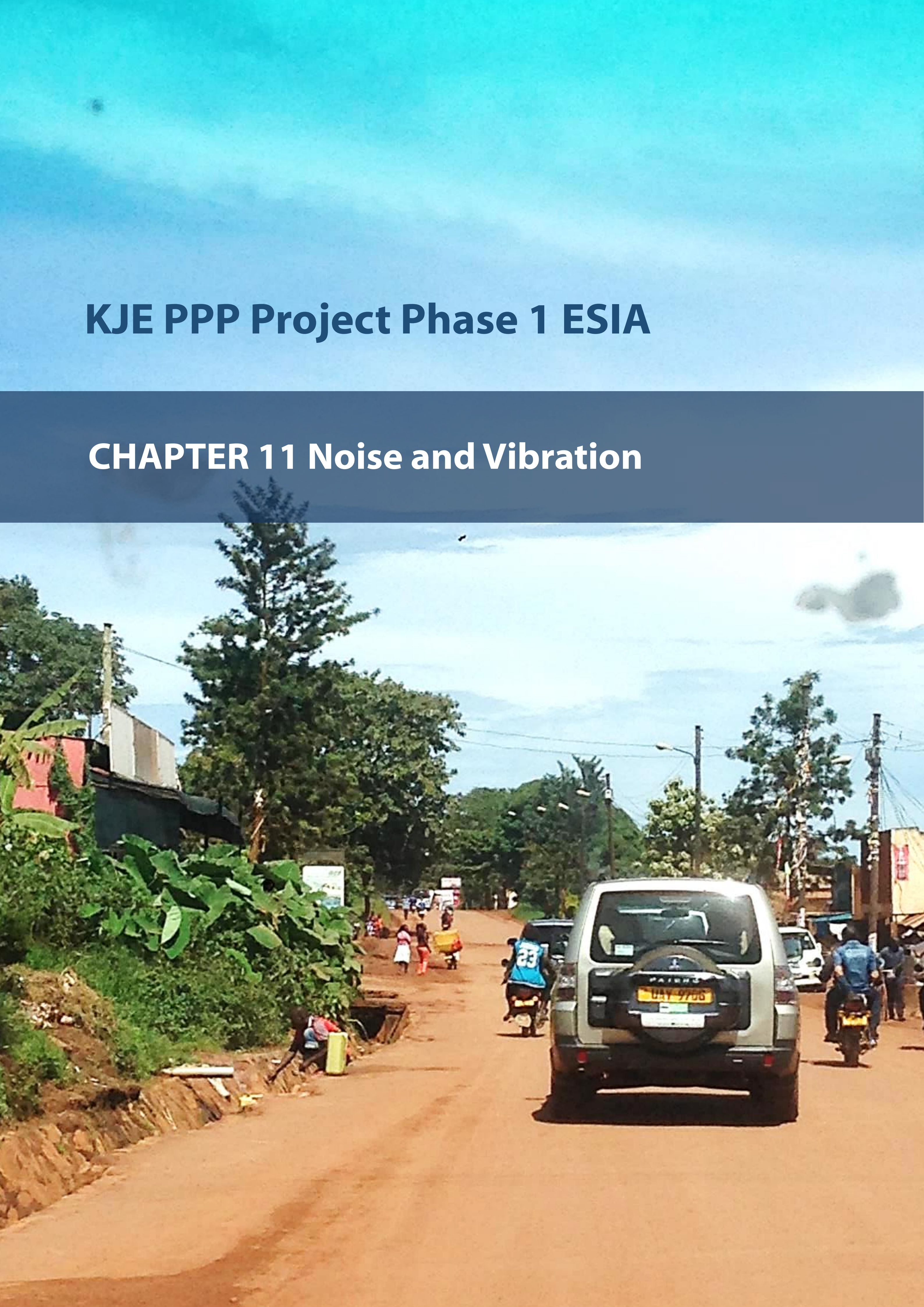
Air pollution and vehicle emissions will pose an impact throughout the construction and operation phases of the Mainline Expressway Phase 1 and Kampala Southern Bypass projects. After modelling and research, the following conclusions are made:

- No air quality impacts are expected to occur during the Pre-Construction Phase as no activities with air emissions will occur for the Project during this phase.

- During Construction, dust emissions from the unpaved road base and rock blasting at quarries may cause short-term impacts to near-field receptors;
- Estimates predict a major reduction in annual Total Suspended Particulates (TSP) and respirable particulates, by use of wetted surface or addition of chemical surfactants (e.g. chloride solutions) during construction;
- Predicted concentrations of CO, NO2 and PM10 were based on predicted traffic levels for cars, trucks and buses and do not include motorcycle;
- Maximum concentrations of CO, NO2 and PM10 were not predicted to exceed WHO or draft Ugandan air quality criteria on any section of the existing Kampala-Namagunga Road, the Mainline Expressway Phase 1 or Kampala Southern Bypass;
- Although, the predicted particulate emission concentrations do not exceed the WHO guidelines, by assuming all particulates are fine particulates, WHO PM2.5 guidelines may be exceeded at several sections of each road, where increased health risks may occur if not appropriately managed and mitigated;
- Receptor impacts were predicted to be relative to the angle of the highway to the prevailing wind, with maximum concentrations predicted within 30 m of roadside;
- Due to the general east-west alignment of the road sections relative to the prevailing southerly wind, model predicted concentrations displayed a bias for higher concentrations of pollutants for receptors located northwards of the highway. Low wind speeds would represent worst-case atmospheric conditions in combination with high ambient pollutant background;
- Minor impacts on neighbouring ecosystems and wildlife may also occur due to wind-blown cumulative particulate matter, which can deposit on surfaces and foliage affecting vegetation and impact camouflage-dependant wildlife along the road corridor;
- During Operations, benefits of the KJE Phase 1 are expected to include reduced traffic congestion on the existing Kampala- Namagunga Road, decreased transit times and improvement of local air quality to the communities in rural areas where traffic congestion is reduced; and
- Development and implementation of a detailed Air Quality Management Plan as part of standard operating procedures for the Project will ensure that the KJE Expressway Phase 1 and Kampala Southern Bypass will have a low to negligible overall impact on the health of the local residents and surrounding environment.

KJE PPP Project Phase 1 ESIA

CHAPTER 11 Noise and Vibration



11. NOISE AND VIBRATION

11.1 Study Area and Methodology

The study area for the noise and vibration assessment is comprised of the Project area, including the 33.6 km Phase 1 section of the 77km Kampala-Jinja Mainline Expressway (KJE) and the 18km Kampala Southern Bypass (KSB), with the main focus lying on several environmentally sensitive areas identified by UNRA (2016). The study area also includes a section of the existing Kampala-Jinja Road, which stretches between the UMA showgrounds at Lugogo Kampala to Namagunga.

11.1.1 Objectives

The key objectives of this assessment were to:

- Characterise existing noise and vibration conditions in the Project area;
- Provide an assessment of potential noise and vibration impacts associated with the Project;
- Provide comparison with national and international noise criteria; and
- Identify management and mitigation measures relevant to noise and vibration.

11.1.2 Overview

The noise and vibration study involved the following components:

- Overview of noise and vibration legislation;
- Assessment of ambient noise baseline for the Project area;
- Estimation of predicted quarry blasting vibrations during construction;
- Modelling of predicted noise from the Project during operations;
- Assessment of potential impacts during operations; and
- Development of management measures to mitigate potential impacts.

Noise, vibration and airblast impacts were simulated using a set of standard procedures, including the US Federal Highways TNM traffic noise screening model, US Bureau of Mines (USBM) airblast and ground vibration methods and US Department of Transportation (USBT) vehicular ground vibration method.

11.1.3 Noise Legislation

The assessment and management of potential noise impacts are based upon the following criteria:

- Uganda National Environment (Noise Standards and Control) Regulations (2003);
- IFC EH&S Guidelines for Toll Roads (2007); and
- IFC EH&S Guidelines: Noise Management (2007)

The most relevant international standards for residential and industrial operations are the guideline values provided in the IFC/WBC *EHS Guidelines – Noise Management* (World Bank, 2007), as listed in Table 10-1. Uganda provides noise guidelines from the Noise Standards and Control Regulations (2003) as listed in Table 11-2.

Table 11-1 IFC noise management guidelines (IFC 2007)

Receptor	Time of Day / LAeq 1-hr dB(A)	
	07:00 – 22:00	22:00 – 07:00
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Table 11-2 Uganda Noise Standards and Control Regulations (2003)

Facility	Time of Day / LAeq dB(A)	
	Day (6am-10pm)	Night (10pm-6am)
Any building used as a hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental or recreational sites.	45	35
Residential buildings	50	35
Mixed residential (with some commercial and entertainment)	55	45
Residential + industry or small-scale production + commerce	60	50
Industrial	70	60

Uganda also provides noise guidelines for construction sites in Table 11-3 and for vehicles on public roads (Table 11-4). Part III Section 8 (1) requires machinery operators, to use the best practicable means to ensure that the emission of noise does not exceed the permissible levels. The Regulations require that persons exposed to occupational noise exceeding 85 dB(A) for 8 hours should be provided with the requisite ear protection.

Table 11-3 Uganda Maximum Permissible Noise Levels for Construction Sites (2003)

Noise Control Zone	Time of Day / LAeq 1-hr dB(A)	
	Day (6am-10pm)	Night (10pm-6am)
Residential	60	40
Commercial	75	50
Industrial	85	65

Table 11-4 Uganda Maximum Permissible Noise Levels for Accelerating Vehicles (2003)

		dB(A)
1	Vehicles intended for carriage of passengers with not more than nine seats, including the drivers seat.	78
2	Vehicles intended for carriage of passengers, and equipped with not more than nine seats, including the drivers seat and having a permissible mass of more than 3.5 tons	
	a) with an engine power of more than 150 kW	80
	b) with an engine power of less than 150 kW	83
3	Vehicles intended for carriage of passengers, and equipped with more than nine seats, including the drivers seat: vehicles intended for carriage of goods	
	a) with a maximum permissible mass not exceeding 2 tonnes	79
	b) with a maximum permissible mass exceeding 2 tonnes, but not exceeding 3.5 tonnes	80
4	Vehicles intended for carriage of goods and having a maximum permissible mass exceeding 3.5 tonnes	

		dB(A)
	a) with an engine power of less than 75 kW	81
	b) with an engine power of not less than 75 kW, but less than 150 kW	83
	c) with an engine power of not less than 150 kW	84

11.1.4 Vibration and Airblast Guidelines

The human ear typically perceives sound in the 20-20,000 Hz (20 kHz) range. The un-weighted dB(L) – decibels "linear" is often used to describe quarry and rock blasting, where pressure across the whole sound spectrum is more appropriate; there is an audible blast with the rest of the "noise" being expressed as an inaudible low-frequency airblast wave.

There are no applicable Ugandan or international standards for vibration associated with blasting, or for human comfort level for vibration. For the purposes of this assessment, the Australian Standard (AS 2187.2 App J, 2006) based on the US Bureau of Mines USBM RI-8507 and British Standard BS 7385-2 is adopted, as summarised in Table 11-5 and Figure 10-2.

Table 11-5 Recommended blasting and airblast criteria (Australian Standards AS2187.2, 2006)

Receptor	Airblast	Ground-Vibration
Sensitive site (more than 12 months or more than 20 blasts)	115 dB(L) for 95% of blasts 120 dB(L) maximum – unless agreement with occupier that higher limit may apply	5 mm/s for 95% blasts 10 mm/s maximum - unless agreement with occupier that higher limit may apply
Sensitive site (less than 12 months or less than 20 blasts)	120 dB(L) for 95% of blasts 125 dB(L) maximum – unless agreement with occupier that higher limit may apply	10 mm/s maximum - unless agreement with occupier that higher limit may apply
Non-sensitive site (factory or commercial premises)	125 dB(L) maximum – unless agreement with occupier that higher limit may apply, Vibrations should be kept below specifications of sensitive operating equipment	25 mm/s maximum - unless agreement with occupier that higher limit may apply Vibrations should be kept below specifications of sensitive operating equipment
Structures (masonry, plaster, concrete, steel etc)	133 dB(L) maximum – unless agreement with occupier that higher limit may apply	15 mm/s - light framed structure at 4Hz 20 mm/s – light framed structure at 15 Hz 50 mm/s – light framed structure at 40 Hz 50 mm/s – reinforced structure above 4Hz
Un-occupied structures (reinforced concrete or steel construction)	–	100 mm/s maximum - unless agreement with owner that higher limit may apply
Above-ground services (pipelines, power-lines, cables)	Limit to be determined by structural design	Limit to be determined by structural design
Human discomfort level	>120 dB(L)	>4.5 mm/s
Imperceptible to humans		<0.9 mm/s

*Sensitive site = low-rise residential buildings, hospitals, schools occupied by people.

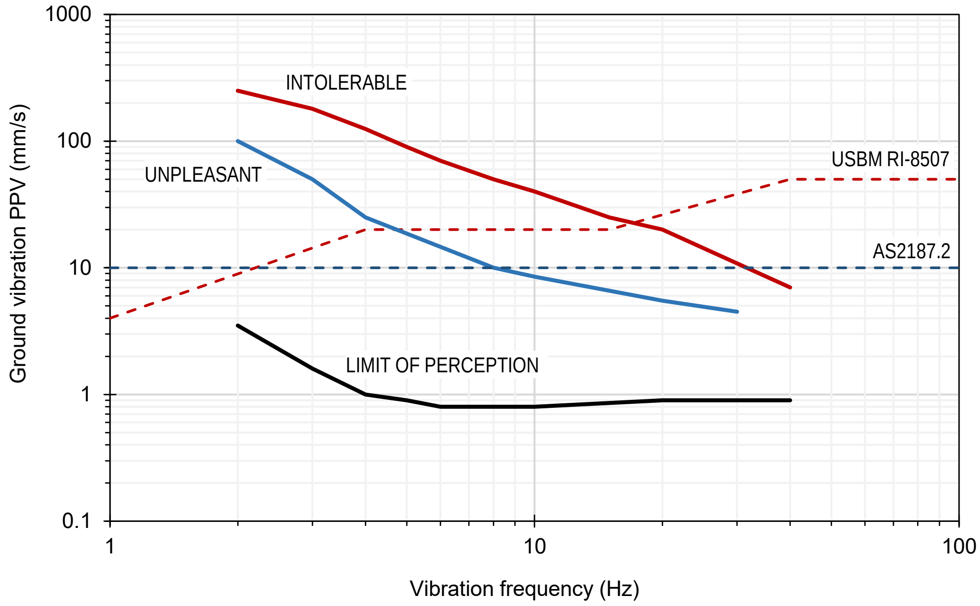


Figure 11-1 Ground vibration perception and guidelines

11.1.5 Hand-Arm Vibrations and Whole Body Vibrations

Hand-arm and whole-body vibrations are associated with use of high power tools and machinery for construction and maintenance, where the degree of the impairment to workers is related to the magnitude of the vibration acceleration. The human body is not equally sensitive to vibration energy at all frequencies, with highest sensitivity around 4-8 Hz (Hertz or cycles per second) for the body, and 8-16 Hz for the hand, which may affect ability to use tools safely or loss of feeling in fingers. Long-term vibration exposure can lead to physical issues such as nerve and blood vessel damage, e.g.;"vibration white finger" syndrome (WHO, 2010). The American Conference of Governmental Industrial Hygienists (AGCIH) provides vibration Threshold Limit Values (TLVs) for hand-arm vibration (WTO, 2013)

Table 11-6 Hand Arm Vibration Threshold Limit Values in x, y or z direction (WTO, 2013)*

Daily Total Exposure Duration (hours)	Maximum value of frequency-weighted acceleration m/s^2
4 to less than 8 hours	4
2 to less than 4 hours	6
1 to less than 2 hours	8
Less than 1 hour	12

*Direction of axes in three-dimensions, in any direction.

11.1.6 Modelling of Project Noise Emissions

The impact of noise with distance from a road can be estimated using an equation-based model. The US Federal Highways Traffic Noise Model (TNM) computes traffic highway noise at nearby receivers and aids in the design and location of noise barriers. The latest TNM version v2.5 propagates traffic sound energy, by taking into account the following;

- Atmospheric conditions (temperature and humidity);
- Ground surface (hard, loose, lawn, snow, water);
- Terrain;
- Roadway (vehicles per hour, vehicle speed, flow controls);
- Barriers and walls (height and length);
- Rows of buildings (height and length);
- Average height of vegetation; and
- Receptors (location, number of dwellings, existing background, noise criteria).

To examine the potential impact of the Kampala-Jinja Mainline Expressway and Kampala Southern Bypass the TNM model was employed to predict the noise propagation, assuming the following conditions:

- No background ambient noise;
- Assumed use of peak PM (afternoon) traffic flow;
- Vehicles assumed as cars (40%), buses and minibuses (30%) and trucks (30%) as per traffic survey;
- Model receptors located across 100 m either side of road link mid-point; and
- Five-metre-high barrier for noise attenuation.

A noise model represents an estimate of a 'snapshot' in time. The TNM noise model has the following limitations:

- Considers only single atmospheric condition. In the real atmosphere, noise propagation varies with temperature and humidity, where low frequencies propagate further in high temperature and humidity;
- Single land-use friction parameter – does not represent the different landforms present in realty and potentially underestimates the noise propagation;
- Wind is not considered in the model, underestimating downwind impacts in prevailing winds;
- Temperature inversions are not considered in the model, potentially underestimates this atmospheric reflection effect on receptors at a distance; and
- Does not incorporate reflection (echo) calculations from terrain – potentially underestimating noise propagation in topography. However, the terrain itself is considered a noise barrier by this model.

11.1.7 Airblast Estimate

The use of explosives in quarrying and construction creates air vibrations called airblasts, which primarily have intensity peaks in the low end of the human hearing range. Airblasts are often experienced as a blast wave, which can startle people and animals, rattle windows, and may potentially cause structural damage to light structures.

Airblast propagation in ambient air is largely dependent on the size of the blast charge, which is assumed here to be equivalent to the typical mine blast charge size. The following equation, provided by the US Bureau of Mines (USBM), is used to estimate airblast at designated receptors:

$$\text{Airblast dB(L)} = 165.3 - (24(\log(SD))$$

where SD = distance (m) / cubed root of charge (kg)

The limitations of the airblast prediction equation include;

- Assumption of single atmospheric condition - in the real atmosphere, airblast propagation increases with temperature and humidity;
- Equation does not consider wind – downwind effects in prevailing winds are underestimated;
- Does not consider effects of terrain or structures – overestimates airblast impacts in areas of topography;
- Does not consider surface absorption or vegetation – overestimates airbast propagation in vegetated areas and at distance;

- Does not consider the noise-frequency of the blast, where lower frequencies propagate further than high frequencies. Thus, potentially underestimates airblast impacts at distance; and
- Single line-distance equation only – not a 3D model. Assumes airblast impacts are identical in all directions regardless of terrain and vegetation. Blasts do not flow around objects or terrain.

11.1.8 Ground Vibration Estimate

11.1.8.1 Blasting

Ground vibration from construction quarry blasting was estimated as peak particle velocity (PPV) using the following equation based on the US Bureau of Mines (USBM):

$$PPV = 1143 \times SD^{-1.6}$$

where SD = distance (m) / square root of charge (kg)

Blasts are often recorded as an acceleration in m/s², or as a multiple of gravitational acceleration g (i.e. 1g = 9.81 ms/²).

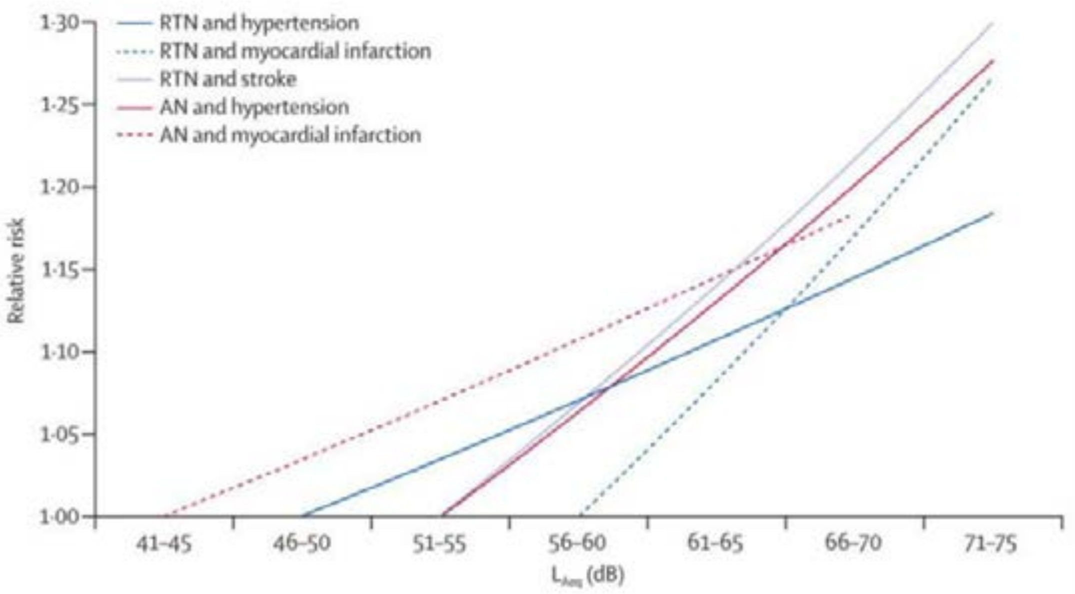


Figure 11-7 shows the relationship between the frequency of blasting ground vibrations in Hz (Hertz) and the Peak Particle Velocity (PPV) for blasts with accelerations of 0.2g and 1g, such that lower frequencies are associated with larger ground vibrations.

Table 11-7 Blasting ground vibration PPV (adapted from ISEE 1999)

Frequency Hz	4	10	15	20	25	30	40	50	100	200
PPV 0.2g (mm/s)	75.2	30.1	20.1	14.9	12.0	10.0	7.6	6.1	2.9	1.5
PPV 1g (mm/s)	377.3	150.7	100.5	74.7	60.0	50.2	38.0	30.6	14.7	7.4

Different types of blasting and ground vibration have characteristic peak frequencies (e.g.: mine blasting ~10 Hz, quarrying ~20 Hz and construction ~40 Hz), and thus are associated with characteristic peak particle velocities. This provides the basis of vibration safety standards for building structures and human comfort guidelines (see Table 11-5 5).

11.1.8.2 Vehicle-related vibrations

Ground vibration due to vehicle movements in peak particle velocity (PPV) was estimated using curves provided by the US Bureau of Transportation (2006) and equations from Hajek (2006);

$$PPV = 0.0028 \times a \times (V/48) \times t \times p \times (r/6)^x$$

where a is the maximum height or depth of the surface defect (in mm), *v* is the maximum expected speed of trucks (in km/h), *t* is scaling factor to account for soil type, *p* is a coefficient to account for the occurrence of the defect in one or both wheel paths (*p* = 1 for both wheel paths, *p* = 0.75 for one wheel path), *r* is the distance of the receiver from the surface defect (in m), and *x* is a power factor to account for vibration attenuation in different soils.

Typical construction vibrations in units of peak particle velocity (PPV) are provided in 11-8.

Table 11-8 Typical vibration levels for construction equipment (adapted from US Department of Transportation)

Equipment	PPV at 7.5 m (mm/s)
Small Bulldozer	0.007
Jackhammer	0.9
Loaded truck	1.2
Large Bulldozer	2.2
Vibratory Roller	5.2
Pile Driver	37.2 max

Air-borne vibration associated with vehicle movements were not modelled.

11.1.9 Sensitive Receptors

UNRA (2016) identified environmentally sensitive areas associated with the development of the Kampala-Jinja Mainline Expressway and Kampala Southern Bypass as summarised in Table 11-9 and Table 11-10. To assess noise emissions within the traffic models, receptors were placed at 10 m intervals across 100 m either side of the mid-point of each road link.

Table 11-9 Kampala-Jinja Mainline Expressway road sections

<table>
<tr><th>Name</th><th>Road Link</th><th>Section</th><th>Distance (km)</th><th>Lanes</th><th>Notes/ impacted area</th></tr>
<tr><td>KJXEP1</td><td>UMA Show ground (Lugogo) to Nakawa /Ntinda Junction</td><td rowspan="4">Start to Butabika Interchange</td><td rowspan="4">7.3</td><td rowspan="4">4-lane</td><td rowspan="4">Kampala city, Kinawataka swamp, flyover at Kyambogo. Increased traffic.</td></tr>
<tr><td>KJEXP2</td><td>Ntinda Junction to Kyambogo</td></tr>
<tr><td>KJEXP3</td><td>Kyambogo to Kireka</td></tr>
<tr><td>KJEXP4</td><td>Kireka to Butabika Interchange</td></tr>
<tr><td>KJEXP5</td><td>Butabika to Namilyango</td><td rowspan="2">Butabika Interchange to Mukono South</td><td rowspan="2">14.6</td><td rowspan="2">3-lane</td><td rowspan="2">Kayobe swamp and virgin land area</td></tr>
<tr><td>KJEXP6</td><td>Namilyango to Mukono South</td></tr>
<tr><td>KJEXP7</td><td>Mukono/Katosi Road to Mbalala</td><td rowspan="2">Mukono South to Namataba</td><td rowspan="2">11.2</td><td rowspan="2">2-lane</td><td rowspan="2">Kasenge Forest and Ssezibwa River. Flora and fauna.</td></tr>
<tr><td>KJEXP8</td><td>Mbalala to Namataba Junction</td></tr>
</table>

Table 11-10 Kampala Southern Bypass road sections

Name	Road Link	Distance (km)	Lanes	Notes/ impacted area
KSB1	Butabika to Portbell Road	4.3	2-lane	Mutungo Hill & Kinawataka wetland
KSB2	Portbell Road to Gaba Road	6.9	3-lane	Bukasa Hill and Nakivibo wetland
KSB3	Gaba Road to Lukuli Road	1	2-lane	Kasanga wetland
KSB4	Lukuli Road to Salama Road	1.7	2-lane	Makindye Hill cut
KSB5	Salama Road to End	3.9	2-lane	Floodplain with viaduct

11.1.10 Baseline Monitoring for ESIA

As outlined in Section 11.2, baseline monitoring data was available for numerous sites along the Phase 1 alignment from previous studies including ICS (2015) who sampled 21 sites along the KSB section, JICA survey results who conducted sampling at 5 sites in Kampala (UNRA 2014) and additional noise monitoring by Atacama at seven (7) locations (Atacama 2017).

To supplement this existing data, additional noise and vibration monitoring was conducted by Earth Systems/Atacama in March 2018 at three sites along the Mainline Expressway Phase 1 section of the alignment. Monitoring sites were selected at key potential sensitive receptors and where set up with consideration of access limitations and security. Monitoring was conducted using the following portable instruments:

- Noise: A Casella CEL-246 sound level meter, providing ambient A-weighted noise level LAeq in the 30–100 dB(A) range and calculated hourly ambient, maximum and minimum noise (LAeq, LAmax, LAmin);
- Noise: A Casella CEL-240 sound level meter, providing 5-minute ambient A-weighted noise level LAeq in the 30–100 dB(A) range and calculated hourly ambient, maximum and minimum noise (LAeq, LAmax, LAmin);
- Noise: Decibel-X noise sensor application technology with monitoring of raw noise data and LAmax, LAmin, average and Time-Weighted-Average (TWA) noise; and
- Vibration: VibSensor sensor application technology with 100 Hz sampling frequency and effective frequency range of 0.03 to 50 Hz, providing a 10-minute continuous record.

Noise was monitored for a continuous period of 24 hours with the Casella-246 sound level meter and for shorter periods during daylight with the Casella-240 and Decibel-X application. Vibration was monitored at high resolution for a period of 10 minutes, six times for each site (twice in the morning and twice in in consecutive afternoons). Locations for baseline monitoring are summarised in Table 10-7 and Figure 11-2.

Table 11-11 Receptor locations for baseline monitoring (2018)

Location ID	Receptor Locations	UTM Coordinates X	UTM Coordinates Y
KJEP1-1	Hilton High School	473901	36065
KJEP1-2	Kyawambgo	475447	38159
KJEP1-3	Ssezibwa Falls	484685	39345

UTM: WGS 84, UTM Zone 36N

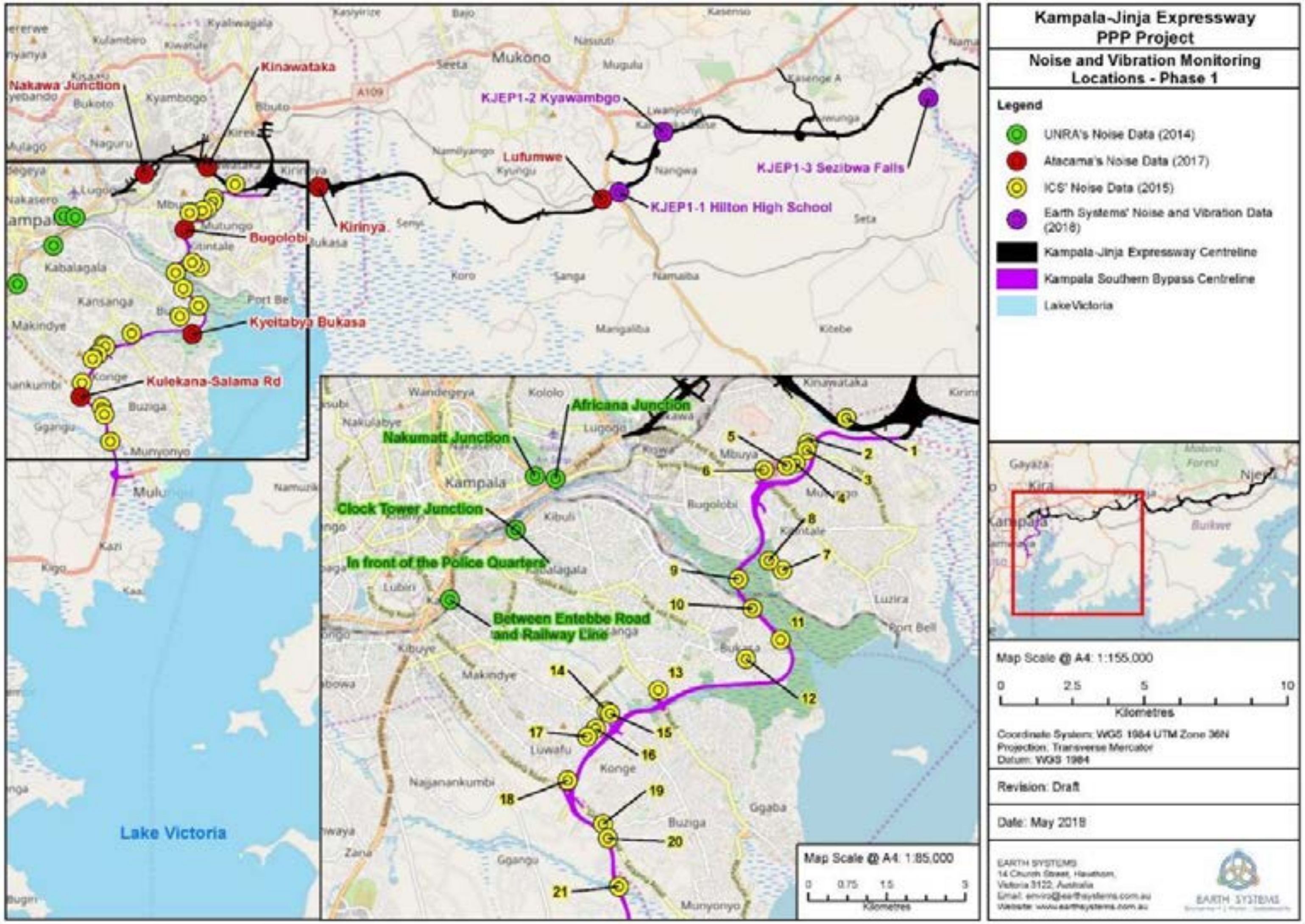


Figure 11-2 Noise and Vibration Monitoring Locations – Phase 1

11.2 Baseline Conditions

The Project ranges from the highly-populated Kampala city to rural areas. The current alignment traverses densely populated areas in and around Kampala and Wakiso Districts, including several informal settlements. Heading east from Kampala, the land use varies from agricultural land, sugarcane plantations, aquaculture and forest land, among others. Several existing and proposed business parks, industrial areas, markets and small to large independent businesses are also present along the alignment. Ambient noise and vibration conditions therefore reflect both anthropogenic and natural sources in these areas.

The national economic strategy has also led to the growth of the industrial and manufacturing sectors within the city, in addition to increasing road traffic and associated noise. A large proportion of vehicles are imported and aging, particularly taxis and small minibuses (matatus) (Kiggundu 2015), and the many motorcycles commonly known as boda-bodas (two stroke engines) (UNRA 2014). Noise monitoring was conducted along the Kampala Southern Bypass in April/May 2013 (ICS 2015), Table 11-12.

Table 11-12 Noise monitoring results for Kampala Southern Bypass route in 2013 (ICS 2015)

	Location Description	Northing	Easting	Leq dB(A)		Max dB(A)
1	Currently a dump site	460507	36336	53	51	65
2	Currently a market	459771	35855	58	64	n/a
3	Primary School	459744	35725	44	54	57
4	Current road crossing	459533	35472	48	51	57
5	Current road crossing	459367	35419	57	59	67
6	Next to active road	458927	35340	71	68	n/a
7	Prison area for women	459283	33430	59	63	n/a
8	Luzira industrial area	459020	33607	45	47	52
9	Railway sugar cane	458442	33255	45	44	67
10	Tunnel start, swamp	458706	32695	44	48	60
11	Muyenga at swamp	459243	32096	45	44	54
12	Bukasa Primary School	458581	31733	45	45	55
13	Gaba road entry	456904	31134	54	59	82
14	St Dennis Church	455920	30728	53	56	64
15	Road crossing	455984	30687	68	65	66
16	Tunnel entry	455712	30398	49	47	73
17	Nakinyuguzi High School	455547	30245	43	47	51
18	Entry to Salama Road	455171	29407	44	54	80
19	Near St Posiano church	455849	28573	58	59	60
20	Model High School Salama	455944	28301	47	49	60
21	Heaven Alter Church	456154	27380	43	45	51
			Leq	60.3	59.3	82 max

Noise monitoring was conducted in Kampala city by a JICA survey team on behalf of UNRA in September 2013, as summarised in

Table 11-14 (UNRA 2014), by Earth Systems/Atacama in 2017 (

Table 11-14) and at various sensitive receptors by Earth Systems/Atacama in March 2018 (12) and Figure 11-2.

Noise monitoring was conducted in Kampala city by a JICA survey team on behalf of UNRA in September 2013, as summarised in

Table 11-14 (UNRA 2014), by Atacama in 2017 (

Table 11-14) and at various sensitive receptors by Earth Systems/Atacama in March 2018 (12) and Figure 11-2.

Table 11-13 Noise monitoring results in Kampala in 2013 (UNRA 2014)

	Day-time Leq dB(A)			Night-time Leq dB(A)	
Location Description	**6am – 9am**	**9am – 12pm**	**12pm – 3pm**	**6pm – 10 pm**	**10 pm – 1am**
Clock Tower Junction	75	80	81	77	55
Between Entebbe Road and Railway	76	82	82	72	59
In front of Police Quarters	50	77	69	71	41
Nakumatt Junction	57	73	78	72	59
Hotel Africana Junction	58	74	77	74	49
WHO Guideline	55			45	
Uganda Guideline	60			50	

Table 11-14 Noise monitoring results in Kampala in 2017 (Earth Systems/Atacama 2017)

	Day-time dB(A)			
Location Description	**Min**	**LAeq**	**Max**	**Notes**
Nakawa Junction	65	83.5	97.6	Vehicular movements
Kinawataka	45.4	66.8	80.8	Sports field, pedestrians, motorcycles
Kirinya	37.6	53.5	68.4	Pedestrians. Lunch church service.
Lufumve	38.8	70.0	84.3	Natural. Birds and brickmakers.
Bugolobi	48	71.4	86.3	Pedestrians, motorcycles, few cars
Kyeitabya Bukasa	36.5	56.8	71.6	Harvesting of wetland products
Kulekana-Salama Road	55	73.2	82.7	Vehicular movements
WHO Guideline	-	55	-	
Uganda Guideline	-	60	-	

Table 11-15 Noise monitoring results at sensitive receptors along Phase 1 section in 2018 (Earth Systems/Atacama 2018)

	Noise dB(A)			
Location Description	**Min**	**LAeq**	**Max**	**Notes**
Hilton High School	46.2	54.4	63.4	High school adjacent to alignment
Kyawambgo	37.0	50.3	69.3	Between KJE and Kampala-Jinja Rd
Ssezibwa Falls	36.1*	58.1	101.8*	Waterfalls within 1 km of alignment
WHO Guideline	-	55	-	
Uganda Guideline	-	60	-	

*As recorded by Decibel-X application

The noise monitoring conducted by the various teams shows that ambient daytime noise is typically above or close to the WHO daytime noise guideline (55 dB) and can exceed the Ugandan requirements of Maximum

Permissible Noise Levels for General Environment for residential areas (60 dB). Locations within Kampala have generally higher ambient noise than those outside the city. Maximum noise levels up to 100 dB were recorded for very short periods, likely associated thunder, waterfalls and passing trucks. Existing noise emissions in the vicinity of the Project largely originate from human activity. Thus, the main noise sources in the Project region are;

- Vehicle and motorcycle use;
- Agricultural machinery and sugarcane industry;
- Medium and small-scale industry;
- Schools, churches, a prison and a market;
- Railway line;
- Wildlife and insect activity; and
- Thunder, rain, rivers and waterfalls.

Ground vibration was measured for continuous periods of 10 minutes at each site during the March 2018 field campaign as summarised in Table 11-16. Typical ground vibrations recorded during the period were low, being less than 0.20 m/s^2. No large impulsive or repetitive vibrations were detected indicative of quarrying, blasting or construction at the monitoring sites. Impulse vibration from within the first second of data was removed to prevent bias to the data. Analysis of the vibration spectra suggests peak wave frequencies below 10 Hz, indicative of mechanical or engine vibration.

Table 11-16 Summary of vibration monitoring results in March 2018 (Earth Systems/Atacama 2018)

	Vibration m/s^2			
Location Description	**Min**	**RMS***	**Max**	**Notes**
Hilton High School	-0.202	0.034	0.217	High school adjacent to alignment
Kyawambgo	-0.190	0.039	0.211	Between KJE and Kampala-Jinja Rd
Ssezibwa Falls	-0.201	0.038	0.197	Waterfalls within 1 km of alignment
WTO Guideline	-	12	-	

*Mean of Route-Mean-Square in x, y and z axes.

11.3 Impact Assessment

The ambient noise level at a particular location is the overall environmental noise level caused by all anthropogenic and natural noise sources in the area. The human ear has a wide sound-sensitivity range, and thus the decibel (dB) is a unit that uses a logarithmic scale that allows human hearing to be compressed into a comprehensible range (). The human ear is less sensitive to low frequency sound than high frequency sound. Thus the "A-weighted" decibel scale dB(A) is used to approximate the human loudness response. The LAeq, (logarithmic A-weighted equivalent sound pressure level), is the most commonly used indicator for noise over a specified time-interval.

Road noise, is a significant contributor to the ambient noise environment, particularly in the city. Sound waves can interfere with natural background sound waves in the same environment, and are generally considered noise pollution where the noise is loud, unpleasant or repetitive. Sounds are considered noise pollution if they adversely affect wildlife, human activity, damage structures or disturb natural processes (UNRA 2014). Noise and vibration management and mitigation measures can be implemented to reduce these impacts.

The expected noise and vibration sources for each stage of Project development are outlined below, and management measures with respect to each type of emission are provided in the following sections.

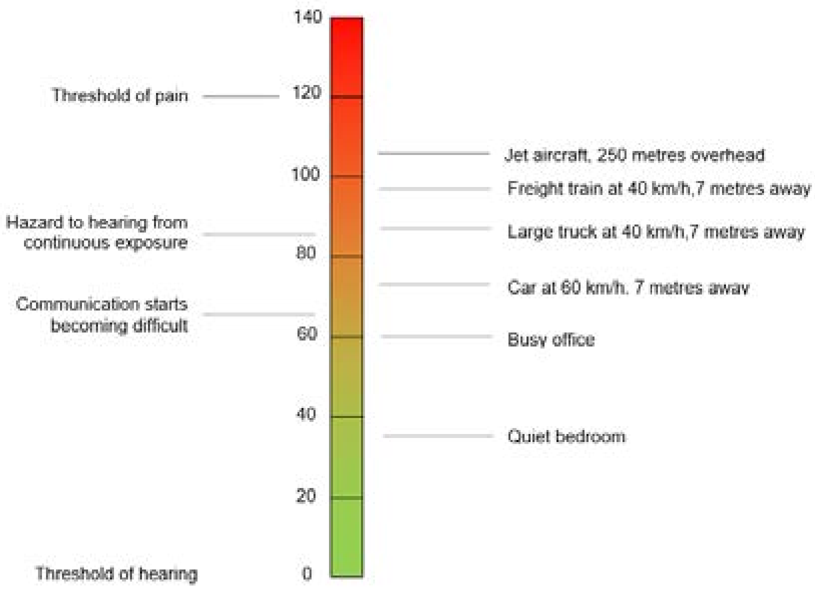


Figure 11-3 Level of common sounds on the dB(A) scale (DPTI SA, 2016)

Road noise, is a significant contributor to the ambient noise environment, particularly in the city. Sound waves can interfere with natural background sound waves in the same environment, and are generally considered noise pollution where the noise is loud, unpleasant or repetitive. Sounds are considered noise pollution if they adversely affect wildlife, human activity, damage structures or disturb natural processes (UNRA 2014). Noise and vibration management and mitigation measures can be implemented to reduce these impacts.

The expected noise and vibration sources for each stage of Project development are outlined below, and management measures with respect to each type of emission are provided in the following sections.

11.3.1 Pre-Construction

Very limited noise and vibration impacts are expected to occur during the Pre-Construction Phase as very little activities with noise and vibration emissions will occur for the Project during this phase.

However, there is expected to be some minor temporary noise and vibration emissions associated with construction material investigation (e.g. drilling).

11.3.2 Construction

11.3.2.1 Construction Noise

Noise emissions from construction of the Project will primarily be associated with the clearing of land, earthworks and transport of construction materials. Some noise is expected during the construction phase associated with

excavation of rock, road cuttings and construction of overpasses. Source noise levels for typical earthworks and road construction are listed in Table 11-17 . Construction noise is anticipated to be localised and short-term, and will progress with the construction of the Project road.

Table 11-17 Construction noise levels (adapted from Malherbe 2005, MAS Environmental)

Equipment	Maximum noise power levels at source Lw (dB)	Maximum noise at source dB(A)	Maximum at 10 m dB(A)	Maximum at 50 m dB(A)	Maximum at 100m dB(A)
Dump trucks	120.8	113	93	79	73
Excavator	126.6	119	99	85	79
Dozer	117.2	109	89	75	69
Grader	115.4	107	87	73	67
Wheeled loader	115.2	107	87	73	67

11.3.2.2 Quarry and Rock Blasting

It is anticipated that there will be several potential road cuttings that may require rock blasting and local quarries that will be utilised during construction for excavation of rock. Airblasts are inaudible, sub-audio air vibrations or over-pressure associated with rock blasting, which can startle people and animals, rattle windows, and may potentially cause structural damage to nearby light structures. Airblasts can be greatly minimised by ensuring all detonations are covered. The predicted unmitigated airblast assuming uncovered surface charge equivalent to 50–200 kg of TNT is shown in Figure 11-4.

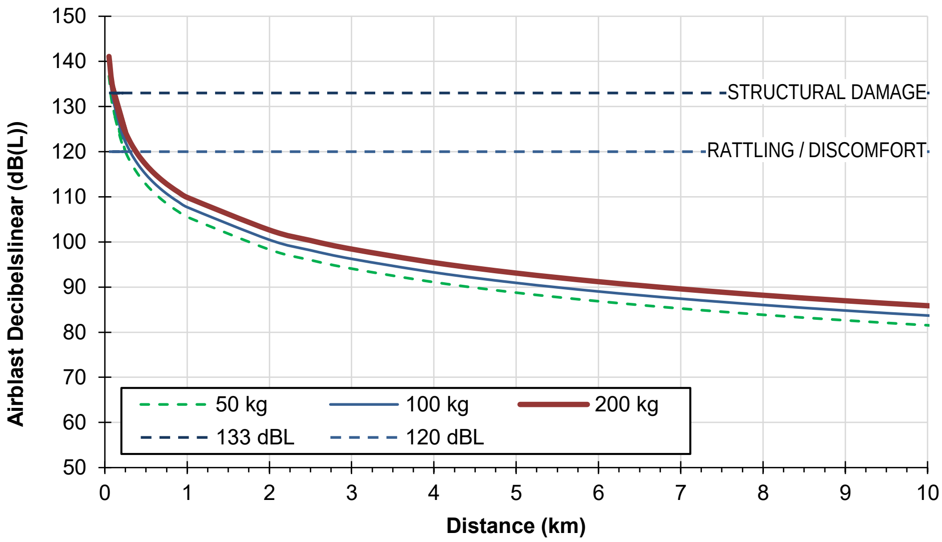


Figure 11-4 Estimated airblast sound pressure level with distance from blast site

The key findings for airblasts are as follows:

- Unmitigated airblast vibrations are estimated to be below the structural damage guideline level of 133 dB(L) to within 100 m of the blast site, and below the rattling/discomfort level (120 dB(L)) to within 400 m of the blast site;
- Unmitigated airblast could cause startling or disturbance within 1–2 km of the blast site; and

- Airblast mitigation by conducting covered blasts with electronic detonation will significantly reduce airblast levels.

11.3.2.3 Ground Vibrations

Ground-borne vibrations during construction are expected to be generated by the following Project activities:

- Grading, excavation, dozing, etc.;
- Heavy vehicle traffic;
- Pumps and generators; and
- Blasting (assumed to be limited).

Ground vibration impacts during construction are expected to be predominantly short-term and localised to the construction work areas, including road base preparation, site road construction, and quarrying. Predicted ground vibrations from quarry blasting are shown in Figure 11-5 for charges of 50–200 kg TNT equivalent.

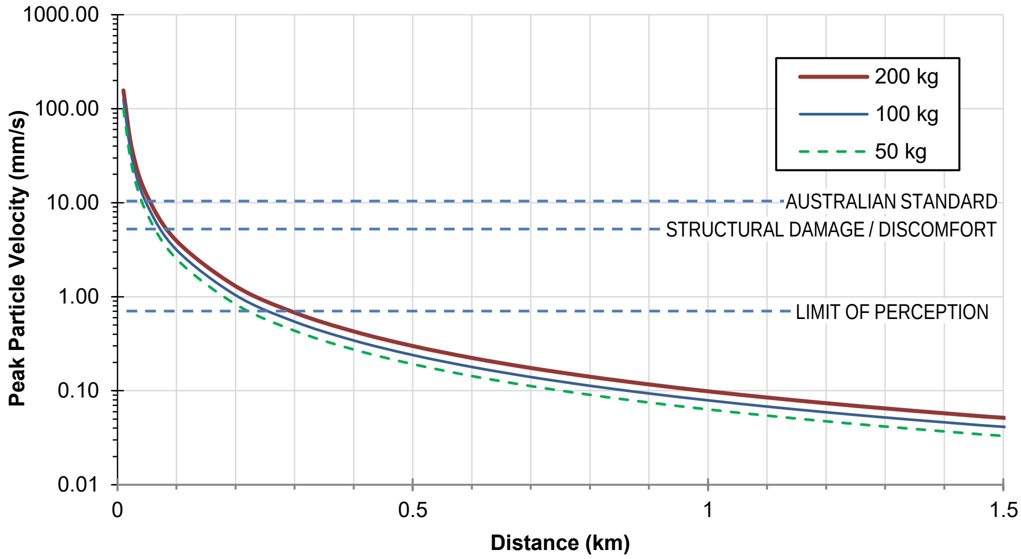


Figure 11-5 Estimated blasting ground vibration with distance from source

To summarise the ground vibration predictions;

- Blasting ground vibrations are predicted to be below applicable standard maximum PPV (10 mm/s) beyond 50 m of the blast site;
- Blasting ground vibrations are below structural damage and discomfort guideline levels beyond 100 m; and
- Blast vibrations are predicted to be imperceptible beyond 300 m of the blast site.

Similar to noise, Project construction vibration will be short-term and will move progressively as the road is constructed. Wildlife is expected to be sensitive to vibrations and to avoid the construction areas during this period. Elevated construction traffic vibration will persist for the duration of the construction phase.

11.3.3 Operation

During operations, the factors that will affect noise emissions from road traffic will include;

- the volume of traffic;
- the speed of traffic; and
- the composition of traffic (number of heavy vehicles versus light vehicles).

Generally, heavier traffic volumes, higher speeds and a larger number of heavy vehicles results in more traffic noise. The main sources of vehicle noise are their engines, exhaust systems and tyres (Figure 11-6). Increased traffic levels (and associated noise levels) are likely to result in nuisance and other health impacts in the vicinity of the Project Roads. The health impacts of noise are shown in the

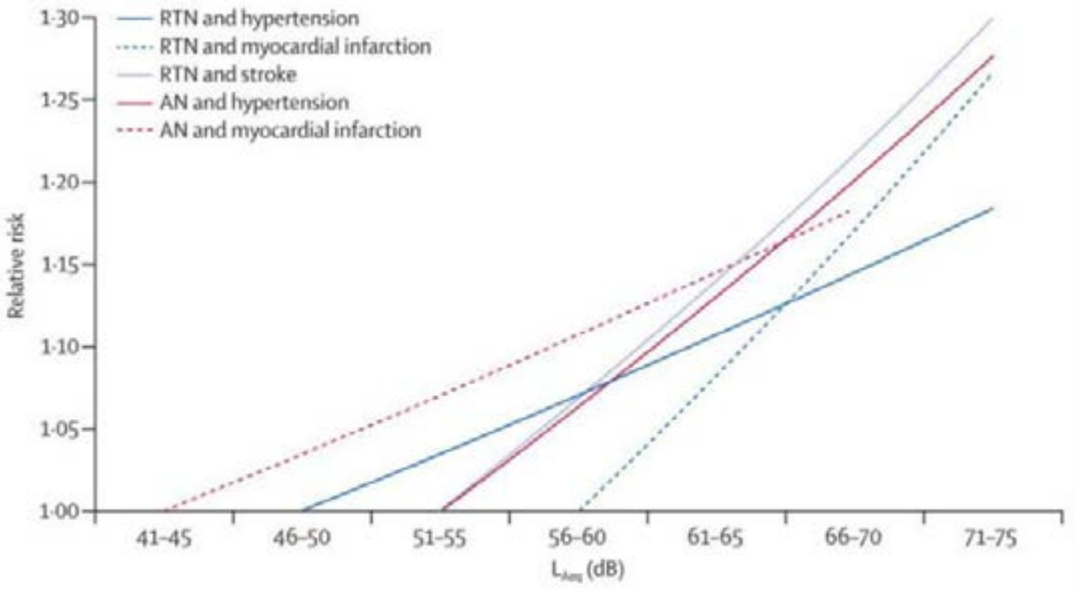


Figure 11-7 and Table 11-18.

. Vehicle noise emissions from the Project during operations were modelled using the TNM model for following;

- Vehicle noise emissions from trucks, buses, and cars;
- Assumed peak operation hours for worst-case emissions;
- Maximum roadside noise emissions; and
- Barrier noise attenuation.

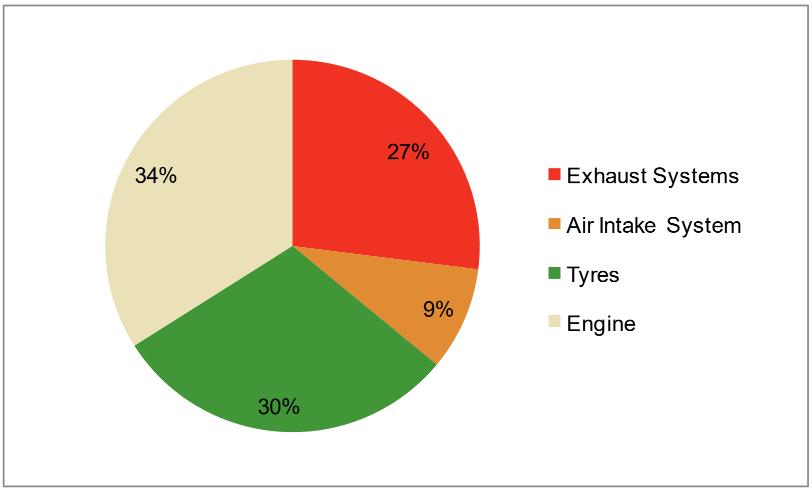


Figure 11-6 Noise source distribution of passenger cars at speeds below 70 km/hr (DPTI SA, 2016)

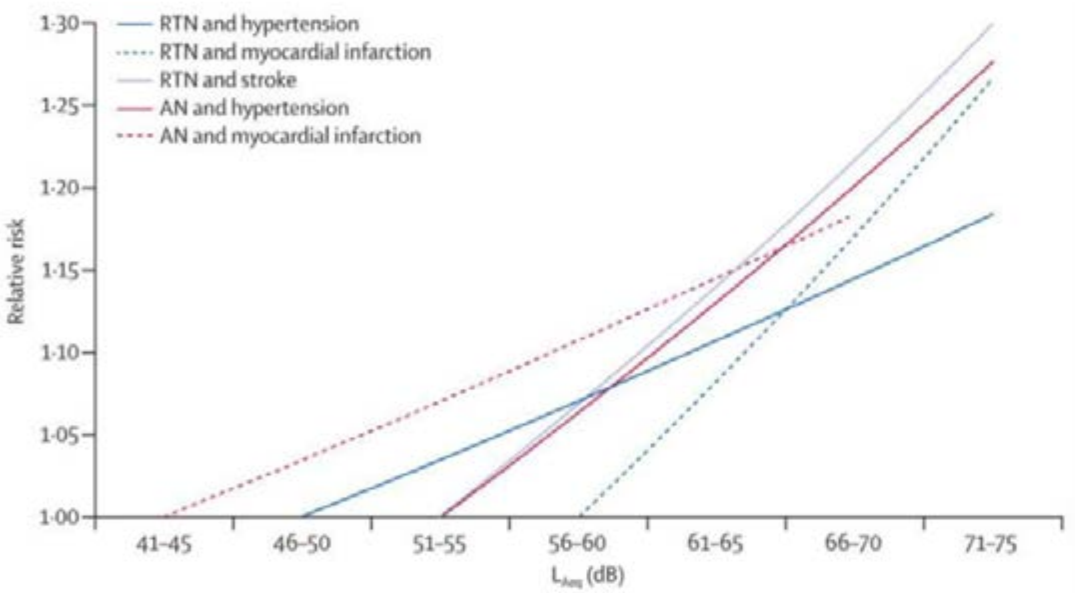


Figure 11-7 Exposure-response curves of road traffic noise (RTN) and aircraft noise (AN), and cardiovascular impacts (Basner et al., 2013)

Table 11-18 Long-term health effects related to noise exposure (Ldn – day-night level) (adapted from Heinrich, 2013)

Effect	Exposure type	Measure	dB	Location of assessment
Hearing impairment	Environmental	LAeq (24 hr avg)	70	Indoors
	Occupational	Ldn (24 hr avg)	75	
Hypertension	Environmental	LAeq (24 hr avg)	70	Outdoors
	Occupational	LAeq (24 hr avg)	<85	Indoors
Coronary heart disease	Environmental	LAeq (24 hr avg)	70	Outdoors
Annoyance	Environmental	Ldn (24 hr avg)	42	Outdoors
	Occupational	LAeq (24 hr avg)	Industry <85	Indoors
			Office <55	
Performance	School	LAeq (avg during school day)	70	Outdoors
	Occupational		70	
Disturbance of sleep pattern	Sleep	LAeq (overnight avg)	<60	Outdoors
Awakening	Sleep	SEL	55	Indoors
Sleep quality	Sleep	LAeq (overnight avg)	40	Outdoors
Mood next day (sleep disturbance)	Sleep	LAeq (overnight avg)	<60	Outdoors

Operational noise emissions consist of vehicle noise that impacts near-field where sensitive residential and ecological receptors are located. Note that model simulations do not include assumed ambient background noise, which is variable, to isolate vehicle noise emissions only. Model predicted noise impacts during operations are summarised in the following sections.

11.3.3.1 Existing Kampala-Jinja Road

To examine the potential noise impact of the current Kampala-Jinja Road, the TNM model was employed to predict the traffic noise emissions for each road link sections as summarised in Table 11-19.

Table 11-19 Predicted maximum roadside noise from current Kampala-Jinja Road LAeq 1-hr dB(A)

Name	Link section	2010	2014	2017
		41 km/hr	33 km/hr	27 km/hr
KJRD1	UMA Show ground (Lugogo) to Nakawa /Ntinda Junction	78.4	78.2	78.7
KJRD2	Ntinda Junction to Kyambogo	76.2	76	76.5
KJRD3	Kyambogo to Kireka	74.8	74.6	75.1
KJRD4	Kireka to Bweyogerere	78.3	77.7	77.8
KJRD5	Bweyogerere to Namanve	77.3	77.2	77.9
KJRD6	Namanve to Seeta	76	76	76.7
KJRD7	Seeta to Mukono	77.3	77.6	78.5
KJRD8	Mukono to Katosi Road	75.9	76.3	77.4
KJRD9	Katosi Road to Mbalala	70.8	71.2	72.4
KJRD10	Mbalala to Namataba	69.3	69.7	70.9
	WHO Daytime Guideline	55	55	55
	Ugandan Daytime Guideline	60	60	60

Despite the 35% reduction in traffic speeds due to congestion on the current Kampala-Jinja Road, the 15% mean increase in traffic from 2010 to 2014 and assumed similar increase for 2014 to 2017 is predicted to have roadside noise maxima above both WHO and Ugandan Daytime noise guidelines (refer to Table 11-2). The model predictions are commensurate with the Kampala city roadside noise measurements for peak traffic hours. There has also been an increase in the noise levels in the Seeta to Mukono-Katosi Road section over the 2010-2017 period, reflecting an increase in traffic in this area.

Chronic exposure to high levels of road side noise may cause residents along the existing Kampala-Jinja road to be affected by several health impacts including hearing impairment and coronary heart disease. Student and office worker performance may be impacted negatively at nearby schools and business areas. Also, there is a significant increase in relative risk of local residents developing hypertension, a heart attack (myocardial infarction) and/or a stroke. If night noise levels remain similar to peak hour noise levels, residents' mood and sleep may also be affected.

Note that the noise model assumes constant traffic flow, and does not include additional noise factors associated with congestion traffic, such as car horns, sirens, revving or engine idling, which may additionally impact near-field noise.

11.3.3.2 Kampala-Jinja Mainline Expressway

The potential noise impacts of the Kampala-Jinja Mainline Expressway were examined with the TNM model, adopting projected traffic flows and speeds for each section (85 km/hr in urban and 100 km/hr rural areas). Table 11-20 summarises the predicted roadside noise maxima with associated potential noise reduction measures, with adoption of physical barriers.

Table 11-20 Predicted maximum noise from Kampala-Jinja Mainline Expressway LAeq 1-hr dB(A)

Name	Link section	Roadside maximum	Maximum at 50 m distance	Maximum at 100 m distance	Maximum with 5 m barrier
KJEXP1	UMA Show ground (Lugogo) to Nakawa /Ntinda Junction	84.4	74.0	67.8	54.4
KJEXP2	Ntinda Junction to Kyambogo	85.0	74.5	68.3	55.0
KJEXP3	Kyambogo to Kireka	80.5	70.0	63.8	50.5
KJEXP4	Kireka to Butabika Interchange	81.8	71.3	65.1	51.8
KJEXP5	Butabika to Namilyango	82.0	71.5	65.1	51.9
KJEXP6	Namilyango to Mukono South	78.5	68.0	61.6	48.4
KJEXP7	Mukono South to Mbalala	75.3	64.7	58.3	45.2
KJEXP8	Mbalala to Namataba Jnc	62.9	52.4	46.0	32.8
	WHO Daytime Guideline	55	55	55	55
	Ugandan Daytime Guideline	60	60	60	60

UMA Show ground (Lugogo) to Butabika Interchange – The city sections of the Mainline Expressway will be located in highly trafficked areas where traffic noise may be a community issue. Increased roadside noise levels were predicted relative to the current Kampala-Jinja Road, exceeding IFC/WHO and Ugandan daytime noise guidelines. Maximum noise levels were predicted within 30 m of the expressway, where both commercial and sidewalk receptors would be impacted. Continued exposure to high levels of noise within 50 m of the expressway may lead to multiple long-term health impacts. Schools and offices may also be affected throughout the day, and especially during peak hour traffic. The proposed flyover at Kyambogo will disperse noise over a greater distance at a lower noise level. Night-time noise may also lead to health impacts, such as sleep disturbance.

Model simulations of noise attenuation suggested that traditional physical barriers (berms or walls), rather than vegetation or buildings, may be an effective method of meeting WHO and Ugandan noise guidelines for noise-impacted receptors on these road sections during peak hour traffic. Vegetation provides only a very small reduction in noise levels. Modern technologies include acoustic enclosures or acoustic fencing, which absorb or deflect highway noise by up to 85%, particularly for noise in high density populated areas.

Cumulative noise from the Kampala Southern Bypass and the Mainline Expressway were not included in the model simulations. Potential impacts to the Kinawataka Swamp would primarily be noise disturbance to wildlife, such as behavioural changes, migration patterns, communication, impacts to nesting birds or sensitive species, which may avoid the road corridor.

Butabika Interchange to Mukono South – Road link sections of the Mainline Expressway to Mukono South are within virgin land, where flora and fauna are the main receptors. Previous traffic from the old Kampala-Jinja Road is assumed will use the Mainline Expressway with additional traffic connectivity to Mukono, Namanve Industrial Park and proposed Bukasa port. Predicted roadside noise levels are reduced, but above WHO daytime noise guidelines, potentially leading to similar health impacts as mentioned earlier. At this section, the road may become a nuisance to office clerks and industrial workers, and wildlife around the Kayobe Swamp area would also be affected negatively by the expected long-term maximum noise levels.

Mukono South to Namataba Junction – Road link sections of the Mainline Expressway from Mukono South to Namataba Junction are in hilly sections, including the Kasenge Forest and Sezibwa River crossing, with the Sezibwa Falls waterfalls within 1 km of the alignment. Predicted traffic flows and associated roadside noise levels are reduced, though above WHO daytime guidelines. However, the hilly terrain and vegetation in this region will act as a natural noise barrier, reducing impacts outside of the right-of-way, though steep gradients in some sections may cause noise issues from heavy trucks accelerating uphill and braking downhill. Potential noise impacts would primarily be to several small communities adjacent to the ROW of the road alignment. However the long-term health impacts would be negligible. Noise disturbance may result in wildlife avoiding the road corridor.

11.3.3.3 Kampala Southern Bypass

The Kampala Southern Bypass was divided into five section links, as highlighted by UNRA (2016). Assuming maximum peak traffic at 100 km/hr of between 2400 vehicles per hour at Butabika Interchange, reducing to 1600 vehicles per hour at Salama Road, the TNM model predicted the following noise levels;

Table 11-21 Predicted maximum noise from Kampala-Southern Bypass LAeq 1-hr dB(A)

Name	Link section	Roadside Maximum	Maximum at 50 m distance	Maximum at 100 m distance	Maximum with 5 m barrier
KSB1	Butabika to Portbell Road	82.5	71.9	65.5	52.4
KSB2	Portbell Road to Gaba Road	82.1	71.5	65.1	52
KSB3	Gaba Road to Lukuli Road	81.7	71.1	64.7	51.6
KSB4	Lukuli Road to Salama Road	81.2	70.7	64.3	51.1
KSB5	Salama Road to End	80.7	70.2	63.8	50.6
	WHO Daytime Guideline	55	55	55	55
	Ugandan Daytime Guideline	60	60	60	60

Maximum traffic noise levels were predicted within 50 m of the expressway, where residential receptors would be potentially impacted. Residents living within 50 m of the bypass are at increased risk of developing hearing impairment. The peak traffic noise would become a nuisance and may affect student performance at schools. Within this distance there is a 1.15-1.27 increase in relative risk of developing hypertension, coronary heart disease experiencing a heart attack or a stroke.

Although, predicted noise levels at a distance of 100 m of all sections the expressway are above WHO and Ugandan noise guidelines, the risk of developing long-term health impacts as a result of repeated and continued noise exposure is reduced significantly. However, nuisance may continue to pose a problem along the bypass and night noise levels should be monitored throughout operation.

Wildlife may be affected along the KSB, with the high noise levels potentially leading to changes in behaviour, migration and reproduction, as well as avoidance of the road corridor.

Model simulations of noise attenuation suggested that traditional physical barriers (berms or walls) of up to 5 m would be an effective single method of meeting WHO and Ugandan noise guidelines for noise-impacted receptors in this residential area during peak hour traffic. Acoustic barriers, which reduce traffic noise by up to

85% are a potential option to consider in built-up areas. By using physical or acoustic barriers, health impacts developed by noise would be non-existent or negligible.

11.4 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management and mitigation measures for noise and vibration impacts (refer Volume D). To minimise potential noise and vibration impacts, a Noise and Vibration Management Plan is to be developed and implemented as part of standard operating procedures for the Project. The key management measures to be included in the Plan are listed in Table 11-22.

Table 11-22 Noise and Vibration Avoidance, Management and Mitigation Measures and Residual Impacts / Risks

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction Phase			
Noise and vibration associated with construction material investigation (e.g. drilling)	► Limit drilling to daylight hours. ► Notification of potentially affected stakeholders. ► Implementation of Grievance Mechanism.	Neutral	Minor Limited noise and vibration emissions from material investigations are expected. Impacts will be minor, localised and temporary.
Construction Phase			
Clearing and construction	► Limit the hours of operation of noisy activities to daylight where practical (eg; tree felling, saws, grinding). ► Maintain unpaved access roads to prevent vehicle vibrations from surface rutting. ► Ensure broadband alarms are used instead of tonal reversing beepers on all construction vehicles. This should be enforced as a mandatory requirement. ► Construction workers to use appropriate hearing protection, vibration gloves and PPE. ► Educate construction workers and staff regarding exposure risks and reduction of noise and vibration.	Negative	Low Risk A low risk of nuisance noise impacts at sensitive receptors will occur for areas close to construction zones and transportation routes. Impacts will primarily be associated with the clearing of land, earthworks and hauling of construction materials. Impacts will vary depending on construction activities conducted, topography and proximity of receptors.
Power generation and general equipment	► Select equipment with lower noise and vibration levels where practical. ► Limit the operation of noisy equipment to daylight hours where practical. ► Place generators away from buildings to reduce noise and vibration impacts ► Place generators or machinery in enclosures to reduce noise levels ► Locate mobile noise sources in less sensitive areas to take advantage of distance and shielding. ► Maintain equipment – worn or faulty tools will emit more noise and vibrations	Negative	Low Risk (Short-term) A low risk of nuisance noise impacts at sensitive receptors will occur for areas close to generators and other noisy equipment. Impacts will generally be short-term.
Quarries	► Conduct blasting during daylight hours only	Negative	Moderate Risk (Short-term)

Aspect / Risk	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
(Blasting)	► Conduct blasting at regular timings ► Conduct blasting at times/weather appropriate to local conditions eg; not in high winds ► Workers must wear personal hearing protectors ► Use electronic detonation ► Cover blast holes to reduce rifling ► Inform public of blast times ► Conduct periodic auditing of noise and vibration levels		A moderate risk of nuisance noise impacts at sensitive receptors will occur for areas close to quarries. Impacts will be short-term during the blasting activities, and localised to areas adjacent to quarries.
Laying of road surface	► Conduct laying and vibration rolling during daylight hours if feasible ► Inform local residents	Negative	Low Risk (Short-term) A low risk of nuisance noise impacts at sensitive receptors will occur for areas close to the road alignment. Impacts will be short-term and localised to areas where the road surface is being progressively laid.
Operations Phase			
Noise and vibration emissions from traffic	► Place expressway at greater distance from sensitive receptors where practicable ► Ensure the Project design includes appropriate berms, barriers and/or vegetation between expressway and sensitive receptors (refer Section 11.4.1). ► Install modern acoustic enclosures or acoustic fencing along expressway which absorb noise ► Offer incentives for shutters or double-glazed windows for affected roadside receptors ► Introduce modern, efficient vehicles ► Replace minibuses (matatus) with larger modern buses (eg; Bus Rapid Transit) ► Do not overload heavy trucks ► Maintain expressway surface ► Prohibit use of truck hydraulic braking in community areas ► Implement a noise and vibration public liaison and complaints procedure ► Regularly monitor noise and vibration	Negative	Minor With the implementation of mitigation measures, including noise barriers where these are required, the Project will result in minor nuisance noise impacts at sensitive receptors adjacent to the alignment. Impacts may increase with increasing volumes in traffic and extended peak hour times. Residual noise impacts will be less outside of the Kampala area, as lower traffic volumes are expected compared to within Kampala.

11.4.1 Physical noise barriers

Model simulations of noise attenuation suggested that traditional physical barriers (berms or walls) of up to 5 m would be an effective single method of meeting WHO and Ugandan noise guidelines for roadside receptors in residential areas during peak hour traffic by controlling the transmission path (see Figure 11-8 below). Though, smaller barriers (3 m) would be acceptable for receptors at greater distances. In urban regions with lower densities or surrounding wetlands it is recommended that noise barriers 2 – 4m tall (low) will be installed. For open areas it

is expected that noise barriers will not be necessary, therefore either fences or natural borders are acceptable. The locations of the respective barriers along the Phase 1 Right of Way are outlined in Figure 11-8. It is predicted that approximately 57 km of high noise barriers, 10km of low noise barriers and 69 km of fencing or natural borders will be needed for Phase 1 of the project. Table 11-23 outlines the average unit cost by height for standard noise barrier materials. These figures are based a study undergone by U.S. department of Transportation's Federal Highway Administration (2010). The average unit cost per height is predicted to be lower than the figures in Table 11-22 due to the reduced labour and material costs within Uganda.

Table 11-24 outlines the total costs for development of noise barriers for the Phase 1 alignment, assuming that 2m barriers are used for low noise barriers and 5m barriers are used for high noise barriers. This data indicates for the total of 67km of noise barriers required, the total cost may range from approximately USD 12,804,400 to USD 20,534,330, depending on the materials selected.

Vegetation only provides a very small reduction in noise levels. Alternative modern technologies include acoustic enclosures or acoustic fencing, which absorb or deflect highway noise by up to 85%, and are particularly suitable for flyovers, road cuts and populated areas. The closer and higher the barrier or acoustic fencing is to the expressway the more effective is the outcome.

Table 11-23 Cost per m² in USD (FHA, 2010)

Barrier Height (m)	Concrete	Block	Wood	Metal
6	$344	$323	$172	$161
5	$312	$291	$226	$183
4	$312	$247	$237	$172
3	$334	$280	$204	$280
2	$258	$226	$237	$226

Table 11-24 Estimated noise barrier costs for Phase 1 in USD (based on rates from FHA, 2010). Note rates not adjusted for inflation, however the average unit cost is predicted to be lower than these values due to the reduced labour and material costs within Uganda.

Barrier Type	Concrete	Block	Wood	Metal
High Noise Barrier (5m height, 57km length)	$17,878,332	$16,645,343	$12,946,378	$10,480,401
Low Noise Barrier (2m height, 10km length)	$2,655,998	$2,323,999	$2,434,665	$2,323,999
Total (67 km)	$20,534,330	$18,969,342	$15,381,043	$12,804,400

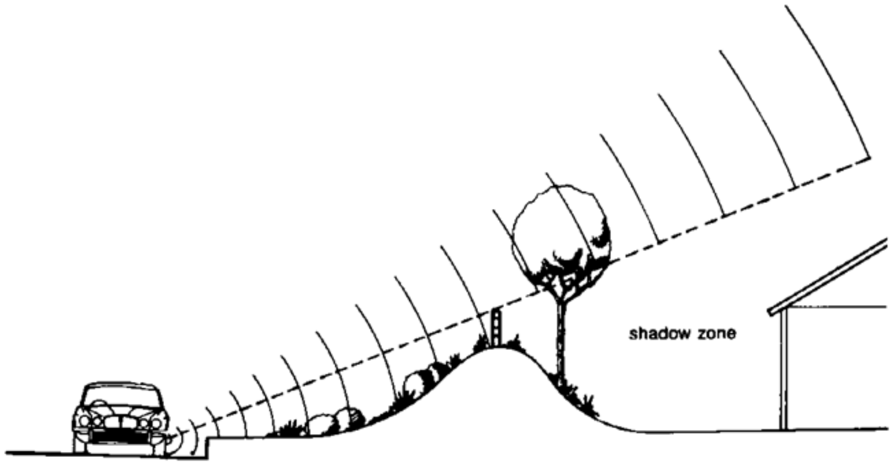
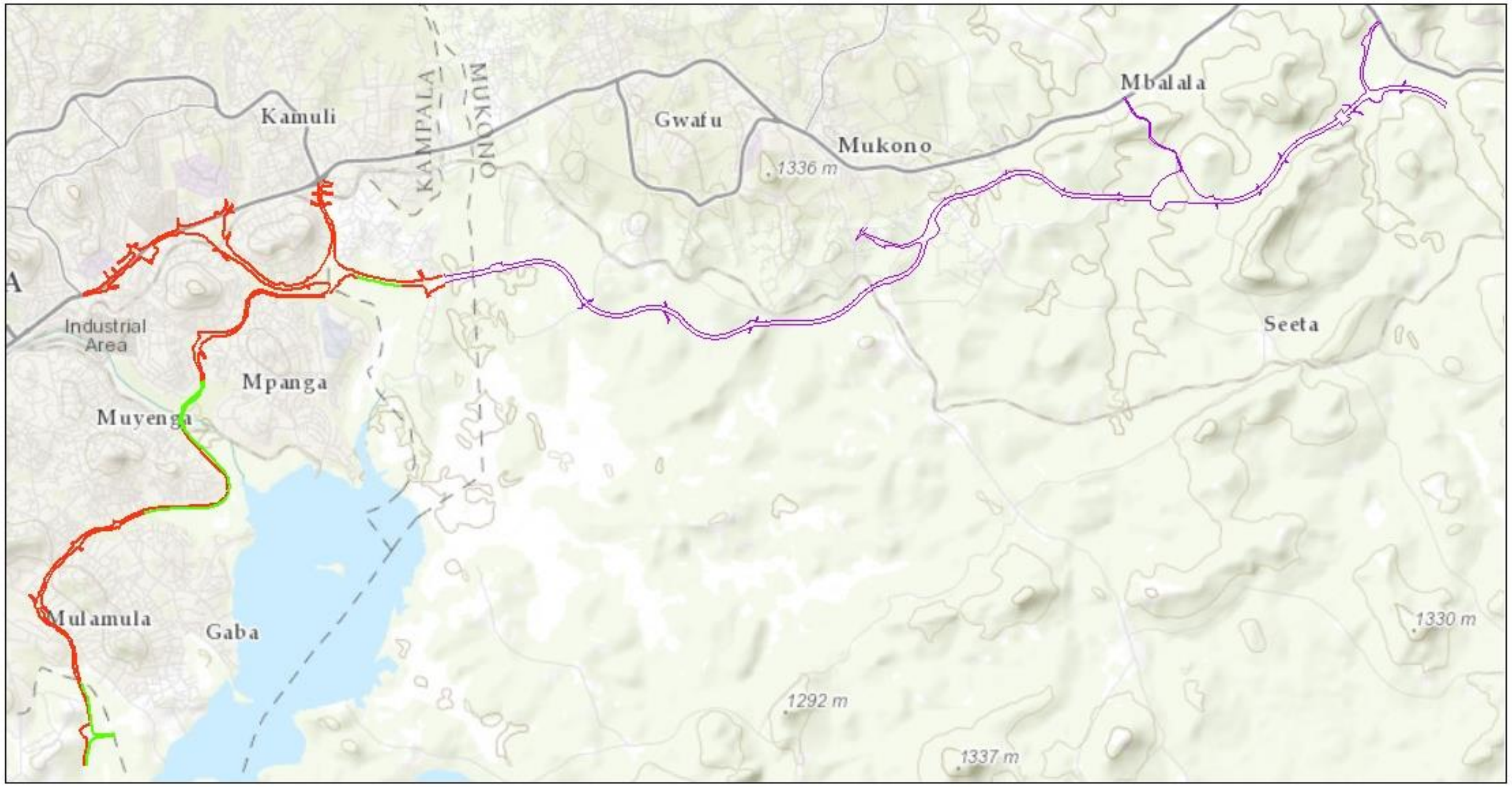


Figure 11-8 Controlling traffic noise along the transmission path (DPTI SA, 2016)



Kampala - Jinja Expressway PPP Project	Legend	Map Scale @ A4: 1:115,000
Proposed Noise Barriers and Fencing for Phase 1	Fencing and Natural Fencing Fencing Plus Noise Barrier (low) Fencing Plus Noise Barrier (high)	0 0.5 1 2 Kilometres N Coordinate System: WGS 1984 UTM Zone 36N Projection: Transverse Mercator Datum: WGS 1984
Revision: Rev1		EARTH SYSTEMS 14 Church Street, Hawthorn, Victoria 3122, Australia Email: enviro@earthsystems.com.au Website: www.earthsystems.com.au
Date: May 2018		

Figure 11-9 Proposed Noise Barriers and Fencing for Phase 1

11.5 Conclusions

Noise and vibrations will pose an impact throughout the construction and operation phases of the Kampala-Jinja Expressway and Kampala Southern Bypass projects. After extensive modelling, the following conclusions were arrived at:

- No noise and vibration impacts are expected to occur during the Pre-Construction Phase as no activities with noise and vibration emissions will occur for the Project during this phase;
- Construction noise activities will primarily be associated with the clearing of land, earthworks and hauling of construction materials;
- Some noise and vibration impacts are expected during the construction phase associated with rock blasting, excavation of rock, road cuttings and construction of overpasses. However, impacts will be localised and short-term;
- Maximum peak hour noise levels on the current Kampala-Jinja Road are lower than with the Mainline Expressway due to current lower traffic flows;
- The city sections of the Mainline Expressway are predicted to have increased vehicle numbers and thus associated noise;
- Maximum noise levels remain relatively consistent along the Kampala Southern Bypass, but levels reduce with distance from Kampala along the Kampala-Jinja expressway. Both expressways are predicted to exceed WHO and Ugandan daytime noise criteria if sound barriers are not erected;
- Noise impacts from the Project include annoyances to community and wetland wildlife, with maximum noise receptor impacts predicted to be typically within 50 m of roadside. Short-term and long-term health impacts reduce significantly with distance from the expressway;
- Night-time traffic noise may be an issue for residents due to sleep disturbances, and nocturnal wildlife may be impacted; and
- Development and implementation of a detailed Noise and Vibration Management Plan including management and mitigation measures such as noise barriers and regular noise and vibration monitoring will result in both KSB and KJE Mainline roads meeting the WHO and Ugandan daytime noise criteria. This Plan should incorporate all relevant measures outlined in the ESMMP (refer to Volume D).

KJE PPP Project Phase 1 ESIA

CHAPTER 12 Greenhouse Gas and Climate Change

12. GREENHOUSE GAS AND CLIMATE CHANGE

Uganda has one of the lowest greenhouse gas emissions per capita in the world estimated at 1.36 tonnes of carbon dioxide equivalent (tCO_{2e}) per capita. Uganda's total emissions of CO_{2e} in 2012 was estimated at 49 $MtCO_2e$ (USAID, 2015).

Total transport emissions for Uganda are estimated at 3.1 $MtCO_2e$ (Uganda Bureau of Statistics, 2016; UN Statistics Division Energy Statistics Database, 2013) representing approximately 6.4% of total emissions for the country. This estimate is based on total petroleum sales in Uganda and a percentage estimate of sales for transportation purposes (all petrol and 80% of diesel sales are for transportation purposes) (Kiggundu, 2015).

12.1 Study Area and Methodology

The study area considered for the greenhouse gas assessment includes the Kampala-Jinja Mainline Expressway (KJE) and the Kampala Southern Bypass (KSB).

The proposed KJE main alignment between Kampala and Namagunga is approximately 33.6 km with interconnectors to join the new road to some of the towns in close proximity (e.g. Mukono).

The proposed KSB (approx. 18 km) will link with the Kampala-Jinja Mainline Expressway through an interchange at Butabika and join the Kampala-Entebbe Expressway at the Munyonyo spur.

Detailed data for some aspects of the calculation of greenhouse gas emissions and energy usage were not available and relevant assumptions were made to estimate emissions for the Construction and Operation Phase.

Only Scope 1 (direct) emissions are considered in the following GHG assessment. Scope 1 emissions are direct emissions from owned or controlled sources.

Scope 2 emissions are indirect emissions from the generation of purchased energy. There is not expected to be Scope 2 (indirect) emissions from the consumption of electricity from the grid during Construction Phase and only minor Scope 2 emissions during the Operations phase as most of the electricity requirement (e.g. for lighting) is planned to be sourced from solar power.

Scope 3 emissions are indirect GHG emissions which occur as a result of sources not owned or controlled by UNRA in relation to the Project. For example, embodied emissions from material use in the Project, emissions from equipment delivery to site, and travel emissions of employees to site. Scope 3 emissions are expected to be minimal and are excluded in this assessment.

12.1.1 Construction

12.1.1.1 Expressway Construction

The Project's construction emissions have been estimated using a global emission factor per km of a typical expressway construction. The emission factor is derived from International Road Federation's greenhouse gas calculator CHANGER, which is fully compatible with the Intergovernmental Panel on Climate Change (IPCC) Guidelines. The range of emission factors for various road categories are shown below (World Bank, 2011) in

Table 12-1.

Table 12-1: Typical unit GHG emission of various road categories (Source: World Bank, 2011)

	Expressway	National Road	Provincial Road	Rural road - gravel	Rural road - DBST
Emission (tCO_2 eq/km)	3234	794	207	90	103
Factor Equivalent to Expressway	100	24.5	6.4	2.8	3.2

Note:*"Expressway: Divided highway used by high-speed traffic with controlled or partially controlled access; National Road: Generally funded, constructed and operated under the auspices of the national government, or, more specifically, the Ministry of Transport; Provincial Road: Generally funded, constructed and operated under the auspices of the provincial government (usually have lower speeds, weights classes and traffic demands compared to a national road); Rural Gravel Road: Constructed with only a gravel wearing course and operated under the auspices of a local government authority within the provincial government or as a separate agency such as a department of feeder roads; Rural DBST road: Double bituminous surface treatment road, generally a major feeder road found in rural areas that falls under the same auspices as the authority or department that oversees rural gravel roads (usually higher quality than rural gravel roads because of their higher traffic and weight requirements)."*

The emission factors are then further broken down into the following components displayed in Table 12-2.

Table 12-2: Typical breakdown of GHG emission, by work item, for various road categories (World Bank, 2011)

Emissions (t CO_2 eq/km)	Expressway	National Road	Provincial Road	Rural road - gravel	Rural road - DBST
Earthworks	161	16	12	3	3
Pavement	1334	425	157	72	86
Culverts	238	51	17	12	12
Structures	1068	119	21	3	3
Road Furniture	432	182	0	0	0
Total	3234	794	207	90	103

12.1.1.2 Vegetation Clearing

Vegetation clearing emissions due to carbon loss can be estimated based on the biomass density of type and area of land cleared. Data from the National Biomass Study Technical Report of 1996-2002 released by Uganda's Forest Department (Ministry of Water Lands and Environment) (Drichi, P., 2002) has been used to estimate the vegetation clearing emissions of the Project, as shown in

Table 12-3. In this assessment, for calculation purposes, it is assumed that the biomass has 50% carbon content.

Not all land types defined by the biomass survey to be cleared during the Construction phase are relevant to the land type list as per

Table 12-3. These land areas would have a low biomass content and were omitted from the assessment.

Table 12-3: Substratification based on stocking densities (Adapted from Drichi, P., 2002)

Land Use / Cover	Substrata			Mean biomass density (without sub-stratification) tons/ha
	Low tons/ha	Medium tons/ha	High tons/ha	
Plantations and woodlots	10-20	20-40	40-100	
Plantations (softwoods)				
Tropical high forest	<150	150-350	>350	
Tropical high forest (degraded)	<50	50-100	>100	
Woodlands	<40	40-80	>80	
Bushlands	<10	10-20	>20	
Grasslands	<10	10-20	>20	
Wetlands				0.46
Subsistence farmlands	<10	10-20	20-30	
Commercial farmlands	N/A			
Built up areas	N/A			
Water	N/A			
Impediments	N/A			

12.1.2 Operations

12.1.2.1 Road Network Greenhouse Gas Emissions

The software Copert Street Level (v.2.3), a modelling program created by Emisia SA, was used to estimate the hot exhaust emissions of road networks. The hot exhaust emission factor calculations included within the European Monitoring and Evaluation Program / European Environment Agency (EMEP/EEA) Air Pollutant Emission Inventory Guidebook were used as the methodology of the software's calculations.

The emission results obtained through Copert Street Level only include the direct hot exhaust emissions created by the number of vehicles that pass through the road at a certain speed. The vehicle fleet age and its technology, Passenger Car Unit (PCU) weights, percentage of each vehicle sector of the total vehicle fleet and fuel consumption of each vehicle sector are all input parameters required to obtain the final emission results. Vehicle speed also influences fuel consumption and this is accounted for in the Copert modelling. The vehicle fleet data of Cyprus is used in the program, as the age and size of its vehicle fleet is comparable to Uganda's vehicle fleet.

Some key assumptions used for the modelling program include:

- An average speed of 20 km/hr for vehicles passing through existing Kampala-Jinja road (as per Table 7-2 in Chapter 8 Traffic, Transport and Accessibility);

- An expected average vehicle speed of 80 km/hr under the Project scenario (higher travelling speed is anticipated due to more vehicle space being made available, thus less congestion);
- The number of lanes on the existing Kampala-Jinja Road was determined using Google Satellite images and Google Street View and verified during field visits. The number of lanes of the proposed KJE was obtained from the feasibility report (2017);
- As per above, Cyprus was used as the input for the baseline country due to its relatively similar size and age of its vehicle fleet compared to Uganda. Other European baseline countries were not selected, as they were not similar to Uganda's vehicle fleet;
  - Cyprus average fleet age is 10 years or older (ACEA, 2016), while Uganda's fleet age is 15 years (Mutenyo J. et al, 2015);
  - Cyprus vehicle fleet size is estimated at 650,000 in 2009 (Republic of Cyprus, Ministry of Finance, Statistical Service, 2017), and Uganda's fleet size is 800,000 in 2014 (Mutenyo et al, 2015), including trailers that had to be omitted for the modelling program (thus Uganda's fleet size is assumed to be similar to Cyprus' fleet size);
- PCU factors assigned for the modelling program were derived from URS Scott Wilson Traffic Survey report (2011). The URS Scott Wilson Traffic data was applied to the KJE sections. PCU factors for KSB were estimated as one third of data at the Butabika interchange;
- The vehicle sector percentage values were based on Uganda's vehicle composition percentage figures in 2009 (Kiggundu, A.T., 2015); and
- Percentages of fuel type used in Uganda for transportation purposes were derived from Baseline Survey of Uganda's National Average Automotive Fuel Economy report (Mutenyo, J. et al, 2015).

The following table lists the figures used based on the assumptions above as inputs to the software (Table 12-4).

Table 12-4: Inputs used to estimate emissions of road networks

Sector	%	Fuel Type (%)			PCU Factor
		Gasoline	Unleaded Gasoline	Diesel	
Cars	29	0	77	23	1
Light Commercial Vehicles (LCV)	12	0	77	23	1
Trucks	5.5	5	0	95	1.9
Buses	0.5	0	0	100	1.1
Other/mopeds	1	100	0	0	1
Motorcycles	52	100	0	0	1

Note: Cyprus was used as a baseline due to its similarities in vehicle fleet size and age to Uganda's.

12.1.2.2 Maintenance Activities Emissions

Due to limited data, emissions resulting from maintenance activities (e.g. pothole patching, cleaning of drainage facilities, repairs of broken road items, resurfacing, maintenance of street lights and signs, etc.) were excluded from

the assessment. The emissions were expected to be minor when compared to the direct hot exhaust emissions created by vehicles passing through the road all year round.

12.2 Baseline Conditions

12.2.1 Kampala-Jinja Road Baseline Greenhouse Gas Emissions

The baseline greenhouse gas emissions of the existing Kampala-Jinja road were estimated based on the 'Do Minimum' scenario in the Traffic Study Modelling report by URS Scott Wilson (2011). The 'Do Minimum' scenario involves highway schemes planned by UNRA and other planning bodies independent of the Project, i.e. they are likely to be implemented even if the Project is not implemented.

Table 12-5 shows the emissions of the 'Do Minimum' baseline scenario for Kampala-Jinja Road if the Project is not implemented.

Table 12-5: Estimation of the emissions from existing Kampala-Jinja Road – 'Do Minimum' Scenario for Phase 1

Year	Daily Hot Exhaust Emissions (tCO_2e/day)	Yearly Hot Exhaust Emissions (tCO_2e/year)
2021	152.36	55,612
2027	217.95	79,550
2037	241.73	88,231

*Simple daily average emissions, not considering vehicle type

12.3 Impact Assessment

The Project is currently planned for a 30-year term, inclusive of the construction period, after which Project facilities will be transferred to UNRA. Once operational, the expressway is expected to save up to 70 minutes of journey time between Kampala and Jinja.

The proposed Project is expected to improve traffic conditions through reduction of traffic congestion, air pollution, noise, accidents, and increase overall efficiency of the road network with a consequent improvement of the national/international road freight traffic. Improved exhaust emission control, facilitated by controlled access onto the carriageways is expected to have a significant benefit. This will result in the reduction of vehicle-operating costs, travel time, fuel consumption and generally improve the road users travel conditions.

Table 12-6 shows the total initial estimate of greenhouse gases emitted from the Construction and Operations phase of the proposed Project.

The Phase 1 emissions of the project during construction (including emissions from vegetation clearing) represents approximately 6% of total 2012 transportation emissions, or 0.4% of Uganda's total 2012 greenhouse gas emissions. For the transportation component only, the vehicle emissions in 2021 represent about 2% of transportation emissions, or 0.2% of Uganda's total greenhouse gas emissions. The figures are expected to increase in years 2027 and 2037 to 4% and 5% of 2012 transportation emissions respectively, or 0.2% and 0.3% of Uganda's 2012 total emissions respectively.

Table 12-6: Estimation of the Project's construction and operations emissions – Phase 1

Component	Construction Phase Emissions (tCO_2e)		Operations Phase Emissions (tCO_2e)		
	KJE	KSB	2021	2027	2037
Expressway construction	108,662	57,565			
Vegetation clearing	13,253	491			
Existing Kampala-Jinja road			22,682	34,812	41,914
KJE Mainline Expressway			41,196	69,817	83,354
KSB			7,636	11,660	12,795
TOTAL	179,972		71,514	116,289	138,063

The following section describes the emissions in more detail.

12.3.1 Pre-Construction

No greenhouse gas emissions are expected to occur during the Pre-Construction Phase.

12.3.2 Construction

12.3.2.1 Kampala-Jinja Mainline Expressway and Kampala Southern Bypass

The construction emission factor used in this assessment is 3,234 tCO_2e/km of the proposed expressway (Scope 1 emissions) with the breakdown shown in

Table 12-1 and Table 12-2 respectively above.

The assessment below considers the construction emissions of the Project's Phase 1, which includes the Kampala-Namagunga (33.6 km) section of the KJE, expected to be completed by 2021, and the Kampala Southern Bypass (17.8 km) which is expected to be completed by 2023. This gives an estimate of 166,228 tCO_2e of GHG emissions released during the Phase 1 construction of the proposed expressway (

Table 10-1).

Table 12-7: Estimation of the Project's construction emissions

Component	Emission Factor (tCO_2e/km)	Emissions (tCO_2e)	
		KJE Construction	KSB Construction
Earthworks	161	5,410	2,866
Pavement	1,334	44,822	23,745
Culverts	238	7,997	4,236
Structures	1,068	35,885	19,010
Road Furniture	432	14,515	7,690
TOTAL	3,234	108,662	57,565
TOTAL PHASE 1		166,228	

12.3.2.2 Vegetation Clearing

Another emission source to consider during the Construction Phase is the carbon loss due to vegetation clearing.

Table 12-3 is used as the basis to estimate the carbon content of biomass from the land cleared based on its type. A 50% carbon content of the biomass cleared has been assumed in this assessment.

See the table below for the breakdown of vegetation clearing emissions due to carbon loss (Table 12-8).

Table 12-8: Estimation of the Project's vegetation clearing emissions – Phase 1

Observation	As per Uganda's National Biomass Study Technical Report	Assumed Stocking Density	Average Biomass Density (t/ha)	Area (ha)		Emissions (tCO_2e)	
				KJE	KSB	KJE	KSB
Agro-pastoral Land	Subsistence farmlands	Medium	15	137.9	12.3	3,793	339
Cleared Land / Minor Agriculture	Subsistence farmlands	Medium	15	34.0	1.5	934	40
Closed Forest	Tropical High Forest	Medium	250	4.6	0.0	2,097	
Degraded Wetland	N/A	N/A	-	25.7	1.1	-	-
Drainage	N/A	N/A	-	2.2	0.0		
Fallow Land	N/A	N/A	-	17.9	0.0	-	-
Grassland	Grassland	Medium	15	0.0	0.1	-	3
Industrial Land	N/A	N/A	-	28.8	0.6	-	-
Open Forest / Woodland	Tropical High Forest (low end)	Low	150	15.7	0.0	4,319	-
Plantation	Plantations and woodlots	Medium	30	10.0	0.0	551	-
Recreational Area	Built up areas	N/A	-	0.7	0.0		

Observation	As per Uganda's National Biomass Study Technical Report	Assumed Stocking Density	Average Biomass Density (t/ha)	Area (ha)		Emissions (tCO_2e)	
				KJE	KSB	KJE	KSB
Road / Tracks	Built up areas	N/A	-	25.3	1.0	-	-
Scrubland	Bushland	Medium	15	26.2	0.3	721	9
Settlement Area	Built up areas	N/A	-	68.9	17.4		
Tea Plantation	Subsistence farmlands	Medium	15	28.9	0.0	795	-
Urban Forest	N/A	N/A	-	0.6	0.0		
Wetland - Papyrus	Wetland	Mean	0.46	31.4	0.0	27	-
Wetland - partially cultivated	Wetland	Mean	0.46	17.6	0.0	15	
Sugar Cane	Subsistence farmlands	Medium	15	0.0	3.6	-	99
Water	N/A	N/A	15	0.0	0.1	-	-
TOTAL PHASE 1				476.4	38.1	13,253	491
				514.5		13,744	

12.3.3 Operations

The results from Copert Street Level modelling program (based on the assumptions listed in 12.1.2) are shown below. Note that actual emissions are likely to be affected by road conditions, tyre conditions, engine conditions, age and technology, as well as driving habits, which are not taken into consideration by the modelling program.

12.3.3.1 Existing Kampala-Jinja Road

Using Copert Street Level modelling program and forecast traffic data from URS Scott Wilson Traffic Study – Traffic Modelling Report (URS Scott Wilson, 2011), the greenhouse gas emissions of the existing road network (for traffic not diverted to the proposed expressway) can be estimated.

The following emissions for 2021, 2027, and 2037 of the existing Kampala-Jinja road are shown in Table 12-9 below.

Table 12-9: Estimation of the emissions from existing Kampala-Jinja Road – Phase 1

Year	Daily Hot Exhaust Emissions (tCO_2e/day)	Yearly Hot Exhaust Emissions (tCO_2e/year)
2021	62.1	22,682
2027	95.4	34,812
2037	114.8	41,914

*Simple daily average emissions, not considering vehicle type

12.3.3.2 Kampala-Jinja Mainline Expressway (KJE) and Kampala Southern Bypass (KSB)

The main greenhouse gas emissions included during the Operations phase is the road network emissions caused by vehicles passing through the proposed road Project.

The emissions estimate is adapted from the forecast data for 2021, 2027, and 2037 from Traffic Modelling Report by URS Scott Wilson (2011) that closely approximates the alignment of the proposed KJE and a proportion of vehicles directed to KSB. The estimates are displayed in Table 12-10.

Table 12-10: Estimation of the emissions from Kampala-Jinja Mainline Expressway – Phase 1 (incl. KSB)

Year	Daily Hot Exhaust Emissions (tCO_2e/day)	Yearly Hot Exhaust Emissions (tCO_2e/year)
2021	133.8	48,832
2027	223.2	81,478
2037	263.4	96,149

*Simple daily average emissions, not taking into account vehicle type

12.4 Avoidance, Mitigation and Management Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management and mitigation measures for minimising greenhouse gas impacts (refer to Volume D).

The key mitigation measures to be implemented and expected residual impacts related to climate and greenhouse gases under normal operating conditions are summarised in Table 12-11. Monitoring will be required during the life of the project to confirm the residual impact predictions, and allow management measures to be adapted accordingly.

Table 12-11 Key Avoidance, Management and Mitigation Measures and Residual Impacts / Risks for Climate and Greenhouse Gas Emissions

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction			
Climate and Greenhouse Gases - Design	► Consider the use of renewable energy (e.g. solar powered lights, biodiesel, etc.) ► Establish energy conservation targets for the Project for measuring improvement in greenhouse intensity of road construction in accordance with good international industry practices. ► Integrate energy efficiency principles in building or facility design. ► Use best available technology to minimise greenhouse gas emissions at site and processing facility (e.g. asphalt plant).	Neutral	Negligible No greenhouse gas emissions are expected to occur during the Pre-Construction Phase.
Construction			

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
Climate and Greenhouse Gases – fuel and energy use	▶ Maximise efficiency of energy use (type of fuel, lighting, etc.) ▶ Follow international industry practices for minimising Project related greenhouse gas emissions, particularly for major emission sources (e.g. asphalt plant) ▶ Apply appropriate greenhouse gas management measures to all Project-related transport activities. ▶ Ensure contractors comply with relevant measures outlined in the *ESMMP* to be prepared for the Project. ▶ Minimise vehicle / equipment idling time to increase efficiency and reduce emissions.	Negative	Minor Minor greenhouse gas emissions will occur due to fuel and energy use from construction activities
Climate and Greenhouse Gases – Vegetation Clearing	▶ Minimise land clearance to reduce carbon loss. ▶ Mulch and chip cleared vegetation rather than burn and re-use in rehabilitation. ▶ Maximise absorption/offset of greenhouse gases through revegetation of land during and after construction. ▶ Progressively rehabilitate and revegetate cleared land during construction to ensure that land is revegetated as soon as possible after construction is completed in line with the Revegetation Plan (Volume D).	Negative	Minor Minor greenhouse gas emissions will occur due to vegetation clearing within the Project footprint
Operations			
Climate and Greenhouse Gases - Heavy equipment and vehicles	▶ Where possible, select the most fuel efficient vehicles and equipment viable for use on site for maintenance activities. ▶ Support policies for the introduction of fuel efficient vehicles to Uganda. e.g. electric vehicles powered by renewable energy sources. ▶ Minimise idle time of equipment and vehicles. ▶ Introduce eco-driving strategies for maintenance vehicles to reduce fuel consumption and emissions, including (Eco Driver, 2009): • Keeping a steady speed on a highway; • Using overdrive at high speeds to save fuel and reduce engine wear; • Travel light if possible (i.e. don't carry excessive weight); • Ensure tyre pressure is appropriate to avoid increased fuel consumption due to under-inflated tires; • Clogged air filter can increase fuel usage by up to 10% because insufficient air make it to the combustion chambers; • Ensure maintenance is up to date (i.e. using worn-out / wrong grade of oil can increase fuel consumption by up to 2%, regular vehicle tune ups can reduce fuel consumption by up to 15%, etc.).	Negative	Moderate Greenhouse gases will be generated by vehicles travelling on the road. Small amounts of greenhouse gases will be also generated through fuel use during road maintenance work.
Climate and Greenhouse Gases - Energy Usage	▶ Consider use of renewable energy (e.g. solar powered lights) to substitute or augment fossil fuel usage for electricity generation (e.g. street lights, toll booths operation) ▶ If possible, consider fuel switching to renewable fuel (e.g. use biodiesel)	Negative	Minor Energy use for street lighting and toll booths will contribute to greenhouse gas production.
Climate and Greenhouse Gases	▶ Establish roadside vegetation where appropriate.	Positive	Minor

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
– Vegetation Clearing	► Progressively rehabilitating cleared land during the Construction and Operations phases to ensure that land is revegetated as soon as possible (refer Revegetation Plan, Volume D).		Revegetation for the Project will result in carbon sequestration.

12.5 Conclusions

The assessment concludes that the impact of the Project's Phase 1 emissions during construction and operations would contribute to the country's emissions minimally (under 1% of the country's 2012 emissions). The Project is expected to generate more greenhouse gas emissions when compared to baseline emissions (under 'Do Minimum' scenario) due to the construction and increased traffic flows under the Project scenario.

However, the decreased congestion would result in vehicles driven at higher speed and steadier pace (less braking) with a reduction of fuel consumption and CO_2 emissions per vehicle. Based on the modelling conducted (using the assumptions stated above as inputs to the modelling program) emissions per vehicle is lower under the Project's Operations Phase in comparison with the 'Do Minimum' scenario. This is mostly a function of the increased vehicle speed and more efficient fuel use. Total greenhouse impacts of the vehicle emissions during expressway operations are minimal, representing 2% - 5% of total transportation emissions or 0.2% - 0.3% of Uganda's total greenhouse gas emissions.

Revegetation of temporarily disturbed areas and establishment of roadside vegetation for the Project will result in carbon sequestration, which will partially offset the greenhouse gas emissions related to vegetation clearance. The extent of this offset will depend on the success of the revegetation efforts. A Revegetation Plan has been developed for the Project (refer to Volume D) to guide the rehabilitation and revegetation activities.

KJE PPP Project Phase 1 ESIA

CHAPTER 13 Visual Amenity and Lighting

13. VISUAL AMENITY AND LIGHTING

13.1 Study Area and Methodology

The study area for the visual amenity and lighting assessment includes communities living within and adjacent to the Project footprint and buffer area. The methodology for the visual amenity and lighting assessment includes:

- Review of background reports and relevant maps of the region;
- Review of Project feasibility studies and work conducted during the previous ESIAs;
- Use of imagery and review of previous site investigations;
- Identification of existing physical features, natural and cultural values, landscape features, tourism features, scenic views and the visual characteristics of the area;
- Impacts were determined through spatial analysis, and 3D modelling to identify potentially sensitive receptors and assess the level of impact.

13.2 Baseline Conditions

13.2.1.1 Landscape Character Types

Landscapes in the Project area vary from urban landscapes to agro-pastoral landscapes, wetland areas and natural habitats.

Much of the landscape within the alignment has been modified by human activities such as subsistence agriculture, the establishment of settlement areas and industrial activities, and commercial agriculture such as plantations. A key feature of the area surrounding the Project is the presence of Kampala city, where the commencement of the KJE and much of the KSB alignment is located.

Landscapes along the KJE alignment vary from the dense urban settlement areas in and around Kampala and Wakiso districts, to agro-pastoral land, natural forest areas, plantations and smaller settlement areas where the alignment passes through Mukono district to Namagunga. The route also passes through several degraded wetlands and papyrus wetland areas (e.g Namanve wetland).

The KSB alignment passes mainly through urban areas and traverses through various physically distinct landscape types between Butabika Interchange and Munyonyo including extensive swamps and wetlands, hills and ridges at Mutungo, Muyenga and Bukasa and densely urban populated areas, including informal settlements. Some agricultural areas comprising of sugarcane farming are also present. No papyrus wetlands were identified along the KSB alignment.

Landscape character types have been defined for the study area to assist in determining the ability of the landscape to accommodate the development of the expressway (Plates 12-1 to 12-6). These include:

- Urban areas / build up land -
- Agricultural/rural land;
- Valleys / foothills;
- Ranges and hilltops;
- Waterways;

- Natural forest;
- Wetlands.

This are described further below.

Urban areas and built up land

These areas are characterised by moderate to intensive land uses ranging from commercial strips, industrial areas, residential areas and public infrastructure areas, with much of the land covered by structures. A large part of the KSB alignment and the first part of the KJE Mainline pass through densely populated urban areas and built up land, particularly in and around Kampala and Wakiso districts. These areas also include several informal settlements.

Wetlands / Swamps

The KSB and KJE alignment passes through a number of urban, peri-urban and rural wetland systems. These are presented in detail in Chapter 16 Ecology and Biodiversity.

Agricultural / rural land

Agriculture is a key land use activity in the Project area, particularly along the KJE alignment. Subsistence agriculture is the main type of agricultural activity along the alignment including intensive agriculture within degraded wetland areas. Pockets of commercial agriculture (sugarcane farming, tea plantations etc) are also present.

Ranges / hill tops

The KSB and KJE alignment passes through a number of ranges and hill tops, where significant cut and fill will be required, such between Mukono and Namagunga on the KJE alignment and around Mutungo, Muyenga and Bukasa on the KSB alignment.

Plate 13-1: Wetland agriculture

Plate 13-2: View of Kampala

Plate 13-3: Kinawataka wetland, KJE alignment

Plate 13-4: Kyeitabya hill, KSB alignment

Plate 13-5: Example of open forest, KJE alignment

Plate 13-6: Rolling terrain, KJE alignment

13.2.1.2 Landscape Character Type and Sensitivity

Landscape sensitivity provides an indication of the ability of a type of landscape to absorb change without dramatically altering its character. The landscape sensitivity categories are:

- High - cannot absorb any physical change;
- Medium - can absorb change with sensitive mitigation; or
- Low - can absorb change.

Table 12-1 summarises the sensitivity of the identified landscape character types to change.

Table 13-1 Potential sensitive receptors and summary of visual impacts

Landscape Character Type	Sensitivity	Reason
Natural forest	High	Any development to occur within this character type may result in a significant visual change due to the loss of forested areas and perceived sense of naturalness.
Papyrus wetland	High	Any development to occur within this character type may result in a significant visual change due to the loss of wetland habitat and perceived sense of naturalness.
Urban / built up areas	Low	Any development to occur in this landscape character is likely to be more easily accommodated by the landscape as it is already modified.
Rural / agricultural areas	Medium	Any development to occur within the landscape type may result in the loss of some vegetation, but may retain the sense of open rural / agricultural areas.
Rolling terrain	Medium	Any development to occur within the landscape type, may result in the requirement for significant cut and fill.

13.2.1.3 Natural and Cultural Values

A baseline of Cultural heritage values in the Project Area is provided in the Archaeology and Cultural Heritage Chapter of the ESIA. The alignment passes over the grounds of several church buildings, grave sites and near to several other religious buildings and tourism sites (e.g. Sezibwa Falls). Views of the area crossed by the alignment will be present from elevated locations in Kampala City where a small number of culturally important sites have been identified (e.g. Kireka Palace).

13.2.1.4 Scenic Views and Tourism Features

It is known for the water beaches and islands on Lake Victoria. Key tourism features in the vicinity of the Project include:

- The Sezibwa Falls are a key tourism and cultural heritage feature in Mukono district. They are located in the vicinity of the Project, approximately 800m south of the alignment from KJE Chainage 32+500 and approximately and approximately 1 km downstream of the Sezibwa River crossing at Chainage 32+800. The falls are a Buganda cultural heritage site and contain scattered shrines as well as remains of archaeological artefacts. The falls have a cultural significance and are visited daily by tourists and traditionalists who go to consult with the priests and priestesses at the shrines (ICS, 2015). The waterfalls are set in an undisturbed natural environment and have also developed into a popular tourist destination for nature adventures and cultural experiences.

- The Kasenge Forest Resort is located in Mbalala, Mukono district, approximately 2km off the existing Kampala-Jinja Highway. The resort offers a natural environment with a wide variety of trees, plants, monkeys and bird species inclusive of a lake and river (ICS, 2015).

Plate 13-7: Kasenge forest resort, Mukono district

Plate 13-8: Sezibwa Falls, Mukono district

13.3 Impact Assessment

13.3.1 Impacts on Landscape Character and Visual Amenity

The main potential impacts on visual amenity and landscape character are likely to occur where the Project alignment:

- Occurs in contrast to natural topography and relief of the landscape, requiring major cut and fill sites which will be different to the surrounding terrain in terms of height, length and incline of slopes;
- Passes through natural habitat such as forests or wetlands, as the Project will add a structural element to natural habitat areas; and
- Affects the views of sites of interest or the views from dwellings.

Negligible to minor impacts are expected where the Project:

- Follows the natural topography and relief of the landscape, as visual disturbance in these areas will be minimised; and
- Passes through modified landscapes where visual amenity is already influenced by other factors, such as in densely urban areas.

The sections below present the potential impacts on visual amenity, landscape character and lighting by section of the Project.

13.3.1.1 Kampala-Jinja Expressway Mainline

KJE Mainline 0 + 000 → 2 + 400 Lugogo to Nakawa/Kyambogo

This section is characterised by high density urban areas with a mix of commercial, residential, industrial and infrastructure land uses. Features of the Project in this section include the expansion of the existing Kampala-Jinja road and two new junctions (KJE 0+520 and 1+560) to allow access from the expressway to New Port Bell Road and Naguru Road and from the expressway to Kinawataka Road via Nakawa-Jinja Road.

Potential overall impacts on landscape character in this section are expected to be low, as the environment is an existing modified urban area and the Project follows the alignment of an existing road. Whilst some dwellings are likely to have a view of the Project, potential impacts on visual amenity are also expected to be low, as the Project mostly involves the upgrade of the existing road. Potential impacts are presented in the table below.

Table 13-2 Potential sensitive receptors and summary of visual impacts

Chainage	Item	Sensitivity of landscape	Level of change	Impact Assessment
KJE 0 + 000 → 2 + 400 Lugogo to Nakawa/Kyambogo	Landscape character: Dense urban landscape – mixture of industrial, commercial and residential uses	Low sensitivity as highly modified urban environment	Low, as first 2.5 km will be an expansion of the existing Kampala-Jinja road	Low
	Dwellings	Low sensitivity	Low	Low

Plate 13-9: Existing Kampala Jinja Road, Nakawa

Source: Google Earth – Street View, 2017

Plate 13-10: Existing Kampala Jinja Road, Nakawa (Chainage 1+500)

Source: Google Earth – Street View, 2017

KJE Mainline 2 + 400 → 4 + 500 Nakawa/Kyambogo to Kinawataka

Surrounding land uses include the industrial area in Kinawataka, degraded wetlands, the Ugandan railway line and the Kinawataka informal settlement area. Features of the Project in this section include two junctions at Kinawataka Road and Kyambogo road. Overall, potential impacts on landscape character and visual amenity are

expected to be low as the Project is in a modified urban environment and the KJE alignment mostly follows the topography of the area. The flyover at Kyambogo Junction will add an additional structural element to the landscape.

Table 13-3 Potential sensitive receptors and summary of impact

Chainage	Items	Sensitivity	Level of change	Impact Assessment
KJE 2 + 400 → 4 + 000 Nakawa/Kyambogo to Kinawataka.	Landscape character - high density urban landscape (including informal settlement areas	Low sensitivity as highly modified urban environment	Low	Low
	Dwellings on slopes adjacent to the alignment	Low to moderate, depending on views of the Project	Low	Low

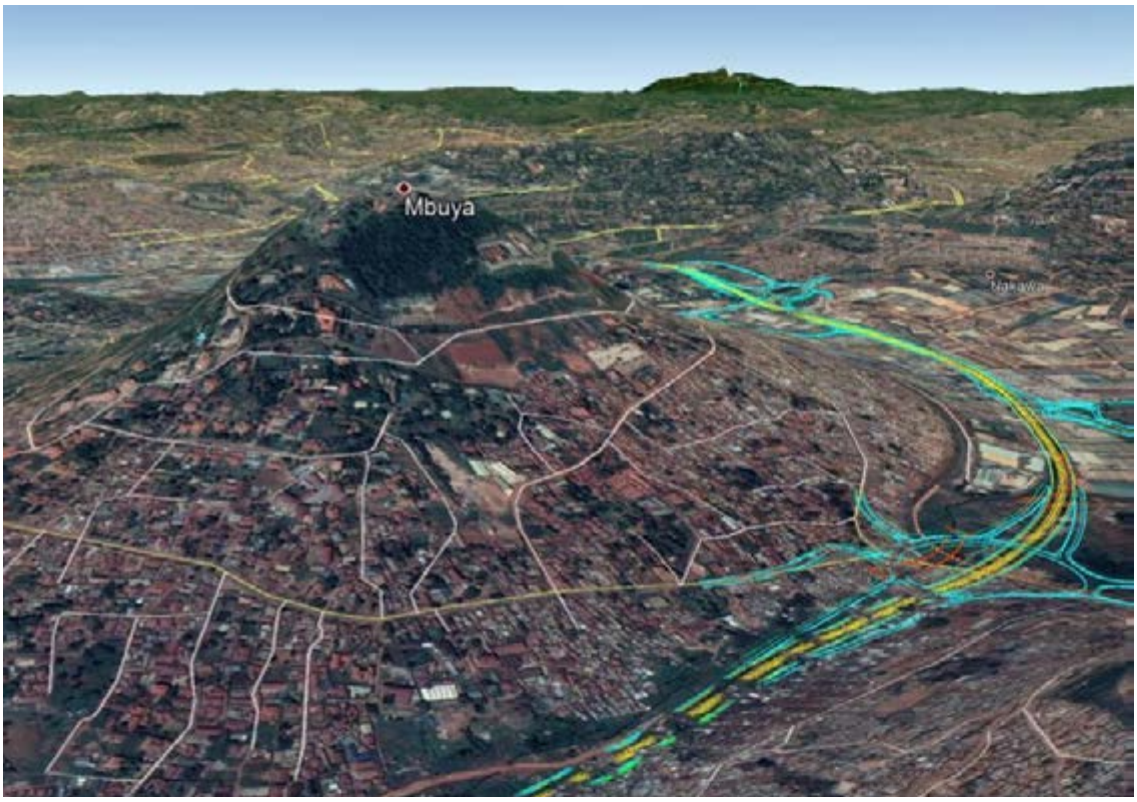


Plate 13-11: View of the KSB alignment from the dwellings on the slopes in the vicinity of Chainage 4+000 – example of low impact on visual amenity

KJE Mainline 4 + 500 → 9 + 200 Kasokoso & Butabika

In this section, the Project follows the topography of the landscape, passing mostly through valley areas. The landscape adjacent to the alignment is characterised by high density urban areas, including informal settlements on the surrounding hills. Key project features in this section include the planned Butabika interchange (Chainage KJE 6 + 400,) which will link the KJE Mainline to the KSB development that will run towards Munyonyo, and the

Bukasa Junction at Chainage 9+030 which will provide access to the expressway from the surrounding residential areas, as well to the Namanve business park, SGR railway station and Bukasa Port.

Overall, potential impacts on landscape character for this section of the Project are expected to be low due to the alignment passing through a modified urban environment. However, localised higher impacts on landscape character and visual amenity are expected from the construction of the Butabika interchange in a floodplain area which will require significant fill. Some visual amenity impacts may occur for dwellings that have a view of the two interchanges.

The Kireka palace located at the top of the Kasokoso hill is likely to have a view of the Butabika interchange and both KJE mainline and KSB alignments. However, as this landscape is already urbanised to a large extent, additive visual amenity impacts may be minimal. Less urbanised areas surrounding the Butabika interchange will likely have a larger visual impact considering the large size of the proposed interchange in this location (>700m wide).

Table 13-4 Potential sensitive receptors and summary of impact

Project section	Items	Sensitivity	Level of change	Impact Assessment
KJE 4+000 to 5+000	Landscape Character: wetland	Low sensitivity as degraded environment from encroachment of settlements	Low	Low
Most of this section	Landscape character: urban area	Low sensitivity	Low	Low
	Dwellings / Cultural sites	Low to moderate depending on views of the project	Low/Moderate	Low/Moderate
Butabika Interchange	Landscape character – floodplain, Significant fill required or construction	Low to moderate	Moderate	Moderate

KJE Mainline 9 + 200 → 11+ 000 Namanve wetland and industrial park

At chainage KJE 9 + 200, the Project alignment enters the Namanve wetland running approximately 1-2 km south of the Namanve Industrial Park which borders the existing Kampala-Jinja road. A key Project feature in this section of the expressway will be the addition of new structural element to the natural habitat of the Namanve wetland. The viaduct will elevate the road approximately 2 m above the water level and utilise concrete pylons driven down into hard rock beneath the wetland sediment and soils.

This is expected to have moderate to high impacts on landscape character. Some visual amenity impacts may also occur from dwellings in the settlement area at Chainage 9+000 if they have an unobstructed view of the expressway and from areas North of the alignment where the Namanve business park is being developed (Plate 13-14). Considerable amounts of fill will also be required as the alignment approaches the railway crossing south of Mukono, which may result in some visual amenity impacts.

Table 13-5 Potential sensitive receptors and summary of impact

Project section	Item	Sensitivity	Level of change	Impact Assessment
Chainage KJE 9 + 200	Alignment and viaduct in Namanve wetland	Moderate to high sensitivity	High	Moderate to High impacts on landscape character
Chainage KJE 9+000	Settlement with views of the alignment through Namanve wetland	Moderate	Moderate	Moderate impacts on visual amenity

Plate 13-12: Viaduct constructed over a wetland area for the Kampala-Entebbe Expressway

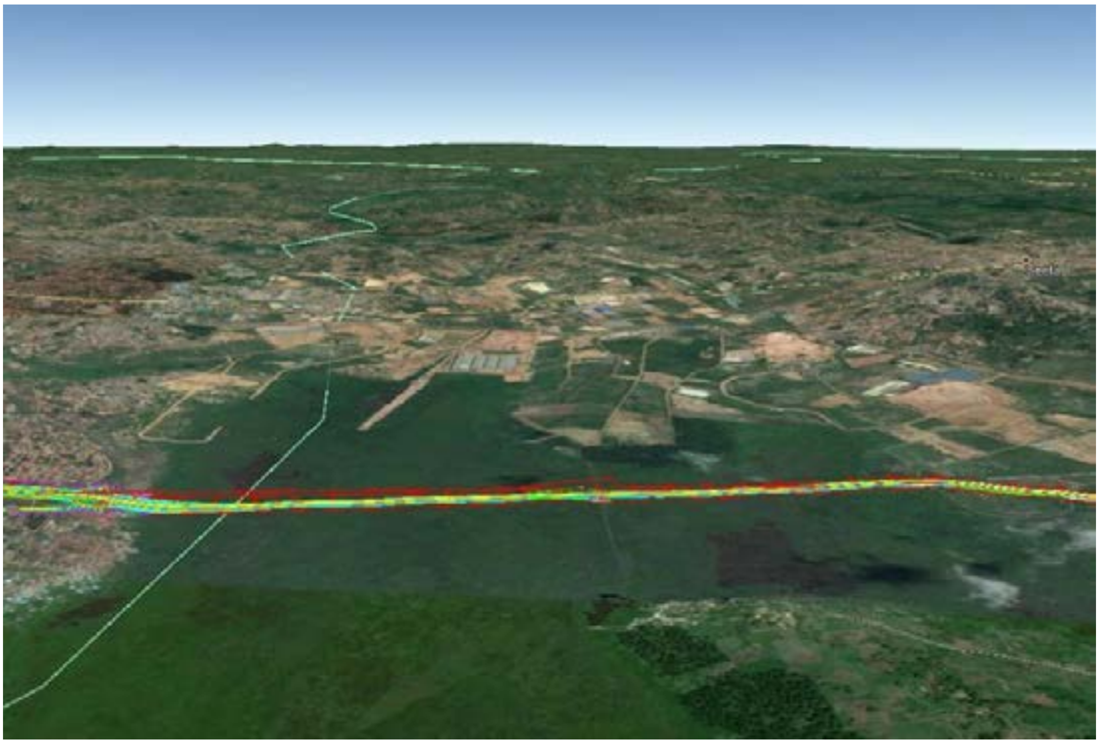


Plate 13-13: Project alignment and viaduct through the Namanve wetland

Plate 13-14: View of the Namanve wetland from an area North of the proposed alignment (465490 E, 36962 N). The alignment will cross this landscape.

KJE 11 + 000→ 33 + 600 Namanve to Namagunga

This section of the Project is characterised by hilly terrain with a number of outcrops, where significant cutting in hard rock will be required for the Project. The surrounding landscapes are mainly rural with modified habitat and land uses including degraded forest habitat, subsistence agriculture and small settlement areas. Some pockets of natural forest are also present.

The main impacts on landscape character and visual amenity are likely to occur in areas where:

- Where the alignment does not follow the natural relief and topography and deep cutting is required in the hillside;
- Where dwellings in settlement areas have a view of major cut and fill sites; and
- Where cut and fill areas require clearing of natural forest vegetation.

In this section, the alignment also traverses through the Sezibwa River. This is likely to have some impact on natural amenity and landscape character in this area. The Sezibwa falls site is approximately 600m from KJE Chainage 32 + 000 and is a popular tourist attraction. The view of the alignment from the falls will be largely blocked by a hilled area to the North of the site. The visual amenity impacts will also be mitigated due to the vegetation cover around the Sezibwa falls site. It is likely that tourists will be able to see the road as they try to obtain access to the site where a vehicular overbridge is planned to be built. There may still be some impact on visual amenity as tourists travel to and from the site.

Table 13-6 Potential sensitive receptors and summary of impact

Chainage	Item	Sensitivity	Level of change	Impact Assessment
Chainage 12+400	Landscape Character: Project alignment through natural forest vegetation	High	Localised moderate change in the landscape	Localised moderate impact on landscape character
Chainage 13+500	Landscape Character: Significant cut and fill required. Dwellings with a view of the alignment	High	Localised moderate change in the landscape	Localised moderate impact on landscape character
	Settlement area with view of cut and fill site	Moderate	Moderate	Moderate
Chainage 17+000	Deep cutting through hills in vegetated areas. Alignment passes through natural forest vegetation. Small number of dwellings in proximity	Moderate	Localised moderate change in the landscape	Localised moderate impact on landscape character
Chainage KJE 19 + 700	The road crosses the existing road linking Mukono and Nakisunga	Moderate sensitivity	Moderate Change	Moderate
From Chainage 19+500 to 24+000	Landscape Character: Mix of settlement areas and agricultural land / degraded habitat	Moderate sensitivity	Moderate Change	Moderate
Chainage 19+800	Dwellings adjacent to the Project	Low – Moderate as partial view of Project	Moderate	Moderate
Chainage 29+500 and 31+500	Cutting through hills in vegetation and forest areas	Moderate sensitivity	Localised moderate change in the landscape	Localised moderate impact on landscape character
Chainage 33+500 to 31+500)	Settlement area - View of KJE Mainline from Namagunga. Dwellings with a view of the alignment	Moderate sensitivity	Moderate	Moderate visual amenity impacts
Chainage 33+000	Agricultural area / cultivated land	Moderate sensitivity	Moderate	Moderate
Chainage 32 + 500	Natural forest, Sezibwa Falls (cultural site and tourism feature)	High sensitivity	Minor to Moderate	Moderate
Chainage 32+800	Sezibwa River crossing	Moderate	Moderate	Moderate

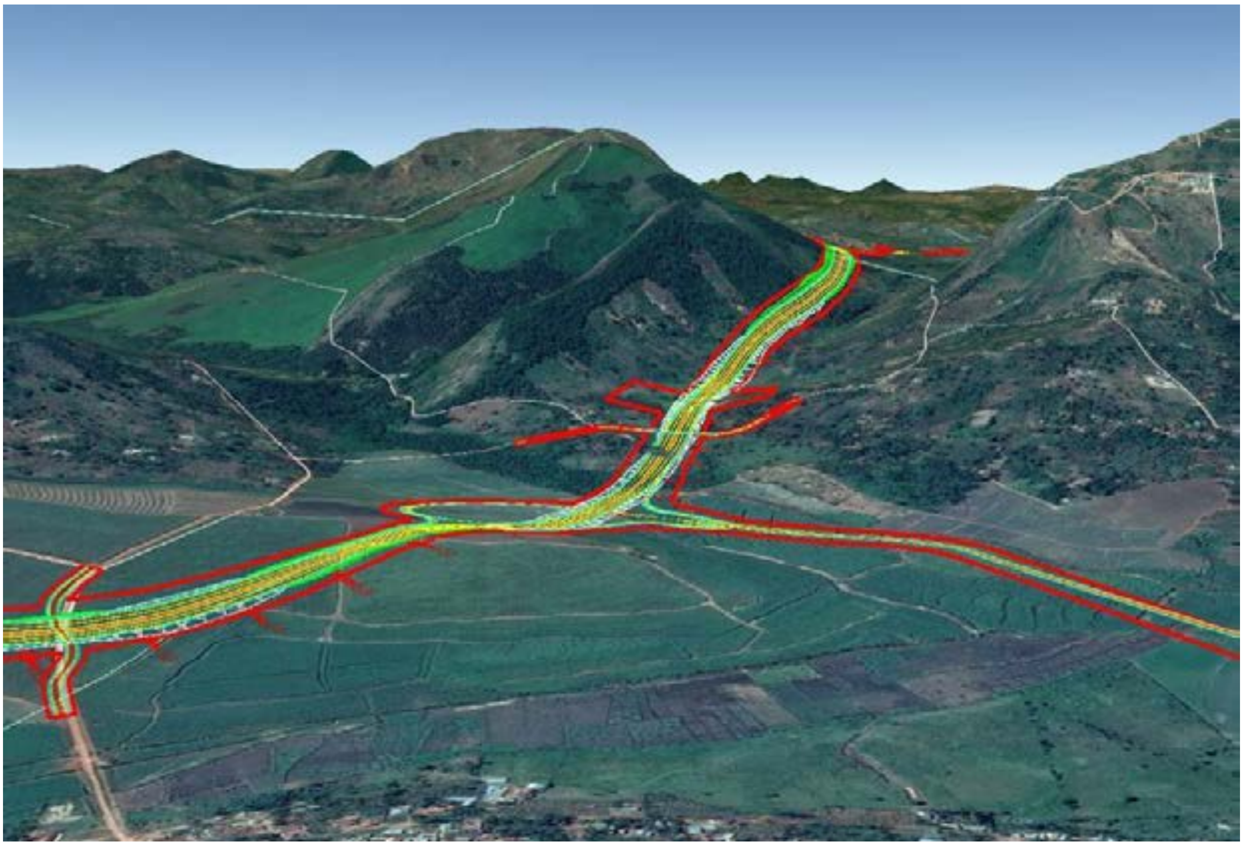


Plate 13-15: View of the KJE Mainline with ROW from Kampala (facing west) from Namagunga

Plate 13-16: Example of landscape at Chainage 24+300

Source: Google Earth – Street View, 2017

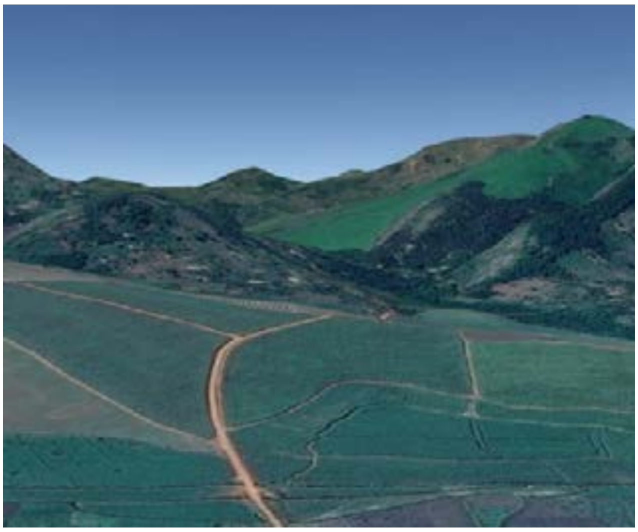


Plate 13-17: Agricultural areas in vicinity of Namagunga, where Project will traverse at Chainage 33+000

13.3.1.2 Phase 1 - Kampala Southern Bypass

KSB 0 + 000 → 4 + 000 Butabika to Mutungo Hill

In this section, the Project mostly traverses through high density urban areas and some wetlands and mainly follows the topography of the area, with the exception of deep cutting required through Mutungo hill. A key feature of the Project in this part of the alignment includes the Butabika interchange where the KSB will join the KJE Mainline alignment. Whilst the Project introduces new infrastructure to the landscape, the surrounding environment is already highly a modified urban environment. Potential impacts on landscape character and visual amenity are presented in the table below.

Table 13-7 Potential sensitive receptors and summary of impact

Chainage	Item	Sensitivity	Level of change	Impact Assessment
0+300 to 0+650	Wetland area	Moderate sensitivity	Moderate	Moderate
Majority of this section	Urban settlement areas - dwellings	Low	Low	Low to moderate
Mutungo hill	Deep cutting through Mutungo Hill	Moderate sensitivity	Moderate	Moderate

KSB 4 + 000 → 5 + 500 Bugolobi and Kitintale

In this section, the Project mostly traverses high density urban areas and mainly follows the topography of the area. A key feature of the Project in this part of the alignment includes the planned Port Bell Road Interchange at Chainage 4+300. Overall, potential impacts on landscape character are expected to be low as the surrounding environment is already modified. Some visual amenity impacts may occur for dwellings close to the alignment. Potential impacts on landscape character and visual amenity are presented in the table below.

Table 13-8 Potential sensitive receptors and summary of impact

Section	Items	Sensitivity of landscape	Level of change	Impact Assessment
Majority of this section	Urban settlement areas	Low sensitivity	Low	Low

KSB 5 + 500 → 11 + 100 Nakivubo Channel, Katongole, Kyeitabya and Ggaba Road

The landscape in the section of the alignment is characterised by urban environments and wetland areas with both natural vegetation and cultivated land areas such as sugarcane farming. Key features of the Project in this section include the viaduct across the Nakivubo wetland and the Ggaba Road Interchange (KSB 11 + 100).

The largest impact on landscape character is expected to be associated with the construction of the viaduct over the Nakivubo wetland. Some dwellings in the settlement area around Chainage 5+300 may also experience visual amenity impacts as a result of the Project. Potential impacts on landscape character and visual amenity are presented in the table below.

Table 13-9 Potential sensitive receptors and summary of impact

Chainage	Items	Sensitivity of landscape	Level of change	Impact Assessment
5+400	Alignment and viaduct in Nakivubo wetland (including cultivated areas such as sugar cane farming)	Moderate to high sensitivity	High	Moderate to High impacts on landscape character
5+400 and 6+700	Settlement with views of the alignment through the wetland	-	-	Moderate impacts on visual amenity and lighting
	Kansanga wetland	Moderate sensitivity	Moderate	Moderate

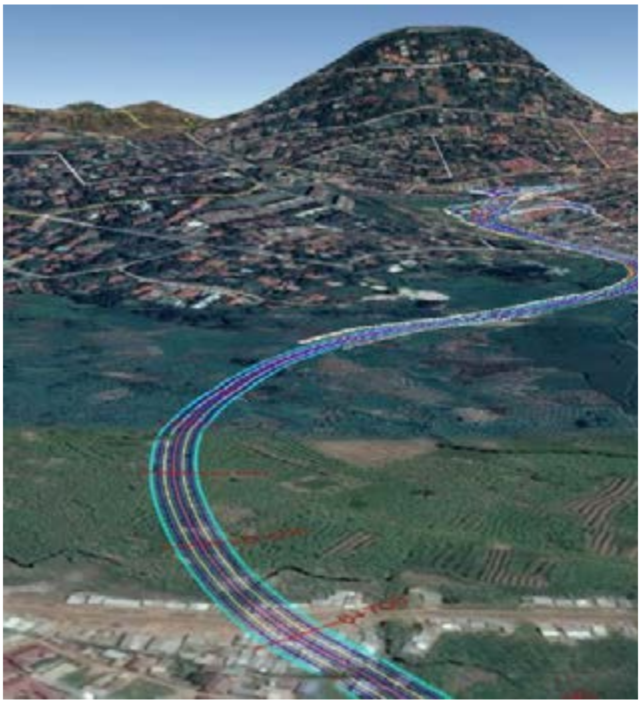


Plate 13-18: View facing north from settlement area at 6+700

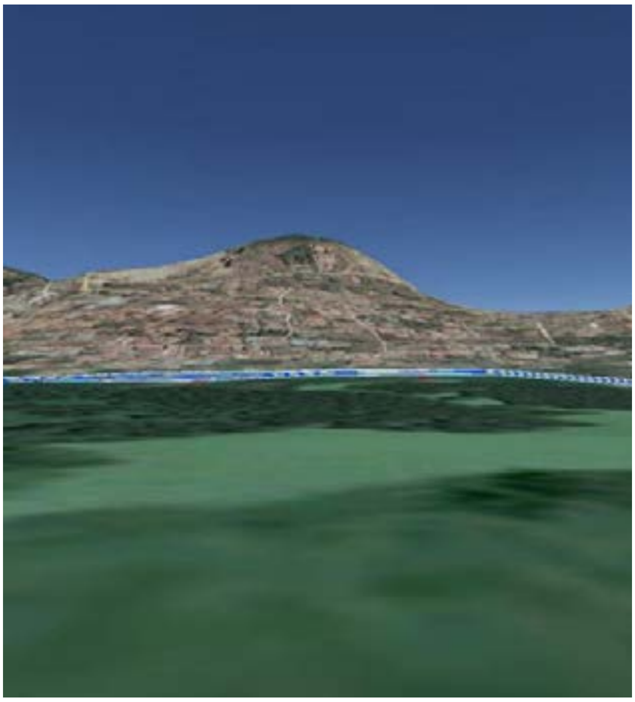


Plate 13-19: View of the KSB from Kasanga wetland

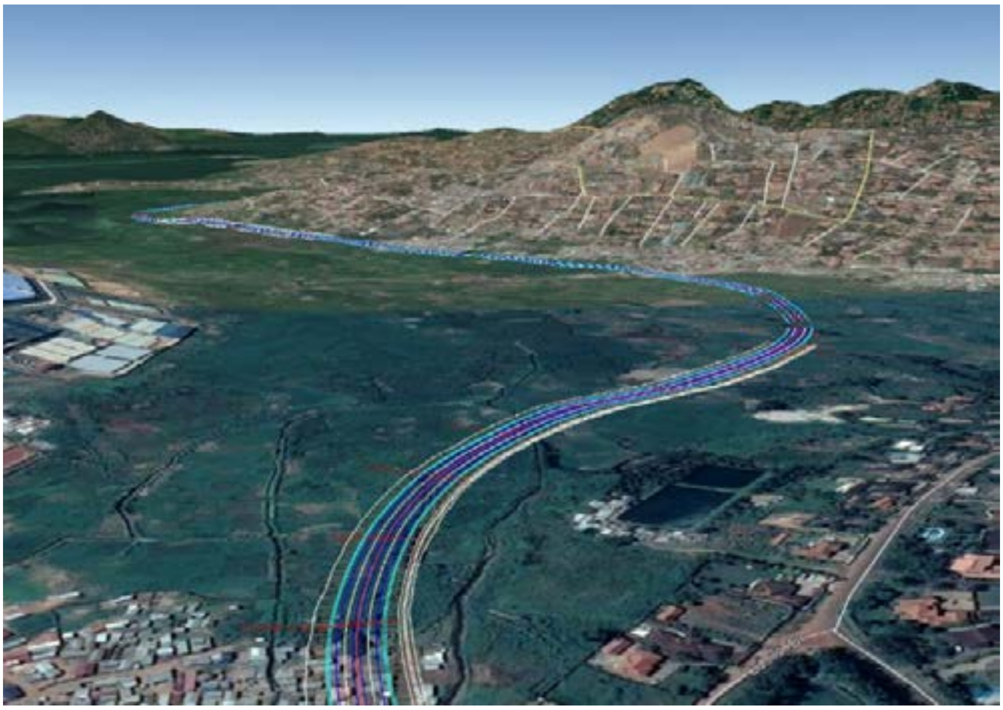


Plate 13-20: View facing south from settlement area at Chainage 5+300

KSB 11 + 100 → 13 + 800 Ggaba Road to Salama Road

Key features of the Project in this section include the Lukuli Road Interchange (12+200) and the Salama Road Interchange (13+800). Minor to moderate impacts on landscape character are expected in this section due to the alignment traversing through the Kasanga wetland. No viaduct is required, thus potential impacts are reduced.

Table 13-10 Potential sensitive receptors and summary of impact

Items	Potential sensitive receptors	Sensitivity of landscape	Level of change	Impact Assessment
Urban settlement area	Dwellings	Low	Low	Low
Kasanga wetland	-	Low - moderate	Low	Low- moderate
Deep cutting through Makindye hill in residential area	Dwellings in adjacent settlement areas	Moderate	Moderate	Moderate

KSB 13 + 800 → 17 + 787 Salama Road to Munyonyo

This section of the alignment is characterised by a mixture of urban settlement areas, wetland habitat and cultivated land. The Project alignment mostly follows the existing topography and towards the end, the alignment closely follows an existing road. The alignment also runs adjacent a wetland. Key features of the Project in this section is the Munyonyo Interchange at Chainage 17+100 where the KSB will connect to the Kampala-Entebbe Expressway which is currently under construction.

Table 13-11 Potential sensitive receptors and summary of impact

Items	Sensitivity of landscape	Level of change	Impact Assessment
Project alignment on high embankment adjacent to floodplain	Moderate	Moderate	Moderate

13.3.2 Lighting Impacts

13.3.2.1 Pre-Construction

No lighting impacts are expected to occur during the Pre-Construction Phase as no activities with lighting requirements will occur for the Project during this phase.

13.3.2.2 Construction

During construction, it is likely that some night lighting will be required at certain locations. It is likely that Project construction sites would require some form of security lighting at specific locations (e.g. entrances and exits, storage areas etc.) to ensure safety and security of personnel and property. In addition to security lighting requirements, lighting would also be required in the event that night time construction activities are undertaken. Some lighting from these locations may be visible from sensitive receptor locations. Although lighting would be focussed over the particular points of interest within the construction sites, some light trespass would be likely. The level of impact is likely to vary depending on the type of construction site and location of nearby receptors.

In the event that night time construction is required, lighting from construction vehicles travelling on access routes and entering or existing construction sites may also result in potential impacts on sensitive receptors if these front onto construction access routes. The impact would be greater for dwellings with limited visual barriers to the alignment such as fencing or vegetation. These could be susceptible to some lighting glare from construction equipment or vehicles.

Light-spill is known to cause disturbance to crepuscular (fauna that are active primarily during dawn and dusk) and nocturnal species (i.e. bats and some birds) and can cause a range of behavioural changes such as altered feeding and roosting patterns (refer to Chapter 16 on Ecology and Biodiversity). This impact is expected to be of minor significance to fauna prior to mitigation.

13.3.2.3 Operation

Once operational, the expressway, including interchanges, will require lighting for safety considerations. Lighting on roadways is known to reduce the risks of accidents for vehicles. The main lighting effects that could be experienced from the Project include:

- Direct effects – where the light source is directly visible and would be experienced if there is a direct line of sight between a viewing location and the light sources; and
- Sky glow – which results from light of sufficient strength being reflected back into the atmosphere. This would create a strong local focal point, although the effect would vary with distance and atmospheric conditions.

Potential lighting impacts will vary for receptors will vary due to local topographic features and distance from the Project. The main lighting impacts are expected to occur where the Project passes through areas that are naturally

darker at night, such as natural habitats and rural areas or communities. In these areas, lighting on the roadway and at interchanges will potentially affect views for nearby receptors by adding a light source to currently unlit or low-lit areas, such as in the more rural areas along the KJE alignment in Mukono district. This is expected to have minor to moderate impacts on sensitive receptors depending on their location. Potential lighting impacts in urban areas are expected to be minor due to higher baseline light levels.

Light pollution and skyglow during operations may also affect certain light sensitive species and result in their movement away from the area. Olsen (2002) also suggests that continuous lighting along roads can create barriers to the movement of some species (i.e. bats). Impacts to mammals and birds from artificial lighting is expected to be a Moderate to Major impact if unmitigated (refer to Chapter 16 on Ecology and Biodiversity).

13.4 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management and mitigation measures to minimise visual amenity and lighting impacts (refer to Volume D). Key related management and mitigation measures are summarised in Table 8-12 below. The residual risk or impact after implementation of the measures is also outlined.

Table 13-12 Visual Amenity, Landscape Character and Lighting Impacts - Avoidance, Management and Mitigation Measures and Residual Risk

Risk / Impact	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction			
General visual amenity and lighting	None required.	Neutral	Negligible No impacts will occur during the Pre-Construction Phase
Construction			
General visual amenity impacts as a result of general construction activities (e.g. ancillary facilities, construction sites)	► Where relevant, incorporate visual amenity management and mitigation measures in tender documents and contracts with construction contractors. The construction contractor EMP will then be required to cover these items; ► Where possible, retain existing roadside vegetation ► Consider protective fencing treatments if required ► Construction sites well maintained and kept tidy ► Providing screen planting where required to minimise visual impact and disturbance ► Establish a Grievance Mechanism so that any significant concerns regarding impacts on visual amenity can be reported by local villagers and responded to appropriately.	Negative	Minor Temporary visual amenity impacts will occur due to general construction activities (e.g. fencing, vehicles, equipment, signage, barriers)
Light spill (from construction site lighting)	► Lighting design will incorporate the minimum wattage required for a safe working environment ► Lights pointed downward and toward operational areas, minimising light egress	Negative	Minor Temporary impacts from lighting required for construction activities at night-time
Visual amenity impacts on tourist sites	► Ensure establishment of roadside vegetation is prioritised in the vicinity of Sezibwa Falls to minimise the visibility of the expressway from the Falls area	Negative	Minor Construction works will be visible on the approach to the Sezibwa Falls area. Negligible impact will occur for Kasenge Forest Resort

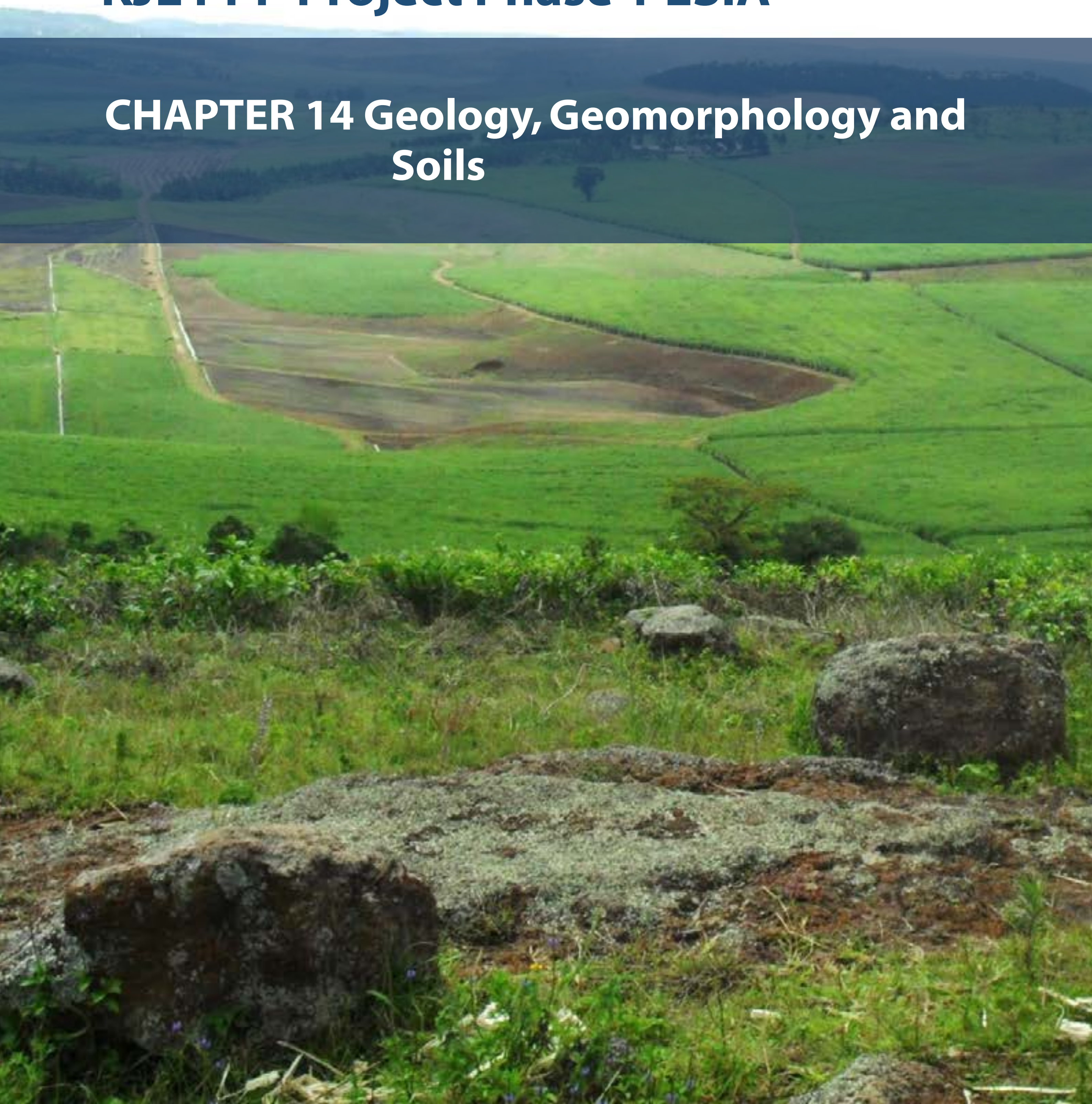
Risk / Impact	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
			due to the distance of the resort from the Project.
Operations			
Visual impacts on nearby dwellings	► Vegetation clearance restricted to the minimum extent practicable for Project construction. Where possible, retain existing roadside vegetation ► Consider protective fencing treatments if required ► Establish screening vegetation in areas with views from affected dwellings ► Where appropriate use, grasses to on fill embankments to provide consistency with surrounding landscape (e.g in rural areas)	Negative	Minor to Moderate Visual impact of the presence of the expressway will vary depending on the visibility of the road and the sensitivity of receptors, as well as the extent of mitigation implemented (see Section 13.3 for impacts per chainage).
Impacts on landscape character as a result of the Project e.g. wetland landscapes.	► Implementation of comprehensive erosion and sediment measures (i.e. storm water drainage channels, sedimentation ponds, sediment control devices such as silt fences and jute netting) ► Construction of vegetated swales where practical to attenuate flow velocities and minimise erosion ► Progressive habitat restoration and enhancement	Negative	Moderate Residual impacts on landscape character in wetland areas is expected to be moderate, as the Project will add a structural element to a natural undeveloped landscape in several parts of the alignment. Negligible to minor impacts will occur for built up areas as there will be no significant change in landscape character.
Impacts from lighting on expressway and interchanges	► Lighting design will incorporate the minimum wattage required for road safety ► Lights pointed downward and toward operational areas, minimising light egress ► Shielded lighting utilised in built up areas to minimise night-time light egress from operational areas and skyglow ► The use of artificial lighting in low wattage bulbs in ecologically sensitive areas ► Establish screening vegetation in areas with views from affected dwellings.	Negative	Minor Residual impacts from light spill for nearby dwellings are expected to be minor, once screening vegetation of the edge of the expressway is established.
Visual amenity impacts on tourist sites	► Ensure establishment of roadside vegetation is prioritised in the vicinity of Sezibwa Falls to minimise the visibility of the expressway from the approach to the Falls area	Negative to Neutral	Negligible to Minor The expressway will be visible on the approach to the Sezibwa Falls area. Overall impacts on tourism for the site are expected to be negligible as increased accessibility from the presence of the road is likely to increase visitation. Negligible impact will occur for Kasenge Forest Resort due to the distance of the resort from the Project.

13.5 Conclusions

The Project is primarily located through cityscapes and is therefore not expected to have any major visual impact in urban areas. These landscapes have a high capacity for accommodating visual change and the Project would not significantly diminish the landscape character in these areas. In natural habitat areas such as wetland areas, the presence of the Project will be prominent and will certainly have an effect on landscape character and the ambience of the area. However, locating the expressway on the edge of wetlands reduces the social impact of the Project. Other key areas where landscape character is likely to be affected includes areas where the Project does not follow the natural topography, requiring significant cut and fill sections. Whilst there are some tourism features in the area surrounding the Project (e.g. Sezibwa Falls), it is not expected that these will be significantly impacted with regards to visual amenity. The lighting associated with the Project is necessary for safety. While impacts of light spill and sky glow will be minimised via the mitigation measures proposed, the lighting will be prominent and will result in minor impacts on visual amenity for local dwellings.

KJE PPP Project Phase 1 ESIA

CHAPTER 14 Geology, Geomorphology and Soils



14. GEOLOGY, GEOMORPHOLOGY AND SOILS

14.1 Study Area

The study area for the geology, geomorphology and soils assessment includes:

- The Right of Way (ROW) for the Kampala–Jinja Expressway (KJE) Phase 1 (Kampala to Namagunga, 33.5 km); and
- Adjacent cuttings and embankments along KJE Phase 1.

14.2 Methodology

The methodology for the assessment included:

- Review of current expressway projects during construction and operations to identify potential issues and impacts related to geomorphology and soils;
- Review of work undertaken in the previous ESIAs by URS (2013, 2014) and ICS (2015, 2016) and previous Project feasibility studies;
- Data analysis of completed field investigation work completed for the Geotechnical Report(s) by URS (2013, 2014) and ICS (2015, 2016) ;
- Spatial analysis of the Project alignment to assess potential geomorphology and soils issues and impacts; and
- Field investigations of key areas and significant sites.

14.3 Baseline Conditions

14.3.1 Geology

A geological map of Uganda is shown below Figure 14-1 and features significant geosites as red stars. The city of Kampala is represented by an outline of a square with a small filled square inside. The Project falls within two of the major geological classifications throughout Uganda. Neoarchean plutonic rocks that are mainly granitoids largely dominate the ROW with Palaeoproterzoic metasedimentary and meta volcanic rocks found in smaller sections along the ROW.

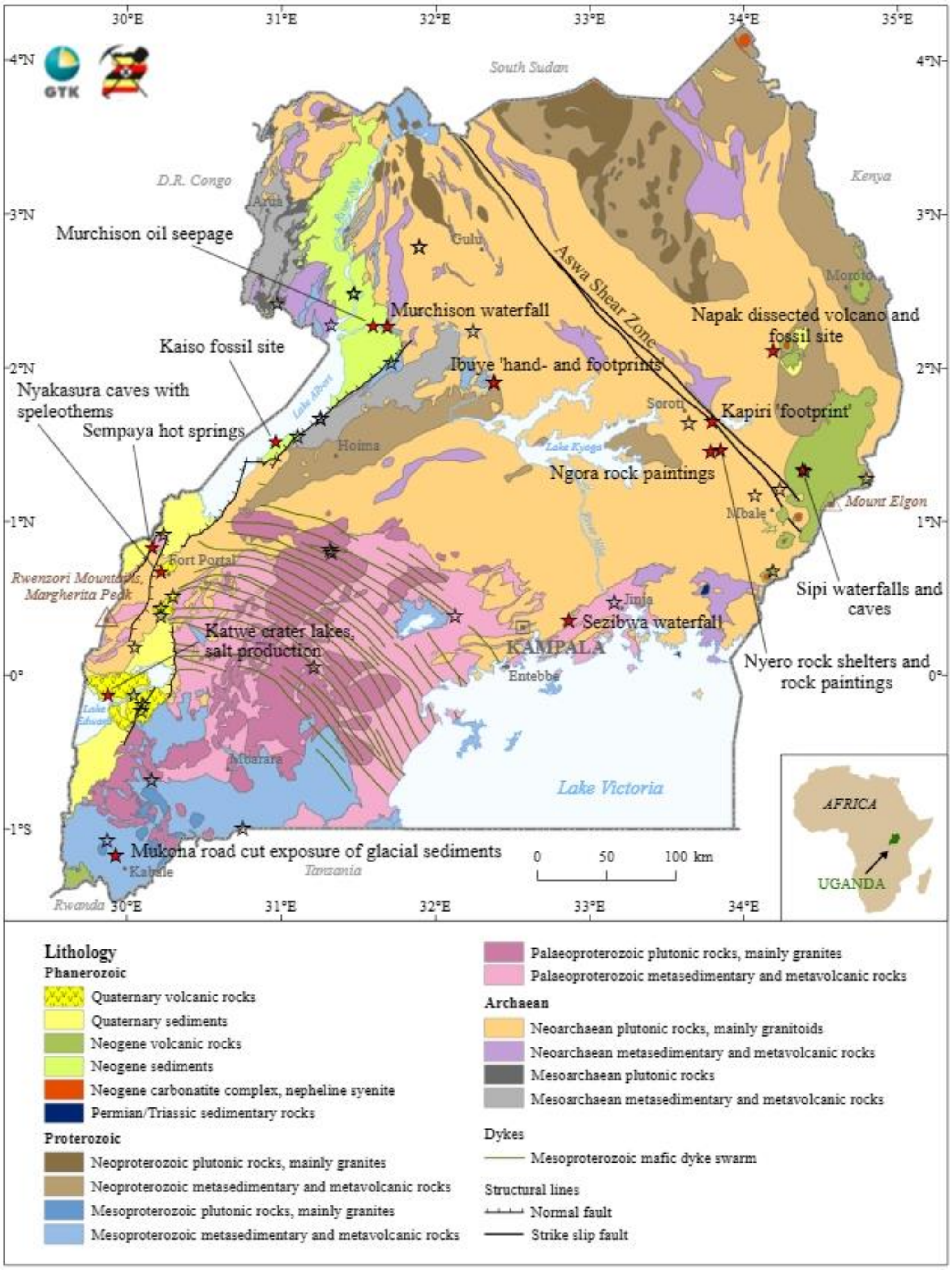


Figure 14-1: Geology and significant geosites of Uganda (Schumann et al., 2015)

A detailed geology around Kampala city is shown below in Figure 14-2. The geology of Kampala is characterised by Palaeoproterozoic rocks (1600–2500 Ma) of the Buganda Group consisting of slate, phyllite, mica, schist and metasandstone, and older Neoarchaean rocks (2500–2800 Ma) of the Kampala Suite, comprising granite and granite gneiss (Westerhof *et al*., 2014). The geology in the Phase 1 ROW is dominated by Archean Golomolo granite (~2.63 Ga) and Kampala Suite granitoids (Lehto *et al*., 2014). Approximately 2 km east of Mukono on the Phase 1 ROW, the Lake Victoria Terrane (fault boundary) meets the West Tanzania Terrane of the Tanzania Craton. East of

Mukono, the Lake Victoria Terrane is overlain by metasediments of the Palaeoproterozoic Buganda Group, and emerges only as elongated domes in the cores of anticlines (Westerhof *et al*., 2014).

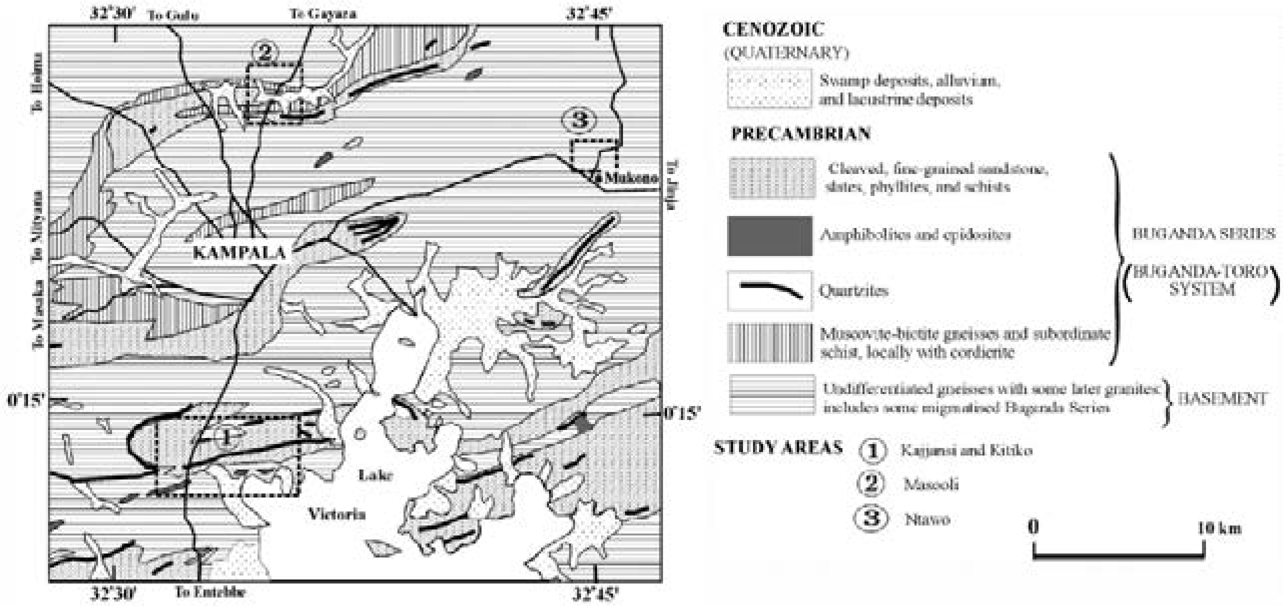


Figure 14-2: Geology of the Kampala area (Nyakairu et al., 2002)

The majority of the road alignment traverses thick, often lateritic soil formations, derived from the in-situ weathering of mainly Precambrian rocks with varying proportions of gravels, sand, clay and silt.

The geology of the Kampala district consists predominantly of a basement complex of undifferentiated gneisses and granites, and the Buganda series of cleaved fine-grained sandstone, slates, phyllite and schists. Muscovite-biotite gneisses and subordinate schist occur in some areas. Overlying these hard basement rocks is a laterite carapace particularly on hills, which forms protective pavements on many slopes.

The majority of Mukono and Buikwe Districts is underlain by the same Precambrian rock system, consisting of granitoids and high to medium metamorphosed formations (mainly undifferentiated gneisses). The western part of the district, stretching from the south and north-wards, particularly associated with the Sezibwa River, is underlain by Pleistocene to recent sediments, alluvium, black soils and moraines.

Boreholes were developed in association with a drilling schedule for both KSB and KJE mainline sections of the alignment to supplement the previous geotechnical report carried out by ICS in 2015 (KJE) and 2016 (KSB). The location of each borehole is shown below in Figure 14-3.

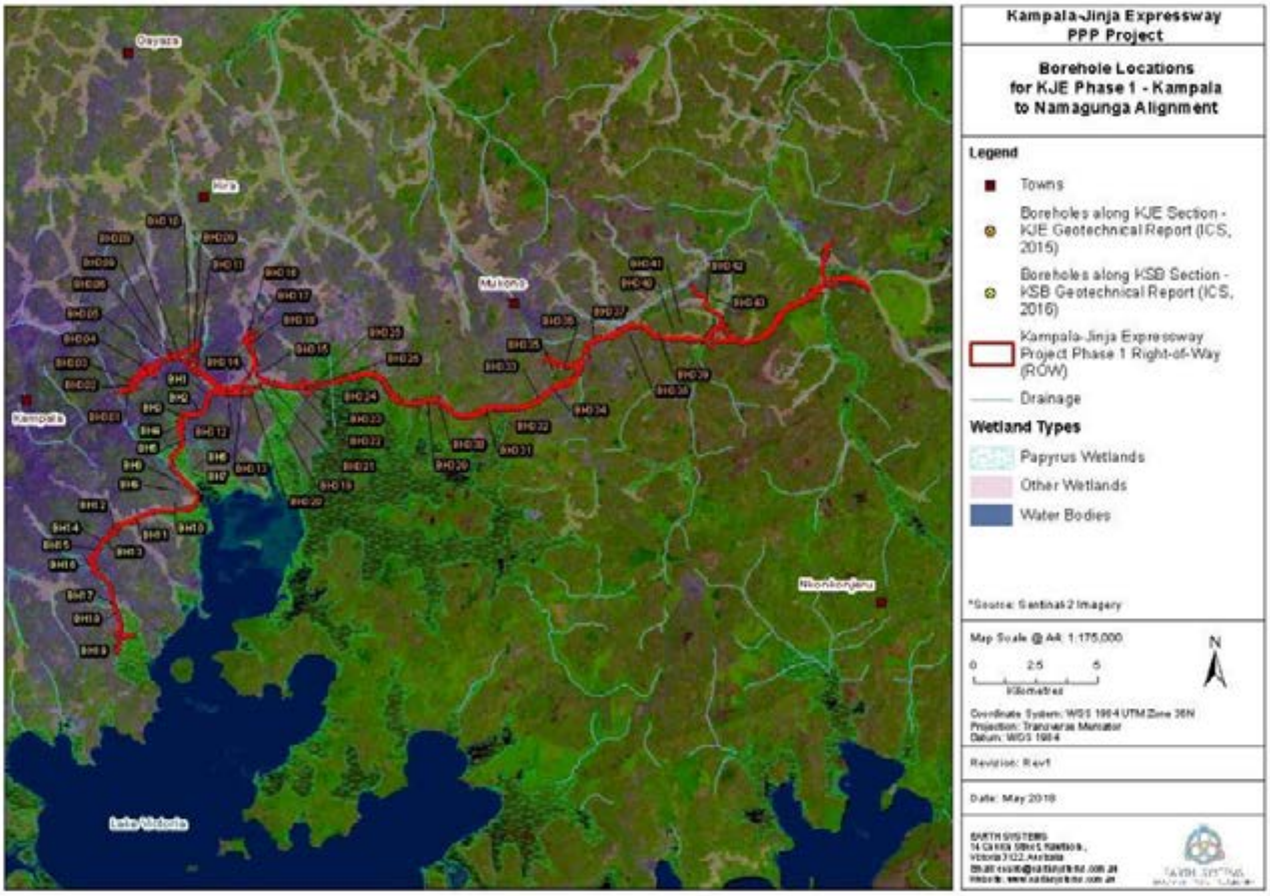


Figure 14-3: Borehole location map for Phase 1 (Earth Systems, 2018)

19 drill holes along the KSB section of the alignment and 39 drill holes along the KJE mainline section of the alignment were logged and these results are provided in the Soils Technical Appendix (refer to Volume C). The median depth of drilling for Phase 1 was 20m and the majority of drill holes indicate deep clay profiles typically for the entire drill hole with basement rock occasionally being logged. The drilling logs suggest that the geology along the Project features a combination of disturbed and undisturbed bedrock, however, where exposed or disturbed, bedrock is typically decomposed.

14.3.2 Soils

Residual soils predominantly cover higher topographic areas and are composed of reddish and reddish brown soils (at places lateritic) derived from the in-situ weathering of mainly Precambrian rocks (granitoid and ortho-gneisses) to a very large extent with varying proportions of gravels, sand, silt and clay. Alluvial/lacustrine soils are mostly confined to flat-bottomed plains of lower topographic areas which are predominantly swamps and wetlands. These soils are often dark to dark grey and brownish sandy silty clays and are locally being used for brick making. The first quarter of the route alignment crosses extensive areas of swamps filled by these soils. Recent deposits of slope-wash generated soils composed of reddish brown silty clay, up to 400 mm thick, cover the topmost parts of some swamps in and around Kampala city. This could be due to increased slope angles induced by urban construction on the adjacent higher grounds.

Except for a small proportion in the lowlands which is covered by alluvial and lake deposits, the soils of Kampala District are ferrallitic, and are extensively leached with little or no remnant mineral reserve. Soils of the Mukono and Buikwe Districts are similarly ferralitic.

Phase 1 traverses alluvial and lacustrine sand, slit clay and gravels, and granitoid gneisses and granules. The soils in the wetlands include grey sands with alluvium and hill wash parent material, grey coarse sand from lake deposits, black and grey clays from river alluvium and peat sands and clay formed from papyrus residue and river alluvium. Alluvial sediments consist of an organic layer with clay over stiff clay with quartzite boulders. Along the ridges and hills, the most common soils are reddish and brown laterites and laterite gravels (ICS, 2015).

Ferralitic soils are typically reddish undifferentiated sandy clay loams. They are friable and porous, but have fair to moderate productivity depending on organic content. The silt/clay ratio is generally less than 0.25 in the B and C horizons, while the clays are predominantly of the 1:1 lattice type and is associated with large amounts of iron oxides present in the soil profile. Ferrisols with slightly better agronomic qualities (exchange capacity generally greater than 20 me/100g) occur in some areas. The reserve of weatherable minerals is often less than 10% of the fine sand fraction, but generally higher than of ferralitic soils. The clay fraction consists of kaolinite minerals, free iron oxides, amorphous gel and sometimes small amounts of 2:1 lattice clays.

In Mukono District, soil erodibility is generally rated medium to high in specific places, influenced by the pastoral activities of local communities. The main causes of soil erosion are over-stocking, poor vegetation cover in the dry season/bush-fires, and highly degraded soils. In more densely populated areas, soil erodibility is generally low, although soil erosion is evident due to poor vegetation cover, and high rainfall erosivity. In Buikwe, soil erodabilty is rated low.

Soil testing was completed in association with a schedule for both KSB and KJE mainline sections of the alignment to supplement the previous geotechnical report carried out by ICS in 2015 (KJE) and 2016 (KSB). The location of each sampling site is shown below in Figure 14-4. Soil analysis for each location was completed through Dynamic Cone Penetration (DCP) primarily by Mackintosh probing supplemented by TRL-DRCP and augering where possible and Test Pitting (TP) supplemented by augering at the base where possible.

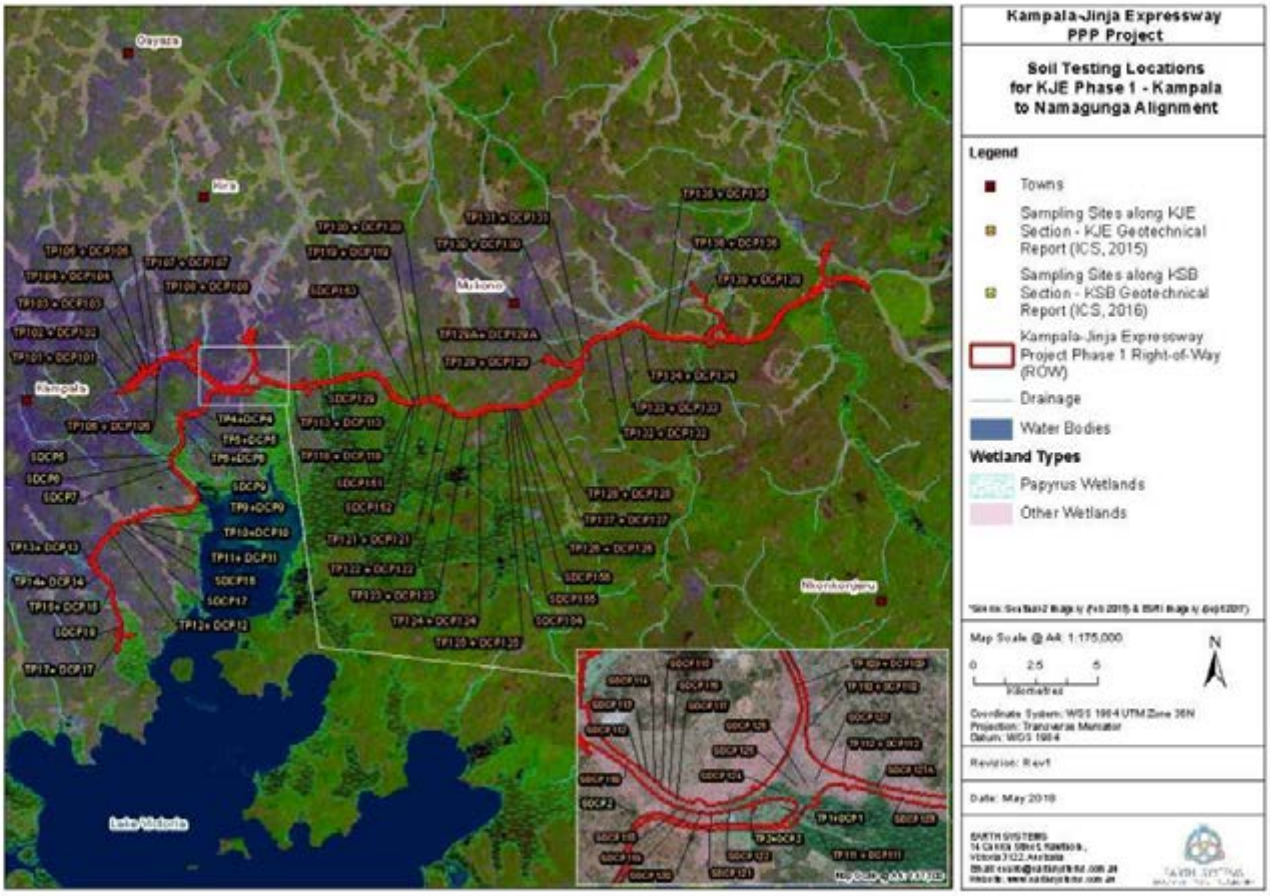


Figure 14-4: Soil sampling location map for Phase 1

21 samples along the KSB section of the alignment and 59 samples along the KJE mainline section of the alignment were analysed and these results are provided in the Soils Technical Appendix (refer to Volume C). The results suggest that the topsoil or alluvium is generally very thin (<0.5 m) within non swamp areas with swamp areas having over 1.2m of topsoil of alluvium. For majority of the Project, dark brown and reddish brown silty clay dominated lower sections with a gradual increase of sand and gravel featuring in upper sections although silty clay still dominates majority of the soil profile.

14.3.3 Geomorphology

The KJE route traverses hills, lowlands, swamps/wetlands and river valleys, and involves approximately 7 major cuttings, a 2 km viaduct across a wetland, and at least 1 bridge (across the Sezibwa River) as shown below in Figure 14-5. The Sezibwa River is the only major river to be crossed by the KJE Phase 1.

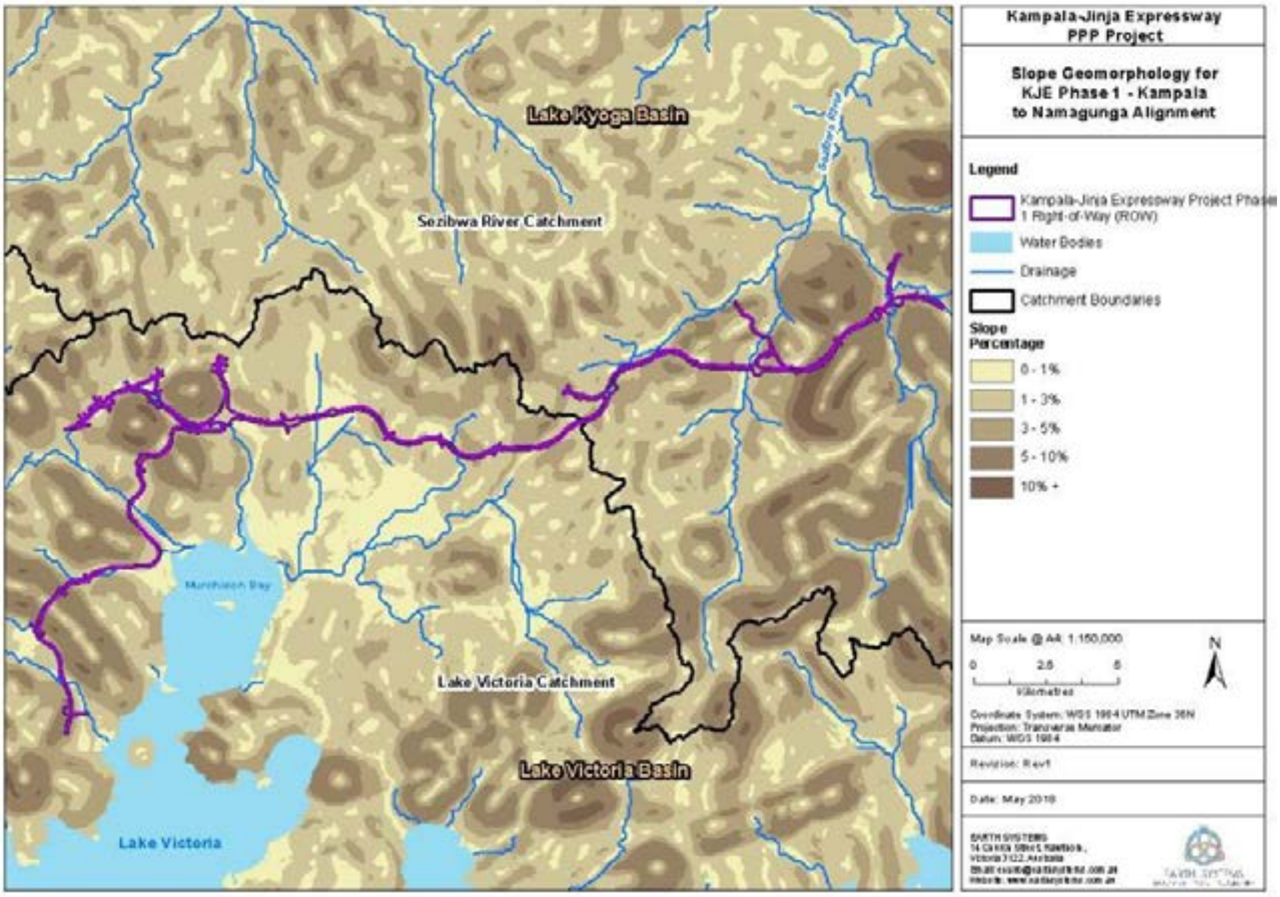


Figure 14-5: Slope Geomorphology along KJE Phase 1

KJE Phase 1 ROW typically transverses through low to medium slope regions with some chainages cutting through some medium to high slope regions. Most of the geomorphology along Phase 1 is likely to be altered given the cutting and filling requirements needed to complete the project.

Erosion and sedimentation are potentially the largest risks to the Project given the geomorphology and significant geosite. During both the construction and operations of the Project, it is likely that these risks have the potential to increase if not adequately managed.

A significant geomorphological feature in the vicinity of the KJE Phase 1 route is Sezibwa Falls (Figure 14-6), which are located 750 m southeast of the KJE route at 32+500, and approximately 1 km upstream of the Sezibwa River crossing at 32+800 (Map shown in Table 17-6). The falls cut through folded and jointed Paleoproterozoic quartzites. Sezibwa Falls is a spiritual area, with numerous shrines and elements used for traditional rituals (Schumann et al., 2015). The waterfalls are set in an undisturbed natural environment with abundant birds and wildlife including the long-tailed cormorant and occasionally the African finfoot. A small rainforest adjacent to the falls is habitat to monkeys and birds. The site is of tourism and cultural heritage significance.

Figure 14-6: Sezibwa Falls

14.4 Impact Assessment

The key potential impacts on soils, geology and geomorphology associated with KJE Phase 1 are as follows:

- Excavation of construction materials (rock, clay, sand) from local quarries and borrow areas and associated impacts;
- Modification of terrain by cut and fill along the route, which raises potential impacts related to the stability of cuttings and embankments, and erosion of dispersive soils and clays as a result of cut and fill activities;
- Deposition of road- and vehicle-derived pollutants (typically copper, lead, zinc, hydrocarbons, oils) on soils proximal to the roadside;
- Temporary disturbance and erosion of soils in the broader right of way during construction;
- Contamination of soils due to spills or leaks of hydrocarbons, oils, greases, tar, asphalt and other pollutants during construction.

These potential impacts are covered in more detail below for the Construction and Operations Phases. No impacts are expected during the Pre-Construction Phase as there will be no Project activities that will result in soil disturbance or erosion / sediment transport during this phase.

No significant impacts associated with erosion or sedimentation are expected for the Sezibwa Falls geosite as it is located upstream of the Project area.

14.4.1 Sources of Construction Material

Construction

The project road is predominantly located on a new alignment and substantial sections of the first quarter of the alignment will be built using embankments over swamp and soft ground. Considerable amounts of borrow materials will therefore be needed to improve the swamp ground, including replacement of swamp deposits with rock fill, and in areas of embankment to attain the appropriate height of earthworks on which to form the required road grade (ICS, 2015). Capping layers may also be required to achieve a uniform roadbed support.

The materials required to be sourced locally for road construction include:

- Natural granular material for possible application as subbase;
- Borrow materials for embankment fill (typically obtained from nearby KJE cuttings but from virgin borrow areas in some cases);
- Quarry stone for production of aggregates for asphalt, crushed stone base, concrete and masonry works; and
- Sand for concrete and mortar.

The possible sources of construction material were previously analysed for both the KSB section of the alignment and KJE mainline section of alignment and results are further detailed in the Soils Technical Appendix (refer to Volume C). These potential sources and locations for Phase 1 are shown below in Figure 14-7. It is intended that sites will supply source materials to the closest section of the alignment to minimise the impact of transporting material.

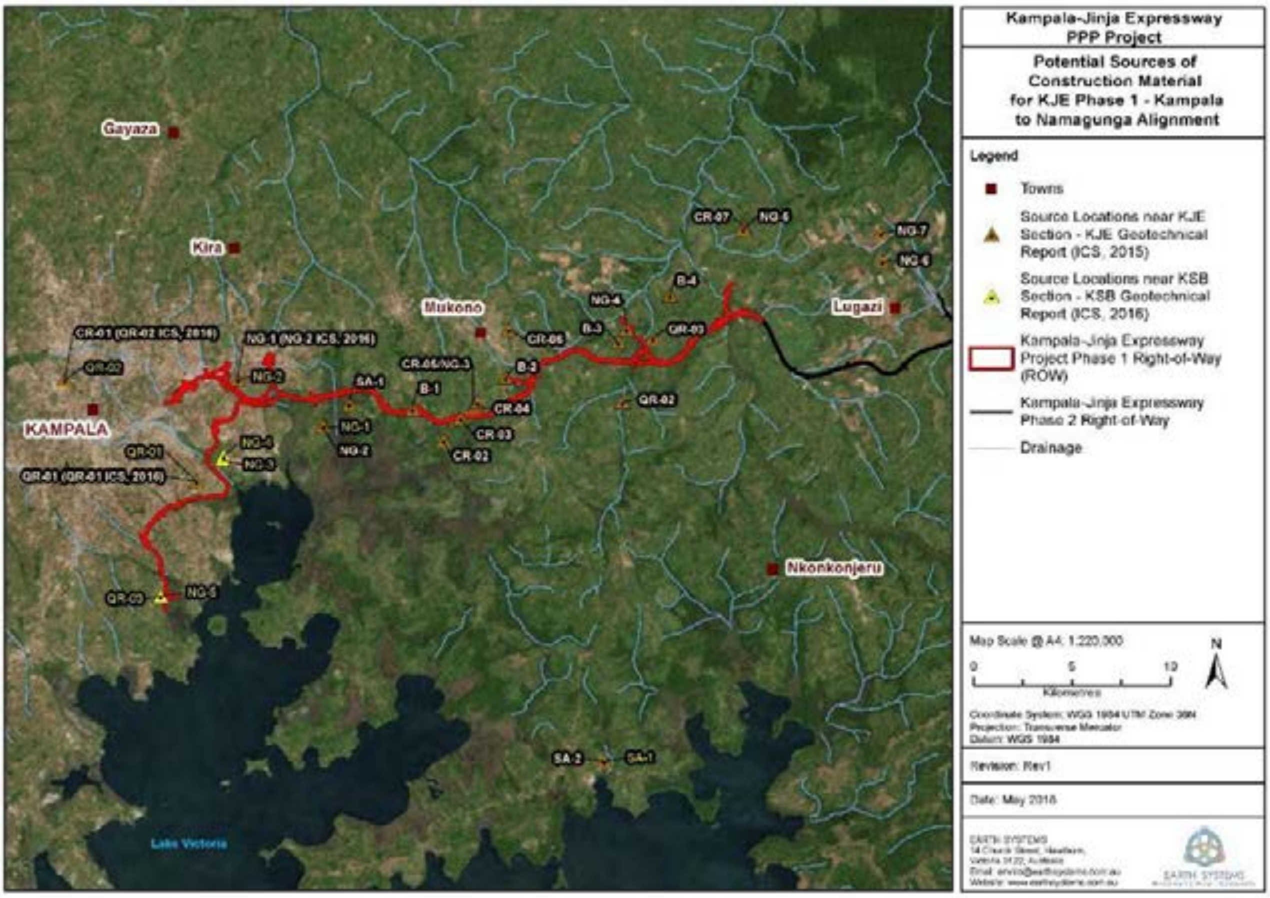


Figure 14-7: Potential sources of construction material for Phase 1

The potential sources are summarised below in Table 14-1 (KSB section of Phase 1) and Table 14-2 (KJE mainline section of Phase 1). The excavation of material from all sites has the potential to impact on the local environment of the sites and the proposed alignment. This is highly dependent on the methods used to excavate the material such as blasting, drilling and crushing and the transportation and stockpiling of material along the proposed alignment.

The potential impacts of material excavation include:

- Exposure of soil that has the potential to lead to increased erosion and discharge of sediment into waterways;
- Exposed faces and slopes that may be at risk of landslide or collapse;
- The dewatering of some areas within source sites has potential to impact on flow activation of potential plumes;
- Discharge of effluents from aggregate washing and crushing has potential to impact on water quality; and
- Increased noise, dust and vibrations in the local area surrounding the source sites.

Table 14-1: Potential sources of construction material near KSB section of Phase 1 (ICS, 2016).

Source No.	Easting	Northing	Potential Application	Material Type	Estimated Quantity (m^3)
QR-01	457884	32030	Asphalt, Base Course, Concrete Aggregates and Hard Core Fill	Ridge forming, widely jointed foliated biolite granite	360 000
QR-02	451198	37191	Hard Core Fill	Ridge forming, medium to widely jointed quartzite	>600 000
QR-03	456055	26206	Hard Core Fill	East West elongated ridge forming, medium to widely jointed quartzite	>320 000
QR-04	446640	23877	Hard Core Fill	Massive to widely jointed quartzite	250 000
NG-1	464297	34851	Subbase, Borrow Fill	Ridge forming, yellowish brown laterite gravels with duricrust stones	420 000
NG-2	459955	37171	Subbase, Borrow Fill	Ridge forming, light to reddish brown laterite gravels	300 000
NG-3	459185	33126	Subbase, Borrow Fill	Smooth topped ridge forming, gravely silty clay	400 000
NG-4	459264	33322	Subbase, Borrow Fill	Smooth topped ridge forming, reddish brown laterite gravels with quartz vein grains	600 000
NG-5	456055	26208	Subbase, Borrow Fill	Smooth topped ridge forming, reddish brown laterite with quartz vein grains	320 000
SA-1	478588	17803	Concrete, Mortar	Pinkish brown gravely sand	Adequate

Table 14-2: Potential sources of construction material near KJE mainline section of Phase 1 (ICS, 2015).

Source No.	Easting	Northing	Potential Application	Material Type	Estimated Quantity (m^3)
QR-01 *(QR-01 ICS, 2016)*	457884	32030	Asphalt, Base Course, Concrete Aggregates and Hard Core Fill	Ridge forming, widely jointed foliated biolite granite	400 000 *(360 000 ICS, 2016)*
QR-02	479511	36057	Asphalt, Base Course, Concrete Aggregates and Hard Core Fill	Widely jointed to massive medium grained pinkish granite	420 000

Source No.	Easting	Northing	Potential Application	Material Type	Estimated Quantity (m^3)
QR-03	481058	39321	Asphalt, Base Course, Concrete Aggregates and Hard Core Fill	Ridge forming, widely jointed augened biotite granodiorite gneiss	720 000
CR-01 *(QR-02 ICS, 2016)*	451198	37191	Hard Core Fill	Ridge forming, medium to widely jointed quartzite	>600 000
CR-02	470438	34127	Hard Core Fill	North south elongated ridge forming, medium to widely jointed quartzite	>800 000
CR-03	471293	35214	Hard Core Fill	North south elongated ridge forming, widely jointed quartzite	400 000
CR-04	472032	35913	Hard Core Fill	Medium to widely jointed quartzite	400 000
CR-05 / NG-3	472156	36057	Hard Core Fill / Subbase	Ridge forming, reddish brown laterite	760 000 / 360 000
CR-06	473723	39740	Hard Core Fill	Massive to widely jointed quartzite	>600 000
CR-07	485655	44977	Hard Core Fill	Massive to widely jointed quartzite	>300 000
NG-1 *(NG-2 ICS, 2016)*	459955	37171	Subbase *(Borrow Fill, ICS 2016)*	Ridge forming, light to reddish brown laterite gravels	300 000
NG-2 *(NG-1 ICS, 2016)*	464297	34851	Subbase *(Borrow Fill, ICS 2016)*	Ridge forming, yellowish brown laterite gravels, with duricrust stones	420 000
NG-4	479723	39740	Subbase	Ridge forming, reddish brown lateritic gravel	320 000
NG-5	485660	44874	Subbase	Ridge forming, reddish brown lateritic gravel	100 000
NG-6	492707	43204	Subbase	Ridge forming, reddish brown lateritic gravel	220 000
NG-7	492661	44650	Subbase	Smooth topped ridge forming, light brown laterite	120 000
B-1	468859	35697	Borrow Fill	Smooth topped ridge forming, yellowish brown laterite	75 000
B-2	473580	37300	Borrow Fill	Smooth topped ridge forming, reddish brown silty clay	>80 000
B-3	479293	39104	Borrow Fill	Reddish brown silty clay	60 000
B-4	481935	41483	Borrow Fill	Reddish brown silty clay	45 000
SA-1	465635	35961	Concrete, Mortar	Light grey to sugary medium grained sand	Adequate

Source No.	Easting	Northing	Potential Application	Material Type	Estimated Quantity (m^3)
SA-2 *(SA-1 ICS, 2016)*	478588	17803	Concrete, Mortar	Pinkish brown gravely sand	Adequate

Quarrying for aggregate, sand and fill will likely result in permanent geomorphological changes in the quarry/borrow areas and the surrounding area. Soils in the areas where construction material will be sourced will be stripped to expose construction materials, which will be susceptible to erosion with the potential for significant downstream sediment transport.

It is recommended that prior to any quarrying, a full environmental assessment is undertaken for each site. Each quarry must have the development and implementation of comprehensive erosion and sediment measures including construction of drainage controls and sedimentation ponds, daily deployment and maintenance of sediment control devices such as silt fences and jute netting, and planning of quarrying operations to minimise long-term exposure of erosive materials. It is expected that each quarry will also have a rehabilitation strategy for the closure of the site after the sourcing of materials.

Operations

The adverse impacts of sourcing construction material from quarries has the potential to have an impact on the project during the Operations Phase of the Project. The use of the incorrect materials and compaction methods has the potential to lead to the loss of structural strength along the alignment. This is likely to cause damage to the proposed alignment and result in hazards for road users. As the Project will require large quantities of imported material, it recommended that a detailed geochemical assessment of the source material is undertaken. This must assess the interaction between any new material and existing conditions at each location under all scenarios. The potential to activate hazardous and naturally occurring substances as a result of new material is also likely to introduce the contamination of local soils and waterways at worst case scenarios.

14.4.2 Modification and Stability of Terrain

Construction

The Phase 1 alignment passes through alternating swamp and hill terrain and it is intended that the Project will involve substantial earthworks in the form of a frequent succession of cuts and fills along the majority of its length. All cuttings, embankments and structural reinforcements have been previously investigated for both the KSB and KJE mainline sections of the alignment. The major cuttings (>15m), embankments (>15m) and structural reinforcements for Phase 1 are shown below in Figure 14-9.

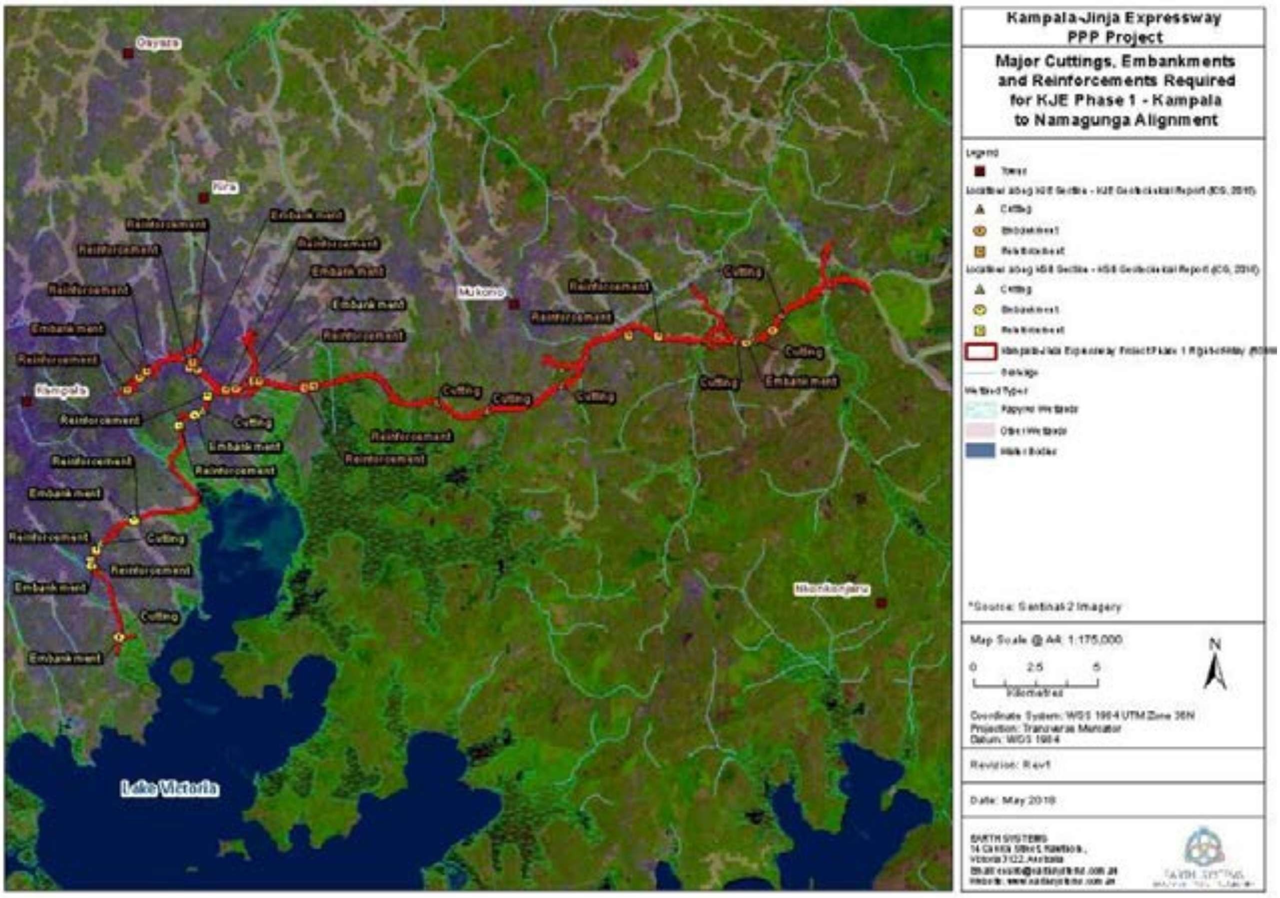
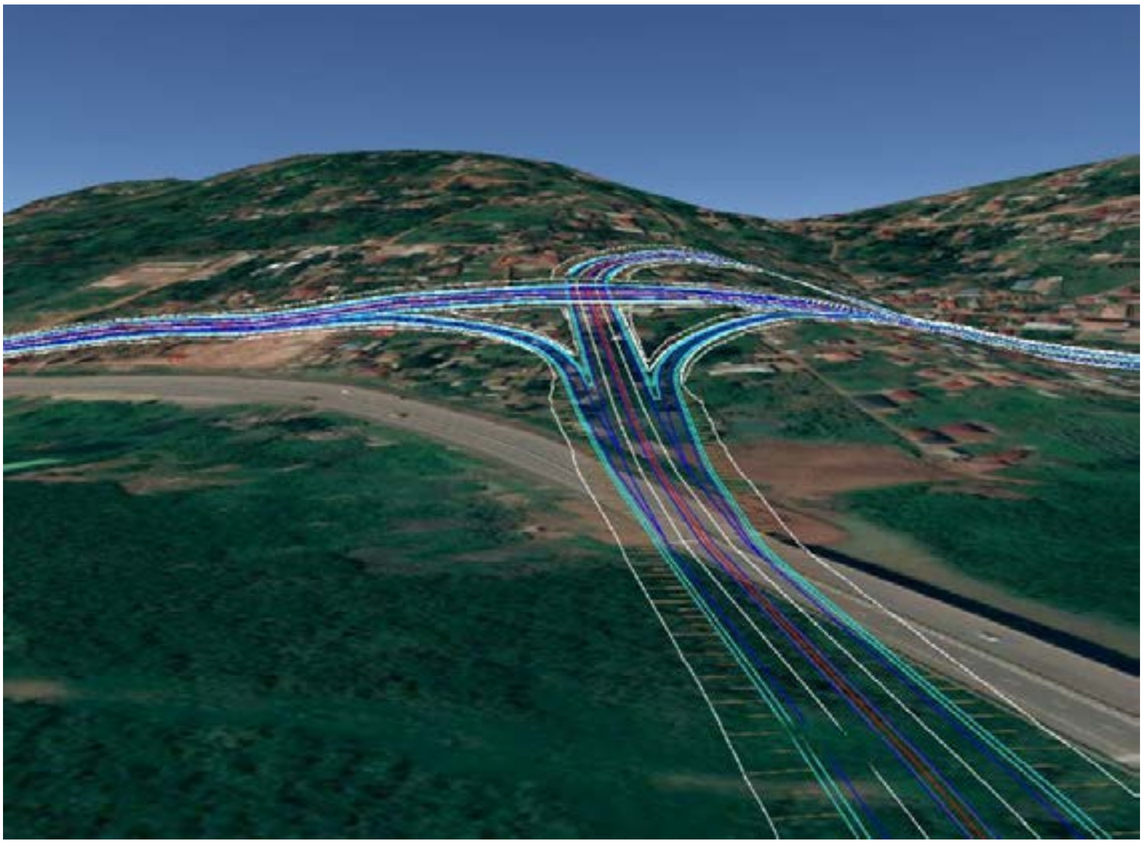


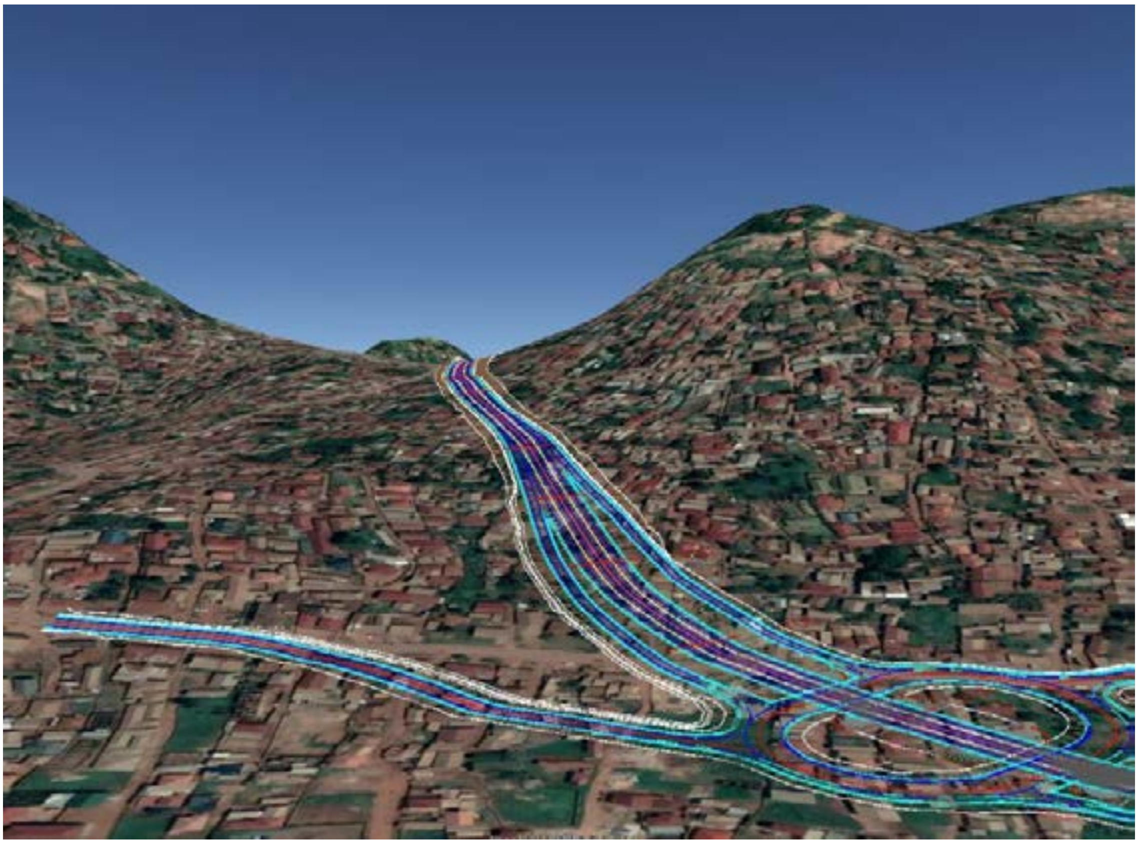
Figure 14-8: Locations of significant cut and fill and reinforcements along Phase 1

At these locations, erosion is a significant risk due to both earthworks and the exposure of large areas of soil and subsoil following vegetation clearance and soil stripping. The removal of vegetation exposes soils, which are then highly susceptible to erosion by surface runoff. Significant downstream transport of soils and sediment is possible during this phase, which can result in the loss of fertile soils and the smothering of downstream waterways and adjacent land.

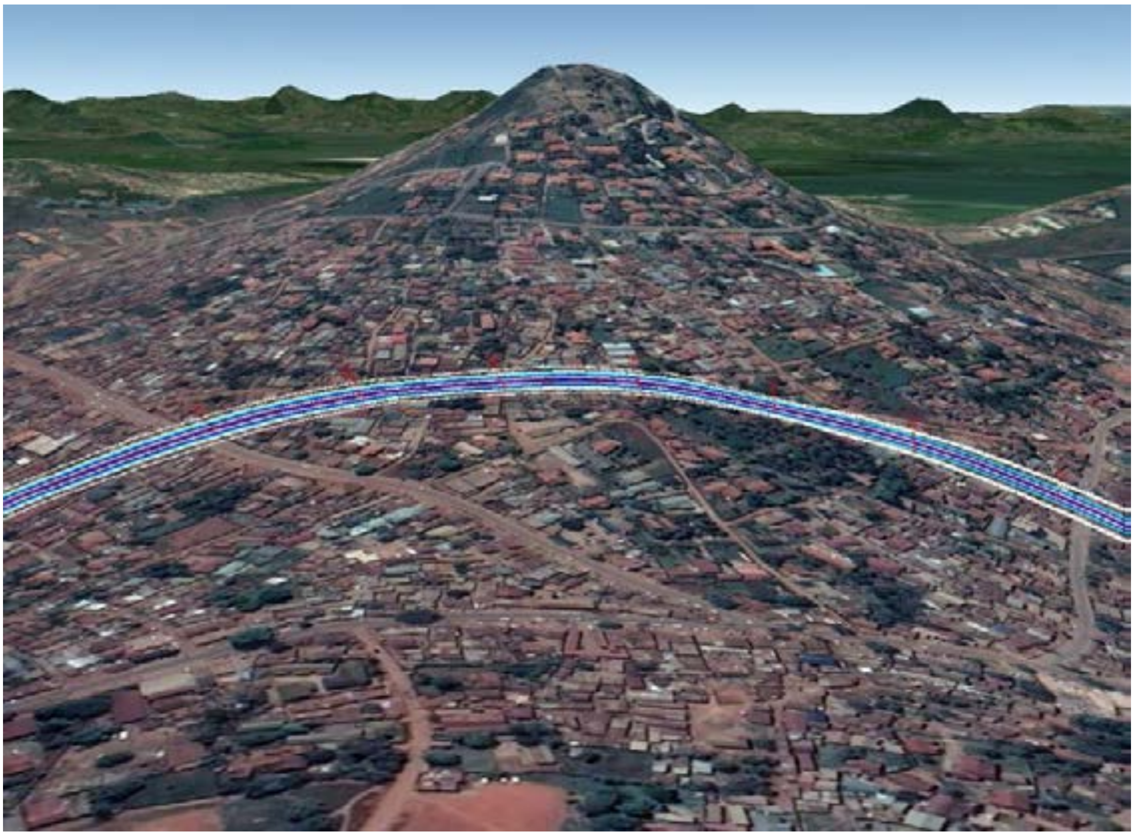
The major sections of road with significant cut are shown in below in Figure 14-9 . These areas have the highest erosion and sediment transportation risks during construction along the Project. These cuttings are represented at a 3 times vertical exaggeration.



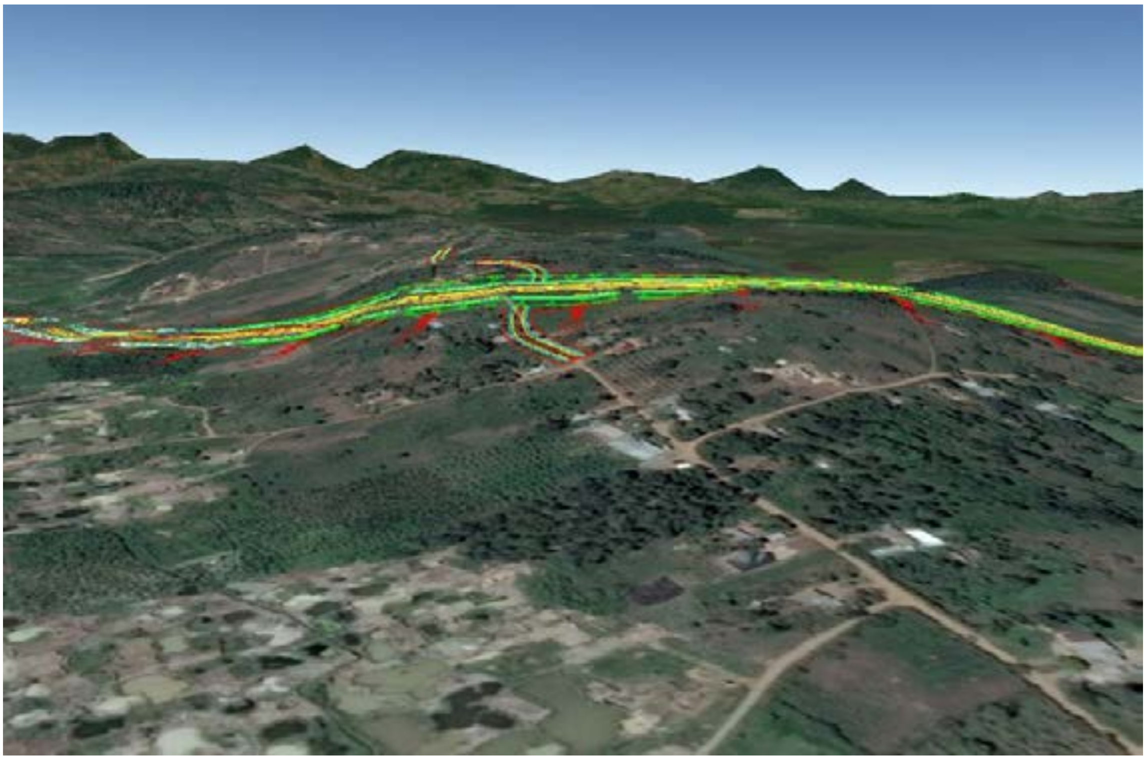
Kabuuma Cutting along KSB section of Phase 1 (Google Earth, 2018)



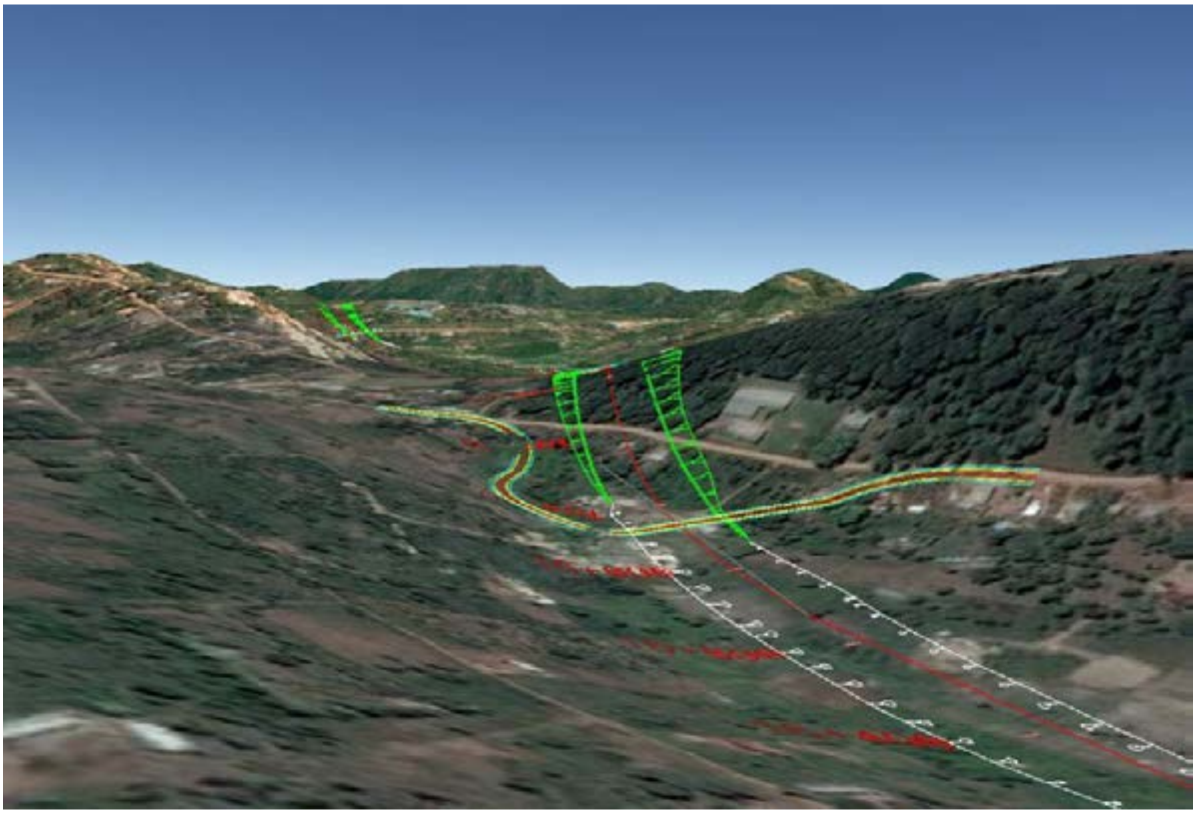
Makindye Cutting along KSB section of Phase 1 (Google Earth, 2018)



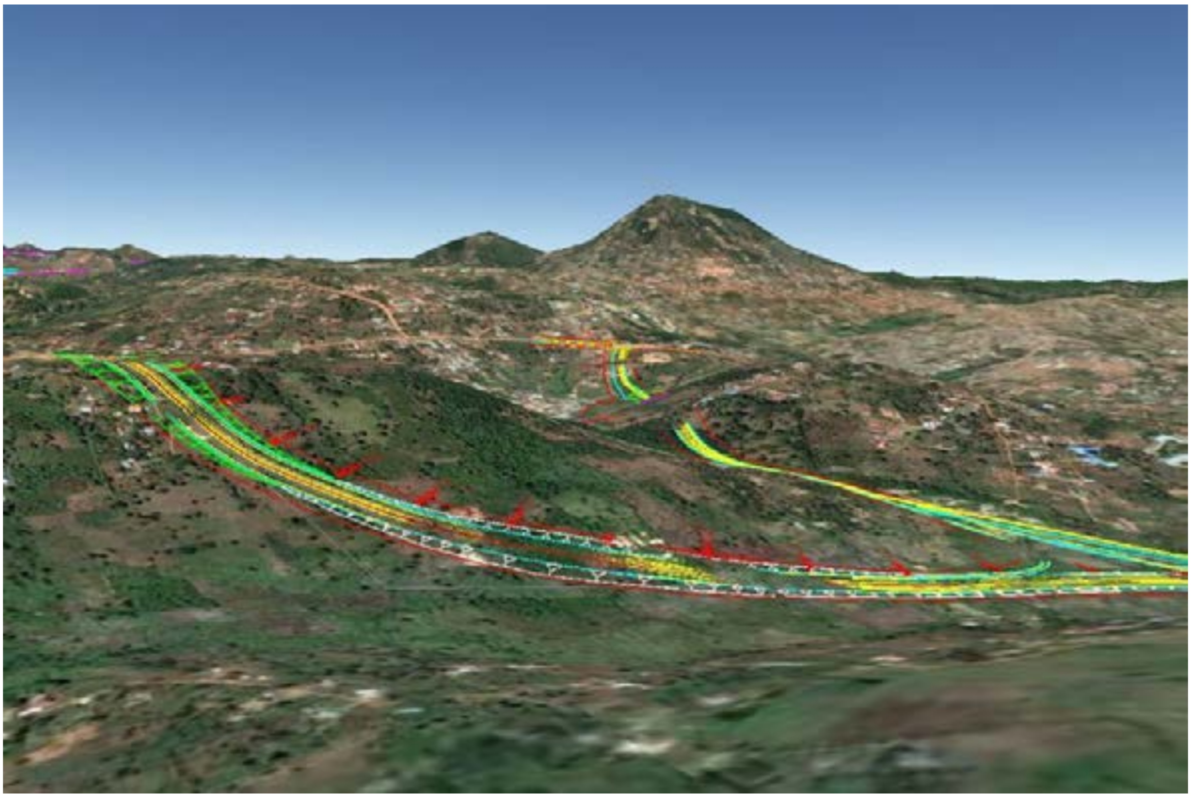
Mutungo Cutting along KSB section of Phase 1 (Google Earth, 2018)



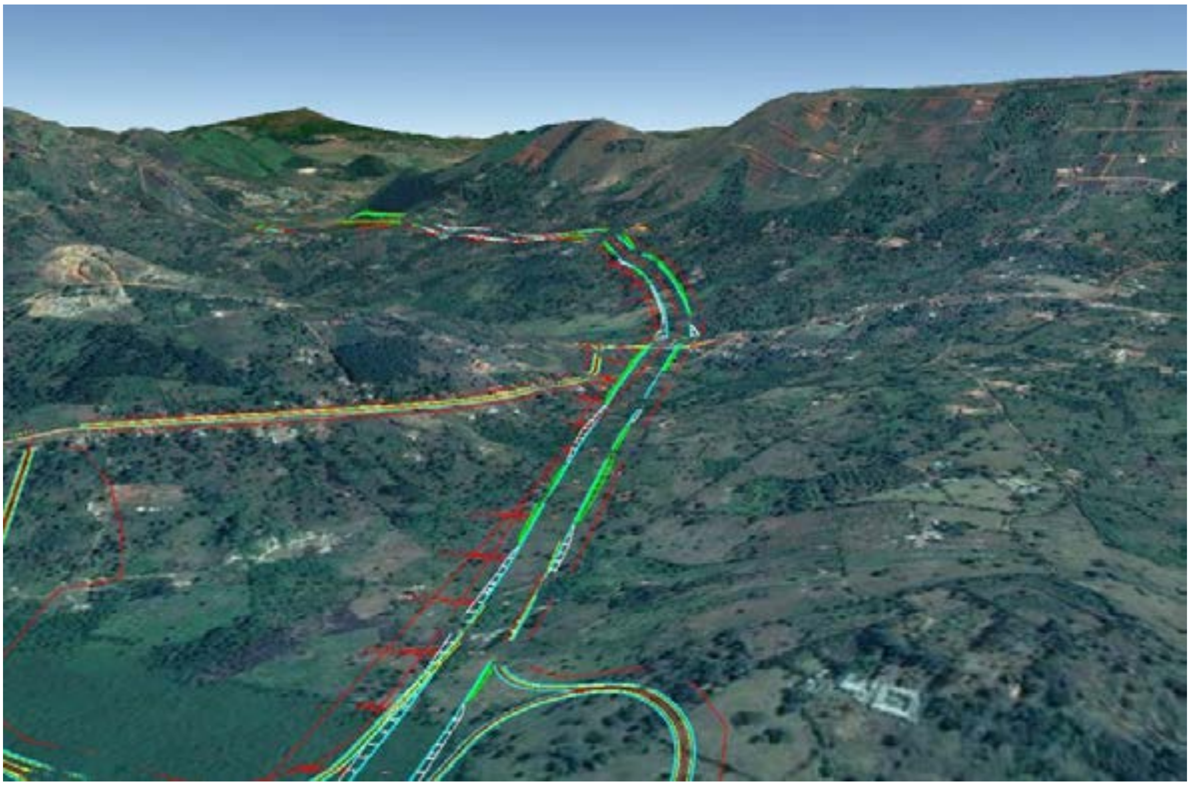
Cutting 6 along KJE mainline section of Phase 1 (Google Earth, 2018)



Cutting 8 along KJE mainline section of Phase 1 (Google Earth, 2018)



Cutting 9 along KJE mainline section of Phase 1 (Google Earth, 2018)



Cutting 16, 17 and 18 along KJE mainline section of Phase 1 (Google Earth, 2018)

Figure 14-9: Sections of significant cut and fill on the KJE Phase 1 route

Earthworks at all cuttings, embankments and reinforcement areas are at a high risk of erosion and sedimentation transport during construction. It is recommended that the development and implementation of comprehensive erosion and sediment measures for each relevant road section, including construction of drainage controls and sedimentation ponds, deployment and maintenance of sediment control devices such as silt fences and jute netting, and planting and maintenance of stabilising vegetation.

Operations

Upon completion of the earthworks, the final slopes of both cuts and fills have the potential to be geotechnically unstable if slope angles are too high, resulting in the potential for rockfalls in cutting sections, and slope failure on fill embankments. Both have the potential for severe or catastrophic impacts on road users (including the potential for fatalities), road infrastructure, and adjacent land and land users.

The final cut and embankment slopes are highly susceptible to erosion due to their relatively high (unnatural) slope angles and the erosive character of exposed materials (clays and unconsolidated gravel fill). Erosion has the potential to degrade geotechnical stability of slopes over time (which can lead to rock falls and slope failures), impact road accessibility, and transport significant quantities of sediment into downstream environments resulting in impacts on downstream water quality, land and water/land users.

It is recommended that these areas are geotechnically monitored for structural stability to ensure that all potential risks are minimised and that the risk of landslides or collapses are minor after construction. The installation of safety measures for road sections with potential for rockfall or slope stability issues, such as drainage controls, rock bolting, concrete reinforcement and gabions must be considered for all locations.

14.4.3 Soil Contamination

Construction

Soils in areas beyond the final roadway footprint (including verges etc.) may be disturbed by heavy equipment and/or contaminated with oil, grease and hydrocarbons during construction, which could impact the utility of those areas for productive use after construction has been completed. Oil and grease contamination of soils in the vicinity of the construction zone but beyond the final roadway footprint is also possible.

It is recommended that construction vehicle refuelling and maintenance should be conducted in designated areas with appropriate bunding and containment, any contaminated soils removed and disposed of appropriately at the end of construction. Signage has the potential to clearly delineate the roadway footprint and ensure that he expansion of construction activities into adjacent areas will be avoided. All areas affected by construction must to be returned to private use where practical and the development and implementation of comprehensive erosion and sediment measures for each construction zone is likely to reduce the risk of pollution.

Operations

Soils adjacent to major roads are known to accumulate 'heavy' metals such as copper, lead and zinc, and to a lesser extent cadmium and chromium derived from mechanical wear of tyres, brakes and other vehicle components (e.g. Pagotto et al., 2010; Akbar et al., 2006). These pollutants are dispersed in the air as fine particulates, and entrained in surface runoff from the roadway. Both pollutant transport routes result in the accumulation of these contaminants in roadside soils over time. However, the concentrations of these contaminants decrease rapidly with distance from the roadside and depth below surface such that there is generally no significant impact beyond a typical verge (~5 m) and adjacent drainage channel.

Oil and grease derived from vehicle traffic are generally transported by surface runoff into the downstream environment. Oil and grease are attenuated slowly by porous soils and vegetation, but can travel long distances in uncontained runoff. This form of contamination generally does not accumulate due to its mobility and propensity to degrade into benign breakdown products over time.

The principal potential impacts associated with vehicle-derived pollutants are as follows:

- Heavy metals (principally copper, lead and zinc) may accumulate in soils immediately adjacent to the roadside (within ~10 m of the roadway), which can impact soil quality in these areas over time (many years) and potentially be taken up by vegetation.
- Oil and grease in surface runoff from the road may impact soil quality in downstream runoff zones, which could impact agricultural use of soils in affected areas.

Therefore, it is recommended that containment structures (e.g. viaduct wall) or drainage channels and verges be implemented with an appropriate design along the length of the Phase 1 to contain pollutants. The implementation of vegetation swales and other water sensitive urban design systems has the potential to partially treat runoff from the Project.

14.4.4 Erosion and Sediment Transport

Construction

The most significant risk of the Project relative to geology, soil and geomorphology is the high potential of erosion and sediment transport along the Phase 1. Available subsurface soil particle distribution data for both the KSB and KJE mainline sections of the Project and are shown below in Figure 14-10 and Figure 14-11 and results are further detailed in the Soils Technical Appendix (refer to Volume C).

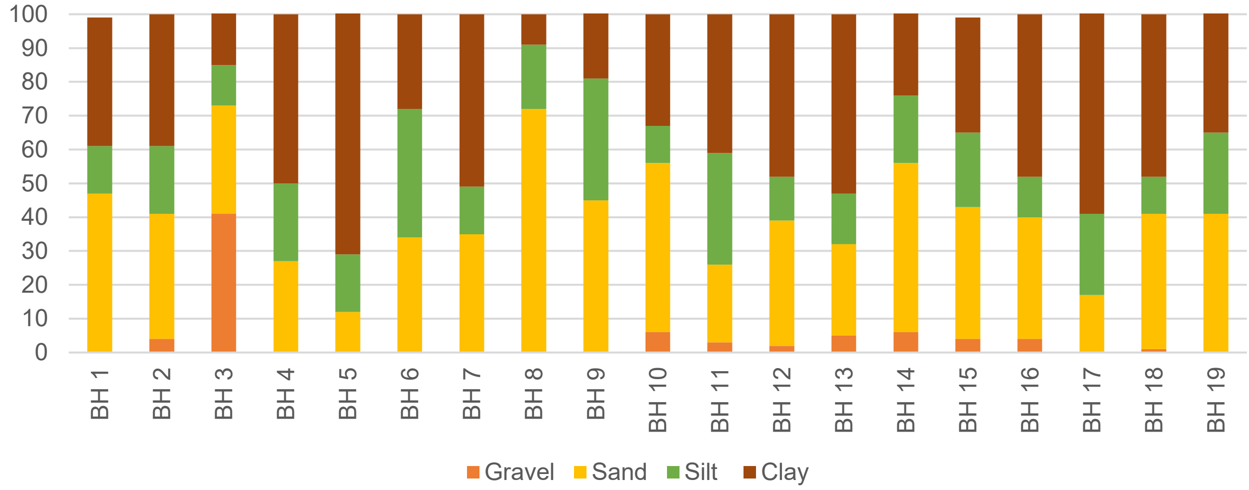


Figure 14-10: Soil particle distribution of bores along KSB section of Phase 1 at subsurface depth (Adapted from ICS, 2016)

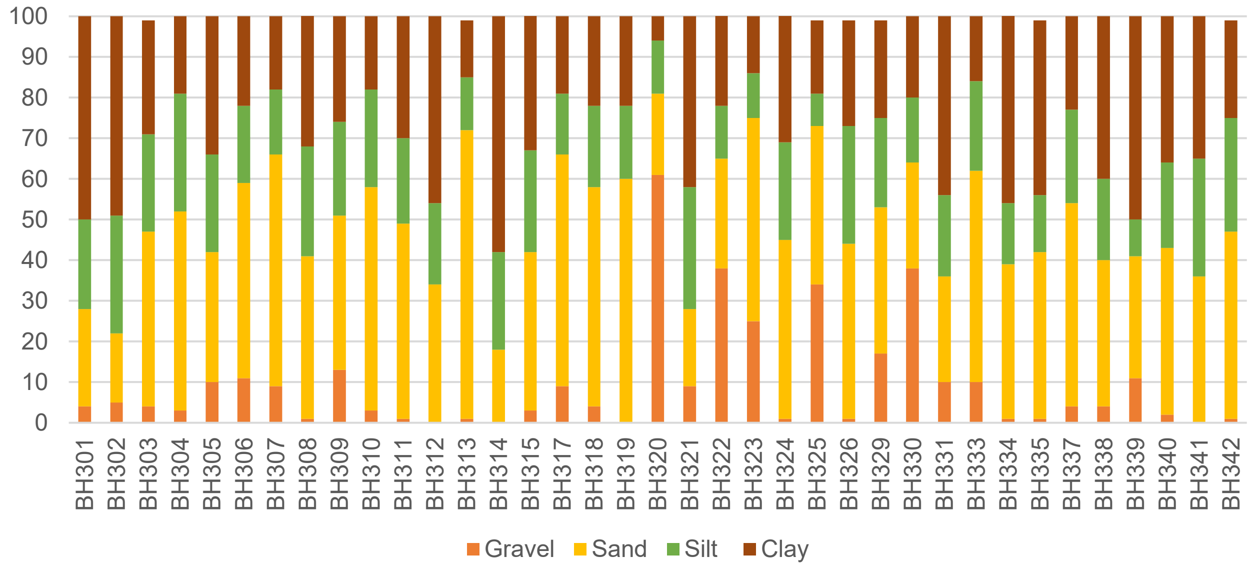


Figure 14-11: Soil particle distribution of bores along KJE mainline section of Phase 1 at subsurface depth (Adapted from ICS, 2015)

The laboratory testing and results from geotechnical reports for the KSB and KJE mainline sections of Phase 1 included gravel percentage which potentially highlights error in the data. However, the data is useful considering the significant earthworks that is likely to be completed for the Project.

The results suggest that at subsurface depths (2- 5m), soil particle distribution mainly consists of sand and clay with silt consistently found throughout the alignment and a few areas that are dominated by gravel.

This particle distribution data from the bores were combined with clay hardness data from both KSB and KJE geotechnical reports (ICS 2015 and 2016) and are shown below in Figure 14-12 and Figure 14-13.

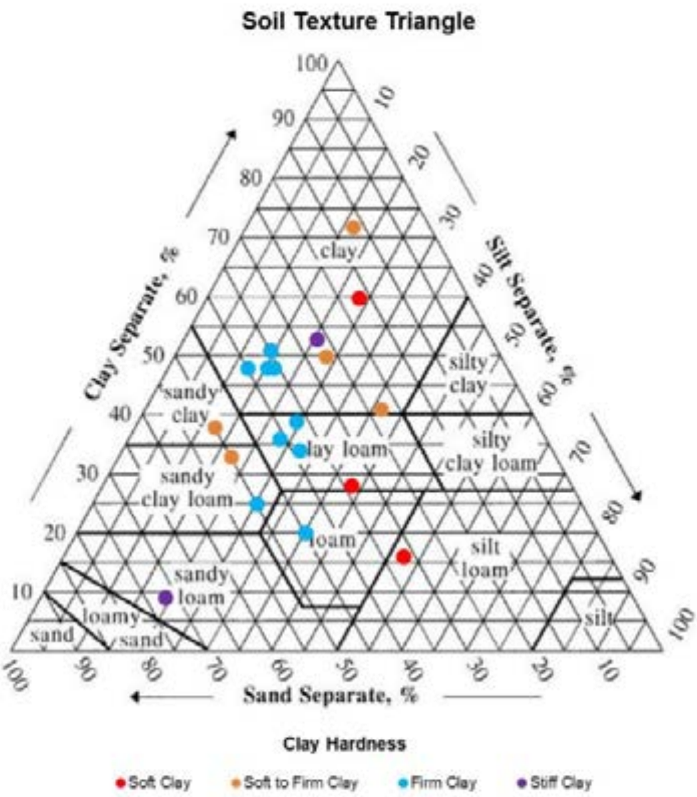


Figure 14-12: Soil Texture Classification of the soil along KSB section of Phase 1 (Earth Systems, 2018)

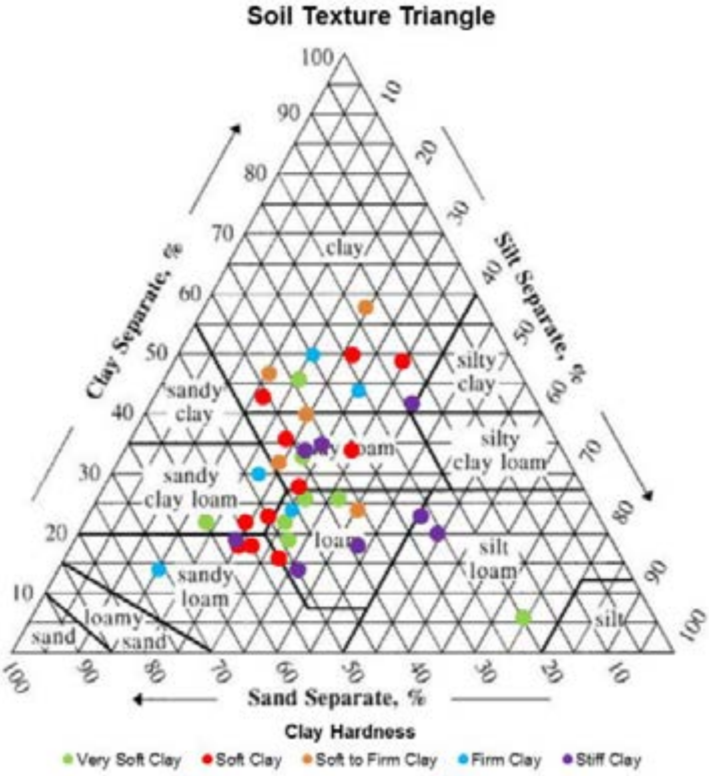


Figure 14-13: Soil Texture Classification of the soil along KJE mainline section of Phase 1 (Earth Systems, 2018)

Soil textures and clay hardness have the potential to be a key indicator for erosion and sediment transport for the Project. Sand, loamy sand, loam, silt loam and silt can be considered high risk soils for erosion and sediment transport. Sandy clay loam, clay loam and silt clay loam are potentially medium risk while sandy clay, clay and silt clay are potentially low risk soils. Very soft, soft, and soft to firm clays are likely to be non-cohesive and potentially have a higher risk of erosion and sediment transport while firm and stiff clays are likely to be cohesive and have a low risk of erosion and sediment transport.

Overall, the results suggest that soils in the Project area may consist of non-cohesive clay particles and a large mixture of medium and high risk soil texture classifications. Along the KSB section of Phase 1, the results suggest that most of the soils are low to medium risk according to texture classifications, however, majority of the samples can be considered non-cohesive.. Along the KJE mainline section of Phase 1, the results suggest that majority of the soils can be considered medium and high risk according to texture classifications, with majority of the samples likely to be non-cohesive.

The combination of non-cohesive soils and medium/high risk soils has the potential to cause significant erosion and sediment transport during construction in these areas. Some cohesive clay particles may have the potential to erode and induced sediment transport given the low clay matrix commonly observed in samples along both sections of Phase 1.

It is highly recommended that prior to construction, soils within the Project area are assessed for dispersiveness through the completion of laboratory Jar and Emerson testing. Additional assessments such as Sodium Adsorption Ratio (SAR) testing may be required to monitor the effect of dispersive soils water quality.

During construction, it is recommended that strong considerations are given towards the development and implementation of comprehensive erosion and sediment measures for all construction zones. This must include as a minimum the construction of drainage controls and sedimentation ponds, deployment and maintenance of

sediment control devices such as silt fences and jute netting as well as any other control mechanisms deemed suitable.

Operations

Given the exposure of new subsurface soils due to the vast earthworks required for Phase 1, it is likely that untested subsoils have the potential to be dispersive during operations once exposed. High rainfall events have the potential to increase significant erosion and sediment transport from newly constructed cut and fill areas. The gemmological changes within the Project has the potential to alter the flow regimes to the newly exposed soils and are likely to erode and transport soil if not adequately managed.

Consideration must be given to the construction of vegetated swales and be implementation where practical, to attenuate flow velocities and minimise erosion. Newly exposed subsurface soils must be vegetated with appropriate grasses, scrub and shrubs to reduce the impact of significant runoff. It is recommended that monitoring be conducted near areas of potential dispersive soils to ensure that the control measures are adequately managing erosion and sediment transport.

14.5 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management and mitigation measures to minimise impacts on soils and geomorphology (refer Volume D). Key related management and mitigation measures for each Project phase are summarised in Table 14-3 below. The residual risk or impact after implementation of the measures is also outlined.

Table 14-3: Soil and Geomorphology Impacts - Avoidance, Management and Mitigation Measures and Residual Risk

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction			
No Risks / Impact during the Pre-Construction Phase	► No measures required.	Neutral	**Negligible** No impacts have been identified during the Pre-Construction Phase as no increase in soil erosion and sediment transport is likely to occur.
Construction			
Excavation of source material	► Full environmental assessment of quarry/borrow areas prior to quarrying ► Development and implementation of comprehensive erosion and sediment measures for each quarry/borrow area, ► Development of a closure and rehabilitation strategy for each quarry/borrow area prior to quarrying, including provisions for progressive rehabilitation where practical	Negative	**Moderate to High** Short-term minor to moderate impacts relating to the excavation of source material due to the large quantities of construction materials (rock, clay, sand) from local quarries. Each quarry will be required to be assed and ensure that requirements meet guidelines set out in the ESMMP.
Modification and stability of terrain	► Design of cutting and embankment slopes and bench intervals in consideration of site-specific geotechnical properties and maximum slope angles with a standard engineering safety factor	Negative	Moderate to High Short-term moderate to high impacts can be expected around the cut and fill regions along the Project due to the

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
	► Development and implementation of comprehensive erosion and sediment measures for each relevant road section, including construction of drainage controls and sedimentation ponds, deployment and maintenance of sediment control devices such as silt fences and jute netting, and planting and maintenance of stabilising vegetation		large earthworks required to ensure stabilisation of the proposed alignment.
Soil contamination by construction vehicles and equipment and transportation into waterways	► Vehicle refuelling and maintenance should be conducted in designated areas with appropriate bunding and containment, any contaminated soils removed and disposed of appropriately at the end of construction ► Clearly delineate the roadway footprint and avoid the expansion of construction activities into adjacent areas to be returned to private use where practical ► Development and implementation of comprehensive erosion and sediment measures for each construction zone, including construction of drainage controls and sedimentation ponds, deployment and maintenance of sediment control devices such as silt fences and jute netting	Negative	Minor to Moderate Short-term minor to moderate impacts on downstream water quality from erosion and sedimentation from construction sites is expected with the use of specifically designed sediment control measures for each section of the project corridor. The magnitude of this impact will be dependent of the diligence of implementation of the associated mitigation measures, and local weather conditions during construction.
Sezibwa Falls	► Implement measures in the Water Management Plan (Volume D).	Neutral	Negligible No significant impacts on Sezibwa Falls are expected from erosion or sedimentation as this site is located approximately 650m upstream of the Project.
Erosion and Sediment Transport due to potential dispersive soils	► Development and implementation of comprehensive erosion and sediment measures for each construction zone, including construction of drainage controls and sedimentation ponds, deployment and maintenance of sediment control devices such as silt fences and jute netting ► Jar and Emerson Testing of both surface and subsurface soils to ensure that erosion and sedimentation controls are designed and implemented adequately.	Negative	Moderate Moderate residual impacts of dispersive soils are expected due to the laboratory analysis of soils from previous studies. New laboratory testing and assessments are recommended to ensure the appropriate controls and measures are designed and implemented.
Operations			
Use of appropriate construction material	► Geochemical assessment of the source materials ► The assessment must investigate all new sources and the interaction with existing conditions,	Negative	**Minor** Incorrect fill could potentially lead to the loss of structural strength in the subbase and concrete and in the worst case scenario, potentially increase the risk of contamination.
Structural stability of cut and in-fill slopes	► Design and installation of safety measures for road sections with potential for rockfall or slope stability issues, such as drainage controls, rock bolting, concrete reinforcement and gabions	Negative	Minor The structural stability of the embankments is engineered to best practice and will be completed in accordance with geotechnical guidance

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
	► Geotechnical monitoring may be required to ensure that all potential risks are minimised and that the risk of landslides or collapses are minor		which is expected to result in minor impacts.
Soil contamination from road users and transportation into waterways	► Construction of a verge and drainage channel or other appropriate containment structure (e.g. viaduct wall) along the length of the Phase 1 to contain pollutants ► Construction of vegetated swales on the edges of verges where practical to rapidly attenuate heavy metal and oil/grease pollution	Negative	Minor Road- and vehicle-derived pollutants are expected to result in minor impacts on adjacent soil areas with the provision of appropriate drainage containment structures and swales to contain and attenuate pollutants.
Sezibwa Falls	► Implement measures in the Water Management Plan (Volume D).	Neutral	Negligible No significant impacts on Sezibwa Falls are expected from erosion or sedimentation as this site is located approximately 650m upstream of the Project.
Erosion and Sediment Transport due to exposure of potentially new dispersive soils	► Construction of vegetated swales where practical to attenuate flow velocities and minimise erosion ► Newly exposed subsurface soils must be vegetated with appropriate grasses, scrub and shrubs to reduce the impact of significant runoff	Negative	Minor Minor residual impacts of dispersive soils are expected if the appropriate control measures are implemented where applicable and according to best practise. Monitoring may have to be implemented to ensure relative measures are effective.

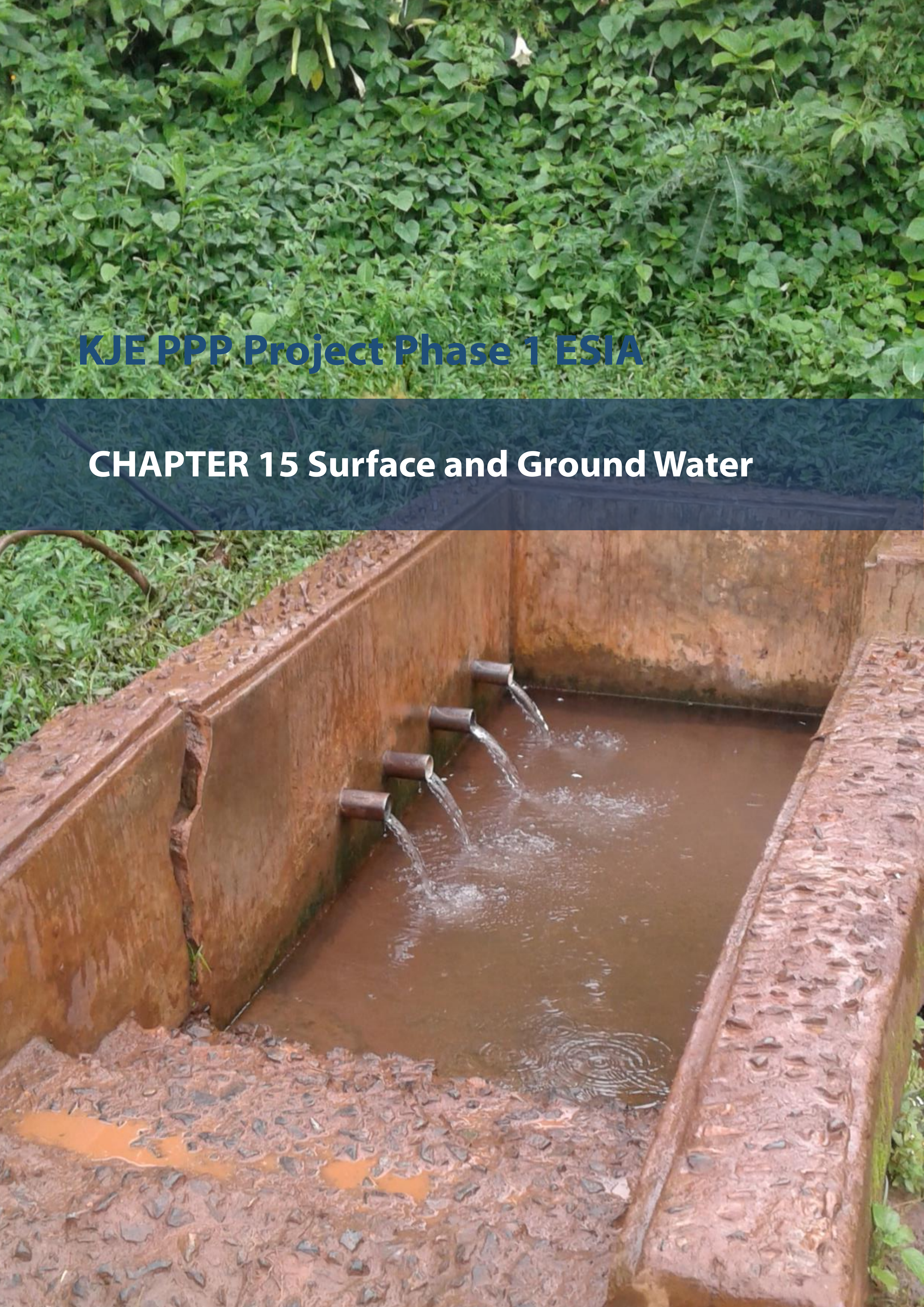
14.6 Conclusions

The implementation of the KJE Phase 1 expressway will require appropriate planning and implementation of management and mitigation measures to meet the ensure residual impacts of the Project on soils and geomorphology are minimal as possible.

The residual impacts of the Project are as follows:

- Residual impacts related to excavation of construction materials (rock, clay, sand) from local quarries and borrow areas are expected to be Moderate to High in the quarry/borrow areas due the large quantities of materials required. Rehabilitation of quarry/borrow sites to a state suitable for productive agricultural use or the establishment of a self-sustaining natural ecosystem will assist in reducing this impact over time.
- Residual impacts related to cuts and fills along the route are considered to be Moderate to High due to the extensive nature of the earthworks involved in construction of KJE Phase 1.
- Deposition of road- and vehicle-derived pollutants on soils proximal to the roadside is considered to have Minor impact due to the provision of a sufficient right of way and verge/drain zone to contain and attenuate pollutants.
- The disturbance and erosion of soils and potential soil contamination during construction is considered to have a High impact of limited duration (Construction Phase) and has the potential to be Minor during operations if adequately managed.

- No significant impacts on Sezibwa Falls are expected from erosion or sedimentation as this site is located approximately 650m upstream of the Project.
- The potential of dispersive soils in the Project area are considered to have a Moderate impact during construction and Minor impacts during operation if adequately managed.



KJE PPP Project Phase 1 ESIA

CHAPTER 15 Surface and Ground Water

15. SURFACE AND GROUND WATER

15.1 Study Area and Methodology

The study area for the surface and ground water assessment includes:

- The Project corridor which is defined as the right of way (ROW) area (nominally 60 m wide) for the Kampala–Jinja Expressway (KJE) Phase 1 (Kampala to Namagunga, 33.5 km);
- The affected catchments, rivers/streams, wetlands and groundwater flow within the Project footprint and buffer area, including upstream and downstream regions that will be impacted by the expressway;
- Adjacent cuttings and embankments along KJE Phase 1.

The methodology for the assessment included:

- Review of current expressway projects during construction and operations to identify potential issues and impacts related to surface water and ground water;
- Review of work undertaken in the previous ESIAs by URS (2013, 2014) and ICS (2015) and previous project feasibility studies;
- Surface and ground water sampling campaign (March 2018) to obtain additional baseline data;
- Spatial analysis of the Project footprint with relevant additional data to identify any new impacts of significance relating to surface and groundwater;
- Review and consideration of other natural or developed surface and groundwater assets potentially affected by the Project.
- Identification of potential risks, impacts, management and mitigation measures, and residual impacts based on the Project design and the new alignment for the Project, utilising the ESIA risk assessment methodology outlined in Chapter 1 – Introduction that includes:
  - Both beneficial and adverse impacts on surface and groundwater from construction and operations;
  - Identification of measures to enhance project benefits and avoid or reduce the impact of the Project;
  - Residual impacts from the Project after mitigation measures.

15.1.1 Hydrologic modelling

The hydrological behaviour of local streams was modelled principally using US EPA Storm Water Management Model 5 (SWMM; Rossman 2010), supported by other rainfall–runoff modelling methods as needed.

Sub-catchment boundaries and stream flow lines were extracted using TauDEM routines from the digital elevation model (DEM) for the project area. Representative catchments were based on the most recent project footprint and were setup to provide information on stream flow for the key risk streams identified along the road corridor area. Hydrologic variables including sub-catchment area and slope, and stream length and slope are based on TauDEM calculations.

Vegetation and land use types where analysed with respect to roughness values for overland flow and stream channels. Stream channel visual assessments (BCC 2003) where then checked against the Modified Cowan method for determining channel roughness. Several representative stream cross sections were created with DEM

data including Mayanja, Nkivubo, Kinawataka, (western road corridor) Kasala, Sezibwa (mid road corridor) and Kagonja (eastern end of road corridor) for inclusion in the model.

Climate and hydrology modelling are based on ICS (2015) 24-hour frequency analysis and associated climate data for the Design Storm. Design storm 24hour rainfall climate data were processed to hourly time series data using ARR (1987) temporal pattern data based on the wet dry tropics storm patterns of Zone 4 (Tropical North Australia). The SWMM model was set up to simulate stream flow for 1:10 ARI rainfall events for all representative streams. The use of 1:10 ARI was for the purposes of surface stream hydrologic flow, rural and urban catchment response and stream behaviour analysis. The data is not intended for use in culvert design. An initial and continuing loss catchment rainfall–runoff model was selected based on previous project site experience in West and East Africa, continuing loss was assumed to be 1.4 mm/h as per ARR (1987).

15.2 Baseline Conditions

15.2.1 Project Hydrology

Almost one sixth of Kampala, or 31 km^2, is covered by wetlands (Mafabi *et al*., 1998). These wetlands exist as a network of small, vegetated valley bottoms in a slightly undulating landscape with water supply from rivers and streams. The Project corridor of KJE Phase 1 is heavily influenced by received rainfall and the local topography. The Mutungo, Makindye and Mbuya hills are located in the higher regions of Kampala and are sources of water that support downstream communities (ICS, 2015). Flooding occurs frequently in low-lying wetland areas in peak rainfall periods and generally occurs in urbanised regions (Nsubuga et al 2014). KJE phase 1 crosses and runs alongside many wetlands as demonstrated in Figure 15-1.

Specifically, the Kampala District is drained by several drainage systems, each consisting of a single major system and numerous minor systems. The major system consists of primary and secondary channels outflowing to the major wetlands while the minor systems convey stormwater to the primary and secondary channels. The major system is generally in the form of an open channel with some drainage infrastructure along major roads where the minor systems are generally small open drains between buildings and minor roads that have little or no drainage infrastructure (ICS, 2015). There are several of these major drainage systems that are crossed by the alignment including St Marks drainage, Kitintale Channel and drainage along Lukuli Rd.

The hydrology of the KJE Phase 1 area is dominated by the catchment boundary of Lake Victoria but also passes through the upper (southernmost) extent of the Lake Kyoga Basin, which drains to the north. The proposed expressway bisects numerous sub catchments as summarised in Table 15-1.

Of these streams, selective sub catchments were modelled to derive predicted flows in the major rivers and streams that may be affected or have an impact upon the road project. This included the drains and bridges that are included in the technical reports of KJE Phase 1 and is based on rainfall intensity and the rational method.

As the availability of stream flow data is minimal for the streams within the project corridor, the model was run for representative catchments, including the major urban catchment streams of Mayanja, Nakivubo, Kinawataka, and the major rural farm land and woodland catchment streams of Kasala and Sezibwa. Storm intensity frequency duration (IFD) data was derived in the ICS (2015) report and was used as the basis for modelling 1-in-10-year average recurrence interval (ARI) design storms for the selected streams. The downscaled climate model specific to the A2 emissions scenario for the period 2070-2100 is applied to a soil moisture balance model to estimate runoff and the associated ground water recharge. This modelling was used to predict hydrological behaviour of the major sub catchments along the alignment in response to the potential impacts of climate change. A screenshot illustrating the modelling is provided in Figure 15-2.

Table 15-1: Sub catchments affected by KJE Phase 1 (Earth Systems, MWE 2008)

Stream	Catchment Area (km^2)	Length of Stream (km)
Mayanja	60.69	9.61
Kansanga	18.15	7.25
Nakivubo	39.77	11.02
Kinawataka	30.73	11.20
Namanve	41.41	9.71
Karugabo	24.00	8.71
Wadola	25.97	4.90
Kame	13.53	3.85
Mwola	31.08	3.62
Kasala	63.34	14.26
Sezibwa	24.31	7.45

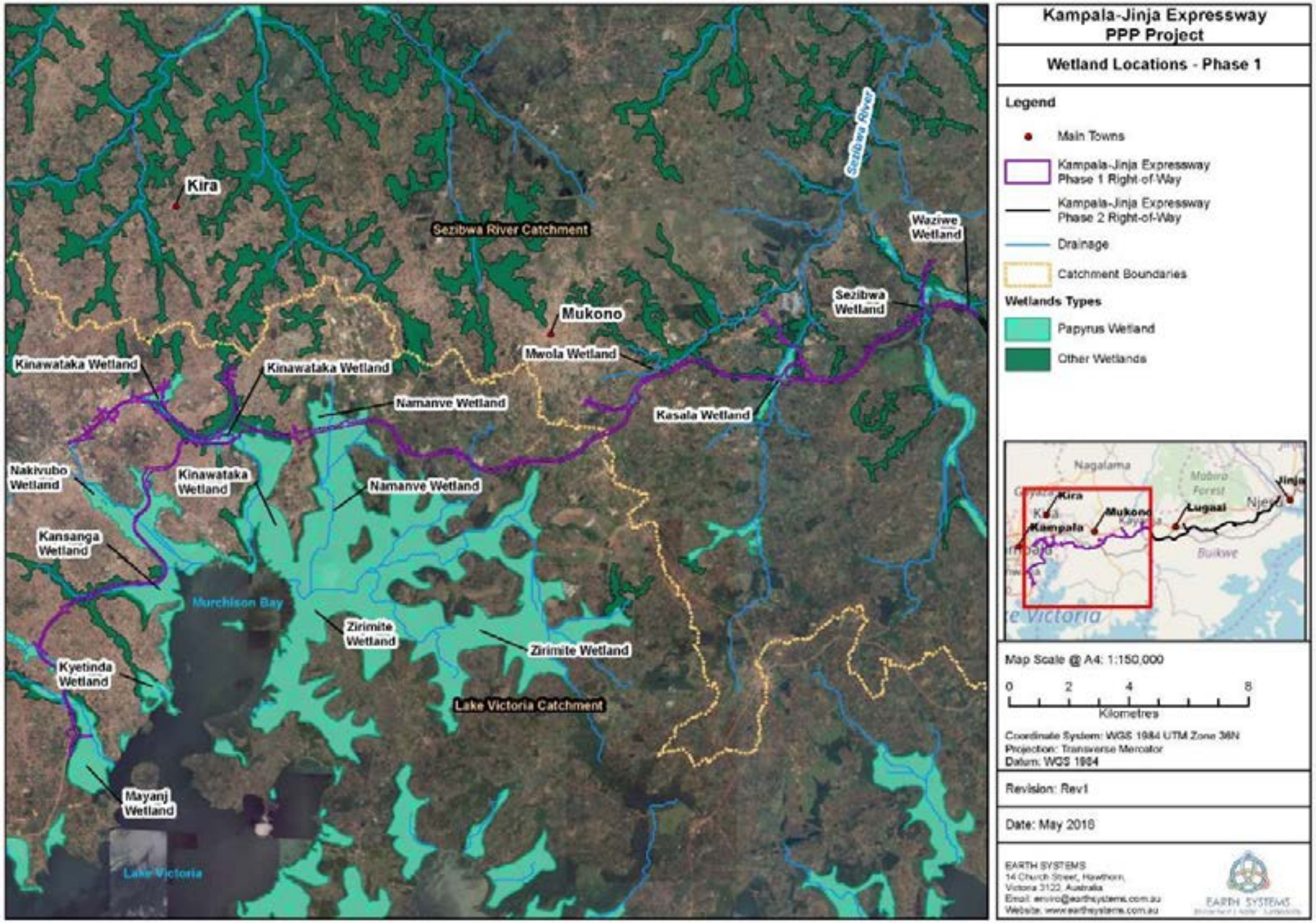


Figure 15-1: Wetlands in the KJE Phase 1 area (MWE 2008)

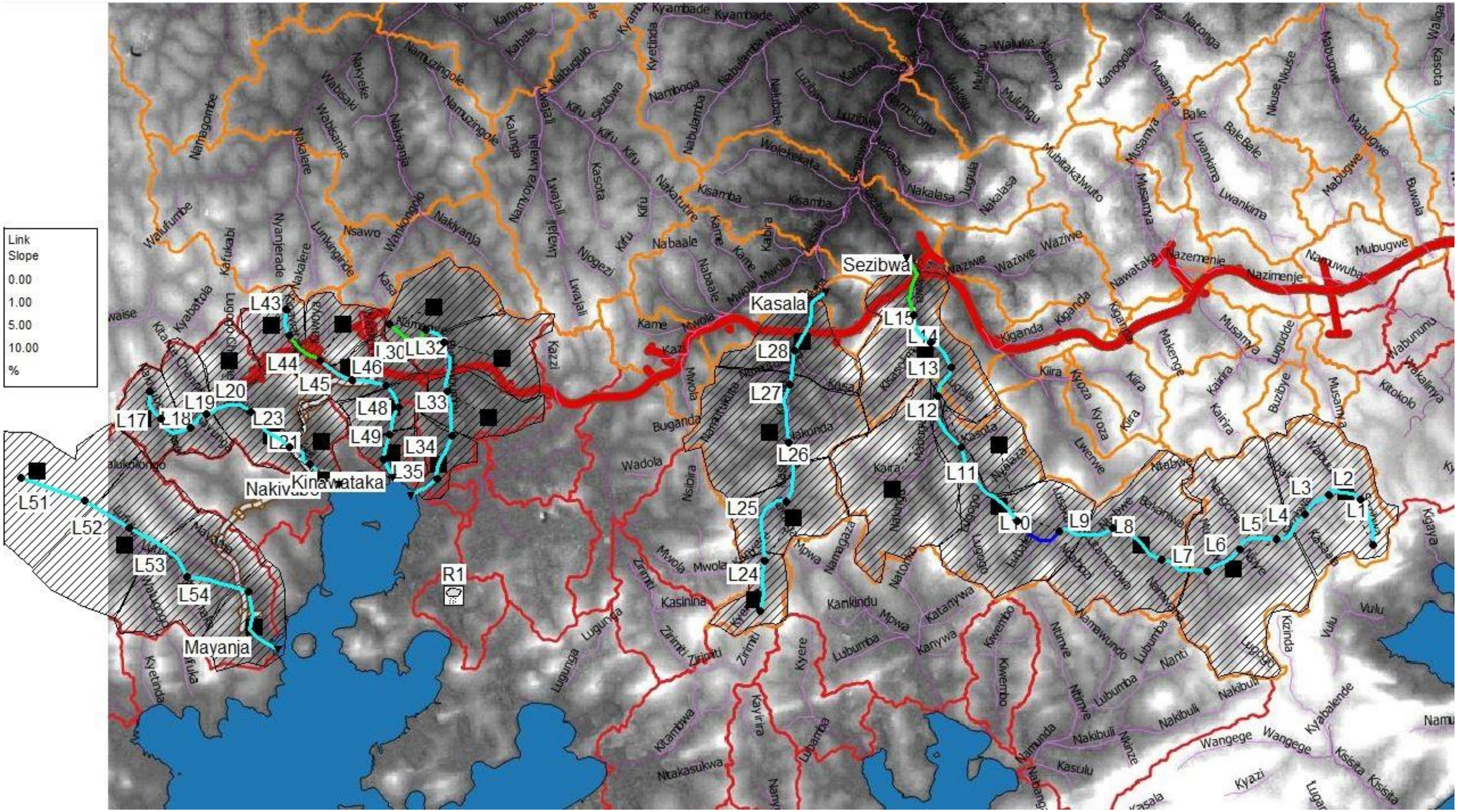


Figure 15-2: Sub catchment responses and relative streams for KJE Phase 1 (Earth Systems, ICS 2015) with streams modelled (blue / green), catchment boundary lines (orange), catchment areas modelled (black hatching), KJE mainline (thick red)

15.2.1.1 Urban Catchment Response

The predicted hydrological behaviour of the Mayanja, Nakivubo and Kinawataka streams in the Kampala urban catchment are shown in Figure 15-3. The Kampala urban catchments show an expected 'peaky' response due to the high levels of impermeable surfaces directing quick rainfall flows to surface streams from rooftops, roads and other impermeable areas of urban infrastructure. The recessional hydrograph of these urban streams is also typical, declining quite rapidly and within hours of the peak flow event. This behaviour shows that in the urban areas of the road project, flash flooding may occur, and elevated peak flows are expected even from reasonably small catchment areas. For example, the Mayanja urban catchment (60 km^2) displays a peak flow of ~122 m^3/s after only 3 hours.

Sliuzus (2013) also found that flooding is another prominent feature of Kampala. Frequent, high-intensity tropical rain storms can generate extremely high run-off that quickly exceeds the capacity of the urban storm water drainage system, causing frequent flooding across the city, but especially in the low-lying valleys and wetland areas that are typical of Kampala's environment as previously mentioned.

15.2.1.2 Rural Catchment Response

The predicted hydrological behaviour of rural farmland and forest streams (Kasala and Sezibwa) are also shown in Figure 15-3. These streams are predicted to have a relatively slow response both in the rising limb of the hydrograph and in the recessional period after the storm activity has ended. Flow will persist for possibly days longer than the urban catchments of the project area, as rainfall is held in shallow soil horizons moving slowly and re-enters the surface streams as interflow. Both the permeability of the natural catchment soils and the leaf and canopy interception processes of plants act to slow down the movement of water. In the case of tree canopy interception, as much as 5 mm or more may be lost each day which can reduce the intensity of stream flow during storm activity.

Rural stream flow peaks are more predictable, and are related to catchment area, and to some extent soil types and vegetation types. Larger catchments produce smaller peak flows than urban catchments. The Sezibwa catchment (176 km^2) is predicted to deliver a gradual peak flow of 110 m^3/s, 9 hours after the storm peak.

15.2.2 Wetlands

Wetlands are areas of vegetation that are permanently or seasonally water logged and have distinct vegetation characteristics that determine the type of wetland. Wetlands in the Project corridor can be broadly categorized as fresh-water, palustrine, and man-made wetlands. Fresh-water wetlands (riverine and lacustrine) include permanent rivers and streams such as the Sezibwa River. Temporary riverine wetlands are seasonal, and are associated with irregular rivers, streams and flooded grasslands. Lacustrine wetlands are mainly associated with permanent fresh-water lakes, including lake-shores subject to seasonal or irregular inundation (such as adjacent to Lake Victoria). Palustrine wetlands include emergent permanent peat-forming fresh-water swamps, tropical upland valley-swamps, shrub and forested swamps dominated by fresh-water marsh, and seasonally flooded fresh-water swamp forests. Man-made wetlands are minor, and include fish ponds and channels for irrigation purposes (ICS, 2015).

Table 15-2 identifies the nine wetlands that are affected by Phase 1 of the Expressway. Six wetlands (Mayanja, Kyetinda, Kansanga, Nakivubo, Kinawataka and Namanve) flow in a southerly direction into Lake Victoria and the remaining three wetlands (Mwola, Kasala and Sezibwa) flow in a northerly direction towards Lake Kyoga. The locations of each wetland are presented in Figure 15-1.

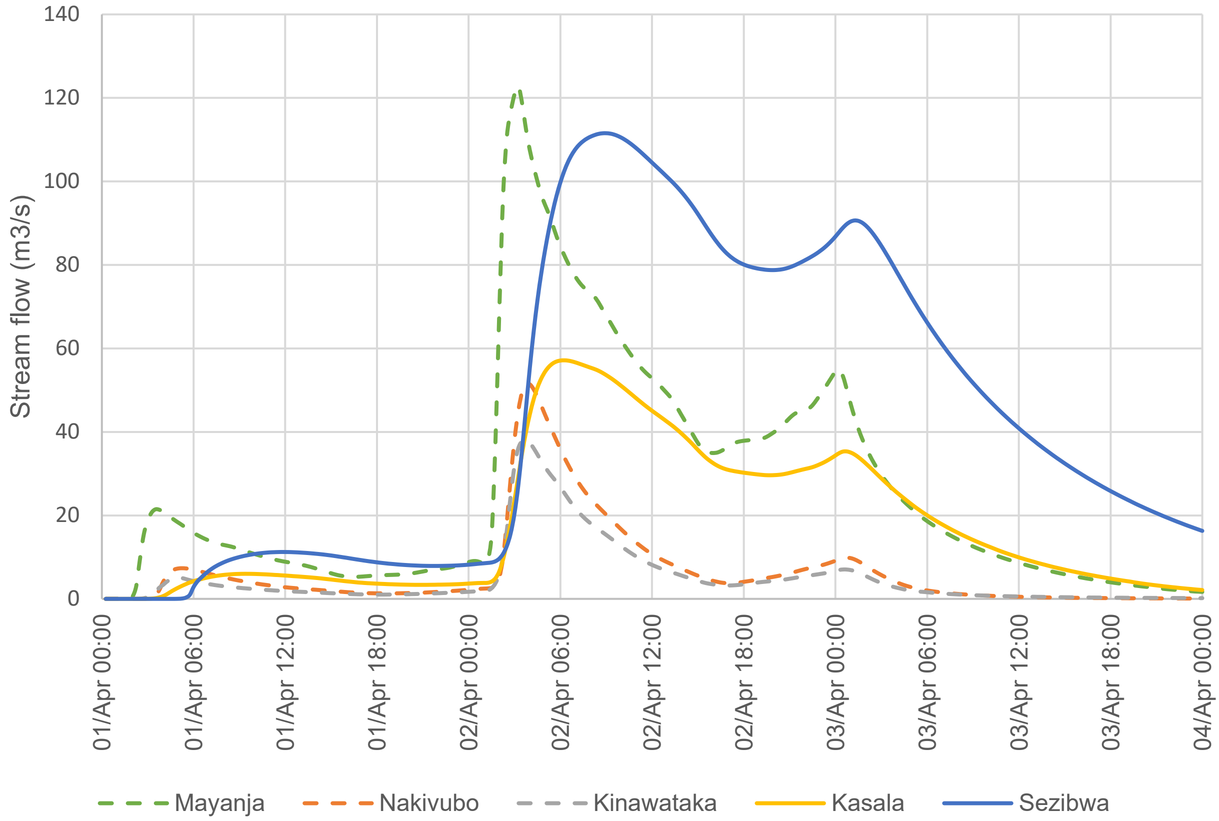


Figure 15-3: Predicted stream flow response for a 1:10 ARI 24-hour storm in selected catchments in the project corridor area for the peak wet season month of April (Earth Systems, ICS 2015)

The Nakivubo and Kinawataka wetlands are the primary and secondary urban wetlands respectively within Kampala, and both currently receive large amounts of untreated effluents from residential and industrial sources. This has severally degraded the health of the wetlands. The Mayanja, Kyetinda and Kansanga wetlands are minor urban wetlands in comparison to Nakivubo and Kinawataka wetlands, and remain largely unaffected by urban effluent discharge. However, degradation has increased over recent times and as a result, additionally eventually contribute to the poor water quality of Murchison Bay Lake Victoria, similarly to the major urban wetlands.

The Namanve wetland is a peri-urban wetland with upstream receiving industrial effluents from industrial sources resulting in poor conditions and downstream receiving no effluent within the transitional zone. The wetland is located within the Namanve Central Forest Reserve (CFR), a semi-protected area. Though sections of the CFR are transforming from a rural area to an urbanised area, altering the condition of the wetland. The expressway intersects the Namanve wetland in an upstream region providing an opportunity to improve the condition of the wetland.

On the contrary, the Mwola, Kasala and Sezibwa urban wetlands are in good health as they are unaffected by urbanisation. These wetlands are the first upstream systems that supply the Kyoga basin and set the precedence downstream wetlands within the basin before flowing into Lake Kyoga (UNDP, 2016)

Table 15-2: Wetlands affected by KJE Phase 1 (MWE 2008)

Wetland	Description	Area (km^2)	Type*	Land-use	Threats
Mayanja	Located in Makindye to the south-east of Kampala city centre on the fringes of Lake Victoria. The wetland is considered to be only 20% modified.	0.7	P	Cultivation, settlements, vegetation harvesting, firewood collection	Conversion
Kyetinda	Located on the fringe of Lake Victoria to the south east of Kampala and remains largely unconverted.	1.43	P	Cultivation, papyrus harvesting	Conversion
Kansanga	Located in Makindye Division, to the south-east of Kampala city centre and is seasonal upstream and permanent downstream. It occupies the valley between Makindye, Nsambya, Bunga and Tank hills.	4.54	P, S	Cultivation, vegetation harvesting, sand extraction, hunting	Conversion
Nakivubo	This is the main wetland and forms the boundary between Nakawa and Makindye Divisions in the valley between Bugolobi, Mpanga and Muyenga hills. The wetland runs from the central industrial district of Kampala, passing through dense residential and industrial settlements before entering Lake Victoria.	4.87	P	Effluent treatment, cultivation, papyrus harvesting, settlement, brick making	Conversion, over-harvesting
Kinawataka	This is the second major wetland featuring the catchments contributing to Lake Victoria. Unlike Nakivubo, the Kinawataka wetland is not connected to the central sewerage system and there is no pre-treatment of raw sewerage effluents from the industrial and residential areas.	4.16	P	Industrial development, cultivation, vegetation harvesting, canoe transport, sand extraction, hunting	Conversion, silting
Namanve	Located to the east of Kampala, the wetland drains into Lake Victoria with the upstream areas closely within the vicinity of the Kampala Industrial Business park treating large amounts of industrial effluents. The wetland occupies certain sections of the Namanve Central Forest Reserve (CFR) which has been degraded over the years although initially setup as an urban forest. The CFR has ceased to exist as the commercial tree planters are selling land for compensation	-	S	Domestic water source, building materials, hunting for food	Road network construction, growing of trees
Mwola	Located east of Kampala, south east of the closer urban area Mukono and is a rural stream and associated wetland that is one of the first tributaries that flows into the Sezibwa River. The wetland consists of swamp forest vegetation and existing infrastructure has been built through the wetland.	-	S	Harvesting materials, fuel wood, clay mining, cultivation for food, watering livestock, fuelwood collection.	Road network, brick burning, vegetation burning, cultivation of yams
Kasala	Located adjacent to the small rural town of Mbalala, the wetland also contributes as a tributary to the Sezibwa River beginning in the higher forest region flowing through the lower slopes and valley. The wetland is not dominated by a particular species as it can be considered to be a regenerating forest area.	-	P	Harvesting materials, stone quarry, fuel wood, seasonal fishing, hunting, domestic water usage,	Road network, exotic animal rearing, human settlement
Sezibwa	This is the main wetland within the rural region and features a large northward river flowing towards Lake Kyoga. The wetland is encroached from both sides and is dominated by papyrus vegetation. The wetland features a waterfall upstream in the higher areas of the region.	-	P	Harvesting papyrus for thatching, hunting, domestic water, building poles collection, fishing.	Vegetation and charcoal burning, brick making, road construction, human settlement, industrial development.

* Perennial (P) / Seasonal (S)

15.2.3 Groundwater Interaction

The geology of the KJE Phase 1 features an overlying layer of weathered Precambrian rock that consists of gravel, sand clay and silt with variably fractured bedrock consisting of granites and gneisses. Due to this geological setting, groundwater in the local region is readily accessible at shallow levels along the project corridor. The vertical and horizontal conductivity of the deep and shallow groundwater is highly interchangeable and is highly reliant on rainfall (BGS 2001).

In combination with the local hydrology and topography, groundwater recharge within the project corridor occurs rapidly through localised interflow that is determined by favoured flow paths and direct access because of the poorly maintained infrastructure. In addition, there are altered and highly porous vadose zones along the urbanised regions of the proposed expressway. This altered vadose zone often contains fill material that is a direct result of the urbanisation and informal settlements, especially in the low-lying Kampala district and relative wetlands.

The alteration of hydrogeological flow due to the change in land use throughout urban and peri-urban areas regions within and surrounding KJE Phase 1 has caused adverse effects. Specifically, there is currently irregular and unpredictable flooding as a result of the increase in the already shallow water table. The contact time between the infiltrating water and soil media is generally inadequate to allow for attenuation processes to occur. Furthermore, the lack of adequate latrine systems, the erosion of backfill areas, surface water collecting uphill because of urban development and other pollution collection uphill contributes to the transportation of contaminants and toxins from surrounding areas to the wetlands that eventually flow out towards Inner Murchison Bay (Kulabako et al. 2007). Specifically, an estimated water balance for Kampala is depicted in Figure 15-4 and demonstrates the groundwater interaction along with contributing hydrological flows.

The following hydrological and groundwater interactions can be identified (Nyenje 2014):

- 1151 mm/y of the 1450mm/y precipitation is evaporated, while the remaining 330 mm/y flows into Lake Victoria via open and closed drains present in Kampala city;
- Approximately 170 mm/y of water is imported from Lake Victoria and used indoors with some leakage of roughly 17 mm/y and approximately 5mm/y for outdoor usages, while the remaining 148 mm/y is converted into wastewater, of which 138 mm/y is disposed of via on-site treatment facilities (pit latrines, septic tanks, etc.), and 10 mm/y is transported to Lake Victoria;
- 1245 mm/y of water reaches the soil, with around 120 mm/y recharging groundwater and only 10 mm/y reappears as springs, where 1100 mm/y of the remaining water evaporates, while some 24 mm/y is stored.

As a balanced hydrological and groundwater system, the long-term storage component should be zero, indicating a situation of steady state. However, this is not the case and water is stored in the subsurface as a further result of urbanisation leading to a rise on average of the groundwater table.

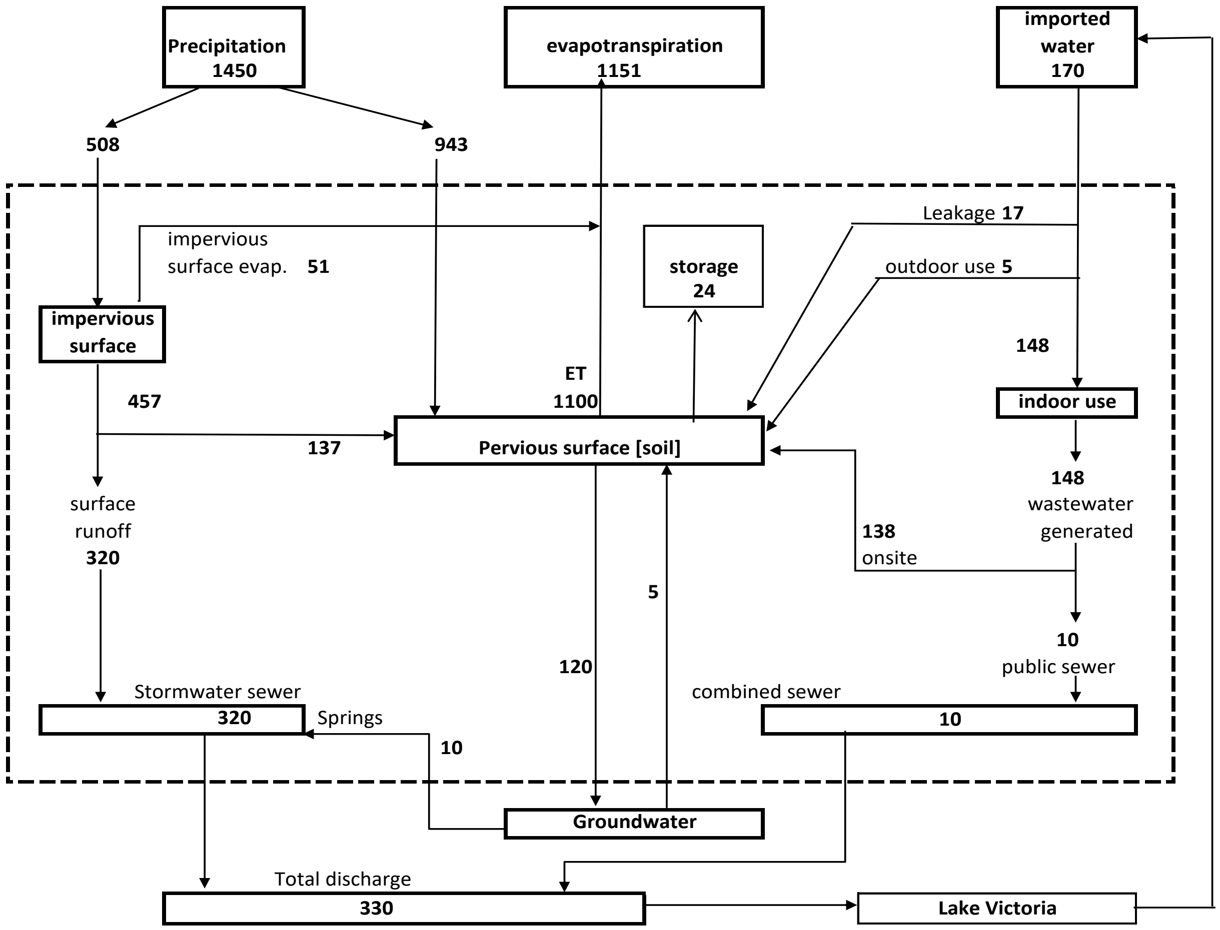


Figure 15-4: Estimated water balance (mm/y) for upper soil compartment in Kampala (Nyenje 2014)

15.2.4 Potable Water Supply

The Inner Murchison Bay is the primary drinking water supply source for Kampala City and Mukono and Wakiso districts serving about 1,357,450 people or 85% of the urban population in Kampala, and an additional 142,360 people in certain sub-districts of Mukono in Wakiso. The National Water and Sewerage Corporation treats water from the Inner Murchison Bay at one of three treatment plants at Gaba, located south of the Navikubo wetland. The Kampala water supply system comprises 24 reservoirs and a piping network of about 2,107 km extending to Nansana in Northern Kampala, Kajjansi on Entebbe road, Buddo in the West and Mukono district in the Eastern part of Kampala. Kampala Area has one sewerage treatment plant in Bugolobi which carries out secondary waste treatment. Surveys of informal settlements and slums indicate that there is an increasingly high rate of access to piped water (>90 %) however, the quality of the piped water is a continuous problem for supply, and it is estimated that only 17% have access to reliably safe water. Approximately 20% of Kampala's population uses groundwater, springs, wells and other unimproved water sources, where piped water is not available (World Bank 2005).

Mukono has a population of 981,600 of which 67% has access to safe water. The rate of water supply in urban and rural areas are 89% and 84% respectively with 2,694 domestic water points in the form of boreholes, shallow wells, protected springs, rainwater harvesting tanks and public tap stands, of which 48 have been non-functional for over 5 years. Water from the protected springs are the main supply and the district has eight piped systems

including four pumped systems (three groundwater based, one surface water based) and four gravity flow systems. These piped systems provide safe water to approximately 18% of the population while 82% of the population is served by domestic point water sources (MWE 2010).

Most of the population in Wakiso live in the peri-urban areas around Kampala. The District has a population of 1,260,900 of which 67% has access to safe water. The rate of water supply in urban and rural areas are 78% and 81% respectively with 3,942 domestic water points in the form of boreholes, shallow wells, protected springs, rainwater harvesting tanks and public tap stands, of which 154 have been non-functional for over 5 years. Water from the shallow wells are the main supply and the district has five piped systems. These piped systems provide safe water to approximately 33% of the population while 67% of the population is served by domestic point water sources (MWE 2010).

15.2.5 Surface Water Quality

KJE Phase 1 will contribute to surface runoff flow of the urban and rural catchments previously outlined. The streams and channels crossing the route currently drain runoff and wastewater and will increase in surface water runoff. A series of erosion valleys and gullies cut the escarpment in the project corridor and discharge runoff, carrying with them considerable silt (despite the clay soils) and debris into the river channels (ICS, 2015).

The polluted surface water in the Nakivubo Channel is filtered by a natural wetland prior to its discharge into Inner Murchison Bay of Lake Victoria (Oyoo, 2011). However, the efficiency of this wetland to treat surface runoff has been degraded due to large-scale draining of the wetland over the years for agriculture and settlement (Kansiime and Van Bruggen, 2001). Similarly, some of the other urban wetlands are rapidly approaching the same state.

Surface water quality data for selected sites within the affected wetlands near the KJE Phase 1 route are depicted in Figure 15-5. The sampling sites have been categorised into urban and rural sites. The sampling sites identified as Namanve 1, Namanve 2, Namanve 3 and Mukono are locations that represent groundwater quality data and discussed later in Section 15.2.6. The water quality data was interpreted from a range of studies (Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011), the previous ESIA (ICS 2015) and sampling conducted by Earth Systems (2018). Figure 15-6 through to Figure 15-13 represents the data in comparison with European Directives 2006/44/EC and 2008/105/EC for aquatic fresh waters. In selecting appropriate guideline values from Directive 2006/44/EC all surface water was conservatively assumed to have minimum hardness (10 mg/L $CaCO_3$) and be suitable for cyprinids (recorded in Lake Victoria). The data is presented per sampling site and has not been averaged across sites.

- Data from urban sites suggests that surface waters within Kampala are subject to varying degrees of nutrient pollution (elevated phosphorus and ammonia) most likely from sewage and fertiliser run off.
- Elevated levels of vehicle pollutants copper and lead were recorded at most urban surface water sampling sites.
- The Navikubo wetland in Kampala has near-neutral pH (~7), but elevated levels of lead (0.01 - 1.6 mg/l), copper (0.006 - 3.3 mg/l), and nutrients - total phosphorus (0.3 – 0.6 mg/L) and ammonia (10.2 – 21.2 mg/L as NH_3).
- The Kinawataka wetland shows more variable pH (5.1-8.5), elevated levels of lead (0.01-0.154 mg/l), copper (0.01-0.52 mg/l) and nutrients - total phosphorus (2.51 mg/L) and ammonia (4.1 – 5.5 mg/L as NH_3).
- The Kyetinda wetland has near-neutral pH, a total phosphorous concentration lower than Kinawataka (0.395 mg/l) and the Kansanga wetlands shows a lower biological oxygen demand (47.35 mg/l) than both Navikubo and Kinawataka.

- The rural wetlands (Namanve, Mwola, Kasala and Sezibwa) have a relative neutral pH range (6.9-7.5), but significantly lower electrical conductivity (86.9-69.1 µS/cm). These sites exhibit some evidence of nutrient pollution through elevated levels of ammonia and total phosphorous.

The surface water data indicates that both the Navikubo and Kinawataka wetlands are highly affected by urban and vehicle pollution with the outer urban wetlands, Kyetinda and Kansanga, more moderately disturbed. Additionally, the data suggest that the Namanve, Mwola, Kasala and Sezibwa rural wetlands (inclusion of peri-urban wetland) remain largely undisturbed in relation to urban and vehicle pollution however, somewhat affected by agriculture operations such as the possible use of fertilisers.

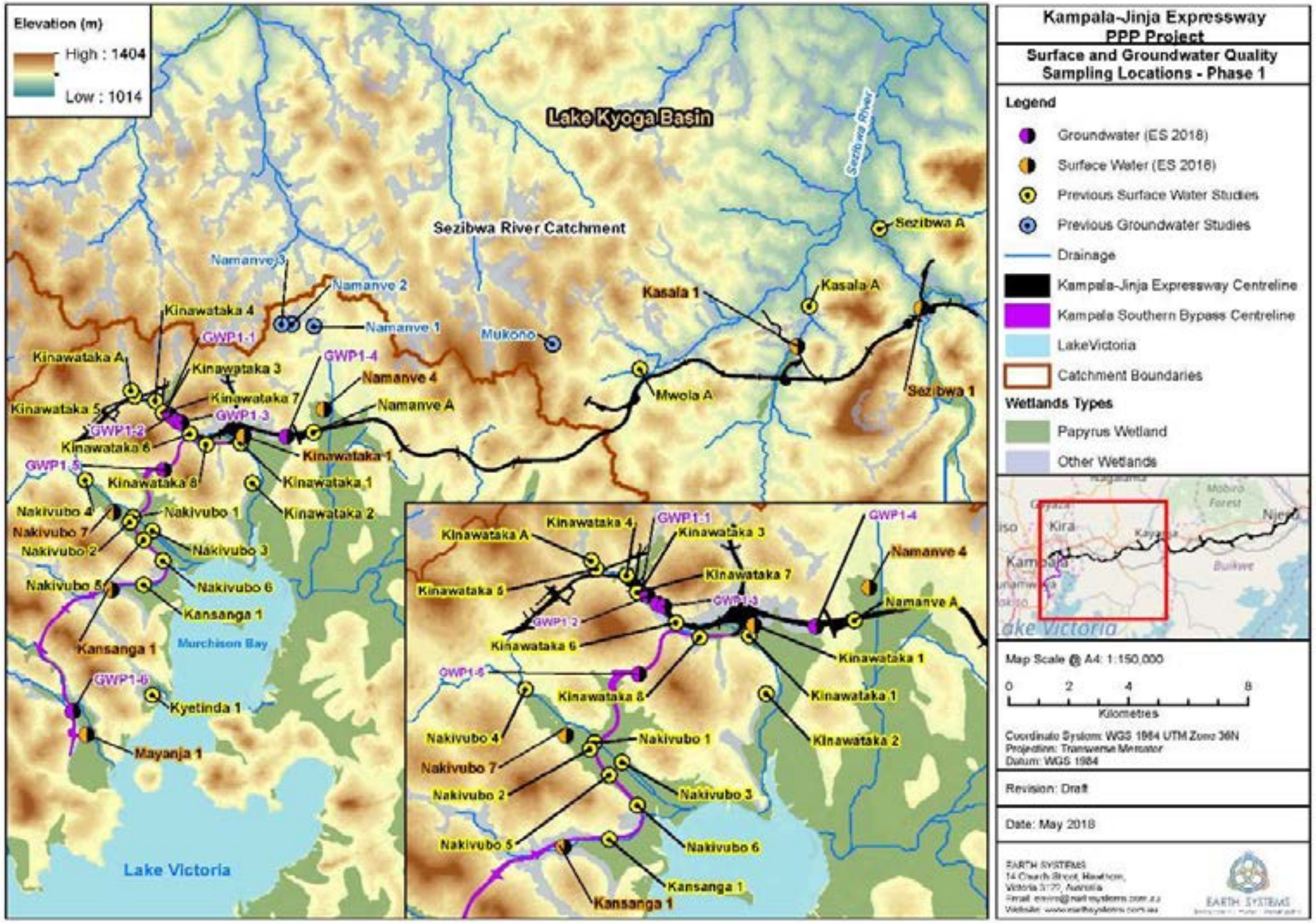


Figure 15-5: Surface and groundwater water sampling locations in the vicinity of KJE Phase 1 (Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

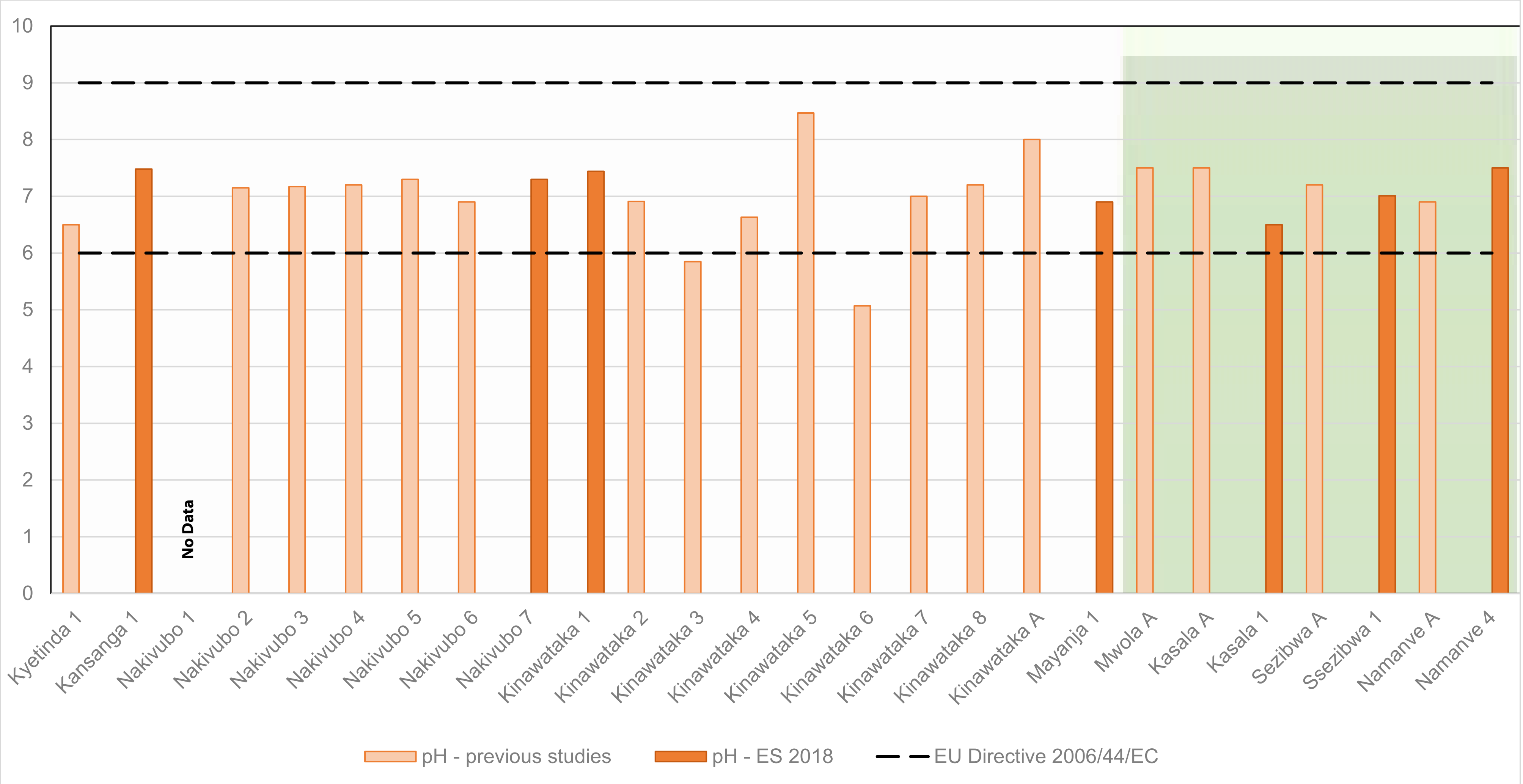


Figure 15-6: pH of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

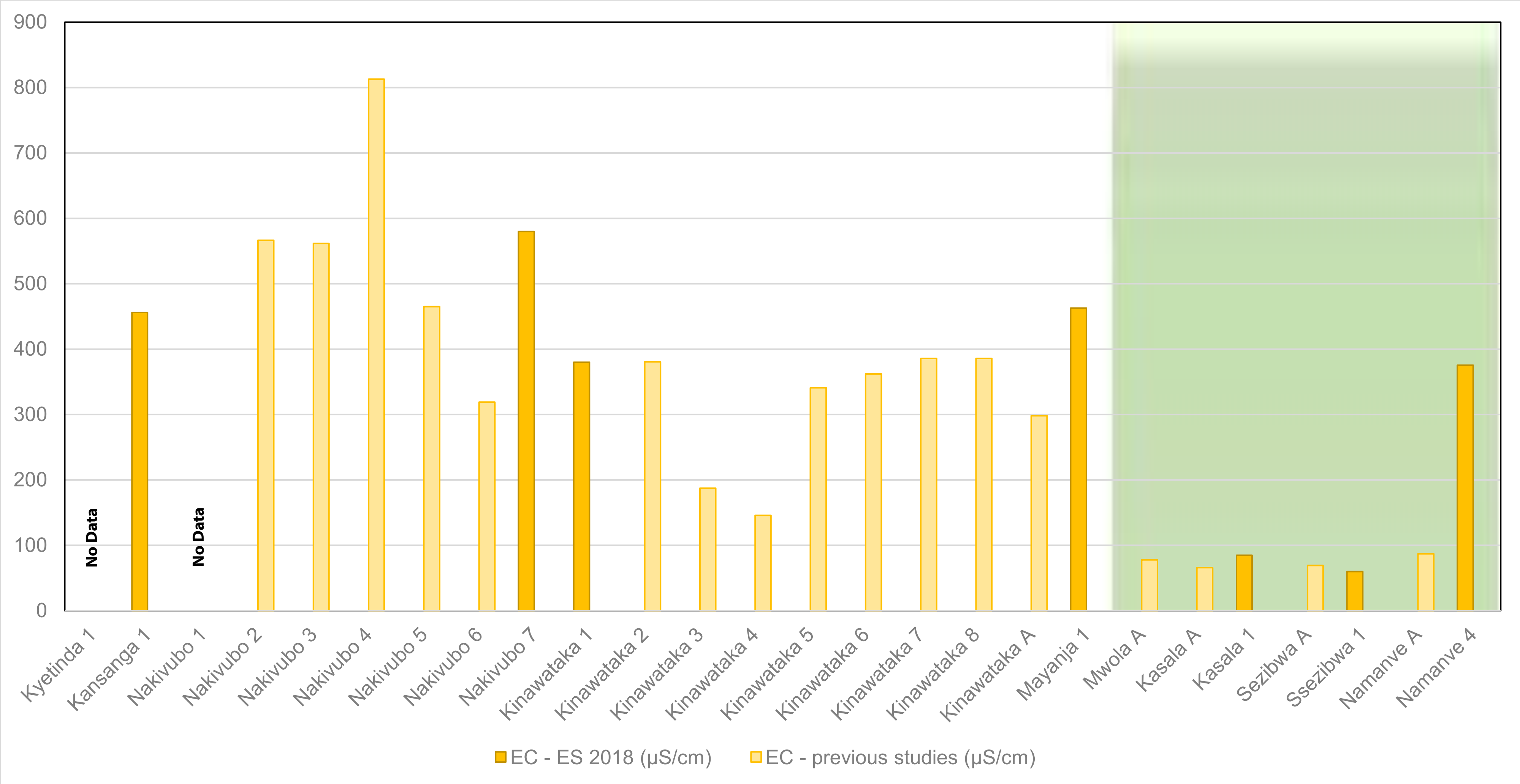


Figure 15-7: Electrical C onductivity (EC) of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

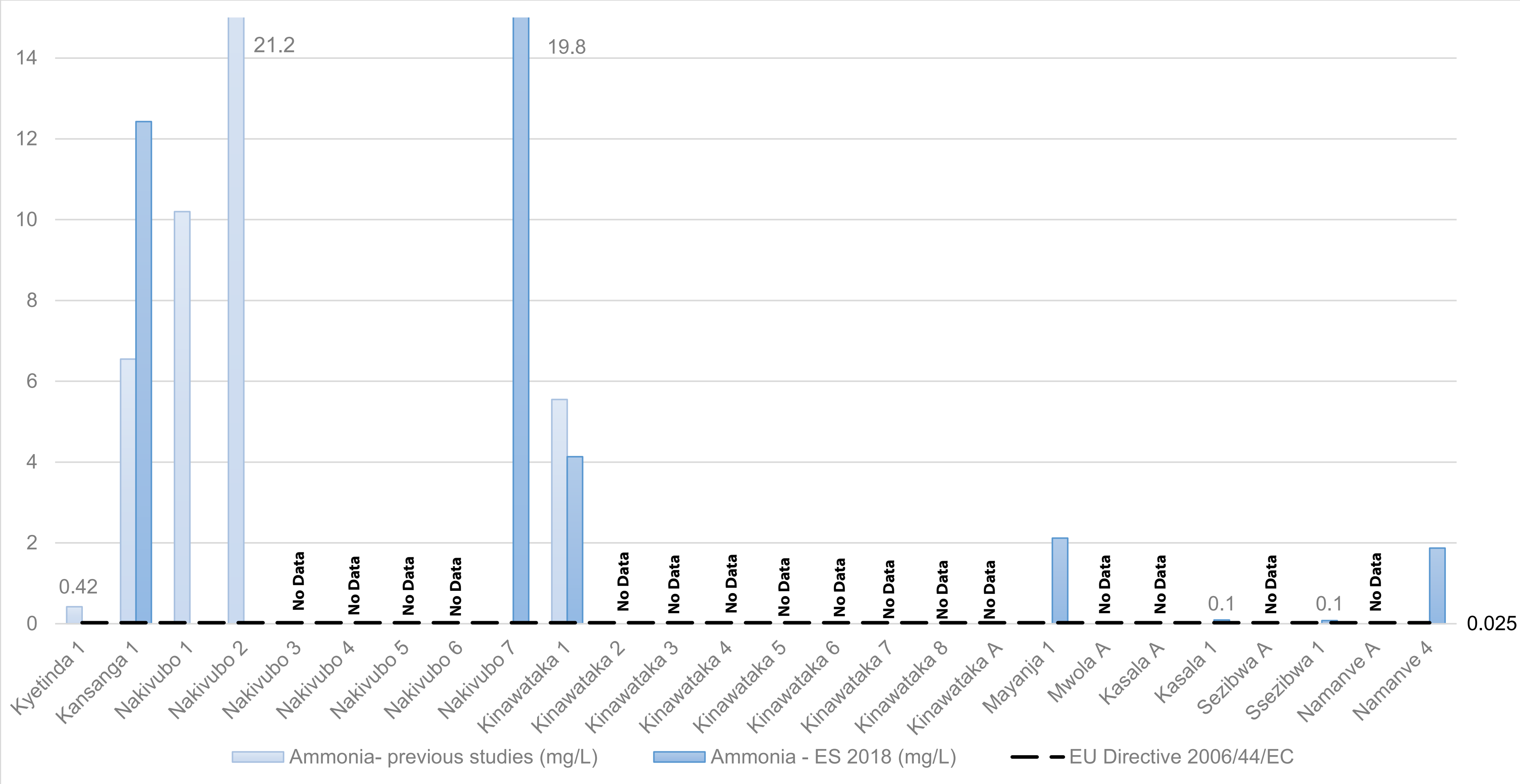


Figure 15-8: Ammonia levels of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

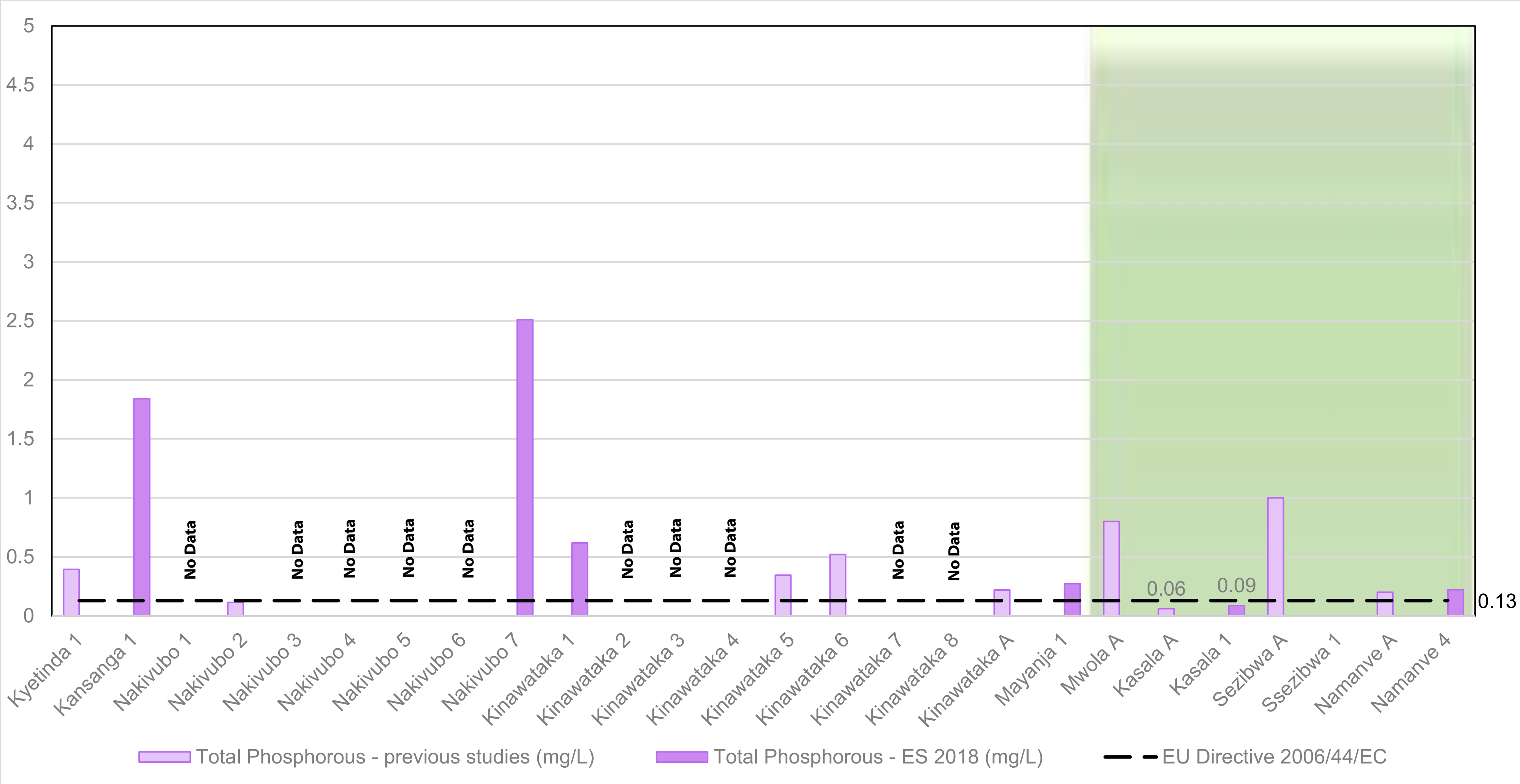


Figure 15-9: Total Phosphorous levels of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

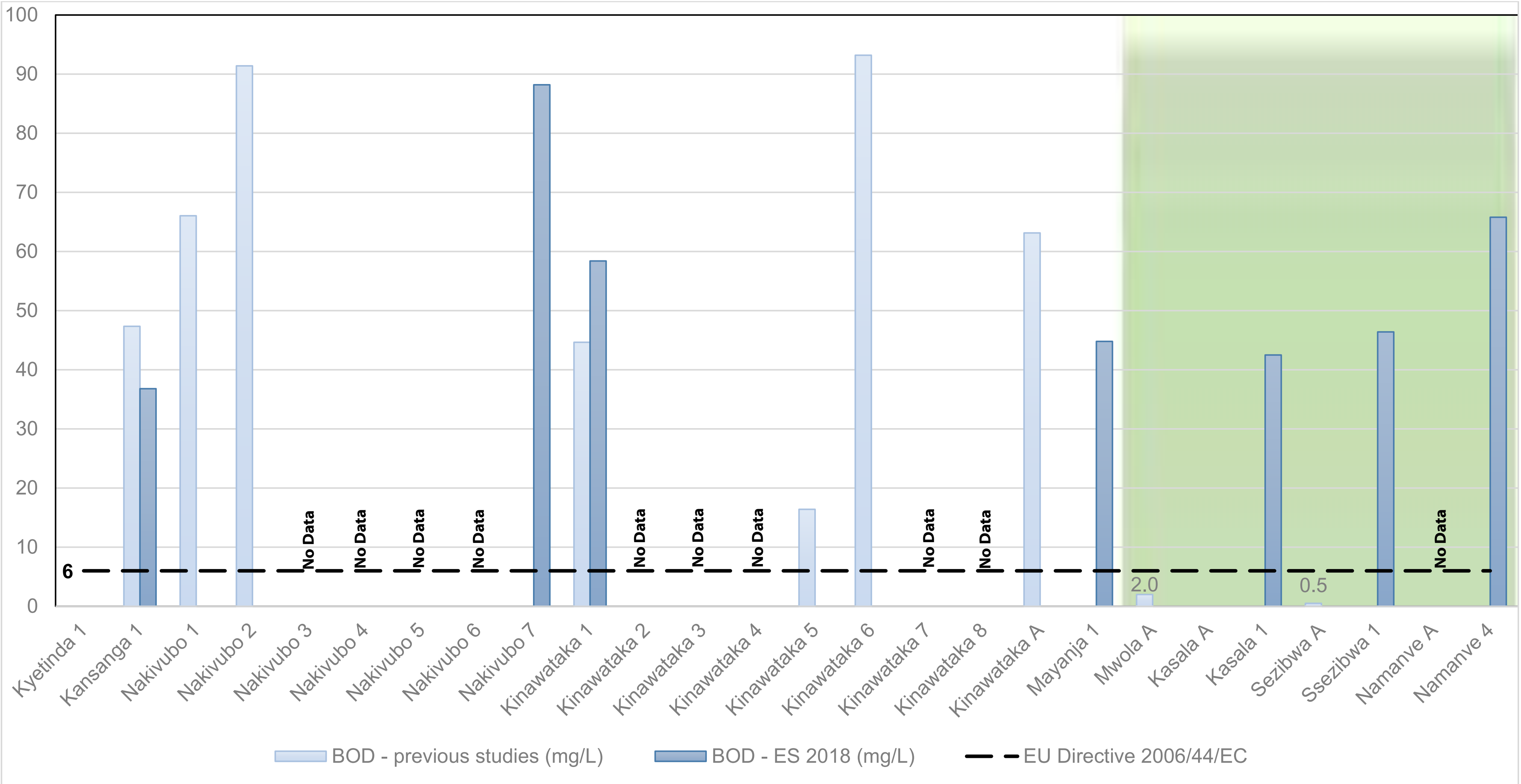


Figure 15-10: Biological Oxygen Demand (BOD) of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

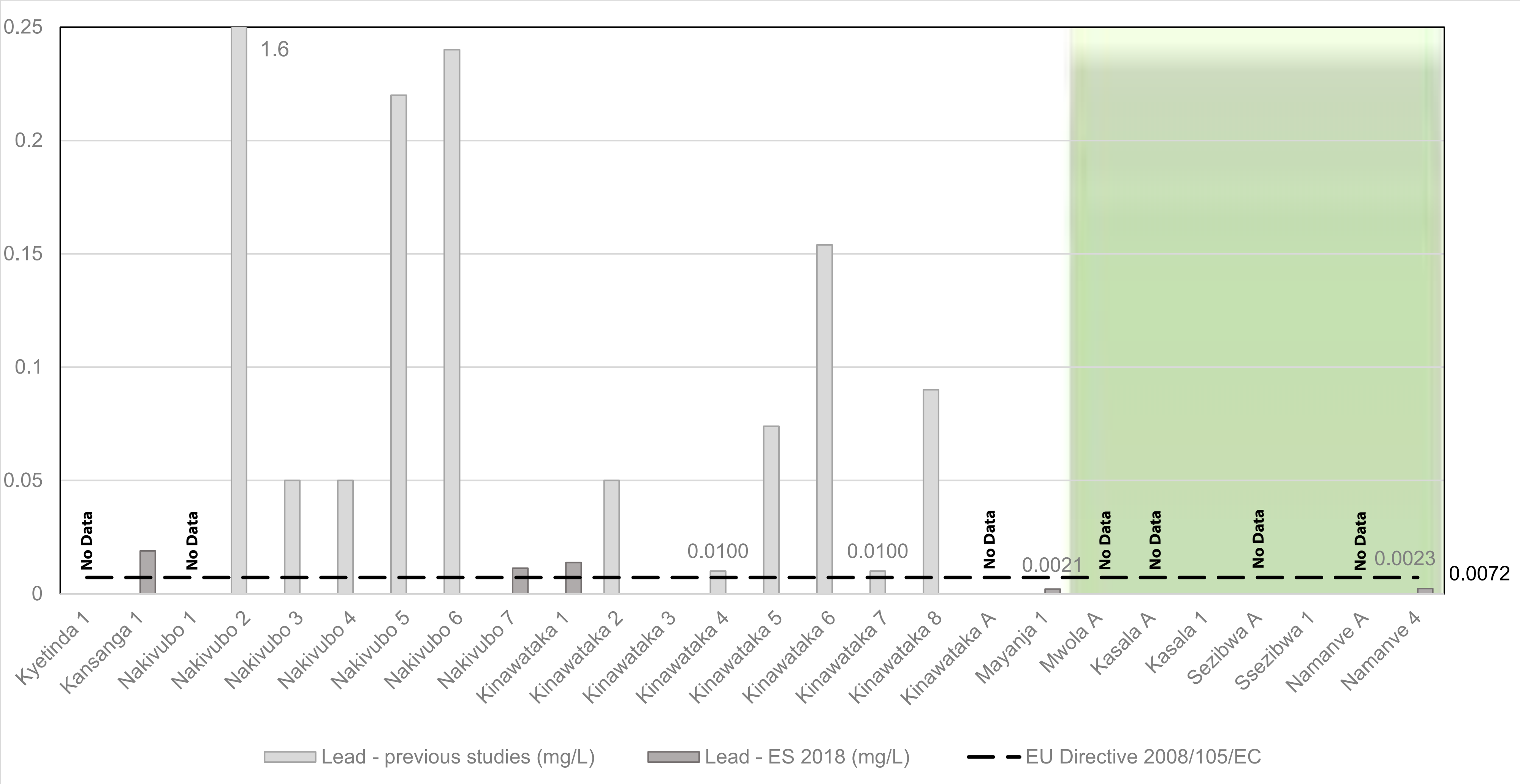


Figure 15-11: Lead concentrations of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

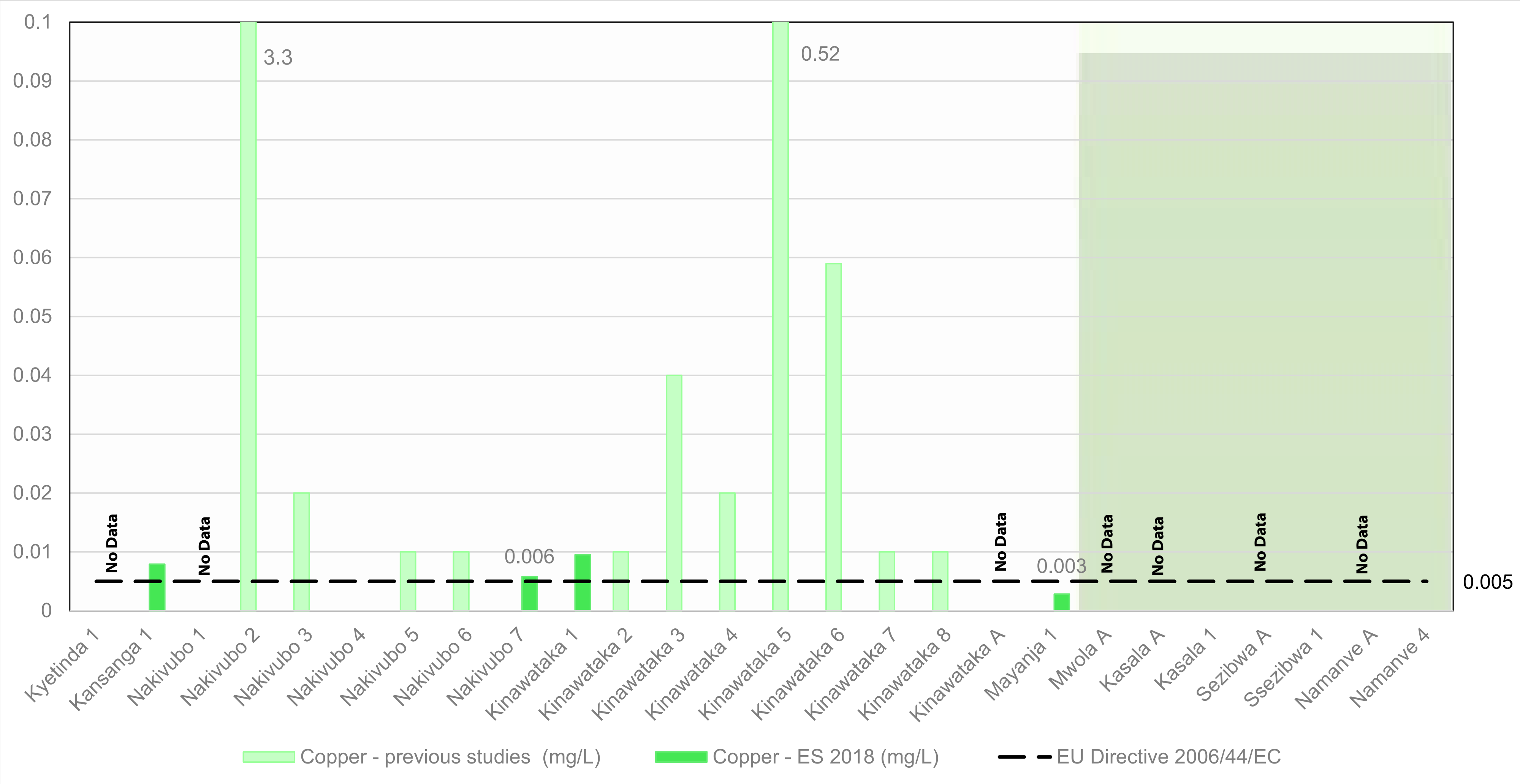


Figure 15-12: Copper concentrations of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

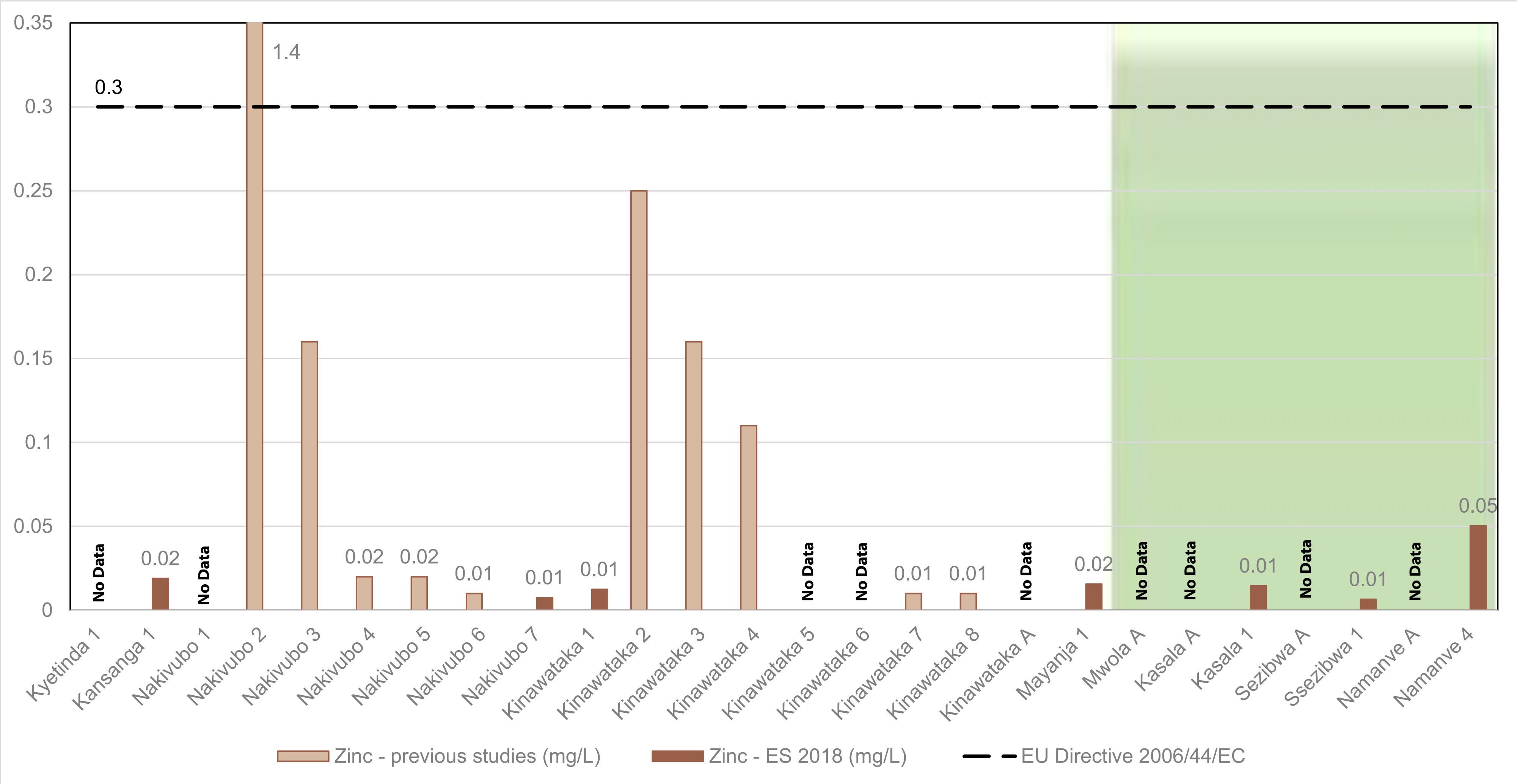


Figure 15-13: Zinc concentration of Urban (white background) and Rural (green background) sampling sites (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

15.2.6 Groundwater Quality

Groundwater quality data for selected sites within proximity of KJE Phase 1 route are depicted in Figure 15-5. The six (6) most frequented groundwater springs (GWP1-1 to GWP1-6) along Phase 1 were sampled for analysis by Earth Systems in April 2018. Field parameters were taken at a further eight (8) sites (details in Technical Appendix). The sampling sites identified as Namanve 1, Namanve 2, Namanve 3 and Mukono are additional groundwater data locations interpreted from previous studies (Smith et al. 1996 and Authority & Kiryabwire 2004). Figure 15-14 through to Figure **15**-**17** represents the data in comparison with the Ugandan National Standards (2015) and WHO Standard (2011) for drinking water.

Groundwater springs sampled by Earth Systems generally demonstrated water quality within acceptable potable water limits except for GWP1-1 & 1-5 (slightly elevated phosphorus for Ugandan potable water standards). pH measurements at sites GWP1-1, 1-2, 1-4 and 1-5 were also just below the Ugandan guideline for natural potable water. However, pH limits are more of an operational water quality parameter than health based. The data suggest there may be some interactions between these shallow groundwater sources and the local hydrology.

The groundwater samples from previous studies were collected from deep wells specifically located within highly urbanised regions. The Namanve sites were situated within the Kampala Industrial Business Park and the Mukono site was situated within a highly populated town. However, both regions demonstrate groundwater quality within acceptable potable water limits. The indicative quality of these sites suggest that the deep wells used as point sources of water are currently not as severely impacted by the groundwater interaction with the local hydrology as the surface water sources of Lake Victoria.

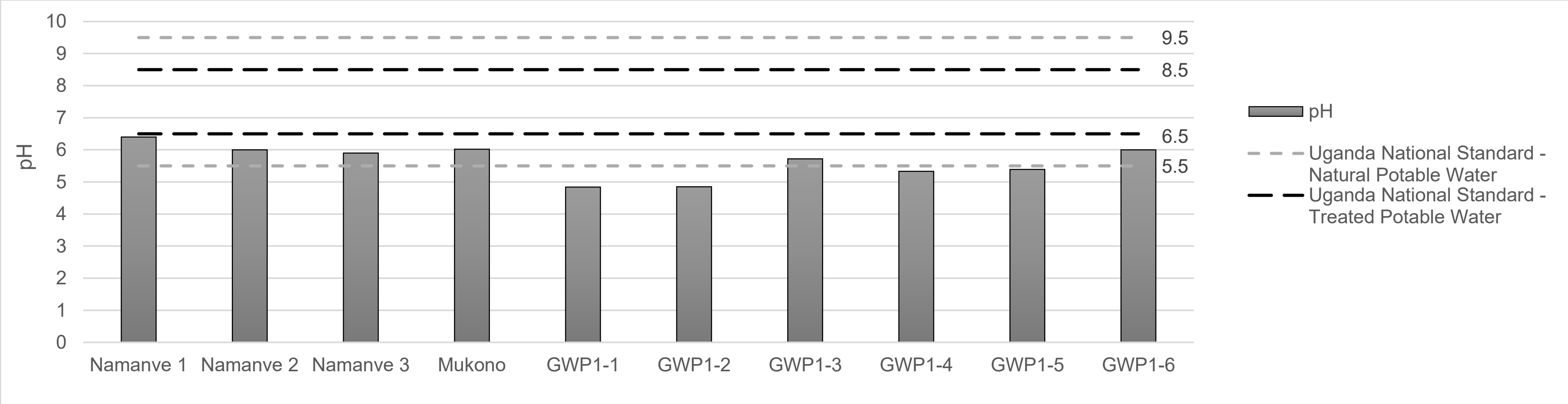


Figure 15-14: pH of groundwater sampling sites (Earth Systems, Smith et al. 1996 and Authority & Kiryabwire 2004)

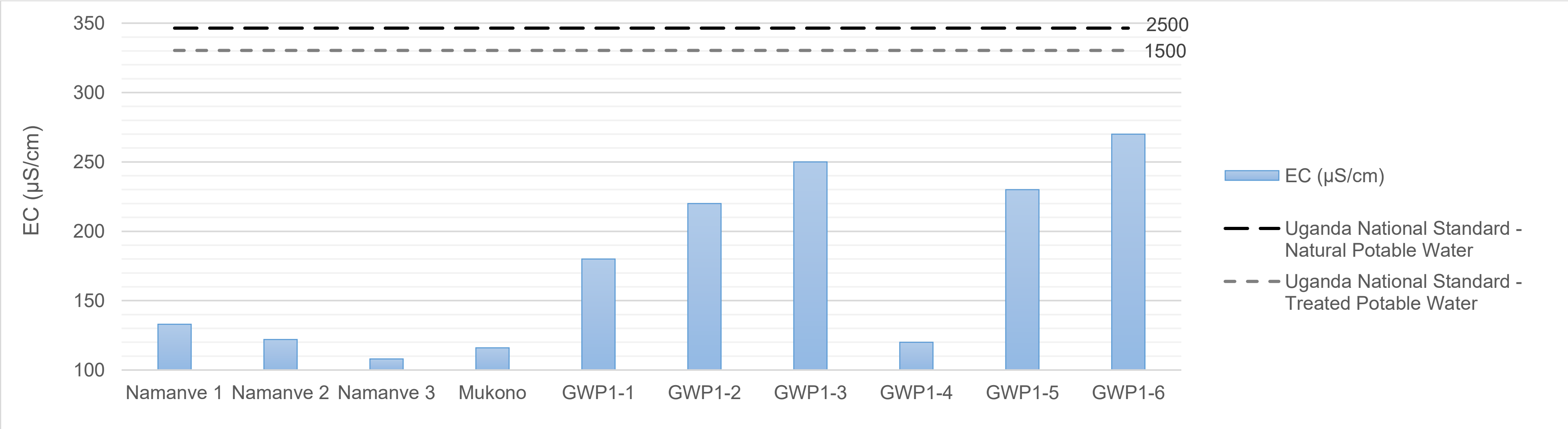


Figure 15-15: Electrical Conductivity (EC) of groundwater sampling sites (Earth Systems, Smith et al. 1996 and Authority & Kiryabwire 2004)

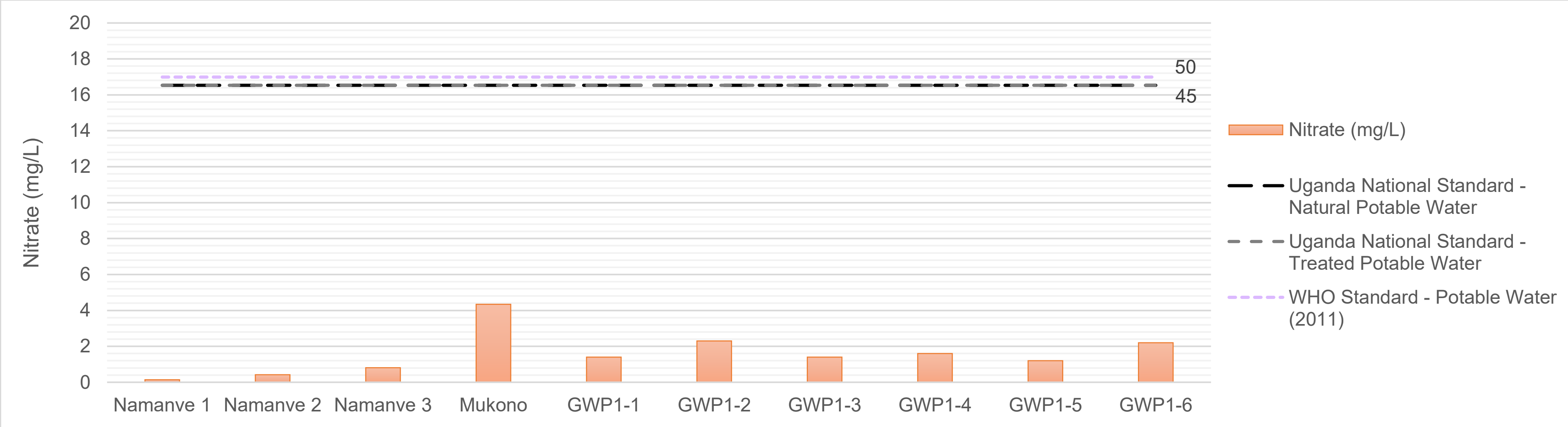


Figure 15-16: Nitrate levels of groundwater sampling sites (Earth Systems, Smith et al. 1996 and Authority & Kiryabwire 2004)

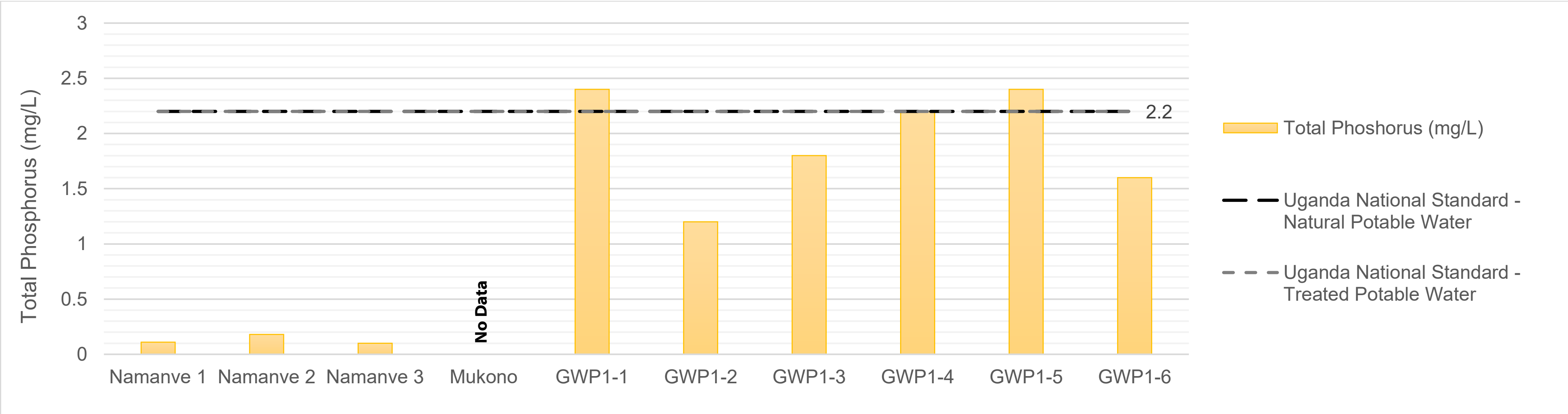


Figure 15-17: Total Phosphorous levels of groundwater sampling sites (Earth Systems, Smith et al. 1996 and Authority & Kiryabwire 2004)

15.2.7 Erosion and Sediment Risks

KJE phase 1 will require the modification and stabilisation of the existing terrain within the project corridor and will entail the removal of land cover and natural landscapes (See Chapter 11). Figure 15-18 demonstrates the stormwater sediment and erosion slope risk areas for KJE phase 1. The slope risk percentage for the corridor is represented five categories with the relative associated risks demonstrated below:

- 0-1% Very Low Risk
- 1-3% Low Risk
- 3-5% Moderate Risk
- 5-10 High Risk
- 10% + Very High Risk

Three areas have been identified as having greatest stormwater erosion and sedimentation risk to the project corridor with multiple very high risk characteristics. The most southern zone outlines very high erosion and sedimentation risks to the Mayanja and Kansanga wetlands, while the central zone identifies very high erosion and sedimentation risks to the Namanve and Kinawataka wetlands and lastly the eastern zone identifies very high erosion and sedimentation risks to the rural Kasala and Sezibwa wetlands. The approximate chainages of these three zones are presented in Table 15-3. The stormwater slope risks evaluation has only considered the current land topography of the project ROW and with the introduction of an impervious surface (roads, culverts, shoulders etc.) the risk will only increase significantly in these zones and may introduce additional zones of risk.

Table 15-3 Chainages for stormwater sediment and erosion slope risk areas for KJE Phase 1 (Earth Systems, ICS 2015)

Zone	Alignment	Chainage from	Chainage to
1	KSB	9+300	15+900
2	KSB	0+000	6+800
	KJE	2+300	7+500
3	KJE	27+300	34+800

The predicted hydrological behaviour of the Mayanja, Nakivubo, Kinawataka, Kasala and Sezibwa steams are shown in Figure 15-19 and could potentially aggravate erosion and sedimentation within the streams and wetlands. The elevated risks of erosion and sedimentation could cause serve implications for streams and result in an increased stream velocity leading to flooding. The hydrograph demonstrates that the relatively low-urbanised Mayanja stream reaches a peak velocity of 4.6 m/s within 3.5 hours of a 1:1 ARI storm occurring. The Nakivubo stream peaks within 4.25 hours at a velocity of 0.92 m/s with the closely urbanised Kinawataka stream peaking at the same time at a velocity of 1.45 m/s. The rural Kasala and Sezibwa streams have a far more gradual build up to the peak velocities of 0.87 m/s and 2.27 m/s respectively approximately 9 hours (Kasala) and 12 hours (Sezibwa) after the commencement of the storm.

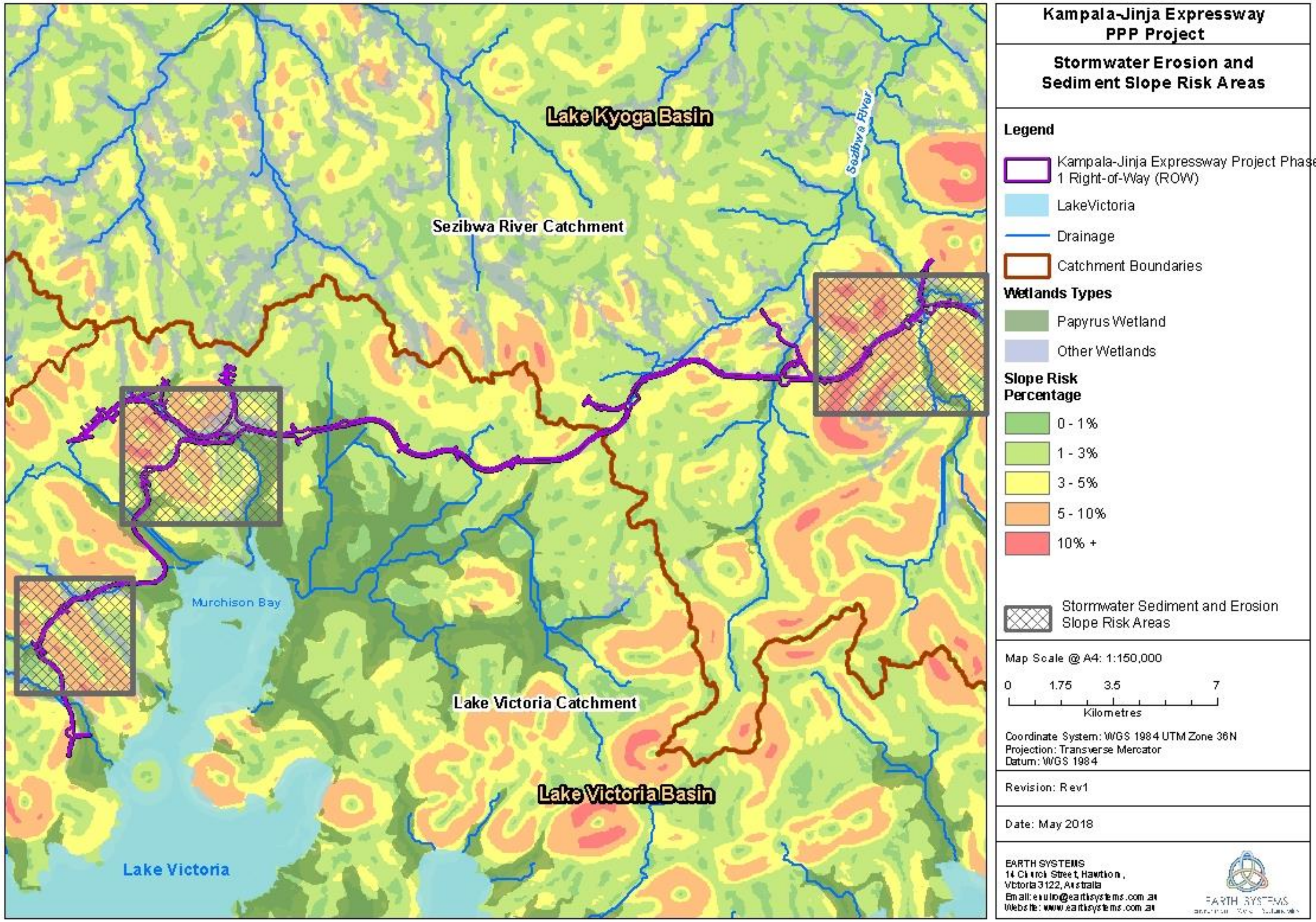


Figure 15-18: Stormwater erosion and sediment slope risk areas for KJE Phase 1 (Earth Systems, ICS 2015)

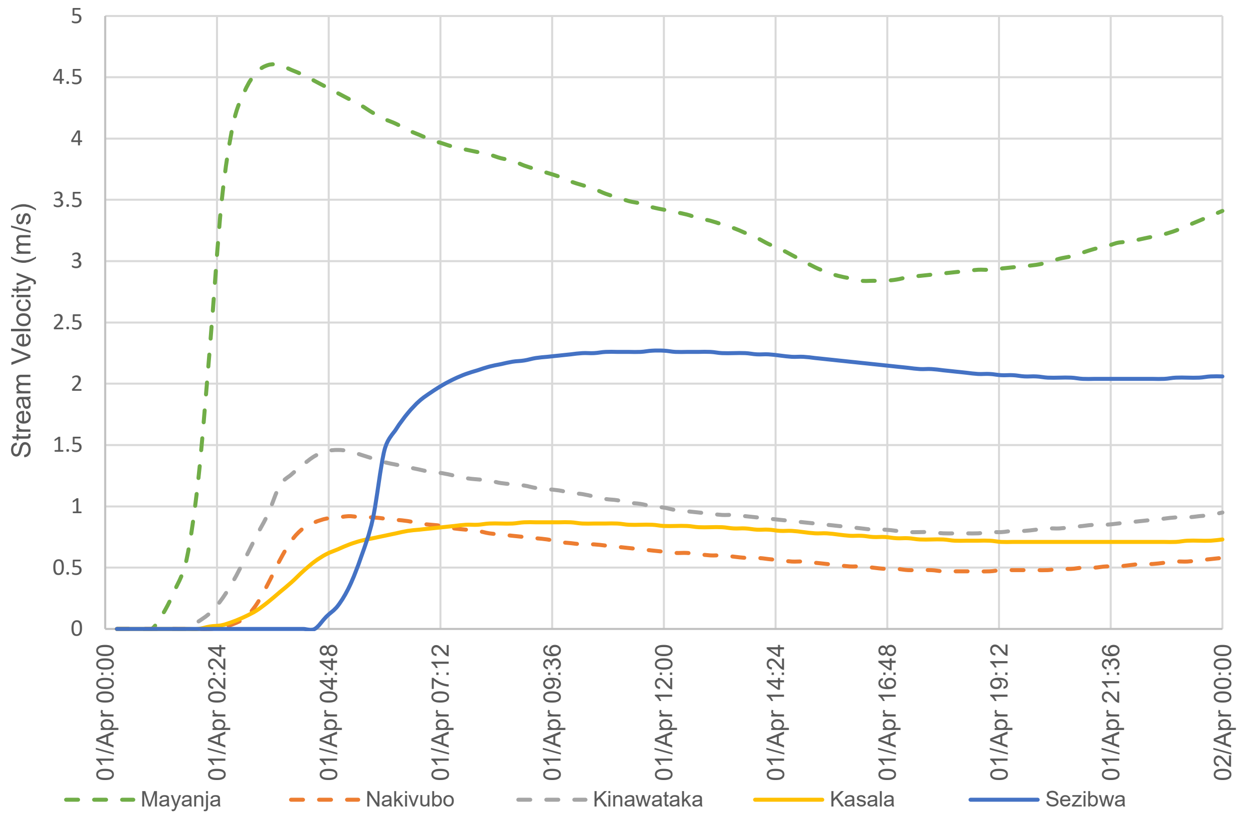


Figure 15-19: Predicted stream velocity response for a 1:1 ARI 24-hour storm in selected catchments in the project corridor area for the peak wet season month of April (Earth Systems, ICS 2015)

15.3 Impact Assessment

The key potential impacts related to surface water hydrology, water quality and, erosion and sediment control for KJE Phase 1 are as follows:

- The roadway will act as an obstruction to existing hydrology and groundwater interaction, causing a potential change of perennial and/or ephemeral flow both upstream and downstream of raised and cutting roadway sections;
- The introduction of new structures such as culverts, bridges and crossings to existing drainage networks could result in changes to existing pathways of hydrology and groundwater interactions leading to new undesired pathways;
- The alteration of the water table because of the change in hydrological and/or groundwater interaction can lead to localised flooding and may also activate acid sulphate soils, or contaminated groundwater plumes;
- The roadway has the potential to be flooded during significant rainfall events, which can endanger road users and result in damage to infrastructure;
- The roadway will introduce new materials sourced from external sites and has the potential to affect the water quality and can further result in possible failures of structural aspects of the project;

- Road and vehicle derived pollutants such as copper, lead, zinc, hydrocarbons, oils and sediment can be transported by surface runoff into surface waters and infiltrate into the groundwater which can contaminate both surface and groundwater;
- Construction area pollutants such as spills or leaks of hydrocarbons, oils, greases, tar, asphalt, material waste and human rubbish can be transported by surface runoff into surface waters and infiltrate into the groundwater which can contaminate both surface and groundwater;
- Temporary disturbance and erosion of soils in the broader right of way during construction may contribute to the disruption of waterways and possibly reduce the capacity of existing drainage structures;
- The roadway will have an adverse effect on the water point sources and piped network sources, causing a potential change in the accessibility, quality and overall supply to the communities with the ROW and further in the district.

These potential impacts are covered in more detail for the Construction and Operations Phases below. The Pre-Construction Phase is not considered as no Project activities potentially affecting surface or groundwater will occur during this phase.

15.3.1 Flooding

15.3.1.1 Construction

KJE Phase 1 will potentially increase the flooding of catchments along the ROW and possibly extend further to residential areas outside of the ROW. Currently, many residential areas currently experience seasonal flooding in association with high rainfall events due to a lack of adequate drainage systems and the implementation of backfill of low-lying regions for urban development (Figure 15-20). Although the exact height of water table is unknown, it can be considered to be close to the surface within the highly-permeable vadose zone, indicating that that a slight alteration to the existing conditions will have adverse effects.

The associated grading activities and cutting leading to the removal of land cover, natural vegetation and landscapes will likely alter flow rate and pathways upstream by introducing the possible widening of wetlands and other natural waterways. Additionally, filling of sections along the ROW will further contribute to the change in flow and pathways similarly to the way that backfill occurred in wetlands for settlement. The change in flow and pathways will likely lead to increase the downstream area vulnerability to flooding as well as increasing the frequency of flooding in existing high-risk areas.

Figure 15-20: Flooding at Luzira located downstream between the Navikubo and Kinawataka wetlands. (UNDP 2016)

15.3.1.2 Operations

New road surfaces for KJE Phase 1 will increase impervious surfaces, a large change from the current pervious surfaces in those locations. Roads maximise runoff generation during rainfall and introduce high flow velocities and significant flow accumulations at exit channels and culverts. These exit channel and culverts will direct the increased runoff into existing and/or new watercourses and potentially will alter the flow and pathways of natural origins. This is particularly relevant to Mayanja, Nakivubo and Kinawataka streams in the Kampala urban catchment which, modelling suggests, exhibit a 'peaky' response to rainfall events.

This increase can also have the capacity to transport debris and waste towards the channels and culverts, leading to blockages that can eventually result in the roadway flooding. The roadway flooding would potentially cause disruptions to the daily operations of many communities that would rely on the KJE Phase 1. Additionally, any infrastructure within the ROW may potentially be exposed to the large volume of water causing possible destruction. More notably, the possible loss of human life may occur when flooding of the expressway occurs.

15.3.2 Water Pollution

15.3.2.1 Construction

The KJE Phase 1 will involve numerous construction zones that have the potential to contaminate water quality. Solid waste from associated camp activities such as human scraps, packaging and waste paper along with spills or leaks of hydrocarbons, oils, greases, tar, asphalt and other pollutants have the potential to contaminate surface and groundwater. This pollution would be transported by surface runoff into waterways, and has the potential to significantly impact water quality. Consequentially, this would have implications on all the people in Kampala, Mukono and Wakiso who heavily rely on water supply from the Lake Victoria and additional various domestic point water sources such are wells and springs. Baseline water quality data suggest rural sites have generally been less impacted by human activities thus a higher potential to contaminate water quality may exist in rural areas.

15.3.2.2 Operations

Heavy metals mainly copper, lead and zinc as well as oil and grease accumulate on road surfaces and will likely deposit in soils immediately adjacent to the roadside resulting in both surface and groundwater pollution. These

can be entrained in surface runoff and transported into downstream waterways, which can degrade downstream water quality and accumulate in sediments affecting biodiversity and wetland health. Additionally, unplanned settlements and services such as washing bays (Figure 15-21) can develop over time within the vicinity of KJE Phase 1 and could further impact water quality.

As quarried material will be used for KJE Phase 1, the combination of possible flow alteration and previous water pollution, may introduce leaching of additional contamination from the roadway over time. This could occur through the activation of acid sulphate soils and groundwater contamination plumes and further impact on the water quality.

Figure 15-21: Kinawataka Washing Bay (UNDP 2016)

15.3.3 Erosion and Sediment Transport

15.3.3.1 Construction

Erosion and sediment movement is a significant risk during construction due to both earthworks and the exposure of large areas of soil and subsoil following vegetation clearance and soil stripping. Removal of vegetation exposes soils, which are then highly susceptible to erosion by surface runoff. Similarly, the stockpiling of this removed material is highly vulnerable to surface runoff and significant downstream transport of sediment is possible which can result in significant degradation of downstream water quality and waterway health. Additionally, inadequate excavations and embankments could lead to slope failure and result in erosion and sediment transport exaggerating other impacts such as flooding and pollution as mentioned previously. It is recommended that an environmental management addresses the storage and removal of unrequired material and that all technical aspects of the project regarding earthworks is adequate.

15.3.3.2 Operations

The KJE Phase 1 will possibly contribute to erosion and transport of sediment due to the higher runoff generated within project corridor. Higher runoff could lead to possible changes in stormwater flow, and consequently result in downstream bank erosion and associated sediment transport within wetlands. Erosion in the highest energy parts of the stormwater drainage system (in downhill channels and in exit flow channels) can be significant if not managed appropriately, resulting in localised scouring and degradation of land, and downstream transport of

sediment related to this erosion. It is recommended that the drainage system flows into existing water networks that have the capacity to deal with higher runoff flows or alternatively affected wetlands can be improved.

There is likely to be erosion from the exposed surfaces areas and slopes created, leading to the increase of sediment content in surface waters that will eventually settle within the main drainage channels. The creation of stock piles and use of material from external sources (quarries) during this process will potentially be eroded by relevant storm water flows and the introduction of culverts as required for the KJE Phase 1 alignment will also increase the sediment load in water bodies affected by the project.

15.4 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) and specifically a Water Management Plan has been prepared for the Project which includes management and mitigation measures to minimise impacts on surface and groundwater values (refer Volume D). Key related management and mitigation measures for each Project phase are summarised in Table 14-3 below. The residual risk or impact after implementation of the measures is also outlined.

Table 15-4: Surface and Groundwater Impacts - Avoidance, Management and Mitigation Measures and Residual Risk

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
Construction			
Localised flooding	► Drainage close to residential areas to be re-routed to appropriate existing drainage infrastructure and / or natural water course that can adequately deal with flows ► Implementation of temporary flood control measures during the construction phase to safeguard from any unpredicted rainfall events ► Flood mapping to be completed to assist with the production of inundation maps for localised area and consequently used for urban planning	Negative	**Minor Impact** A moderate risk of localised flooding is expected as the area of the project corridor is highly vulnerable to irregular flooding. The Project's impact on increasing flood risk in the vicinity of the Project area will be minor with the appropriate water management systems.
Water pollution from construction zones (excluding erosion and sedimentation)	► Vehicle refuelling and maintenance should be conducted in designated areas with appropriate bunding and containment, any contaminated soils removed and disposed of appropriately at the end of construction ► Implementation of regularly updated monitoring systems for major domestic point sources downstream for wells/springs and associated wetlands ► Wastewater treatment prior to discharge ► Appropriate storage and handling of bitumen and asphalt according to procedures (bunding etc.) ► Paving in dry weather to prevent runoff of asphalt or cement materials ► Water quality monitoring	Negative	**Low Risk** A low risk of water contamination from runoff from construction areas and spills of chemicals such as fuels will remain.
Disturbance and erosion of soils	► Development and implementation of comprehensive erosion and sediment measures for each construction zone, including construction of drainage controls and sedimentation ponds, deployment and	Negative	Minor to Moderate Short-term minor to moderate impacts on downstream water quality from erosion and sedimentation from construction sites is expected with the use of specifically designed sediment control

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
	maintenance of sediment control devices such as silt fences and jute netting ► During the placements of culverts and bridges, scouring will be done with the use of gabions, stone pitching as well as lining banks with concrete ► Implement sediment control mechanisms such as mulching and silt traps around construction areas as well as trenches to control excessive flooding		measures for each section of the project corridor. The magnitude of this impact will be dependent of the diligence of implementation of the associated mitigation measures, and local weather conditions during construction.
Flow alteration	► Ensure adequate drainage measures are implemented to approximate natural flow including temporary construction access roads and especially for sections of the road crossing wetlands (box culverts or viaducts recommended) ► Ensure temporary construction access roads that are no longer required are removed in a timely manner ► Phased-construction in flow sensitive areas such as wetlands to minimise flow disturbance ► Plan construction over flow sensitive areas during low flow to minimise flow disturbance	Negative to neutral	Minor to Moderate Short-term minor to moderate impacts on water flow regimes from construction sites is expected with the use of specifically designed drainage infrastructure for each section of the project corridor. The magnitude of this impact will be dependent of the diligence of implementation of the associated mitigation measures, and local weather conditions during construction.
Operations			
Roadway flooding	► Stormwater drainage and channels will need to be adequately designed to be able to adequately control flow on a regular basis. This is particularly relevant for urban catchments which, modelling suggests, exhibit a 'peaky' response due to the high levels of impermeable surfaces. New drainage infrastructure should be integrated with existing drainage where possible. ► Stormwater drainage and channels will need to be regularly cleared of rubbish and other debris ► Construction of overflow drainage systems to adequately deal with irregular high rainfall events	Negative	**Minor Impact** A moderate risk of localised flooding is expected as the area of the project corridor is highly vulnerable to irregular flooding. The Project's impact on increasing flood risk in the vicinity of the Project area will be minor with the appropriate water management systems.
Water pollution from vehicles attributed contaminants	► Construction of a verge and drainage channel or other appropriate containment structure (e.g. viaduct wall) along the length of the KJE Phase 1 to contain pollutants ► Construction of vegetated swales on the edges of verges where practical to rapidly attenuate heavy metal and oil/grease pollution ► Effective stormwater treatment systems will remove pollutants a prevent ground recharge ► Where significant oil and grease is expected, using oil/water separators in the treatment activities ► Implementation of regularly updated monitoring systems for major domestic point sources downstream for wells/springs and associated wetlands	Negative	Minor Road- and vehicle-derived pollutants are expected to result in Minor impacts on downstream areas with the provision of appropriate drainage containment structures and swales to contain and attenuate pollutants.
Water pollution from ROW maintenance	► Ensure appropriate herbicide use for ROW maintenance	Negative	Minor

Risk / Impact	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
	► Training of personnel to apply herbicides ► Compliance with international restrictions on pesticide use		Minor residual impact to downstream water sources expected due to unavoidable contaminated runoff
Increased runoff generation and erosion potential	► Construction of a verge and drainage channel or other appropriate containment structure (e.g. viaduct wall) along the length of the KJE Phase 1 with appropriate design elements to lower flow energy while avoiding flooding ► Construction of vegetated swales where practical to attenuate flow velocities and minimise erosion; ► Construction of stormwater containment channels and ponds to lower flow energy at exit points with constructed spillways ► Embankments, trenches and outfalls will be strengthened ► Limited areas of fill and drainage culverts will limit potential increased recharge effects	Negative	Minor Minor residual impacts of increased runoff generation are expected due to the sealed road surface, with the implementation of appropriate flow energy controls and sediment containment structures.
Leaching contamination	► Geochemical reactivity of road base and construction materials tested and reactive soils treated before use. ► Limit areas of fill and for and use of clean fill, replacement of in-situ soils to recreate pre-excavation conditions ► Implementation of regularly updated monitoring systems for major domestic point sources downstream for wells/springs and associated wetlands	Negative to Neutral	Negligible to Low Risk A very low risk of residual impacts on surface and groundwater from leaching from the expressway is expected with the implementation of testing of all materials that are used.
Flow alteration	► Ensure that drainage infrastructure is regularly inspected and well maintained (cleared of blockages that may occur)	Negative to neutral	Negligible to Low Risk A low risk of residual impacts on surface and groundwater flow is expected with the implementation, inspection and maintenance of drainage infrastructure.

15.5 Conclusions

The implementation of the KJE Phase 1 expressway will require careful development of drainage control systems. The appropriate technical systems for sedimentation ponds, vegetation swales and other runoff measures need to be adequately designed to deal with the predicted pollution and flow alteration to minimise the risk of impacting downstream water quality and consequentially reducing the risk to the wetland and rivers. Water sources downstream in the form springs, wells and open water affected by KJE Phase 1 need to be protected and monitored to ensure that the people of Kampala and associated districts are not affected short or long term by the expressway.

KJE PPP Project Phase 1 ESIA

CHAPTER 16 Biodiversity and Ecology

16. BIODIVERSITY AND ECOLOGY

Both terrestrial and aquatic biodiversity baseline conditions for the proposed Project are discussed in this chapter; which informed the identification of potential Project impacts on flora and fauna and habitats.

Project impacts will have different degrees of significance on species diversity, terrestrial and aquatic habitats throughout the project cycle i.e. pre-construction, construction and operation phases. Mitigation measures have been proposed to avoid or minimise potential impacts while following the 'mitigation hierarchy' where adverse expected negative Project-related impacts are avoided, minimised, restored as well as offsetting the residual impacts on priority biodiversity habitats and species are offset. Following a mitigation hierarchy will ensure a Net Gain (NG)/No Net Loss (NNL) on biological diversity within the project area.

A biodiversity monitoring and evaluation programme has been developed to guide the implementation of suggested mitigation measures. Diligent application of best practices especially the requirements of *IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources* (IFC PS6, 2012) for managing potential impacts will significantly decrease the potential for residual impacts. Detailed plans for the management and monitoring of potential biodiversity impacts of the Project are presented in the *Biodiversity Action Plan* (refer to Volume D).

16.1 Study Area

Intensive biodiversity and ecological surveys were conducted within the proposed ROW and the surrounding areas that will potentially be affected by the Project. The Study Area includes the Project Footprint and surrounding terrestrial habitat, aquatic environments such as rivers intersected by the alignment, as well as nearby protected areas.

16.2 Methodology

16.2.1 Literature Review

A review of publicly available studies and data regarding the ecological characteristics of the Study Area was undertaken with an aim of gathering additional information on terrestrial and aquatic habitats, species diversity and ecological communities in the Study Area. This guided the identification of priority species and biodiversity "hotspots" within the Project area.

Priority species are defined in accordance with IFC Performance Standard 6 criteria and include species that are internationally threatened or endemic species, migratory species, congregatory species and/or species of key evolutionary significance (IFC, 2012). This includes those species listed on the National Red List for Uganda (WCS, 2016), as well as International Union for Conservation of Nature (IUCN) Red List of threatened species.

Key literature sources included:

- Government of Ugandan fauna and flora legislation and policies and local development plans;
- National Red List for Uganda for the following Taxa: Mammals, Birds, Reptiles, Amphibians, Butterflies, Dragonflies and Vascular Plants (WCS, 2016).
- Previous flora and fauna studies conducted in the Study Area and region by universities, research centres, NGOs and international organisations; and
- Relevant WB/IFC guidelines and performance standards.

A database search was also conducted of the Integrated Biodiversity Assessment Tool (IBAT) (http://www.ibatforbusiness.org). This database provides Protected Area and Key Biodiversity Area information. The core datasets integrated via IBAT currently include:

- World Database of Protected Areas (WDPA): a joint venture of UNEP and IUCN, produced by UNEP-WCMC and the IUCN World Commission on Protected Areas (IUCN-WCPA) working with governments and collaborating NGOs. The WDPA is compiled from multiple local and national sources and is the most comprehensive global dataset on marine and terrestrial protected areas available;
- Key Biodiversity Areas (KBAs): KBA status is triggered by the presence of key biodiversity criteria, informed by the IUCN Red List of Threatened Species. KBA mapping builds upon the work of a number of existing partnership-supported initiatives - such as BirdLife International's Important Bird Areas, PlantLife International's Important Plant Areas and sites identified by the Alliance for Zero Extinction;
- Alliance for Zero Extinction (AZE): AZE sites are the last refuges for some of the highest threatened species on the planet. AZE sites are discrete areas that contain 95% of the known global population of an Endangered (EN) or Critically Endangered (CR) species or 95% of one life history segment (e.g. breeding or wintering) of an EN or CR species;
- IUCN Red List of Threatened Species: The IUCN Red List of Threatened Species™ (2014) is widely recognised as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. This is based on a scientifically rigorous approach to determine risks of extinction that is applicable to all species, and has become a world standard (refer Appendix 1); and
- Broad-scale conservation priorities, including Biodiversity Hotspots, Endemic Bird Areas and High Biodiversity Wilderness Areas.

This review of the literature informed all aspects of this terrestrial biodiversity and habitats baseline study.

16.2.2 Satellite Imagery and Remote Vegetation Interpretation, and Habitat Mapping

Habitat mapping was conducted in 2017 using visual interpretation of the satellite imagery and was supplemented by existing baseline data and GPS ground-truthing conducted in 2017. The GIS mapping of land use and habitats was conducted manually based on Satellite Imagery from Digital Globe, January and February 2017 and February 2018. The habitat types mapped and descriptions are presented in Table 16-1. Habitat types that were mapped within the ROW were closed forest, open forest/woodland, wetlands and water. These vegetation types are described in detail in Section 16.3.1. Refer chapter 7 for further details on the land use / habitat mapping process.

Habitats were then categorised into as either Natural or Modified based on IFC Performance Standard 6 criteria (IFC, 2012) which categorises the extent of anthropogenic modification (i.e. habitat loss and degradation) of the ecosystem as follows:

- *'Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition'; and*
- *'Modified habitats are defined by IFC as areas of land that support a large proportion of flora and or fauna species that are non-native in origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition'.*

Table 16-1: Habitat types mapping classifications

Habitat Type	Description
Natural Habitats	
Closed forest	Includes Albizia-Milicia forest that is moderately / highly degraded, >90% canopy cover and more than 1 ha forest patch.
Open forest / woodland	Includes Albizia-Milicia forest with >50% canopy cover. Forest that is highly degraded. Characterised by small tree sizes, the presence of *Dicrostachys cinarea*, the invasive paper mulberry (*Brousonetia papyrifera*), and thorny shrubs i.e. *Capparis erythrocarpos*, *Toddalia asiaticaformed* dense tangles with immature trees i.e. *Celtis Africana*, *Celtis zenkeri, Albizia grandibracteata, Diospyros abyssinica, Sapium ellipticum* and *Milicia*.
Scrub	50% cover of shrubs; Deciduous or evergreen trees and bushes may occur widely spaced, or sometimes form small clumps.
Wetland / swamp	Includes Papyrus swamp which occurs in permanently water logged wetlands dominated by *Cyperus papyrus* in association with *Cissampelos micronata*, *Leersia hexandra*, *Polygonum salicifolium* and *Ipomoea* spp.
Water	Standing water, streams and rivers
Modified Habitats	
Fallow land	Fallow land refers to the stage of crop rotation in which the land is deliberately not used to raise a crop.
Agro-pastoral land	This includes agricultural land and grazing pasture in terrestrial habitats. Arable land that is worked by ploughing, sowing and raising crops / land covered with grass or herbage and suitable for grazing by livestock
Degraded Wetlands	Significantly degraded by anthropogenic activities, e.g. agro-pastoral, historic plantations.
Sugar Cane Plantation	Large-scale sugar cane plantations
Tea Plantation	Plantations of tea
Tree Plantation	Large-scale farm that specialises in cash crops (e.g. eucalyptus)
Cleared land	Bare ground / significant vegetation clearance
Settlements	Urban areas and rural settlements
Industrial Land	Industrial areas such as factories
Road / tracks	Existing roads and tracks

16.2.3 Field Surveys

16.2.3.1 Indigenous Knowledge Surveys

A baseline indigenous knowledge survey was undertaken for the Project to assess the potential for the Project Area to support species of high conservation importance. Members of the different local communities were asked about the presence of medium sized and large mammals in their respective areas to ascertain the potential inheritance of fauna within the ROW and surrounds. Additional local knowledge surveys were also undertaken in 2018 as part of the study of ecosystem services (see Chapter 17).

16.2.3.2 Habitat and Flora

Habitat and flora surveys were undertaken by a botanist (2018; see specialist report in Volume C) during both dry and wet seasons in June and December of 2017 respectively. Habitats that were intensively surveyed included forests (Sezibwa Forest, Namanve Central Forest Reserve and pockets of semi-natural closed habitats); wetlands (e.g. Kasala, Mayanja and Nakivubo wetlands). A habitat/ landscape survey was also undertaken as part of the

baseline assessment where the Zone of Influence (ZOI) was considered up to 500 metres on either side of the proposed road centre-line. A total of 121 sampling points were assessed during both dry and wet seasons following a Transect-Plot sampling technique. The sampling points were established at intervals of 10m from the edge of each plot along transects of varying length (Plate 16-1a) that were established in the selected habitats. Transect routes and sample points were identified prior to the commencement of field work based on a desktop project-area analysis and a review of the available data.

In forests, circular plots of radius 5m were used to inventory saplings, poles and mature woody species while seedlings were inventoried within 1m radius plots that were nested in the 5m radius. In wetlands, circular plots of radius 3m were used (Plate 16-1b) to assess non-woody species (sedges, grass and herbs). However, notable plant species or communities that were encountered in between the sampling points were also recorded.

Opportunistic encounter of plant communities, species of conservation concern and invasive species were also recorded. Photographs, field notes and GPS coordinates were taken at each of the sampling sites. The number of sample points along each transect route was dependent on the presence of highly sensitive habitats (i.e. forests). The presence of plant species and their abundance was estimated using the DAFOR scale (D – Dominant; A – Abundant; F – Frequent; O – Occasional and R – Rare).

The vegetation at each sampling site was described based on the floristic and landscape features observed in the habitat types, the variation in the habitat structure, and species diversity composition. Unidentified species observed during the field work were collected, pressed and allocated unique number for reference; and taken to Makerere University Herbarium (MHU) for taxonomical identification. The conservation status of species was assessed in accordance to the IUCN Red List of Threatened Species (IUCN, 2018); National Red List for Uganda (WCS, January 2016) and National Forestry Authority (NFA) species List.

a) Establishing a transect within Namanve Wetland

b) Species inventory within plots

Plate 16-1: Flora Survey Methods

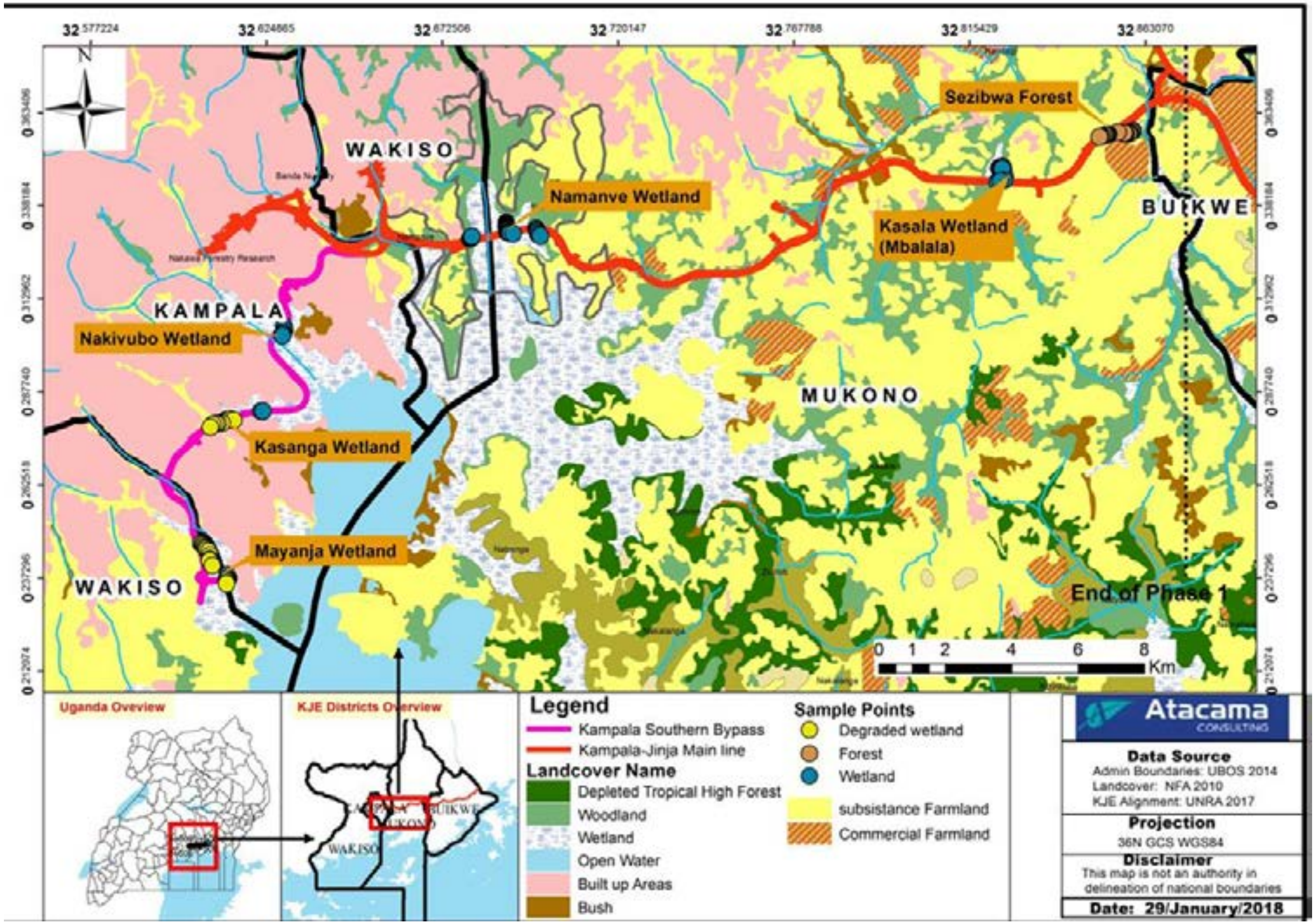


Figure 16-1: Flora Study Survey Points

A habitat survey was also undertaken as part of the baseline assessment of the Kampala Southern Bypass ESIA (ICS, 2013). The Zone of Influence (ZOI) was considered up to 500 metres either side of the proposed road centre-line. Rapid baseline transect surveys were undertaken by URS along three road alignment options of both Phase 1 and Phase 2 of the main KJE alignment between the 12th and 23rd June 2011 (URS, 2015). The three route options selected were those outlined for the original feasibility study. Options 1, 2 and 4 were the three selected at this original phase (see Chapter 4). The survey aimed to characterise habitats and determine the ecological status of habitats and species of flora located in the Project Area and surrounds. Transect routes and sample points were identified prior to the commencement of the field work based on a desktop analysis of the available data. The number of sample points along each transect route was dependent on the presence of highly sensitive habitats (i.e. forests). The presence of plant species and their abundance was estimated using the DAFOR scale (D – Dominant; A – Abundant; F – Frequent; O – Occasional and R – Rare). Unidentified species observed during the field work were collected, allocated unique number for reference and taken to Makerere University Herbarium (MHU) for species identification.

16.2.3.3 Mammals

Mammal surveys were undertaken for the ESIA in December 2017 (2018, see specialist report in Volume C). Survey sites were selected based on a literature review and reconnaissance visit. At each survey site, transects were surveyed to search for both direct and indirect evidence of fauna presence. Interviews were also conducted with local communities, user groups (hunters) and reserve area managers to inform the identification of mammals and threats to the habitats within the project area. A map of fauna survey locations is provided in Figure 16-2. A fauna habitat assessment was also conducted.

Baseline transect fauna surveys were undertaken along and near to three KJE mainline alignment options (for both Phases 1 and 2) by URS in June 2011 (URS, 2015). These alignments were those being investigated at this early stage in Project Design as potential routes for the Expressway (see Chapter 4). Transects were positioned within specific habitats within the ROW (i.e. forest) and within key areas outside of the ROW (e.g. Mabira forest and wetlands). The surveys were limited to the identification of medium and large sized mammals and entailed the collection of direct evidence of fauna activity (e.g. sightings, vocalisations) and indirect evidence (e.g. faeces, prints, local knowledge). Nocturnal mammals were excluded since the survey was conducted during day light hours.

16.2.3.4 Birds

Bird surveys were undertaken during the dry season in June 2017 and during the wet season in December 2017 (see specialist report in Volume C). A combination of Timed Species Counts (TSCs), transect walks, point counts and opportunistic observations were used to survey avian species diversity within the ROW (see Bibby *et al*., 2000 and Voříšek *et al*., 2008). The surveys targeted the Sezibwa Forest, Kasala wetland, agricultural farms, and Namanve Central Forest Reserve (located in the footprint of the mainline alignment) and Mayanja wetland, Kansanga Wetland, Nakivubo wetlands and Kinawataka wetland (located in the footprint of the KSB section of the alignment).

Prior to the commencement of fieldwork, transect routes (approximately 500 m in length) were established in within the main vegetation types in each targeted habitat type. The ornithologists walked along each transect route and searched for the presence of birds. Birds were recorded at any distance as long as they were in or above the habitat being sampled. Counts were made at various times of day. Whenever possible, counts at each survey site were made at different times, to account for different activity patterns. Species were identified through visual observations and the identification of bird vocalisations. The ornithological survey team were equipped with high powered binoculars to aid identification. The bird surveys were also supplemented with opportunistic observations. Birds that were recorded during the survey were categorised according to the criteria presented in Table 16-2. The conservation status of each species was then assessed in accordance with the IUCN Red List of Threatened Species (IUCN, 2018) and National Red List for Uganda (WCS, January 2016).

A specific study of Hooded Vultures (*Necrosyrtes monachus)* was also prepared for the ESIA (see report in Volume C). This study documents the findings of a monitoring program conducted from January 2016 to February 2018 under Kampala Hooded Vulture monitoring scheme. Monitoring was conducted at six sites around Kampala where the species is known to feed, which are abattoirs and landfill sites.

Table 16-2 Bird categories based on habitat preferences (Carswell et al, 2005)

Main Category	Sub-category with Codes		Descriptions
Forest birds	FF	Forest specialists	Forest interior birds
	F	Forest generalists	Normally breed in the forest or fragments but may occur outside the forest
	f	Forest visitors	Non-forest birds
Aerial	AA	Aerial feeders	Species feeding on the wing
Water birds	W	Water specialist	Restricted to wetlands or open water
	w	Water generalist	Often found near water
Grassland	G	Grassland specialist	Characteristic of open grasslands
	g	Grassland generalist	May be found in grassland habitats but also able to utilise woodland and forested habitats.
Migrants	A	Afrotropical	Species migrating within Africa
	P	Palaearctic	Species breeding in Europe or Asia
	Ap	Afro-Palaearctic	Species with both Palaearctic and Afrotropical populations

Rapid transect bird surveys and timed point counts were also undertaken along three KJE mainline alignment options (Phases 1 and 2) and surrounds by URS in June 2011(URS, 2015). Transects were positioned in sensitive ecosystems / areas where along the proposed alignments, including the Sezibwa River.

16.2.3.5 Herpetofauna

Herpetofauna (reptiles and amphibians) was surveyed in December 2017 using mainly Visual Encounter Surveys (VES) within 500 m around pre-geo-referenced points, and dip-netting methods within water logged swamps (see specialist report in Volume C). Five representative sites of the remaining extensive wetland were intensively surveyed for herpetofauna along the route alignment.

As described in Table 16-3 and illustrated in Figure 16-3, the surveyed sites were; Namanve Wetland, Kasaala Wetland (Mbalala/wankoba), Sezibwa Forest (Lukonge), Mayanja Wetland (Munyonyo) and Kasanga Wetland (Bukasa-Muyenga).

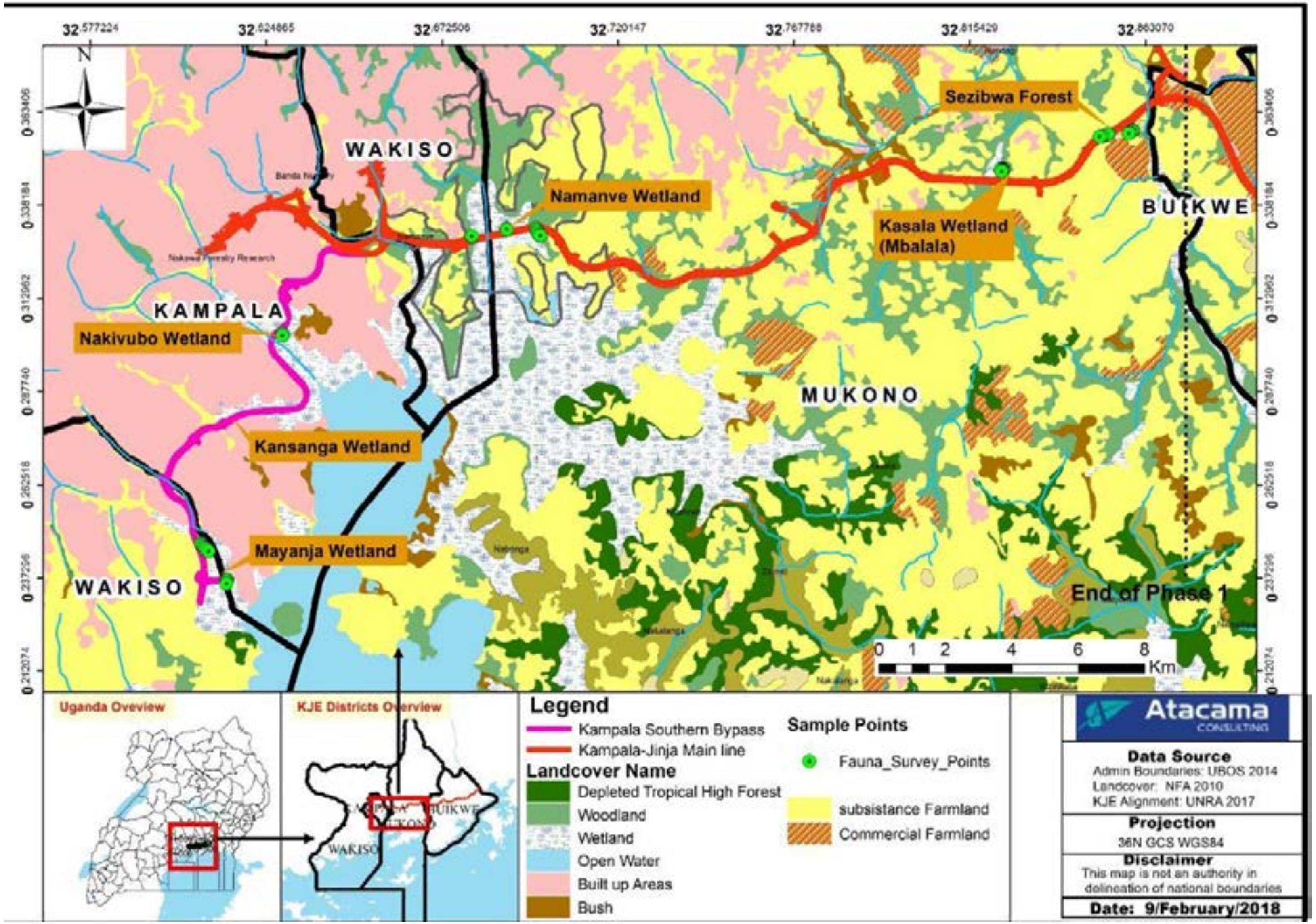


Figure 16-2: Fauna Study Survey Points

Table 16-3 Sites Surveyed for Herpetofauna Study.

Date	Site	Easting	Northing	Altitude (masl)	Habitat description
21-Dec-17	Namanve Wetland	465717	36836	1140-1141	Extensive wetlands, dominated by Papyrus, with heavy urban disturbance
22-Dec-17	Kasaala (Mbalala/Wankobya) Wetland	480499	38635	1112-1115	Permanent Wetland
22-Dec-17	Sezibwa Forest (Lukonge)	480499	38635	1154-1170	Fragmented forest surrounded by agricultural landscape, with river in valley
23-Dec-17	Mayanja (Kabili-Kabwuma-Munyonyo) Wetland	456552	26034	1132-1142	Highly degraded wetland, dominated by Papyrus, with brick making and rice growing activities in some places
23-Dec-17	Kansanga (Bukasa-Muyenga) wetland	457866	31200	1137-1142	Degraded permanent wetland with rice growing in some place

Plate 16.2 Sampling using dip net for aquatic herpetofauna

A herpetofauna survey was also undertaken by URS within the footprint and surrounding area of the Phase 1 KJE mainline alignment between the 12th and 23rd June 2011 (URS, 2015). Eight survey sites were positioned near to the KJE Phase 1 alignment and focused on habitat with likely occurrence for herpetofauna (Figure 16-3).

Time constrained count searches (see Bury and Corn, 1991 and Heyer *et al*.,1994) were undertaken to obtain semi-quantitative data on amphibians. This method generated encounter rates of each species per sample site / habitat type. Surveys were undertaken during the day and night. Opportunistic observations and frog calls were also recorded.

Reptiles were identified using (Schiøtz, 1975, 1999; Stewart, 1967) while amphibians were identified using Channing and Howell (2006) and information was collected on relative species abundance, distribution and richness.

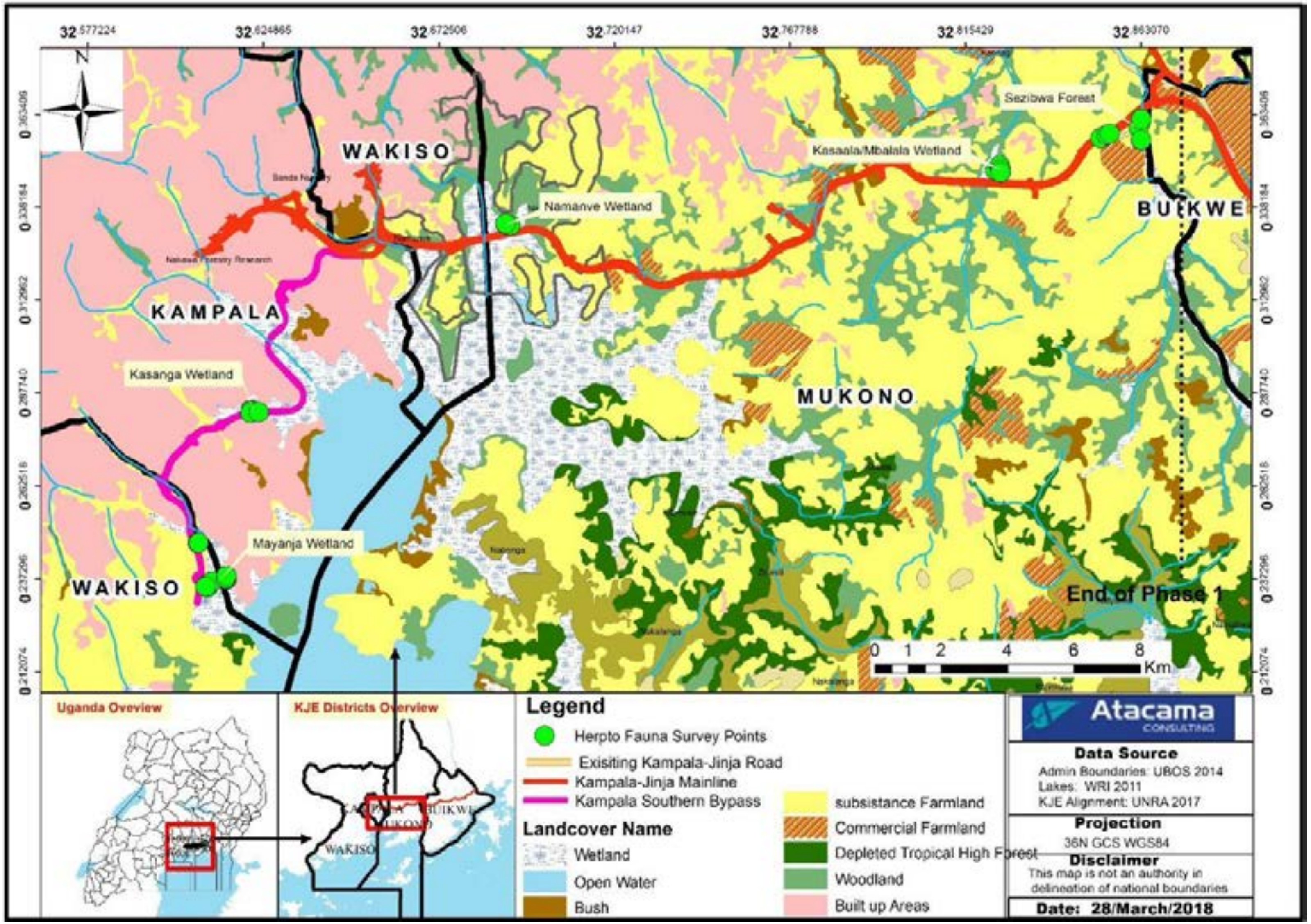


Figure 16-3: Herpetofauna Study Survey Points

Table 16-4 Herpetofauna survey sites along the Phase 1 KJE Mainline (URS, 2015)

Name	Site Number	X	Y
Kasaala stream at culvert	Amph-16	482185	44183
Sezibwa River	Amph-17	483344	43118
Kasaala Stream	Amph-18	480593	40499
Mwola Stream at culvert area	Amph-19	475344	38407
Kazi stream	Amph-20	474263	37359
Kayobe swamp 1	Amph-21	468059	35341
Kayobe swamp 2	Amph-22	464391	36219
Kinawataka Wankolokolo	Amph-23	462091	36616

16.2.3.6 Fish and Other Aquatic Fauna

Fish surveys were undertaken for the ESIA during the dry season in June 2017 and during the wet season in December 2017 (wet season specialist report provided in Volume C). Methods employed included a literature review, consultations with local fishermen, and project site visits for direct observations, photography and fish sampling. For each aquatic habitat, one to two sampling points were investigated. Investigation points were selected within 300 m of the proposed Project ROW. Habitat quality was assessed by observation, supported by photographs and geo-referencing of points within the habitats.

For fish sampling, gillnets and baited (with dried fish and breed) minnow traps were set in aquatic habitats within the Project area. Two gill nets (of 3- and 4-inch mesh size) were set along the Sezibwa River, parallel to the river flow, fastened onto vegetation and left overnight while gillnets were used in Mayanja wetland and Sezibwa River, where water depth was >0.5m. Two baited minnow traps were set in vegetated shallow shorelines and wetlands, fastened onto vegetation and left overnight.

Trapped fish species were identified using illustrations and descriptions from FishBase. The conservation status of recorded fish species was assessed using FishBase and IUCN (2018). To obtain further information about the fish species that were caught, interviews with local fishermen were held.

a) **Setting the minnow traps in Mayanja wetland**

b) **Setting the gill nets along Sezibwa River**

Plate 16-3: Examples of the methods used to survey fish

In addition, an assessment of fish populations within the area of the KJE mainline alignment options (Phases 1) was conducted by URS in June 2011 (URS, 2015). The assessment aimed to identify and document the diversity of fish species and their distribution in aquatic habitats within the Project Area as well as the global and national conservation status of the identified fish species.

Data was collected through interviews with the local communities living adjacent to those wetlands along the project area e.g. the fishery, species presence, fish abundance, fishing activities undertaken by respondents and equipment. Observations were also made by surveyors regarding water characteristics and the surrounding plant cover. Sampling was undertaken at eight sites located near to Phase 1 of the expressway (Table 16-5).

Table 16-5: Fish sampling sites (URS, 2015)

Sampling points	Site Name	Latitudes (36 N)	Longitudes	Chainage and Distance from Current Alignment
Nakalasa / Wabuyimba / Jugula stream at road crossing	KJE-Aqua14	484825	44128	3km N of KJE Chainage 33 + 000
Sezibwa River	KJE-Aqua15	483344	43116	3km N of KJE Chainage 31 + 500
Kasala stream	KJE-Aqua16	480989	40516	2km N of KJE Chainage 30 + 500
Mwola stream	KJE-Aqua17	475330	38413	0.4km NW of KJE Chainage 22 + 500
Kazzi stream	KJE-Aqua18	474217	37277	0.8km W of KJE Chainage 21 + 500
Kayobe 1	KJE-Aqua19	467186	35410	0.4km SW of KJE Chainage 12 + 500
Kayobe 2	KJE-Aqua20	467907	35377	0.2km SE of KJE Chainage 13 + 200
Kayobe swamp 3	KJE-Aqua21	464392	36300	0.05km S of KJE Chainage 9 + 200

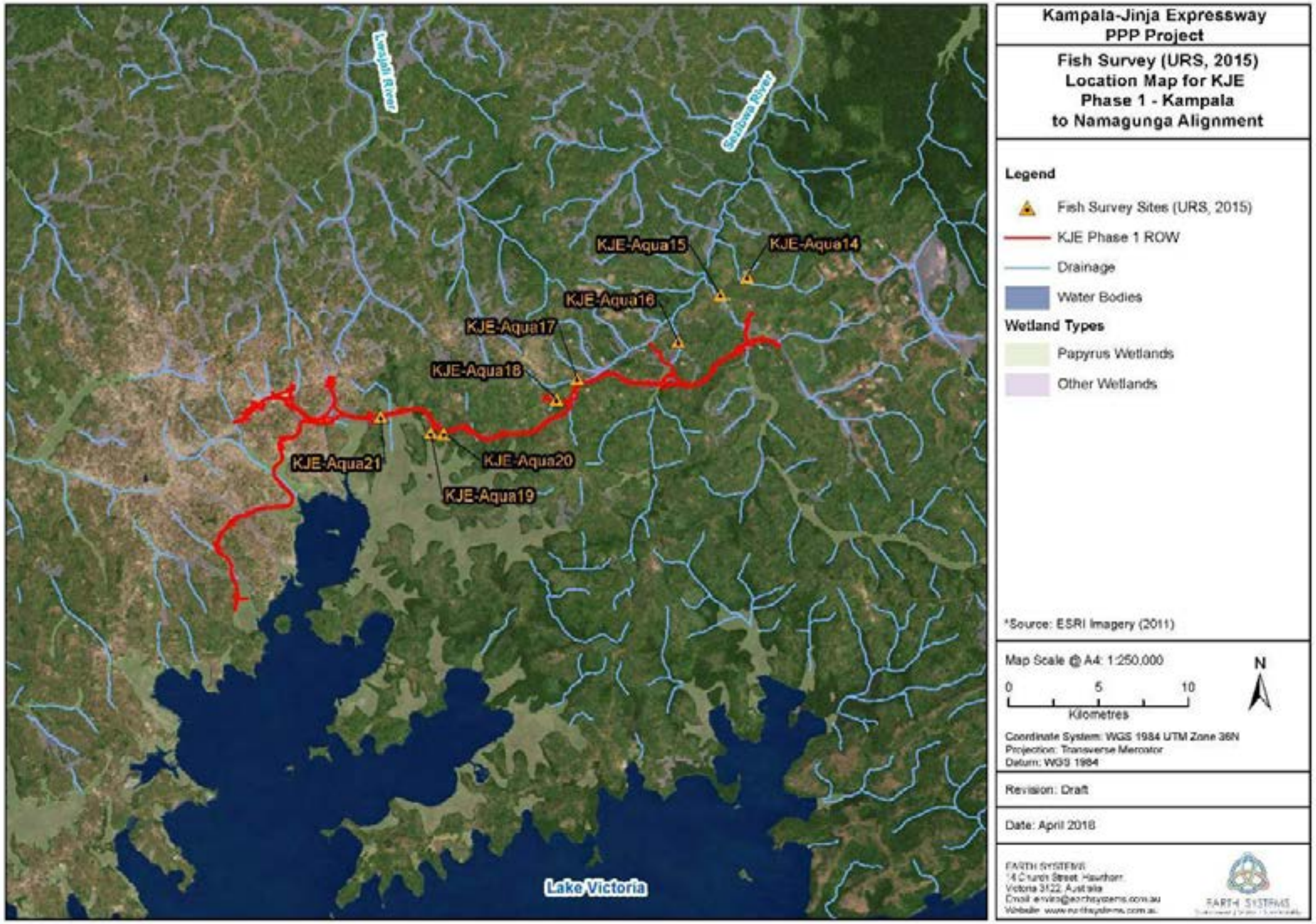


Figure 16-4: Fish Survey Points from URS (2015) Study

16.3 Baseline Conditions

16.3.1 Habitats and Flora

16.3.1.1 Habitat Description

The ROW for the Project is dominated by modified habitats (accounting for 73.6% of land cover), relative to natural habitats (26.4% of land cover), which is a reflection of significant human activity in the vicinity of the Project (Figure 16-5). Detailed maps of land use / habitat coverage and distribution are presented in Chapter 7. The main modified habitats types present within the ROW are settlement areas, agro-pastoral land and industrial land (Table 16-15). These are described below:

- **Settlements:** A significant proportion of the ROW lies within Kampala, a densely populated city with an estimated population of approximately 1.5 million as of 2014 (UBOS, 2014). Kampala is the dominant urban centre for Uganda, with 80% of the country's service and industrial sector companies operating there (IFPRI 2011). However, a large proportion of dwellings within and surrounding the ROW are considered to be part of widespread informal settlements, where sprawling, temporary structures are common. Kampala city is devoid of natural habitats, however small fragments of modified habitats (i.e. vegetation, along road verges, parks, gardens, waste land, and culverted watercourses) provide refuge for wildlife. In total, 20.2% of the ROW is settlement land.
- **Agro-pastoral:** The second most dominant modified habitat types within the ROW are agro-pastoral and fallow land which are generally located near settlements and account for approximately 26.3% of land cover within the ROW. Common species of annual and perennial crops located within the Project Area includes *Saccharum officinarum*, *Zea mays*, *Manihot esculenta*, *Eucalyptus spp*, *Maesopsis eminii, Musa spp*., *Ipomoea batatas,* and *Brassica oleracea*.
- **Industrial land:** 5.2% of land located within the ROW was classified as industrial land. Industrial land uses in Kampala include factories, retail structures and car dealerships. For example, between KJE Chainage 0 + 000 and the Butabika Interchange many businesses are impacted by the ROW including Total petrol station, Spear Motors, Cooper Motors and Yuasa car bond. This industrial land may still retain some value for biodiversity within the city. For example marabou storks and black kites are common occurrences in industrial areas within Kampala.

Four principal natural terrestrial habitats occur within the ROW and surrounding area, namely: forest habitats (i.e. closed forest and open forest/woodland), scrubland and wetlands (including degraded wetland) (Table 16-15 and Figure 16-5).

All terrestrial habitat types within the ROW are common in nature and are unlikely to qualify as 'highly threatened and/or unique ecosystems' or 'areas associated with key evolutionary processes' in accordance with IFC criteria for Critical Habitat (IFC, 2012). However, wetlands are of conservation importance at the local and regional level and are therefore considered to be priority habitat types for the Project. The floristic composition of each of these habitat types are discussed in more detail below:

- **Forest habitats:** Only 3.4% of the entire ROW comprises forested habitat (i.e. closed forest and open forest/woodland) and is only present within the footprint of the Kampala-Jinja Mainline Expressway (Plate 16-2). A high proportion of forest stands (76% of all forest) located in the ROW are degraded by anthropogenic activities. These degraded stands are characterised by small sized trees, an open canopy (>50% canopy cover) and an understory of thorny shrubs (i.e. *Capparis erythrocarpos* and *Toddalia asiaticaformed*). The encroachment of Paper mulberry (*Broussonetia papyrifera*), a noxious weed, has reduced the floristic composition of the native forest understory. The dominant forest type within the

project area is Albizia-Milicia which is characterised by key indicator species, namely: *Celtis Africana, Celtis zenkeri, Albizia grandibracteata, Diospyros abyssinica, Sapium ellipticum* and *Milicia* sp.

- **Scrub:** 4.5% of the ROW comprised scrubland which covers approximately 26.4 ha of the ROW. Scrub is characterised by a mosaic of deciduous or evergreen trees, herbaceous shrubs and woody shrubs that are less than 5 m in height. Scrub is often an intermediate habitat between herbaceous vegetation (i.e. grassland) and forest habitat and often develops in response vegetation clearance activities. The majority of scrub is located in rural environments some distance from Kampala.
- **Grassland:** Small area of grassland were observed in areas adjacent to the ROW and consist of *Echinochloa* grassland, which commonly occurs in seasonally flooded area (i.e. on the edges of wetlands). This type of grassland is dominated by *Echinochloa pyramidalis*, interspersed with *Cyperus dives, Cyperus latifolius* and *Leersia hexandri*a subdominant with a continuous herbaceous cover.
- **Aquatic Habitats:** The KJE mainline alignment intersects the Sezibwa River and the KSB crosses the Nakivubo River (Figure 16-6). Other smaller seasonal streams are also passed by the alignments.
- **Wetlands:** Located in the Lake Victoria Basin, wetlands are transitional ecosystems between land and water and are generally characterized by high diversity of flora and fauna including waterfowl (see Section 16.3.3). Approximately 17.9% of land located within the ROW is classified as wetland. Of this approximately two thirds of the wetlands within the ROW, particularly those wetlands located within the ROW of the Kampala Southern Bypass (i.e. Mayanja, Kansanga and Nakivubo wetlands), are significantly degraded by anthropogenic activities (Figure 16-6).

  Relatively higher quality wetlands are only present within the footprint of the KJE mainline (i.e. the Namanve wetland (Plate 16-1) and Kasala wetland; see Figure 16-6). These wetlands are characterised by three naturally occurring transitional zones (Wakwabi, Balirwa and Ntiba, 2006) as follows:

  - **Palm Zone** – characterised by an abundance of *Phoenix reclinata, Raphia monbuttorum* and *Mitragyna stipulos.*
  - **Miscanthidium Zone** – Indicator species include *Sphagnum spp*. *Dissotis brazzei, Leersia hexandria* and *Miscanthidium Violaceum.*
  - **Intermediate Papyrus Zone** - dominated by Papyrus (*Cyperus papyrus*), *Miscanthus* sp. Interspersed with dense stands of *Phragmites* sp., *Typha* sp., *Echinochloa sp*. and *Afromomum* sp.

Plate 16-4: Namanve Wetland

Plate 16-5: Sezibwa Forest

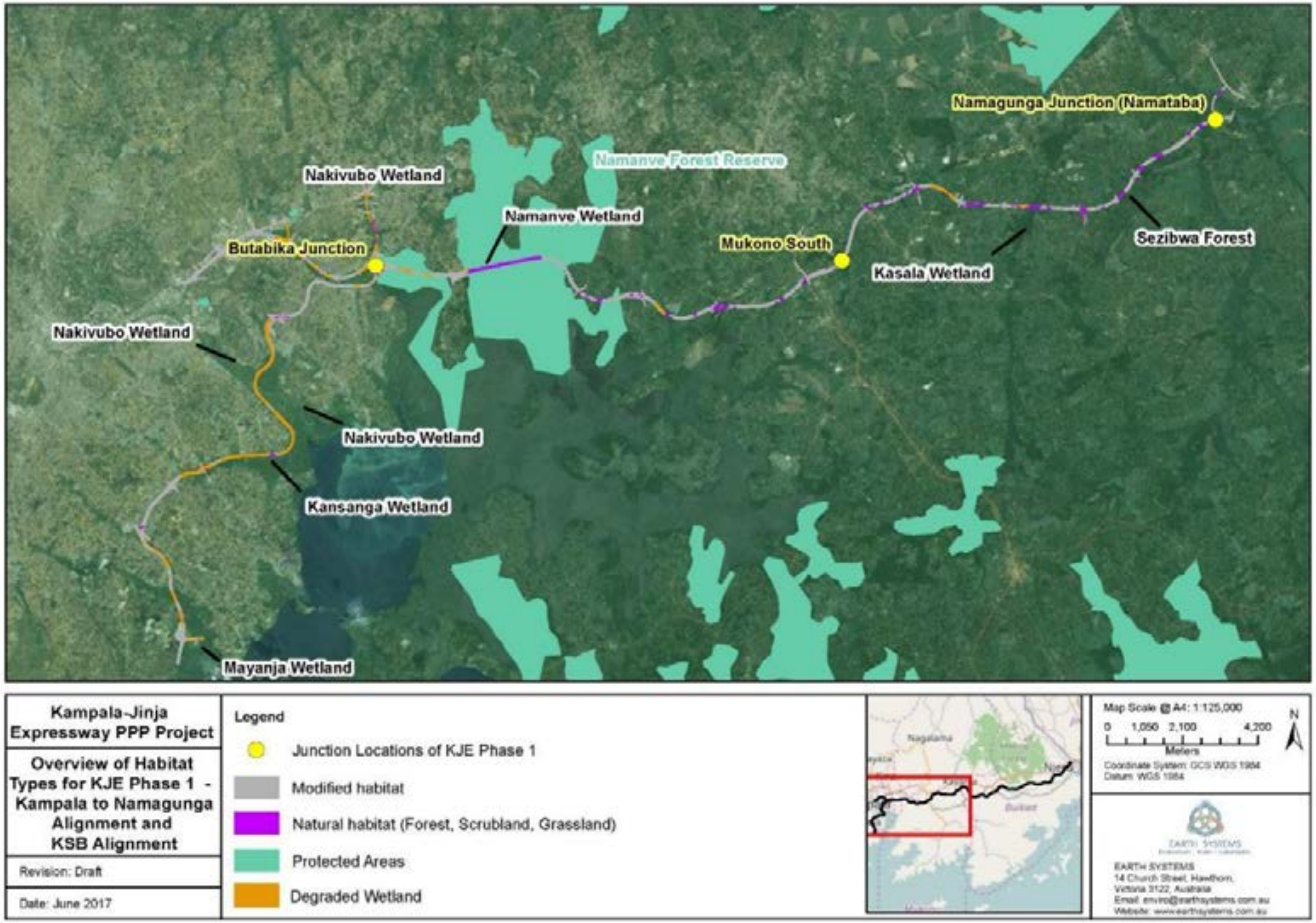


Figure 16-5: The presence of modified and natural habitats in the ROW

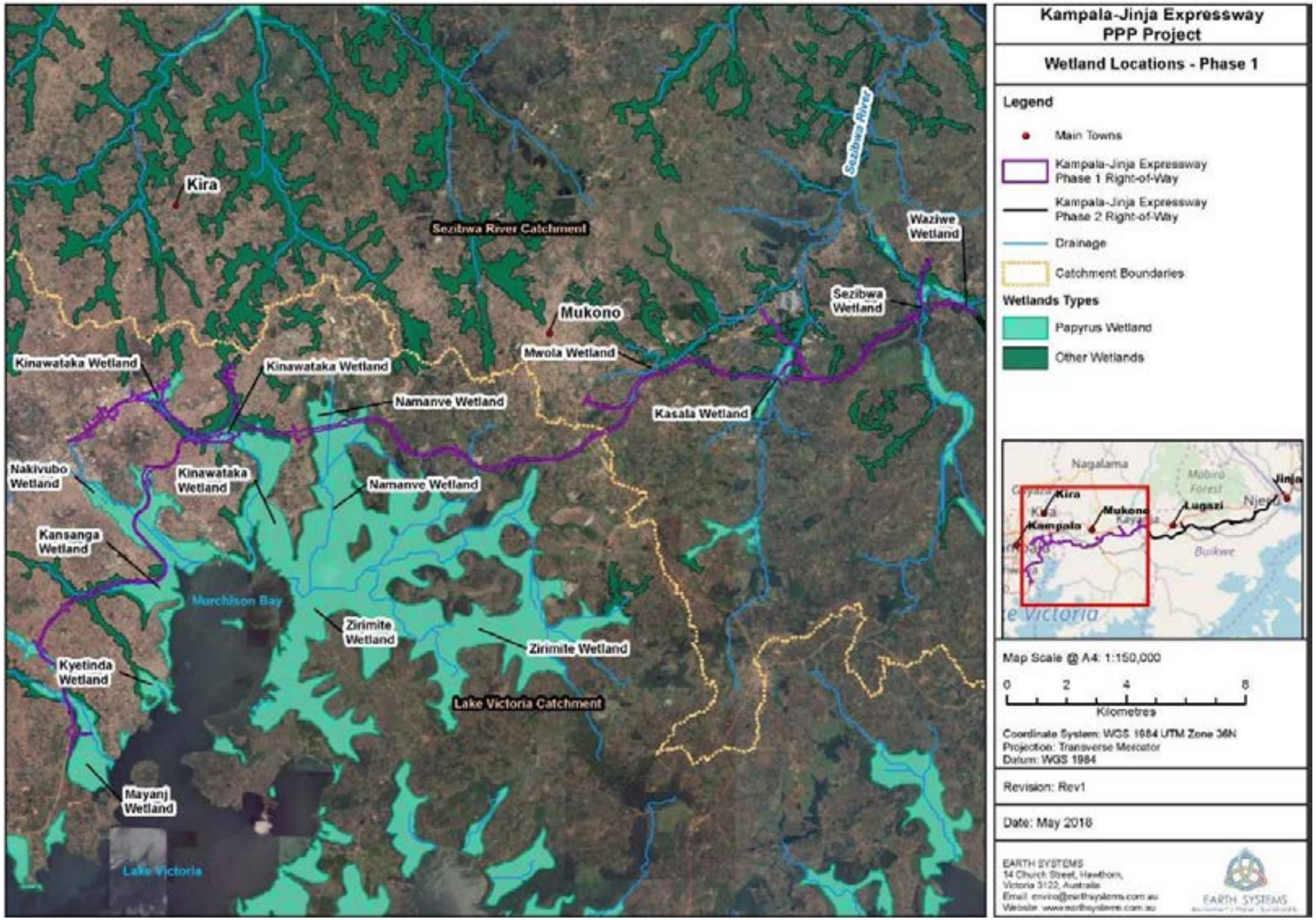


Figure 16-6: Wetland and aquatic habitats located in proximity to the ROW

16.3.1.2 Habitat Distribution and Condition

Habitat conditions vary throughout the ROW. Baseline surveys and assessments, including satellite imagery analysis clearly shows that large areas of natural habitat within the project area and surrounds are significantly impacted by anthropogenic activities that have resulted in habitat degradation, loss and fragmentation. This is likely to have increased the pressure on existing natural resources and protected areas in the vicinity of the Project in the last 10 years. These anthropogenic activities include habitat clearance for agro-pastoral activities, the development and expansion of settlements and industries, the establishment and upgrade of transport infrastructure and habitat degradation arising from the over-exploitation of natural resources. Plates 16-3 to 16-5 clearly show the encroachment of Kampala city from 1985 to 2017 into surrounding rural land and the subsequent loss of habitats. Habitat distribution and condition within key sections of the ROW are discussed below:

Kampala Southern Bypass: Butabika Interchange to Munyonyo

The section of the Kampala Southern Bypass from Munyonyo to Butabika Interchange predominately intersects modified habitats associated with the urban sprawl of Kampala. Very little natural habitat is located within or in close proximity to the proposed road alignment. The main natural habitat types located within and or close to the Kampala Southern Bypass are the Mayanja, Kansanga and Nakivubo wetlands (Figure 16-5 and Figure 16-6). A significant portion of these habitats have been degraded by anthropogenic activities as follows:

Manyanja Wetland

Manyanja Wetland is located in Makindye to the south-east of Kampala city centre on the fringes of Lake Victoria. In total, 22 plant species were identified as inhabiting this wetland in 2017. Dominant species include *Cyperus dives, Cyperus papyrus, Leersia hexandria* and *Enhydra fluctuans.* Unregulated harvesting of *Cyperus papyrus*, the extraction of clay for brick manufacturing, subsistence cultivation and the encroachment of settlements - has resulted in habitat degradation and habitat loss on the fringes of this wetland (ICS, 2015). The Kampala-Entebbe Expressway project crosses part of this wetland and an infestation of water hyacinth (an exotic invasive species) was recorded near Entebbe expressway during the 2017 baseline surveys.

Kansanga Wetland

Kansanga Wetland is situated in Makindye Division, to the south-east of Kampala, a valley between Makindye, Nsambya, Bunga and Tank Hills. It is part of the extensive natural wetlands fringing the northern shores of Lake Victoria. This wetland is ephemeral in nature further upstream from Lake Victoria. Approximately 70% of this wetland has been modified by cultivation, hunting, the harvesting of papyrus and palms and the extraction of sand material. The north-east fringes of the wetland, located in close proximity to Lake Victoria, are of relatively higher biodiversity value and are dominated by *Cyperus papyrus* vegetation. Land adjoining the Kansanga Wetland is dominated by settlements and subsistence cultivation (ICS, 2015).

Nakivubo Wetland

Nakivubo Wetland forms the boundary between Nakawa and Makindye Divisions in the valley between Bugolobi, Mpanga and Muyenga hills. This wetland spans the central industrial district of Kampala, passing through dense residential and industrial settlements before entering Lake Victoria at Murchison Bay. The Nakivubo Wetland is one of the major wetlands on the north-western shores of Lake Victoria. A total 52 plant species were recorded from this area during the baseline surveys in 2017. Dominant wetland plants included: *Aerva lanata*, *Coix lacryma, Cyperus papyrus*, *Leersia hexandra* and *Echnochloa pyramidalis*.

The less waterlogged fringes of the wetland have been modified by the cultivation of yams and sugar cane, especially around Namuwongo and Bugolobi (ICS, 2015). Approximately 20% of Nakivubo wetland is under cultivation. Other areas of the wetland have been degraded by the encroachment of the exotic invasive species water hyacinth and unregulated clay extraction for brick manufacturing.

The Nakivubo River and its tributaries, which flow into the wetland, provide the main drainage channel for Kampala. They carry wastewater from the city centre, industrial areas and residential zones. Up to 90% of Kampala's residents are not connected to a piped sewerage supply and so these wastes are largely organic. Together they are equivalent to the raw sewage produced by almost half a million people – or 40% of the population of Kampala (COWI/VKI, 1998). The outflow for Kampala's sewage treatment works at Bugolobi also runs into the wetland. Drainage channels were notably polluted with plastic and other waste during baseline surveys undertaken in 2017 and the continued inundation of this wetland by pollution is thought to be negatively affecting the health of this ecosystem and the provision of associated ecosystem services.

More than 100,000 people live on the fringes of the wetland, including both high cost housing estates and low-cost, high-density settlements and slums. To the north of the wetland is where Kampala's main industrial area is situated. The continued expansion of settlements poses a significant threat to the integrity of this wetland (ICS, 2015).

Kampala-Jinja Mainline Expressway: Butabika Interchange (J5) to Mukono

Habitat composition within the section of the Kampala-Jinja Mainline Expressway footprint generally grades from modified urban environments associated with the city of Kampala at the Butabika Interchange (J5) to relatively rural habitats towards Mukono. The western fringes of the Kampala-Jinja Mainline Expressway at the Butabika Interchange in Kampala intersect the Kinawataka Wetland, which is a highly degraded patch of wetland habitat. The alignment also passes through the Namanve Central Forest Reserve between KJE Chainage 9 + 000 and 11 + 500. This protected area is located approximately 2.9 km east of the Kinawataka Wetland. The urban environments of Kampala (e.g. settlements and roads / tracks) directly border the western boundary of this reserve. As the alignment exits the Namanve Central Forest Reserve, the eastern extent of this alignment section is dominated by a mosaic of agro-pastoral land, fallow land, scattered trees and settlement areas interspersed with smaller areas of scrubland and forest. The habitat condition of natural habitats present within this section of the road alignment is discussed below:

Kinawataka Wetland

Kinawataka Wetland is the second largest wetland located within the Project footprint and appears to be the most degraded wetland passed by the alignment. The Kinawataka wetland is a significant wetland area within Kampala providing ecosystem services that protect Lake Victoria from the catchments of Mutungo, Mbuya, Nakawa, Ntinda, Kyambogo, Banda, Kireka, Bweyogerere, Namboole, Kirinya and Butabika (ICS, 2015; Chapter 16). Similar to the Nakivubo wetland, these catchments are heavily industrialised and densely populated leading to the release of nutrient rich effluents into the wetland. This effluent is a potential pollutant to Lake Victoria if they are allowed to reach the lake. However, unlike Nakivubo, the Kinawataka catchments are not connected to the central sewerage system and there is no evidence of pre-treatment both from industrialists and residential areas. Therefore, the streams of Kinawataka, Mayindo, Kasokoso and Namboole are major carriers of raw sewerage effluents from the catchments.

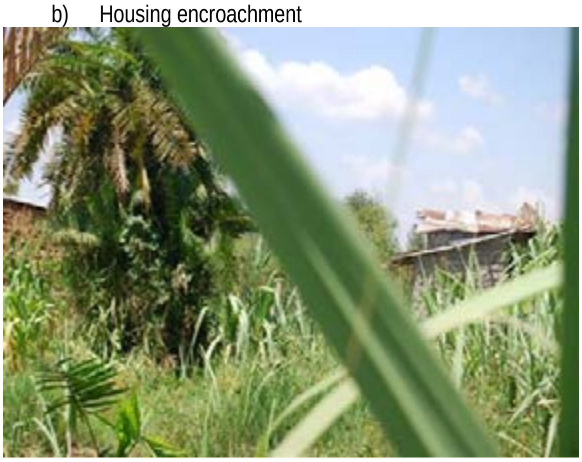
The area of wetland crossed by the Project between KJE Chainage 3 + 000 and 4 + 500 is severely degraded with visible evidence of water pollution, solid waste disposal, land reclamation activities, invasive species (e.g. *Eichhornia crassipes*) and agricultural activity (i.e. sugar cane) within the remaining wetland landscape. Small areas of *Cyperus papyrus* vegetation do still exist but are confined to deeper areas of wetland habitat that have not yet been reclaimed. Less disturbed areas of vegetation closer to Lake Victoria are dominated by *Cyperus papyrus*, with patches of *Phragmites* sp, *Typha* sp, *Echinochloa* sp and *Afromomum* sp.

Namanve Central Forest Reserve (CFR)

Namanve Central Forest Reserve is bisected by the Kampala-Jinja Mainline Expressway which passes through the reserve for approximately 2.5 km. This reserve is a protected area comprising relatively high-quality papyrus wetland with small scattered stands of *Eucalyptus grandis* trees, *Therypteris confluens* and *Miscanthus halocens*. In total, 41 plant species were recorded from this wetland in 2017. Dominant wetland flora species include: *Cyperus papyrus*, *Echnochloa pyramidalis, Leersia hexandra* and other species of Poaceae family. The presence of *Miscanthus halocens*, *Disa* sp and *Eulophia* were also newly identified within this wetland in June 2017. Disturbance arising from unregulated anthropogenic activities pose a significant threat to the integrity of the reserves' papyrus wetland (see Plate 16-6).

a) Brick making at the edges of Namanve wetland

b) Housing encroachment



c) Sugarcane/banana gardens at the edge of the wetland

d) Wetland back filling for roads by the industrial park

Plate 16-6: Examples of various types of habitat degradation in Namanve Wetland

Forest

Patches of closed forest and open forest located within this section of alignment are highly fragmented and small sized (< 3ha). These patches of forest are surrounded by agricultural landscapes and are unlikely to be of high biodiversity value.

Kampala-Jinja Mainline Expressway: Mukono to Namagunga

The section of the proposed Kampala-jinja Mainline Expressway from Mukono to Namagunga Junction predominantly comprises a mosaic of scattered broadleaf trees, agro-pastoral land, fallow land and plantations interspersed with small settlement areas, roads / tracks and a small fragments of natural habitats such as forest (including Sezibwa Forest). Habitat quality is relatively higher than other section of the ROW (i.e. the Kampala Southern Bypass). Wildlife associated with this section of the ROW are predominantly agricultural and forest dwelling species that are tolerant of rural human activities (see Section 16.3.3.1). Key natural habitats located within this section of the ROW as discussed below:

Kasala Wetland

This wetland is permanently waterlogged and is characterised by a relatively uniform community of wetland plants. A total of 41 plant species were recorded from in this wetland during baseline surveys in 2017. Dominant wetland plant species include *Cyperus papyrus*, *Leersia hexandra* and *Echnochloa pyramidalis* interspersed with woody shrubs at the wetland's margins including B*ridelia micrantha, Tabernamontana holstii* and *Triumfetta macrophylla*. The southern margins of the Kasala Wetland have been cleared for agriculture and area of the wetland have been degraded by sand extraction (see Plate 16-7).

a) Sand mining

b) Wetland burning

c) Fish ponds

d) Passionfruit garden

Plate 16-7: Habitat degradation in Kasala Wetland

Sezibwa Forest

Sezibwa Forest is typically a secondary forest dominated by pioneer species averaging 15m in height however retains a diversity of flora (Figure 16-5). A total of 62 plant species have been recorded in this area. The plant community is largely influenced by topography, soil structure and depth. The dominant tree species are *Artocarpus heterophylla, Maesopsis eminii, Coffea carnephora*, *Ficus exasperate* and *Halungana madagascariensis*. The shrub layer is dominated by *Acalypha neptunica* and *Afromomum* grass swards.

Historically a large proportion of this forest (approx. 60%) has been cleared for the development of agricultural land and settlements. The Sezibwa Forest is surrounded by an agricultural landscape dominated by banana, coffee and passion fruit plantations.

Close to Sezibwa Forest is an area of higher quality forest near the ROW is known as Kasenge Forest, and is located north of the expressway towards Mbalala. The forest is located approximately 1.2km from the main expressway and is adjacent to one of the accessory/connector roads that will be constructed for the Project.

Grassland

Grassland swards are small sized, fragmented and interspersed with agricultural land, fallow and plantations. No grassland areas were located directly within the ROW.

Sezibwa River

Sezibwa River is a moderately sized river flowing over a sand-loam bed. Portions of the riparian vegetation along the riverbanks are dense however other sections have been cleared. The river is bordered by a plantation road to the east and beyond the road is a sugar plantation. The river receives effluent from a sugar factory.

16.3.1.3 Flora Species of Conservation Concern

Rare or Threatened Fora

Baseline flora surveys undertaken for the ESIA in 2017 identified the presence of a total of 155 plant species from wetlands (i.e. Mayanja, Nakivubo, Namanve and Kasala) and forest (i.e. Sezibwa forest) habitats (refer Volume C). No species of conservation concern based on the IUCN Red List (2018) were recorded, however the global conservation status of most species recorded have not been assessed by the IUCN and therefore rated "Not Evaluated (NE)". None of the wetland and forest species identified during this survey are classed as endemic. It likely that habitats are too degraded by anthropogenic activities to support endemic Ugandan or globally threatened wetland species, and they therefore only support wetland-generalist species.

Previous studies in Namanve reported a number of endemic orchids. Among the species reported were *Cynorchis anacamptoides, Nervitia afzelii, Habenaria sp, Disa eminii, Satyrium crassicaule* and *S. niloticum.* These species grow only in modified swamps. In the surveys of the Project area conducted in 2017, only *Eulophia horsfallii* (a giant purple-flowered orchid) was recorded. It has restricted distribution in Uganda, only recorded in three other wetlands. It was occasionally recorded in Namanve and Kasala (Mbalala).

Legally Protected Species

Milicia excelsa was recorded in the field surveys conducted for the ESIA (Plate 16-19) which on Uganda's National Forestry Authority Reserved Species list and therefore protected from exploitation and threats to its habitats (Government of Uganda 2003, The National Forestry and Tree Planting Act 2003, Article 30, 1 & 2). Such species may not be cut, damaged, disturbed, removed, collected, transported, exported, purchased, sold or donated without written consent of the Minister of District Council (The National Forestry and Tree Planting Act 2003, Article 31, Section 4a & 4b). However, it is logged commercially especially for its quality timber and use as firewood and charcoal. *M. excelsa* was occasionally found within subsistence agricultural gardens occasionally along the right of way in the Sezibwa area. The species is widely distributed in Uganda, found in Bunyoro and Masaka, and in the North and East in the districts of Mbale and Busoga. It is listed as Near Threatened (NT) on the IUCN Red List (2018).

Individuals of *Markhamia lutea* were also recorded in the field surveys which is a species listed on the Uganda Forestry Authority Reserved list (see Plate 16-11). The species was recorded at 10 locations in the field surveys. The species is widely distributed in Uganda and is mainly planted in homesteads where it is used for building poles.

Plate 16-8: *Milicia excelsa* at Sezibwa

Invasive Species of Flora

Several invasive species of flora, as defined by IFC PS6 criteria (IFC, 2012) and listed on the Global Invasive Species Database (ISSG, 2017), were recorded in the vicinity of the ROW in surveys conducted in 2011 and 2017, namely *Mimosa pigra, Imperata cylindrical, Bidens pilosa* and *Lantana camara*. Water Hyacinth (*Eichhornia crassipes)* has also been recorded in several wetlands within the Project area including Nakivubo Wetland Kinawataka Wetland. These species are highly invasive and have been subsequently regarded as some of the world's worst invasive alien species. These species are aggressive competitors and as such are capable of progressively dominating and degrading natural habitats.

A total of seven species of invasive species were recorded in the 2017 surveys for the ESIA (see specialist study by Bulafu 2018 in Volume C). These belonged to seven genera and five families (Table 16-6).

Table 16-6: Invasive Species in the Proposed Project Area.

Family	Species	Life form	Chainage	Site name
Moraceae	*Broussonetia papyrifera*	Tree	KJE 11+000→33+ 500 KSB 4+000→5+ 500	Sezibwa/Nakivubo (Bugolobi)/Kansanga
Fabaceae	*Mimosa pigra*	Shrub	KJE 9+ 200→11+ 000 KSB 13+800→17+ 787	Namanve, Mayanja (Munyonyo)
Fabaceae	*Senna spectabilis*	Tree	KJE 11+000→33+ 500	Sezibwa
Asteraceae	*Tithornia diversifolia*	Shrub	KSB 4+000→5+ 500 KJE 11+000→33+ 500	Nakivubo (Bugolobi)/Sezibwa/Kansanga (Ggaba)
Pontederiaceae	*Eichornia crassipes*	Herb	KSB 13+800→17+ 787	Mayanja (Munyonyo)
Verbaceae	*Lantana camara*	Shrub	KJE 11+000→33+ 500	Sezibwa
Asteraceae	*Parthenium hysterophorus*	Herb	KSB 4+000→5+ 500	Nakivubo (Bugolobi)
Euphorbiaceae	*Ricinus communis*	Shrub	KSB 4+000→5+ 500 KJE 11+000→33+ 500	Kansanga (Ggaba), Nakivubo (Bugolobi), Kinawataka, Mayanja (Munyonyo)

Descriptions of the key invasive species for the Project are provided below.

M. pigra is a prickly shrub (Plate 16-14) that reproduces by floating seed pods that can be introduced and spread through flood waters, often travelling many kilometres from the original source (ISSG, 2017). *M. pigra* reaches sexual maturity within the first year and seeds are extremely robust, remaining dormant for more than 15 years. *M. pigra* is a common alien invasive species in the tropics and is commonly seen along roadsides and in degraded areas of habitat. *M. pigra* prefers floodplains, grasslands, riverbanks and coastal areas. This species out-competes natives and can reduce water flows, increase silt and can prevent land from being used for agricultural activities due to its dominant nature.

The grass *I. cylindrica* has spread far beyond its original range and can rapidly dominate an area where it has been introduced (ISSG, 2017). Its invasiveness and invasive potential are due to its extensive rhizome (root) system, tolerance of a wide range of soils, drought tolerance, genetic plasticity and fire adaptation. The extensive rhizome system encompasses at least 60% of the total biomass. One hectare of the grass can produce 4.5 million shoots, 10 metric tons of leaf material and more than 6 metric tons of rhizomes (ISSG, 2017). The rhizome system is relatively well-protected underground and can easily regenerate from any human-related or natural disturbance. The grass can reproduce asexually from rhizomes or through prolific seed production. *I. cylindrica* out-competes native species by its dominance of above and below ground biomass and can deprive competitors of nitrogen. The extensive rhizome systems allow rapid regeneration after fire and the species appears to favour frequent intense fire regimes (ISSG, 2017).

Bidens pilosais is an annual herb which originates from tropical and Central America. It can invade a vast range of habitats, thrives in disturbed areas and is capable of surviving severe droughts. *B. pilosia* is not fire tolerant but is known to quickly invade burnt areas. A single plant may produce 3,000-6,000 seeds per year which are spread by attaching to animals, birds and people or dispersed by wind and water. The herbs' full reproductive cycle may be completed in 57-70 days and there may therefore be 5-6 cycles in a single year. Seeds can remain viable for up to 5-6 years. This reproductive strategy facilitates the species rapid establishment and encroachment in degraded areas (ISSG, 2017).

Lantana camara is a highly variable species and has been cultivated for over 300 years and now has hundreds of cultivars and hybrids. The encroachment of *L. camara* amongst agricultural and natural habitats poses major problems in many countries across the world. This species is capable of rapidly becoming the dominant understorey species of woodland habitats, disrupting ecological succession and decreasing floristic diversity. *Lantana camara*'s allelopathic qualities can reduce the vigour of adjacent plants and reduce the productivity of plantations and orchards (ISSG, 2017).

Originally from South America, water hyacinth (*Eichhornia crassipes*) is an aggressive competitor that rapidly invades water-ways and dramatically reduces biological diversity in aquatic ecosystems (Plate 16-16). This species is fast growing and rapidly crowds native aquatic plants preventing sunlight and oxygen from reaching the water column, submergent macrophytes and aquatic fauna (ISSG, 2017). Infestations of water hyacinth in the Lake Victoria Basin have reportedly block drainage channels flowing into Lake Victoria, interfered with boat traffic and fishing activities, destroyed fish spawning and nursery grounds, increased cases of vector borne diseases and have caused the closure of a hydroelectric plant at Jinja (ISSG, 2017).

Several non-native plants (i.e. *Eichornia crassipses, Senna didymobotrya, Senna spectablis, Tithoria* sp. and *Broussonetia papyrifera*) were recorded in the ROW in 2017 are not listed by the Global Invasive Species Database (ISSG, 2017) as being alien invasive species, but are considered to be noxious non-native weeds in Uganda. The encroachment of paper mulberry (*Broussonetia papyrifera*) is particularly problematic in forest habitats within the vicinity of the project.

B. papyrifera (Plate 16-15) is a medium to large sized deciduous tree which grows at remarkable rates and can quickly change the composition of a forest ecosystem. It aggressively dominates areas through a combination of vegetative propagation with suckers and very small lightweight seeds (540,000 seeds per kilogram) which help it quickly establish in newly cleared forest areas (CABI, 2017).

Plate 16-9: *Mimosa pigra* growing at the side of the newly constructed Kampala-Entebbe Expressway

Plate 16-10: Paperbark Mulberry (*Broussonetia papyrifera*) growing in Mabira Forest CFR

Plate 16-11: Water Hyacinth (*Eichornia crassipes*) in Kibili wetland

16.3.2 Protected Areas

16.3.2.1 International Protected Areas

There are no internationally protected areas such as sites on the World Heritage List designated for natural values or Ramsar Wetlands in the direct vicinity of the Project.

The closest site of international significance is the Lutembe Bay Wetland System which is a Ramsar site designated in 2006, and occurs approximately 8 km south of the KSB alignment. The bay is known to support globally threatened species of birds, endangered Cichlid fish, rare butterfly species, regularly supports Palaearctic and Afrotropical migrant birds, breeding ground for Clarias and lungfish, supports huge congregations of individual species of birds and more than 1% of the White-winged Black Terns' population (Nature Uganda, 2005). The wetland is also considered an Important Bird Area (Birdlife International, 2018). Current threats to the wetland include the conversion of wetlands through cutting of papyrus for sale to local markets, and cultivation of crops within the wetland area by local residents.

16.3.2.2 National Protected Areas and Reserves

Approximately 26.4% of Uganda land is subject to some form of protection, which includes National Parks, nature reserves and other protected natural areas (Earth Trends, 2003). The location of statutory designated sites of conservation importance located within or near to the Project is presented in Figure 16-7.

No National Parks, Wildlife Reserves or Wildlife Sanctuaries occur in the vicinity of the Project. Several Central Forest Reserves (CFRs) occur in the vicinity of the Project which are managed by National Forestry Authority (NFA) under the National Forestry and Tree Planting Act 8/2003. There are 506 designated Central Forest Reserves in Uganda which are generally managed to protect natural forest, develop plantations, and support tourism activities. The biodiversity of three of the key Central Forest Reserves for the Project are discussed below.

Namanve Central Forest Reserve

The proposed ROW intersects the Namanve Central Forest Reserve between KJE Chainage 9 + 000 and 11 + 500. Namanve forest was originally planned to be an urban forest that would help meet the need of the growing urban population in Kampala and the surrounding towns (URS, 2015). It was originally partly planted with eucalyptus for commercial use, however this plantation became degraded and over-harvested over time (URS, 2015). An analysis

of satellite imagery also indicates that some parts of the protected area have been utilised for the development of Namanve Business Park.

A large proportion of the area enclosed by the Central Forest Reserve's boundaries is wetland habitat dominated by papyrus vegetation. The habitat forms a permanent wetland of high quality. Numerous settlement areas occur within and surrounding the wetlands within the reserve. Around the edges of swampy areas, sand exploitation and brick manufacturing are common activities (URS, 2015).

Mabira Central Forest Reserve

Mabira Central Forest Reserve and buffer zone were designated as a protected area in 1932 and covers c.29,000 ha (Birdlife International, 2017). The reserve is located approximately 11.5 km northeast from the end of the Phase 1 ROW, 54 km from Kampala and the southern boundary of the reserve is lies 13 km from the shoreline of Lake Victoria. The entire reserve lies outside of the proposed Phase 1 ROW.

Mabira Central Forest Reserve is the largest remnant stand of semi-deciduous forest in central Uganda and supports dense tropical forests and papyrus (*Cyperus papyrus*) swamps which are of conservation importance (Birdlife International, 2017). Several tree species known to inhabit the reserve are of globally threatened or rare, namely: *Milicia excelsa* (IUCN listed: Lower Risk/near threatened); *Irvingia gabonensis* (IUCN listed: Lower Risk/near threatened); *Entandrophragma angolense* (IUCN listed Vulnerable); and *Lovoa swynnertonii* (IUCN listed Near Threatened; Birdlife International, 2017).

Langdale-Brown *et al*., (1964) reported the reserve as supporting nine species found nowhere else in Uganda (i.e. six butterflies, one moth, one bird and one tree). Currently the reserve is known to support the nationally endangered short-palated fruit bat (*Casinycteris argynnis;* IUCN listed Least Concern; non-endemic) (The Wildlife Conservation Society, 2016) and Nahan's partridge (*Ptilopachus nahani*) which is listed by the IUCN as globally Endangered (Birdlife International, 2017). The forest also supports a mangabey population (*Lophocebus albigena* spp. *johnstoni*) which is likely to be confined to Uganda and classed as an Endemic species (Groves, 2007).

The reserve has been designated as an Important Bird Area (IBA) and supports 30% (over 300 species) of bird species found in Uganda. It is an important site in Uganda for avifauna associated with the Guinea-Congo biome such as Nahan's partridge (*Francolinus nahani*), fiery-necked nightjar (*Caprimulgus nigriscapularis*), grey-hooded capuchin babbler (*Phyllanthus atripennis*), grey longbill (*Macrosphenus concolor*) and Western crested-flycatcher (*Trochocercus nitens*) (Birdlife International, 2017).

The existing Kampala-Jinja road passes through the Mabira Forest Reserve. The reserve is also surrounded by densely populated area and there are several settlements within the reserve boundary (Birdlife International, 2017). The distinct vegetation types (sub-climax communities) of the reserve have been impacted by anthropogenic activities including over exploitation of natural resources (e.g. timber and non-timber resources), commercial logging, agricultural encroachment and habitat clearance for the development of plantations (Birdlife International, 2017).

Banda Tree Nursery

The Banda Tree Nursery is a small Central Forest Reserve area in Kampala, covering approximately 2.3 ha. Based on recent satellite imagery the actual nursery area established covers approximately 2.5 ha, and partly occurs outside the official area designated on the Government GIS layers of protected areas. The nursery is managed by the National Forestry Authority's (NFA) National Tree Seed Center (NTSC). The nursery supplies a range of services including advice, training and seeds/seedlings to small-large scale forestry and horticulture enterprises (supplying up to 2 million trees annually).

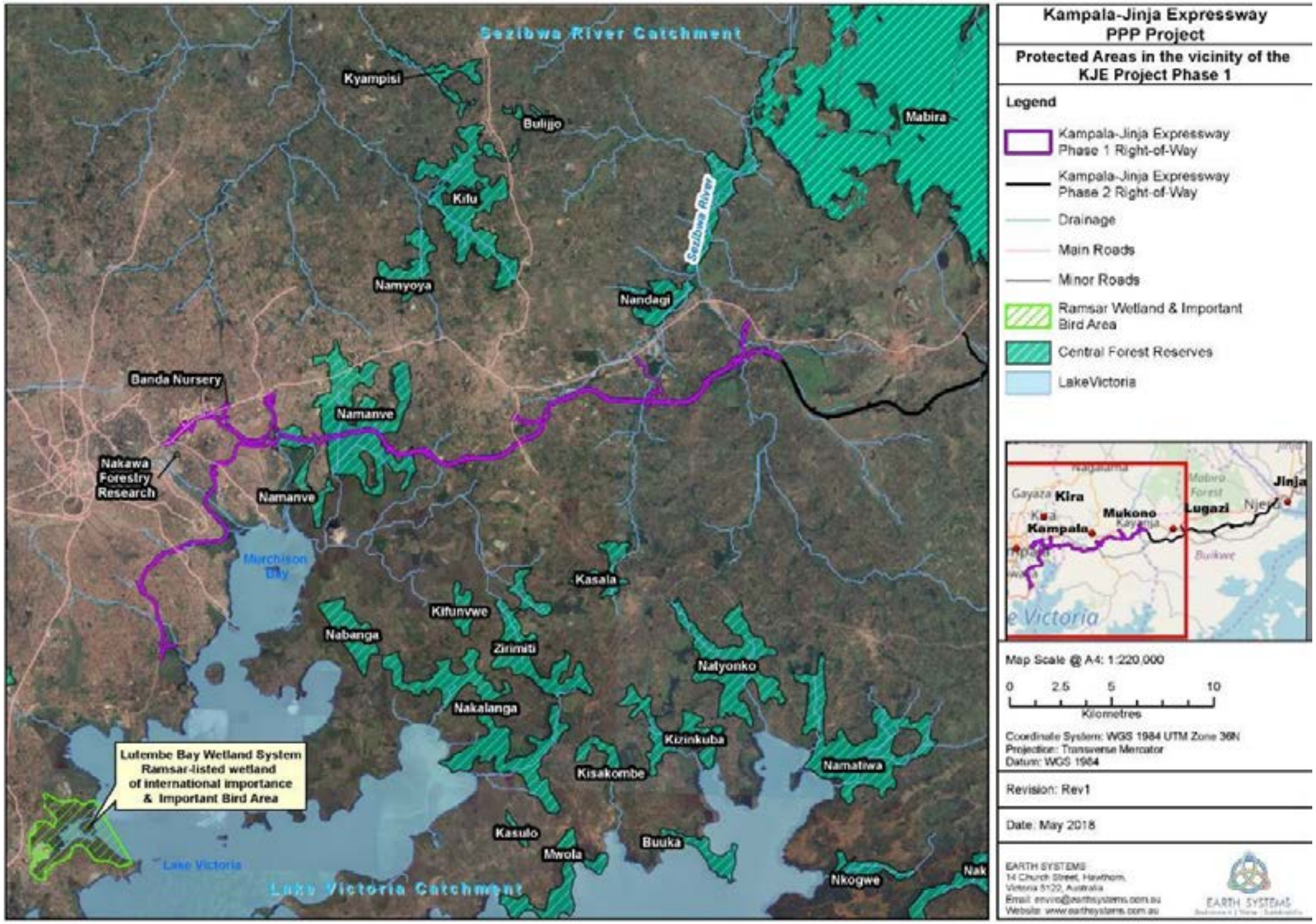


Figure 16-7: Protected areas located in the vicinity of the Project (Phase 1)

16.3.3 Fauna and Their Habitats

16.3.3.1 Fauna Habitats

The distribution and quality of fauna habitats varies throughout the ROW. Fauna habitats located within the ROW have been categorised into urban environments, agricultural environments, forest habitats, wetlands and other aquatic environments. Their importance for supporting fauna are discussed as follows:

Urban environments

The abundance and diversity of fauna is likely to be significantly lower in densely population urban environments such as Kampala compared to other habitats within the Project area, including agricultural landscapes. However, vegetation along road verges, parks, gardens, waste land, and culverted water courses within the city provide refuge to some species of birds and small mammals that have become habituated to high levels of disturbance. The majority of these species are common and widespread in urban environments in east Africa. For example, during the baseline assessment in 2017, ecologists recorded the presence of wetland birds and birds of prey in Kampala city (i.e. marabou stork (*Leptoptilos crumenifer*), hadada ibis (*Bostrychia hagedash*), black kite (*Milvus migrans*), hamerkop (*Scopus umbretta*), cattle egret (*Bubulcus ibis*), common bulbul (*Pycnonotus barbatus*) and woodland kingfisher (*Halcyon senegalensis*). The majority of species are not of high conservation value. However, ecologists also confirmed the presence of hooded vultures (Critically Endangered) in Kampala. The city provides foraging habitat for vultures which scavenge for carrion along roads and in abattoirs (see Section 16.3.3.3).

Agricultural landscapes

Agro-pastoral land, fallow land and plantations located within the footprint of the Kampala-Jinja Mainline Expressway are likely to support birds and small mammals that are adapted to modified habitats and disturbance.

Forests

Within the ROW, forest habitats (i.e. closed forest and open forest/woodland) are only located within the proposed alignment for the Kampala-Jinja Mainline Expressway. The majority of these forest stands are highly fragmented, small sized and as such are unlikely to provide sufficient carrying capacity to support a high diversity and abundance of fauna (i.e. mammals and birds). These patches of forest are surrounded by agricultural landscapes which are likely to limit the movement of some medium to large sized mammals between forested areas. In comparative terms, the Sezibwa Forest (located within the mainline alignment between Mukono South and Namagunga Junction) is of the highest biodiversity value for fauna such as small to medium sized mammals and birds. This area of secondary forest is comparatively larger than other patches of forest located within the ROW and reportedly supports eastern black-and-white colobus (*Colobus guereza*) and other primates. The forest also supports several species of birds, none of which are forest specialists (i.e. variable sunbird (*Cinnyris venustus*), bronze mannickin (*Lonchura cucullata*), common bulbul (*Pycnonotus barbatus*) and great blue turaco (*Corythaeola cristata*).

Wetlands

Within the Lake Victoria Basin wetlands range from permanent swamps to highly seasonal or ephemeral swamps around open water bodies and along rivers. These wetlands are characterized by high diversity of flora and fauna (Wakwabi et al., 2006). Wetlands located within the Project Area are of variable habitat quality (see Section 16.3.1.2). Highly impacted wetlands located in the ROW (i.e. Mayanja, Kansanga, Nakivubo and Kinawataka) and less likely to support a high diversity and abundance of fauna than wetlands with relatively lower levels of disturbance (i.e. Namanve and Kasala).

Birds are usually a dominant and diverse component of wetlands. Omoding *et al*., (1996) recorded 159 bird species in 38 families from 82 wetlands from wetlands in Uganda. Wetlands located within the footprint of the Kampala-Jinja Mainline Expressway offer potentially suitable habitat to support a relatively wide diversity of birds including wetland specialists and water fowl (Section 16.3.3.3). The carrying capacity of the wetland located in the footprint of the Kampala Southern Bypass (i.e. Mayaja, Kansanga, Nakivubo and Kinawatak) and the may potentially have been reduced through habitat loss, degradation, fragmentation and high levels of disturbance near the wetland fringes. The majority of birds utilising wetland habitats in the ROW are unlikely to be of high conservation importance. However, the baseline assessment in 2017 confirmed the presence of the globally and nationally Endangered, grey crowned crane (*Balearica regulorum*) in the Namanve Wetland.

The Lake Victoria basin supports several species of amphibians, mammals, and reptiles. A total of 31 amphibians, 28 reptiles and 44 mammal species have been recorded from various sites in Lake Victoria basin. Most amphibians are reliant on aquatic environments during breeding and the early stages of growth (Omoding *et al*., 1996). The inshore fringes of wetlands and littoral habitats provide important habitats for several species of reptiles. For example monitor lizard (*Varanus niloticus*) reportedly inhabit the Kansanga Wetland (URS, 2015)

The majority of mammals which utilise habitats in the Lake Victoria Basin are generalists and use wetlands and terrestrial habitats (i.e. forests) for refuge and to forage. Their habitat usage is partly dependent on the flooding patterns and many mammals move to drier areas during heavy rain (Wakwabi et al., 2006). Wetlands located in the ROW are highly unlikely to support a large diversity and abundance of large mammals (see Section 0), particularly those located within the Kampala Southern Bypass which are highly degraded with high levels of disturbance. However, the Kansanga wetland reportedly supports sitatunga or marshbuck (*Tragelaphus spekei*) which is highly adapted to wading through wetland vegetation and swimming in water (ICS, 2015). Higher quality wetlands in the footprint of Kampala-Jinja Mainline Expressway (i.e. Namanve) offer potentially suitable habitat to support sitatunga. The National Red List for Uganda (WCS, 2016) have classed sitatunga as Vulnerable as the geographic range of sitatunga is limited and the Ugandan population is known to be in a state of decline.

Other Aquatic Environments

The proposed ROW intersects several rivers and streams (see Chapter 15) including the Sezibwa River. Much of the riparian vegetation of the Sezibwa River has been cleared from along the eastern banks of the river and downstream aquatic habitats receive effluent from a sugar factory. This river is unlikely to support a high diversity and abundance of aquatic fauna but does provide some refuge to some species of fish (see Section 16.3.3.6). This river may potentially serve as a water resource for birds and mammals.

16.3.3.2 Mammals

The field surveys conducted for the ESIA identified direct and indirect evidence of a number of different mammals in the vicinity of the Project area as shown in Table 16-7. Field surveys generally indicated a low abundance and diversity of mammals in the study area. Hunting was reported to be commonly conducted in the surveyed areas. No direct or indirect evidence of any threatened mammal species were recorded (based on National Conservation Status, as well as the IUCN Red List Status). Two species considered internationally Vulnerable (IUCN, 2018) were reported to occur in close to the Project area by local hunters; the Hippopotamus (Hippopotamus amphibius) and the Giant Pangolin (*Smutsia gigantean*). Both these species are also considered Vulnerable at the national level. Although the survey team did not directly observe any Pangolins during the survey, a local hunter reported the presence of Giant Pangolins in Kasaala (Mbalala) wetland. The hippopotamus was reported by hunters to occur within Mayanja wetland. While not globally threatened, indirect evidence of the Sitatunga (*Tragelaphus spekii*) was recorded which is also considered Vulnerable at the national level (see sections below for further information on Sitatunga).

Table 16-7: Recorded or reported mammal species, and their conservation status within and near the ROW.

Common Name	Scientific names	National Conservation Status	IUCN Conservation Status
Sitatunga	*Tragelaphus spekii*	Vulnerable	Least Concern
Hippopotamus	*Hippopotamus amphibius*	Vulnerable	Vulnerable
Civet cat	*Civettictis civetta*	Least Concern	Least Concern
Genet	*Genetta genetta*	Least Concern	Least Concern
Edible rat	*Thryonomys swinderianus*	Least Concern	Least Concern
Bush Duiker	*Sylvicapra grimmia*	Least Concern	Least Concern
Giant Pangolin	*Smutsia gigantea*	Vulnerable	Vulnerable
Bush buck	*Tragelaphus scriptus*	Least Concern	Least Concern
Serval cat	*Leptailurus serval*	Least Concern	Least Concern
Vervet monkey	*Chlorocebus pygerythrus,*	Least Concern	Least Concern
Red Tailed Monkey	*Cercopithecus ascanius*	Least Concern	Least Concern
Crested porcupine	*Hystrix indica*	Least Concern	Least Concern
Banded mongoose	*Mungos mungo*	Least Concern	Least Concern
Greater cane rat	*Thryonomys swinderianus*	Least Concern	Least Concern
Black backed jackal	*Canis mesomelas*	Least Concern	Least Concern
Grey-cheeked Mangabey	*Lophocebus albigena*	Least Concern	Least Concern
African palm civet	*Nandinia binotata*	Least Concern	Least Concern

a) Bush Duiker footprint (0480469, 0038505)

b) Sitatunga foot print (480416E, 38543N)

c) Vervet Monkey foot print (480371E, 38477`N)

Plate 16-12: Animal evidence observed in Kasaala (Mbalala) Wetland.

Previous baseline surveys of mammals were also conducted of mammals in 2011 (URS, 2015). Few field signs indicative of direct or indirect evidence of mammalian activity were recorded during these surveys (URS, 2015). However, the transect survey confirmed the presence of six species of mammals within or in close proximity to the ROW. The type of evidence of field activity relating to these species, their national and international conservation status, and habitats of occurrence are presented in Table 16-8 below. All species are common in nature and are categorised by the IUCN Red List of Threatened Species (IUCN, 2018) as Least Concern. Furthermore, none of these species are nationally threatened according to the National Red List for Uganda (WCS, January 2016).

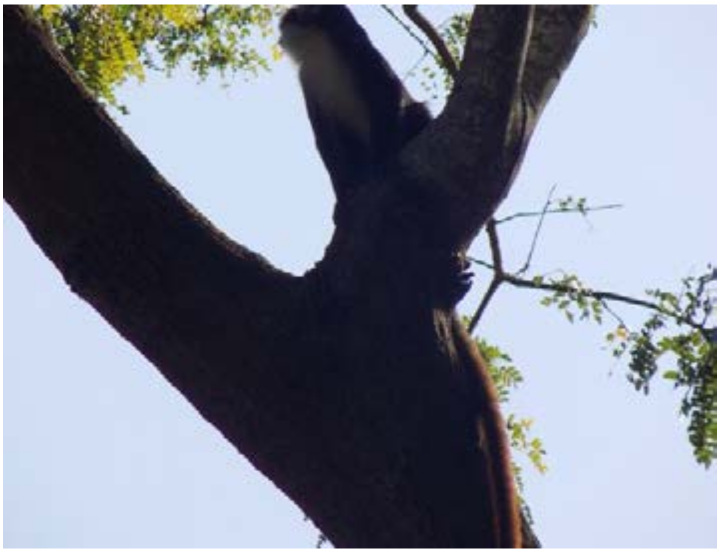


Plate 16-13 Red Tailed Monkey observed in a tree in Sezibwa Forest

The majority of mammalian activity observed during this baseline survey were located amongst woodland in Kasala Forest Reserve, which is located approximately 6 km to the south of the alignment. Red-tailed monkey (*Cercopithecus Ascanius*), Bush buck (*Tregelaphus scriptus*) and Grey-checked mangabey (*Lophocebus albigena*) were the most commonly recorded species.

Table 16-8: Direct and indirect evidence of mammal activity, their conservation status and habitats of occurrence within and near the ROW (URS, 2015)

Scientific Name	Common Name	IUCN Status	Uganda Red List Status	Direct evidence	Indirect evidence	Habitats
Lophocebus albigena	Grey-checked mangabey	LC	LC	+		Woodland of the Kasala Forest Reserve
Tregelaphus scriptus	Bush buck	LC	LC	+		Woodland of the Kasala Forest Reserve
Sylvicapra grimma	Common duiker	LC	LC		+	NA
Cercopithecus ascanius	Red-tailed monkey	LC	LC	+		Woodland of the Kasala Forest Reserve
Civetta sp	Civet sp	LC	LC		+	Ssezibwa wetlands
Chlorocebus pygerythrus	Vert Monkey	LC	LC	+		This species is present in savanna, open woodland, and forest-grassland mosaic, especially close to rivers.

Respondents of the local knowledge interviews undertaken in 2011, indicated that other mammalian species were potentially present in natural habitats within and in close proximity to the proposed road alignment. Namely: banded mongoose (*Mungos mungo*), crested porcupine (*Hystrix cristata*), black-backed jackal (*Canis mesomelas*), leopard (*Panthera pardus*), serval (*Leptailurus serval*), sitatunga (*Tragelaphus spekii*) and cane rats (*Thryonomys* sp) and *Genetta* sp. All of these species are common in nature and not considered to be globally or nationally threatened, with the exception of leopards and sitatungas.

Recent data on small mammals from the nearby Mabira Central Forest Reserve is available from surveys conducted by Babyesiza (2016). As per section 16.3.2.2 the reserve is located approximately 11.5 km northeast from the end of the Phase 1 ROW. A total of 28 species of rodents and shrews were recorded in the reserve from the families of Muridae, Gerbillidae, Sciuridae and Soricidae; and 15 species of bats from six families (Pteropodidae, Hipposideridae, Molossidae, Nycteridae, Rhinolophidae and Vespertilionidae). These surveys were conducted in large areas of high quality forest habitat within the reserve. Forest habitat of similar quality does not occur within or near the ROW for the Project.

In addition, the data reviews conducted as part of the Critical Habitat Assessment for the Project also identified three species listed as Data Deficient by the IUCN (2018) which are nationally threatened species that qualify as having critical habitat within the DMU area used for the Critical Habitat Assessment, which includes a large area around the Project Footprint (see Biodiversity Action Plan, Volume D). These species are the Trevor's mops bat (*Mops trevori*) and Samburu pipistrelle bat (*Neoromicia helios*), as well as the Endangered moon shrew (*Crocidura selina*).

The estimated range of the two bat species based on IUCN (2018) do not intersect the Project area, so they are not expected to be significantly impacted by the Project based on available information, and are therefore not considered priority species for the Project. The moon shrew is thought to be restricted to a small range in Uganda, however there is significant uncertainty about the shrew's conservation status and the distribution of the species,

as there is very limited survey data available. The moon shrew has only been recorded at four sites in Uganda, and has not been recorded since 1989. While the estimated range of the moon shrew from IUCN (2018) overlaps the Project Footprint, none of the sites where the species has been recorded are directly impacted by the Project. The Project Footprint also does not contain high quality forest habitats such as where the species has previously been recorded, and the species was also not recorded in the baseline surveys or local knowledge surveys conducted for the ESIA. The moon shrew is therefore considered unlikely to be impacted by the Project, however based on the precautionary principle the Project should still consider this species in terms of management and mitigation to help ensure any potential impacts are minimised.

Based on all the surveys and data reviews conducted it is considered that the priority mammals for the Project based on their conservation status and potential to occur in the vicinity of the Project are leopards and sitatungas. The ecology of leopards and sitatungas are discussed below in more detail:

Leopards

Spatial data published by the IUCN (2018) indicate that leopards (IUCN listed Endangered) are probably absent from the majority of Uganda, excluding some habitat types in the northeast (Figure 16-8). In contrast, the National Red List for Uganda (WSC, January 2016) state that leopards are widespread throughout Uganda and are classed as Vulnerable. If present, leopards are most likely to be restricted to higher quality habitats and wildlife corridors located in the protected areas network (i.e. Mabira Forest Reserve). The ROW is not thought to offer potentially suitable habitats to support leopards.

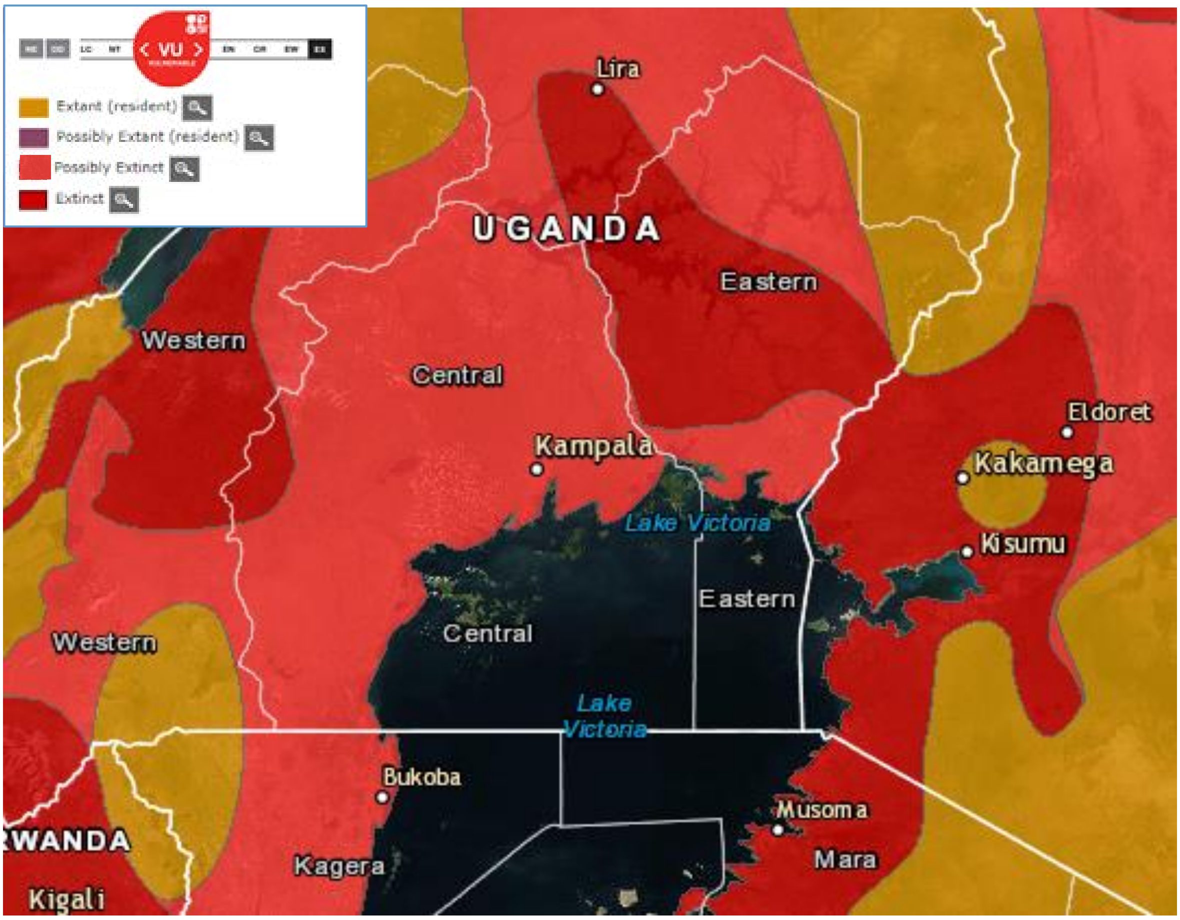


Figure 16-8: The distribution of the leopard (*Panthera pardus*) in Uganda (IUCN, 2018)

Sitatungas

Sitatungas or marshbuck (*Tragelaphus spekii*) have been reported as inhabiting wetlands in the Project area including the Mayanja wetland, Namanve wetland and Kasaala (Mbalala) wetland. Other wetlands (i.e. Namanve) may offer potentially suitable habitat to support this species, hence the sitatunga is a priority species for the Project.

The sitatunga commonly inhabits tall, dense vegetation of perennial and ephemeral swamps, marshy clearings within forests, riparian habitats and mangrove swamps (IUCN, 2018). This species also inhabits large monospecific stands of papyrus (*Cyperus papyrus*) and reeds (e.g. *Phragmites* spp. and *Echinochloa pyramidalis* (May and Lindholm, 2013). The species will avoid open water devoid of vegetation. They are selective mixed feeders browsing on a range of grasses and sedges (May and Lindholm, 2013).

The total global population of sitatunga or marshbuck (*Tragelaphus spekii)* has been estimated at 170,000, of which 40% are thought to inhabit protected areas and their surrounds (IUCN, 2018). Whilst the sitatunga has a very small range in West Africa across Senegal, Gambia, Guinea and Guinea-Bissau, this species is widespread and locally common in some parts of East Africa, including Uganda (WSC, January 2016), hence this species is listed as Least Concern by the IUCN Red List of Threatened Species (Figure 16-9; IUCN, 2018). However, the National Red List for Uganda (WCS, January 2016) have classed sitatunga as Vulnerable as the geographic range of sitatunga is limited and the Ugandan population is known to be in a state of decline.

The main threats to sitatungas are habitat loss, fragmentation and degradation caused by loss of wetland habitats (i.e. habitat clearance) and long-term changes in the water levels of wetlands leading to a decline in floristic diversity. This species is also vulnerable to predation and unsustainable hunting in many parts of its range (May and Lindholm, 2013) for subsistence and trophy hunting (IUCN, 2018).

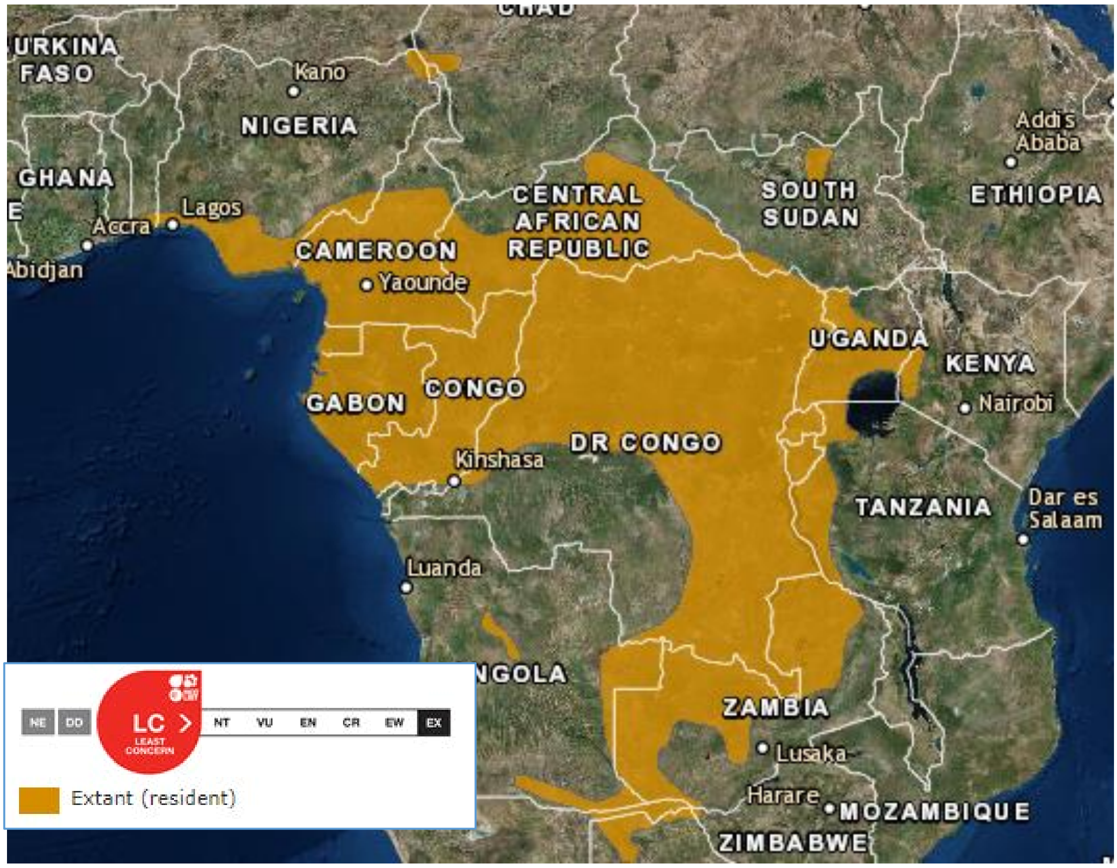


Figure 16-9: The global distribution of sitatunga or marshbuck (*Tragelaphus spekii*) in Uganda (IUCN, 2018)

16.3.3.3 Birds

The baseline survey undertaken during the dry season in June 2017 (Bitebekezi, 2017) characterised the bird assemblages in the Sezibwa Forest, Nakivubo wetland and the Namanve Wetland while baseline survey undertaken during the wet season in December 2017 (Namukasa, 2018) characterised the bird assemblages in the Sezibwa Forest, selected agricultural farm, Kasala wetland, Nakivubo wetland, Kinawataka wetland, the Namanve Wetland, Kansanga wetland and Mayanja wetland. Globally significant concentrations of migratory species and / or congregatory species were not recorded within these survey sites.

In total, 42 species of bird were recorded in the Project area during dry season baseline surveys in 2017 (Bitebekezi, 2017). These birds are categorised as Least Concern by the IUCN Red List of Threatened Species (IUCN, 2017) and the National Red List for Uganda (WCS, January 2016) with the exception of the grey crowned crane which is listed as Endangered on the IUCN Red List (see further information on this species below). In the wet season surveys in 2017 a total of 106 species were identified (Namukasa, 2018). Similar to the dry season surveys most species recorded were classed as Least Concern, with the exception of the grey parrot (*Psittacus erithacus*) which was recorded in Kasaala wetlands and is classed as endangered on the IUCN red list (2018).

A total of 146 species of bird were reportedly recorded during baseline surveys in 2011 (URS, 2015). Many of these birds are thought to have been sighted in protected areas outside of the ROW. The full species list and their recorded locations have been omitted from the previous ESIAs (URS, 2015) and as such should be made available and incorporated into this baseline assessment. A total of 74 species of birds were identified within and near the footprint of the Kampala Southern Bypass in 2013 including water bird non-specialist, grassland species, forest generalists and forest visitors (ICS, 2015).

Commonly sighted birds were: helmeted guinea fowl *(Numida meleagris*), African palm-swift (*Cypsiurus parvus*), angola swallow (*Hirundo angolensis*), hamerkop (*Scopus umbretta*), African open-billed stork (*Anastomus lamelligerus*), hadada ibis (*Bostrychia hagedash*), African fish eagle (*Haliaeetus vocifer*), long-crested eagle (*Lophaetus occipitalis*), African wattled lapwing (*Vanellus senegallus*), Egyptian goose (*Alopochen aegyptiacus*), red-eyed dove (*Streptopelia semitorquata*), grey parrot (*Psittacus erithacus*), brown parrot (*Poicephalus meyeri*), great blue turaco (*Corythaeola cristata*), eastern grey plantain eater (*Crinifer zonurus*), Kampalaas' cuckoo (*Chrysococcyx Kampalaas*) and didric cuckoo (*Chrysococcyx caprius*). The Nahan's partridge (*Ptilopachus nahani*) does not appear to have been sighted during this survey.

Globally significant concentrations of migratory species and / or congregatory species were not identified during the baseline survey (URS, 2017). Several migratory and / or congregatory birds were however identified during the baseline survey in low numbers.

From all the surveys conducted of the Project area, the majority of species recorded were categorised as Least Concern by the IUCN Red List of Threatened Species (IUCN, 2018). However, several species recorded within the zone of influence are globally and nationally threatened or rare, namely the hooded vulture (*Necrosyrtes monachus*), grey parrot (*Psittacus erithacus*) and the grey crowned-crane (*Balearica regulorum*). The presence of the saddle-billed stork (*Ephippiorhynchus senegalensis*) was also identified during the baseline survey. This species is of categorised as Least Concern at the global scale (IUCN, 2018) but is classed as Vulnerable at the national level (WCS, 2016). These species are discussed below in more detail:

Hooded vultures

The hooded vulture is listed as Critically Endangered by the IUCN Red List of Threatened Species (IUCN, 2018) and Endangered according to the National Red List for Uganda (WCS, January 2016). Hence, the hooded vulture is considered to be a priority species for the Project. Hooded vultures are widespread in Sub-Saharan Africa (Figure 16-10; Ferguson-Lees and Christie, 2001). The global population has been estimated at a maximum of 197,000 individuals (IUCN, 2018). Trends in Uganda are difficult to detect owing to strong annual variations (Pomeroy *et*

al., 2012), however, the hooded vulture is thought to have a widespread distribution (WCS, January 2016; IUCN, 2017).

Based on the hooded vulture monitoring program conducted around Kampala (see specialist report in Volume C) the population of hooded vultures in Kampala is estimated to be at least 196 individuals. While hooded vultures occur across Uganda, Kampala is considered the 'stronghold' for the species in Uganda. None of the breeding, roosting and feeding sites around Kampala where hooded vultures have been monitored will be directly impacted by the Project. The closest of these sites to the Project is City Abattoir which is 750m southwest from the western end of the mainline alignment towards the centre of Kampala. No significant impacts on the use of this site by hooded vultures are expected from the Project.

Plate 16-14: Hooded Vultures at a feeding site at Kalerwe abattoir, Kampala.

Six hooded vultures (listed as forests visitors) were recorded during bird surveys in 2011 (URS, 2015) and individuals were sighted in Kampala in 2017 during field exercises. In local knowledge surveys conducted (see Chapter 17) residents of several villages along the alignment also stated that they observed the species near their village on a daily basis. This species is often associated with human settlements - hence it is unsurprising that this species was recorded during the baseline surveys and is commonly observed by villagers. However, hooded vultures are also found in open grassland, the edges of forests, wooded savannah, deserts and along coasts (Ferguson-Lees and Christie, 2001). The species is generally sedentary, with some dispersal being undertaken by individuals in response to rainfall in the Sahel of West Africa and by non-breeders and immature birds (Ferguson-Lees and Christie, 2001). It feeds mainly on carrion, but is also known to feed on insects. This species breeds throughout the year in Africa, however breeding is most prevalent from November to July. Hooded vultures nest in trees and lay a clutch of one egg. Young are dependent on their parents for a further three to four months after fledging (Ferguson-Lees and Christie, 2001).

This species is thought to be undergoing a very rapid decline in its global population (Ogada and Buij 2011). Major threats to this species include non-target poisoning, capture for traditional medicine and bushmeat (McKean *et*

al., 2013), capture for illegal wildlife trade, hunting for bush meat, habitat loss through development and improvements to abattoir hygiene and rubbish disposal in some areas, particularly in East Africa (Ogada and Buij 2011).

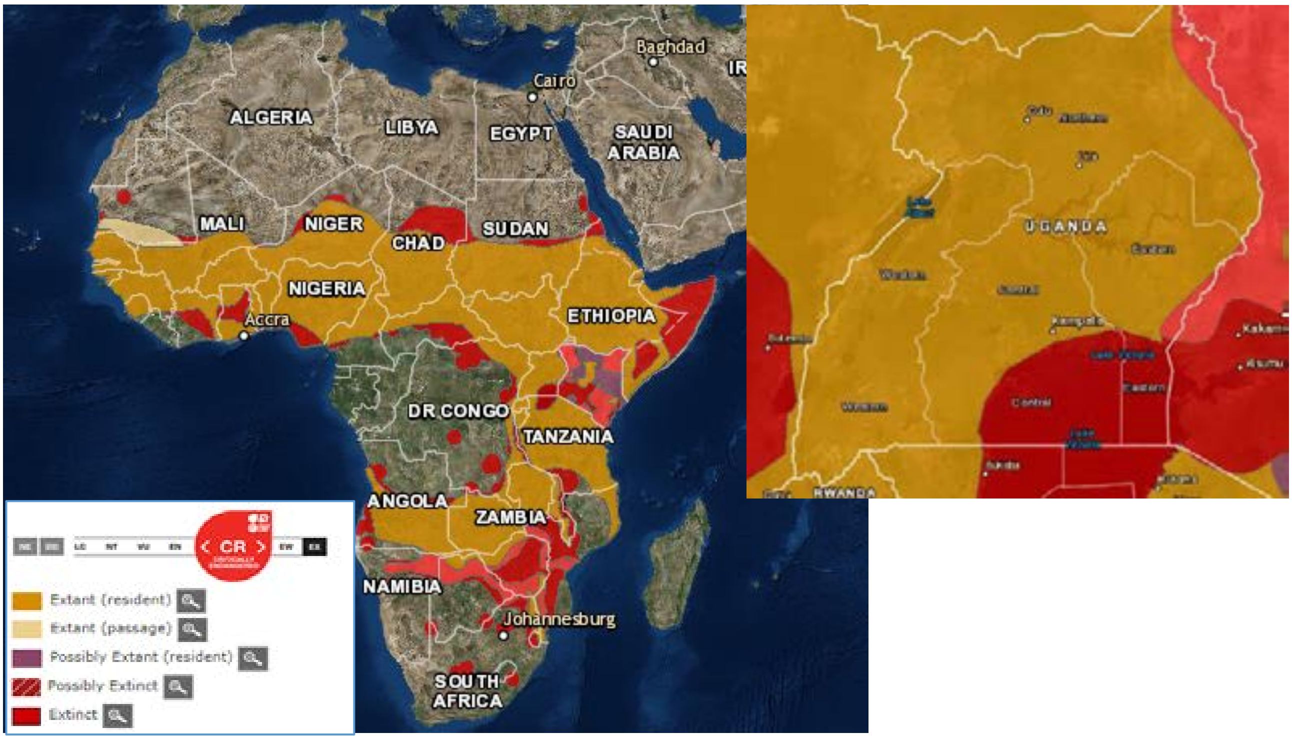


Figure 16-10: The global distribution of the hooded vulture (*Necrosyrtes monachus*) with the Ugandan distribution inset top right (IUCN, 2018)

Grey parrots

The grey parrot (*Psittacus erithacus*) is listed as Endangered by the IUCN Red List of Threatened Species (IUCN, 2018) and Vulnerable according to the National Red List for Uganda (WCS, January 2016). Hence, the grey parrot is considered to be a priority species for the Project.

This species is native to 18 countries with an estimated global population of between 560,000 and 12.7 million individuals. The Ugandan distribution of the grey parrot population is illustrated in Figure 16-11. In Uganda, grey parrots are known to inhabit the Mabira Forest Reserve, the Bwindi Impenetrable National Park, Maramagambo Forest Reserve, Lake Victoria (including Islands) and western forests (WCS, January 2016). Grey parrots typically inhabit dense forest, but they are also commonly observed at forest edges, gallery forest, mangroves, wooded savannah, clearings, cultivated areas and gardens (Juniper and Parr 1998). Hence, stands of forests outside of the Mabira Forest Reserve, within the ROW may offer suitable foraging and nesting habitats for grey parrots.

This species is highly gregarious, forming large roosts, in some cases these roosts comprise c.10,000 individuals (Juniper and Parr 1998). Much smaller groups (approximately 30 individuals) gather to feed and their diet comprises a variety of fruits and seeds (Juniper and Parr 1998). Grey parrots are usually solitary nesters however, they are known to form loose colonies (IUCN, 2018).

Population declines have been recorded in many counties across their range including Uganda. Major threats to the diversity and abundance of this species are collection of individuals and their eggs for the wild bird trade and habitat loss (IUCN, 2018).

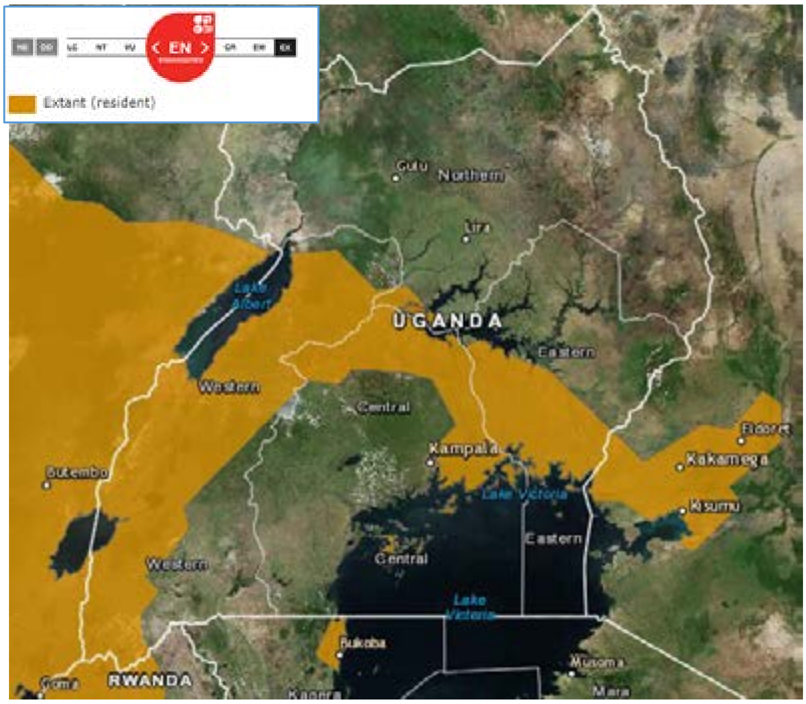


Figure 16-11: The distribution of the grey parrot (*Psittacus erithacus*) in Uganda (IUCN, 2018)

Saddle-billed storks

The global Saddle-billed stork (*Ephippiorhynchus senegalensis*) is listed as Least concern by the IUCN Red List (2018). Their population is relatively large, estimated at between 1,000-25,000 individuals with approximately 670-17,000 mature individuals (IUCN, 2018). They are not considered to be threatened or rare at the global level but are categorised as Vulnerable in Uganda due to a decline in the Ugandan population (WCS, January 2016). Known sites where saddle-billed storks have been recorded are Murchison Falls National Park, Queen Elizabeth National Park, Lake Mburo National Park, Lake Victoria, Lake Albert and the West Nile (WCS, January 2016). One individual was sighted during baseline bird surveys (URS, 2015).

Saddle-billed storks inhabits margins of rivers, lake shores, flood plains, wetlands (with high fish numbers) in open, semi-arid areas and savanna with stands of trees nearby for nesting and roosting. This species generally avoids deeply forested areas (Birdlife international, 2016). The diet of the saddle-billed storks comprises predominantly of fish which is supplemented by crabs, shrimps, frogs, reptiles, small mammals, young birds, molluscs and insects (del Hoyo *et al*., 1992).

Grey Crowned Crane

This species is listed as globally and nationally Endangered (IUCN, 2018; WCS, January 2016), hence, the grey crowned-crane (*Balearica regulorum*) is considered a priority species for the Project. The largest remaining populations are thought to be in Kenya (10,000-12,500 individuals in 2014), Uganda (500-8,000 individuals), Zambia (2,000-2,500 individuals) and South Africa (6,500 individuals (IUCN, 2018)); see Figure 16-12 for their global distribution.

The size of grey crowned crane's home range and the extent of local and seasonal population movements is dependent upon the abundance and distribution of food and suitable nesting sites. The grey crowned crane shows a preference for foraging in open grasslands adjacent to wetlands and roosts in water along rivers, in marshes or on perches in nearby trees. The species often forms flocks and roosts communally at night. The grey

crowned crane is a generalist and its diet comprises of agricultural pulses, nuts and grains, seed heads, new tips of grasses, insects, frogs, lizards and crabs. Breeding takes place within the margins of wetlands and peaks during the dry season in East Africa. The species nests in solitary territorial pairs and only rarely nest in trees, preferring to nest in wetlands amongst tall emergent vegetation (IUCN, 2018).

The grey crowned crane was directly observed in the biodiversity surveys conducted for the ESIA in the Namanve wetland, Mayanja wetland and Kansanga wetland. In local knowledge surveys conducted (see Chapter 17) residents of several villages along the alignment also stated that they observed the species near their village on a daily basis.

The species is threatened by the loss and degradation of wetland breeding areas caused by changes in land-use, live capture of birds for the illegal wildlife trade, egg-collecting, hunting and the heavy use of agricultural pesticides. Mortality of these birds due to electrocution and collision with overhead power lines is also a serious threat in Uganda (IUCN 2018).

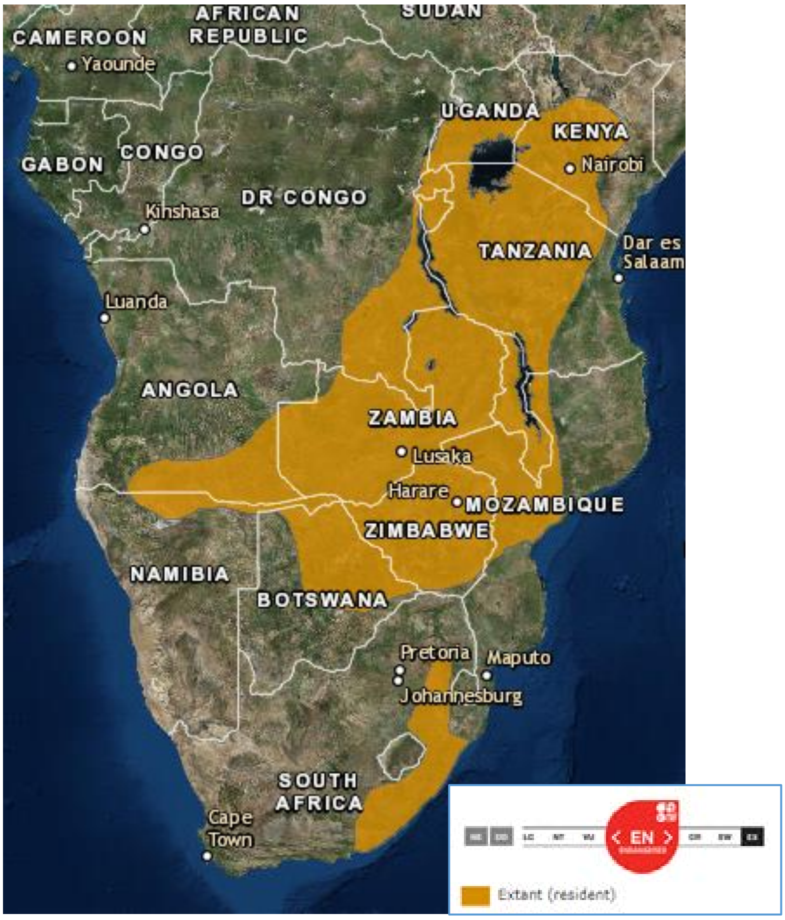


Figure 16-12: The global distribution of the grey crowned crane (*Balearica regulorum*) (IUCN, 2018)

16.3.3.4 Reptiles

A total of 13 species, belonging to three orders, nine families and 11 genera, were recorded during the herpetofauna surveys conducted for the ESIA (see specialist report in Volume C). Reptiles recorded at each site area shown in Table 16-9. Kasaala wetland (Mbalala-Wankobya) was the most species-rich site with eight species recorded, followed by Mayanja Wetland (Kabili-Munyonyo) with seven species. The most widely distributed species recorded was the water cobra (*Naja melanoleuca*) recorded at four of the five sites. The blue-headed agama (*Acanthocercus atricollis*) and hissing sand snake (*Psammophis sibilans*) were also each recorded at three of the five sites. Most other species were recorded once or twice during the entire survey.

There were no reptile species of conservation concern recorded in the study area, although the global conservation status of some species recorded have not been evaluated by the IUCN (2018). The National Red List (WCS, 2016) categorizes all species recorded as Least Concern at the national scale.

Table 16-9: Reptile Species Richness for Surveyed Sites along the Phase 1 alignment

Count of Reptiles	**Site name**					
Species	**Mayanja Wetland (Kabili-Munyonyo)**	**Sezibwa forest (Lukonge)**	**Kansanga wetland (Muyenga Bukasa)**	**Namanve wetland**	**Kasaala wetland (Mbalala-Wankoba)**	**Total**
Typhlops lineolatus					1	1
Acanthocercus atricollis		2		3	2	7
Bitis nasicornis		1				1
Bitis arietans					1	1
Dendroaspis jamesonii	1					1
Pelomedusa subrufa		1				1
Naja melanoleuca	3		1	1	1	6
Philopthamnus semivariegatus	1				1	2
Psammophis sibilans	1	2			1	4
Python sebae	1					1
Trachylepis maculilabris	1				1	2
Trachylepis striata					1	1
Varanus niloticus	2					2
Total	10	6	1	4	9	30

Trachylepis maculilabris at 457141N, 26309E

Acanthocercus atricollis (male) at 465587N, 36849E

Plate 16.15 Examples of reptiles observed in the surveyed sites

Additional reptile surveys conducted in the vicinity of the Project (URS, 2015) confirmed the presence of 11 species of reptiles within and in close proximity to the Phase 1 road alignment. Of these, five species are categorised by the IUCN (2018) as Least Concern and the threatened statuses of six reptile species have not been assessed by the IUCN (species are listed in Table 16-10). Two genera of python and tortoise were not identified to species level. These reptiles are not considered to be nationally threatened according to the National Red List for Uganda (WCS, 2016).

The priority habitat and species analysis identified the potential presence of two nationally threatened reptiles in the region, Blanding's tree snakes (*Toxicodryas blandingii*) and the cape file snake (*Gonionotophis capensis*). The Blanding's tree snake is classed as Vulnerable at the national level (WCS, 2016) and inhabits montane grasslands, shrublands, tropical and subtropical moist broadleaf forests, grasslands, savannahs and shrublands. The global threatened status of this species has not been assessed by IUCN. Stands of forest and protected areas in the vicinity of the Project may offer potentially suitable habitat to support this species.

The cape file snake is listed as Least Concern by the IUCN but is categorised as Vulnerable according to the National Red List for Uganda (WCS, 2016). This species inhabits moist broadleaf forests, grasslands, savannahs and shrublands in Uganda. Cape file snakes predominantly seek refuge in holes in the ground, cavities in walls, hollow logs or in deserted termite mounds during the day and emerge at night to hunt. In Uganda, this species is known to frequently enter areas of human habitation (IUCN, 2018).

Table 16-10 Reptile species identified at eight sites within and near to the Phase 1 KJE Mainline (URS, 2015)

Species of Reptile	Common name	IUCN Status	Site Number							
			Amph -16	Amph -17	Amph -18	Amph -19	Amph -20	Amph -21	Amph -22	Amph -23
Agamidae										
Acanthocerus atricollis	Blue-headed tree agama	LC	+	+	+	+		+	+	+
Acanthocercus atricollis?	Red headed rock agama	LC	+							

Species of Reptile	Common name	IUCN Status	Site Number							
			Amph -16	Amph -17	Amph -18	Amph -19	Amph -20	Amph -21	Amph -22	Amph -23
Acanthocercus cyanogster	Black-necked tree agama	LC				+				
Lizards										
Varanus niloticus	Nile monitor lizard	NA	+	+					+	
Chameleons										
Chamaeleo gracilis	Graceful Chameleon	LC	+							
Geckos										
Hemidactylus brooki	Brooke's Gecko	N/A	+						+	+
Hemidactylus mabouia	House Gecko	N/A	+							
Tortoise (unidentified)*	-	-				+			+	
Skinks										
Trachylepis maculilabris (synonym: Mabuya maculilabris)	Speckle-lipped Skink	N/A	+	+	+					+
Trachylepis punctatissima (synonym: *Mabuya striata*, FitzSimons, 1943)	Speckled Rock Skink	LC	+			+			+	+
Lepidothyris fernandi (synonym: Lygosoma fernandi, Boulenger, 1887)	Feuerbauch-skink	NA	+	+					+	
Snakes										
Python sp.	-	-	+	+		+			+	+
Philothamnus angolensis (Bocage, 1882)	Western Green Snake	NA	+	+		+			+	+
Bitis arietans (Merrem, 1820)	Puff adder	NA	+	+	+	+	+	+	+	+

Data sourced from: URS (2015) Kampala-Jinja Expressway Environmental and Social Impact Assessment. * = species could not be identified to species level, or there is ambiguity as to the exact species of the individual identified. LC = least concern; NT = near threatened; VU = vulnerable; EN = endangered; CR = critically endangered; + = present; and NA = not assessed by the IUCN Red List of Threatened Species but are listed in the Catalogue of Life: (29th May, 2017).

16.3.3.5 Amphibians

A total of nine amphibian species, belonging to six families and six genera, were recorded during the amphibian surveys conducted for the ESIA in December 2017. Species recorded are shown in Table 16-11 and Plate 3.1. Mayanja Wetland (Kabili-Kabwuma/Munyonyo) and Kasaala Wetland (Mbalala/Wankobya) had the highest diversity with seven species each, while Sezibwa forest and wetland (Lukonge) and Kansanga (Muyenga-Bukasa) had three species each. Only two species were recorded at the Namanve site. Phrynobatrachus natalensis and Ptychadena mascareniensis were the most common species recorded in all the five sites while Amietophrynus regularis was recorded in three sites and the rest of the species were recorded once or twice.

No species of conservation concern at the national or global scales were recorded. The global conservation status of species recorded were all Least Concern (IUCN, 2018).

Table 16-11: Amphibian Species Richness of the Surveyed Sites

Count of Amphibia	Site					
Species	**Mayanja Wetland (Kabili-Munyonyo)**	**Sezibwa Forest (Lukonge)**	**Kasanga (Muyenga Bukasa)**	**Namanve Wetland**	**Kasaala (Mbalala/ Wankobya)**	**Total**
Amietophrynus regularis	1		1		1	3
Hoplobatrachus occipitalis	3				1	4
Hyperolius cinnamomeoventris					1	1
Hyperolius kivuensis	1				1	2
Hyperolius viridiflavus	1				1	2
Phrynobatrachus acridoides	1					1
Phrynobatrachus natalensis	1	1	1	3	2	8
Ptychadena mascareniensis	3	2	1	3	1	10
Xenopus victorianus		1				1
Total	11	4	3	6	8	32

The additional baseline survey undertaken in 2011 confirmed the presence of 12 amphibian species (frogs and toads) in the Project area (Table 16-12), of which, five species were recorded in the Sezibwa River (i.e. flat-backed toad, cinnamon-bellied reed frog, African groove-crowned frog and Mascarene grass frog). All species are listed as Least Concern by the IUCN Red List of Threatened Species (2018) and are not considered to be rare or threatened in Uganda (WCS, 2016), excluding the common reed frog (*Hyperolius viridiflavus*) which is listed as Data Deficient (WCS, 2016). This implies that there is currently insufficient data to determine the conservation status of this species in Uganda.

Xenopus victorianus tadpoles at 484768 E, 40020 N

Amietophrynus regularis at 456555E, 26033N

Hyperolius viridiflavus at 456552N, 26034E

Hyperolius cinnamomeoventris at 480498N, 38634E

Phrynobatrachus natalensis at 465587N, 36849E

Hoplobatrachus occipitalis at 456555N, 26033E

Plate 16-16 Amphibian species observed with in the survey sites

Table 16-12 Amphibians (frogs and toads) identified at eight sites within and near to the Phase 1 KJE Mainline

Species	Common name	IUCN Status	Site Number							
			Amp h-16	Amp h-17	Amp h-18	Amp h-19	Amp h-20	Amp h-21	Amp h-22	Amp h-23
Bufonidae										
Sclerophrys gutturalis	Guttural toad	LC	+							+
Sclerophrys maculata (synonym: Amietophrynus maculatus)	Flat-backed toad	LC	+	+	+	+	+	+	+	+
Hyperoliidae										
Hyperolius cinnamomeoventris	Cinnamon-bellied reed frog	LC	+	+	+	+			+	+
Hyperolius kivuensis	Kivu reed frog	LC	+	+	+	+	+	+	+	+
Hyperolius viridiflavus	Common reed frog	LC	+							
Hyperolius acuticeps	Sharped-headed long reed frog	LC	+					+		+
Kassina senegalensis	Senegal land frog	LC	+		+	+	-	+	-	+
Leptopelis bocagii	Bocage's Tree Frog	LC	+			+	+	+	-	-

Species	Common name	IUCN Status	Site Number							
			Amp h-16	Amp h-17	Amp h-18	Amp h-19	Amp h-20	Amp h-21	Amp h-22	Amp h-23
Ranidae										
Hoplobatrachus occipitalis	African groove-crowned frog	LC	+	+		+	+	+	+	+
Ptychadena mascareniensis	Mascarene grass frog	LC	+	+		+	+	+	+	+
Ptychadena anchietae	Anchieta's Ridged Frog	LC	+							
Phrynobatrachidae										
Phrynobatrachus natalensis	Natal dwarf puddle frog	LC	+			+				+

16.3.3.6 Fish

Nine species of fish were recorded in the surveys conducted by by Namyalo (2018; see full report in Volume C). The geographical scope of the study was limited to selected aquatic sites along the Phase 1 aligment stretch including Sezibwa River, Mayanja wetland, Kansanga Wetland (Bukasa), Nakivubo wetland (Bugolobi), Kinawataka wetland, Namanve wetland and Kasaala (Mbalala) wetlands. No species of conservation concern were identified in the surveys, with all species being classed as Least Concern on the IUCN Red List.

The additional baseline surveys undertaken in 2011 confirmed the presence of four fish species (i.e. *Protopterus aethiopicus*, *Clarias galiepinus, Clarias casonnii* and *Oreochromis leucostictus*) and 1 genus (*Barbus* sp) within the search area (Table 16-13). All captured fish were small in size indicating of over exploitation of fish stocks, as adult fish are more sought after by fishermen. An assessment of the biodiversity significance of these species is limited as the fish are not included in the National Red List for Uganda (WCS, 2016). Furthermore, only *Oreochromis leucostictus* has been assessed for global significance by the IUCN (2018) and is categorised as Least Concern.

Table 16-13: Fish species identified in aquatic habitats in the vicinity of the Project (ICS, 2015).

Site Name	Identified Fish Species				
	Protopterus aethiopicus	*Clarias galiepinus*	*Clarias casonnii*	*Oreochromis leucostictus*	*Barbus*
KJE-Aqua14			+		+
KJE-Aqua15 - Sezzibwa River		+	+	+	+
KJE-Aqua16 - Kasala stream		+	+		+
KJE-Aqua17			+		+
KJE-Aqua18					
KJE-Aqua19			+		+
KJE-Aqua20					
KJE-Aqua21	+		+		+

16.3.3.7 Alien Invasive Fauna

Coptodon rendalli (formerly *Tilapia rendaii*) is an invasive fish species recorded in the fish study by Namyalo *(2018)*. C. *rendaii* is a herbivorous species feeding on algae and other plant material. It was introduced to Uganda for aquaculture stocking, and algae and weed control in aquaculture production systems (ponds).

The baseline assessment in 2017 also confirmed the presence of the guppy (*Poecilia reticulate*) in the Nakivubo wetland & Mayanja wetlands. *P. reticulata* is listed as an alien invasive species on the Global Invasive Species Database (ISSG, 2017) which is native to Brazil, Guyana, Venezuela and the Caribbean Islands. This small benthopelagic fish is a popular aquarium species that has been widely introduced into areas to control mosquito populations. It can occupy a wide range of aquatic habitats (including fresh and brackish water). *P. reticulata* is a carrier of exotic parasites (i.e. nematodes and tapeworms) and is believed to play a role in the decline of several threatened and endangered species.

Other alien invasive species of fish, including the Nile perch (*Lates niloticus*), which are known to be present in the Lake Victoria Basin were not observed during the baseline surveys in 2011 and 2017.

The Nile perch (*Lates niloticus*) is a large freshwater fish that can grow up to 2 m in length with a weight of 200 kg and two metres in length. It is listed on the Global Invasive Species Database (ISSG, 2017), that was introduced to Lake Victoria in 1954 and has since contributed to the extinction of more than 200 endemic fish species in the Lake Victoria Basin through predation and competition for food.

16.3.4 Existing Threats to Biodiversity

Habitat quality and species diversity in the ROW and surrounding environment has been significantly impacted by anthropogenic disturbance. The region has had a long history of human habitation and thus agricultural land use has featured prominently in the area. Existing threats to biodiversity in Uganda and the ROW are listed as follows:

- The clearance of habitat for the development of agricultural land (e.g. cropping, livestock and apiary), settlements, roads and tracks (refer to Plate 16-17). Clearing is most extensive around existing settlements and adjacent to protected areas and wetlands. Within Kampala city, the wetland areas are heavily degraded largely due to urbanisation and illegal encroachment of settlements, agricultural land and clay extraction for brick manufacturing (Plate 16-18 and 16-19);
- Use of fire for the clearing of land for agro-pastoral activities and as a management tool. Bushfires have contributed to the large-scale degradation and destruction of habitats within the region. Altered fire regimes have been known to change habitat and flora composition, including changes to microclimate, soil composition and soil stability;
- Forest clearance in Uganda has been occurring for centuries however increased rates of habitat clearance are increasing pressure on natural resources. Forest are being cleared for timber, charcoal, firewood, grazing, subsistence farming and the development of settlements and industries. An estimated tropical high forest cover in Uganda has gone from 12 % in 1900 to less than 3 % in 1987, with an estimated additional 2% loss every year. The majority of forest clearance occurs on public land, however some clearance is undertaken illegally in protected areas. Areas most affected are the unprotected tropical high forests, woodland and bush (The Jane Goodall Institute Uganda, 2017). Timber extraction for charcoal production was noted in the Study Area in rural areas to the east of the Phase 1 alignment;
- Overexploitation of non-timber products has caused the degradation of some ecosystems surrounding the ROW. For example, the extraction of Papyrus canes and clay from the wetland ecosystems, for the

production of mats and bricks respectively, has led to the severe degradation in some sections of wetland habitats;

- The development of large industrial projects poses a risk to biodiversity near Kampala City where development is occurring rapidly. For example, the Namanve wetland is currently being impacted by the development of the Namanve Industrial Park to the north and other future projects planned along its central area and southern borders (e.g. Bukasa Port, Standard Gauge Railway);
- Within urban areas, the production of waste can lead to environmental degradation when it is deposited in aquatic and terrestrial environments. Within Kampala City, waste is regularly deposited into ecosystems near the ROW. Wastewater and sewage enters into the wetland habitats as well as solid wastes such as plastic, litter and cardboard;
- The accidental or intentional introduction of alien invasive species (i.e. *Mimosa pigra, Imperata cylindrica*, *Bidens pilosa*, *Eichhornia crassipes*). At present, these species appear to have a relatively restricted distribution in the Project Area (Plate 16-20). However, there is the a potential for the distribution of these species to become more widespread with an increase in human activity / in-migration and also a potential for other alien invasive species to be introduced into the area; and
- Hunting is a major threat to fauna and particularly large mammals such as sitatungas (*Tragelaphus spekii*) that are targeted by the local hunters. It was report by local villagers that the number of sitatunga in Mayanja and Namanve has drastically decreased over the past 10 years due to hunting.
- Uganda is a major transit country for East Africa's illegal wildlife trade and was among the eight countries implicated as having significant involvement in the global illegal ivory trade during the 16th Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) held in March 2013.

Plate 16-17: Clearance of wetland habitat for agriculture / settlement development in the project area

Plate 16-18: Loss of wetland habitat for making clay bricks

Plate 16-19: Yam crops planted in the Mayanja Wetland

Plate 16-20: Rubbish and water hyacinth (*Eichhornia crassipes*) in the Kinawataka Wetlands

16.3.5 Summary of Priority Habitats and Species

Habitats present in the ROW and surrounding environs is fragmented and degraded by human activities. In addition, fauna species are under constant threat from habitat loss and other sources of anthropogenic disturbance. Nonetheless, the baseline assessment identified several priority habitats and species of conservation importance for the Project. A summary of the known features of priority habitats and species are presented in Table 16-14. The effective management of these priority biodiversity values is expected to be a key issue for the permitting of the Project. Some of these habitats have also been identified as providing priority ecosystem services for the Project. These are outlined in Chapter 17 of the ESIA.

Table 16-14: Priority habitats and species for the Project

Type of Risk Receptor	Priority Biodiversity Values	IUCN Status	National Threat Status	Confirmed presence in ROW
Legally Protected Areas	Namanve Central Forest Reserve			+
Priority Natural Habitats (and fauna habitats)	Wetlands			+
	Forest habitats			+
Large Mammals	Sitatungas or marshbuck (*Tragelaphus spekii*)	LC	VU	
Birds	Hooded vulture (*Necrosyrtes monachus*)	CR	EN	+
	Grey parrot (*Psittacus erithacus*)	EN	VU	+
	Grey crowned crane (*Balearica regulorum*)	EN	EN	+
	Saddle-billed stork (*Ephippiorhynchus senegalensis*)	LC	VU	
Reptiles	Blanding's tree snakes (*Toxicodryas blandingii*)	NA	VU	
	Cape file snake (*Gonionotophis capensis*)	LC	VU	

Key: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC=Least Concern

16.4 Impact Assessment - Vegetation and Flora

16.4.1 Pre-Construction and Construction

16.4.1.1 Direct Vegetation Loss, Degradation and Fragmentation

A significant impact to remnant natural vegetation (i.e. forest, scrubland and wetlands) and flora is expected to occur during the Construction Phase when vegetation within the ROW will be cleared. Most vegetation within the direct footprint of Project will be removed resulting in the permanent loss of existing vegetation in this area. However, it is noted that some wetland areas within the parts of the expressway where viaducts will be constructed will not be completely lost as the viaducts will pass over the wetlands. The wetlands below the viaducts will be disturbed during construction activities and are expected to be rehabilitated/revegetated once construction is complete which will reduce the long-term impacts on these wetlands. Two large viaducts are planned to cross wetland areas passed by the Project ROW. One viaduct is planned to cross the Namanve wetland area between chainage KJE 9 + 000 and 11 + 000. This viaduct will elevate the road approximately 2 m above the water level and utilise concrete pylons driven down into hard rock beneath the wetland sediment and soils. Another set of viaducts are planned for the KSB to cross the Nakivubo, Kasanga and Mayanja wetlands from KSB Chainages 6 + 140 to 7 + 440, 7 + 980 to 8 + 980 and 15 + 640 to 16 + 107 respectively.

Natural terrestrial vegetation (e.g. forest and scrub) within the ROW are highly fragmented. All natural vegetation to be removed have been directly disturbed by anthropogenic sources in some way.

Only approximately 26.4% of the habitat within the ROW can be considered natural habitat (IFC PS6 Criteria, 2012). It is expected that approximately 156.6 ha of natural habitat and 436.2 ha of modified habitat will be cleared within the ROW for the construction of the Project (Table 16-15). Clearance will result in the loss of approximately 106.3 ha of wetland from the ROW, of which 33.3 ha is degraded and 39.5 ha is partially cultivated. As discussed above, some wetlands within the ROW will be rehabilitated following the construction of viaducts over the wetlands. The Project will also result in the clearance of 20.3 ha of forest (closed forest and open forest/woodland) and 3.6 ha of aquatic habitats (i.e. rivers and streams). Approximately 50.3 ha of vegetation with lower biodiversity value (i.e. scattered scrubland, fallow land and urban forest) will also be removed from the ROW.

Table 16-15: Land Use / Habitat types within the ROW

Vegetation	Area within ROW (Hectares)					
	Phase 1 Mainline	% Phase 1 Mainline	KSB Section	% KSB	Total Phase 1	% Phase 1
Modified Habitat						
Urban Forest	0.6	0.1%	5.4	4.7%	6.0	1.0%
Recreational Area	0.7	0.2%	0.4	0.4%	1.1	0.2%
Sugar Cane	0.0	0.0%	0.0	0.0%	0.0	0.0%
Plantation	10.0	2.1%	0.0	0.0%	10.0	1.7%
Fallow Land	17.9	3.8%	0.0	0.0%	17.9	3.0%
Road / Tracks	25.3	5.3%	8.7	7.5%	34.0	5.7%
Tea Plantation	28.9	6.1%	0.0	0.0%	28.9	4.9%
Industrial Land	28.8	6.0%	2.3	2.0%	31.1	5.2%
Settlement Area (Total)	68.9	14.4%	51.1	44.1%	120.0	20.2%
Cleared Land / Minor Agriculture	34.2	7.2%	14.9	12.8%	49.0	8.3%
Agro-pastoral Land	138.0	28.9%	0.0	0.0%	138.0	23.3%
Total	353.3	74.1%	82.9	71.5%	436.2	73.6%

Vegetation	Area within ROW (Hectares)					
	Phase 1 Mainline	% Phase 1 Mainline	KSB Section	% KSB	Total Phase 1	% Phase 1
Natural - Non-Wetland						
Scrubland	26.4	5.5%	0.0	0.0%	26.4	4.5%
Drainage	2.2	0.5%	1.4	1.2%	3.6	0.6%
Closed Forest	4.6	1.0%	0.0	0.0%	4.6	0.8%
Open Forest / Woodland	15.7	3.3%	0.0	0.0%	15.7	2.6%
Total	48.9	10.2%	1.4	1.2%	50.3	8.5%
Natural - Wetland						
Degraded Wetland	25.7	5.4%	7.6	6.6%	33.3	5.6%
Wetland - Partially Cultivated	17.6	3.7%	22.0	19.0%	39.5	6.7%
Wetland - Papyrus	31.4	6.6%	2.0	1.7%	33.4	5.6%
Total	74.7	15.7%	31.6	27.3%	106.3	17.9%

Vegetation clearance for the Project will result in habitat fragmentation. Residual fragments may be vulnerable to further degradation caused by edge effects (e.g. altered environmental conditions). Increased edge effects are created by the remaining fragments having a larger/longer edge than the previous patches of vegetation or continuous forest (Laurance *et al*., 2009). This will result in the edge being exposed to increased light (solar radiation), different temperatures, differing wind regimes and generally a different climate to habitats in the interior of forest patches (Murcia, 1995). Edge effects are major drivers of change in many fragmented landscapes, but the effects are often highly variable (Laurance *et al*., 2007). The new fragments may be impacted by one or a combination of increased:

- Soil erosion and sediment transport during rain events;
- Exposure to solar radiation and altered microclimate;
- Exposure to weeds and parasites carried by wind and increased traffic; and/or
- Changed risk of fire outbreaks.

Edge effects may contribute to the degradation of remnant natural vegetation adjacent to areas cleared for the Project. It is expected that this impact will be of minor significance for priority habitats (i.e. forests) since, other than Sezibwa Forest, most forest stands are located some distance from the Project.

No flora species or communities that are listed as threatened at the national or global levels were identified which will be directly impacted by the Project. The orchid *Eulophia horsfallii* has a restricted distribution in Uganda and was recorded in several wetlands in the vicinity of the ROW during the flora surveys. It is likely that some individuals of this species will be impacted by the land clearance within the ROW. Some uncertainty remains regarding the impacts of vegetation clearance on globally / nationally threatened species of flora as the global conservation status of most flora species recorded in the baseline surveys have not been assessed by the IUCN. However, apart from the orchid *Eulophia horsfallii* mentioned above, no species of high conservation significance were identified in the surveys and assessments by the flora experts for the ESIA.

16.4.1.2 Impacts on Protected Areas

No international protected areas such as sites on the World Heritage List or Ramsar Wetlands will be impacted by the Project. The Project will also not impact any protected areas of national significance such as National Parks, Wildlife Reserves or Wildlife Sanctuaries as no such areas occur in the vicinity of the Project.

The main legally protected area directly impacted by the Project will be the Namanve Central Forest Reserve. The Project alignment passes through the Namanve Central Forest Reserve for a distance of 2.5 km, resulting in disturbance to approximately 65 ha of the reserve. While the vegetation of this reserve is significantly disturbed by human activities, the ROW will impact approximately 22 ha of relatively high-quality papyrus wetlands within the reserve. This vegetation type is common in the surrounding areas, so the vegetation loss due to the Project not considered significant at the regional level. Very small patches of degraded wetlands, forest and scrubland also occur within the ROW inside the reserve (totalling 1 ha). Habitat quality has been reduced in the reserve by the encroachment of eucalyptus trees (arising from a historic plantation in the area) and the northern periphery of the reserve has been earmarked for the development of the Namanve Business Park resulting in further habitat loss and degradation. As discussed in Section 16.4.1.1, some regeneration of wetlands may occur after the construction phase for areas where viaducts are constructed.

Apart from the direct habitat loss, the most significant long-term impact on the vegetation and habitats of the Namanve Central Forest Reserve is likely to occur due to Project-induced in-migration and urbanisation which is discussed in Section 16.4.1.3 below.

In addition to Namanve Central Forest Reserve, the Project ROW will also impact the Banda Tree Nursery which is a small Central Forest Reserve area located in Kampala at chainage KJE 3+400 - 3+500. Satellite imagery (captured February 2017) indicates that the current extent of the demarcated CFR for Banda Tree Nursery (covering 2.3ha) is currently—to a large extent—settled by residences and businesses, with the nursery grounds partially falling outside of the demarcated CFR boundary. Satellite imagery indicates that the existing nursery covers an area of approximately 2.5 ha, and approximately 1 ha of the nursery will be impacted within the Project ROW.

16.4.1.3 In-migration, increased access and urbanisation

During the Pre-Construction and Construction Phase, Project-induced in-migration and urbanisation is expected to lead to an increase the exploitation of natural resources (i.e. papyrus, herbs, grasses and timber) and habitat clearance (natural and modified) due to increased urbanisation and agro-pastoral activities. In-migration may also increase pressure on the natural resources of the protected areas in the vicinity of the Project (i.e. The Namanve Central Forest Reserve and Mabira Forest Reserve). This has the potential to increase habitat loss and degradation in the vicinity of the Project. Increased natural resource collection is expected to be concentrated in natural habitats the vicinity of settlements, but may extend to protected areas. Forest stands are most likely be targeted for fruit and timber collection and wetlands are likely to be targeted for papyrus and clay extraction.

The construction of the expressway will improve accessibility to the Namanve Central Forest Reserve which may stimulate illegal exploitation of timber and non-timber forest products. If unregulated, this may further contribute to habitat degradation and a decline in species diversity and abundance in protected areas. Impacts arising from increased access are expected to be largely mitigated by the construction of a fence along the boundary of the expressway. However, access to the reserve may potentially be gained at Junction 6 of the expressway (located near the reserve) which serves the Bukasa area on the outskirts of Kampala.

16.4.1.4 Invasive Alien Species

Several alien invasive species have been recorded in the vicinity of the ROW (i.e. *Mimosa pigra, Imperata cylindrical, Bidens pilosa, Lantana camara* and *Eichhornia crassipes*). These species are aggressive competitors and as such are capable of progressively dominating areas of terrestrial and aquatic habitats (i.e. wetlands, streams and rivers). Without control, there is a risk that the movement of heavy machinery, vehicles and human activities may spread these species through the transfer of seeds and rhizomes from currently affected areas to new receptor sites. There is also a risk that the introduction of people, vehicles and goods from outside the area of the Project could result in the introduction of non-native and/or invasive plant species. Such plants can pose a threat to the floristic diversity of habitats by out competing native species. This risk is expected to be greatest during the Construction

phase when soil disturbance and heavy vehicle movements will peak. Impacts to habitats and flora arising from invasive species are expected to be of Minor to Moderate significance prior to mitigation, particularly in wetland habitats.

16.4.1.5 Aquatic Ecology

As per Chapter 15, the primary impact to surface water quality during the Pre-Construction and Construction Phase is expected to be from suspended sediments generated by earthwork activities (e.g. habitat clearance, top-soil removal, stockpiling etc.). Sediment-laden runoff from the construction site is expected to result in localised degradation of natural terrestrial habitats (i.e. forests and scrub), which is expected to be of Minor significance. Sediment-laden runoff is expected to impact downstream habitats in the locality of the Project.

Suspended sediments may adversely impact emergent and riparian vegetation in wetlands located within the ROW of the Kampala Southern Bypass (i.e. Mayanja, Kansanga and Nakivubo) and the Kampala-Jinja Mainline Expressway (i.e. Namanve and Kasala wetlands). Suspended sediments may be input into the Sezibwa River and could also potentially impact downstream water quality and aquatic habitats. If sediment levels are high, it could smother wetland vegetation if unmitigated. Impacts from suspended sediments to wetlands and other aquatic habitats and species are expected to be of Moderate significance prior to mitigation.

The roadway will act as an obstruction to existing hydrology, with potential for localised flooding upstream and the loss of perennial and/or ephemeral flow downstream of raised roadway sections. There will also likely be an interception of surface water flows in cutting sections. This may result in localised destruction of aquatic habitats and changes in the floristic composition of terrestrial habitats due to the altered hydrology.

Any spills or leaks of hydrocarbons, oils, greases, tar, asphalt, chemical surfactants etc. could contaminate receiving waters within wetlands, stream and rivers and may also result in the degradation and loss of terrestrial habitats. This impact would be of a Minor to Moderate significance for receiving habitats and flora, dependent on the pollutant type, volume and habitat type (aquatic verses terrestrial).

16.4.1.6 Air Quality Impacts on Biodiversity

Localised air quality impacts are expected to occur within approximately 50 m of the ROW (depending on weather conditions) during the Pre-Construction and Construction Phase (see Chapter 10). Fugitive dust emissions, measured as particulate matter of varying particle size (e.g. PM_{10} and $PM_{2.5}$) will be generated by land clearance and earthwork activities along the proposed expressway, access roads and at material sourcing sites (e.g. borrow pits, quarries). Construction will expose moderately large surface areas to wind erosion / dust generation. Impacts of this nature will be highest on newly created embankments and newly cleared areas along the proposed expressway. Potential dust impacts to terrestrial habitats and flora are expected to be of Minor significance in affected areas prior to mitigation.

An accumulation of dust on leaves can "clog" the stomata and thereby impact on normal photosynthetic, transpiration and cellular respiration rate (Sharifi *et al*., 1997) and finer dust can be directly taken into the stomatal openings (Farmer, 1993) adversely impacting the biological fitness of plants. Prolonged smothering can result in the death of an individual and long-term impacts can result in habitat degradation.

Habitats (i.e. stands of forest) and flora located adjacent to the ROW and access roads, including habitats in the Namanve Central Forest Reserve and Sezibwa Forest, are expected to experience the greatest impacts arising from fugitive dust during the Pre-construction and Construction Phase. However, impacts are expected to be temporary and largely limited to the timing of construction along each specific section of the expressway. Impacts to habitats and flora arising from fugitive dust may be relatively more prolonged at quarry and borrow sites which will be operational for longer periods during this phase.

Diesel powered vehicles and plant machinery will generate combustion emissions such as NOx, SO_2 and CO. Other potential emissions include volatile organic compounds (VOCs) from fuels and the laying of bituminous surfaces and other hydrocarbon spills. Respiration of oxides of nitrogen and sulphur can have serious effects on flora (Emberson *et al*., 2001). However, the magnitude of air quality impacts from the combustion of diesel fuel is expected to be relatively low during the Construction phase. Adverse impacts to local air quality will be localised and staged over a 5 year period. It is anticipated there will be a Negligible impact on flora and habitat due to exhaust emissions.

16.4.2 Operations

No additional direct habitat loss is expected to occur for the Project during Operations. However, many of the adverse impacts to terrestrial and aquatic habitat and flora which occur during the Pre-Construction / Construction Phase will continue in varying degrees and intensities into the Operation Phase of the Project.

- Increased accessibility to the Namanve Central Forest Reserve which may stimulate illegal exploitation of timber and non-timber forest products;
- Increased runoff generation from the new road surface may exacerbate local erosion and sediment runoff leading to localised terrestrial habitat loss and degradation in the vicinity of the expressway;
- Potential air quality impacts from the Mainline Expressway are predicted to occur between 10 to 100m of the roadway and are within WHO health guidelines; and
- The risk of spread and introduction of alien invasive species will be reduced due to a significant reduction in earth works, although greater vehicle use along the expressway may promote the spread of some flora species.

Ongoing rehabilitation and revegetation activities, including establishment of vegetation along the roadsides, will assist in compensating for losses during the Construction Phase, and provide habitat from some fauna species.

16.5 Impact Assessment – Fauna and Their Habitats

16.5.1 Pre-Construction and Construction

16.5.1.1 Direct Habitat Loss, Degradation of Fauna Habitats

It is expected that vegetation clearance works will result in the permanent loss of approximately 156.6 ha of natural habitat for fauna for the construction of the Project during the Construction Phase. No primary forest occurs within the ROW, and most of this habitat is significantly degraded, however the loss of natural habitats will include 4.6 ha of higher quality closed forest (primarily from Sezibwa forest) as well as a total of 33.4 ha of higher quality papyrus wetlands. The majority of these papyrus wetlands that will be impacted by the Project (22 ha) occur within the Namanve Central Forest Reserve.

Habitat loss is expected to cause the displacement of some species of fauna from the ROW. The majority of these species are widespread and common in nature. Displacement of fauna may also increase competition for resources in the area surrounding habitats, depending on the current carrying capacity (number of individuals per area/resources) of the area (Hayward *et al*., 2007). If the carrying capacity is low and resources are already limited, then competition will be high. Predation is also a likely consequence of reduced habitat size and increased fragmentation (e.g. competitor avoidance (Durant, 2000). Once an area reaches capacity, there are generally population bottlenecks, mass die offs and/or migrations away from an area.

Habitat clearance is expected to result in the loss of a small proportion of habitat for nationally and / or globally rare or threatened birds and mammals (i.e. hooded vultures, grey crowned crane, saddle-billed stork and sitatungas). Vultures can have very large territories and the loss of a small area of hunting habitat is not expected to dramatically impact foraging success (Monadjem and Garcelon, 2005), hence the impact to hooded vultures arising from habitat loss is expected to be of Minor significance. The impacts to wetland specialists such as the grey crowned crane, saddle-billed stork and sitatunga may potentially be of relatively higher significance due to limited habitat availability.

16.5.1.2 In-migration and Accessibility

Minor Project-related in-migration is expected to occur during the Construction Phase due to the influx of the Project workforce and others seeking economic opportunities to provide goods and services to support construction activities (refer Chapter 19). This minor population increase could potentially lead to an increase in the exploitation of natural resources (including hunting) and further contribute to the loss, fragmentation and degradation of fauna habitats surrounding the Project area.

Minor impacts to fauna habitat may also occur due to construction of temporary access roads for construction activities. While the direct impacts of these tracks are not expected to be significant, they have the potential to increase accessibility of natural resources within local wetlands and forests, resulting in higher levels of exploitation. Careful placement of accommodation camps, prohibition of hunting for the Project workforce and measures to minimise Project-related in-migration will help to minimise impacts on biodiversity during Construction.

16.5.1.3 Fragmentation of Fauna Habitat / Barriers to Movement

Roads, artificial structures, cleared land and fragmented habitats are known to create barriers to fauna movements. It is likely that existing settlements / cities, vehicle traffic and human activity form barriers to movement for some species in the region of the Project. Barriers to home-range use and movement can alter communication, sociality and reproduction (Taylor and Goldingay, 2010). Many species show strong avoidance of cleared areas and will avoid even narrow (<30 m wide) clearings, such as roads (see for review Laurance *et al*., 2009). Species that avoid cleared areas and roads will often align their territories along or abutting clearings and therefore clearings become significant barriers to movement (Laurance *et al*., 2009). The KJE Project will construct a large linear barrier across the landscape which has potential to prevent fauna movement across the landscape.

Barriers to home-range use and movement can alter fauna communication, sociality and reproduction and restrict access to importance food and water resources. If populations of the same species are permanently separated by artificial barriers, the resultant isolation can lead to genetic diversification and speciation in isolated populations, reduced gene flow, inbreeding or local extinction (Taylor and Goldingay, 2010). A review undertaken by Holdregger & Giulio (2010) on the genetic effects of road projects showed that roads, in particular fenced highways, can act as barriers to gene flow and therefore decrease functional connectivity, and increase the genetic differentiation between certain fauna populations, in particular large mammals and amphibians. However, they also noted that roads rarely completely prevent gene flow between populations in fauna species and in highly modified areas the road verges can actually act as corridors connecting areas of less disturbed habitat (Holdregger & Giulio, 2010).

Much of the ROW and surrounds is dominated by modified habitats and significant levels of disturbance in the region are likely to already significantly limit fauna migration. The construction of the expressway may however further compound these negative impacts on fauna by further limiting fauna movement in some areas. The proposed Project will serve as a barrier to some mammals, particularly small ranging species, and this may lead to some of the impacts highlighted above (e.g. barriers to gene flow, restriction of access to food and water resources). However, it should be noted that most fauna recorded in the direct vicinity of the ROW are common

species. No major wildlife corridors or migration routes are expected to be impacted by the expressway. Impacts on fauna movement are expected to be greatest for areas with good existing habitat continuity such as within the Namanve Central Forest Reserve. The most significant impacts are expected during the Construction Phase. The establishment of viaducts in the Namanve Central Forest Reserve will reduce the impact of barriers to fauna movement in this area during Operations as fauna will be able to pass beneath the viaduct.

16.5.1.4 Surface Hydrology and Water Quality

During the Pre-Construction and Construction Phase surface water quality is expected to be negatively impacted by suspended sediments generated from earthwork activities (e.g. habitat clearance, top-soil removal, stockpiling etc.). The ingestion of water with a high sediment content may adversely affect the health of fauna. Some species of fauna are likely to avoid using water sources with a high turbidity. Increased nutrients and turbidity from sediment runoff can also lead to the formation of blue-green algal blooms (Conley et al., 2009) which can impair water quality and adversely affect some aquatic fauna. Nutrients can also accumulate along the bottom of streams and lakes in calmer conditions and enhance eutrophication (Webster *et al*., 2001). Nitrogen and phosphorus are important nutrients in aquatic systems and phosphorus is considered the limiting nutrient for phytoplankton production in freshwater systems (Rabalais, 2002). Algal blooms are less likely to remain in systems that are periodically flooded, but may increase during the dry season, though unlikely to become extensive and problematic. The deposition of sediments in aquatic environments may result in the localised loss of benthic habitats and macrophytes which are smothered by sediment if unmitigated and may potentially impair the health of fauna e.g. macro-invertebrates and some species of fish.

The roadway will act as an obstruction to existing hydrology, with potential loss of perennial and/or ephemeral flow downstream of raised roadway sections, and interception of surface water flows in cutting sections. This could result in the loss of downstream aquatic habitats and species, and may potentially result in the loss of water resources for mammals and birds. The drainage structures integrated into the Project design are expected to reduce these impacts. The expected impact to aquatic habitats and species during construction from adverse changes hydrology and water quality is expected to be of Minor significance prior to mitigation.

Pollution of surface and ground water through accidental spills or seepages of hydrocarbons, oils, greases, tar, asphalt and/or chemical surfactants during construction could contaminate receiving waters and terrestrial habitats. It would also be detrimental to the health of fauna (i.e. mammals, birds, fish and herpetofauna) if ingested and may compound the impacts of habitat loss.

16.5.1.5 Air Quality

Fugitive dust emissions (e.g. PM_{10} and $PM_{2.5}$) and air pollutants (i.e. CO, SO_2, NOx and VOCs) will be generated during the Pre-Construction and Construction Phase (see Chapter 10) which will be short term, localised and staged over a three year period. Localised air quality impacts are expected to occur within approximately 50 m of the proposed expressway (depending on weather conditions) during the Pre-Construction and Construction Phase (see Chapter 10).

The magnitude of impacts to fauna arising from the inhalation of these emissions (dust and air pollutants) is dependent on the quantity, composition, respiratory rates and health of fauna. Emissions can cause irritation and impairment of respiratory functions, skin irritation and vision impairment of fauna. Potential impacts may be cumulative in nature. Pollutants could also be ingested (for example when deposited on plants or fruit which is then consumed) and then adversely affect the health of fauna. Impacts to priority fauna from dust and air pollutants during pre-construction and construction are expected to be of Minor significance prior to mitigation, as most fauna is expected to move away from construction areas due to noise and increased human activity.

16.5.1.6 Noise, Vibration and Airblast

Noise assessment and modelling have been undertaken and are outlined in Chapter 11. Noise emissions from the construction of the Project, which may affect fauna, will primarily be associated with the clearance of land, earthworks and transport of construction materials. Some noise is expected during the Construction phase associated with excavation of rock, road cuttings and construction of overpasses. Construction noise is anticipated to be localised and short-term, and will progress with the construction of the Project roads (see Chapter 11). Ground-borne vibrations are also expected to be generated during the Pre-Construction and Construction Phase from grading, excavation, heavy vehicle traffic and the use of pumps and generators. It is anticipated that local quarries will be utilised during construction for excavation of rock. The primary impacts of blasting will be excess noise generation, airblast, and ground vibrations. Unmitigated airblast could cause disturbance to fauna within 1–2 km of the blast site. However, blast vibrations are predicted to be imperceptible beyond 300 m of the blast site and are below Australian Standard maximum PPV (10 mm/s) beyond 50 m of the blast site (see Chapter 11).

Generally large mammals and birds are wary of unfamiliar and/or loud noise, vibration and / airblast, particularly if it is associated with anthropogenic disturbance, and are expected to respond with a flight reaction. Mammals and birds can also experience stress, reduced biological fitness and decreased breeding success (Francis and Barber, 2013). Chronic stress can make species more susceptible to diseases, pathogens and parasites (Dhabhar, 2002, Sapolsky *et al*., 2000).

Excessive noise and vibration may also compromise hearing by damaging inner-ear structures, provided that the acoustic energy is within an animal's sensory range and the animal is close to the source (Barber *et al*., 2010). The behaviour of birds and social mammals (e.g. primates) could be adversely affected if vocalisations are masked or the perception of sound is inhibited by high noise and vibration levels, as a large proportion of these species rely on acoustic signals for courtship and mating and predator detection and avoidance. Some birds and mammals are known to develop short-term adaptations to noise, such as vocal adjustments (i.e. changing song frequencies, amplitude or timing; Barber *et al*., 2010). Species that are quickly able to adapt to changes in ambient noise and vibration levels are less affected than species that are unable adapt. If noise or vibration is perceived as a threat, animals can increase vigilance and anti-predator behaviour (Francis and Barber, 2013).

Without mitigation measures, it is likely that many fauna species will actively avoid the ROW and surrounding habitat during Construction and into the Operations phase, particular in rural environments. However, some birds currently utilising habitats within and near settlements, including the highly-populated Kampala city, are accustomed to extensive human activity and high ambient noise / vibration levels and as such may not be displaced from existing habitats. Noise and vibration is however predicted to cause localised displacement of mammals and birds from their habitats in the Namanve Central Forest Reserve and Sezibwa Forest in areas directly adjacent to the ROW. Disturbance caused by noise, blasting and vibration during construction to priority mammals and birds is expected to be of Moderate significance prior to mitigation.

16.5.1.7 Light-spill

It is expected that artificial lighting will be used during construction works for any night time project construction activities and for security lighting at specific locations (e.g. entrances and exits, storage areas etc.) to ensure safety and security of personnel and property (see Chapter 13). Light-spill is known to cause disturbance to crepuscular (fauna that are active primarily during dawn and dusk) and nocturnal species (i.e. leopards, bats and some birds) and can cause a range of behavioural changes such as altered feeding and roosting patterns. For example, in the UK many diurnal bird species have been recorded singing at night time and breeding earlier in the year due to increased artificial light levels surrounding urban centres and roads (Outen, 2002). Light-spill may affect the circadian rhythms and cycles of activity of nocturnal, crepuscular and diurnal species, disruption of seasonal acclimatisation, disrupts predator-prey relationships, increase prey intake and alter reproduction behaviour (Gaston *et al*., 2013; Longcore and Rich, 2004). Many species use lightscapes (e.g. moonlight) as cues for movement

around their environment and altering these lightscapes by light pollution may disrupt these movements by disorienting the animal (Gaston *et al*., 2013). This can potentially result in physiological stress and thereby reducing biological fitness.

Negative impacts to mammals and birds inhabiting urban areas such as Kampala are likely to be minimal. However, impacts to fauna outside of urban areas and in areas such as Namanve Central Forest Reserve and Sezibwa Forest (where the use of artificial lighting is reduced) are expected to of relatively greater significance. Overall, disturbance to fauna arising from artificial lighting is expected to be of Minor to Moderate significance to fauna prior to mitigation.

16.5.1.8 Vehicle Collision

Traffic generated by the construction of the Project will predominately be associated with the transport of construction machinery, equipment and materials to site. Traffic will also be generated by worksite contractors accessing the site during the period of work (see Chapter 8). Preparatory works (i.e. habitat clearance and earth works) and the construction of the expressway and access roads will present a risk of accidental mortality and injury to mammals and birds as a result of collision with vehicles and machinery. The areas where fauna will be most at risk are the Namanve Central Forest Reserve, Sezibwa Forest and other areas of natural habitat (e.g. other areas of forest and wetland).

Ground dwelling or low-flying bird species may collide with vehicles and machinery, particularly at dusk or dawn when birds are generally more active. Hooded vultures may be particularly vulnerable to collisions as they are often feed on carrion on roads and roadsides. The mortality of vultures (i.e. hooded vultures) resulting from collisions could significantly impact the respective species' population at the local and national scales.

The likelihood of death or injury may be partly reduced as many species of fauna are expected to avoid areas of activity due to disturbances (i.e. noise, vibration, artificial lighting and presence of humans etc.). Road width, speed restrictions and traffic load affect roadkill rates (Corlatti *et al*., 2009). Most vehicles and machinery will be travelling at reduced speeds within the road construction site. Nevertheless, some fauna, particularly small mammals, reptiles and amphibians are expected to be killed or injured, especially during vegetation clearance works and night-time construction works. The expected impacts associated with potential vehicle collisions on mammals and birds is considered to be of Minor significance prior to mitigation.

16.5.2 Operations

Many impacts experienced during the previous phases will continue in varying degrees and intensities into the Operation Phase. No further direct impacts on fauna habitats will occur, however light-spill impacts and the risk of fauna-vehicle collisions will increase. The risk of further habitat degradation from Project-related in-migration will increase as the operational expressway promotes the urbanisation and growth of towns and settlements along the expressway, and particularly on the outskirts of Kampala. The following discussion of impacts during operation should be considered in addition to those impacts outlined above.

16.5.2.1 Noise, Vibration and Airblast

During operation, noise emissions will be generated by increased road traffic levels and are likely to result in nuisance noise impacts in the vicinity of the ROW along key sections (see Chapter 11). For example, modelling predicted increased roadside noise levels along the UMA to Butabika Interchange, relative to the current Kampala-Jinja Road, to exceed IFC/WHO and Ugandan daytime noise guidelines. Maximum noise levels are predicted to occur within 30 m of the highway. The proposed flyover at Kyambogo are predicted to disperse noise over a greater distance at a lower noise level. Potential noise impacts are expected to arise from increased peak hour traffic noise and night-time noise. Disturbance to fauna arising from noise emission at these sections of the Project

during operation are of Minor significance to fauna prior to mitigation as most species are likely to disperse from roadside habitats or are tolerant to noise emissions.

Fauna (mammals and birds) that are most at risk to disturbance arising from noise emissions are those species that inhabit the Namanve Central Forest Reserve and Sezibwa Forest close to the ROW. Predicted roadside noise levels are above WHO daytime noise guidelines along this section of the road during operation. Noise and vibration is however predicted to cause localised displacement of mammals and birds.

16.5.2.2 Fragmentation of Fauna Habitat / Barriers to Movement

Disturbance to fauna arising from habitat fragmentation and barriers to movement will continue into the Operation Phase and are likely to further compounded by adverse impacts from street lighting and increased volumes and speeds of vehicles. It is anticipated that roadside fencing will be installed along the length of the expressway. Barriers to home-range use and movement can alter communication, sociality and reproduction and restrict access to importance food and water resources.

The significance of impacts to fauna (mammals) inhabiting the Namanve Central Forest Reserve generating from habitat fragmentation and barriers to movement is likely to be reduced during Operations following the installation of the viaduct (at chainage KJE 9 + 000 and 11 + 000) which will elevate the road approximately 2 m above the water levels thus allowing the movement of small to medium sized fauna underneath the road. Another set of viaducts are planned for the KSB alignment to cross the Nakivubo, Kasanga and Mayanja wetlands from KSB Chainages 6 + 140 to 7 + 440, 7 + 980 to 8 + 980 and 15 + 640 to 16 + 107 respectively. These viaducts will greatly assist in reducing impacts on fauna movement in these areas.

16.5.2.3 In-migration and increased accessibility

Project-related in-migration and urbanisation close to the alignment which began in the Construction Phase is expected to continue and intensify once the expressway is operational, leading to an increase in the exploitation of natural resources due to increased urbanisation and agro-pastoral activities. This will further contribute to the loss, fragmentation and degradation of fauna habitats surrounding the Project area. This is likely to reduce the carrying capacity of some remnant habitats for fauna populations. Increased natural resource collection (i.e. fishing, hunting and fruit collection) may also impact on fauna in areas surrounding the ROW.

Mammals, birds and fish and their habitats in the Namanve Central Forest Reserve are particularly vulnerable to these impacts as the construction of the expressway will improve accessibility to this reserve. If unregulated, this could lead to a decline the diversity and abundance of fauna. Impacts arising from increased access are expected to be reduced though the construction of a fence along the boundary of the ROW for most of the expressway's length.

16.5.2.4 Vehicle Collision

During Operations, the volume and speed of vehicle traffic will significantly increase compared to the Pre-construction and Construction Phase, particularly along the eastern section of the KJE mainline. The risk to mammals and other terrestrial fauna will be low in areas where fences are constructed to stop pedestrian access to the expressway, as these fences will also provide a barrier for most fauna. However, there is a significant risk of accidental mortality and injury to birds as a result of collision with vehicles. The risk of collisions are greater at the end of the KJE mainline alignment, compared to the start of the KJE alignment and along the KSB, were fauna activity is likely to be higher due to increase habitat availability. Hooded vultures are particularly vulnerable as they are more likely to be hit by a vehicle whilst feeding on carrion on the road or beside the road (Forman and Alexander, 1998). The mortality of vultures (i.e. hooded vultures) resulting from collisions could significantly impact the respective vulture population at the local and national scales in the absence of mitigation.

Maintenance activities such as regular removal of roadkill from the expressway will assist in reducing risks to vultures and other birds of prey.

The likelihood of death or injury may be partly reduced as many species of fauna are expected to avoid areas of activity due to disturbances (i.e. noise, vibration, artificial lighting and presence of humans etc.). The development of the Namanve Central Forest Reserve viaduct and the viaducts on the KSB alignment will also minimise the risk of fauna collisions and will facilitate fauna movement across the reserve. The expected impacts associated with potential vehicle collisions on mammals and birds are considered to be of Minor- Moderate significance prior to mitigation.

16.5.2.5 Light-spill

It is anticipated that artificial lighting will be used to illuminate the entire extent of the expressway. Vehicle headlights will also contribute to light-spill arising from artificial lighting. The use of artificial lighting will result in direct effects where the light source is directly visible and would be experienced if there is a direct line of sight between a viewing location and the light source(s). Skyglow may also occur where light of sufficient strength is reflected back into the atmosphere (see Chapter 13). Skyglow occurring above poorly shielded lighting, scattered by low clouds or ambient dust can potentially increase apparent lighting impact by 40% (German Federal Ministry of Education and Research, 2011).

During the Operation's phase, light-spill and skyglow may result in a significant visual impact at night-time, leading to certain light sensitive species moving away from the area. Olsen (2002) also suggest that continuous lighting along roads can create barriers to the movement of some species (i.e. bats). Impacts to mammals and birds in the Project area from artificial lighting is expected to be a Moderate significance if unmitigated.

16.6 Avoidance, Management and Mitigation Measures and Residual Impacts

In order to avoid, minimise and offset potential ecology and biodiversity impacts, a stand-alone *Biodiversity Action Plan* has been developed for the Project (refer Volume D). The key management and mitigation measures to be included in the Plan are listed in Table 8-12 below. The residual risk or impact after implementation of the measures is also outlined.

Table 16-16 Ecology and Biodiversity Impacts - Avoidance, Management and Mitigation Measures and Residual Risk

Risk / Impact	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction and Construction Phase			
Habitat loss, degradation and fragmentation	► Avoid the use of fire and herbicides to clear vegetation ► Maintain a minimal footprint for vegetation clearance ► Avoid disturbance of ecologically sensitive areas where feasible ► Sensitive and progressive habitat clearance to facilitate fauna dispersal ► Identify and enforce no-go zones in areas of ecologically sensitive habitat adjacent to construction areas ► Workforce awareness training ► Project staff and contractors banned from collecting timber / non-timber products (NTFP) in	Negative	Moderate Unavoidable impacts will include loss of 156.6 ha of natural habitat and 436.2 ha of modified habitat. Displacement and dispersal of fauna will also occur from construction areas. Where viaducts area constructed over wetlands (such as in Namanve CFA), this will reduce the residual loss of wetland habitats.

Risk / Impact	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	the vicinity of the Project including protected areas ► Progressive revegetation of disturbed areas. ► Establish roadside vegetation where practicable. ► From the edge of the road area to the boundary of the right-of-way, vegetation to be structured with smaller plants near the road and larger trees further away to provide habitats for a wide variety of plants and animals ► Implementation of Biodiversity Offset Strategy as outlined in the *Biodiversity Action Plan* (refer Volume D).		
Project-related in-migration, increased access and urbanisation	► Locate temporary accommodation camps away from protected areas and other priority habitats where feasible ► Implement measures in Chapter 19 to minimise Project-related in-migration ► Strict ban for natural resource harvesting (such as hunting, wildlife trade) for all Project workers ► Installation of fencing along roadway to restrict access to protected areas and other priority habitats	Negative	Minor Minor impacts on forests and wetlands are expected to occur due to increased utilisation of natural resources resulting from the presence of the construction workforce
Alien Invasive Species	► Establish wash-down bays and ensure vehicles are inspected before entering work sites and washed down where needed to remove seeds and rhizomes ► Inspect sites that are sources of construction materials such as borrow pits to ensure that there are free of any invasive species ► Ensure non-invasive species used for revegetation and roadside plantings ► Implement an invasive species eradication program within the Project Footprint ► Report any identified invasive species to District local government for long term management	Negative	Minor Even with the diligent implementation of management measures some introduction and spread of invasive species is likely to occur.
Disruption of fauna migration / barriers to movement	► Ensure design includes the development of the Namanve Central Forest Reserve viaduct (and other planned viaducts) to facilitate fauna movement ► Establish roadside vegetation where practicable. ► Progressive revegetation of disturbed areas. ► Construct culverts at all stream crossings.	Negative	Minor Establishment of the Project Footprint will create a large barrier to fauna movement. During construction this will include disruption of fauna movement between the southern and northern sections of Namanve Central Forest Reserve. Impacts will be reduced during operations as species will be able to pass under viaducts in areas where these are established.
Impacts on aquatic fauna from changes to surface hydrology and water quality	► Implement surface water mitigation measures outlined in Chapter 15	Negative	Minor-Moderate Minor to moderate impacts on local aquatic fauna are expected due to the Project, particularly from loss of wetlands and erosion and sedimentation during construction. The level of impact will depend on how diligently mitigation measures implemented.
Impacts on biodiversity from changes to air quality	► Implement air quality mitigation measures outlined in Chapter 10 ► Implementation of a progressive revegetation scheme.	Negative	Minor Minor dust impacts on vegetation located directly adjacent to work areas will occur during construction due to dust deposition.

Risk / Impact	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Impacts on biodiversity from changes to noise, vibration and airblast	► Implement noise and vibration mitigation measures outlined in Chapter 11	Negative	Minor Minor impacts on local fauna will occur due to noise from construction activities (particularly piling and blasting) which will result in fauna moving away from construction areas.
Impacts on biodiversity from light-spill	► Implement measures for lighting outlined in Chapter 13	Negative	Minor Minor impacts on local fauna will occur due to light spill from construction areas. This will benefit some species and disadvantage others.
Impacts on biodiversity from vehicle collisions	► Prohibit driving at night in the construction site near priority fauna habitats ► Enforce reduced speed limits in the construction site ► Driver awareness and training regarding fauna collisions	Negative	Low Risk A low risk of fauna injury or mortality will remain for construction areas.
Operations			
Habitat loss, degradation and fragmentation (ongoing from Construction Phase)	► Continued revegetation of areas temporarily disturbed during construction ► Continued establishment and maintenance of roadside vegetation ► Implementation of Biodiversity Offset Strategy as outlined in the *Biodiversity Action Plan* (refer Volume D).	Negative	Minor Habitat loss, degradation and fragmentation impacts from the Construction Phase will carry over into Operations. No additional habitat loss or fragmentation is expected to occur during Operations. Habitat restoration will reduce overall residual impacts.
In-migration, increased access and urbanisation	► Installation of fencing along roadway to restrict access to protected areas and other priority habitats	Negative	Minor Minor impacts on forests and wetlands are expected to occur due to increased utilisation of natural resources resulting from increased accessibility from the Project
Alien Invasive Species	► Implement ongoing weed eradication programme along roadsides as part of maintenance activities	Neutral	Negligible Negligible additional introduction or spread of weed species is expected with implementation of an effective weed control programme along roadsides.
Disruption of fauna migration/ barriers to movement	► Progressive habitat restoration and implementation of a revegetation scheme. ► Development of the Namanve Central Forest Reserve viaduct to facilitate fauna movement ► Minimise artificial lighting in the Namanve Central Forest Reserve, and where lighting is required only use capped and directional lighting	Negative	Moderate Establishment of the ROW will create a large barrier to fauna movement. In particular this will include reducing the ease of fauna movement between the southern and northern sections of Namanve Central Forest Reserve. No significant fauna migration routes or biodiversity corridors are expected to be disrupted.
Impacts on aquatic fauna from changes to surface hydrology and water quality	► Implement surface water mitigation measures outlined in Chapter 15	Negative	Minor Minor impacts on aquatic fauna are expected, particularly from continued loss of wetlands and changes in hydrology
Impacts on biodiversity from changes to air quality	► Implement air quality mitigation measures outlined in Chapter 10 ► Implementation of a progressive revegetation scheme.	Neutral	Negligible No significant impacts on biodiversity from changes to air quality are expected during Operations.

Risk / Impact	Key Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Impacts on biodiversity from changes to noise, vibration and airblast	► Implement noise and vibration mitigation measures outlined in Chapter 11	Negative	Minor Minor impacts on local fauna will occur due to increased noise from traffic which will result in some fauna moving away from the Project area. Fauna may become habituated to road noises over time.
Impacts on biodiversity from light-spill	► Implement mitigation measures for lighting outlined in Chapter 13	Negative	Minor Minor impacts on local fauna will occur due to light spill from road lighting.
Impacts on biodiversity from vehicle collisions	► Consider installation of fencing along the road verge for ecologically sensitive habitats to limit vehicle collisions with medium/large sized mammals ► Ensure the maintenance program includes regular removal of any roadkill from the expressway will assist in reducing vehicle collision risks to vultures and other birds of prey ► Install wildlife warning signage at ecologically sensitive areas e.g. Sezibwa forest where medium/large mammals were observed.	Negative	Low Risk Limited fauna movement across the carriageway is expected, especially if the expressway is fully fenced as planned. A low risk of collisions with fauna will remain, particularly for birds of prey.

16.7 Conclusions

Habitat condition varies throughout the ROW. Baseline surveys and assessments clearly identified that natural habitats located within the ROW are significantly impacted by anthropogenic activities resulting in habitat degradation, loss and fragmentation and remnant patched of higher quality habitat are under threat.

No international protected areas or nationally significant protected areas such as National Parks, Wildlife Reserves or Wildlife Sanctuaries occur in the vicinity of the Project. The main protected area impacted by the Project is the Namanve Central Forest Reserve, with the ROW potentially resulting in disturbance to approximately 65 ha of the reserve. While the vegetation of this reserve is significantly disturbed by human activities, the ROW will impact approximately 22 ha of relatively high-quality papyrus wetlands. A small area of the Banda Tree Nursery (approx. 1 ha) in Kampala will also be directly impacted by the ROW, which is also a designated Central Forest Reserve.

The baseline assessment identified the presence of several priority habitats and species which are of high biodiversity value for the Project. Wetlands are a priority biodiversity feature for the Project as they are characterised by a high diversity of flora and are an important refuge for fauna (i.e. wetland specialist birds, mammals and aquatic fauna). The Namanve Central Forest Reserve contains higher quality wetland habitat compared to other wetlands intersected by the ROW (i.e. Mayanja, Kansanga, Nakivubo and Kinawataka wetlands). Baseline surveys also confirmed the presence or likely occurrence of several nationally and / or globally rare or threatened birds and mammals within the project area (i.e. hooded vultures, grey crowned crane, saddle-billed stork and sitatungas).

In total, vegetation clearance and the construction of the Project is expected to result in the loss of approximately 156.6 ha of natural habitat (i.e. wetlands, forest and scrubland) and 436.2 ha of modified habitat, including the clearance of approximately 72.8 ha of degraded/cultivated wetland and 33.4 ha of higher quality wetland from the ROW. The higher quality wetlands impacted by the Project occur mainly in the Namanve CFR. The hydrology of some wetlands will be partially restored during the Operations phase in areas where viaducts are constructed, which will minimise long term impacts on key wetlands such as those within the Namanve CFR. All natural habitats

to be removed from the ROW have been directly disturbed by anthropogenic sources in some way, but some retain important biodiversity values.

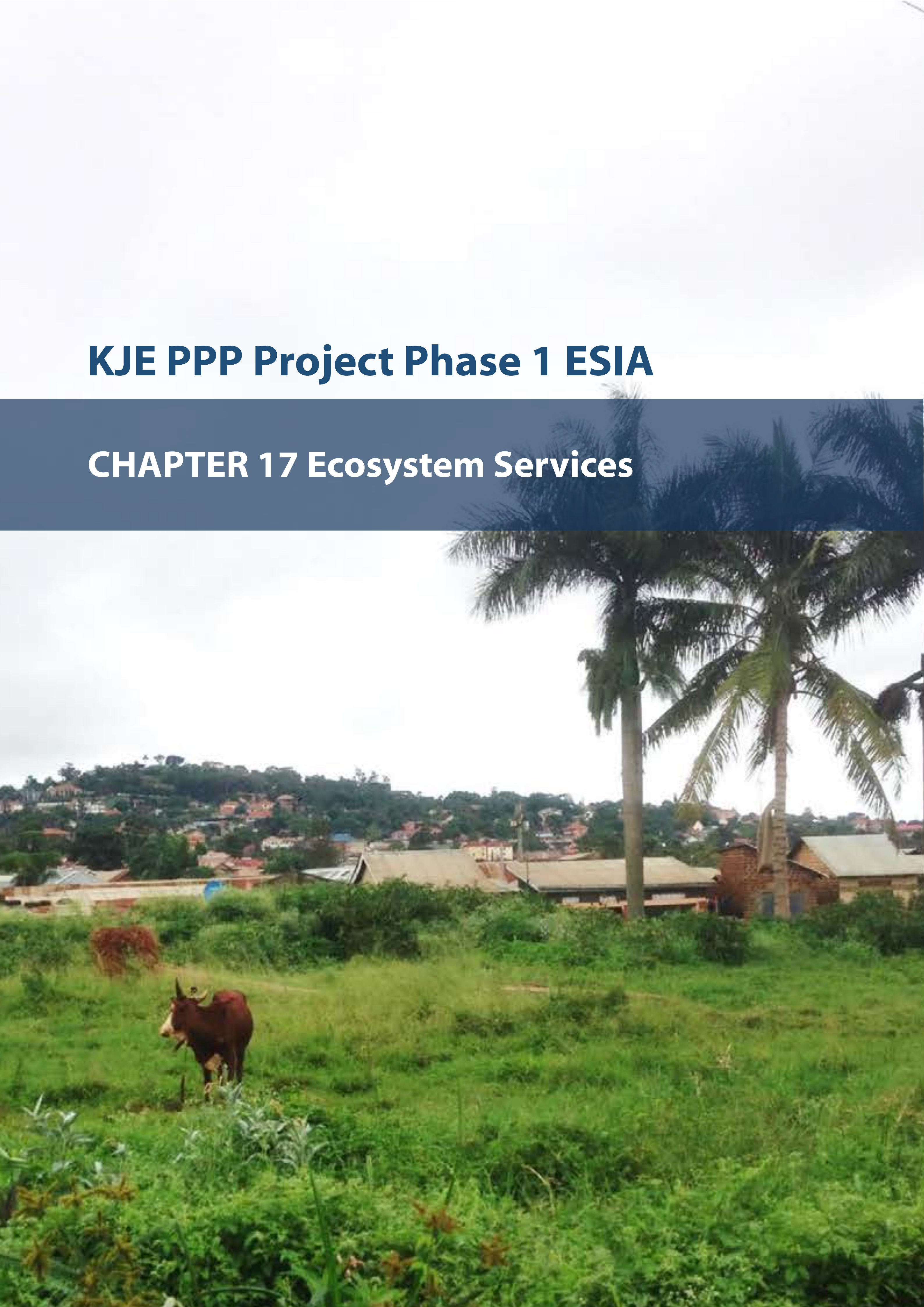
Habitat clearance and disturbance arising from noise, vibration, airblast, light-spill, human activity etc. generated during construction will result in the displacement of fauna and the permanent loss of a small proportion of habitat for nationally and / or globally rare or threatened birds and mammals (i.e. hooded vultures, grey crowned crane, saddle-billed stork and sitatungas).

There is a significant risk of accidental mortality and injury to mammals and birds as a result of collision with vehicles during operation and the proposed road will fragment habitats and is likely to act as a barrier limiting the movement of fauna in some areas.

The Project is aligned with best practice with plans to avoid, minimise and restore adverse impacts to biodiversity. However, it is recognised that even after all feasible mitigation is put in place, residual impacts will remain for some priority habitats and species. A key priority for the Project is the conservation of priority habitats (particularly wetlands) and species including the Critically Endangered hooded vulture, the Endangered grey crowned crane and the Endangered grey parrot. It is therefore recommended that UNRA follow industry good practice guidance on biodiversity to develop and implement a biodiversity offsets programme that adequately compensates for significant residual impacts as part of the *Biodiversity Action Plan* for the Project (refer Volume D).

KJE PPP Project Phase 1 ESIA

CHAPTER 17 Ecosystem Services



17. ECOSYSTEM SERVICES

17.1 Study Area

The area studied to create a baseline for ecosystem services and to inform likely Project impacts included the ROW and surrounding areas where ecosystem services, land or communities are likely to be affected by the Project's activities. Due to the complex nature of ecosystem services forming as a result of interactions between the biotic and abiotic components of the environment, the area studied incorporates Study Areas investigated for other environmental and social parameters (see the respective chapters) but also takes a national or global approach in some instances.

17.2 Methodology

17.2.1 IFC Performance Standard 6

IFC Performance Standard 6 outlines several requirements related to ecosystem services including the requirement for a full consideration of a project's impacts on ecosystem services, an outline of management and mitigation measures to reduce these impacts and a determination of residual impacts likely to occur as a result of the project's implementation. This will also include an identification of priority ecosystem services, the criteria for which is outlined below. The following text from IFC (2012) outlines these requirements:

- *The risks and impacts identification process as set out in Performance Standard 1 should consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts. This process will consider relevant threats to biodiversity and ecosystem services, especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution*
- *As a matter of priority, the client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented*

Some areas of habitat and land use may be particularly important for the provision of ecosystem services and identified as priority areas/services for the Project. Priority ecosystem services are designated in IFC Performance Standard 6 (2012) as two fold:

- *"Those services on which project operations are most likely to have an impact and, therefore, which result in adverse impacts to Affected Communities; and/or"*
- *"Those services on which the project is directly dependent for its operations (e.g., water). When Affected Communities are likely to be impacted, they should participate in the determination of priority ecosystem services in accordance with the stakeholder engagement process as defined in Performance Standard 1"*

Where impacts on priority ecosystem services are significant, or where the effects on ecosystem services are of relevance to affected communities, the Project should aim to avoid all adverse impacts (IFC, 2012) through an appropriate implementation of the mitigation hierarchy. Where these impacts cannot be avoided IFC PS6 outlines that *"the client will minimise them and implement mitigation measures that aim to maintain the value and functionality of priority services."*

17.2.2 Ecosystem Services / Millennium Ecosystem Assessment

Ecosystems provide more than the resources needed for material welfare and livelihoods. In addition to supporting all life and regulating natural systems, they specifically provide benefits to people through services including the goods produced by the environment, the results of environmental regulatory processes, cultural benefits and supportive services. Thus, ecosystem services can be defined as the benefits humanity derives from natural ecosystems. The Millennium Ecosystem Assessment in 2005 looked at the state and type of services provided by the world's ecosystems. The services were grouped into four (4) categories:

Provisioning

- These are the direct products people obtain from ecosystems including food, water and non-timber forest products.

Regulating

- The ecosystems also provide a number of regulating services which help regulate environmental processes. These include the regulation of climate as well as disease and pest control.

Cultural

- Ecosystems also provide a number of cultural benefits. For example they may hold important spiritual or religious significance and / or provide habitat for important charismatic, culturally important species.

Supporting

- These are supporting services provided by ecosystems that help maintain the other services. This for example includes the pollination of crops and the production and regulation of soil which is vital for agricultural production.

IFC Performance Standard 6 provides the following definition of Ecosystem services which are concurrent with categories outlined by the Millennium Ecosystem Assessment in 2005:

"Ecosystem services are the benefits that people, including businesses, derive from ecosystems. Ecosystem services are organised into four types: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services." (IFC, 2012)

This chapter will utilise this framework for the discussion of ecosystem services within and surrounding the Project Footprint in line with requirements set out in IFC PS6.

17.2.3 Literature review

A background literature review was conducted of previous Project documentation and relevant scientific literature to determine baseline conditions for ecosystem services in the Project Footprint and surrounding environment. This chapter incorporates information from other relevant chapters in the ESIA and frames the information in terms of ecosystem functions and services – services provided by ecosystems that benefit the surrounding human population.

17.2.4 Village Surveys

Local Knowledge Surveys to collect additional information on ecosystem services (provisioning services) were conducted in villages at intervals along the alignment. Villages surveyed included Kibiira A (Mayanja wetland), Wankoba (Mbalala wetland), Busiba (Mukono), and Bukasa (Namanve Wetland). Interviews were conducted with a focus group at each village consisting of village representatives knowledgeable about plant and animal use in the village (including both males and females). Questionnaires were used to collect information on hunting, plant use, and fishing. Example photographs of plants/animals/fish and reference books were also used to help in identification of species.

Additional information on ecosystem services were also gained from interviews with villagers and tourist guides conducted as part of the biodiversity surveys (refer Chapter 16), as well as during the socioeconomic surveys conducted for the ESIA (refer Chapter 19).

17.2.5 GIS Analysis

A detailed analysis of land use and habitat type was conducted using satellite imagery of the ROW in GIS software (refer Chapter 7). This imagery varied in date between 2015 and 2017 depending on which imagery was most recently available (Google Earth, 2017). Areas where classifications were not clear from satellite imagery (such as in some plantation and wetland areas) were ground-truthed in fieldwork exercises in June 2017 to record further information on habitat type, main floristic composition and degradation processes. This habitat and land use mapping exercise supports the discussion of ecosystem services provided for the area surrounding the Project including the types and extent of ecosystem services provided.

17.3 Baseline Conditions

17.3.1 Provisioning Services

Communities living in and surrounding the proposed ROW for the Project rely on the environment for several provisioning services. This includes agricultural production and the hunting/farming of fish in wetlands and Lake Victoria. The importance of the provisioning services to local villages was higher in the mostly rural areas in the easterly sections of the Project alignment. Areas closer to Kampala and along much of the KSB alignment are heavily populated meaning that much of the land traversed by the alignment is urbanised, severely degraded and of less importance for provisioning services. Communities living in these more urban areas rely on food and agricultural products produced elsewhere, although small scale agricultural production on available land is still common in some areas.

Key provisioning services provided by the environments within the proposed ROW are summarised below.

17.3.1.1 Agricultural Production

Agriculture is prevalent along the alignment and most households that have adequate land also grow some form of crop for subsistence use and/or sale. This is more common in the mostly rural easterly sections of the KJE mainline where there is more land per household and many areas of degraded habitat suitable for conversion to agricultural land. Common crop types found along the alignment included a range of grains, tubers, fruits and herbs suited to growing in the tropical climates around Kampala. For example these included:

- Banana (*Musa sp.*);
- Sugar Cane (*Sacchurum officinarum*);

- Tarrow (*Colocasia esculenta*);
- Sweet Potato (*Ipomoea batatas*);
- Coffee (*Coffea arabica*)
- Maize (*Zea mays*);
- Pumpkin (*Curcubita pepo*); and
- Watermelon (*Citrullus lanatus var. lanatus*)

Small areas of agroforestry were also noted during fieldwork exercises. In these systems, large tree crops such as banana and jackfruit were grown above a layer of ground cover crops including tomato, pumpkin and maize.

Agricultural production within the ROW and the surrounding areas is discussed in detail in Chapter 7 (Land, Assets and Infrastructure).

17.3.1.2 Hunting

Numerous fauna species are known to use the habitats surrounding the Project Area (see Chapter 16). Based on the findings of the Local Knowledge Surveys, hunting was conducted in all villages surveyed and particularly in rural areas located in the eastern part of the Project alignment. Hunting is usually conducted by men, mainly in the dry season. The frequency of hunting was variable between villages and ranged from twice per week in Bukasa village (Namanve Wetland) to monthly in Wankoba village (Mbalala wetland). Some villages such as Wankoba indicated that they also hunt in the wet season on a quarterly basis. The sitatunga (*Tragelaphus spekii*) was reported to be the main animal hunted, followed by the bush buck (*Tragelaphus scriptus*). Areas used for hunting include the area of the ROW as well as surrounding areas.

Villages in rural areas generally reported that approximately 30% of food consumed in the dry season was from hunting, indicating that wild animal meat makes a small but not insignificant contribution to protein intake for rural villages in the dry season. In more urbanised areas, hunting was rarely conducted by villagers due to the lack of nearby suitable fauna habitat. Notably, Wankoba village (Mbalala wetland) reported that 70% of meat consumed is from hunting, which indicates that in some villages hunting still plays a primary role in providing protein for subsistence use.

Most villages primarily rely on domestic animals for their subsistence protein supply (e.g. cattle, goats and chickens). From an ecosystem services' perspective, it should however be noted that these domestic animals utilise grasslands, wetlands and other resources from the natural environment for food.

17.3.1.3 Fishing

Based on the findings of the Local Knowledge Surveys and the fish surveys conducted for the biodiversity studies as part of the ESIA (refer to Chapter 16), fishing is conducted by the villagers in rural areas along the Project alignment on approximately a weekly basis, although it is conducted daily in some villages such as Bukasa (Namanve Wetland). Fishing is conducted by groups of men, however women reportedly help with the smoking of the fish in some villages. Fishing is conducted in all seasons, but is mostly conducted in the dry season when the low water levels make it easier to catch fish. Fishing is primarily conducted in the local wetlands close to the villages, with some villages also reporting that they fish in Lake Victoria. Additionally, villages close to Sezibwa river indicated that the river is the primary water source used for fishing. The most common way to catch fish is with hooks, however baskets and spears are also used. The fish is either consumed as food or sold.

The proportion of protein intake reportedly sourced from fish was variable between villages, and ranged from 5% in Busiba village up to 70% in Kibira A village. This indicates that fishing is of significant importance to subsistence

food sources in some villages but is not important in other villages. Commonly caught fish include cichlids (such as Tilapia), *Clarias* spp. and *Protopterus aethiopicus*.

Fish farming is not common in the vicinity of the ROW but was observed at one location within the outskirts of Mayanja wetland as well as within Namanve wetland. The fish farm in Mayanja wetland consisted of dug-out ponds. The source of water for the dug-out ponds is a local creek, and fish are naturally stocked by the system. No supplementary feeding is provided to the fish. Fish species within the fish farm included *Oreochromis leucostictus, Pseudocrenilabrus multicolor, Protopterus aethiopicus* and *Clarias gariepinus*.

Additionally, in the wider area surrounding the Project, fish and other aquatic resources provide important provisioning services. Lake Victoria contains a large and diverse community of aquatic fauna consisting of hundreds of cichlid fish species as well as 46 cyprinids, catfish and other fish species (Kolding et al, 2008). Massive ecosystem change caused by the damming of the Nile and by the introduction of the Nile Perch to the lake occurred in approximately 1950. The introduction of the perch is thought to have contributed to the decline of the native haplochromine cichlid fauna meaning that now the ecosystem is comprised predominately of four fish species, although remnant populations of many of the cichlids still exist. This change in aquatic faunal assemblage led to impacts on the fisheries of the lake - fisheries of native stocks started to decline, but in the 1980s a new Nile Perch fishery started to emerge creating employment for many people surrounding the Lake that total catches on the lake reached over 1 million tons per year. These catches were predominately of Nile Perch, *Rastrineobola* and Nile Tilapia (Kolding et al, 2008). The Lake Victoria fisheries are now important for the livelihoods of many people living around Lake Victoria, although these fisheries are threatened by overexploitation and eutrophication of the lake ecosystems.

17.3.1.4 Timber and Charcoal

Much of the area surrounding the Project is highly degraded and has been modified by agricultural activities and land clearance. As a consequence, some areas which would previously have been forested have been converted into a semi-natural agricultural landscape. Wide-scale logging or land clearance is not common in the vicinity of the Project but does occur in some areas. For example, Plate 16-1 shows timber extraction and agricultural land conversion near KJE mainline Chainage 32 + 000.

Based on the Local Knowledge Surveys conducted, timber collection by local villages near the Project is mainly for firewood. Both men and women collect timber for firewood in areas surrounding the village, including within the proposed Project Footprint. The wood is mostly used for cooking but is sometimes sold or used to make charcoal.

Charcoal is produced through a process known as slow pyrolysis where the timber is burned at high temperatures (~300°C) in the absence of oxygen. This causes the carbon in the plant material to become fixed in a more stable, solid form (charcoal) which is utilised by local residents for cooking. Charcoal is the main source of energy used for heating of water and cooking in households within and near the ROW as other sources of energy such as gas and electricity are not affordable for most of communities in along the ROW. During field surveys a charcoal kiln was observed near Sezibwa secondary forest (Plate 17-3).

There are some small areas of *Eucalyptus* plantation along the alignment (e.g. KSB Chainage 14 + 600) and many other plantations on land surrounding the alignment (e.g. 200m SW of KJE Chainage 13 + 000). *Eucalyptus* trees are a widely used plantation crop, utilised for their fast growth and good timber qualities. However, eucalyptus plantations can have detrimental environmental effects such as increased water use, although these are likely to be minimal near the Project Area due to the low occurrence of plantation crops.

Plate 17-1: Land recently cleared for timber extraction and charcoal production approximately 300m South of KJE Chainage 32 + 000.

Plate 17-2: Clearance of wetland habitat for agriculture / settlement development in the project area Chainage 31 + 500.

Plate 17-3: Abandoned charcoal kiln close to Sezibwa secondary forest Chainage 32 + 800.

17.3.1.5 Other Non-Timber Forest Products

Several other products are obtained from the ecosystems surrounding the Project. These include the making of bricks (Plate 16-4) from wetland soils and the collection of plants.

Based on the Local Knowledge Surveys conducted, plant collection in the villages surveyed in rural areas is mainly done by women, but also by men in some villages. Plants collected varied between villages, however the most commonly collected plant was Ekitogo (papyrus cane) (plate 16-5) which is collected on a daily basis for making mats. Ensansa (palm fronds) were also reported as being collected on a weekly basis for making mats for sale.

These plants are collected all year round but mostly in the dry season. The areas used for plant collection include the wetlands and forests within the footprint of the proposed Project as well as surrounding areas (generally within 1km of the villages). Villages reported that a small proportion of food intake (0% to 20%) is from wild plant collection, and included a variety of wild fruits and vegetables (e.g. wild yam). Some villages also reported that plants are collected for medicine, however this was rarely done.

Papyrus canes (*Cyperus papyrus*) are commonly harvested from wetlands in and surrounding the Project ROW. The stems of the plant are harvested and stripped of leaves. The canes are then dried and utilised to make mats and baskets. In some areas along the alignment, *Papyrus* is not a common species - especially where wetlands have been encroached by settlements and agricultural land - partly due to overharvesting of *Papyrus* stems (refer Flora Specialist Report for Phase 1, Volume C).

Brick making is a common livelihood activity in wetland areas traversed by the alignment. This practise involves the removal of wetland soil and the firing of bricks in rudimentary kilns, often made from other bricks produced previously by the process. The bricks are then sold in local towns and villages for construction activities. The bricks vary in quality with the best quality bricks made from 100% clay material. The communities harvest this clay, compact it into brick shaped moulds and then fire these clay bricks in kilns. This process can lead to the formation of ponds within or near wetland habitats and in some cases can lead to rapid environmental degradation.

Plate 17-4: A Clay Brick kiln along the KJE Mainline Alignment Chainage 19 + 000.

Plate 17-5: Papyrus plants in a wetland near the Project Footprint Chainage 9 + 300.

17.3.1.6 Water

Water use varies across the Study Area with water extraction from springs, shallow wells and deep boreholes being the most common forms of water sources in the districts affected by the Project (MWE, 2017). It is thought that none of the communities get water directly from the wetlands for consumption, although some communities utilise springs which rely on the wetlands for recharging. The districts have several water pipeline projects but a varying percentage of the population with access to safe drinking water (87% Kampala; 74% Mukono; 42% Wakiso; 56% Buikwe). The quality of these water sources is linked to the state of the surrounding environment. It is likely that in many areas, soil erosion, nutrient influx and poor waste management have caused water quality to be substantially affected in areas along the ROW, but particularly in the urban areas along and near to the KSB and

the start of the KJE Mainline near Kampala (Natumanya et al, 2010). During the dry season, farmers utilise water from wetland areas to irrigate their fields (see Flora Specialist Report for Phase 1, Volume C).

17.3.1.7 Genetic Resources

Flora surveys revealed that ecosystems surrounding the Project contain a diversity of plant species (refer to Chapter 16). Each of these species will contain genetic information and variants that may be useful for future generations. For example, wild Sorghum (*Sorghum arundanaceum*) was recorded in one of the wetlands, populations of which may contain genetic information useful for plant breeding (see Flora Specialist Report for Phase 1, Volume C). No endemic or restricted range plant species were identified that may be significantly affected by the Project.

17.3.2 Regulating Services

17.3.2.1 Water purification and pollutant removal

In Kampala a large amount of industrial, domestic and sewage waste and wastewater flows directly into wetland environments where historically many of the pollutants and excess nutrients would have been removed from the water before flowing into Lake Victoria.

Wetlands use physical, biological and chemical processes to remove pollutants – including excess nitrogen (N) and phosphorus (P) which can occur at high levels due to the fertilisation of agricultural land and the input of sewage waste into the environment. The wetlands also help to remove heavy metals from the water stream by converting them from soluble to insoluble forms. Lastly, the wetlands promote the sedimentation of suspended solids and bacteria from the water stream and once this matter is deposited it allows for their subsequent biodegradation (World Bank, 2015).

The majority of wetlands along the KJE alignment link directly to the Lake Victoria ecosystem (e.g. Kinawataka wetland, Nakivubo wetland, Mayanja wetland, Namanve wetland). These wetlands are important for the purification and removal of pollutants from water streams flowing from the urban areas of Kampala towards Lake Victoria. The Nakivubo channel is a major channel funnelling waste water from Kampala to Lake Victoria and it has been estimated that the water purification services provided by this wetland had a replacement cost of between 1,000,000 USD and 1,750,000 USD per year in 2003 (IUCN, 2003).

However, in Kampala, the wetland environments are very degraded. Nutrient loading has occurred and some wetland systems are saturated with N and P from wastewater (Natumanya et al, 2010). The wetlands are also being degraded due to urbanisation processes (residential and industrial), infilling of wetlands and the expansion of agricultural land. The water purification services provided by these wetlands are being slowly diminished.

17.3.2.2 Regulation of soil erosion

Soil is a vital part of the ecosystem - being necessary for the growth of agricultural crops in areas across the world. If soil is lost from an ecosystem it can take many years to reform and an area can be left unsuitable for agricultural production. Thus, the prevention of soil erosion is an important ecosystem service provided by vegetated landscapes to maintain soil levels and prevent the sedimentation of water courses. Vegetated ecosystems in and surrounding the ROW, particularly those on steep slopes, provide services to prevent soil erosion with plant root networks acting to stabilise the ground. In the case of areas of steep gradients within Kampala city surrounding the ROW, most have already been cleared of vegetation for urbanisation (e.g. Kasokoso) and soil erosion in these urbanised areas appears to be severe (Plate 16-6).

Plate 17-6: Soil erosion along a steep slope in Kampala.

17.3.2.3 Flood prevention

Kampala is a city built on several large hills surrounded by valleys which were previously filled with wetland habitats. These wetlands are important for the collection and slow release of flood water during high intensity rainfall events and so can help regulate the extent and severity of flooding in the landscape. As these wetlands have been degraded in much of Kampala City, they have become less effective at dealing with flood waters and thus flooding events are common across the city. The people living in reclaimed wetlands along the alignment (e.g. Kasanga wetland, Kinawataka wetland) are prone to being affected by these flooding events due to the location of their houses within areas of low-lying agricultural landscapes. As wetland degradation continues across Kampala, this ecosystem service will continue to be degraded and flooding events may become more extreme if sound drainage systems are not installed.

17.3.2.4 Waste decomposition / detoxification

Ecosystems also provide waste decomposition services and detoxification of waste streams. In the Project Area, black kites and Marabou storks are often seen feeding on dead animals at the side of the road and vultures are known to inhabit areas surrounding the Project. These scavengers can help remove these potentially dangerous waste streams and prevent the spread of associated diseases.

Waste streams (e.g. grey water / sewage) also flow into wetland ecosystems in Kampala. As discussed in Section 17.3.5, these ecosystems act to purify the liquid wastes and remove pollutants before the water enters Lake Victoria.

17.3.2.5 Air Quality

Urban areas can have high levels of air pollutants including ozone (O_3), sulphur dioxide (SO_2) and particulate matter ($PM_{2.5/10}$) released from industrial and vehicular sources. On a global scale, natural environments help regulate the composition of the atmosphere but they also have local effects on air quality which can be beneficial for human populations.

For the areas in the vicinity of the Project, one of the most important ways that vegetation serves to reduce adverse air quality is by stabilising soils and thus reducing dust generation. In addition, as trees and other natural vegetation have such a large surface area they can cause the deposition of large amounts of particulate matter on their surfaces. For example, a recent study in Italy showed that trees and green barriers could effectively remove particulate matter from the atmosphere and could therefore reduce levels of urban air pollution in Rome (Silli et al, 2015).

Small areas of vegetation exist adjacent to the road in Kampala city and larger areas of vegetation are present in wetland habitats and agricultural landscapes to the east of the KJE mainline alignment which may help reduce the severity of particulate matter pollution. This regulating service is potentially very important, particularly in the highly populated urban areas traversed by the Project especially where particulate matter concentration is likely to be high. Particulate matter in urban areas causes adverse health effects in both developing and developed countries including respiratory and cardiovascular diseases (WHO, 2005). Green barriers and vegetation may also be able to prevent particulate matter from roadside pollution travelling large distances from the road thereby representing a potential health benefit.

17.3.3 Supporting Services

A variety of supporting services will be provided by ecosystems in the Project Area from nutrient recycling to pollination and seed dispersal. These are less easy to quantify than provisioning services, but are nonetheless potentially important for agricultural production, local livelihoods and the maintenance of ecosystem integrity.

Examples of supporting services provided by ecosystems within and surrounding the Project ROW include:

- Nutrient recycling;
- Primary production;
- Soil formation;
- Pollination; and
- Seed dispersal.

To take one example, soil formation is a long-term process occurring over thousands of years through the degradation of and build-up of organic material in the ground layer. This process occurs predominately in vegetated landscapes and is fundamental for successful agricultural production in the long term by providing soil in which agricultural and plantation crops can grow. In some areas of East Africa, soil erosion has been a major problem (e.g. UNDP, 2007) and soil is being lost at a rate far higher than soil is being added back to the landscape. Forested and vegetated ecosystems within and surrounding the ROW may be important for ensuring that nutrient rich, fertile soil continues to be created in the long term.

Some vertebrate, bird and insect species are vital for the pollination of crops (in agricultural landscapes) and the dispersal of seeds (in natural ecosystems). Loss of natural ecosystems within the ROW therefore has the potential to affect the pollination of crops in surrounding areas. In some instances, it has been shown that increasing proximity to natural environments can actually enhance the pollination of crops (e.g. Klein et al, 2003), although this may differ depending on the specific crop and geographic location.

17.3.4 Cultural Services

The ecosystems, landscapes and biodiversity in the Project area also have important cultural values for the local and global communities. Cultural heritage is discussed in more detail in Chapter 18 of the report. To take one example, the Sezibwa falls are located approximately 600 m from KJE Chainage 32 + 000. This area is known as a tourism and cultural site and is characterised by fast flowing water surrounded by natural vegetation. Here the environment provides an important cultural service to communities affected by the Project.

Green space is an important component of a city environment providing residents with access to open space and a traffic free environment. They can even influence the mental and physical wellbeing of surrounding communities and provide the primary contact between urban residents and the 'natural' environment (e.g. Barbosa et al, 2007). Kampala has expanded rapidly in size over the past 20 years (see figures in Chapter 16) and very little green space is present in the city. The wetlands traversed by the Project (e.g. Kinawataka wetland, Nakivubo wetland) are some of the last remaining areas of open vegetated land in the city and thus provide a cultural service to communities living around Kampala.

Visual amenity provided by forested, wetland and agricultural habitats near and surrounding the Project Footprint also provide a cultural service to local communities. Several areas along the alignment have been identified in Chapter 13 as being important for visual amenity (e.g. Plate 16-7).

Some areas of habitat along the alignment provide habitat for threatened and nationally important species such as the Grey Crowned Crane. The Grey Crowned Crane is the National Bird of Uganda and is currently listed by the IUCN and the Ugandan National Red List as Endangered. As a consequence, this species and its habitat provide a cultural ecosystem service to local communities and the people of Uganda.

Plate 17-7: View of the valley traversed by the KJE Mainline Expressway at approximately KJE Chainage 31 + 500

17.3.5 Priority Areas

17.3.5.1 Wetlands surrounding Kampala

Wetlands in Uganda cover almost 30,000km,[2] totalling about 13% of the country. Many of these wetlands are under threat but particularly those found in urban centres around Uganda – including Kampala. Wetlands in Kampala used to cover approximately 1/6th of the land area (IUCN, 2003) but it is now thought to be closer to 9% (World Bank, 2015). Even though wetlands were designated in 1994 as green corridors in the Kampala structural plan they are severely threatened by urbanisation, pollution and industrial development (IUCN, 2003). Compared to the wetlands originally surrounding the Kampala settlement, by 1993 it was estimated that 25% had been converted for development and by 1999, 46% had been converted. Of those wetlands that remain only 8% are thought to have retained a high level of ecosystem functioning and the highest levels of wetland encroachment are occurring within Kampala city (World Bank, 2015). Chapter 16 provides figures showing land use changes around the wetlands traversed by the Project Footprint.

These wetlands traditionally provided numerous ecosystem services which supported the city and the Lake Victoria basin. These are outlined by the World Bank (2015) and included:

- **Regulating** - Cleansing water, filtering out sediments and nutrients – This service was historically provided primarily by the wetlands throughout Kampala. Wastewater would flow from urban and industrial areas into the wetlands before entering Murchison Bay. The wetland plants would effectively remove phosphorous and nitrogen from the waste streams, cause the sedimentation and decomposition of suspended solids, pollutants and pathogenic organisms in the wetland sediments and convert heavy metals from soluble to insoluble forms (IUCN, 2003) before the water entered Lake Victoria.
- **Regulating** - Absorbing stormwaters – Kampala experiences dramatic rainfall events which can lead to substantial flooding around the city. The wetlands act as a sponge, absorbing the stormwaters and releasing them slowly over a longer time period reducing the extent and potential severity of flooding events.
- **Regulating** - Human waste processing – 90% of Kampala's residents households are not connected to a piped sewage system (IUCN, 2003). A sewage treatment plant at Bugolobi treats the sewage in the piped system but large amounts of untreated wastewater flows through the surface or groundwater supplies into the wetlands around Kampala. The wetlands perform a vital service helping remove pollutants, nutrients and bacteria from this water before it enters Lake Victoria.
- **Provisioning** - Food, fuel and building materials – The wetlands also provide food sources (e.g. fish), fuel and building materials utilised by local residents. However, it should be noted that the harvesting of these resources can lead to the further degradation of the wetland environments.

Several wetland areas are crossed by the Phase 1 ROW including the Nakivubo wetland and Kasanga wetland. Most of the wetland area is degraded but they provide important ecosystem services as outlined above and are thus designated as priority ecosystem services for the Project. More information on each of the wetlands passed by the alignment are provided in Chapter 16.

17.4 Impact Assessment

Ecosystem services are defined as the functions of ecosystems that provide benefits to human populations. These functions and services are a result of interactions between the biotic and abiotic components of the environment and as a consequence, impacts on ecosystem services are wide-ranging, complicated and difficult to accurately quantify. As ecosystem services are linked to several environmental and social components discussed in the ESIA

documentation, many impacts on ecosystem services have been discussed in the context of other sections of this report (e.g. hydrology, socio-economic, aquatic and terrestrial biodiversity, water quality, soil and erosion etc.). The section below adds to this information already discussed and outlines it more specifically in the context of ecosystem services.

17.4.1 Pre-Construction

No impacts on ecosystem services are expected to occur in the Pre-Construction phase, as no Project activities affecting local ecosystems will occur during this phase.

17.4.2 Construction

17.4.2.1 Provisioning Services

The studies conducted for the ESIA found that the ecosystems within and surrounding the Project ROW provide a range of provisioning services to local people. The land within the ROW supports agricultural practices with most households in rural areas growing some form of crop for subsistence use and/or sale. The wetlands and forests in the rural areas provide food from hunting, which provides a significant proportion of protein intake in some villages. In addition, the wetlands also provide sources of plant material for crafts made by women such as papyrus mats for sale. The wetlands within the ROW and surrounding areas are also used regularly for fishing, contribute to drinking water supplies, and provide water for irrigation.

During the Construction phase, the Project will give rise to impacts on ecosystem services through the direct clearance of land within the ROW to prepare the land for the construction of the road infrastructure. It is estimated that approximately 138.0 ha of agro-pastoral land. 49.0 ha of cleared land and 10.0 ha of plantation land will be lost within the ROW. This will reduce the land available for agriculture and agroforestry in the area. As most of this agriculture is carried out on small scale farms, this loss may have substantial socio-economic impacts on the affected persons if compensation is not provided in an adequate and fair manner. There may also be issues of severance where access to agricultural land may be blocked by the expressway (refer Chapter to 7 for further discussion of agricultural impacts).

Approximately 106.3 ha of wetland (degraded, partially cultivated and papyrus) and 46.7 ha of forested habitat (closed forest, open forest/woodland and scrubland) are expected to be impacted as part of the land clearance for the Project ROW, and cause further fragmentation of habitats (see land use assessment in Section 7.1.1.4). This will likely diminish the provisioning services provided by these areas of habitat (e.g. hunting areas, NTFPs, *Papyrus* harvesting, and fishery resources), and may make some areas more difficult to access where the ROW lies between the villages and the area used for hunting or collecting resources. However, these resources are widely available in the areas surrounding the ROW, so it is likely that local villagers will be able to find alternative areas nearby that will provide these resources during the Construction phase.

During Construction, some in-migration is expected to occur around the construction areas due to the presence of the construction workforce as well as people seeking to provide goods and services to support construction activities (refer to Chapter 19). This will place additional pressure on land and natural environments such as wetlands, impacting on the availability of ecosystem services for local people.

17.4.2.2 Regulating Services

The Project will directly impact wetland habitat (approx. 106.3 ha) within the ROW, although some wetlands in Namanve wetland will be less impacted as viaducts will be installed allowing water to flow beneath the viaduct. The impacts on wetland habitat are outlined in detail in Chapter 16. As indicated in Section 17.3.5, these wetland

habitats are important for providing regulatory ecosystem services to the communities living within and surrounding Kampala, such as water purification and waste decomposition. Although this Project will lead to the loss of only a relatively small proportion of the wetlands in the broader area, it will add to the high rates of degradation that area already occurring and may promote further degradation of the wetland environment by stimulating the expansion of settlements and agricultural land surrounding the construction areas. The loss of wetland habitats within the ROW will have a moderate impact on the regulatory services provided by Kampala's wetlands – including the regulation of flood waters, the purification of water and waste processing.

Temporary access roads constructed to allow construction machinery to access the sites in wetlands could further inhibit the regulating services provided by wetlands, such as through blocking the flow of water in wetlands if adequate drainage is not provided, or increased sedimentation of the wetlands. However, following the completion of infrastructure construction in wetlands, these temporary access roads are planned to be removed and rehabilitated and so impacts on the wetland environment (and their associated ecosystem services) will be minimised.

The removal of vegetation during land clearance runs a risk of exposing the soil surface to high levels of precipitation and winds which can increase soil erosion in the landscape. The potential for increasing soil erosion risk is highest on steep slopes crossed by the alignment where existing vegetation is likely to provide an important service preventing high levels of soil erosion.

The clearance of vegetation within the ROW for the Project will also impact the air quality benefits provided by vegetation, particularly through increasing the area of exposed soil which will result in the potential for dust generation on windy days.

17.4.2.3 Supporting Services

Supporting services are difficult to outline and quantify but are nonetheless provided by ecosystems surrounding the ROW. For example, the direct loss of wetlands and forests due to the Project will reduce the nutrient recycling in these environments and remove habitat suitable for pollinator species survival. It is likely that the direct impacts of the Project on habitat during construction will have minimal effects on supporting ecosystem services at a broader scale as there is an abundance of similar habitats in the surrounding areas.

17.4.2.4 Cultural Services

No significant adverse impact on natural cultural sites such as Sezibwa falls is expected from the Project due to the distance of this site from the ROW (refer Chapter to 18 for further details). No natural cultural heritage sites (e.g. cultural tree sites) are expected to be directly impacted during construction.

The construction of the expressway will lead to visual amenity impacts especially in the easterly section of the Phase KJE mainline expressway where there are currently only small roads traversing the rural landscape. The impacts on visual amenity are discussed in Chapter 13.

Urbanisation promoted by the development of the road will likely lead to the reduction in green space within and surroundings of Kampala City which is already limited in extent. If urban planning is not adequately implemented by the relevant authorities, this could lead to a loss of cultural services provided by the green spaces surrounding the Project ROW.

Impacts on terrestrial and aquatic species are outlined in Chapter 16. This includes potential minor impacts on the habitat of culturally important species including the Grey Crowned Crane – the national bird of Uganda.

17.4.3 Operations

17.4.3.1 Provisioning Services

There will be no further direct impacts on ecosystem services during the Operations phase as no further direct land loss will occur due to the Project during this phase.

The most significant impacts on provisioning services during the Operations phase are expected to occur indirectly, due to the rapid population growth and increased land pressures in the areas surrounding the Project. The development of a large expressway will likely lead to rapid population growth and in-migration due to the enhanced access that will be provided to Kampala city (e.g. from Mukono, Namataba etc.). Urbanisation of currently undeveloped areas surrounding the ROW would lead to the conversion of agricultural land to settlement areas, the infilling of wetlands, impacts on water quality and the potential overharvesting of the remaining fishery resources. If unregulated urbanisation occurs near the ROW it could have moderate impacts on provisioning ecosystem services provided by the surrounding environment (e.g. agricultural productivity, wetland use, safe water sources).

17.4.3.2 Regulating Services

As with provisioning services, the most significant impact on regulating services during Operations is expected to result from the increased pressure on land and natural resources due to the rapid increase in population and urbanisation that is expected to occur following the construction of the expressway. The indirect impact on the wetlands and forested areas surrounding the ROW will decrease the regulating services provided by these areas.

UNRA has committed, through their Green Right of Way (GROW) program, to conduct roadside re-vegetation along the expressway, which will increase the regulating services provided by the Project (such as improved air quality) and will assist in compensating for the impacts on regulating services caused by loss of vegetation during the Construction Phase.

In wetland areas it is expected that temporary access roads and other construction areas disturbed in the Construction Phase will be rehabilitated and excess sediment removed from the wetland. This will allow the wetland areas around viaducts (e.g. Namanve wetland) to recover and reduce impacts on the regulating services provided by these wetlands.

17.4.3.3 Supporting Services

As discussed in Section 17.3.3 the ecosystems within and surrounding the ROW provide a range of supporting services. While there will be no further direct loss of natural environments during the Operations Phase, indirect impacts (such as urbanisation promoted by the road's development) and cumulative impacts (see Chapter 21) may lead to large scale ecosystem change and therefore have larger impacts on supporting services provided by natural environments surrounding the ROW.

17.4.3.4 Cultural Services

It is expected that the impacts of the Project on cultural services from the Construction Phase will continue into the Operations Phase. There will for example be a large impact on visual amenity and landscape character particularly to the east of the KJE mainline expressway where currently no major roads exist through the gently undulating terrain (refer to Chapter 13).

No known natural cultural heritage sites are expected to be directly impacted during the Operations Phase.

17.5 Avoidance, Mitigation and Management Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes a variety of management and mitigation measures to minimise impacts on ecosystem services (refer to Volume D). Key related management and mitigation measures are summarised in Table 17-1. The residual risk or impact after implementation of the measures is also outlined. Due to the complex nature of ecosystem services depending and impacting upon several environmental and social aspects, many of the mitigation measures outlined in other chapters of the ESIA will also be relevant to reduce the impacts on ecosystem services.

Table 17-1: Avoidance, Mitigation and Management measures and residual impacts regarding ecosystem services.

Risk / Aspect	Avoidance, Mitigation and Management Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction			
Ecosystem services	• None required	Neutral	Negligible No significant impacts on ecosystem services are expected during the Pre-Construction Phase
Construction and Operations			
Provisioning Services – Agricultural Production	• Implement mitigation measures in Chapter 7 (Land, Assets and Infrastructure) • Implementation of the Resettlement and Livelihood Restoration Plan (refer to Volume D)	Negative	Moderate Direct impacts on agricultural production will occur through loss of wetland habitats during construction (refer to Chapter 7). This is likely to be exacerbated during Operations by conversion of wetlands and other agricultural areas resulting from Project-related in-migration and urbanisation, particularly around Kampala. Through implementation of the RLRP, appropriate compensation should be provided to ensure no long-term impact on livelihoods as a result of the direct acquisition of agricultural land for the Project.
Provisioning Services – Hunting, Fishing and NTFP collection	• Implement mitigation measures in Chapter 15 (Surface and Groundwater) • Implement mitigation measures in Chapter 16 (Ecology and Biodiversity)	Negative	Minor The loss of wetlands and forests as well as water quality impacts from the Project will result in minor impacts on hunting and fishing conducted for subsistence use, as well as collection of plants for crafts and other uses. As above, this is likely to be exacerbated by conversion of wetlands resulting from Project-related in-migration and urbanisation during the Operations Phase, particularly around Kampala. Impacts on villages from changes in availability of areas for hunting, fishing and NTFP collection will vary between villages depending on their dependence on these activities for subsistence use and income.
Provisioning Services – Timber and Charcoal	• Implement mitigation measures in Chapter 16 (Ecology and Biodiversity)	Negative	Minor Impacts on the availability of timber for firewood, or making charcoal, will occur through direct vegetation loss within the ROW, and potentially also through indirect impacts such as conversion of surrounding forest areas as a result of Project-related in-migration and urbanisation.
Provisioning Services – Water Supplies	• Implement mitigation measures in Chapter 15 (Surface and Groundwater)	Negative	Minor Loss of some wetlands within the ROW will result in minor impacts on hydrology and the availability of water for irrigation in surrounding agricultural areas. No significant impact on drinking water supplies from ecosystems is expected, as water is not generally sourced directly from wetlands or waterways potentially affected.

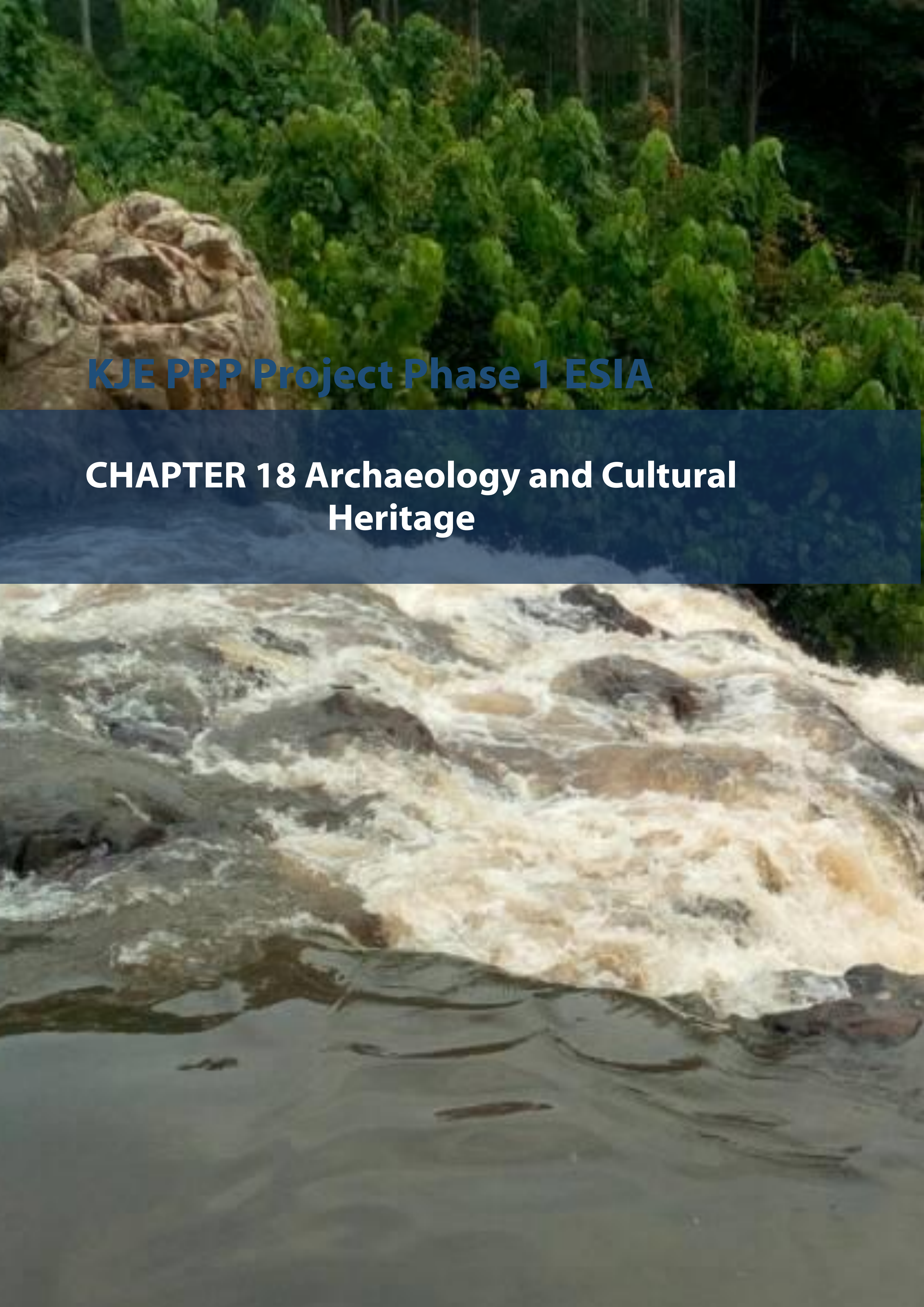
Risk / Aspect	Avoidance, Mitigation and Management Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Provisioning Services – Genetic Resources	► None required	Neutral	Negligible No significant impact on genetic diversity is expected
Regulating Services – Water purification and regulation of soil erosion	• Implement mitigation measures in Chapter 16 (Ecology and Biodiversity) Implement mitigation measures in Chapter 15 (Surface and Groundwater)	Negative	Minor Minor impacts on the ability of ecosystems to provide water purification and regulation of soil erosion will occur through direct loss of forests and wetlands within the ROW during the Construction Phase. These impacts will be reduced though the proposed drainage and erosion control measures for the Project.
Regulating Services – Flood Prevention	• Implement mitigation measures in Chapter 15 (Surface and Groundwater)	Negative	Minor Minor impacts on the ability of ecosystems to provide flood prevention will occur due to the loss of forests and wetlands within the ROW during the Construction Phase.
Regulating Services – Waste	• Implement mitigation measures in Chapter 16 (Ecology and Biodiversity) • Construction of bridges / viaducts to minimise wetland loss • Construction of fences along alignment to restrict access	Negative	Minor Minor impacts on the ability of ecosystems to provide detoxification of waste streams will occur due to the loss of wetlands within the ROW, which can act as filtration systems. Detoxification services could be further reduced by conversion of wetlands resulting from Project-related in-migration and urbanisation during Operations, particularly around Kampala.
Regulating Services – Air Quality	• Implement mitigation measures in Chapter 10 (Air Quality)	Negative	Minor Minor impacts on the ability of ecosystems to improve air quality and reduce dust generation will occur during construction activities due to the direct loss of vegetation within the ROW. Indirect impacts are also likely to occur during Operations due to vegetation clearance related to increased urbanisation in areas surrounding the expressway. The residual impact will depend on the success of the rehabilitation/revegetation activities conducted and the implementation and maintenance of roadside vegetation.
Supporting Services	• Implement mitigation measures in Chapter 16 (Ecology and Biodiversity) • Implement mitigation measures in Chapter 15 (Surface and Groundwater)	Negative	Minor During Operations, indirect impacts (such as urbanisation promoted by the road's development) and cumulative impacts (see Chapter 21) may lead to large scale ecosystem change and therefore have larger impacts on supporting services provided by natural environments surrounding the ROW. Negligible impacts on supporting services in the region are expected during construction.
Cultural Services	• Implement mitigation measures in Chapter 13 (Visual Amenity and Landscapes) • Ongoing consultation with Local Government and Central Government Agencies village, LC3 and City authorities.	Negative	Minor to Moderate The enhanced road network will likely result in loss of green space through promoting the continued urbanisation of Kampala. However, if appropriately managed by other government authorities impacts on cultural services may be lessened. Residual impacts on visual amenity from the presence of the expressway will occur along the broader alignment with the level of impacts dependent on the visibility of the road from sensitive receptors and will be greatest in areas in the eastern part of the alignment where there are currently no major roads. No significant impacts on natural cultural or tourism sites are expected.

17.6 Conclusions

Ecosystem services provided by environments in the Project Footprint and surrounding area are varied and provide important benefits to the surrounding communities. Of particular concern are the wetland habitats intersected by the road which provide important regulatory ecosystem services which will be costly to replace. These services have historically been, and continue to be, important for the city of Kampala and the ecological integrity of Lake Victoria. Wetlands are also important for subsistence hunting, fishing and harvesting of Papyrus canes (*Cyperus papyrus*) in many local villages, particularly in the rural areas in the eastern section of the alignment.

The Project will result in the direct loss of natural habitats (including areas of wetland and forest) but the most severe risk to ecosystems services is expected from the potential indirect loss of habitat due to urbanisation promoted by the improved transportation network. Further degradation of wetland ecosystems resulting from the rapid increase in population and urbanisation in areas surrounding the expressway will likely exacerbate the loss of associated regulatory and provisioning ecosystem services.

If appropriate management and mitigation measures are implemented (as outlined in relevant chapters throughout the ESIA), then impacts on ecosystem services will be reduced. Residual impacts on livelihoods from changes in ecosystem services are expected to be compensated for through the implementation of the *Resettlement and Livelihood Restoration Plan* (refer to Volume D).



KJE PPP Project Phase 1 ESIA

CHAPTER 18 Archaeology and Cultural Heritage

18. ARCHAEOLOGY AND CULTURAL HERITAGE

18.1 Study Area and Methodology

The Study Area focussed on the Project footprint and immediate surrounding area where there is a potential for impacts on cultural heritage and archaeological sites. It also included an analysis of major cultural sites and archaeological finds in the wider area surrounding the Project to provide a broad overview of the surrounding landscape, analyse impacts on structures located further from the Project Footprint that may still be affected by the Project's construction and to inform of archaeological finds similar to those that have potential to be unveiled during the road's construction.

The Archaeology and Cultural Heritage study entailed the following:

- A literature review was conducted based on the history of the area and earlier studies conducted for the KJE and KSB Projects.
- A visit to organisations that are well versed with the cultural heritage of the area for information on existing physical cultural resources in the Project Area. The institutions outlined in Table 18-1were conducted;
- Field work in the projected area of the express way to confirm existence of any cultural heritage resources within the vicinity of the project; and
- An analysis of the collected data followed by the writing of the Archaeology and Cultural Heritage Chapter.

Table 18-1: Institutions Consulted regarding Cultural Heritage and Archaeology.

Number	Date of Consultation	Institution Consulted	Aspects covered during the consultation:
1	12/6/2017	Cross Cultural Foundation of Uganda	Historic Buildings in the Project area and Kampala city.
2	13/6/2017	Buganda Heritage Tourism Board	Historical and tourist sites of Buganda in Project area
3	14/6/2017	Uganda Museum	Historical and archaeological sites in Project area.
4	14/6/2017	Uganda Society Library	Archaeological map of Uganda
5	15/6/2017	Buganda Kingdom, Kyagwe County Headquarters.	Historical, sacred and tourist sites of Buganda in Project area

18.2 Baseline Condition

18.2.1 Legal Protection

Uganda's Department of Museums and Monuments is responsible for protecting sites or artefacts of cultural or archaeological significance. All such resources are also legally protected by Uganda's Historical and Monuments Act, 1967. The international conventions that apply to tangible and intangible cultural heritage are described in Chapter 2.

The proposed ROW passes through 7.6 Km of urban Kampala. Due to previous developments in this urban area, most of the archaeological contexts have been disturbed. However, there are many pre- and post-colonial buildings of religious and cultural value and burial sites within or close to the ROW of the project. These are described in the sections below.

18.2.2 Historical Overview

Cultural records for Uganda in the archaeological field extend backwards in time at least 2 million years. This period saw tremendous technological changes marked by specific timeframes for human populations. For instance, human cutting tools beginning with simple effective cutting edges produced by detaching flakes from stone pebbles are the hallmark of the Oldowan tools found at Nkondo and Kaiso sites on the shores of lake Albert by the Uganda paleontological expedition in 1986.

Technological advances continued with the later emergence of the hand axe culture (Acheulian) in Uganda. This phase produced the Sangoan hand axes whose production centre was the Sango bay area near Lake Victoria in Masaka District around 50,000 years ago. Artefacts of these periods were collected during earlier national and international palaeontology expeditions and are exhibited at the National Museum and the Geological Survey and Mines Department Museum in Entebbe.

Later human technological advances witnessed the development of stone blades in the late stone age about 5,000 years before present (B.P) and the emergence of metal technologies in the Great Lakes region from approximately 1,000 B.C. This coincided with the arrival of the Bantu people in Uganda who practiced agriculture, animal husbandry and pottery in addition to metal technology. This period - known as the Early Iron Age - is associated with the Urewe pottery which is characterised by cross hatch and grooved or channelled decorations. The passage of time brought on the late Iron Age (LIA) from 1000 A.D which is represented by roulette decorated pottery.

An important characteristic of the archaeological record of Uganda is that most sites of archaeological significance were found in buried deposits. Cultural resources are usually encountered only where soils have been disturbed and cultural resources have been brought to the surface. Several of Uganda's archaeological resources were found in earth moving activities. The Entebbe figurine was discovered in 1964 when the Uganda government geological department was expanding its garages and in 1929 prison labourers levelling a hill top within Luzira compound (see location in Figure 1-1) exposed the Luzira head and associated figurines and pottery.

"*It can therefore be concluded that the majority of Uganda's archaeological resources are not visible on the surface but lie underground and are yet to be discovered*". (Andrew Reid 2003, the Uganda Journal)

This conclusion points to the need to undertake archaeological research in areas where development projects are to be carried out to salvage the underground archaeological resources that may exist in the area.

Surface archaeological resources in Uganda comprise largely of pottery shards that are scattered in the countryside and at rock art sites (see Figure 1-1). The pottery shards are a common feature in the countryside especially in cultivated fields where settlements were once located.

Due to the shifting agricultural methodologies utilised historically, settlements used to shift to new fertile land after exhausting agricultural land after a period of farming. Broken pottery was naturally left at these sites. The pottery patterns and carbon dating indicate that human communities practicing agriculture have been in the area since approximately 500 B.C.

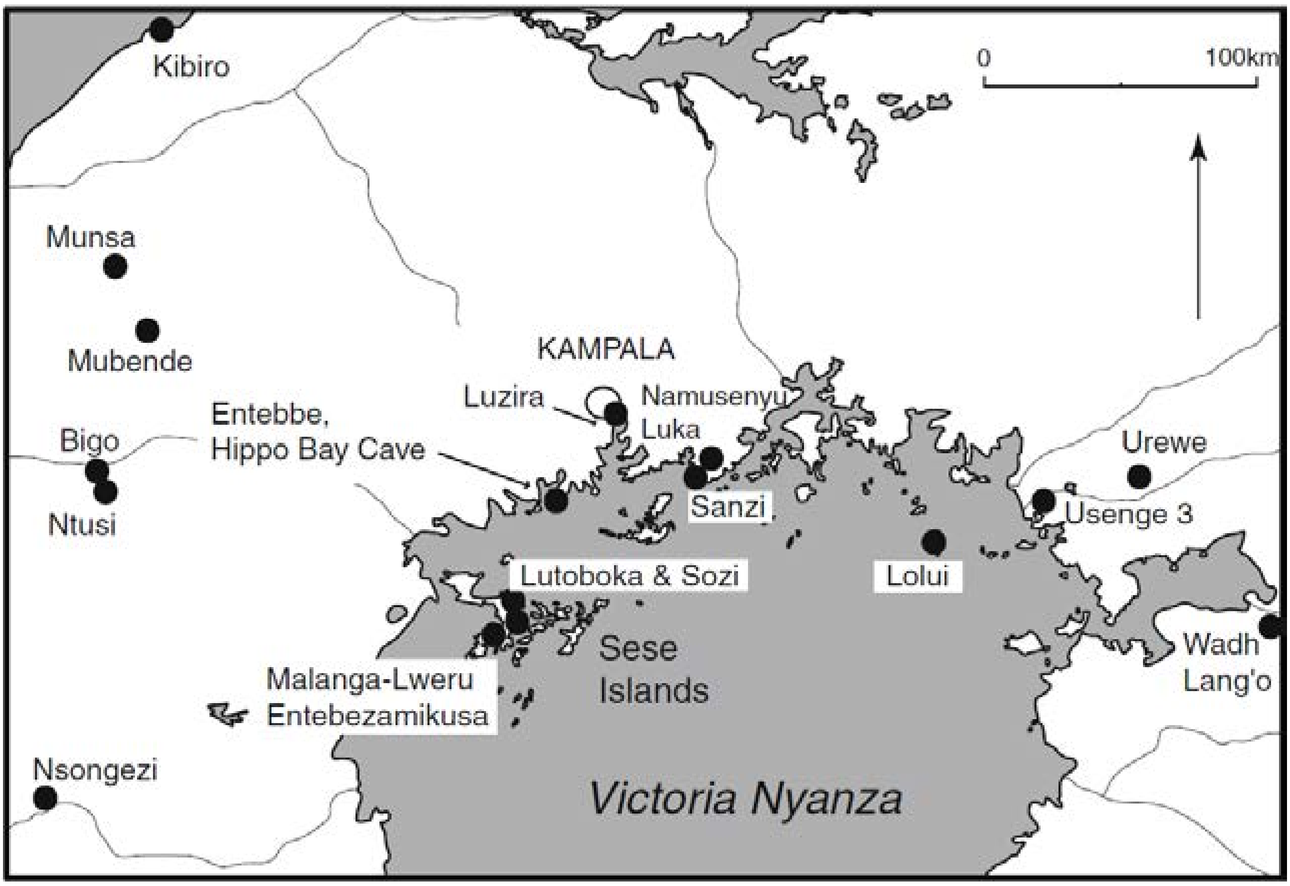


Figure 18-1: Sites where archaeological sites containing ceramics have been identified in the Uganda and surrounding countries (Ashley, 2010)

Rock art sites in Uganda are associated with the hunter gatherer communities related to the pygmies of the Congo who were the original human inhabitants before the arrival of the Bantu and Nilotic people in the country. These sites are found in Eastern Uganda and are dated to the period called the late stone age due to the stone tools discovered at the sites.

Historic buildings which constitute cultural heritage are mostly palaces and places of worship which are historical and are a reference point in the history of the country. A case in point is the Kasubi mausoleum of four deceased kings of Buganda Kingdom located in the Great hut called Muzibu-Azala-Mpanga at Kasubi hill in Kampala (at Kasubi). This is the only Ugandan cultural site inscribed on the UNESCO World Heritage List. It showcases the pre-colonial African architecture of Uganda. The building of structures with modern materials in Uganda is just over 100 years as it started at the close of the 19th century. Historic buildings regarded as national treasures begin with the palaces of Ugandan kingdoms and the headquarters of the major religions like the Roman Catholic church, the Anglican church, the Muslim faith as well as the Bahai faith and Indian temples in Uganda - all built in the colonial period of British rule.

18.2.3 Study Area Overview

The proposed Kampala-Jinja Expressway Project is located in an area on the northern side of Lake Victoria. Archaeological records indicate the presence of agricultural communities in the Project area from approximately 500B.C onwards. The first agricultural communities introduced what is known as the Urewe culture of the great lakes region. Urewe pottery pot shards are found in cultivated fields in the region surrounding the Project Area. The area transitioned to the late Iron Age (LIA) around 1000 A.D which is represented by roulette decorated pottery and is associated with the start of the great lakes kingdoms. The countryside is littered with many roulette decorated pot shards.

The agriculture practiced in the prehistoric times of the Project area was facilitated by iron implements in form of hoes to till the ground and machetes and axes to prepare ground for agriculture by cutting trees and bush thickets. Iron slag found in the countryside of the northern side of Lake Victoria is the visible archaeological evidence of metal working activities in the area. A lot of iron slag called Masengere in the Luganda language is found in Mukono district in Ngogwe and Ssi areas. Observations at locations of iron slag indicate a technology used which was distinct from other smelting traditions of the great lakes. In several instances, banana stem impressions have been noted in the slag debris" (Andrew Reid, Uganda Journal Vol 48, 2002).

There is one location of archaeological interest in the vicinity of the expressway but located at a distance from the route. This is the Moniko hill top where historic rock carvings exist. Moniko hill is located 5 km from Lugazi Municipality opposite the Engineering College belonging to the Ministry of Defense on the Kampala jinja highway. The Moniko rock engravings mainly feature Mweso game boards.

Ancient graves are also found in the Study Area. These are represented by earth mounds covered with stones in homesteads and in the bush areas at the locations of past settlements. Most notably the World Heritage listed Tombs of Buganda Kings at Kasubi are located approximately 6 km west of the western end of the alignment,

18.2.4 Places of Worship

Multiple branches of Christianity are common within communities surrounding the Project Footprint. Most community members will attend church services regularly throughout the year. Several church buildings are present near the alignment as well as other cultural/worship sites. The places of worship within or adjacent to the ROW are shown in the Table 18-2. It is worth noting that most of these are churches. Islam is also commonly practised in some communities surrounding the Project and mosques are common across Kampala City.

Table 18-2: Places of worship in close proximity to the Project Footprint

Name of place of worship/ cultural site	Co-ordinates	Details
Kampala Southern Bypass		
Mutungo Zone 3		
Dream Church	460101 E/ 36512 N	
Mutungo Zone 1		
St Augustine Centre (Church & Hall)	459766 E/ 35386 N	The St Augustine Centre is directly affected
Pentecostal Church	458890 E / 35046 N	The Church is directly affected and located at the cut off between two roads at Port Bell junction
7th Day Adventist Church	459349 E / 36736 N	

Name of place of worship/ cultural site	Co-ordinates	Details
Christ the King Church (also a school)	473429E / 35911 N	
Kitintale Mosque	459118.81 E / 34950.54	The Mosque is located on Port Bell Road, 100m from ROW.
St Denis Catholic Church	455980 E / 30409 N	St Denis Catholic Church is located 10m away from ROW
St Pontiano Catholic Church	456035 E / 28289 N	The grounds are affected and the Church is located 85m from ROW
Heritage Zone		
Bethesda Church	457284 E/ 31324 N	
Zone 5		
Power of God's Word Church	455588 E/ 30323 N	
Nakinyuguzi Zone		
Shrine	455184 E/ 29200 N	
Kibiri A Zone		
Rehoboth Revival Centre Church	456346 E/ 26745 N	
Anointed Church of Jesus Christ, Kitintale	458806 E/ 35335 N	
Joint effort Church	458716 E/ 34893 N	
The Church of Jesus Christ	459467 E / 36683 N	
The House of Prayer	459523 E / 36679 N	
Kiiza Charles' Shrine	455115 E / 29094 N	
Martyr's Shrine in Munyonyo	457408E/26222N	
World of Truth Church	456635 E / 30679 N	
Kira		
Life Power of God	460565 E / 36204 N	
Kampala Jinja Expressway - Kampala to Namagunga		
Sezibwa Falls (1.3 and 1.4))	484723 E, 39360 N	Sezibwa fall is located 650 meters south of KJE alignment. The proposed alignment will cross one of the access roads to Sezibwa falls. A tourist site and a cultural site for Buganda Kingdom. Lubaale (deity) Sezibwa of Buganda Kingdom is worshiped at the site. Several other spirits are believed to be at this site and traditional believers come to pray to them and offer sacrifices. Though often associated with the olden days of the African Traditional Society, a number of people to-date still practice this ancient culture of spirit worship, known among the Baganda people as "Okusamila". Traditionalists ask for different favours from the different spirits that are known to deliver them such as riches, marriage strengthening, healing of different ailments and diseases,

Name of place of worship/ cultural site	Co-ordinates	Details
		fighting enemies, blessings & removal of curses, provide rain, a good harvest, etc. There are traditional healers that set up shrines & these act as the oracles of the spirits. Items you find at the shrines and are used in the spirit worship include burning firewood. The smoke from the fires is believed to carry the prayers to the spirits in the atmosphere. Others are pots, bark cloth, cowrie shells, calabashes, & coffee beans. These are items that were used historically and traditionalists believe having these items easily connects them with these ancient spirits. Traditionalists also offer sacrifices to Sezibwa Falls, and on visiting you can find them slaughtering animals and throwing them into the falls. By this they are feeding the spirits. The river has its source at Kawonya in Ngogwe subcounty Mukono. According to the legend, Sezibwa was a Lubale (spirit) born by a woman called Nakangu Tebatesa, whose father was called Nsubuga Sebwato. The woman gave birth to twins in form of water (together with it's brother River Bwanda) , whereupon Sezibwa flowed west, passing many obstacles and deriving its name, while Bwanda flowed east, toward Nyenga. When Senzibwa river flowed, it met rocks at the falls and it spilled over. The name Sezibwa come from the saying in Buganda language Sizibirwa Kubbo (Meaning no one can block my path). In the nineteenth century, Kabaka Mwanga (King of Buganda) used to make royal appointments/ proclamation from the compound of Sezibwa falls. People come to Sezibwa to pray to the lubaale (god) Senzibwa at the top of the water falls call Embuga ya Sezibwa (court of Sezibwa). The chief priest is called Mr. Kimbowa. Other important Lubaale's (gods of Buganda) have worship spots near the court of sizibwa. These include; Mukasa, Kiwanuka, Musoke, Dungu, Muwanga,anad Magobwe. There is also a resident princess of the Buganda kingdom at the site. She is the resident authority on traditional matters and she regulates the priests at the site. The site is managed by the Buganda Kingdom. The site is also a tourist site and an eco-camp managed by the Buganda kingdom.
Mosque in Mbala	479815 E / 39892 N	
St Mary and Apostles Church	481549 E / 37923 N	
St Andrews Church of Uganda	479691 E / 39962 N	
Dominion Church International, Mbuya	459799.12 E / 36456.99 N	This Church is located approximately 140m from ROW

Plate 18-1: Worshipers at the top of the falls in

Plate 18-2: Worshipers at the top of the falls in

Plate 18-3: Resident princess at Sezibwa

Plate 18-4: Offerings left by worshippers

Plate 18-5: Sezibwa water falls

Plate 18-6: Tourism at the top of the Sezibwa falls

18.2.5 Burial Sites

Several burial sites of varying scale are found within the proposed Project Footprint. This includes sites with only one or two graves and some larger sites such as the Kampala Capital City Authority Cemetery. The KSB section includes a number of burial grounds, comprising family cemeteries and individual plots. The table below shows the burial sites located to date within the alignment (Table 18-3).

Most of the KSB section of Phase 1 is inhabited by the Baganda community, the largest ethnic group in Uganda. Baganda people are the owners or caretakers of all burial sites recorded on the KSB route.

Table 18-3: Burial sites identified within or near to the Project Footprint

Name of burial site	Co-ordinates	Details
Graveyard	456163E/ 30879N	
Graveyard C/O Safina, Kibiri A Zone	456330E/ 26541N	Contains 14 graves
Owner not identified	458735E/ 32663N	Two owners
Mr. Lubega Abubakhars Burial Site	456161E/ 30875N	Site has more than ten graves
Kevina Birontono's Site	456161E/ 30875N	Approximately 20 graves
Namwaduka Kasozi	455312E/ 29907N	Two graves. Potentially a historic settlement here.
Cultural shrine at Mr Lubega's	456177E/ 30855N	
Mubigya Nankya's Cultural Shrine	455175E/ 29193N	
Kampala Capital City Authority Cemetery (Plate 18-7)	463787E/36158N	Located in Bweyogere, Bukasa, Kiira Municipality. Covers 50 acres. Some parts of the cemetery have been sold to developers. An interview with cemetery attendant Mr. Ganja Simon revealed that cemetery was started in 1979 by KCCA to burry unclaimed dead bodies. It is a public cemetery.
Burial Site	473923 E / 36312 N	Located in the Mukuno area in proximity of a Mosque and a Catholic Church. Approximately 55m from ROW.
Islamic Cemetery	463967 E / 36247 N	Unclear if this will be directly impact
Multiple graves from two families	456263 E / 30602 N	There are 19 graves from one of the families and 21 graves from the other. This burial site is located directly on ROW.

Plate 18-7: Entrance to the Kampala Capital City Authority Cemetery

Plate 18-8: Some of prepared graves at the Kampala Capital City Authority Cemetery

18.2.6 Archaeological Sites

The baseline study revealed several archaeological sites close to the Project Footprint including areas of pottery finds and a major archaeological site near the Luzira prison. The proposed alignment does not directly cross these sites. The sites are described in more detail in Table 18-4.

Table 18-4: Archaeological sites in close proximity to the Project Footprint

Name of archaeology site	Co-ordinates	Details
Kasala Stream	0480600 E / 0040527 N	The area contains surface scatters of slag.
Kazi Stream	0474263 E / 0037359 N	Site includes a forested area. Occasional scatters of pottery exist on the northern side of the stream.
Luzira Prison	459974 E / 33178 N	This prison is located where a major archaeological find was encountered in 1929 during the British colonial rule in Uganda. During the construction of the prison, the Luzira head (Plate 1.5) and associated pottery artefacts were collected and now form part of the British museum collection of prehistoric Ugandan artefacts. The Luzira Head is an indicator of possible future chance finds during construction of the Expressway.

Plate 18-9: The Luzira Head discovered in October 1929 at Luzira. It is now in the British Museum.

Plate 18-10: A sample of roulette decorated pot shards observed during transect walks along the KJE alignment

Surface reconnaissance of the Project footprint was undertaken in Mukono district between Kyetume and Nsuube areas where a number of ancient pot shards were observed. The expressway passes through a peri-urban area with houses and plantations. Most households gave permission to observe the potshards in the plantations. The potshards (Plate 1.6) observed fitted with the general pattern of archaeological samples obtained from other surveys done in the area and those in the records of ceramics of the East African Great Lakes region. There is already a good representative sample of the archaeological resources in the area at the Uganda Museum collection of Uganda pot shards.

18.2.7 Heritage Sites

Two main heritage sites have been identified in relatively close proximity to the proposed ROW. These are outlined in Table 18-5, although it is not thought they will be directly impacted by the Project.

Table 18-5: Heritage sites in close proximity to the Project Footprint

Name of Heritage Site	Co-ordinates	Details
Banda Palace	458035 E 33178 N	Banda palace is within the vicinity of the project area located above Kyambogo University not far from the 3km marker on the main KJE section leading from Lugogo (the palace is 1.7km north of the KJE alignment). The place is historical as the first European explorers Speke and Grant met Kabaka Mutesa I at this location. The palace is owned by Buganda Kingdom.
Kireka Palace	460971 E 37375 N	Kireka palace is the official residence of the current Kabaka of Buganda - Ronald Mutebi II. It is located on top of Kireka hill. The Expressway will traverse the valley below the palace (The palace is 1.2 km north of the KJE Chainage 6+000).

Plate 18-11: Banda palace is within the vicinity of the project area

Plate 18-12: Kireka palace on top of Kireka hill. This is the official residence of the current Kabaka of Buganda kingdom

18.2.8 Historical Buildings

Kampala has several historical buildings. The cross cultural foundation of Uganda mapped 51 historical buildings with Kampala which included but were not limited to Bulange (450871E, 34211N) which is the Parliament of the ancient Kingdom of Buganda, Twekobe (451752E, 33365N) which is the King of Buganda's palace and the churches like Rubaga (450161E, 33387N) and Namirembe (450962E, 34832N) cathedrals. These buildings and sites are renowned custodians of history and culture which has at times prompted world travellers to plan trips to Uganda. These buildings have thus been deemed worthy of preservation. None of the mapped historical buildings are crossed by the proposed KJE alignment.

18.3 Impact Assessment

18.3.1 Pre-Construction

No impacts on archaeology and cultural heritage values are expected to occur during the Pre-Construction Phase.

18.3.2 Construction

The proposed alignment does not impact on any known archaeological sites of global or national significance. Most notably the World Heritage listed Tombs of Buganda Kings at Kasubi are located approximately 6 km west of the western end of the alignment, and will not be impacted by the Project. It is also worth noting that other significant heritage sites (such as the palaces of Buganda kingdom) near the expressway will not be directly impacted by the Project. Additionally, the traditional religious sites of the Buganda kingdom for the worship of the Lubaales (deities), Tonda and Sezibwa and the Munyonyo Martyrs Shrine near the KSB will not be directly impacted by the Project.

Several sites of local cultural importance including churches, graves and cemeteries are likely to be directly impacted by the Project Footprint of the KJE and KSB alignments. These sites will need to be removed and/or relocated to another location. Other areas will not be directly affected but access to the sites may be cut off by the road alignment and sites may be impacted by noise and air pollution from the construction of the road. Sites within and near the Project footprint are summarised in Table 18-2 to 18-6.

It is important that relocation of impacted cultural sites such as cemeteries is conducted in a participative way with involvement from local communities and local spiritual leaders. An appropriately qualified cultural heritage expert or anthropologist should be employed to coordinate the relocation of cultural sites and ensure the process implemented is culturally appropriate.

Intangible heritage can include traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts. No intangible heritage values are expected to be significantly affected by the Project.

Table 18-6: Likely impacts on places of worship along the alignment

Name of place of worship	Co-ordinates	Impact	Visual Location
Dream church C/O Ps Lumu Daniel	460101 E / 36512 N	Direct impact (on edge of ROW)	
St Augustine Centre (Church & Hall)	456997 E / 35682 N	Indirect impact (200m from ROW)	
Pentecostal Church	458890 E / 35046 N	Direct impact	

Name of place of worship	Co-ordinates	Impact	Visual Location
Kitintale Mosque	459118.81 E / 4950.54 N	Indirectly affected 100m	
St Denis Catholic Church	455980 E / 30409 N	Significant indirect impact 10m from ROW	
St Pontiano Catholic Church	456035 E / 28289 N	Indirectly affected 85m from ROW	
7th Day Adventist Church	459349 E / 36736 N	Not significantly impacted. 85m from ROW	

Name of place of worship	Co-ordinates	Impact	Visual Location
Christ the King Church (also a school)	473429E / 35911 N	Potential indirect impact 30m from ROW	
The House of Prayer	459523 E / 36679 N	Not significantly impacted. 75m from ROW	
Good Samaritan Mission Church	458846 E / 31315	Significant indirect impact. 20m from ROW	
Life Power of God	460565 E / 36204 N	Direct Impact Within ROW	

Name of place of worship	Co-ordinates	Impact	Visual Location
Mosque in Mbala	479815 E / 39892 N	Potential indirect impact. 20m from ROW	
St Andrews Church of Uganda	479691 E / 39962 N	Significant indirect impact. 10m from ROW	
St Mary and Apostles Church	481549 E / 37923 N	Direct Impact (Within ROW)	
Bethesda Church	457284 E/ 31324 N	No significant impacts. 275m from ROW	

Name of place of worship	Co-ordinates	Impact	Visual Location
Power of God's Word Church	455588 E / 30323 N	No significant impacts. 300m from ROW	
Shrine	455184 E / 29200 N	Significant indirect impacts 10m from ROW	
Rehoboth Revival Centre Church	456346 E / 26745 N	Direct impact (Within ROW)	
Anointed Church of Jesus Christ	458806 E / 35335 N	Direct Impact (Within ROW)	

Name of place of worship	Co-ordinates	Impact	Visual Location
Joint effort Church	458716 E / 34893 N	Significant indirect impacts. Access to church may be impacted. Church is only 10m from the ROW	
Sezibwa Falls	484723 E / 39360 N	Sezibwa fall is 650m away from the KJE alignment. Although not directly affected by the alignment the access road to the falls will be crossed by the alignment and an overpass will be built as part of the project. The accessibility of the falls will be increased by the close proximity of the expressway. The road is also likely to generate noise which could affect the serenity of the area.	
Kasubi Tombs	450388 E / 36370 N	The Kasubi tombs will not be effected by the Project as they are located approximately 6 km to the west of the ROW	
Dominion Church International, Mbuya	459799 E / 36457 N	No significant impacts expected	

Table 18-7: Grave sites likely to be impacted by the Project

Name of burial site	Co-ordinates	Impact	Visual Location
First Graveyard in Kubiri Zone	456163 E / 30879 N	No significant impacts 250m from ROW	
Grave Yard C/O Safina, Kibiri A Zone	456330 E / 26541 N	Direct (Within ROW)	
Second Grave yard in Kubiri Zone	458735 E / 32663 N	Direct (Within ROW)_	
Mukwano Graveyard Kasokoso	459404 E / 37092 N	Direct (Within ROW)	

Name of burial site	Co-ordinates	Impact	Visual Location
Graves Near Mukuno	473923 E / 36315 N	Potential indirect impact. 60m from ROW	
9 Graves of the Kajob Family	456144 E / 30407 N	Direct (Within ROW)	
Mr. Lubega Abubakhars Burial Site	456161 E / 30875 N	No significant impacts 250m from ROW	
Kevina Birontono's Site	456161 E / 30875 N	Direct (Within ROW)	

Name of burial site	Co-ordinates	Impact	Visual Location
Namwaduka Kasozi	455312 E / 29907 N	No significant impacts 200m from ROW	
Cultural shrine at Mr Lubega's	456177 E / 30855 N	No significant impacts 250m from ROW	
Mubigya Nankya's Cultural Shrine	455175 E / 29193 N	Direct (edge of ROW)	
Kampala Capital City Authority Cemetery	463787 E / 36158 N	Direct (Within ROW)	

Name of burial site	Co-ordinates	Impact	Visual Location
Islamic Cemetery	463967 E / 36247 N	Direct (Within ROW)	
Multiple graves from two families	456263 E / 30602 N	Direct (Within ROW)	

18.3.3 Operations

Indirect impacts on sites near the Project footprint are summarised in Table 18-2 to 18-7. The primary impact on archaeology and cultural heritage values during the Operations Phase is expected to be noise from traffic on the expressway which may result in nuisance noise impacts for nearby cultural sites such as churches (which are not relocated for the Project). Air quality may also be reduced at some cultural sites close to the ROW.

In addition, impacts on the local accessibility of some cultural sites resulting from the establishment of the ROW will continue during the Operations Phase. However, the establishment of the expressway will also increase the accessibility of many cultural sites near the alignment, which compensates for the local impacts on accessibility to some degree.

18.4 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management measures to minimise impacts on archaeology and cultural heritage (refer Volume D). Key related management and mitigation measures for the Project are summarised in Table 18-8. The residual risk or impact after implementation of the measures is also presented.

Table 18-8: Avoidance, Management and Mitigation Measures for Archaeology and Cultural Heritage, and Residual Impacts / Risks

Risk / Impact	Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction			
General	► Ensure that inductions and training regarding the protection of cultural heritage values will be conducted for all staff and contractors on site, as relevant to their role and responsibilities. ► Establish a Grievance Mechanism so that any significant concerns regarding impacts on cultural heritage can be reported by local villagers and responded to appropriately.	Neutral	Negligible No impacts are expected to occur during the Pre-Construction Phase.
Construction			
The direct loss of culturally important buildings (e.g. churches), including full or partial loss.	► The Project footprint should avoid areas of cultural significance wherever possible. ► Compensation at full replacement cost for the loss of such structures and assistance with the development of new buildings/infrastructure at new locations where required.	Negative	Moderate Several structures of cultural significance will be directly impacted by the ROW. Appropriate compensation for losses will reduce residual impacts.
The direct loss of grave and cemetery sites under the Project footprint.	► Any relocation of burials grounds requires close and ongoing consultation with the communities associated with the graves, to ensure the appropriate cultural practices are followed. ► The compensation for relocation of graves is recommended to be valued at full replacement costs. This includes cost of materials, labour, transport to relocation site and the payments to religious practitioners who conduct prayers for the relocation exercise and associated rituals. ► An appropriately qualified cultural heritage expert or anthropologist should be employed to coordinate the relocation of cultural sites such as graves and cemeteries and to ensure the appropriate cultural practices are followed. ► Grave relocations should be handled in accordance with the cultural norms of the local community in consultation with both the elders and local leaders. ► Establish a Grievance Mechanism so that any significant concerns regarding impacts on grave sites can be reported by local villagers and responded to appropriately.	Negative	Moderate Several cemeteries and graves will be directly impacted by the ROW. Appropriate compensation to provide for relocation of graves will reduce residual impacts.
Loss of access to important cultural sites (e.g. churches, shrines, Sezibwa falls)	► Implement mitigation measures in Chapter 8 (Traffic, Transport and Accessibility)	Negative	Minor During construction, local access to cultural sites adjacent to the alignment will be reduced by the establishment of construction areas.
Impact on unknown sites and artefacts during land clearance and earthwork activities.	► Implementation of a Chance Find Procedure for all land clearance and earthworks. ► All contractors hired by UNRA to construct the express way should have on board supervisory staff that have undergone heritage awareness training. ► UNRA to engage an archaeologist to inspect all major excavations as they occur to ensure all artefacts encountered are retrieved and appropriately documented. A pre-visit by section	Neutral	Negligible No significant residual impacts on archaeology values are expected if the Chance Find Procedure and other mitigation measures are strictly adhered to. A low risk of inappropriate disturbance of an

Risk / Impact	Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	before the start of working activities is also recommended to identify possible traces of cultural sites to avoid degradation.		unknown archaeological site will remain.
Operations			
Noise, vibration and air quality impacts on important cultural sites	► Implement mitigation measures outlined in Chapter 10 (Air Quality) ► Implement mitigation measures outlined in Chapter 11 (Noise and Vibration) ► Establish noise barriers at locations close to churches and other places of worship, or provide full compensation for the relocation of sites.	Negative	Moderate There will be significant nuisance noise impacts on cultural sites close to the proposed alignment which are not relocated (e.g. Sezibwa forest, some churches near the alignment).
Accessibility impacts on cultural sites	► Implement mitigation measures in Chapter 8 (Traffic, Transport and Accessibility)	Neutral	Negligible The overall impact on accessibility of cultural sites is considered negligible. Impacts on the local accessibility of some cultural sites resulting from the establishment of the ROW will continue. However, the establishment of the expressway will also increase the accessibility of many cultural sites close to the alignment (e.g. Sezibwa Falls).

18.5 Conclusions

The proposed alignment does not impact on any known archaeological sites of global or national significance. However, the alignment is proximal to some of the most significant archaeological finds that have been made in Uganda including being 800 metres from where the 1000-year-old Luzira Head was found in 1929 which is displayed at the British Museum. The Sezibwa Falls is also a site of cultural and spiritual importance that is located 600 m from the proposed alignment.

The Project Footprint passes directly over and near to several sites of cultural importance including churches, graves and cemeteries. Several places of worship and burial sites will be directly impacted by the proposed alignment and are likely to need to be removed/relocated for the construction of the road. The other impacts on cultural heritage may be the separation of sections of the population from their places of worship as a result of severance caused by the expressway. This may result in the people having to travel long distances to find crossings of the expressway to get to their worship places – however this impact can be mitigated by the appropriate establishment of pedestrian crossings. Once established, the expressway will also increase the accessibility of some sites close to the alignment (e.g. Sezibwa Falls).

The Project has the potential to impact on underground cultural heritage resources which are currently unknown through the extensive groundwork activities that will need to be undertaken. The case of the discovery of the Luzira head during the construction of Luzira prison by the British colonial authorities is an indicator that future chance finds may be encountered during excavations and the construction of the express way. A Chance Finds Procedure has been developed as part of the ESMMP (refer Volume D) and will need to be implemented during construction.

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CHAPTER 19 Socio-economic Conditions and Livelihoods

19. SOCIO-ECONOMIC CONDITIONS AND LIVELIHOODS

19.1 Study Area and Methodology

The study area for the socio-economic assessment includes communities traversed by the expressway in the following Local Government areas:

- Kampala City;
- Wakiso District;
- Mukono District; and
- Buikwe District.

19.2 Review of Previous Information

A detailed desktop review of available information relevant to the socio-economic conditions and livelihoods assessment was undertaken, including:

- Review of studies undertaken in the previous ESIAs by URS (2013, 2014) and ICS (2015) and previous RAPs (2015, 2016);
- Review of the Project Feasibility Study (UNRA, 2017); and
- Review of statistical and other data relevant to the socio-economic status of Kampala and its surrounds.

19.3 Use of UNRA Compensation and Socio-Economic Assessment Data

Socio-Economic data was collected by UNRA in 2017 during an assessment of compensation of land and assets along the entire Project alignment. 2017 UNRA compensation and socio-economic data targeted owner-occupied and titled households within some settlement areas.

19.4 Use of 2018 Earth Systems Census Survey Data

Data pertaining to households, businesses and public facilities located within the ROW were collected via a Census Survey (2018 census) conducted in March-April 2018 by Earth Systems and Atacama, in partnership with UNRA. Census data was analysed and incorporated with spatial analysis to assess and identify:

- Location of settlement areas;
- Location and estimation of displaced population and residences;
- Socio-economic demographic information; and
- Location, number and type of businesses and public facilities, including main activities and size.

A summary of the types and chainages covered by socio-economic surveys are shown in (Table 19-1).

Table 19-1 Summary of socio-economic data collected during 2017-2018 census surveys

Route	LC3	Data source	Data details
KJE Phase 1	All divisions and sub-counties within the KJE Ph 1 alignment.	March-April 2018 - Earth Systems census survey of residences, businesses and public facilities.	Owner-occupied and tenanted/caretaken residences were surveyed, including those without land title.
KSB (Chainage 1+000-5+300)	Nakawa Division	March-April 2018 - Earth Systems census survey of residences, businesses and public facilities.	Owner-occupied and tenanted/caretaken residences were surveyed, including those without land title.
KSB (Chainage 5+400-17+800)	Makindye Division; and Ssabagabo-Makindye Sub-county	December 2017 UNRA census survey of residences, businesses and public facilities.	Residences with title were surveyed

19.5 Estimation of Population within the ROW

The 2018 census, which targeted all household types, including: owner-occupied, tenanted, caretaker and squatted residences, was used to estimate the number of people potentially impacted by the loss of housing structures. The 2018 census was conducted along the entire KJE alignment ROW, and partially along the KSB alignment ROW (between chainages 1+000-5+300). The KSB chainages 5+400-17+800 were not covered within the 2018 census due to this section having been already surveyed as part of a UNRA socio-economic survey. The population and socio-economic status of residences along the remaining section of the KSB alignment was estimated based on the population density per structure (see Chapter 7 – Land Assets and Infrastructure - section 7.1.1.4) along sections of the alignment covered by the 2018 census. The total displaced within ROW population was derived from confirmed population data combined with estimates, and using the following key assumptions:

19. Where residential structures were partially located within the ROW, the entire structure was classified as being within the ROW as displacement of the entire household, or structure would potentially be required; and
20. Large structures with areas >0.016 ha (identified via satellite imagery) were not considered as residences and therefore not used to estimate population.

19.6 Interpretation of Recent Satellite Imagery

High-resolution satellite imagery was used to complement socio-economic data. High-resolution Digital Globe WorldView-2 (September 2017) imagery with a resolution of 0.31 m to 0.6 m was used within spatial analyses.

This imagery was used to:

- Define the Project ROW, land use and cover;
- Define settlement and commercial areas; and
- Define structures (residential and industrial sized structures).

19.7 Risk Assessment

Potential impacts, management and mitigation measures, and residual impacts were identified using the ESIA risk assessment methodology outlined in Chapter 1 Introduction. This considered:

- Both beneficial and adverse impacts on social values resulting from construction and operations;
- Identification of measures to enhance project benefits and avoid or reduce the impact of the Project; and
- Residual impacts from the Project were also assessed.

19.8 Baseline Conditions

19.8.1 Governance and Systems for Planning and Development

19.8.1.1 District and Lower Government Structure

District governments are lead agencies under the National Environment Act and will be involved in the development of the Project as described in Chapter 2. Each district has lower local government councils, whose primary role is to monitor the general administration of the area under their jurisdiction. The lower local government councils also comprise of sub-county councils (LC III) that incorporate representatives from parishes (LC II), and youth, women and people with disabilities. Lower Local Government areas that will be affected by the Project include:

- Kampala Central Division;
- Goma Sub-county;
- Kawolo Sub-county;
- Kira Municipality;
- Makindye Division;
- Mukono (TC) Sub-county;
- Nagojje Sub-county;
- Nakawa Division;
- Nakisunga Sub-county;
- Nama Sub-county, and
- Ssabagabo-Makindye Sub-county.

Lower Local Government councils will play a key role in supporting mobilization of communities during the land acquisition process for the expressway and monitoring the resettlement and livelihood restoration program (see Resettlement and Livelihood Restoration Plan, Volume D).

19.8.2 Land Administration

At the national level, the following bodies play a key role in land planning and development aspects of the Project.

Kampala Capital City Authority – Land Registration and Administration

The Kampala Capital City Authority (KCCA) was created in 2010 as a corporate entity tasked with governance of the city on behalf of the central Government. The Land Registration and Administration Department is responsible for the management of all land title, leasing requests and disputes.

Kampala Capital City Authority - Planning Directorate

The KCCA Planning Directorate is responsible for planning, designing and managing physical infrastructure, including zoning, sub-divisions and demarcating areas for development. The Planning Directorate guides the Authority on the urban design, infrastructural improvement and land development in the City.

Buganda Land Board

The Buganda Land Board was established to manage the land reclaimed under the 'Restitution of Assets and Properties Act of 1993'. This was based upon an agreement between the President of Uganda and the His Majesty the Kabaka. The KJE alignment transects significant sections of Buganda lands.

The Buganda Land Board provides advisory to claimants in leasing lands, extending leases, as well as performing subdivisions and land transfers. The Buganda Land Board is expected to be involved in the land acquisition process for the Buganda Kingdom land within the ROW.

Ministry of Lands, Housing and Urban Development – Department of Land Registration

The Ministry of Lands, Housing and Urban Development – Department of Land Registration is responsible for recording land titles in the country. It handles any issue related to land title change, or transfer. If a citizen f sells a plot of land, the department records the change and transfers the title to the new owner, as well as issuing certificates for land ownership.

Second National Development Plan (NDPII) 2015/16 – 2019/20

The Second National Development Plan (NDPII) is part of the country's 'Uganda Vision 2040' with the aim of achieving middle income status by 2020 by:

- Reducing the poverty rate from 19.7% to 14.2%;
- Reducing the inequality co-efficient from 0.443 to 0.452;
- Reducing the number of young people not in education, employment or training by at least 20%;
- Increasing the number of students transitioning from primary to secondary school and the number completing secondary school;
- Increasing access to electricity from 14% to 30%;
- Increasing access to potable water from 65% to 70% in rural areas, and from 77% to 100% in urban areas;
- Increasing paved road infrastructure; and
- Reducing infant and maternal mortality rates.

The NDPII emphasises the importance of land reform to enable faster acquisition of land for urbanization, infrastructure development and agricultural production (GoU, 2015; UN Habitat, 2016). The Government will ensure that land acquisition is driven by the market within the urban development framework and respects zoning laws.

The NDPII endeavours to conduct a nationwide systematic land demarcation and survey program to formally title the remaining 80% of land of that is not registered by the end of the Vision period. The majority of the titling will fall under customary tenure system. This exercise hopes to encourage urban growth through investment in land and property, freeing up local government resources for improving infrastructure and services. The land demarcation and survey program addresses implementation of the National Land Policy (2013).

Social Development Sector Plan (SDSP) 2015/16 -2019/20

The SDSP outlines the government's commitment to address the concerns of the vulnerable and marginalised groups in line with the National Development Plan. The theme of the Plan is "Empowering communities particularly the vulnerable and marginalized groups for wealth creation and inclusive development". In particular, the SDSP seeks to address gaps and challenges of high and increasing number of vulnerable and marginalised groups, inadequate human and financial resources, weak coordination and monitoring and evaluation as well as management Information Systems. The Plan prioritizes five thematic programme areas:

- Labour, Productivity and Employment;
- Community Mobilization and Empowerment;
- Social Protection for Vulnerable and Marginalized Groups;
- Gender Equality and Women's Empowerment; and
- Institutional Capacity Development.

In relation to road developments, a key planned outcome of the SDSP is to improve health and safety in workplaces and projects. Planned activities associated with this include promotion of workplace registrations and inspections, and strengthening of social safeguards.

Sustainable Development Goals

Uganda has adopted the 2015 Sustainable Development Goals aimed at improving the social and economic conditions of people, including:

- Access for all to adequate, safe and affordable housing and basic services, and the upgrading of slums;
- Access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, such as women, children, persons with disabilities and older persons;
- Inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries;
- Reduction of the adverse per capita environmental impact of cities, including paying special attention to air quality and municipal and other waste management;
- Universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities;
- Positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning;
- Increasing the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and developing and implementing, in line with the Sendai Framework for Disaster Risk Reduction 2015- 2030, holistic disaster risk management at all levels; and
- Supporting least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials" (UN Habitat 2016).

Development Programs for Informal Settlements

A number of development programs are in place focused on improving the living standards and tenure challenges in Uganda's informal settlements in KCCA, Mukono and Wakiso districts. UN Habitat (2016) has been at the forefront of a number of initiatives including:

- Supporting the ACTogether / Slum Dwellers International Federation (SDI) to deliver the Tenure Security for Urban Poor through Implementation of the Social Tenure Domain Model (STDM), a land management system that is based on participatory approaches, is pro-poor and gender responsive. The tool has been implemented in informal settlements in14 municipalities including Kampala. To date, a total of 89 settlements have been profiled, four STDM Data Management and Learning Centres have been established in Masaka, Mbale, Entebbe, and Tororo. The initiative also includes capacity building of Municipal Councils on the use of STDM for settlements profiling, mapping, enumerations and data processing;
- Housing and Slum Upgrading/Re-development Program targeting interventions to improve living conditions of poor communities through provision of housing, basic infrastructure and services, and improvement of livelihood opportunities. The program will result in a National Housing Policy incorporating reforms in the housing sector to increase supply of affordable housing. Support to local government will be provided to ensure it has the capacity to record land and property rights in informal settlements;
- The program will fund housing and informal settlement upgrading through up-scaling of the ongoing Participatory Slum Upgrading Program funded by the European Union; and
- National Slum Upgrading Strategy aims to ensure that upgrading/redevelopment of informal settlements efforts are integrated into national policies and legislation to enable their implementation.

19.8.3 Population, Demographics and Migration

Population and demographics

The Project is located in southeast Uganda, situated mainly to the east of the capital city of Kampala and to the north of Lake Victoria, which is the largest lake in Africa by area. The Project area stretches across two of the four main administrative regions in Uganda; the Central and Eastern Regions. Within these two Regions, the Project ROW intersects four administrative districts, including Kampala City District. Table 19 2 summarises the administrative districts, and associated divisions and sub-counties (LC3) within each that are intersected by the Project ROW.

Table 19-2 Summary of administrative areas traversed by the Project ROW

District	Divisions/Sub-counties (LC3)
Buikwe District	Kawolo Sub-county
Kampala City	Central Division, Makindye Division, Nakawa Division
Mukono District	Goma Sub-county; Nagojje Sub-county; Mukono TC Sub-county; Nakisunga Sub-county; Nama Sub-county
Wakiso District	Kira Municipality; Ssabagabo-Makindye Sub-county

Data from 2018 Census Surveys of households within the Project ROW, indicated that an estimated of 29,983 occupants belonging to 6,177 households were living within the ROW. 51% of occupants were female, 15,291

14,392 (48%) were male, and 299 (1%) recorded no gender information (this was due to information omitted by the respondent representing the household). The details data of occupants per LC3 is shown in Table 19-3 below.

Table 19-3 Summary of gender within the Project ROW

LC3	Female	Male	Other	Total population	Households
KJE	8,740	8,226	171	17,137	3,505
KSB	6,551	6,166	128	12,846	2,672
Total	15,291	14,392	299	29,983	6,177
Total (%)	51%	48%	1%	100%	-

Source: 2018 Census Survey, Earth Systems.

Table 19-4 provides a summary of occupants by age group per LC3 administrative. Occupants aged 18-60 were the largest group by age, comprising 14,992 (50%) of occupants. Occupants aged less than 18 years were accounted for 14,092 (47%) of occupants. Occupants aged greater than 60 years comprised only 299 (1%), and 600 (2%) recorded no age information.

Table 19-4 Summary of occupants per age group within the Project ROW

LC3	<18 years	18-60 years	>60 years	Other	Total
KJE	8,054	8,569	171	343	17,137
KSB	6,038	6,423	128	257	12,846
Total	14,092	14,992	299	600	29,983
Total (%)	47%	50%	1%	2%	100%

Source: 2018 Census Survey, Earth Systems.
*Other age undisclosed

Household Size

The most common household size was 5-7 members (34% of households), which is higher than the national average of 4.7 (UBOS 2014). The remainder of households surveyed were:

- 19% of households had 1-2 members;
- 29% of households had 3-4 members;
- 14% of households had 8-10 members; and
- 4% of households had more than 10 members.

Population Density

2018 Census Survey data indicated that the population density within the urban and peri-urban areas of Nakawa Division and to a lesser extent, Kira Municipality and Ssabagabo-Makindye Sub-county, greatly exceeded the national average population density of 173 persons per square kilometre km2 (UBOS 2014). In these areas, population density exceeded 1,000 occupants per km2 (Figure 19 1 & 19 2). This accounts for more than 80% of the population situated in the ROW, concentrated within the Nakawa Division and Kira Municipality. High population density is particularly observed within informal settlement areas such as Kinawataka and Kasokoso in Nakawa Division, and Bweyogerere in Kira Municipality. Residences within these settlements, comprise a large number of small dwellings and permanent and temporary structures.

Household Heads

2018 Census survey data indicate that most households (4,262; 69%) were headed by a male, living within a conjugal within a conjugal relationship, either monogamous or polygamous. Female headed households were less common, most of which were headed by women living as a single, either never married, separated or widowed. 5992 (97%) of household heads were aged 18-60 years, however 6 households were identified in which all members including the household head were aged below 18 years.

Within the ROW, 314 single adult (aged 18-60) headed households were identified, i.e. households that contain only one member of working age, with all other members aged less than 18 years. 283 of these single-headed households were low-income (average householder income was less than 216,000UGX per month), 177 of which were headed by females.

9 single elderly-headed households were identified, i.e. households that contain only one adult member, over the age of 60, with all other members aged less than 18 years. 8 households that contained only persons above the age of 60 years were also identified, four of which were low income.

Migration

Uganda is a country with a diversity of ethnic backgrounds. Whilst Kampala and surrounds are part of the Buganda Kingdom, there are many people from different ethnicities who migrate to Kampala. Less than half of the people in Kampala are born in Kampala (Uganda Poverty Report, World Bank 2016). A further quarter of the population are from Buganda and another quarter are from Uganda, outside of Buganda. Approximately 1.5% of residences are from other parts of Africa and there is also a small percentage of non-African residents. In Kampala, people from different ethnicities generally reside harmoniously, although there are parts of the city (e.g the Acholi quarter which is near the KJE) where certain ethnicities predominate. Along the KJE alignment the informal settlements are represented by many recent migrants of different Ugandan ethnic background. This diversity is generally culturally accepted amongst these communities.

Migration to Kampala is identified as a pathway from rural poverty by many Ugandans. The urbanisation of Uganda is happening at a rapid rate. Droughts, conflict, remoteness, and a cash economy all drive urban migration. Urbanisation and industrialisation in Kampala can attract occasional and seasonal labourers such as builders, brick layers and carpenters. Other reasons for migration include marriage and education.

Census data indicated that 92% of household heads within the ROW were not born within their residing community and had migrated to the area, most of which were from rural Uganda or smaller cities, such as Jinja.

Of all households surveyed within the Project ROW, 34% of households reported to own additional property at a different location, however additional house ownership was lower in areas further from Metropolitan areas, such as Ssabagbo-Makindye and Mukono sub-counties, which saw rates of secondary home ownership averaging 16%. It is likely that those with wage-based livelihoods in the city also have family practicing agriculture in their home village or town from which they migrated.

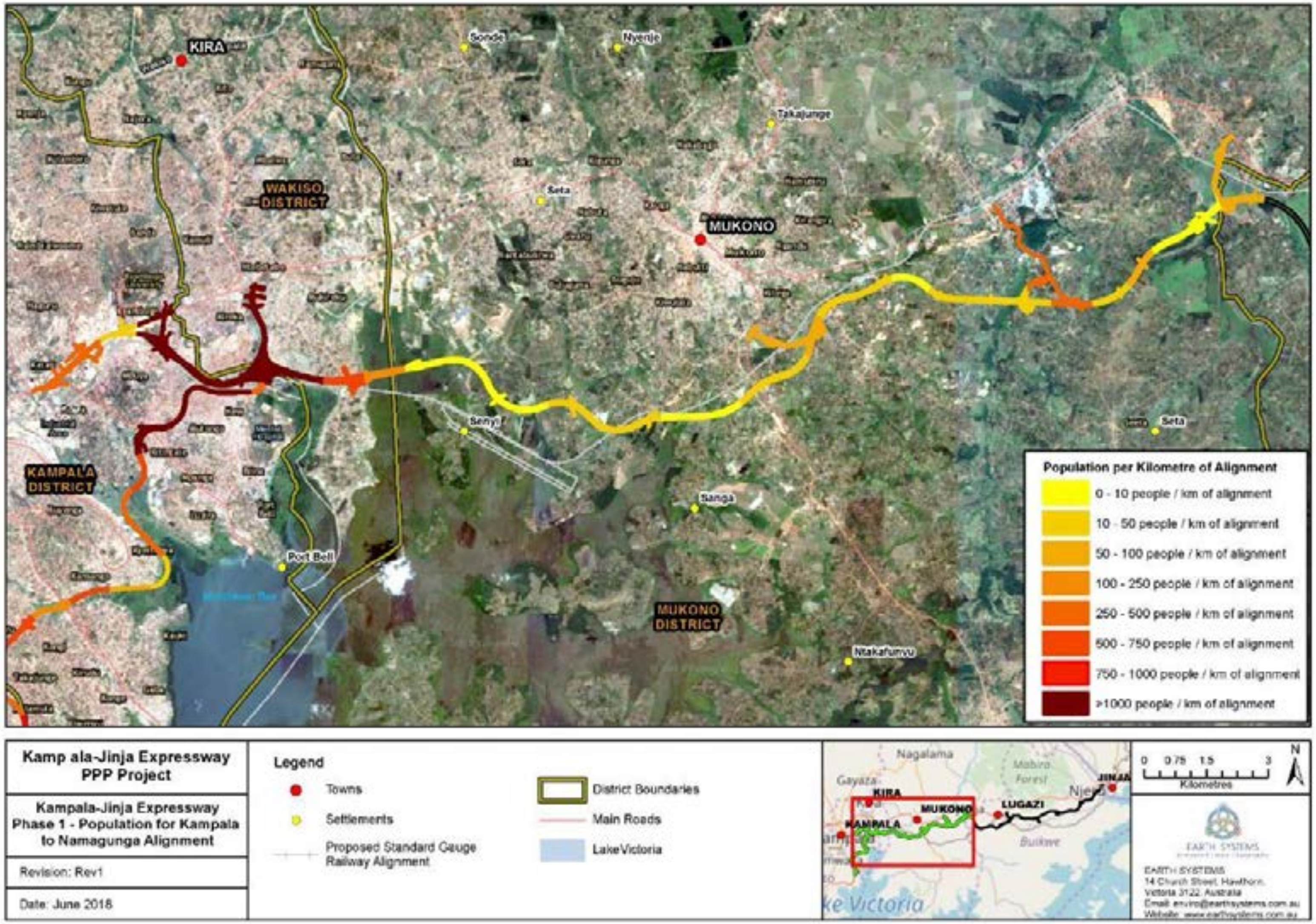


Figure 19-1 Population distribution along the KJE alignment

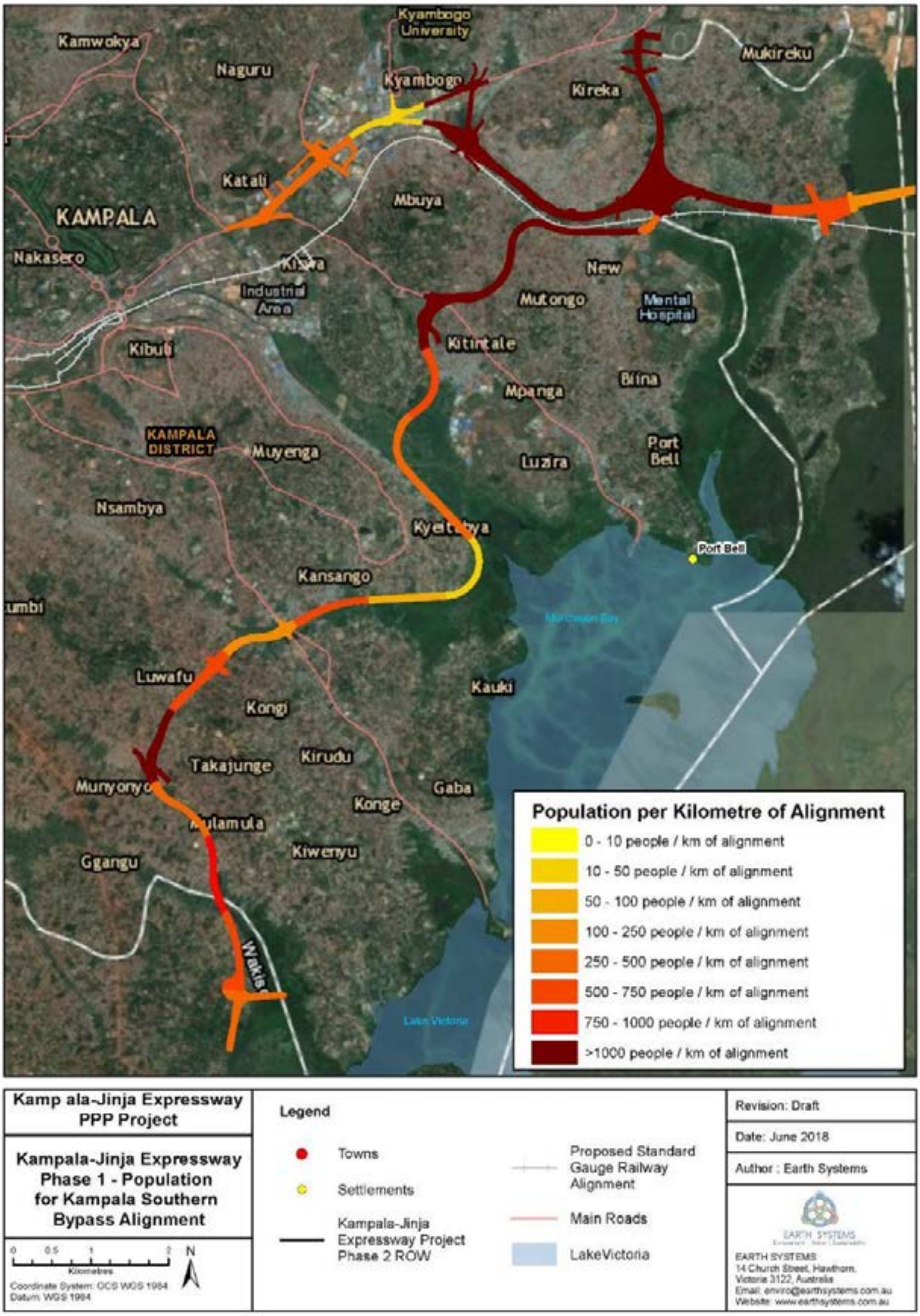


Figure 19-2 Population distribution along the KSB alignment

19.8.4 Ethnicity, Language and Religion

Uganda is home to more than forty indigenous groups and languages. Socio-economic data (UNRA, 2017d) indicates that Buganda is to be the most common ethnic group within the ROW. Other ethnic groups present within the ROW are the Banyankole, Bakinga, Japadhola, Basoga and Banyarwanda among others. Along the Project alignment, Luganda the is most commonly spoken language, however other languages are present, and their use varies regionally. 2018 Census Survey data indicates that Christianity is the main practiced religion, with a number of Christian places of worship and educational facilities identified along the alignment. Islam, is also practiced, and several mosques and gravesites have been identified within the ROW. The prevalence of each of these religions is indicated to vary regionally also.

19.8.5 Education

2018 Census Survey data indicated that 96% of surveyed household heads had some form of education (Table 19 5). Households along the KSB ROW tended to have higher rates of higher-education, i.e. Secondary (Advanced Level) and Tertiary Level. Secondary (Ordinary Level) education accounted for the largest proportion of household heads, followed by those that had completed Primary School. Secondary and tertiary education rates were overall higher among male respondents; this is discussed further in section 19.8.12– Gender inequality and vulnerability of females.

Table 19-5 Education levels of household heads within the Project ROW

Education Level	KSB (%)	KJE (%)
No education	3%	4%
Functional Literacy	1%	<1%
Primary School (incomplete)	18%	19%
Primary School (complete)	23%	18%
Secondary (Ordinary Level)	25%	34%
Secondary (Advanced Level)	12%	9%
Tertiary (University, Vocational)	18%	16%
Total	100%	100%

Source: 2018 Census Survey, Earth Systems.

19.8.6 Income and Livelihoods

Income

2018 Census Survey data indicated that 20,190 (67%) of occupants belonging to 3,975 households had an average income less than 216,000 UGX per month (

Table 19-6), which is equivalent to the International Poverty Line of USD$1.90 per day. 12,921 (43%) of the population reported an average income of less than half of this amount, living on less than 101,000 UGX per month. The remainder of the population surveyed were:

- 5,021 (17%) earned between UGX 216,000 and 500,000 / month (approximately USD$27 - US$135/month);
- 1,524 (5%) earned between UGX 501,000 and ,1000,000 / month (approximately USD$139 - US$275 / month);
- 1,025 (3%) earned more than UGX 1,000,000 / month (approximately USD$278 /month); and

- 15 (<1%) occupants earned more than 10,000,000 / month (approximately >USD$2,650 / month).

The relative proportions of income did not vary significantly along the alignment.

Table 19-6 Education levels of household heads within the Project ROW

Income	KJE			KSB			Totals		
	Pop.	Pop. (%)	HH	Pop.	Pop. (%)	HH	Pop.	Pop. (%)	HH
0-100k	8,038	47%	1,489	4,883	38%	980	12,921	43%	2,469
101-215k	4,308	25%	907	2,961	23%	599	7,269	24%	1,506
216-500k	2,837	17%	676	2,184	17%	490	5,021	17%	1,166
501-1,000k	643	4%	154	881	7%	175	1,524	5%	329
1,001-10,000k	511	3%	107	514	4%	95	1,025	3%	202
>10M	14	<1%	2	1	<1%	2	15	<1%	4
Other	786	5%	170	1,422	11%	331	2,208	7%	501
Total	17,137	100%	3,505	12,846	100%	2,672	29,983	100%	6,177

Source: 2018 Census Survey, Earth Systems.

Livelihoods

Census data indicated that approximately half of households (49%) relied on more than one source of income, the predominant sources being: self-employment, wage and salary-based employment, rental income, and subsistence agriculture. The proportion of both subsistence and commercial agriculture as income sources was higher in households in non-metropolitan areas, such as Goma, Mukono and Nakisunga Sub-counties, whereas salary and wage-based employment and rental income was higher in metropolitan areas, namely, Nakawa and Makindye Divisions. Table 19-7 summarizes the sources of income as a percentage per LC3.

Table 19-7 Percentage of income sources of residences within ROW by LC3 administrative unit

Income Source	Central	Goma	Kawolo	Kira	Makindye	Mukono	Nagojje	Nakawa	Nakisunga	Nama	Ssabagabo -Makindye
Subsistence	-	23%	-	2%	8%	25%	19%	3%	26%	8%	8%
Commercial	-	15%	-	3%	4%	0%	12%	2%	17%	-	6%
Fish-farming	-	-	-	-	-	-	-	-	1%	-	1%
Self-employment	-	23%	-	47%	29%	13%	15%	35%	17%	29%	30%
Wage-based	-	15%	-	13%	7%	25%	4%	14%	12%	13%	11%
Salary	-	8%	-	18%	17%	25%	15%	23%	5%	17%	10%
Rental	-	8%	-	7%	16%	13%	12%	10%	10%	13%	1%
Interest/Dividend	-	-	-	-	1%	-	4%	-	-	2%	-
Remittance	-	8%	-	1%	1%	-	0%	2%	3%	0%	3%
Eating place	-	-	-	1%	0%	-	0%	1%	1%	6%	1%
Trade Jobs	-	-	-	1%	10%	-	0%	1%	1%	2%	21%
Retail/Kiosk	-	-	-	3%	1%	-	4%	2%	4%	8%	-
Spousal support	-	-	-	5%	1%	-	15%	5%	3%	2%	-
Pension	-	-	-	1%	4%	-	-	1%	2%	-	8%

Total	-	100%	-	100%	100%	100%	100%	100%	100%	100%	100%

Source: 2018 Census Survey, Earth Systems.

Agriculture

Subsistence agriculture is the main livelihood activity practiced by people living in the Mukono and Buikwe Districts, and to a lesser extent in Kampala and Wakiso Districts. Along the KSB and KJE, informal agriculture is commonly practiced in wetlands areas on relatively small, smallholder plots. 2018 Census Survey data and other ground-level reconnaissance in Wakiso and Nakawa Districts found that the most commonly grown subsistence food crops are banana, sweet potatoes, rice, maize, cassava, yams and beans.

Formal and informal cultivation of cash crops is also practiced within the alignment ROW, including tea plantations (28.9 ha of total land use), timber plantations (10 ha), as well as coffee, sugar cane, fruits (mangoes, oranges and pineapples) and vanilla. Plantation areas form a relatively small proportion of land use along the KJE alignment in Mukono District and in the vicinity of Namagunga.

Pastoralism

Livestock raising is generally not permitted in the more densely populated urban centres such as the Kampala District. However, raising of cattle, pigs, sheep, goats and poultry are common in Mukono and Buikwe districts, where there is a larger availability of grazing pastures. Livestock raising is particularly common where the alignment passes through agro-pastoral areas in Mukono districts between the 14 km and 18 km mark (see Chapter 7). 2018 Census Surveys indicated that a significant portion of respondents along the KJE alignment kept or sold livestock.

Aquaculture

216 households within the ROW reported that aquaculture was a primary activity. These households were concentrated within Mukono and Buikwe Districts where aquaculture ponds are not uncommon. No aquaculture ponds were identified by 2018 Census Surveys or via inspection of satellite imagery as within the alignment ROW.

Informal Residential Rentals

Informal rental businesses were identified as a significant livelihood activity of households, particularly within urban and peri-urban areas of Nakawa Division, with approximately 39% of businesses activities along the KJE reporting that they are informal residential agents. In most cases, other livelihood activities are also practiced such as trade or agriculture.

Trade

Trade is a common livelihood activity among the population living within the ROW, particularly within urban areas of Kampala. 2018 Census Survey data indicated that 25% of business activities are primarily focussed on trade, the vast majority of which is conducted by sole-traders and small family businesses dealing in ready-made and raw foods. Clothing and homewares is also a common trade activity, and to a lesser extent electronics and hardware. More than 1,000 small traders (approximately 25% of all recorded businesses within the ROW) have been identified centred on the Nakawa Market. Here, stallholders sell food, clothing and homewares, servicing a large surrounding community.

A number of small scale commercial operations focused around food provision, including small markets for fruit and groceries, fast food stalls, small bars and hair salons, petrol stations and vehicular services are found along the alignment, particularly in around markets Nakawa Division

Brick manufacturing has also been observed within wetlands in Mukono District, between chainages 19+000 and 19+500.

Boda boda (taxi) drivers operate throughout the alignment, particularly along main roads in urban areas. A large stage from which boda boda drivers operate was identified within the Project ROW, next to Nakawa Market along the existing Jinja Road in Nakawa Division.

Employment and Business Activities

Based on 2018 Census Survey and ground-level reconnaissance, it is estimated that 5,378 businesses are present within the ROW. 65% of these businesses operate as sole-traders and 22% operate as small businesses employing between 1 to 2 staff. The majority of these businesses are situated in Nakawa Division, within high density settlement areas such as Kinawataka and Kasokoso, and industrial areas, such as along the existing Jinja Road. Due to sole-trader businesses accounting for the vast majority of businesses, self-employment is a major contributor to employment within these businesses, however 283 medium to large businesses, employing between 10 to more than 20 staff have been identified and are estimated to contribute significantly to employment within the ROW.

Only 2% of households surveyed within the 2018 Census reported cases of unemployment. However, this finding is likely not indicative of the level of access to formal employment within the communities of the ROW, with most employment being informal self-employment.

Table 19-8 Summary of businesses activities within the KJE and KSB alignments

Business Activities	KJE	KSB	Total	Total (%)
Retail	652	297	949	18%
Rental (Residential and Commercial)	1,459	654	2,113	39%
Hotels, Eating Places, Bars and Entertainment Venues	248	113	361	7%
Petrol station/garage/parking/auto-repairs	70	32	102	2%
Car yard	17	8	25	0%
School	2	15	17	0%
Health facility	10	3	13	0%
Drugstore, Healers	16	7	23	0%
Agricultural Produce and Livestock	277	127	404	8%
Community Centres	3	0	3	0%
Furniture	38	18	56	1%
Electronics (sales and repairs) and Stationery	148	67	215	4%
Banking and Financial Services	16	7	23	0%
Hardware and construction	288	131	419	8%
Industrial Manufacturing	14	6	20	0%
Wholesalers	12	5	17	0%
Ready-Made Food, Drinks, Groceries and Charcoal	247	113	360	7%
Beauty Salon	71	33	104	2%
Business Services	8	4	12	0%
Other (*not disclosed*)	98	45	143	3%
Total	3,693	1,685	5,378	100%

Source: 2018 Census Survey, Earth Systems.

Table 19-9 Summary of businesses by size within the KJE and KSB alignments

Business Size (No. Staff)	KJE	KSB	Total	Total (%)
Sole-trader (0)	2,255	1,227	3,482	65%
Small (1-2)	893	297	1,190	22%
Small-Medium (3-5)	332	87	419	8%
Medium (6-10)	107	44	151	3%
Medium-Large (11-20)	86	18	104	2%
Large (>20)	16	12	28	1%
Other (undisclosed)	4	0	4	0%
Total	3,693	1,685	5,378	100%

Source: 2018 Census Survey, Earth Systems.

19.8.7 Land Tenure

19.8.7.1 Land tenure systems

Uganda recognises formal and informal land ownership rights. Land tenure systems included Mailo, freehold, leasehold, customary and public land as defined in Uganda's 1995 Constitution and governed under the Land Act (1998). These are described below.

Freehold Tenure

Freehold land tenure refers to the holding of registered land in perpetuity with full powers of ownership, subject to statutory and common law requirements. It enables the holder to use and develop the land, including selling, leasing or subdividing the land. Freehold tenure also allows giving away the land to any person by will.

Mailo Tenure

Mailo land tenure refers to the holding of registered land in perpetuity and allows for separation of ownership of the land from ownership of developments on the land made by a lawful or a bona fide occupant. It also enables the holder to pass down his/ her title to successors with the same ownership rights, subject to the customary and statury rights of those persons at the time the tenure was created.

Under Mailo ownership, informal rights are also recognised through kibanja / bibanja rights; tenants who settled on 'mailo' land with either full knowledge of the mailo owner, or succession or purchase from the former bibanja holders. A large proportion of affected persons are kibanja holders.

The 1995 Constitution protects tenure rights of lawful and bonafide occupants on Mailo land, freehold or leasehold land.

Leasehold Tenure

Leasehold tenure is created by contract or by operation of law. It enables holding of land for a given period from a specified date of commencement, on such terms and conditions as may be agreed upon by the lessor and lessee. This type of tenure arrangement is usually, but not necessarily, provided in return for a rental payment. A significant proportion of affected persons were found to be in rental arrangements, particularly within informal settlements.

Customary Tenure

Customary Tenure refers to a system of land tenure regulated by customary rules and not governed by law. It applies local customary rules to ownership, use and occupation of, and transactions on land. It also provides for communal ownership of land. A certificate of customary ownership may be acquired by any individual, household or community holding land under customary tenure on former public land.

19.8.8 Land ownership and Housing

Census data indicated that an estimated 2,965 households reported to be owner-occupied with legitimate land title, 309 claimed to be owner-occupied with no title, and 2903 claimed to be non-owner-occupied, either renting or caretaking a residence. It is likely though that questions pertaining to land rights are not always accurate within the census as the rate of informal, illegal settlement is indicated to be higher based on 2017 UNRA compensation data and spatial analyses.

Table 19-10 Population and residences identified within Project ROW

Alignment	Population	Households	Owner-occupied with Title	Owner-occupied - No Title	Non-owner-occupied
KJE	17,137	3,505	1,682	175	1,647
KSB	12,846	2,672	1,283	134	1,256
Total	29,985	6,177	2,965	309	2,903

The majority of residences identified within the ROW are small (with areas <0.004 ha), permanent structures roofed with iron sheets (UBOS, 2014). Informal settlements and wetland areas are dominated by semi-permanent and temporary structures. Within informal settlements, overcrowding is also a major concern due to lack of development regulations or enforcement of these. For informal settlements that have developed on wetlands, flash floods during the rainy seasons is common, which can result in destruction of property and disruption of businesses, but also in the outflow of contaminated water leading to health issues (e.g. cholera outbreaks) (UN Habitat, 2016).

19.8.9 Land Use

As discussed in Chapter 7 – Land Assets and Infrastructure, the dominant land use within the alignment is agro-pastoral land (138 ha) followed by settlement areas (120 ha), minor agricultural land (49 ha) and roads and tracks (34 ha). Other land uses are summarised in Table 19-11.

Table 19-11 Land use and habitats within the Project alignment

Land Use / Habitat Type	Area within ROW (Hectares)					
	Phase 1 Mainline	% Phase 1 Mainline	KSB Section	% KSB	Total Phase 1	
Urban Forest	0.6	0.1%	5.4	4.7%	6.0	1.0%
Recreational Area	0.7	0.2%	0.4	0.4%	1.1	0.2%
Sugar Cane	0.0	0.0%	0.0	0.0%	0.0	0.0%
Plantation	10.0	2.1%	0.0	0.0%	10.0	1.7%
Fallow Land	17.9	3.8%	0.0	0.0%	17.9	3.0%
Road / Tracks	25.3	5.3%	8.7	7.5%	34.0	5.7%
Tea Plantation	28.9	6.1%	0.0	0.0%	28.9	4.9%
Industrial Land	28.8	6.0%	2.3	2.0%	31.1	5.2%

Land Use / Habitat Type	Area within ROW (Hectares)					
	Phase 1 Mainline	% Phase 1 Mainline	KSB Section	% KSB	Total Phase 1	
Settlement Area (Total)	68.9	14.4%	51.1	44.1%	120.0	20.2%
Cleared Land / Minor Agriculture	34.2	7.2%	14.9	12.8%	49.0	8.3%
Agro-pastoral Land	138.0	28.9%	0.0	0.0%	138.0	23.3%
Scrubland	26.4	5.5%	0.0	0.0%	26.4	4.5%
Grassland	0.0	0.0%	0.0	0.0%	0.0	0.0%
Drainage	2.2	0.5%	1.4	1.2%	3.6	0.6%
Closed Forest	4.6	1.0%	0.0	0.0%	4.6	0.8%
Open Forest / Woodland	15.7	3.3%	0.0	0.0%	15.7	2.6%
Degraded Wetland	25.7	5.4%	7.6	6.6%	33.3	5.6%
Wetland - Partially Cultivated	17.6	3.7%	22.0	19.0%	39.5	6.7%
Wetland - Papyrus	31.4	6.6%	2.0	1.7%	33.4	5.6%
Total	476.9	100%	115.9	100%	592.7	100%

Source: 2018 Census Survey, Earth Systems.

19.8.10 Access to Water, Sanitation and Electricity

Water

Access to improved water supply (i.e. piped, infrastructure-based water) across the country is estimated to be 71% and 67% in urban and rural areas, respectively, and up to 86% have access to protected sources. Of these, only 26% of the urban population is estimated to have piped water on premises, and less so within informal settlements (MWE, 2016). 2018 Census Survey data indicated that 16% of households had water piped or collected at their homes, with the majority of households relying on community water points for drinking, cooking, cleaning and agriculture. Several community water points such as wells and taps were identified within the ROW that serviced a significant number of homes in surrounding communities. See Chapter 7 – Land, Assets and Infrastructure—for more detail on community water points.

Rural populations use mostly boreholes, shallow wells, piped water, protected springs and rainwater. Those with access to springs and streams use these for domestic purposes (Mutongo Hill), of which some are found in protected areas. However, a number of initiatives by the National Water and Sewerage Cooperation are aiming to improve access to clean water through installation of public stand posts with subsidized and affordable tariffs (MWE, 2016).

Sanitation

Sewage connection to residences within the ROW is still underdeveloped, with only 3% of households having sewage connections. Households within the ROW rely on public pit latrines and to a lesser extent, flush toilets within their community. A number of public toilet facilities were identified as within the ROW, servicing a significant population from surrounding communities. See Chapter 7 – Land, Assets and Infrastructure—for more detail on community toilet facilities.

Plate 19-1 Ventilated Improved Pit (VIP) Latrine

Electricity

Electricity was the most common utility connected to residences, with 76% of households within the ROW having electricity connected to their homes (Table 19-12). These connections are typically low capacity and are used primarily to power lights and charge mobile devices.

Table 19-12 Access to basic infrastructure along KJE and KSB alignments. E = Electricity; W = Water; = Sewage.

LC 3	Services connected								
	No services	E	W	S	E&W	E&S	W&S	E&W&S	Total
KJE	806	2,103	35	0	456	35	0	70	3,505
KSB	615	1,603	27	0	347	27	0	53	2,672
Total	1,421	3,706	62	0	803	62	0	124	6,177

Source: 2018 Census Survey, Earth Systems.

19.8.11 Socio-economic Zones

Within the Project Area, socio-economic zones were defined based on an integrated analysis of geographical and sociological data sources, including 2018 Census Survey data, UNRA compensation assessments, designated wetland area data, and satellite and ground-level reconnaissance. These socio-economic zones represent areas where a particular land use (e.g. settlement area, agricultural area, industrial area etc.), socio-economic demographic, and land-title status predominate. These socio-economic zones are linked to the livelihood restoration zones that are described in Chapter 9 of the RLRP (refer section 9.3) and together can be used to:

a) identify the type and extent of Project Affected Peoples/Communities within a given area, and

b) guide restoration strategies most suitable to a particular area or demographic based on a common socio-economic status and entitlement under Ugandan law to compensation from land acquisition.

The following sections outline the socio-economic zones that were defined, their extent within the Project Area and how they are characterised. A summary of each zones area, population and key assets are presented below in Table 19-13Table 19-14.

Formal and titled settlement areas

These areas account for 54 ha (KJE: 10 ha; KSB: 44 ha) of the total area within the Phase 1 ROW and comprise normal residential areas in Kampala city in which property is obtained legally. Within these areas, residences are typically permanent and owned with title, or rented. Land that is legally obtained in these areas is eligible for compensation due to acquisition under Ugandan law.

783 businesses and 37 public/community facilities also operate within this zone either formally or informally, as a secondary land use. 2018 Census Survey data indicated that a large proportion of small businesses was accounted for by residential rentals and small roadside vendors of food, charcoal and other household goods. Most public facilities within these areas are churches and schools.

Occupants within this socio-economic zone accounts for approximately 23% of the ROW population, the large majority of which are situated along the KSB alignment.

2018 Census Surveys indicated that households within formal and title settlement areas had a substantially higher average monthly income per occupant (489,000 UGX) than that of occupants living within informal settlement areas (284,000 UGX). Average population densities of formal settlements were less than a quarter of densities calculated for informal settlement areas.

Informal settlement areas

These areas account for 78 ha (KJE: 66 ha; KSB: 12 ha) of total land area and comprise residential areas in which residences are not legally owned and lack legitimate title. These areas develop illegally on marginal public land including wetland areas.

2,583 businesses and 63 public/community facilities also informally operate within these areas as a secondary activity. Similar to formal settlement areas, the majority of businesses in these areas are small informal rentals and sole- vendors with most public/community facilities being places of worship.

Occupants within this socio-economic zone accounts for approximately 65% (19,622 occupants) of the within ROW population, with approximately 50% of which are situated along the KJE alignment in the Kampala urban slums of Kinawataka and Kasokoso.

2018 Census Surveys indicated that households within this zone are predominantly cash-poor (approximately 75% live below the international poverty line), and lack formal title and other assets for which they can be compensated under Ugandan law. Compensation for any improvements or structures made to land can be sought, however, many dwellings within informal settlements are semi-permanent and of low-quality for which valuation is expected to be low.

Due to lower average household incomes, relatively high population densities, lack of formal infrastructure and an absence of legitimate property assets, households within informal settlement areas are expected to be more vulnerable to displacement than their formal settlement counterparts. Thus, households residing within these areas should be considered as a distinct socio-economic category that require special consideration to ensure that livelihoods are adequately restored following displacement and that conditions that give rise to poverty within surrounding communities are not exacerbated by the Project.

Non-wetland agricultural areas

These areas account for the largest proportion of land within the Phase 1 ROW; 233 ha (KJE: 232 ha; KSB: 1 ha) most of which is situated in rural areas, east of Kampala city. These are areas in which formal and informal agriculture is practiced on tenured land.

This land is legally obtained and thus land as well as its structures, improvements and crops are eligible for compensation from acquisition under Ugandan law.

Relatively fewer residences are present in these areas (1% of the ROW population) compared to formal and informal settlement areas and are typically occupied by the associated smallholders' and agropastoralist families.

Average monthly income of occupants within these areas was approximately equivalent to that of formal settlement areas (466,000 UGX) with livelihood activities predominantly being commercial agriculture, which was commonly bolstered by subsistence agriculture.

Wetland agricultural areas

These areas account for 26 ha (KJE: 14 ha; KSB: 12 ha) of total land area and comprise areas in which intensive commercial and subsistence agriculture is practiced illegally on designated wetlands. The majority of these areas are situated within urban and peri-urban areas of Kampala. Regular inundation of these wetlands limits widespread settlement, and so only a relatively small number of residences are settled in these areas, typically residing within semi-permanent, low-quality dwellings.

Census data indicates that of the 847 occupants residing within these areas, most had little to no reportable income and relied heavily subsistence wetland agriculture as a primary livelihood means. It is expected that communities adjacent to these wetlands outside of the ROW also utilise these areas for subsistence activities.

As designated wetlands can not be legally owned, residences and livelihood activities associated with these areas are only eligible for approved structures, improvements and crops under Ugandan law. It is expected that the loss of this agricultural land will displace livelihood sources from those settled in these areas as well as from surrounding communities.

Industrial zones and large businesses

These areas account for 13 ha (KJE: 13 ha; KSB: 0 ha) of total land area and comprise urban and peri-urban industrial areas and business estates, where larger and formalised businesses typically operate. These areas are situated along the KJE alignment, particularly along the existing Kampala-Jinja Road in Kampala city.

91 businesses, 11 of which were large businesses (employing more than 20 regular staff) were identified within these areas. Most businesses were small to medium sized selling non-food items such as electronics, hardware, and furniture.

The larger businesses most commonly included manufacturers, petrol stations, car-yards and larger suppliers of construction and electronic goods.

This land is legally obtained and the businesses operating in these areas are typically eligible for commensurate compensation under Ugandan law to restore capacity and mitigate any losses to business productivity.

Small and informal business areas

These areas account for 10 ha (KJE: 5 ha; KSB: 5 ha) of total land area and comprise areas in which small businesses such as road-side and market vendors operate.

2018 Census Survey data indicated that 1,433 small and informal businesses operated within these areas, the vast majority of which are situated within the vicinity of the Nakawa Market. These businesses operate informally, commonly from semi-permanent stalls selling food, clothing, and household items.

These businesses generally operate on legally obtained land either formally or informally and are eligible for compensation for impacted structures under Ugandan law. It is expected however that as these businesses are typically clustered and operate as marketplaces that service the local and extended surrounding communities,

special considerations should be made to ensure that similar areas can be established so that communities can still access these marketplaces.

Public land and public facilities

These areas comprise predominantly roads and some minor public infrastructure and account for 29 ha (KJE: 28 ha; KSB: 1 ha) of total land area. 2018 Census Survey data indicated that 265 small road-side vendor businesses and marginal informal settlement of 184 occupants are situated within these areas as a secondary land use.

Settlement/squatting of public land is illegal and occupants residing on public land will only be compensated for any structure or improvements, which are typically of low-quality.

Small road-side vendors in these areas typically operate from semi-permanent stalls selling food, charcoal and other household items. Similarly, these businesses are eligible for compensation under Ugandan law for any impact to structures but not land. It is expected that displacement will mean that these businesses will re-establish in other areas along road-sides.

Wetland and forested areas with little or no infrastructure or economic activity

These wetland and forested areas account for 149 ha (KJE: 107 ha; KSB: 42 ha) of total within ROW land area and are owned by the Government of Uganda. This land is restricted from use and any activity, including agriculture, settlement or business conducted on this land is illegal. Only minor settlement and agricultural activity occurs on these lands due to its restricted use or because the land is unsuitable for intensive cropping.

2018 Census Survey data indicated that a relatively sparse population of 517 occupants reside within these areas and are predominantly cash and asset poor and mainly practice subsistence agriculture as a primary livelihood activity.

As these designated wetlands and forested areas cannot be legally owned, residences and livelihood activities associated with these areas are only eligible for approved structures, improvements and crops under Ugandan law. It is expected that the loss of this settlement and agricultural will push these settlements and activities into adjacent wetland and forested areas. Special considerations should be made for these displaced residents so that their livelihoods are adequately restored and so land pressure on wetlands and forested areas is not further exacerbated.

Table 19-13 Summary of socio-economic zones within the Phase 1 ROW – KJE alignment.

Socio-economic zone	Area (ha)	Population	Households	Pop. density / ha	Total businesses	Large businesses	Public facilities
Formal and titled settlement	10	524	108	52	50	3	9
Informal settlement	66	14,812	3,032	224	2048	1	59
Non-wetland agricultural	232	431	90	2	153	0	3
Wetland agricultural	14	847	158	61	70	0	3
Industrial/large businesses	13	0	-	-	91	11	1
Small informal businesses	5	110	23	22	1058	1	3
Public land/roads	28	184	47	7	222	0	3

Wetland/forests with no infrastructure/economic activity	107	228	47	2	0	0	2
Total	447	17,137	3,505	-	3,693	16	80

*Large businesses include those that employ more than 20 regular staff.

Table 19-14 Summary of socio-economic zones within the Phase 1 ROW – KSB alignment.

Socio-economic zone	Area (ha)	Population	Households	Pop. density / ha	Total businesses	Large businesses	Public facilities
Formal and titled settlement	44	6,238	1,332	142	733	11	28
Informal settlement	12	4,810	973	401	535	1	4
Non-wetland agricultural	1	0	0	0	0	0	0
Wetland agricultural	12	2	2	0	0	0	0
Industrial/large businesses	0	0	-	-	0	0	0
Small informal businesses	5	1,507	323	301	375	0	1
Public land/roads	1	0	0	0	43	0	0
Wetland/forests with no infrastructure/economic activity	42	289	41	7	0	0	3
Total	117	12,846	2,672	-	1,685	12	35

*Large businesses include those that employ more than 20 regular staff.

19.8.12 Poverty and Vulnerable Populations

Vulnerable groups are people who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status may be limited in their ability to claim or take advantage of development benefits. Vulnerable households may include:

- Households with persons falling under the generally accepted indicator for poverty, or the landless;
- Divorced or widowed female headed households with dependents and low income;
- Households with physical or mental disabled persons;
- Elderly households with no means of support;
- No source of cash income; and
- Ethnic minorities that are socially stigmatised and/or economically marginalised.

Poor households

Uganda boasts the second fastest reduction in extreme poverty per year in sub-Saharan Africa. Reduction in the poverty rate has been primarily attributed to income growth in the agricultural sector, which has been reported to benefit poor households. However, more than third of the country's population lives below the international

extreme poverty line of US$1.90 per day, which is approximately 216,000UGX per month. Vulnerability has also remained high, with estimates that for every three Ugandans that have moved out of poverty, two have fallen into poverty.

The poor lack savings or assets that can assist in coping through hardships, and therefore, are particularly vulnerable to changes such as loss of land or livelihoods. The poor tend to be more severely affected by these changes and take longer to recover. Poor households lack the financial buffer to carry their families through difficult periods and are therefore more likely to resort to marginal activities, sell vital assets, or incur debt. Lower income households also tend to be large, have a greater number of dependents, and lack access to education.

Total income per household was obtained from 2018 Census Surveys, from which an average householder income per month was calculated. Census Survey data indicated 67% of surveyed households situated within the ROW were living on an income below the international extreme poverty line of US$1.90 per day ($216,000UGX per month). Further to this, 43% were living on of half this (0-100,000UGX per month). Table 19-15 shows number of occupants per Project alignment.

Table 19-15 Average monthly income (UGX) per occupant within the KJE and KSB alignment ROW

	KJE			KSB		
Av. monthly Income (UGX)/occupant	Population	Population (%)	Residences	Population	Population (%)	Residences
0-100k	8,038	47%	1,489	4,883	38%	980
101-215k	4,308	25%	907	2,961	23%	599
216-500k	2,837	17%	676	2,184	17%	490
501-1,000k	643	4%	154	881	7%	175
1,001-10,000k	511	3%	107	514	4%	95
>10M	14	0%	2	1	0%	2
Other	786	5%	170	1,422	11%	331
Total	17,137	100%	3,505	12,846	100%	2,672

Source: 2018 Census Survey, Earth Systems.

Household with no ownership and the landless

It is estimated that 60% of Kampala's residents live in informal settlements, with low access to the formal land market due to the high costs associated with entry into the formal land market (UN Habitat, 2016).

A large proportion of the population within the Project ROW lives in informal settlements of Kasokoso, Kinawataka and Kintenale, among others, with no recognised land ownership. Within the ROW it is estimated that there is a total of 78 ha of informal settlements, with a total of 4,684 buildings/structures recorded in these areas. Most of these are on the KJE Mainline alignment with only 961 buildings/structures recorded in informal settlements on the KSB alignment.

Gender inequality and vulnerability of females

Although gender mainstreaming has been a key focus of the National Development Plans with gender policies and mainstreaming emphasises across sectors, Uganda remains a customarily and institutionally a patriarchal society (Asiimwe 2010). Females are typically afforded less rights, access and support than males with respect to education, employment opportunities, land ownership, social status and other resources that are necessary to

improve their standard of living for themselves and their families. As a result, female and female-headed households are typically more vulnerable to livelihood changes and displacement than male equivalents.

51% of the ROW population comprise females, and same as the general ROW population, the largest proportion (10,007) are living within informal settlement economic zones, where conditions that lead to increased vulnerability among the population are more prominent compared to formal and titled settlement zones. Factors of vulnerability relating to females and female headed households are expected to be exacerbated for those situated within informal settlement zones, particularly regarding land and land-based livelihood displacement given the limitations posed to women in negotiating land rights (Asiimwe 2010).

Table 19-16 Summary of estimated female population per socio-economic zone within the KJE and KSB alignments.

Socio-economic zone	KJE – Total Females	KSB - Total Females
Formal and titled settlement	267	3,181
Informal settlement	7,554	2,453
Non-wetland agricultural	220	0
Wetland agricultural	432	1
Industrial/large businesses	0	0
Small informal businesses	56	769
Public land/roads	94	0
Wetland/forests with no infrastructure/economic activity	116	147
Total	8,740	6,551

Source: 2018 Census Survey, Earth Systems.

2018 Census Survey data indicated that unemployment among women (of working age) was low with women commonly operating as informal residential rental sole-traders, small stall vendors (of food and homewares) and within informal (subsistence and commercial) agriculture. Despite this, women overall tend to be employed in less lucrative economic sectors and have substantially less access to inputs such as land, agricultural advice, seed and credit compared to men. In Uganda, the main burden of biomass collection and use is by women who are the major domestic caretakers and employees in the informal food industry (GoU, 2015).

2018 Census Survey data indicated that female headed households on average had incomes at 69% of male headed households. Female headed households were also more likely to report higher incidence of other vulnerable groups within their households (40% of female headed households compared to 14% of male headed households). These vulnerable groups most commonly included household members with chronic illness (respiratory disease, diabetes, kidney disease/high-blood pressure etc.), physical disabilities (mainly sustained injuries), mental disabilities, and elderly members. These findings suggest that females and female headed households within the Project Area are more likely to face both systemic inequality (e.g. lower incomes and rates of land/asset ownership) and be burdened by other vulnerability factors.

2018 Census Surveys indicated that higher education levels, particularly advanced-level and tertiary education (university and diploma level) were lower for females compared to males among survey respondents of working age. Overall, respondents situated within the KSB alignment ROW had higher levels of education compared to KJE respondents and males recorded the highest rate of advanced tertiary education and the lowest rate of incomplete primary school education. KJE females recorded the highest rate of incomplete primary school education. As women are the predominant domestic caretakers in Uganda, it is expected that many women do not continue onto secondary or higher education due to competition from domestic duties.

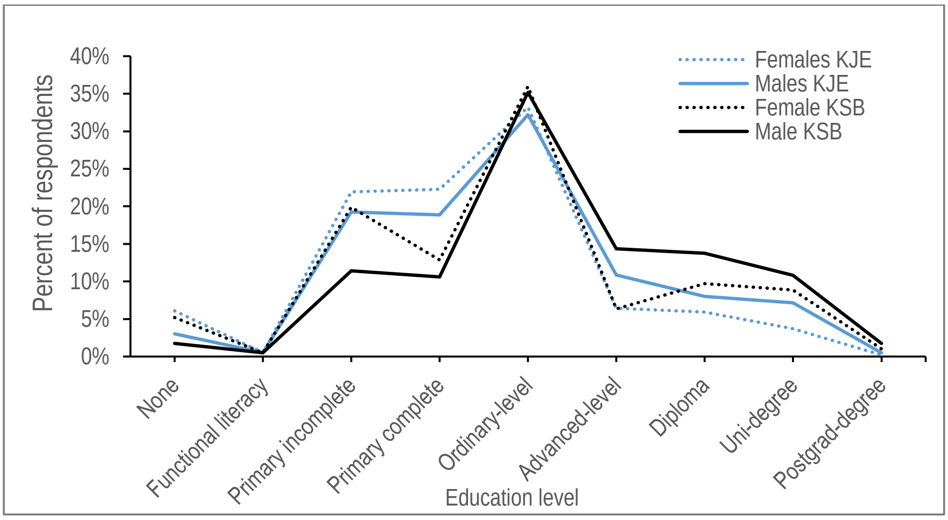


Figure 19-3. Percent of female and male respondents (of working age) per education level within KJE and KSB alignments. Data source: 2018 Household Census Survey, Earth Systems.

Gender Based Violence

Gender-based violence (GBV) is acknowledged as a key social issue within Uganda. Women in Uganda experience more than twice the rate of GBV than men, with 22% of women (8% of men) reporting to have experienced GBV at some time. Rates of GBV are lower in women educated above a secondary level (14%), belonging to higher income groups (18%), and living within urban areas (19%) compared to women less educated, of lower income, and living within rural areas (UBOS & ICF, 2017).

Instances of gender-based violence have been recorded at other major infrastructure projects in Uganda (IDRD, 2017)", which has been linked to:

- Modifications to existing community structures from the displacement of peoples, community infrastructure and livelihoods; and
- Introducing project personnel, subcontractors and peoples from outside the community, brought in during the construction phase.

The potential for instances of GBV to increase due to the Project will need to be actively managed for the Project to minimise risks.

Other vulnerable groups

Initial surveys conducted along the KSB alignment (UNRA, 2017) estimated that approximately 13% of the vulnerable groups surveyed were households with elderly or physically disabled residents. National statistics report 14% of the population 5 years of age and above to live with physical disability. Disability was also found to be higher among women than men, and higher in rural areas compared to urban areas (UOS, 2014).

A case study of War Veterans in Bukasa, Kasokoso and Kinawataka is provided in Chapter 9 of the RLRP.

19.9 Economic Analysis

Uganda has experienced sustained economic growth of 3.6% over the last several decades resulting in an increase of vehicle numbers. Traffic surveys undertaken in 2014 established that on average during the day, about 60,000 vehicles use the section from Kampala to Mukono (UNRA, 2017). Forecasted annual vehicle growth rates from

2011-2047 show between a 2.0% to 6.9 % of different classes of vehicles (Chapter 8) (URS Scott Wilson, 2011) showing a clear need to reduce existing congestion and meet future demand.

The financial model developed as part of the Project Final Feasibility Study (UNRA, 2017b) indicates that development costs of the entire Project including Phase 1 and Phase 2, will be approximately US$1.3 Billion. Annual operation and maintenance costs are expected to be US$11.9M (Table 19-17).

Table 19-17 Summary of estimated Project Costs

Costs	KJE Mainline (USD Million)	KSB (USD Million)	Total (USD Million)
Capital Project Costs			
Capital costs	860	280	1,140
Land acquisition	100	70	170
Total			1,310
Annual Operation and Maintenance			
Operation staff	$0.9M per year	$0.7M per year	$1.6M per year
Operation other	$1.5M per year	$0.3M per year	$1.8M per year
Maintenance:	$7.6M per year	$0.9M per year	$8.5M per year
Project Management	--	--	$1.5M per year
Total			$13.4M per year

Adapted from UNRA (2017a).

A Road User Charge / toll will be in place. Willingness to Pay study results show that on average, motorists would be willing to pay US$0.02 / km. This value is representative of what would be considered as affordable and competitive against the existing Kampala-Jinja road, which is free of cost to use. The predicted annual revenue generated from tolls is presented in Table 19-18. A sensitivity analysis was performed on aspects such as frequency of toll road use, extra capacity on the network, speed flow curves and rounding errors. In all cases, the analysis shows relatively small differences and variations.

Table 19-18 Summary of predicted revenue generated from Project tolls

Scenario	Revenue per Year (USD Million)					
	2022	2027	2032	2037	2042	2047
Low scenario	2.6	6.0	9.1	12.3	16.1	19.7
Medium scenario	4.4	12.2	21.5	34.3	50.9	70.9
High scenario	6.5	20.7	39.9	66.8	98.0	139.0

Adapted from UNRA (2017a)

Revenue is predicted to continue increasing in line with projected population growths of Uganda. This will provide the Government an opportunity to use the revenue to pay back for the Project. This would also enable UNRA to commission the expressway sooner than traditional tax-based revenue.

19.10 Impact Assessment

The key potential socio-economic and livelihood impacts of the Project are as follows:

- Temporary or permanent disruption and loss of access to properties, social and commercial services, facilities and natural resources along the alignment;
- Improvements in regional accessibility, connectivity and travelling times, facilitating regional economic development;
- Displacement of residents and loss of their land, assets and livelihoods;
- Loss of revenue, assets, structures, land and employee incomes for businesses from small kiosks to industrial establishments. Small or informal businesses which are not registered or have secure land tenure are particularly vulnerable;
- Provision of employment to local communities in the construction phase and, to a lesser extent, in the operation phase;
- Risks associated with labour influx during construction, including potential violence or harassment of women and children (as experienced and documented for the Uganda Transport Sector Development Project);
- Potential change of land use patterns throughout the area with associated livelihood and business impacts (e.g. loss of cultivated and grazing land) for large to small-scale farmers; and
- Impacts to utilities (e.g. power and water distribution services) and community property (e.g. worship sites, recreational facilities, local markets, cemeteries and schools).

Impacts on assets, infrastructure and land, and community health and safety due to increased dust and vehicular emissions, noise, vibration, night-time light pollution, waste generation, contamination and safety due to increased traffic are evaluated in detail in the following ESIA chapters:

- Chapter 7 Land, Assets and Infrastructure;
- Chapter 8 Traffic, Transport and Accessibility;
- Chapter 9 Materials Use and Waste Management;
- Chapter 10 Air Quality;
- Chapter 11 Noise and Vibration;
- Chapter 13 Visual Amenity;
- Chapter 15 Surface and Ground water; and
- Chapter 20 Community Health and Safety.

The focus of this assessment will therefore be on impacts to livelihoods and economic development of people within the Study Area.

19.10.1 Pre-Construction and Construction

Economic Development

During construction, the Project will provide a range of direct and indirect economic benefits at the local, regional and national levels. Direct benefits include government revenue through fees and taxes, as well as increased direct foreign investment in the country. The construction of the project represents a total Investment of approximately

$1.3 billion in capital expenditure (refer Section 19.9). Indirect benefits include flow on effects, training / skills development and infrastructure development. The capital expenditure will likely result in flow on effects to the Ugandan national economy, and its estimated to result in an increased GDP and Foreign Direct Investments of at least $300million (UNRA, 2017). There will also be significant economic opportunities for local businesses to provide goods and services to support the construction activities.

The construction works have the potential to result in significant local employment and training opportunities. It is estimated that US$0.1M will be spent on labour for Phase 1 and 2 of the KJE. This will result in a significant increase in regional and local employment opportunities with approximately 1,500 jobs created during construction (UNRA, 2017).

Occupational health and safety is a key aspect of the Project and is addressed in the ESMMP (refer Volume D).

Displaced Population

Based on 2018 Census Surveys of households situated within the ROW, it is estimated that land acquisition of the Project will cause physical and economic displacement of at least 29,983 people. In particular, in Kampala and Wakiso Districts, which are densely populated with a mixture of land tenure systems and land ownership status, including those who do not have any recognised land rights (e.g. squatters) and therefore do not qualify for compensation under Ugandan and expropriation laws. Land acquisition will result in the loss of 120 ha of settlement areas, comprising residential land and community areas, with the majority of the settlement areas impacted by the Project being situated in the Kampala and Wakiso Districts. Economic displacement will result in loss of livelihoods including loss or impact on wage-based livelihoods, businesses and land-based livelihoods. These are discussed in further detail below.

Further details on physical displacement from the Project are provided in Chapter 7.

Wage and Enterprise-Based Livelihoods

Due to the mainly urban context of Phase 1 of the KJE Project, income generating activities mainly comprise trade as either informal sole-trader enterprises or as wage-based employment. For the majority of Affected Persons, it is estimated that the majority of income is generated outside the Project ROW, however at least 39% of sole-trader income activities derived from informal residential rental enterprises based from a landlord's place of residence. Because of this, it is expected that the displacement of residences will result in significant loss to these activities.

Approximately 31.1 ha of industrial land will be affected by the Project footprint and buffer, with the majority of this land located along the KJE alignment (29.4 ha). Due to the concentration of industrial and commercial activity within this land type, particularity along the first 3 km of the KJE alignment, socio-economic impacts are likely to be high for business owners and employees. Impacts may be permanent where businesses are location dependent and cannot be re-established elsewhere, or temporary until the business is re-established. Impacts on business employees will vary depending on the employee's ability to resume their job functions in the new location.

5,378 informal and formal businesses were identified within the Project. Although many businesses were identified as small and informal sole-traders with operating from semi-permanent stalls, an estimated 706 businesses are established with more than 3 employees; 28 of which are large employee more than 20 staff. These businesses will need to access support to re-establish their activities to mitigate any potential loses that are likely to occur from displacement, including loss of local and regional productivity and employment. These will be coverin detail within the *Resettlement and Livelihood Restoration Plan* (RLRP, Volume D).

Land and Wetland-Based livelihoods

Land based livelihoods are practiced in all districts within the Project ROW with cultivated wetlands comprising 47 ha of total land use, 30 ha of which are within the KSB alignment. Subsistence agriculture and pastoralism is the most common and 120 ha of agro-pastoral land will be lost. Although subsistence agriculture has been observed throughout all districts traversed by the expressway, it is predominantly practiced in the Mukono and Buikwe Districts. Impacts on cash crops (e.g. coffee) and large-scale agriculture (e.g. plantations) in Mukono District and on crops grown on residential land in urban areas will also occur. Pastoralism will be mainly impacted in rural areas as it is prohibited within urban centres such as the KCCA.

A total of 59 ha of papyrus and degraded wetlands will also be lost, such as the Nakivubo and Kasanga wetlands along the KSB alignment. Wetlands have been degraded primarily as a result of human livelihood and economic activities such as intensive agriculture, brick manufacturing and aquaculture, among others. Brick manufacturing and fish ponds have been observed in wetlands in the Mukono District.

Severance and loss of access to areas where livelihood activities are conducted will also be an important issue where the Project design does not have adequate access for pedestrians and vehicles.

It is important to note that intensive agricultural activity within wetlands, in particular those found in informal settlements have in part been as a result of people moving to these areas after being displaced by other infrastructure projects (ICS, 2014). Therefore, well thought through compensation and livelihood restoration measures will be critical to ensuring impacts on land and wetland-based livelihoods are minimised, and people are provided the necessary assistance to, at a minimum, reinstate their standard of living elsewhere with secure land tenure.

Further details on direct land impacts from the Project are provided in Chapter 7.

Water Resources Use

The Project will impact the Kinawataka and Nakivubo wetlands where a number of informal settlements are present. As mentioned in Section 19.8.10, only 19% of the within ROW population has piped water on premises and access in informal settlements is particularly limited (MWE, 2016) with Census Survey data indicating that most people residing in informal settlements rely on springs and streams for their domestic water needs. The Project therefore has the potential to have the following direct impacts on water resources:

- Suspended sediments from runoff and erosion affecting surface water quality; and
- Loss of access to water resources (via direct loss within the ROW, and impacts on accessibility due to loss of access routes from the establishment of construction areas).
- A detailed assessment of potential hydrology and water quality impacts during Operations are provided in Chapter 15.

Gender

Although Uganda is progressively implementing a gender mainstreaming framework across all sectors through various initiatives guided by the Gender Policy, studies conducted on gender mainstreaming in Uganda's road sector have shown that the sector still suffers from inadequate gender capacity and inadequate priority and financing given to gender awareness (World Bank, 2013b).

As a result, construction of the Project will likely impact women more than men through:

- Loss of, or reduction in, access to services;
- Increase in the amount of time and cost to access services and natural resources (e.g. water sources); and

- Disproportionate employment opportunities with the Project.

In the context of the Project, women are typically more vulnerable to livelihood changes due to fewer available education, employment and training opportunities, and a higher reliance on agricultural activities. Women tend to be employed in less lucrative economic sectors and have substantially less access to inputs such as land and credit.

Gender discrimination may limit women's access to resources, opportunities, and public services necessary to improve the standard of living for themselves and their families. As a result, women are often the first to suffer when resettlement is planned or poorly executed. Women tend to rely more heavily than men do on informal support networks, such as the help of friends, neighbours, or relatives for child care. Women with children also have less physical mobility to travel to find ways of earning a livelihood.

There is potential for instances of Gender-based violence to increase as result of changes to the community structure in and around the expressway, as well as from increased pressure on livelihoods, with a higher rate of GBV directed towards women than men (UBOS & ICF, 2017).

Worker Health and Safety

UNRA is committed to building a workforce that is motivated, healthy and has a good working ability, and to creating healthy and safe workplaces that are free from accidents and work-related disease, in compliance with the Ugandan Occupational Safety and Health Act (2006). The OHS program for the Project will also take into account the IFC Environmental Health and Safety Guidelines for Toll Roads (2007).

Workers on the Project will be exposed to a number of risks from dust, noise, blasting activities, traffic, and handling of hazardous materials. Appropriate precautions will need to be taken to avoid work-related accidents, injuries or illness. UNRA and the Contractor will work to (i) identify potential hazards to workers, particularly those that may be life threatening; (ii) provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) train workers; (iv) document and report occupational accidents, diseases, and incidents; and (v) organise for emergency prevention, preparedness, and response.

Key OHS measures for the Project have been outlined in the ESMMP (Volume D). The construction contractor/concessionaire will also be required to develop, maintain and disseminate a detailed standalone OHS Plan for the Project, incorporating the measures outlined in the ESIA and other measures required to meet legislative requirements and relevant international standards.

Labour and Working Conditions

During the Construction phase, and during the Operation phase, 1500 and 250 workers will be employed by the Project respectively. There is potential for Project workers to encounter unfair and unreasonable working conditions, including: coerced labour, unfair work agreements, pay, dismissal, and compensation; unsatisfactory work accommodation; and improper grievance procedures—among others. Migrant and child workers are particularly vulnerable to unfair working conditions.

To comply with National and International standards and guidelines, specifically: IFC Performance Standard 2, and AfDB Operational Safeguard 5, UNRA is committed to implementing mitigation measures to safeguard workers against unfair labour conditions and to establish equal work opportunities. Key measures addressing Labour and Working Conditions for the Project have been outlined in the ESMMP (Volume D).

19.10.2 Operations

Economic Development

During Operations, the establishment of the expressway is expected to result in significant benefits to economic development at the national, district and local levels. The Project will contribute to improving access and trade between districts and improve transportation of goods across the country. A number of developments are currently planned within the Kampala – Jinja corridor including supermarkets, housing estates, industrial and business parks (e.g. Bweyogerere Business Park and Luzira Business Park), and individual industries (UNRA, 2017), which will benefit from the improved traffic management and access the expressway will provide. Likewise, communities will benefit from having access to existing and planned developments such as the Namanve Industrial Park and the new port at Bukasa, which will enhance job opportunities. The expressway will also significantly increase the accessibility of services such as markets and education facilities, which will contribute to livelihoods and local economic development opportunities.

During operations, it is estimated that Phase 1 and Phase 2 of the KJE will employ a total of 250 employees (UNRA, 2017). Most of these will be required as toll attendants for each expressway. Due to the geographic extent of the Project, it is anticipated that attendants will be locally recruited from communities situated near toll stations.

Displacement

As no additional land acquisition will be required during operations, no additional displacement is anticipated.

Wage and enterprise-based livelihoods

Impacts on wage and enterprises will continue until affected people are able to re-establish their livelihoods and sources of income. For temporary business disruptions, these impacts will stop as no additional land acquisition will be required.

Land and Wetland-Based Livelihoods

Further direct impacts on land and wetland-based livelihoods will not occur during Operations as no more direct land acquisition will be required. However, within the urban context, the limited available land means that displaced persons may not be able to resume their livelihoods and may fall into worse economic conditions than prior to the Project construction. Those that resume their livelihoods, in particular those living in informal settlements who move to a different area in an informal settlement will add pressure on existing limited resources and people.

Water Resource Use

During operation, it is expected that sediment transport will be less extensive than during construction. However, runoff during the rainy seasons will have the potential to impact water quality (e.g. hydrocarbon contamination). Further details on potential water quality impacts during Operations are provided in Chapter 15.

Gender

Women have different transport needs than men and therefore are more likely to be disproportionately affected by road development projects such as the KJE Project which is geared towards motor vehicle traffic. Women, in particular those from poor households, tend to walk or use intermediate means of transport as their main source of transportation, which will not be permitted on the expressway. Unlike men, whose transportation needs are

more centred around employment, women are more likely to make multiple trips per day to community and social services (World Bank, 2013a).

19.11 Avoidance, Management and Mitigation Measures and Residual Impacts

A summary of key mitigation measures for potential impacts on livelihoods will aim are presented in Table 19-19 below. Specific measures for impacts due to land and asset acquisition are discussed in detail in the *Resettlement and Livelihood Restoration Plan* (RLRP, Volume D).

For affected livelihoods conducted in urban areas, income and livelihood restoration will include:

- Preferential employment opportunities during Project construction;
- Skills training to improve current skillset or re-skilling to take on new employment opportunities. Affected Persons choosing this option will be provided assistance to find local training opportunities and programs;
- Financial literacy and provide assistance to access credit facilities; and
- Support local entrepreneurial initiatives in collaboration with Local Councils and relevant NGOs;

For affected agricultural land outside metropolitan and urban areas, income restoration will focus on improving land productivity, through measures such as:

- Improving irrigation and extent of irrigation;
- Training on agricultural inputs, cultivation techniques, cash crops (e.g. sugarcane)
- Creation or improvement of cultivatable land; and
- Improving animal husbandry.

Gender based practical measures will consider:

- Ensuring that land titles and compensation entitlements are issued in the name of both spouses;
- Reducing women's workloads by supporting development of basic community infrastructure such as water delivery;
- Improving access to health and supporting educational programs such as family planning advice and water supply and sanitation training;
- Improving family services by supporting the provision of immunisations, elementary schools, inputs for food-crop production and housing; and
- Increasing incomes by setting up credit groups and providing small business / skills training and improving access to markets.

Strategic gender initiatives should include:

- Improving educational opportunities (providing literacy and numeracy training, promoting girls' education);
- Improving access to productive assets (e.g. credit);
- Improving participation in decision-making (support for women's interest groups);
- Promoting equal opportunity for women's employment;
- Providing training and contractual obligations to concessionaire and sub-contractors in respect to a code of conduct for engagement with communities; and

- Provisioning gender-based violence prevention programs and support services.

The Project should also enhance the provision of prevention programs and response services for those at risk of sexual violence in the Project area. A specific budget for these programs is provided in the ESMMP (Volume D). Activities should include:

- Community campaigns to reduce social tolerance of Gender Based Violence (GBV),
- Enhancing systems of support for victims of GBV (i.e., coordinating health, police, justice services),
- Ensuring all employees must be signatory to a concessionaire policy of no tolerance for any form of abuse or inappropriate contact or sexual exploitation of co-workers, and likewise in respect to relations with members of communities with whom they are in contact during construction and in operational activities; and
- Strengthening community support system capacity to respond to GBV, including village health teams, local council leaders, and religious and cultural leaders.

Special assistance to support vulnerable households is provided in the RLRP, and will be further determined by the UNRA Community Department and the Resettlement Advisory Committee. Special assistance to vulnerable groups may consist of the following:

- Ensuring they rightfully receive their compensation;
- Protection from opportunistic relatives;
- Open bank accounts;
- Special support for widows and children from female headed households to access support from the Administrator Generals office or designated representative at the district and sub-county levels so as to enable them to process their entitlements
- Financial literacy training;
- Find new land and / or accommodation; and
- Securing land tenure in new location.

Table 19-19 Key avoidance, management and mitigation measures and residual impacts / risks for socio-economic conditions and livelihoods.

Risk / Aspect	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction			
Socioeconomic impacts from loss of housing, structures, and physical displacement	► Avoidance of settlement areas to the extent possible. ► Where displacement is unavoidable, follow measures described in the Resettlement and Livelihood Restoration Plan, including compensation at full replacement cost and a disturbance allowance (15%). ► Where resettlement is preferred by vulnerable person, assist finding new residence. ► Provide livelihood restoration measures as appropriate. ► Assist in securing tenure. ► Implementation of Grievance Mechanism and monitoring.	Negative	Moderate The loss of land within the ROW and physical displacement of AP will result in socioeconomic impacts particularly due to loss of wage-based livelihoods in urban areas. These will be compensated for through the implementation of the *Resettlement and Livelihood Restoration Plan.* Impacts may still be moderate as compensation measures place the responsibility for relocation and re-establishment of livelihoods on the affected person. Ability of affected person to settle into new location may vary.

Risk / Aspect	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
Socioeconomic impacts from loss of business properties (i.e. unemployment)	► Follow measures described in the Resettlement and Livelihood Restoration Plan, including compensation for re-establishing commercial activities elsewhere, lost net income during transition period, cost for transfer and reinstallation of the structure / equipment. ► Prior to disruption of businesses, strategies and plans should be developed in consultation with affected businesses for how the disruption of the business will be minimised. ► Livelihood restoration measures for vulnerable persons ► Implementation of Grievance Mechanism.	Negative	Minor Assets associated with numerous businesses will be lost due to the establishment of the ROW (refer Chapter 7 for specific impacts). With implementation of mitigation measures described in the *Resettlement and Livelihood Restoration Plan*, residual impacts on businesses and employees are expected to be minor.
Socioeconomic impacts from loss of community and social infrastructure	► Conduct ongoing consultation and engagement with affected communities; ► Relocation/compensation of community structures e.g. churches, mosques; ► Implementation of Grievance Mechanism.	Negative	Moderate A significant amount of community infrastructure will be directly impacted by the ROW and require relocation (refer Chapter 7 for specific impacts). Limited land available in the densely populated areas may result in reestablishment of community infrastructure at a distance that is not easily accessible by affected community (e.g. schools).
Socioeconomic impacts from loss of agro-pastoral land	► Cash compensation at market value of land of equal productive use, compensation for improvements on the land including irrigation structures, disturbance allowance etc. ► Salvage of all crops on land, prior to expropriation. ► Livelihood restoration (e.g. training) with special consideration of vulnerable groups. ► Implementation of Grievance Mechanism.	Negative	Minor Loss of land directly impacted by the ROW will affect livelihoods for those earning incomes from these areas (refer Chapter 7 for specific land loss impacts). With compensation, appropriate implementation of livelihood restoration measures and monitoring, any residual impacts are anticipated to be minor.
Water Resource Use	► Implement mitigation measures in Chapter 15 (Surface and Groundwater), including Project design features to ensure impacts on downstream water uses are minimised. ► Ensure water supplies in resettlement areas are sufficient to provide adequate access to water for AP who are displaced and provide additional services where required as part of the RLRP.	Neutral	Negligible With implementation of the measures proposed no significant impacts on water use are expected during the Pre-Construction Phase.
Construction			
Economic Development	► Continue to implement the RLRP (Volume D) ► Require construction contractors to implement a local procurement policy to maximise economic benefits for local businesses ► Implement measures in Chapter 8 (Traffic, transport and accessibility) to minimise impacts on accessibility for local businesses. ► Implement measures to maximise employment benefits (see below)	Positive	Major During construction, the Project will provide a range of direct and indirect economic benefits at the local, regional and national levels. Examples of direct benefits include fees and taxes paid to the Government, as well as provision of local employment. Examples of indirect benefits include economic opportunities for local businesses to provide goods and services for construction activities.

Risk / Aspect	Avoidance, Management and Mitigation Measure	Impact Direction	Magnitude and Key Residual Impacts / Risks
Employment	► As part of the livelihood development strategies in the RLRP, provide financial and technical support to existing or new small businesses that can provide goods and services to the Project ► Ensure construction contractors are required to implement a 'locals first' hiring policy which preferentially provides employment to people directly impacted by the Project (AP). This should include training and employing AP for skilled labour opportunities where possible ► Ensure construction contractors are required to develop contracts for casual labourers. These should specify labour requirements, wages, working conditions, workers' rights and Company obligations	Positive	Major The Project will provide a large number of direct jobs during the Construction Phase, with associated training opportunities. There will also be significant indirect employment opportunities through the supply of goods and services to support construction activities.
Water use	► Implement mitigation measures in Chapter 15 (Surface and Groundwater) ► Ensure any water sources impacted within the ROW are replaced where needed so there is no reduction in access to water sources for communities.	Negative	**Minor - Moderate** Short-term minor to moderate impacts on downstream water quality from erosion and sedimentation from construction sites is expected, which may affect downstream water use and associated livelihoods, particularly in wetland areas. A low risk of impacts on water use from water contamination from runoff from construction areas and spills of chemicals such as fuels will also remain.
Operations			
Economic Development	► Implement mitigation measures from the Construction Phase, where applicable	Positive	Major The Project will contribute economic development particularly through improving access and trade between districts, and improving access to services such as markets and education for local people.
Employment	► Implement mitigation measures from the Construction Phase, where applicable	Positive	Minor While employment opportunities during the Operations Phase will be much less than during Construction, provision of employment during Operations will benefit the livelihoods of those employed.
Water use	► Implement mitigation measures in Chapter 15 (Surface and Groundwater)	Neutral	Negligible No significant impacts on downstream water uses are expected during Operations with diligent implementation of the mitigation measures proposed. A low risk of impacts on water use from water contamination from runoff from the road (e.g. oils) will remain.

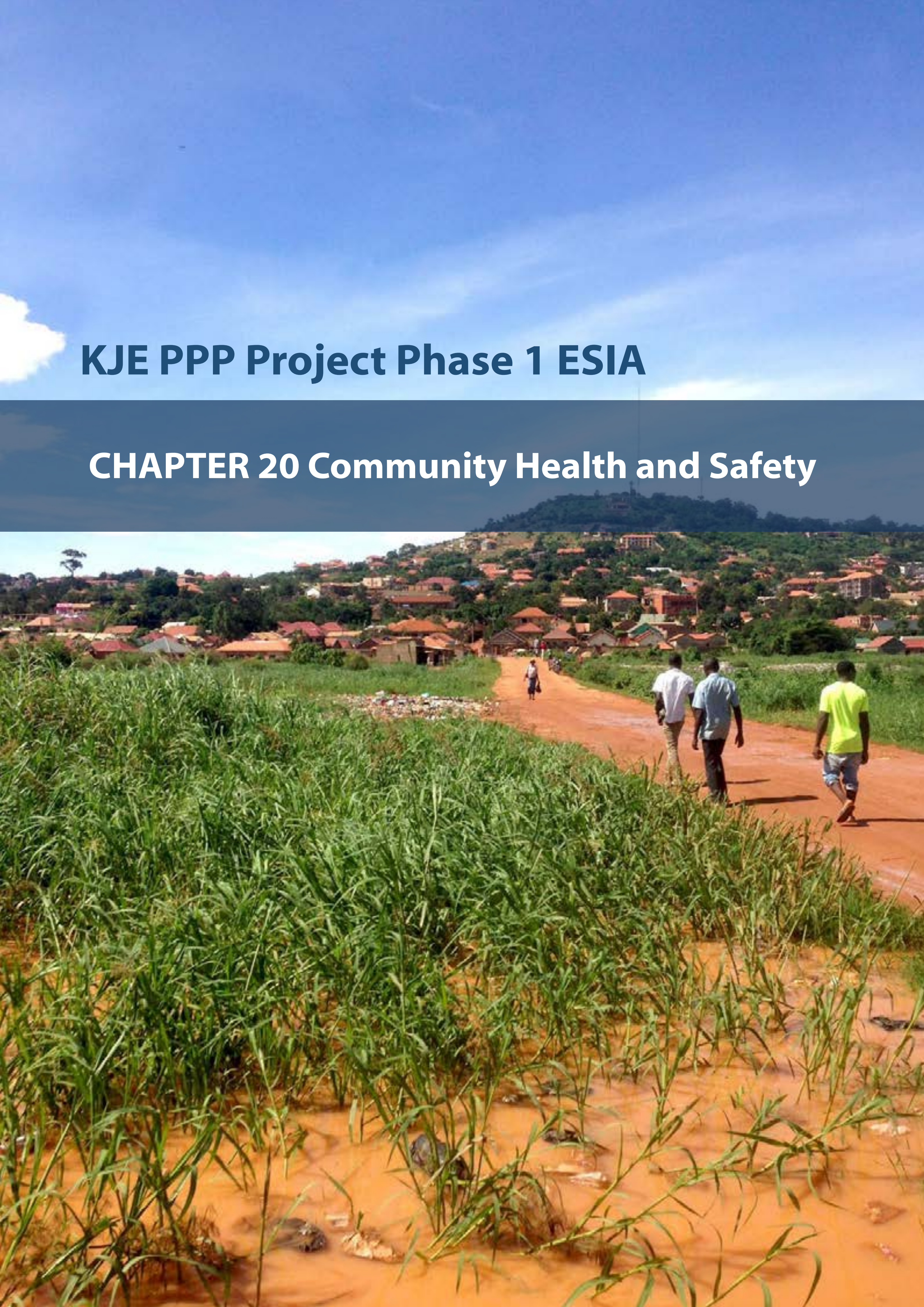
19.12 Conclusions

The linear nature and geographic extent of the Project means that the expressway traverses urban and rural areas with varying demographics, land tenure systems and livelihoods. Key areas of impact will be the densely populated areas of Kampala and Wakiso Districts where the project will displace an estimated 29,983 people living directly within the Project ROW. A large proportion of the population live in informal settlements and already live under challenging socio-economic conditions and limited access to basic needs.

The land acquisition required for construction of the Project, will result in physical displacement including loss of residential property, land, and community infrastructure. Economic displacement will include loss of livelihoods and income generation through, informal businesses activities, subsistence activities such as agriculture, and wage-based livelihoods through loss of enterprises. A detailed *Resettlement and Livelihood Restoration Plan* has been developed (refer Volume D) to ensure that all affected persons are able to at minimum regain their pre-Project standards of living and where possible improve their quality of life, in particular for the vulnerable and those living in informal settlements.

KJE PPP Project Phase 1 ESIA

CHAPTER 20 Community Health and Safety



20. COMMUNITY HEALTH AND SAFETY

20.1 Study Area and Methodology

To assess the potential impacts on community health and safety, the following activities were undertaken:

- Scoping process to identify potential community health and safety issues for communities closest to the Project. These were informed by a review of:
  - Community health and safety issues associated with current expressway projects during construction and operations to identify potential health and safety impacts;
  - Social and health assessment related work undertaken in the previous ESIAs by URS (2013, 2014) and ICS (2015) and a review of previous Project feasibility studies;
  - Consultation activities conducted for the previous ESIAs for the Project, with a particular focus on community health and safety aspects;
  - Health related information collected during the 2011 social surveys with households in the previous alignments for the Project;
  - Other technical studies conducted for the project including air quality, noise and traffic/ accessibility modelling;
  - Information from additional site visits conducted in 2017 for the ESIA and RAP update;
- Description of the community health and safety baseline for the Project area, using the information obtained during the scoping component. This also included:
  - Analysis of the health status of the population in the project area (including use of government data from the Ministry of Health);
  - Analysis of safety issues associated with roadways and review of key road traffic incident data from Ugandan Police reports;
  - Review of existing health infrastructure in the Project area.
- Primary data on health and safety was collected from the census and socioeconomic surveys conducted for the Project (refer methods in Chapter 19)
- Identification of potential health and safety risks, impacts, management and mitigation measures, and residual impacts based on the Project design and the new alignment for the Project, utilising the ESIA risk assessment methodology outlined in Chapter 1 – Introduction. This considered:
  - Both beneficial and adverse impacts on community health and safety resulting from construction and operations;
  - Identification of measures to enhance project benefits and avoid or reduce the impact of the Project;
  - Residual impacts from the Project were also assessed.

20.2 Baseline Conditions

20.2.1 Access to Health Services

Health care services in Uganda are delivered at different administrative levels: hospitals at the national and regional levels, district services and various levels of primary health care through different types of health centres

(Health Centre IV, III, and II) at the sub-district level. Most residents in Kampala have good access to health services. For example within the Kampala district approximately 18.1% of households are 5 km or more from the nearest public health facility and 4.3% of households are 5 km or more from the nearest health facility, whether public or private (NPHC and UBOS, 2014).

A number of health facilities were identified in the vicinity of the KSB and KJE Mainline alignments, mostly in Kampala and Wakiso districts. These facilities comprise mostly of pharmacies, medical clinics and health centres (refer Section 20.3.3), although they also include three hospitals:

- China Uganda Friendship Hospital – a regional referral hospital in Lugogo, Kampala;
- Kirrudu General Referral Hospital - public general hospital (just over 8km south of Lugogo);
- Paragon hospital, a private hospital - 5 km east of the Kampala CBD.

Consistent with district trends, access to health care in the Project area is fairly good with approximately half of respondents (46%) in the 2011 social surveys indicating that they were able to receive treatment within 2 km of their home. Approximately 20% reported that they had to travel over 4 km to a health facility. Most respondents reported that they used hospitals for treatment, followed by Health Centre IIIs.

20.2.2 Morbidity and Mortality

20.2.2.1 Morbidity

Malaria remains the leading cause of morbidity in Uganda, followed by cough or cold. The prevalence of malaria in Uganda is 30.4%, however rural children are over 3 times more likely to test positive for malaria than those within urban communities (UBOS and IFC, 2017). The Uganda Demographic and Health Survey (2017) defines specific 'subregions' in their analysis of the country. Subregions intersected by the Project footprint are provided below, with the Project districts occurring within each subregion listed (among others):

- **South Central:** Wakiso
- **North Central:** Buikwe, Mukono
- **Kampala:** Kampala

All of the subregions intersected by the Project Footprint are below the national average with regards to malaria prevalence, with the percentage of children in the South Central, North Central and Kampala regions testing positive for the malaria are 16.1%, 21.5% and 0.9% respectively (Table 20-1). The prevalence of malaria is the highest within the lowest wealth quintile and lowest within the highest wealth quintile, with the percentage of children testing positive for malaria being 52.3% and 4.9% respectively (UBOS and IFC, 2017).

Table 20-1 Prevalence of Malaria in children (UBOS and IFC, 2017)

Background Characteristic	Malaria prevalence according to RDT	
	RDT Positive (%)	Number of Children
Residence		
Urban	11.5	912
Rural	34.9	3,799
Subregion		
South Central	16.1	575
North Central	21.5	508
Kampala	0.9	134
Wealth Quintile		

Background Characteristic	Malaria prevalence according to RDT	
	RDT Positive (%)	Number of Children
Lowest	52.3	1,025
Second	35.3	980
Middle	29.4	968
Fourth	24.6	909
Highest	4.9	829
Total	30.4	4,711

RDT = Rapid Diagnostic Test SD Bioline Pf/Pv
Percentage of children age 6-59 months classified as having malaria, according to background characteristics.

Consistent with national trends, malaria was the most common illness affecting respondents from the 2011 social surveys (64.4%). Other common causes of mortality included coughs or respiratory tract infections (17%), diarrhoea (6.7%), worms (4.4%) and HIV/AIDS (4.4%) (URS, 2011).

20.2.2.2 Mortality

According to Institute for Health Metrics and Evaluation (2018), the leading cause of mortality in Uganda in 2016 was HIV/AIDS, followed by tuberculosis and thirdly malaria. In adults other causes of death included diarrheal diseases, cardiovascular diseases and other non-communicable diseases. In 2008 the three main causes of mortality in children, were malaria (19%), diarrheal diseases (14%) and pneumonia (11%) (WHO, 2011).

Early Childhood Mortality

The infant and child mortality rates of a nation serve as an indicator for the socioeconomic status of a country. The Uganda demographic and health survey (2017) compiled the data for early childhood mortality from three successive five year periods preceding 2016, estimating the following:

- Neonatal mortality: The probability of dying within the first month of life;
- Post-neonatal mortality: The probability of dying after the first month of life but before the first birthday:
- Infant mortality: The probability of dying before the first birthday;
- Child mortality: The probability of dying between the first and fifth birthday; and
- Under-5 mortality: The probability of dying between birth and the fifth birthday.

Table 20-2 shows the largest early childhood mortality rate per thousand is between the years 1 and 5. The early childhood mortality has also declined since 2000, with the exception of neonatal mortality. The total early childhood mortality rate (under-5 mortality) has decreased by 45% since 2000 in Uganda.

Table 20-2 Early childhood mortality rates

Years preceding the survey	Neonatal mortality	Post-neonatal mortality	Infant mortality	Child Mortality	Under-5 mortality
0-4	27	16	43	22	64
5-9	28	25	53	32	83
10-14	24	45	69	51	116

Source: Uganda Demographic and Health Survey (2017)
All rates are expressed per 1,000 live births, except for child mortality, which is expressed per 1,000 children surviving to age 12 months.

Maternal Mortality

The Ugandan rate of mortality associated with pregnancy and childbearing is 0.63 maternal deaths per 1,000 woman, as opposed to the global average of 0.22 maternal deaths per 1,000 (UNICEF, 2018). The highest age specific maternal mortality rate is from 40 – 44 and the lowest is 45 – 49. Within the seven year survey period (2009 – 2015) maternal deaths represented 18% of all of the deaths sampled amongst women (UBOS and IFC, 2017).

Table 20-3 Maternal mortality

Age	Percentage of Female Deaths that are Maternal	Maternal Deaths	Maternal Mortality Rate
15-19	17.2	19	0.39
20-24	24.5	31	0.61
26-29	20.3	29	0.66
30-34	19.0	31	0.91
35-39	13.0	17	0.65
40-44	19.2	20	1.19
45-49	2.3	2	0.16
Total (15-49)	17.5	149	0.63

Source: Uganda Demographic and Health Survey (2017)
Direct estimates of maternal mortality rates for the 7 years preceding the survey, by 5-year age groups

20.2.2.3 HIV/AIDS

While the incidence of HIV/AIDS has been reducing in Uganda in recent years, it remains a significant issue with an estimated 1,400,000 people living with HIV in 2016 (UNAIDS, 2017). Data indicates that contributing factors to the high incidence of HIV/AIDS may include low knowledge of HIV prevention among young people (aged 15-24), and relatively low condom use.

20.2.2.4 Traffic Related Incidents

Road traffic incidents are a serious concern in Uganda, with the country's rate of road traffic incidents being one of the highest in the African region (WHO, 2015). Currently, the country experiences 28.9 road traffic related deaths per 100,000 people, a figure which exceeds that of the African region (24.1) and the global average (18.0) (WHO, 2015). In 2014, there were 17,848 reported casualties from traffic related incidents, with 2,845 reported deaths (UPF, 2014). Pedestrians and passengers are the most vulnerable category of road users, comprising 41% and 26% respectively of those killed in 2014. The main causes of accidents were through human factors (such as careless or reckless driving and careless pedestrians) (UPF, 2014). Vehicle conditions (e.g break failure) and road conditions (e.g potholes) contributed to a small minority of incidents. The main vehicle types involved in crashes were cars, motorcycles (boda bodas) and omni-buses.

Data on road traffic related incidents from the Ugandan Police Force are presented in the tables below. The existing Kampala-Jinja road has one of the highest accident rates in the country (UNRA, 2017). Key factors contributing to road traffic incidents along the existing road include poor road geometry (sharp curves, steep gradients and minimal climbing lanes), narrow road width, high percentage of trucks and agricultural vehicles and difficulty overtaking (UNRA, 2017). These factors lead to motorists taking higher risks to overtake, thus resulting in a high rate of motorcycle accidents. Pedestrians are also at a high risk of mortality or injury from traffic incidents (Table 20-4).

Table 20-4 Road victims by user category for May 2017

Road user	Victims	
	Killed	Seriously injured
Drivers	08	55
Motor Cyclists	43	203
Pedal Cyclists	10	34
Passengers	36	271
Pedestrians	73	140
Total	170	707

Source: UPF, 2017

Table 20-5 Summary of road traffic incidents along the Kampala-Jinja Road, 2013-2015

	2015	2014	2013
Fatal	211	186	214
Serious	1222	1174	1199
Minor	958	1001	879
Total	2392	2361	2292

Source: UPF in UNRA, 2017

The social surveys conducted as part of the 2011 ESIA included community perceptions of the causes of road traffic incidents along the Kampala-Jinja road. Nearly half of the respondents believed that trailers were the main cause of accidents, while others believed that taxis or agricultural vehicles were the main cause. Few respondents indicated that motorcycles (boda bodas) or buses were the main cause of accidents.

20.2.3 Water, Sanitation and Hygiene

Water, sanitation and hygiene are key public health concerns in Uganda. Most of the KSB alignment and the first 12 km of the KJE mainline pass through the urban areas of Kampala and Wakiso Districts, including the informal settlements of Kinawataka, Kasokoso (KJE Mainline) and Kantogole. Particular water and sanitation concerns in these areas include (IBRD and World Bank, 2015):

- Contamination of urban water supply systems from unsanitary conditions and flooding, resulting in outbreaks of water borne diseases such as cholera;
- Increase in the incidence of malaria and diarrheal diseases after heavy rains;
- Predisposition to meningitis and other diseases such as eye and skin infections caused by lack of water for adequate sanitation;
- High density of informal settlement areas and lack of basic public infrastructure such as water, sewage, and solid waste collection, resulting in significant public health issues which mainly affect the poor.

Approximately 34% of households in Uganda have access to improved latrine facilities, with this being higher in urban areas. Covered pit latrines are the most common latrine facilities used, with coverage being highest in the project districts of Kampala (99%) and Wakiso (90%), followed by Mukono (81%). Overall, 71% of the population have access to improved water sources, with this being higher in urban areas (85%) compared to rural areas (65%). The percentage of households without access to clean water and toilet facilities in the Kampala Central district is 3.7% and 0.6% respectively (NPHC and UBOS, 2014).

20.2.4 Air Emissions and Health

Ambient air quality in Kampala has deteriorated significantly in the past two decades due primarily to the heavy reliance on wood and charcoal for cooking and the increase in the number of motor vehicles. In particular, the shift towards higher emission emitting vehicles such as motorcycles (boda bodas) is also having a significant impact on air quality in urban areas (IBRD and World Bank, 2015).

The air quality baseline for the Project area is provided in Chapter 10. The monitoring data shows that ambient air quality around Kampala is very poor. Existing vehicle emissions (SO2, NOx, CO) and dust particulates from nearby roads are the primary factors reducing air quality in the vicinity of the Project. Windblown dust and burning of vegetation in the dry season also impacts on air quality in the region, which results in enhanced particulate concentrations from smoke and ash, above health criterion levels.

For example, baseline data is available from the long-term hourly monitoring of Particulate Matter PM2.5 occurs at the US Embassy in Kampala, which is located approximately 3 km from the Phase 1 section of the Mainline Expressway (see Chapter 10). For the period February 2017-January 2018, the PM2.5 Kampala dataset shows the following;

- Maximum PM2.5 was recorded at 407 µg/m3;
- Mean PM2.5 was 54 µg/m3 – over twice the WHO PM2.5 Guideline 25µg/m3;
- Maximum monthly PM2.5 concentrations are in December, February and July (dry season):
- Minimum monthly PM2.5 concentrations are in May (wet season); and
- PM2.5 concentrations peak at 8 am in morning and 10 pm in evening.

20.2.5 Noise Disturbance and Health

Unmitigated, elevated noise levels can disturb the local community and reduce the quality of life. Elevated noise (above guideline levels) can have short-term and long term impacts on health including sleep disturbance, hearing impairment, interference with speech, impacts on performance, possible indirect effects on mental health (through exacerbation of existing issues in vulnerable populations) and possible tinnitus (which can result in sleep disturbance, anxiety, irritability and listening issues) (WHO, 2011).

The noise baseline for the Project area is described in Chapter 11, including baseline data from surveys along the alignment that have been conducted in several recent studies. The noise monitoring conducted by the various teams for the ESIA shows that ambient daytime noise is typically above the WHO daytime noise guideline (55 dB) at sensitive receptors and can exceed the Ugandan requirements of Maximum Permissible Noise Levels for General Environment for residential areas (60 dB). Locations within Kampala have generally higher ambient noise than those outside the city. Existing noise emissions in the vicinity of the Project largely originate from human activity. Thus, the main noise sources in the Project region are:

- Vehicle and motorcycle use;
- Agricultural machinery and sugarcane industry;
- Medium and small-scale industry;
- Schools, churches, a prison and a market;
- Railway line;
- Wildlife and insect activity; and
- Thunder and rain.

20.2.6 Nutritional Status in Children

Food security and nutritional insecurity are serious issues within Uganda and have a profound impact on child malnutrition within the country (Alderman, 2007). Measurements of nutritional status, usually based on the growth of children, are commonly used as potentially useful indicators of the health and welfare of communities (Dowler, 1982). The Uganda Demographic Health Survey (2017) measured the nutritional status in children by three parameters; height by age (linear growth), weight by height (current nutritional status) and weight by age (composite index). Height by age tests for chronic malnutrition (if a child is stunted), the data show that 29 percent of children under 5 are considered to be short for their age or stunted (below -2 SD), and 9 percent are severely stunted (below -3 SD). Weight by height tests for acute malnutrition (if a child is wasted), overall, 4 percent of children are wasted (below -2 SD) and 1 percent are severely wasted (below -3 SD). The results show that 11 percent of all children are underweight (below -2 SD), and 2 percent are severely underweight (below -3 SD). Notably the Uganda Demographic Health Survey (2017) indicated nutritional status is generally better for children in Kampala compared to the other 'subregions' affected by the Project in more rural areas.

20.3 Impact Assessment

20.3.1 Pre-Construction Phase - Health Impacts of Displacement

The Project will result in full and partial loss of land, residences and businesses, which may result in temporary short-term increases in mental stress and anxiety among the resettled population (refer Chapter 7). Moving house is known to be a significant stressor on individual health as it temporarily disrupts family life. Relocation can also cause temporary disruption to social networks and community relationships which may also add some level of stress and anxiety.

Whilst the potential for stress and anxiety associated with relocation cannot be completely avoided, potential impacts can be minimised through an open, transparent and participatory resettlement process. Recommendations regarding the resettlement process are provided in the *Resettlement and Livelihood Restoration Plan* (refer Volume D).

The assessment of social impacts associated with land acquisition for the Project and associated relocation of affected households is provided in the *Resettlement and Livelihood Restoration Plan* (refer Volume D) and Chapter 19 on Socio-economic Impacts.

Apart from the health impacts of displacement discussed above, no other significant impacts on community health and safety are expected for the Pre-Construction Phase. Potential impacts associated with the Construction and Operations phases are discussed below.

20.3.2 Community Safety and Changed Traffic Conditions

20.3.2.1 Construction

During Project construction, a number of access routes will be used to facilitate the transportation of construction materials, equipment, fuel, general supplies and construction workers to the various construction sites, quarries, borrow areas and construction camps to be used for the Project. Where possible, the Project will utilise existing road infrastructure, however in some areas, new temporary access roads may have to be constructed to access construction areas, particularly in the more rural areas east of Kampala. The Project is also expected to generate a large number of light and heavy vehicle movements during the construction period.

Unmanaged, a key community health and safety issue during the construction period is likely to be an increase in road safety risks in settlement areas around construction sites and access routes, as a result of a temporary change in the road environment and traffic conditions associated with the Project. Potential changes in the road

environment include an increase in the number of heavy vehicles through the addition of Project vehicles on the road network, additional road hazards around construction sites, variable speed limits and unfamiliar conditions. Unmanaged, this is could impact community health and safety through an increased risk of vehicle collisions, resulting in personal injury or death. A key vulnerable group will be pedestrians (particularly children) near construction sites and in villages along Project transportation routes. A number of pedestrian diversions will need to be implemented during construction to protect community safety and provide alternative access routes. Proposed pedestrian crossing locations for the Project have been identified in Section 8.3.6. Safety fencing/barriers around construction sites in urban areas will also assist in separating pedestrians from construction vehicles and equipment.

Impacted road users will include private vehicles, public transport, two or three wheeled vehicles, non-motorised vehicles and pedestrians. This risk will be higher for people living or travelling near the construction sites and access routes used by Project vehicles. These include existing roads, construction access routes or the accessory roads being built or upgraded as part of the Project.

Community risks may also be exacerbated where the quality of existing road infrastructure is low or has been damaged, if night-time transportation is required, or where there is a high prevalence of existing road hazards such as pedestrians (particularly children), livestock and slow moving vehicles (such as tractors and bicycles). Children are likely to be at greatest risk of road accidents, as they commonly play by the roadside, and use the roads to walk/ride to and from school.

In addition, traffic safety awareness, particularly in rural areas (where Project vehicles pass through existing roads or where new access roads are created) may be more limited than in urban areas, which could increase the risks of road hazards.

Other accidents may occur from unauthorised access to construction sites. Security measures such as security fences and signage around construction sites in populated areas will be required to minimise risks of unauthorised access. Ensuring alternative access is provided for pedestrians where existing access routes are blocked will also assist in reducing the likelihood of trespass through construction areas.

Examples from the recently opened Kampala-Entebbe Expressway are indicative of pedestrian risks on multilane expressways. During ESIA surveys, papyrus collectors in the Mayanja Wetlands were observed walking across the Kampala – Entebbe expressway, carrying large bundles of papyrus and climbing over lane dividers. Whilst use of Mayanja Wetland for economic purposes is illegal – these activities have continued, and community members face severe safety risks associated with pedestrian use of expressways.

20.3.2.2 Operation

One of the primary benefits of the Project is expected to be an overall improvement in general road safety and a potential reduction in crash rates in the region (refer to Section 20.2.2.4 for safety risk factors on the existing roads). The Project is expected to improve road safety in the region by providing an alternative to the existing undivided road from Kampala to Namagunga, with a multiple lane dual carriageway, with improved alignment, more overtaking opportunities and controlled access via interchanges. Specifically improvements in road safety as a result of the Project are likely to include:

- Implementation of a dual carriageway with central medians to divide oncoming traffic which is expected to reduce the risk of collisions compared to an undivided road where oncoming traffic is not physically separated;
- By limiting access to certain vehicle types, the use of the expressway will also help separate vulnerable road users such as motorised two or three wheeled vehicles and non-motorised vehicles from normal vehicles and heavy vehicle traffic, thus helping to reduce risk of accidents (WHO, n.d).

- Reduced number of entry points to the expressway which will help reduce the friction associated with vehicles entering from numerous points;
- Avoidance of the black spots on the existing roads, by diverting traffic to the expressway;
- The Project is also expected to help improve the health and safety of pedestrians and local road users in towns bypassed by the Project, by diverting traffic (particularly heavy vehicle traffic travelling through the region) to the expressway.
- As pedestrian access will not be permitted on the expressway during Operations, risks of collisions with pedestrians are expected to be minimal along the expressway. Alternative pedestrian access routes and crossings will need to be provided where required.

Whilst motorways are generally considered to be safer compared to normal roads in built up areas, they present a different set of community health and safety issues, which could impact road users utilising the expressway. These include (Road Observatory, UK):

- Less experienced drivers may have a poorer understanding of the risks associated with driving on the motorway, and be more susceptible to the risk of accidents;
- Road accidents, should they occur on the expressway, could be more severe due to the high speeds travelled on the expressway; and
- Motorways provide a monotonous driving environment due to their form (e.g. few junctions, unidirectional flow etc). This can be riskier for fatigued drivers. Commercial vehicle drivers are particularly at risk due to spending most of their working time on the road.

The 2015 ESIA (ICS, 2015) identified that with the current driving culture in the country and the unfamiliarity of some road users with this type of road, there is a risk of community health and safety impacts associated with:

- Road users not understanding or practicing the road safety requirements outlined in the Highway Code (2009);
- Road users trying to cross the expressway in areas where there is no road crossing; and
- Roadside communities attempting to construct illegal access to the expressway.

Design features such as installation of barriers along the expressway, pedestrian crossings, warning signs and other information signs, as well as enforcement of speed limits and other traffic regulations, will be important to help minimise potential health and safety issues associated with utilisation of the expressway.

20.3.3 Access to Health Facilities

20.3.3.1 Construction

No hospitals are located within the ROW or directly adjacent to the ROW. No significant adverse impacts on hospitals due to direct or indirect disturbance from Project construction activities is expected, as all hospitals are located over 350m from the ROW.

The Project will result in direct loss of some health facilities due to the establishment of the ROW. As per Table 20-6, a total of 13 facilities will be impacted including medical clinics, dental clinics and medical centres. Almost all of these are located on the KJE mainline section in Nakawa Division.

Table 20-6 Health Facilities Directly Impacted within the Phase 1 ROW

Name of Health Facility	Division / Sub-county	X Coord	Y Coord	KJE/KSB Section
276 Medical Centre (KCCA)	Nakawa Division	459313	37060	KJE
Allied Life Care Clinic	Nakawa Division	457067	36493	KJE
Don Ken - Dental Clinic Kampala	Nakawa Division	457069	36480	KJE
Dr. Kilama Moro Dental Surgery	Nakawa Division	456963	36375	KJE
God Care Medical Clinic	Nakawa Division	459500	36981	KJE
Gv Medical Center	Nakawa Division	456996	36415	KJE
Kukaanya Clinic	Kira Subcounty	461888	36729	KJE
Market Street Medical Clinic	Nakawa Division	456976	36397	KJE
Mutungo Clinic and Maternity Centre	Nakawa Division	459834	35399	KSB
Nakawa Medical Clinic	Nakawa Division	457035	36465	KJE
S and B Clinic	Nakawa Division	456921	36500	KJE
S&K Medical Clinic	Nakawa Division	459769	35366	KSB
St Louis Medical Centre	Makindye Division	455282	29081	KSB

Unmitigated, the construction of the Project may result in the following additional impacts on access to health facilities in the Project area:

- The acquisition of land for the Project may result in a localised reduction in access to health services for communities where the alignment cuts through local roads currently used to access health facilities.
- Some short term temporary impact on access to health facilities through increased travel times, as a result of increased construction traffic and construction works.
- Increased demand for services and facilities, such as medical and emergency services, from an influx of workers to the study area for the Project's construction, and other Project-related in-migration.

Further details on impacts on accessibility from the Project and associated mitigation measures are provided in Chapter 8.

20.3.3.2 Operations

Once operational, the presence of the Project is likely to directly and indirectly result in an improvement to health services in the region through the facilitation of greater accessibility to the areas serviced by the expressway, the improvement of traffic flows and by providing an alternative route to relieve heavy congestion in southern Kampala and the existing Kampala-Jinja road.

This could help ensure the more efficient delivery of supplies to health facilities in the areas serviced by the expressway and provide opportunities to improve access and response patterns for emergency and other health services in the region.

At the local level, the Project has the potential to reduce the accessibility of health facilities for some residents where health facilities occur on the other side of the expressway to residential areas. Alternative access routes and pedestrian crossings will need to be provided to minimise impacts on accessibility.

20.3.4 Prevalence of Disease

The Project has the potential to result in an increase in the prevalence of vector related, respiratory, soil and water borne and sexually transmitted diseases. Increased prevalence may be through introduction of new disease, increased transmission of existing diseases or a combination.

As malaria is the leading cause of morbidity in Uganda, the Project will need to ensure that the risk of increases in malaria are managed appropriately. The Project may result in an increase in malaria incidence due to Project-related in-migration, including the influx of the Project workforce to areas close to the Project. Unmitigated, Project construction works may also potentially increase the breeding habitat for disease bearing mosquitoes (e.g. through water collecting in borrow areas, sediment ponds, or drainage channels left by construction activities).

One of the major health issues raised by Project construction is the potential for increased rates of STI infection and transmission – in particular HIV/AIDS – among the local community. In particular, the influx of Project workers to the area during construction has the potential to result in an increase in STIs. The construction workforce is expected to be approximately 1,500 workers at peak – a majority of which are likely to migrate to the area from outside. The Project could potentially indirectly contribute to the spread of STIs and HIV/AIDS in the following ways:

- A likely in-migration of people (mainly young men) to the Project area in search of employment and business opportunities is expected to increase the local male to female ratio and lead to an increase in prostitution.
- The local economic stimulation as a result of the Project is likely to result in an increase in a further rate of in-migration of immigrant workers who migrate to the villages in the vicinity of the Project construction area to provide goods and services to support construction activities.
- In-migration associated with Project works in areas where there are limited testing facilities currently available (particularly in the rural areas in the eastern part of the KJE mainline alignment) could have an increased risk for the spread of HIV/AIDS other STIs due to low rates of medical treatment and screening of local populations.
- Contributing to overloading of existing health services/ other public infrastructure (e.g. water supply, sewerage waste management, health, education and other government services).
- Increasing traffic in construction areas in the Construction Phase, and along the expressway during Operations, may provide a conduit for the spread of STIs. Opening up new traffic routes and improving access and personal mobility can contribute to the rapid spread of communicable disease such as AIDS, and can bring the epidemic from high prevalence areas such as cities and towns to low prevalence areas in rural regions (World Bank, 2009).

Additionally, poor sanitation and solid waste disposal from the workers accommodation camps have the potential to introduce new pathways for diseases such as amoebic dysentery and acute diarrhoea. Water-borne diseases are more likely to be an issue during the wet season.

The presence of the Project also has the potential to bring about an overall improvement in the health status of populations in the vicinity of the Project and the general region. Potential benefits which could be expected include:

- Easier access to health services, which will occur during the Operations Phase from the presence fo the expressway (refer Section 20.3.3);
- Benefits from health education programs for local communities, where delivered as part of the Project development (mainly during the Construction Phase);

- Employment and economic development opportunities, resulting in reduced poverty and commensurate positive impacts on health status (both Construction and Operations Phases).

20.3.5 Health Impacts of Air Emissions

Air emissions will occur as a result of Project construction and operation, though activities such as vegetation clearance, general earthworks, quarry operations and Project traffic movements during construction and due to general traffic on the expressway once operational. A detailed assessment of air quality impacts associated with the Project is provided in Chapter 10 on Air Quality.

Unmitigated, elevated levels of air pollution can have effects on human health and has been linked to a number of health issues including the aggravation of asthma, respiratory symptoms and cardiovascular diseases, which are caused by different air pollutants (refer to Table 19-2). These pollutants can be inhaled directly from the air, ingested when people eat food that has had particles settle on it, or ingested when people touch surfaces in their environment and then make contact with their mouths.

Table 20-7 health effects of different air pollutants

Air pollutant	Health impact
Particulate matter	Health impacts of particulate matter include respiratory and cardiovascular morbidity, such as aggravation of asthma, respiratory symptoms, as well as mortality from cardiovascular disease, respiratory diseases and lung cancer (WHO, 2013). Whilst short term exposure to PM_{10} is known to have effects on respiratory health, long-term exposure to $PM_{2.5}$ is considered a greater risk factor, particularly in relation to mortality (WHO, 2013).
Ozone	This has an effect on respiratory symptoms and lung function, and can exacerbate asthma and respiratory diseases (WHO 1997).
Carbon monoxide	This is linked to cardiovascular disease, and has been associated with increased incidence of neurological disturbances, visual impairment, reduced ability to learn, and low birth weights (WHO 1997).
Carbon monoxide	This is linked to cardiovascular disease, and has been associated with increased incidence of neurological disturbances, visual impairment, reduced ability to learn, and low birth weights (WHO 1997).
Oxides of nitrogen	These can result in reduced efficiency of the lung's immune defence systems thus increasing the chance of respiratory illness, especially in young children (WHO 1997).
Lead	This affects the functioning of most organs but especially the central nervous system of young children (WHO 1997).
Benzene, toluene, formaldehyde and other organic compounds	These can increase the risk of cancers such as lung, leukaemia and lymphoma (WHO 1997).

Potential health effects from air emissions as a result of the Project are detailed below.

20.3.5.1 Construction

During construction, dust (referred to as particulate matter) and gaseous combustion emissions will be generated for short periods of time from activities such land clearance and earthworks along the alignment, Project vehicle movements on access roads and use of material sites (e.g. borrow pits, quarries). Dust generation will also be more significant in the dry season. Short term exposure to particulate matter has the potential to exacerbate existing health conditions such as asthma and result in other respiratory symptoms, however this is considered less of risk factor compared to long term exposure (WHO, 2013). The impact of air emissions on the health of Project workers and residents in these areas are expected to range from minor to moderate, depending on the level and duration of exposure (e.g those working outdoors may be more exposed), as well as pre-existing health conditions. This is mainly expected to be an issue for:

- Project workers in construction zones and unsealed access roads;

- Residents living and working within 50m of the main alignment construction footprint and other major Project components, and within 200 m of unsealed access roads.

Potential impacts will be short term and localised in nature as the construction process is expected to be staged. However, health effects on nearby residents may be more prolonged at quarry and borrow sites as these will be operational for longer periods during the construction process.

During construction, some additional vehicle exhaust emissions (such as CO, SO_2, NO_x, particulate matter (PM10 and PM2.5) and VOCs) associated with Project vehicle movements are anticipated on access routes. However, given the high level of existing traffic in most of the Project area and the staged process of construction, the contribution from Project related activities is expected to be localised and minor and is not expected to add significantly to existing health issues.

20.3.5.2 Operations

Air quality in Uganda is already heavily affected by traffic, cooking fuel and burning which has been linked to adverse impacts on human health (IBRD and World Bank 2014).

Once operational, the KJE and KSP project should lead to a more efficient motorised transport in Kampala and potentially a slight overall improvement in air quality which could have a resulting positive impact on community health. This is expected to be achieved through reduced traffic congestion, improved traffic flows, reduced vehicle accelerations and reduced times that vehicles remain stationary. Communities along the Kampala-Jinja road and towns bypassed by the expressway (ie Seeta, Mukuno and Namagunga), may potentially experience some improvements in community health associated with reduced traffic emissions in the town areas from the diversion of vehicles to the expressway.

However, localised effects on community health as a result of traffic related air pollution from vehicles on the expressway may occur in certain communities adjacent to the expressway. The level of impact will depend on their location, weather conditions, other sources of air pollution and surrounding land use and traffic patterns.

This is expected to mainly be an issue in communities residing within 100m metres of the expressway, particularly in areas where existing traffic density in nearby roads is low, as in these areas use of the expressway may add to local levels of ambient air pollution (refer to Table 20-3 below). Studies have shown (HEI, 2010) that long term exposure to traffic related air pollution from residing in proximity to major roads and highways has been linked to the onset of childhood asthma, non-asthma respiratory symptoms, impaired lung function, and cardiovascular mortality and morbidity.

Communities located adjacent to the expressway in areas which already have high density baseline traffic and nearby major roads, are unlikely to experience significant additional air emissions as a result of the Project. It is likely that these communities are already exposed to health effects from ambient air pollution in these areas.

20.3.6 Noise and Vibration Disturbance

Noise and vibration disturbance will occur as a result of Project construction and operation, though as vehicle traffic, equipment use and blasting activities during construction and through general vehicle movements on the expressway once operations. A detailed assessment of noise and vibration impacts associated with the Project is provided in Chapter 11 on Noise and Vibration.

Impacts of night-time noise are considered below. Night-time noise can more problematic as it results in sleep disturbance through provoking biological changes in the form of a stress response, which can also affect the quality of sleep. This can impact health through daytime sleepiness, annoyance, mood changes, decreased cognitive performance, increased risk of accidents and links to cardiovascular disease (Halperin, 2014; WHO, 2011).

Groups particularly susceptible to the effects of elevated night time noise levels include children, elderly people, the chronically ill and shift workers as they have different sleep cycles or schedules (WHO, 2009).

Potential health effects from noise disturbance as a result of the Project are presented below.

20.3.6.1 Construction

Noise emissions from construction of the Project will primarily be associated with the clearing of land, earthworks and hauling of construction materials. Some noise is expected during the construction phase associated with excavation of rock, road cuttings and construction of overpasses. Construction noise emissions from sections of the alignment will be temporary, localised in nature, and short-term. Prolonged noise emissions are likely to occur from quarry and borrow pits as these areas will be used throughout the construction phase and from construction of major areas such as interchanges (refer to Chapter 11 on Noise and Vibration).

Noise modelling (refer to Chapter 11) indicates that unmitigated, construction activities could result in minor to moderate temporary noise impacts at sensitive receptors close to Project components, including the alignment and construction sites such as the locations of bridges and flyovers, major cut and fill sites, borrow pits and ancillary facilities. Potential impacts on community health from noise disturbance will depend on the efficacy of noise mitigation measures employed. This include (but are not limited to):

- Minor temporary impacts on health such as annoyance, irritability, interference with speech communication and reduced work and school performance for noise levels; and
- Moderate impacts such as sleep disturbance for sensitive receptors adjacent to construction sites if construction activities occur at night-time.

Airblast from blasting will also result in short term temporary impacts for some sensitive receptors near blasting sites. It is anticipated that there will be several potential road cuttings that may require rock blasting and local quarries that will be utilised during construction for excavation of rock. Airblasts are inaudible, sub-audio air vibrations or over-pressure associated with rock blasting. Unmitigated, airblasts could potentially startle people and animals, rattle windows, and may potentially cause structural damage to nearby light structures. Blast vibrations are predicted to be imperceptible beyond 300 m of the blast site and are below Australian Standard maximum PPV (10 mm/s) beyond 50 m of the blast site (see Chapter 11 of the ESIA). Airblasts can also be greatly minimised by ensuring all detonations are covered.

During construction, management and mitigation measures such as use of noise sensitive equipment and scheduling of activities to daytime hours will be important to minimise potential impacts on the community.

Where Project vehicles utilise existing road infrastructure, ambient noise conditions are likely to remain relatively unchanged due to the number of large vehicles currently utilising the road network. Moderate noise impacts may occur where construction access routes pass near settlements in rural areas which don't have high ambient traffic prior to the Project.

20.3.6.2 Operation

During operations, the factors that will affect noise emissions from road traffic will include;

- The volume of traffic;
- The speed of traffic; and
- The composition of traffic (number of heavy vehicles versus light vehicles).

Project noise impacts are discussed in detail in Chapter 11 on Noise and Vibration. The assessment indicated that:

- The city sections of the Mainline Expressway are predicted to increase vehicle numbers and thus associated noise.
- Maximum noise levels remain relatively consistent along the Kampala Southern Bypass, but levels reduce with distance from Kampala along the Kampala-Jinja mainline. Both highways are predicted to exceed WHO and Ugandan daytime noise criteria if sound barriers are not erected.
- Noise impacts from the Project include annoyances to community and wetland wildlife, with maximum noise receptor impacts were predicted to be typically within 50 m of roadside. Short-term and long-term health impacts reduce significantly with distance from the highways.

Based on the findings of the noise assessment, noise disturbance for sensitive receptors during operations is expected to be highest within 50 m of the expressway. As the noise monitoring showed that the baseline ambient daytime noise is typically already high at sensitive receptors (above the WHO daytime noise guideline), it is expected that most sensitive receptors will be already used to relatively high noise levels, which is likely to reduce the impact of noise disturbance from the Project on local communities. As existing noise levels were found to be lower in rural areas, higher noise disturbance impacts for communities may occur where the expressway passes near settlements in rural areas.

20.3.7 Transport of Hazardous Materials

During construction, there is potential for Project vehicles bringing supplies and materials to construction areas to be involved in an accident along the Project access routes. This could result in spills of hazardous materials (e.g. hydrocarbons or chemicals) with consequent significant adverse impacts. The potential social and health impacts of a spill of hazardous materials could be significant if an incident occurred in the vicinity of urban areas, wetland, a waterway or other ecologically sensitive areas. Unmanaged, this could also have resulting effects on food and water supplies.

Once operational, the Project should help reduce the probability of a hazardous materials spills compared to the use of the existing roads, as the expressway will likely have lower safety risks for vehicles.

20.3.8 Flyrock Safety Risks

It is anticipated that there will be several potential road cuttings that could require rock blasting and blasting may be used at local quarries during construction for excavation of rock. Blasting has the potential to generate flyrock, which is the undesired propulsion of rock fragments through the air or across the ground that leaves the blast area. Flyrock may pose a safety risk to persons in the vicinity of the blasting area and may also damage property. Workplace and public health and safety will be the primary concern for managing flyrock. The generation of fly rock in the blasting process indicates that explosion energy has been wasted. Controlled blasting practices, therefore, will aim to eliminate flyrock. To minimise safety risks, the Project will need to implement best practice blasting methods and establish an exclusion zone around blasting areas during blasting.

No flyrock safety risks will occur during Operations as no blasting for the Project will occur during this Phase.

20.4 Avoidance, Management and Mitigation Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) has been prepared for the Project which includes management measures to minimise risks to community health and safety, as well as occupational health and safety (refer Volume D). Key related management and mitigation measures for community health and safety for the Project are summarised in Table 8-12 The residual risks and impacts after implementation of the measures

is also presented. Whilst some adverse risks (e.g transportation and road safety) cannot be entirely avoided, implementation of the measures outlined will help minimise risks to acceptable levels.

It is expected that a detailed stand-alone OHS Management Plan will also be prepared for the Project prior to work commencement, based on the measures outlined in the ESMMP.

Table 20-8 Community Health and Safety - Avoidance, Management and Mitigation Measures and Residual Risk

Risk / Impact	Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Pre-Construction			
Stress and anxiety from relocation of displaced households and businesses	► Implement a transparent and participatory resettlement and livelihood restoration process as per the RLRP (Volume D).	Negative	Minor - Moderate Potential impacts on health will be reduced with the implementation of a participatory resettlement process and other measures in the PRLP, however some levels of anxiety and stress during relocation is unavoidable.
Construction			
Increased frequency of accidents along access routes due to additional traffic from Project vehicles	► Develop and implement Traffic Management Plans during construction to identify and minimise potential impacts on road operations ► During construction works, ensure access routes are in good condition. ► Prevent members of the public from accessing construction areas through appropriate fencing and barriers. Signage should also be used to deter unauthorised entry. ► Implement speed controls and provide access traffic with appropriate signalling and direction around construction areas. ► Regular consultation with roadside residents to confirm the effectiveness of mitigation measures and any necessary improvements Distribute the Highway Code to schools and the local community and conduct awareness raising campaigns on road safety in local communities. ► Carryout road safety campaigns to schools which are close to the ROW	Negative	Low Risk Though risks to community health and safety from transportation cannot be entirely avoided, during construction these risks will be minimised with implementation of Transport Management Plans and the transportation safety measures outlined in the ESMMP.
Safety risks to Project workers and the public during construction activities	► Development of a transportation management plan for road works that includes measures to ensure work zone safety for construction workers and the traveling public; ► Reduction of maximum vehicle speeds around work zones; ► Provide alternate access routes for vehicles and pedestrians during construction activities (refer Chapter 8). ► Pedestrian crossings over the expressway should be established based on the locations identified in Section 8.3.6. ► Ensure Project workers are adequately briefed and trained regarding the required public safety precautions for specific construction activities ► Ensure that plants and vehicle operators are properly licensed and trained ► Quarry operations and roadway excavations, particularly blasting should be carried out and supervised by trained personnel. Explosives for the project activities should be stored in a secure	Negative	Low Risk Whilst public health and safety risks cannot be entirely avoided, risks to community health and safety are expected to be Low with implementation of the measures outlined.

Risk / Impact	Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	location in proper way and all due precautions should be taken to ensure that blasting does not induce any unnecessary rock falls ► Ensure provision of first aid facilities, readily available trained paramedical personnel and emergency transport facilities to nearest hospital ► Ensure an Emergency Preparedness and Response Plan (EPRP) is developed prior to the Construction phase		
OHS	► Implement relevant community health and safety measures as above ► Ensure appropriate training for workers regarding OHS ► Ensure provision and proper implementation of PPE ► Develop, maintain and disseminate an OHS Plan for the Project, which should be prepared prior to construction; ► Implement specific OHS measures outlined in the ESMMP (Volume D)	Negative	Low Risk Whilst occupational health and safety risks cannot be entirely avoided, risks to workers are expected to be Low with implementation of the measures outlined.
Safety risks due to blasting	► Ensure national legislation and relevant international standards are met for blasting activities during construction ► Blasting Plan to be developed prior to construction ► Establish and maintain a fly rock Exclusion Zone around the blast site during blasting; ► On days when blasting is required, ensure local communities are notified at least 24 hours prior to blasting. ► Prior to blasting, ensure that the exclusion zone is clear by patrolling the zone. ► Prior to blasting, implement access controls along roads in the vicinity of blasting zones, to assist in ensuring that no unauthorised vehicles or pedestrians are present in the exclusion zone; ► Blasting may only be conducted during the daytime between 09:00 and 17:00, and preferably during favourable weather conditions. ► Visually monitor fly rock and noise to confirm that the exclusion zone adequately protects community and worker safety, and continually re-assess the adequacy of blast design controls in reducing the generation of fly rock. ► Provide training for Project staff on flyrock safety and conduct a public education program regarding community safety issues associated with blasting in areas close to blasting sites.	Negative	Low Risk Whilst risks cannot be entirely avoided, risks to workers are expected to be Low with implementation of the measures outlined.
Impact on community due to dust generation from construction activities and vehicle emissions from Project transportation	► Implement the measures outlined in Chapter 10 (Air Quality), including dust suppression techniques, construction scheduling and ongoing monitoring. ► Conduct consultation with potentially affected communities. ► Implement a grievance mechanism to record and respond to community complaints.	Negative	Minor With implementation of the mitigation measures proposed, dust and other air quality emissions from the Project are not expected to exceed health guidelines for sensitive receptors. Nuisance dust impacts on some sensitive receptors will occur during construction (refer Chapter 10 for further details).

Risk / Impact	Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Noise and vibration impacts on community due to construction activities	► Implement the measures outlined in Chapter 11 on Noise and Vibration, construction timetabling to minimise noise impact (e.g restricting activities to daylight hours where possible), informing sensitive receptors ahead of construction schedule and utilisation of quieter construction methods where possible. ► Restrict truck movements to haulage routes and the routes outlined in the Traffic Management Plans. Where reasonable and feasible, locate routes as far away from sensitive receptors as possible. ► Develop and implement a Blasting Management Plan; ► Implement a grievance mechanism to record and respond to community complaints.	Negative	Minor With implementation of the mitigation measures proposed, noise impacts are not expected to exceed health guidelines. Nuisance noise impacts on some sensitive receptors will occur during construction (refer Chapter 11 for further details).
Risk of community exposure to hazardous substances in the event of an accidental spill during construction activities	► Implement the hazardous materials management measures as per Chapter 9 (Materials Use and Waste Management) ► Ensure an Emergency Preparedness and Response Plan (EPRP) is developed prior to the Construction phase.	Negative	Low Risk Though risks from hazardous materials cannot be entirely avoided, risks to community health and safety are expected to be very low with application of management measures outlined.
Reduced access to health facilities as a result of land acquisition for the Project	► Where health facilities are directly impacted by the ROW, comparable health services should be re-established to ensure there is no overall reduction in availability of health services in the region. Compensation for impacts on infrastructure should be provided in accordance with the RLRP (Volume D) ► Implement the accessibility measures for the construction period as per Chapter 8 (Traffic, Transport and Accessibility), including implementation of Traffic Management Plans and provision of alternative access routes where required.	Neutral to Negative	Negligible to Minor With well-planned reestablishment of lost health facilities, impacts will be minimised. The local accessibility of some health facilities may be reduced for some residents by the establishment of construction areas and changed traffic conditions.
Introduction and spread of diseases	► To reduce risks associated with malaria and other vector borne diseases: • Provide education concerning malarial risk and prevention to all employees, including construction contractor employees. • Support existing malaria prevention strategies in Project districts; • Minimise areas of standing water by providing effective drainage in construction areas (refer Chapter 15); • Ensure drainage design prevents disruption to natural drainage, in line with the Water Management Plan (Volume D); • Provide all the staff at construction camps with impregnated mosquito nets. ► Implement appropriate measures to reduce risks associated with the introduction or spread of HIV/AIDS and other STIs (e.g. inductions, training, health care facilities for workers) ► Consider supporting improvements to existing health care services and facilities, particularly for resettlement areas.	Negative	Minor – Moderate A net minor-moderate impact on introduction and spread of diseases is expected from the Project. The magnitude of residual impacts will depend on the success of the mitigation measures implemented, and the efficacy of adaptive management conducted in response to the findings of the monitoring program.

Risk / Impact	Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
	► Implementation of rodent control programs in construction accommodation camps and in the villages close to the camps. ► Consider supporting Government or NGO initiatives aimed at improving family planning, contraceptive use and education, particularly for young women and reproductive health for adolescents. ► Appropriate indicators of health status amongst the construction workforce and local community should be developed (e.g. STI rates) and regularly monitored to ensure that the impacts of construction (both positive and negative) are identified and appropriate management and mitigation measures can be implemented and refined.		
Operations			
Improved or changed access to health facilities in areas serviced by the expressway, through improved traffic flows	► Undertake early and ongoing engagement and consultation with emergency services to allow planning for potential changes to response patterns and to provide input on Project design	Positive	Moderate The overall impact on accessibility of health facilities from the Project is will be a moderate positive impact. The local accessibility of some health facilities may be reduced for some residents by the establishment of the ROW. However, improved traffic flows and greater accessibility to areas serviced by the expressway will result in a significant positive overall impact on access to health facilities in the region and improved deployment of emergency services.
Impact on community from air emissions due to vehicular traffic on the expressway	► Implement mitigation measures outlined in Chapter 10 (Air Quality).	Positive	Minor to Moderate Use of the expressway is expected to result in a minor to moderate positive net impact on air quality and community health at a regional level through reduced traffic congestion, improved traffic flows in the region. Air quality will be reduced compared to baseline conditions in rural areas directly adjacent to the alignment as a result of increased exhaust emissions (refer Chapter 10).
Community safety and changed traffic conditions	► Ensure the Project design includes barriers along the expressway where required, particularly in busy urban areas. Ensure barriers are high enough to discourage individuals from climbing over ► Ensure accessibility impacts are minimised through provision of pedestrian crossings and alternate routes for vehicles where required (refer mitigation measures in Chapter 8) ► Conduct community education campaigns to raise awareness regarding the safety practices in the Highway Code to help improve road safety behaviours	Positive	Minor Though road safety risks cannot be entirely avoided, the Project should help to reduce road traffic incidents in the region through the provision of a dedicated roadway with an improved alignment, which isolates vehicle traffic from pedestrians and non-motorised vehicles. Safety risks will also be reduced via implementation of road safety design measures (e.g barriers), community engagement and regulation from local authorities.
	► Implement the mitigation measures outlined in Chapter 11 (Noise and Vibration), including the	Negative	Minor to Moderate With the implementation of noise sensitive measures, the potential effects

Risk / Impact	Avoidance, Management and Mitigation Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Traffic related noise impacts on communities	construction of noise barriers and retrofitting of housing where required to reduce noise pollution ► Conduct operational noise monitoring within a year of operations to compare the actual noise performance of the project against predicted noise performance and review model and management measures if required. This should also include a review of the grievance register for any noise complaints.		of nuisance noise disturbance on nearby settlements from traffic on the expressway is expected to be Minor to Moderate (depending on proximity and sensitivity of receptors). Perceived impacts are expected to be greatest for settlement areas not currently exposed to road traffic noise.
Introduction and spread of diseases	► Implement mitigation measures for 'Introduction and spread of diseases' from the Construction Phase, where applicable.	Positive	Minor With implementation of appropriate mitigation measures, a net minor benefit in relation to introduction and spread of diseases is expected from the Project at the regional level, particularly due to increased access to health services provided by the expressway. The benefit or impact will depend on the ability of existing and new health services to cope with the increasing population as urbanisation along the expressway increases over time.
Risk of community exposure to hazardous substances in the event of accidental spill on the expressway	► Implement the hazardous materials management measures as per Chapter 9 (Materials Use and Waste Management) ► Consider relevant design features to reduce the probability of potential spills on the expressway such as geometric design, shoulders and barriers. ► Ensure an Emergency Preparedness and Response Plan (EPRP) is maintained during Operations.	Negative	Low Risk Though risks from hazardous materials cannot be entirely avoided, risks to community health and safety are expected to be low with application of management measures outlined.

20.5 Conclusions

The Project should help to reduce road traffic incidents in the region through the provision of a dedicated roadway with an improved alignment, which isolates vehicle traffic from pedestrians and non-motorised vehicles, has a dual carriageway with central medians to separate oncoming traffic and also diverts traffic from the towns and villages bypassed by the expressway.

Aside from a potential improvement in the rate of road accidents, the largest potential impact on community health through motorised transport is air emissions and resulting air quality. The air quality in Uganda is already heavily affected by traffic, cooking fuel and burning. Once operational, the Project should lead to a more efficient motorised transport in Kampala and potentially a slight improvement in air quality. Improved fuel and car technology is also the biggest potential driver of air quality in Kampala.

Traffic on the expressway will also generate significant traffic related noise for potential receptors in close proximity to the Project. Implementation of the outlined measures such as noise barriers and retrofitting of households will be important to minimise potential noise disturbance to acceptable levels in these areas.

Fencing of the expressway with appropriate barriers will be important to ensure that the community, animals and vehicle types which would be at risk in fast moving traffic (such as non-motorised vehicles, low powered

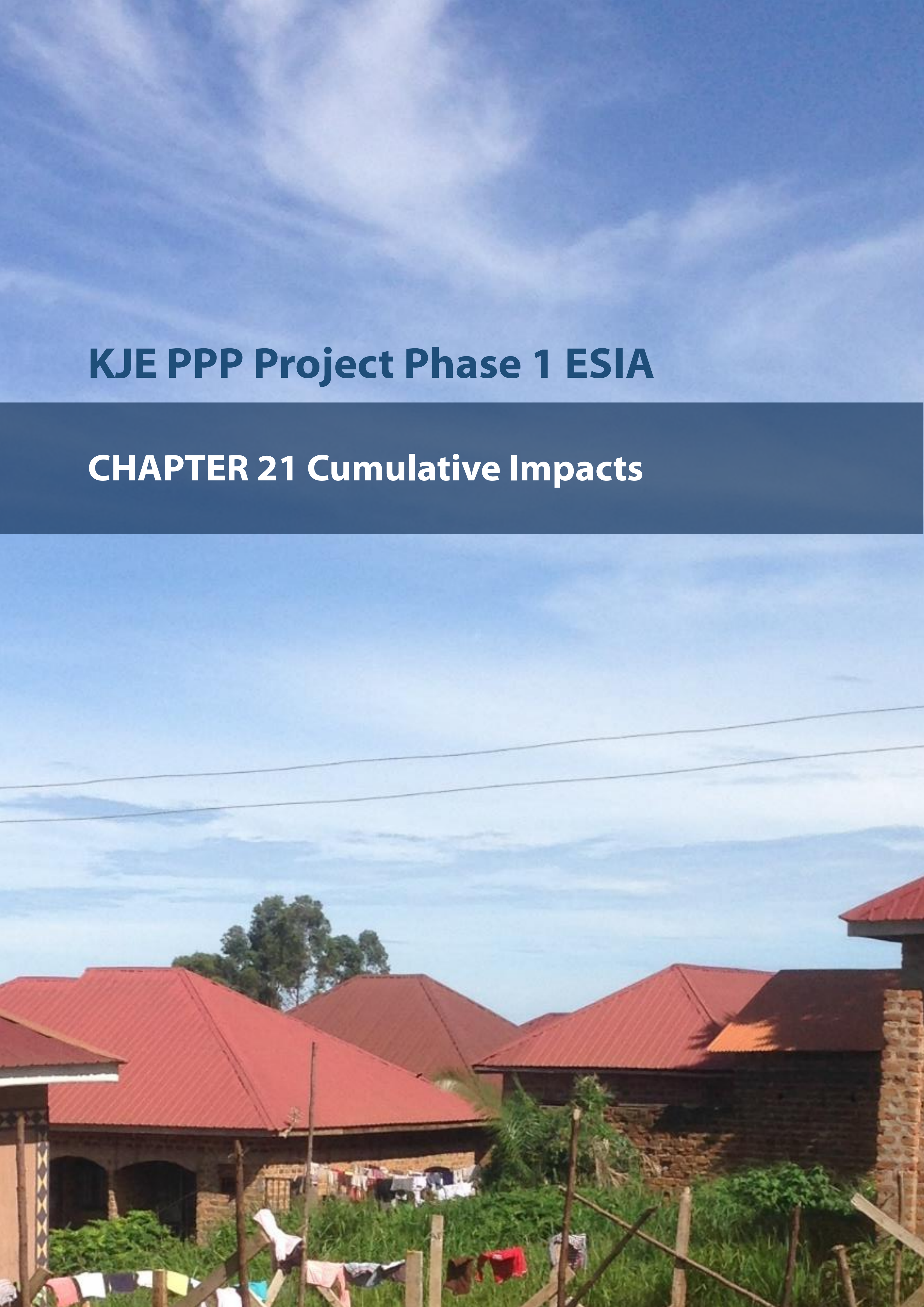
motorcycles and agricultural vehicles) do not inappropriately access the expressway and comprise health and safety.

Project-related in-migration (including the Project workforce), ponding in construction areas and population growth have the potential to result in an increase in vector-borne disease in areas surrounding the Project Footprint, particularly during construction. The extent of the impact will depend largely on the effectiveness of management and mitigation measures. Children and the elderly would be expected to be key vulnerable groups potentially impacted by any change in the prevalence of malaria or other mosquito borne diseases due to their inherent vulnerability to these diseases. Implementation of risk management and awareness measures for malaria as well as HIV and STIs will help ensure that the spread of these diseases is minimised.

Some short-term localised impacts on community health and safety may occur during the construction period including air emissions, noise disturbance and changes in accessibility. During operations, the presence of the expressway is expected to benefit the health of local communities particularly though increasing accessibility of health services.

KJE PPP Project Phase 1 ESIA

CHAPTER 21 Cumulative Impacts



21. CUMULATIVE IMPACTS

21.1 Study Area and Methodology

Cumulative impacts can be defined as the successive, incremental and combined impacts of one or more activities on society, the economy and the environment. Cumulative impacts result from the aggregation and interaction of impacts on a receptor and may be the product of past, present or future activities.

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation or social impacts, that are the focus of cumulative impact analysis. While impacts can be differentiated by direct, indirect, and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time. The cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity is undertaking the actions.

Cumulative impacts can be both positive and negative and can vary in intensity as well as spatial and temporal extent. Cumulative impacts may interact such that they trigger or are associated with other impacts. Cumulative impacts can result from individually minor but collectively significant projects or activities taking place over a period of time.

In terms of the proposed Project, cumulative impacts may occur in combination with impacts on the physical environment, biodiversity and socio-economic conditions arising from existing projects and planned developments. These projects and developments include other road projects, agricultural projects, infrastructure projects and tourism enterprises.

Geographic boundaries and time periods used in cumulative impact analysis are based on all resources of concern and all actions that may contribute, along with the project effects, to cumulative impacts. Generally, the scope of analysis will be broader than the scope of analysis used in assessing direct or indirect effects. To avoid extending data and analytical requirements beyond those relevant to decision making, a practical delineation of the spatial and temporal scales is needed. The selection of geographic boundaries and time period is based on the natural boundaries of resources of concern and the period of time that the proposed action's impacts will persist, even beyond the project life.

The methodology adopted for the assessment of cumulative impacts in this report comprises the following:

- Assessment of residual impacts and risks from the proposed Project, including cumulative Project related impacts;
- Review of existing and planned developments / activities in the region that have the potential to result in cumulative impacts, and the key drivers that affect them;
- Identification of key potential cumulative impacts relating to these developments / activities;
- Analysis of key potential cumulative impacts, including consideration of geographical and temporal aggregations and interactions; and
- Stakeholder consultation and review of potential impacts.

21.2 Other Projects and Activities

The Project will have a significant influence on the future development of Kampala. It will result in cumulative impacts on a number of other developments that are being implemented or are planned for the future. Key planned and current developments are illustrated in Figure 21.1 below.

21.2.1 Road Network

Roads are the predominant transport infrastructure in Uganda. Over 90% of the country's passenger and freight traffic is transported via roads, which also provide the only form of access to most rural communities. The Country has a road network length totalling 140,000km which is comprised of 21,000km of national roads, 32,000km of district roads, 12,000km of urban roads and 75,000km of community access roads. Only a small proportion of the country's roads are paved, with many roads severely eroded due to poor stormwater drainage.

The KJE Project will link with a number of other major roads that are planned or being constructed within and around Kampala. Importantly, these planned roads will take vehicles around the congested urban centre of Kampala. The GKMA Transport Plan and the 2010 National Development Plan proposes measures for decongesting the Kampala CBD and improving trade movement in the GKMA amongst which include the following:

- Institutional reforms to strengthen institutions involved in the provision of the necessary transport infrastructure and services required to improve traffic flows in the GKMA including management of key infrastructure activities;
- Multi-lane road construction to widen arterial routes stemming from Kampala;
- Circumferential/ring road construction;
- Junction improvements to ease traffic congestion;
- Public Transport Improvements including development of the Bus Rapid Transit and Light Rail Transit; and
- Development of a City Airport and Bukasa Port.

In a bid to adhere to the aspirations of the Uganda Vison 2040, the National Transport Masterplan and National Development Plan, UNRA has commenced the process leading to the development of the following Expressways, as per Table 21-1 and illustrated in Figure 21.2:

- Kampala-Entebbe Expressway (51km) (See Plate 21-1 and Plate 21-2 below);
- Kampala-Mpigi Expressway (32km);
- Kampala-Jinja Expressway, (77km);
- Kampala Southern Bypass, (18km);
- Kampala-Bombo Expressway, (50km);
- Kampala Outer Beltway (second ring road), (100km); and
- Kampala-Busunju-Hoima Expressway, (200km).

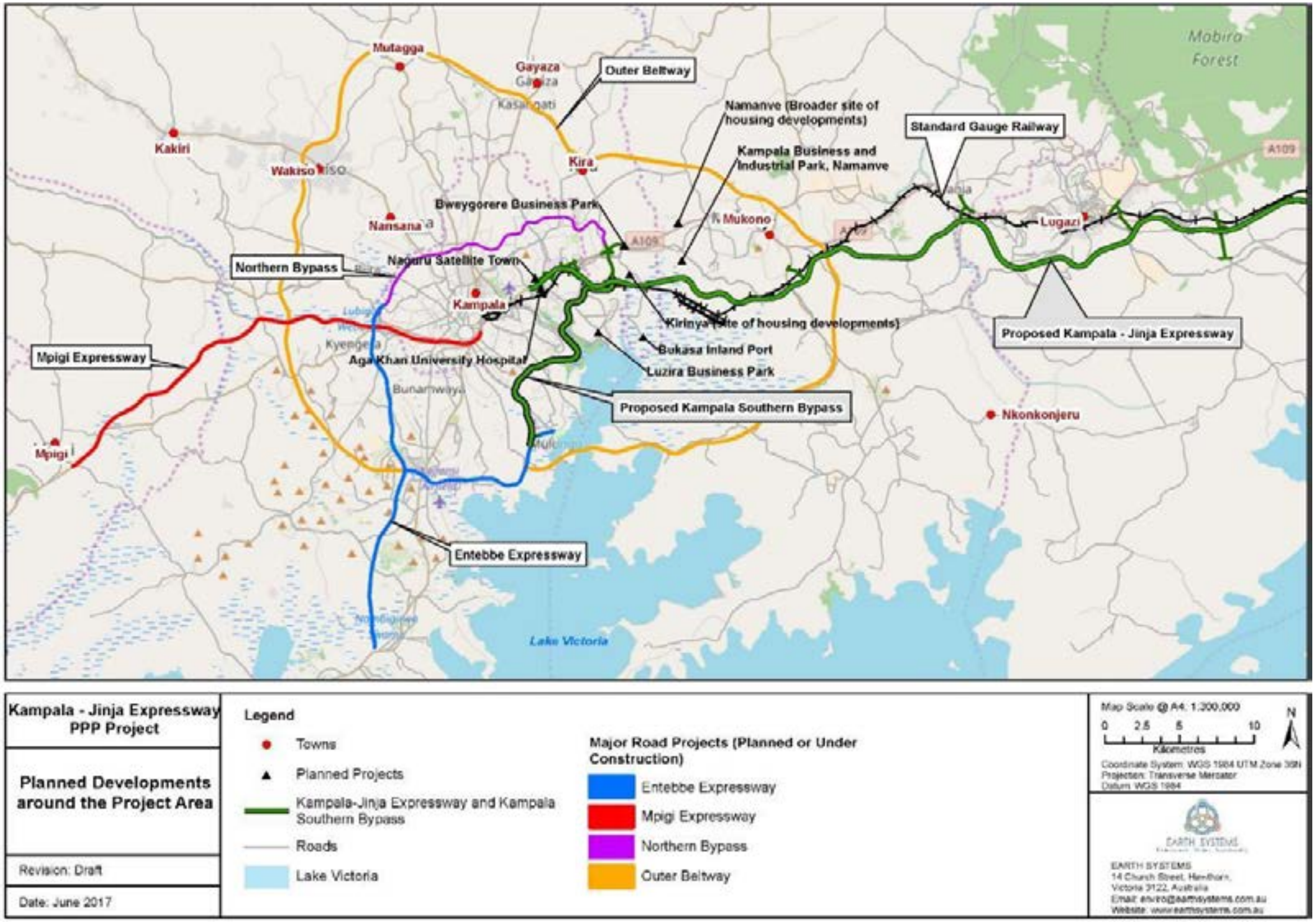


Figure 21.1 Key Planned Developments around the Project Footprint

Plate 21-1: Kampala Entebbe Expressway Construction, May 2017

Plate 21-2: Kampala Entebbe Expressway Construction, May 2017

Table 21-1 Status of Proposed Expressways in Uganda (Adapted from UNRA Feasibility Study)

Project	Length (km)	Number of Lanes	Status
Kampala Northern Bypass	21	2+2	The Northern Bypass was originally built as a single carriageway and opened to traffic in October 2009. However it is currently being expanded to a dual carriageway with funding from EU and GoU. This expansion follows from the design capacity having been exceeded within 5 years of opening. Construction is expected to end in 2018
Kampala-Entebbe Expressway	51	2+2	The Entebbe Expressway is currently under construction with funding from China Exim Bank and the GoU. Operations and maintenance to be under a PPP. Construction is expected to be completed in December 2017.
Kampala-Mpigi Expressway	36	3+3 (9km), 2+2 (27km)	This road project is split into two sections as follows: (i) Section 1: Kampala-Busega (9km) - currently under procurement with financing expected from China Exim Bank; (ii) Section 2: Busega-Mpigi (27km) - currently under procurement with funding from the AfDB and GoU. Operations and maintenance to be under a PPP. Expected construction start is January 2018.
Kampala Flyover Project	5	3+3(1km), 2+2 (5km) plus 1+1 flyovers	Procurement of Lot 1 (Queensway flyover and Mukwano road widening) commenced in March 2017. Procurement for Lot 2 (Kitgum junction flyover) to be launched by December 2017. The project is supported by financing from Government of Japan through JICA.
Kampala-Bombo Expressway	50	3+3	A design study is ongoing and expected to be completed by December 2017.
VVIP Expressway	5	2+2	A flyover/viaduct between the Kampala Northern Bypass and Garden city. A design study is currently ongoing and expected to be completed by March 2018.
Kampala Outer Beltway	100	3+3	A design study is currently ongoing and expected to be completed by December 2017.

Project	Length (km)	Number of Lanes	Status
Kampala-Busunju-Hoima Expressway	200	Yet to be defined	The procurement of a design consultant is ongoing. The design study is expected to commence by December 2017.

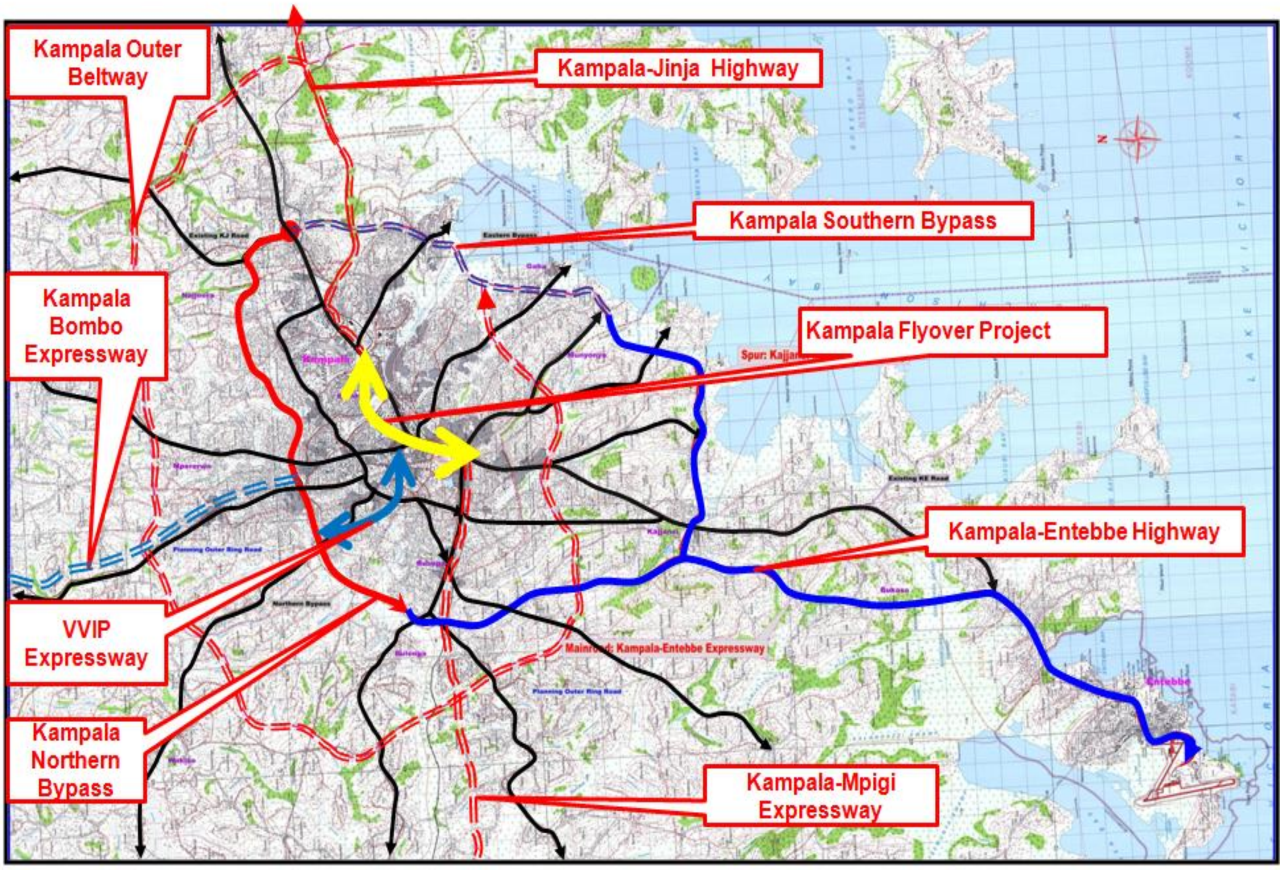


Figure 21.2 Illustration of the planned road network surrounding Kampala (UNRA, 2017)

21.2.2 Standard Gauge Railway Project (SGR)

The proposed Standard Gauge Railway Project (SGR) runs parallel to the proposed route for the KJE Project. This development is described in the KJE Draft Feasibility Study (UNRA, 2017) and is summarised below.

The SGR project was agreed to in 2011 by the East African Presidents of Uganda, Kenya, Rwanda and South Sudan. Since the initial agreement, Rwanda rejected the alignment in favour of the Tanzanian route after it realised that Uganda was not prioritising the Kampala-Kigali connection, which would have seen it transport its goods through Kenya.

The Government of Uganda has been seeking to secure funding for the initial 293km stretch between Malaba and Kampala, the indication being that funding will only be accessible should Kenya confirm the SGR link between Kisumu and Malaba. There have been recent indications from Kenya that their desire is to terminate the SGR line at Kisumu, rather than continuing to Malaba. Although the decision has not yet been confirmed, this has led Uganda to consider an alternative line through Tanzania, having already secured funding for the construction of the Port Bell harbour. This would enable Uganda to build its railway to the shores of Lake Victoria, where it would feed into a new port harbour that would then connect with the Tanzania rail line to the Port of Tanga or Dar es Salaam.

Should the Government of Uganda proceed with its own SGR construction from Kampala to Port Bell, it will hope to utilise either the Mwanza or Musoma ports on Lake Victoria in Tanzania to receive goods from either the Port of Dar es Salaam or Tanga. If Kenya abandons the construction of the Kisumu-Malaba route, it will mean the planned Malaba-Kampala, Malaba-Juba, Kampala-Kigali and Kampala-Kinshasa will no longer be feasible.

Studies for the SGR indicate that the freight target is at least 30%. Given that the current metre gauge railway currently has a 10% share of freight, it is expected that the additional 20% would be attracted from road due to improved time reliability and reduced costs. It is also expected that supporting policies would be instituted by the East African Governments to promote SGR use.

The standard gauge railway design provides for at least three stations along the route between Kampala and Jinja. These stations have not been designed as multi-modal stations, which is likely to have an impact on the attractiveness of SGR for small freight and passenger transport. The current design of the SGR appears to lend itself more to long haul freight from Mombasa to Kampala, rather than shorter inland freight transport.

The uncertainty regarding construction of the Kisumu-Malaba leg of the SGR by Kenya puts into doubt a shift of transport modes from road to rail. It appears likely that road transport will remain the major mode of transportation along the Kampala-Jinja corridor in the medium term, emphasising the need for an improved road network.

21.2.3 Ugandan Railway

The Ugandan Railway is the main railway system in Uganda. The Ugandan Railway is a meter gauge railway and is currently operated by RVR. The railway crosses 12 Districts, these districts are; Tororo, Butaleja, Iganga, Mayuge, Jinja, Buikwe, Mukono, Wakiso, Kampala, Manafwa, Mbale and Port Bell. The Ugandan Railway line is separated into five main lines (ABDG);

- The Malaba-Kampala Main Line;
- The Tororo Station to Mbale Station Line (TRR-MBL);
- The Jinja Station to Jinja Pier Line;
- The Kampala Station to Port Bell Line (KPL-PBL); and
- The Kampala Station to Nalukolongo Workshop Line (KPL-NGL).

The Malaba-Kampala Main Line of the Ugandan Railway has the most relevance to the current Project. The line runs 273km roughly parallel to the KJE Mainline alignment (Phases 1 and 2) and terminates at Bukasa Port near Port Bell ABDG). The alignment of the Malaba-Kampala Main Line in relation to the Project is shown in Figure 1-2 in Chapter 1. The expressway will cross the existing railway line in several places, however the design of the KJE Project took into account the presence of the Ugandan Railway, and there is not expected to be any significant impact on the functioning of the railway infrastructure from the Project development.

21.2.4 Bukasa Port Facility

The Bukasa West Port is a planned inland port connecting Uganda to the port of Musoma and Mwanza on Lake Victoria. It is planned to be fully operational in 2027. The Port would be located along the northern shores of Lake Victoria on approximately 500 acres in Bukasa, Wakiso District, 16km south-east of Kampala. The site is close to the Namanve wetland and the alignment of the KJE Project (Figure 21-5). The KJE Project is expected to play a key role in supporting economic growth in the region as a key trade route to the Port of Mombasa by road, and to Tanzania's ports by road and ferry. The core elements of the port are; terminals and related infrastructure, storage facilities, workshops and maintenance, utilities, port administrative areas and auxiliary areas.

It is projected that by 2030 that the import and export rates by road from the Bukasa Port will be 203,000 and 1,632,000 tons respectively (MWT, 2017). This will account for 11.6% of imports and 93.6% of the exports of the Bukasa Port. The Bukasa Port is projected to have significant positive impacts on the Ugandan economy. Table 21-2 outlines the projected economic developments after the initiation of Phase II. Table 21-2 shows an increase in exports, imports, GDP per factor growth and export development.

Table 21-2: Bukasa Port Forecast projection parameter from 2030 – 2040 (MWT, 2017)

Description	2015	Bukasa Port Phase II		
		2030	2035	2040
Exports	6.66%	10.6%	11.4%	11.1%
Imports	4.93%	9.3%	10.5%	10.1%
GDP per factor cost	4.91%	8.4%	9.3%	8.9%
Export development	6.66%	11.2%	12.0%	11.7%

21.2.5 Kampala Industrial Business Park / Namanve Business Park

The Kampala Industrial Business Park (KIBP) is planned to be fully developed by 2027. It is located in Namanve, approximately 11km east of Kampala city. It was designed to provide easily accessible serviced land for industry and business establishment on the outskirts of the capital. It is a 2200 acre facility, with more than two hundred investors allocated land in the Park (See Plate 21-3and Plate 21-4). Upon its completion, the KJE Project will likely be of advantage to tenants of the KBIP due to improved accessibility afforded to people, movement of goods, as well as decreased transport costs. Reduced transport delays and more reliable travel times for goods are likely to save costs and improve economic outcomes for tenants of the KIBP.

Plate 21-3: Kampala Industrial Business Park (Visual)

Plate 21-4: Kampala Industrial Business Park (Visual)

21.2.6 Naguru Satellite Town

The Naguru Satellite Town development, otherwise referred to as the Naguru-Nakawa Estate, is an ‘ultramodern satellite town’ with 60,000m^2 mixed commercial and retail, and 2266 residential units located in the Nakawa and Naguru area in Kampala expected to be complete by 2027. Upon its completion, the KJE will likely promote the Naguru Satellite Town by:

- Ensuring orderly flow of traffic to this area by increasing the level of accessibility;
- Meet the increasing travel demand of the residents of the area; and

- Improving service delivery to and from this area.

21.2.7 Aga Khan University Hospital, Nakawa

The Aga Khan University Hospital is a teaching hospital under construction in Kampala, with Phase I to be completed by 2020 and Phase II by 2025. The University Hospital will be located at the junction of Jinja Road and New Port Bell Road in Nakawa Division in the heart of Kampala, opposite Nakawa Business Estate. Upon its completion, the Project is expected to be beneficial to the construction of the Agha Khan University Hospital by:

- Facilitating easy and fast access to the hospital for patients, students and employees;
- Reducing traffic congestion and delays for delivery of goods;
- Lowering the cost of transportation to and from the hospital; and
- Improving ambulance access.

Should the hospital be completed prior to completion of the KJE, accessibility and rapid access for emergency access is likely to be impeded. It may be necessary to make special provisions for ambulance access to the hospital to ensure that patients are treated rapidly during periods of lane / road closure. Management of dust and other particulate matter will also be important to protect patients suffering from respiratory disease.

21.2.8 Bweyogerere Industrial Estate

Bweyogere Industrial Estate is located within Wakiso District approximately 10 kilometres north-east of Kampala. It is located on the existing Kampala Jinja Road and comprises approximately 50 acres. The site is currently operational and fully allocated.

It is expected that the Kampala Jinja Expressway will have a positive impact upon this site once complete due to improved accessibility and connections to Kampala and road trade routes for goods. During construction however, accessibility to this site is likely to be impacted due to road closures and subsequent traffic congestion.

21.2.9 Private Housing Developments

A number of privately owned housing estates are in various stages of development and use across the broad region of Kampala, Wakiso and Mukono Districts. These estates range in size from 70 to 1000 acres, and are comprised of residential, commercial (retail), and recreational zones. It is expected that the larger developments will increase the volumes of vehicles accessing the Kampala Jinja Expressway for those looking to reside outside the city, and potentially commute for work.

During construction of the KJE, it is expected that the sites under construction may be affected by congestion associated with road and lane closures. Noise, vibration and dust may also impact upon these estates located within close proximity to the Project alignment.

Upon completion of construction it is expected that the estates will benefit from reduced traffic congestion and therefore reduced travel times between Kampala and Jinja.

21.2.10 Government Housing Projects

The National Housing and Construction Company (NHCC) is a Ugandan construction and real estate management organisation partly owned by the Ugandan Government (51%) and the Libyan African Investment Company (49%). The Ugandan Government announced its intention to purchase the organisation outright in 2016.

Examples of these developments include:

21.2.10.1 Bukerere Housing Estate

Located in Bukerere, Mukono District, the Bukerere Housing Estate is planned to have between 2,000 and 3,000 housing units of three to four bedrooms. A section of this development will consist of three storey flats (condominiums) intended for upper middle-class clients.

21.2.10.2 Jasmine Apartments

These flats, each measuring 117 square metres (1,260 sq ft), with three bedrooms, are located in Naalya, Kira Municipality and are intermixed with retail shops and communal amenities including gardens and rooftop terraces.

Upon its completion, the KJE is likely to benefit these developments by providing improved transport accessibility, reduced traffic congestion improving service delivery in the area.

During construction it is anticipated that construction schedules for these proposed housing developments may extend due to road/lane closures and subsequent traffic congestion, inferring longer timeframes to bring equipment and materials to site.

21.2.10.3 Kireka Slum Redevelopment

Within Kireka and Kampala there are 292 acres of land owned by the National Housing and Construction Company Limited (NHCC), which is a Ugandan construction and real estate management company, partly owned by the Uganda Government. During the period of 2007 and the present, approximately 90% of the area has been developed by house construction, stone quarrying, and schools, among others. The land is now a densely populated area with a significant number of the settlements within the region is settled by illegal squatters.

Within the area the Kireka Slum Redevelopment Proposal has been put forth to redevelop the site based on the zoning plan shown in Figure 21-3. NHCC has considered the option of a Public Private Partnership with the Ministry of Lands and Urban development, Ministry of Housing, Slum Dwellers International, Actogether, and eventually the resident community with the objective of redeveloping the site in a socially and economically viable manner. The proposal involves a large amount of resettlement (approximately 100 acres of informal settlements).

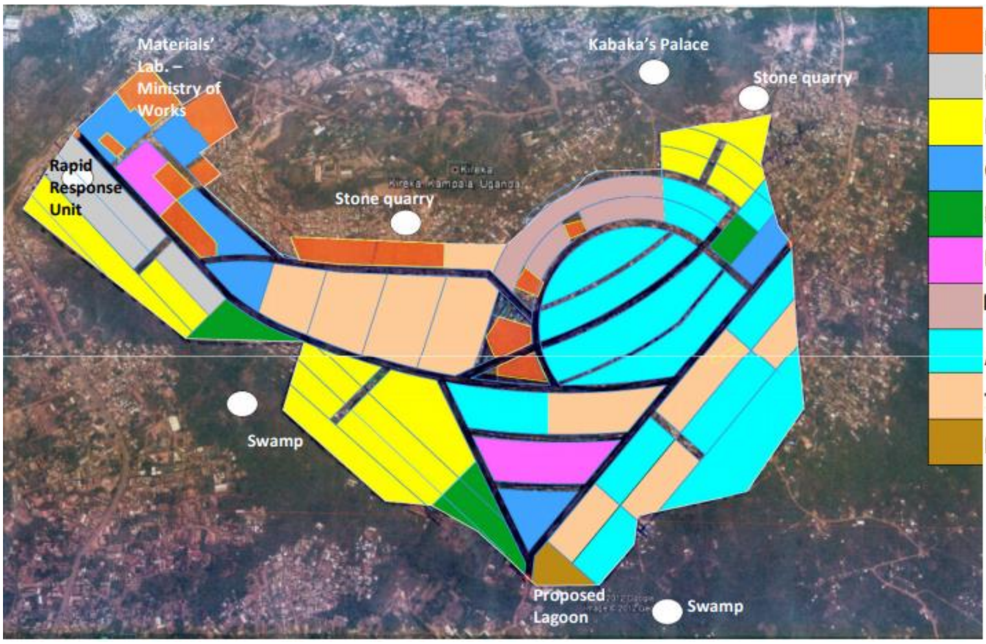


Figure 21-3 Zoning plan for Kireka Slum Redevelopment Proposal (NHCC)

There have been land disputes in this area with disagreements arising between residents and the NHCC - with both parties claiming ownership of the land. The NHCC plan to build a large number of residential structures in this area. Currently, this land dispute is still ongoing presenting a social risk for the KJE Project if these issues with the community are inadequately managed.

21.2.11 Kampala Cement Factory

Kampala Cement Factory is a manufacturer of cement in Uganda located in Namataba on the existing Kampala-Jinja Road, approximately 40km east of Kampala. The Kampala Cement factory has requested access directly to the KJE.

Plate 21-5 Kampala Cement Factory

Upon its completion, the KJE is anticipated to:

- Reduce travel times due to reduced traffic, reduce road accidents and transportation costs for goods;
- Increase accessibility for the people and transportation of the cement; and
- Increase labour mobility.

The construction phase may provide an opportunity to sell concrete to the constructor, however it is anticipated that some negative impacts will be experienced on a temporary basis such as:

- Interference with utilities (i.e. water supply, electricity); and
- Increased traffic due to road/lane closures resulting in delays for equipment and material delivery.

21.2.12 Sewage/Drainage Works

Drainage and sewage works are being implemented across Kampala City. One such project that may interact with the proposed Kampala-Jinja Expressway Project is the sewer line being planned in the areas of Kinawataka and Kasokoso crossed by the KJE alignment between KJE Chainage 3 + 000 and 7 + 000. There are also plans for a new sewage treatment plant in this area.

21.2.13 High Voltage Transmission Lines

There is the potential for the Project to impact on existing and planned high voltage transmission lines crossing the alignment. The potential for these lines to be impacted will depend on the detailed design of the Project and the locations of pylons. Transmission lines identified by the Consultant close to the proposed alignment of the Project include:

- The existing Nalubale - Lugogo 132KV transmission line runs roughly parallel to the north of the proposed alignment between Kampala and Jinja. The transmission line is generally about 5km from the Phase 1 alignment, but comes within 500m close to Jinja (Phase 2).
- A planned 132KV transmission line from Namanve South - Luzira Industrial Park will cross the KJE Mainline alignment at approximately 9+100.

21.3 Assessment of Cumulative Impacts

21.3.1 Transportation

Approximately 465,000 vehicles were recorded in use in Kampala in 2012, a number that is rapidly growing. The increased proliferation of private vehicles coupled with urban sprawl has resulted in a congested, inefficient transport network in greater Kampala, locally referred to as 'jam'.

High volumes of traffic and inadequate infrastructure means that transport in Kampala is typically slow and inefficient, with short journeys often taking significant periods of time. For personal travel, this means a high amounts of productive time are spent waiting in traffic; for the transport of goods, this means transport costs are typically higher than they should be due to unreliability and delays.

To address this problem, multi-modal transport options are being considered, including upgrades of key roads as well as the planned introduction of Standard Gauge Rail (SGR). These projects come at a significant financial cost, not to mention the high costs of land acquisition in prime economic zones of Kampala. It is critical to ensure that the multiple transport networks being developed work together intelligently to address traffic flows, transportation times as well as improving public transport networks.

Upon completion, the KJE is anticipated to alleviate traffic congestion on the key trade route of Kampala to Jinja by providing a greater number of lanes to vehicles on this road. The introduction of the SGR is also expected to alleviate demand for road use by providing an alternative means of transporting freight out of Kampala, as well as providing passenger options.

While the KJE Project will cross the existing Ugandan Railway in several locations, no significant impacts on the functioning of this railway will occur as the railway corridor has been taken into account in the design of the Project. The Project will add cumulatively to the existing transportation network provided by this railway and current roads.

21.3.2 Economic Development

Kampala has experienced decades of significant urban growth and is currently the second-fastest-growing city in Eastern Africa. Economic gain is the key driver of in-migration to Kampala, and the Government of Uganda is encouraging increased investment through the establishment of industrial and business parks as hubs of economic activity. Examples of business parks include the Kampala Industrial and Business Park (KIBP), Luzira Industrial and Business Park, Bweyogerere Industrial Estate and the Jinja Industrial and Business Park.

These business parks have been designed as sites with access to electricity, water and sewage - providing preferred industrial space to organisations working to add value to Uganda's natural resources (i.e. steel works, food preparation, manufacturing of soft goods and clothing).

Improving Kampala's efficiency in industry and manufacturing is a critical path for creating job opportunities. However profit making is dependent on the efficiency of transport of goods and services to consumers within Kampala and abroad. The current Kampala-Jinja Road providing access to the Port of Mombasa in Kenya is a variably paced but generally slow, unreliable route for export with high transport costs associated with heavy vehicles, poor roads and long time requirements. Upon completion of the KJE Project, it is expected that transport times between Kampala's industrial centres and Kenya's Ports (via KJE – Mombasa) and Tanzania's Ports (via KJE and Port Bell, Mwanza) will significantly decrease, resulting in faster 'to market' times, reduced transport costs and improved cashflow - potentially allowing the growth of successful exporters.

The KJE Project will also support the viability and economic development opportunities provided by other development Projects close to Kampala (e.g. Bukasa Port, refer Section 21.3.5).

21.3.3 Urban Development

The growth of Kampala is rapid. The city has quadrupled since the 1980s in structure and shape at a pace faster than its planning. A city that had been estimated to host 300,000 at the maximum is now home to almost 2 million people. The rapid growth in physical developments as well as in its population since early 1980s has caused Kampala to spread: east towards Mukono, south-west towards Entebbe, north towards Luwero, Wakiso and north-west towards Mpigi.

This unplanned rapid horizontal city development has caused structural and socioeconomic challenges for the greater Kampala area including: poor land tenure system; low levels of physical planning; lack of an integrated transport system; challenges related to environmental management; development of slums and unplanned settlements, spiralling urban poverty exacerbated by high unemployment levels, poor infrastructure for markets, water and health service systems and housing; and severe challenges of crime, crowding, congestion and pollution.

In 2010, the Government of Uganda created the Kampala Capital City Authority (KCCA) as a central government agency with overall responsibility to streamline operations and improve service delivery in the city. Over time, it

has become apparent that the development challenges of Kampala cannot be resolved by KCCA alone. In 2013, the Cabinet approved the Greater Kampala Metropolitan Area (GKMA) Development Framework 2040 that provided the new boundaries and its associated maps. Greater Kampala spreads over an area of up to 839 sq kilometres. The framework also includes various physical, spatial, environmental, ecological, socio-economic and other plans designed under a Capital Investments Planning (CIP) modular that define intended micro and macro projects for the development of the greater Kampala.

Kampala has grown outward from the urban centre along upland corridors, with development spreading down the slopes of the city's 24 hills into the low-lying wetland areas. This growth has led to an increasingly inefficient pattern of development that encroaches into wetland areas and presented difficulties for provision of adequate sanitation, drainage, flood control and environmental asset protection in addition to proving costly for the government to service (World Bank, 2015). A consequence of rapid urbanization has been the overall decline in the quality of the urban natural environment.

The Expressway will contribute to the urban development of Kampala and the surrounding suburbs, but will assist in the planned development of the city.

21.3.4 Kireka Slum Redevelopment Proposal

As described in Section 21.2.10.3, the Kireka Slum Redevelopment Proposal has been put forth to redevelop a site owned by the NHCC which aims to redevelop the site in a socially and economically viable manner. The development of the proposal would involve a large amount of resettlement (approximately 100 acres of informal settlements).

As shown in Figure 21-4, the footprint of the KJE Project runs along the edge of the area of the proposed Kireka Slum Redevelopment Project, and directly overlaps the NHCC land in some areas. The NHCC estimate that approximately 19 ha of the NHCC land will be directly impacted by the KJE Project in this area. This overlap means that the Projects will interact significantly and at least one of the Projects would need to be modified to account for the other if they both proceed.

Notably there have been land disputes in this area with disagreements arising between residents and the NHCC - with both parties claiming ownership of the land. These tensions may impact the development of the KJE Project (refer to the RLRP, Volume D, for further discussion of this issue).

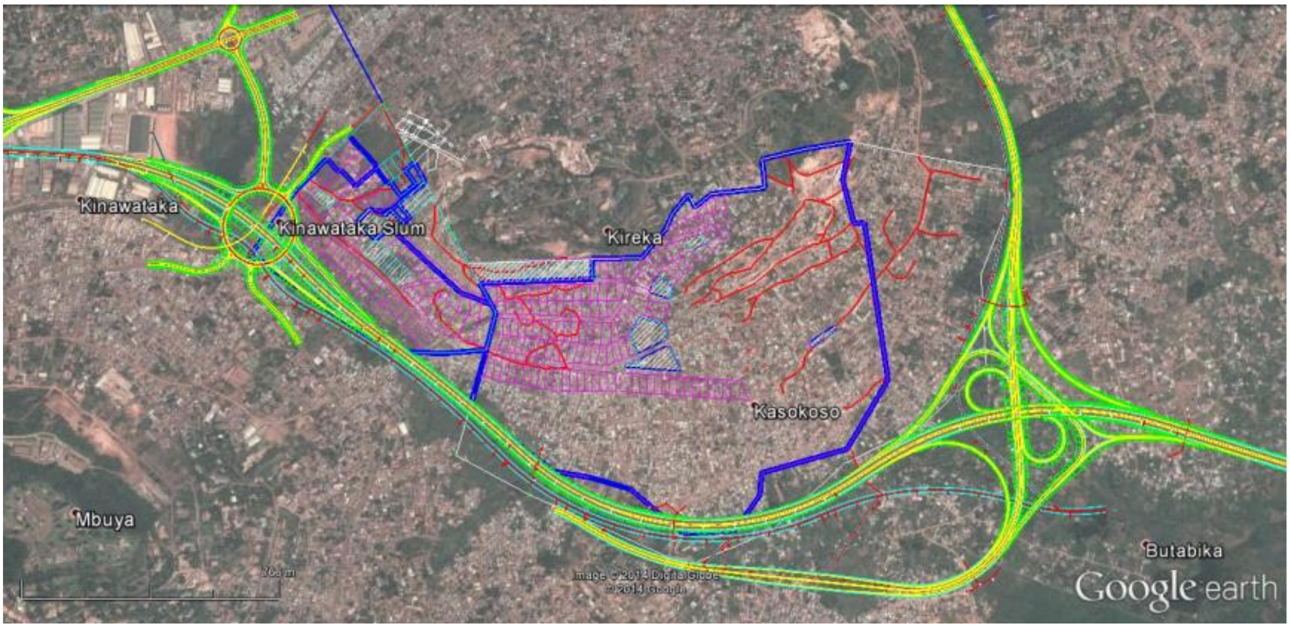


Figure 21-4 Kireka Slum Redevelopment Proposal Area with KJE alignment overlaid (NHCC)

21.3.5 Bukasa Port

The development and success of the Bukasa Port and the KJE alignment are strongly linked. The KJE Project will support the Bukasa Port development by significantly increasing the accessibility of this site. The combined impact of the two projects will result in enhanced economic development and promotion of growth of imports and exports. It is anticipated that KJE Project will:

- Facilitate access, transportation of materials during the construction of the port (should this occur upon completion of the KJE);
- Reduce traffic to the Wet Port, particularly should the planned direct route between the Kampala Industrial Business Park be completed;
- Improve transport and communication to and from the Wet Port during the operation phase; and
- Save costs associated with delayed and unreliable transport.

The intended primary access route from the Bukasa Port is by road. Both the imports and exports from the port will be facilitated by the KJE Expressway and the Jinja Road Kampala. The implementation of the road linkage between the KJE Project and the Bukasa Port is planned to for the Phase II of the port's development. Figure 21-3 shows the locations in which the connected infrastructure links with the Bukasa Port.

The combined effect of the two projects will also add cumulatively to environmental impacts associated with the KJE Project. For example both projects will impact existing wetlands (refer Section 21.3.7) and increase existing land pressures on the outskirts of Kampala (refer Section 21.3.6).

Figure 21-5: Bukasa Port Linkages (MWT, 2017)

21.3.6 Land Pressure

Kampala's urban growth has occurred at a rapid pace, resulting in sprawling high density informal settlements upon marginal lands, with limited access to basic infrastructure and services such as sewage and electricity. As the capital city, Kampala is the industrial, commercial and education centre of Uganda which leads to an increasing pressure on land causing an overall decline in the quality of the urban environment and environmental health.

With the increase in population, particularly the rural-urban migration of the rural poor, open land is already scarce. The construction of the KJE and its footprint, in combination with other existing and planned projects in the region (e.g. SGR Project, Bukasa Port) is likely to exacerbate land pressure along its route, however will also provide improved accessibility to other areas that may have proven less desirable prior to their connection.

21.3.7 Kampala Wetlands

Kampala has relied on the city's wetlands to provide numerous ecological services that support the city. The Urban Environment Profile for Kampala (World Bank, 2015) identifies the following key services provided by wetlands:

- Wetlands have served as the city's primary infrastructure for physically and biologically cleansing water, filtering out sediments and nutrients that enable the raw drinking water to be cost-effectively treated for human consumption;

- The wetland system has also served as the city's primary sponge for absorbing stormwaters, slowly releasing and cleansing waters by discharging into Lake Victoria or recharging groundwater flows;
- Wetlands have provided the city's predominant human waste processing function by receiving raw sewage and mechanically treated waste water, processing nutrient loads, and releasing waste water downstream with a higher degree of treatment;
- Wetlands have provided food, fuel, and building materials; and
- Additionally, the wetlands help support the fisheries that provide livelihoods for approximately 1,200 people at Port Bell, Ggaba and Munyonyo (KCCA, 2014).

Beyond this, the wetlands at Lutembe Bay are recognised as an Important International Bird Area and RAMSAR Convention wetland, due to its high biodiversity of roosting waterbirds, and prevalence of rare birds particularly between October and February when water levels are low. The development of the KJE Project will have an additional cumulative impact on the wetlands. The severity of this impact will be influenced by drainage design associated with the development and the adherence to environmental and social management and monitoring procedures described in the ESMMP (refer Volume D). A Water Management Plan and Biodiversity Action Plan (BAP) have also been developed for the Project which will also help to minimise impacts on the wetlands associated with the Project (refer Volume D).

21.3.8 Lake Victoria

Lake Victoria is a critical source of livelihood for hundreds of thousands of Ugandans, Kenyans and Tanzanians. Kampala has approximately 33 kilometres of shoreline along Lake Victoria, comprised of a key trade hub at Port Bell, as well as smaller trading points for fisherman and fish processing. Most importantly, Lake Victoria is a key source of drinking water, with water drawn from Murchison Bay through the Gaba Treatment Plant.

As discussed above, Kampala's wetlands and floodlands flow into Murchison Bay on Lake Victoria, providing critical ecosystem services in the absorption and filtration of the city's stormwaters (see Chapter 16). Protecting runoff into Lake Victoria is critical for its long-term potential for fisheries, as increased sediment load and influx of nutrients has previously resulted in algal outbreaks and eutrophication, affecting fish stocks. It is estimated that 6.34 tonnes of BOD, 1.5 tonnes of nitrogen, and one tonne of phosphorous are discharged into Lake Victoria daily (World Bank, 2015).

Climatic modelling indicates an uncertain future for Lake Victoria's water supply, with 80% of the Lake's recharge coming from rain falling upon its surface. Should rainfall patterns in the region decrease, increasing percentages of recharge will come from the Lake's surrounding basins, highlighting the need for protecting these resources.

As a result, impacts upon Kampala's wetlands associated with the Kampala Jinja Expressway will need to be managed carefully to ensure the natural nutrient cycling that protects Lake Victoria continues. Increased pollution is not only likely to have an impact upon fish stocks, it is also anticipated to trigger higher costs for water treatment at the Ggaba Treatment Plants to ensure that processed water is considered to be 'safe'. Implementation of the management and mitigation measures outlined in the ESMMP, Biodiversity Action Plan and Water Management Plan will help reduce these impacts on Lake Victoria (refer Volume D).

21.3.9 Kampala Water Supply

As mentioned above, Kampala's key water supply comes from Lake Victoria, more specifically from Murchison Bay and the Ggaba Treatment Plants (I, II and III). The total capacity of the existing water treatment network is 200,000m^3 per day, which was designed to meet the needs of Greater Kampala's water supply up until 2015. Given

population growth, further works are required to ensure that treatment capacity is adequate to cope with population estimates.

To address water quality issues, a pipeline was constructed 1.5km into Lake Victoria at a depth of 11m in an effort to draw higher quality water than what is available on the lake edges. A number of international financiers have also contributed to upgrades of the Ggaba I and II Treatment Plants amongst other infrastructure developments in an effort to improve water supply in Greater Kampala up until 2035, including significant lengths of pipeline and reservoir installations. It is estimated that more than 90% of Kampala's residents have access to piped water, however it is estimated that only 17% of residents have access to reliably safe water.

The KJE provides an opportunity to improve surface water runoff management through installation of stormwater drains along the expressway. Despite this, inadequate facilities for stormwater and sewage treatment, coupled with poor industrial and commercial waste management mean that even 'treated' effluents discharged to Lake Victoria are likely to result in significant pollution. Measures which aim to reduce Project impacts on water quality are outlined in the Water Management Plan (Volume D).

21.3.10 Air Quality

The World Health Organisation found Kampala to be in the top 30 cities with the worst air pollution in 2016. The majority of Kampala's air pollution emissions are generated from domestic sources (open-air burning of waste, wood and charcoal) and transport (cars, trucks and motorcycles).

Household air pollution emissions have been increasing commensurate with the increase in informal settlements due to the use of fuel wood for cooking as a result of poor access to other energy sources.

The number of vehicles in Kampala has also steadily increased, with 465,000 registered vehicles in Kampala in 2012. In the last decade, vehicle use has increased significantly as per Table 21-3. A reliable public transport system is not currently in place, with motorcycles, or 'bodaboda' being the preferred mode of transport. Motorcycles are particularly harmful, as they produce a higher volume of emissions per kilometre than other forms of transport. Vehicular emissions in Kampala are also especially high due to broad-scale traffic congestion leading to increased time periods of cars being on the road idle.

Table 21-3 Vehicle Use Increase by Mode (2002 – 2012)

Mode Share	2002 - 2012
Light Transit	5.7%
Mini Buses	12.6%
Buses	5.4%
Trucks	9.2%
Motocycles	15.7%

Adapted from World Bank (2015)

The Kampala Jinja Expressway is expected to have a mixed effect on air quality, particularly with reference to vehicles. Upon its completion, free-flowing traffic is likely to result in a net decrease in emissions from idling vehicles, however it may encourage further vehicle ownership due to improved mobility. Measures to mitigate the Projects impacts on air quality are outlined in the ESMMP (Volume D).

21.3.11 Standard Gauge Railway Project and Accessibility Impacts

Severance impacts caused by the Project are discussed in Chapter 8 which highlights areas where communities and businesses will be adversely affected by the Expressway blocking previous access routes at the local level. Whilst the impact of the Project on accessibility is significant, the impacts may be worsened when considered in combination with other Projects in the surrounding area. Of particular importance is the proposed Standard Gauge Railway (SGR) project which follows a similar alignment to the KJE for much of Phase 1. If this Project proceeds there will be communities blocked on both sides by large linear Projects and accessibility impacts will be far more severe than if just considering the KJE Project alone. The combined impact is likely to be significant in some areas where the two alignments are located close together, as the residences and businesses between the alignments may have local access routes blocked on two sides. The combined accessibility impacts of the KJE and SGR alignments are discussed in further detail in Chapter 8.

21.3.12 Greenhouse Gases and Climate Change

Modelling conducted for this ESIA suggests that only minor impacts regarding climate change and greenhouse gas levels will occur as a result of the Project. This is because the Project will contribute to less than 1% of Uganda's annual emissions (Chapter 12). Whilst this may be the case, when considered in the context of other projects surrounding Kampala and with the high rate of development in Kampala and the numerous regional centres that may be enhanced by the Expressway (see Section 20.3.3), there may be much larger impacts on greenhouse gas levels and climate as a result of all these projects combined. Kampala and the surrounding towns are rapidly developing and it is likely that greenhouse gas emissions will also continue to rise as the city rapidly develops.

21.4 Avoidance, Mitigation and Management Measures and Residual Impacts

An *Environmental and Social Management and Monitoring Plan* (ESMMP) and other management plans have been prepared for the Project which include a variety of management measures to minimise cumulative impacts and risks from the Project (refer Volume D). Key cumulative impacts and related management and mitigation measures are summarised in Table 17-1. The residual risk or impact after implementation of the measures is outlined and the residual risks and impacts after implementation of the measures are also presented.

As the cumulative impacts are interlinked with a variety of other issues discussed in the ESIA, many of the mitigation measures outlined in other chapters of the ESIA will also be relevant to reduce the potential cumulative impacts. References to relevant chapters are provided where appropriate.

Table 21-4: Key avoidance, mitigation and management measures and residual cumulative impacts

Risk / Aspect	Key Avoidance, Mitigation and Management Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Transportation	Implement measures as per Chapter 8. Consultation and coordination with other projects such as the SGR.	Positive	Major The Project will add significantly to the development of the transportation network in Uganda in conjunction with other existing and planned road and rail projects and alternative transport options such as the SGR.
Economic Development	Implement related measures as per Chapter 19.	Positive	Moderate Enhanced economic development and promotion of growth of businesses and urban centres within and surrounding Kampala.

Risk / Aspect	Key Avoidance, Mitigation and Management Measures	Impact Direction	Magnitude and Key Residual Impacts / Risks
Urban Development / Housing	Implement related measures as per Chapter 19. Consultation and coordination with other projects such as Kireka Slum Redevelopment Project proposed by the NHCC.	Positive	Moderate The Expressway will contribute to the strategic urban development of Kampala and the surrounding suburbs. The KJE Project directly intersects part of the land proposed to be developed for the Kireka Slum Redevelopment Project.
Bukasa Port	Implement related measures as per Chapter 19.	Positive	Moderate The KJE Project will support the Bukasa Port by significantly increasing the accessibility of this site. The combined impact of the two projects will result in enhanced economic development and promotion of growth of imports and exports.
Land Pressure	Implement measures as per Chapter 7. Consultation and coordination with other projects such as the SGR.	Negative	Minor The construction of the KJE and its footprint is likely to exacerbate existing land pressures along its route, but may also ease pressure in populated areas by improving accessibility of rural areas.
Kampala Wetlands	Implement measures as per Chapter 15, as well as the Water Management Plan and Biodiversity Management Plan (refer Volume D).	Negative	Moderate The Project will add to the loss of wetlands from other existing and planned Projects (e.g, Bukasa Port). The level of cumulative impacts on water quality of wetlands from the projects will depend on drainage design and how diligently the water quality management and mitigation measures are implemented for the projects.
Lake Victoria and Kampala Water Supply	Implement mitigation measures as per Chapter 15, as well as the Water Management Plan (refer Volume D).	Negative	Minor-Moderate Cumulative impacts on water quality from the Project will depend on drainage design and how diligently the management and mitigation measures are implemented.
Air Quality	Implement measures as per Chapter 10.	Neutral	Negligible Overall, the Project is not expected to add significantly to air quality impacts of other Projects. Free-flowing traffic resulting from the Expressway is likely to result in a net decrease in emissions from idling vehicles, however the Project may encourage further vehicle ownership due to improved mobility.
Local land accessibility	Implement related measures as per Chapters 7 and 8. Implementation of RLRP (refer Volume D).	Negative	Minor - Moderate If the SGR Project is developed, the KJE Project will add cumulatively to local accessibility impacts from the two projects. The combined impact is likely to be significant in some areas where the two alignments are located close together. These impacts will be reduced via the implementation of the proposed management and mitigation measures outlined in this ESIA and associated management plans.
Greenhouse Gases	Implement measures as per Chapter 12.	Negative	Minor The high rate of development in Kampala and regional centres will be enhanced by the Expressway resulting in increased impacts on greenhouse gas levels and climate.

21.5 Conclusions

The environmental health of Kampala City is affected by a complex network of natural and manmade features. At the centre of much of Kampala's environmental health, particularly in relation to water, lies the vast network of wetlands surrounding Lake Victoria, providing key environmental services in the filtration of surface water flowing from the city back into the Lake at Murchison Bay.

As a result – it is critical that the construction of the Kampala Jinja Expressway takes into account the protection of wetlands which are impacted by several other planned Projects and urbanisation across Kampala. The Project should also consider the indirect impacts of land acquisition in a city already experiencing land pressures. Provision of appropriate resettlement sites is critical to ensure that wetlands are not further 'reclaimed' for residential uses and thus decreased in size and quality further.

The road will likely lead to enhanced economic development and promote the growth of businesses and urban centres within and surrounding Kampala, as well as supporting the development and success of projects such as Bukasa Port. Whilst beneficial for economic growth, cumulative increases in urbanisation, if inappropriately managed, may lead to severe environmental impacts such as accelerated degradation of wetlands surrounding Kampala which support a range of biodiversity and provide important ecosystem services.

Some significant interactions are expected between the KJE Project and other planned Projects such as the SGR Project and the Kireka Slum Redevelopment. Most notably the SGR Project, if developed, has significant potential to result in cumulative impacts on local accessibility, which is discussed further in Chapter 8. Close coordination between the KJE project and other nearby projects will be required to ensure that cumulative adverse impacts are minimised and potential benefits are maximised.

Other important options for consideration include the management of air quality as a result of vehicular emissions. The design of the KJE provides an opportunity to establish effective and reliable transport systems through inclusion of multi-modal stations along the length of the KJE. Improving public transport can reduce dependency on private vehicles, thus reducing emissions from single-occupancy vehicles and congested traffic.

Diligent implementation of the ESMMP and other management plans prepared for the Project (refer Volume D), combined with adequate consultation with key stakeholders involved in other nearby development projects, will assist in ensuring the potential adverse cumulative impacts of the Project are minimised wherever possible.

KJE PPP Project Phase 1 ESIA

CHAPTER 22 Environmental and Social Management and Monitoring

22. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING

22.1 Overview

This ESIA chapter describes how the Project proposes to manage the social and environmental impacts and risks that will arise during the Construction, Construction Decommissioning and Operation of the Project.

The proposed management and monitoring strategy for the various phases of the Project has been documented in a detailed *Environmental and Social Management and Monitoring Plan* (ESMMP, Volume D).

Environmental and social management measures covering the following Project aspects and activities have been incorporated in the ESMMP:

- Land Clearance;
- Erosion and Sediment Control;
- Water Resources;
- Hazardous Materials and Waste Management;
- Air Emissions;
- Noise and Vibration;
- Greenhouse Gases and Climate;
- Borrow Pits and Quarries;
- Ancillary Facilities;
- Biodiversity Management;
- Ecosystem Services;
- Land Acquisition, Resettlement, Compensation and Livelihood Restoration;
- Archaeology and Cultural Heritage;
- Stakeholder Engagement;
- Traffic;
- Visual Amenity;
- Community Health and Safety;
- Occupational Health and Safety;
- Accommodation Camps; and
- Emergency Response Framework.

During the Construction and Operation Phases of the Project, it is expected that the ESMMP will be reviewed and updated as required to incorporate any significant changes or at least annually during the life of the Project.

UNRA is responsible for ensuring that management and monitoring strategies are implemented during the life of the Project as discussed in the ESMMP. Suitable staff, equipment, support systems, and financial resources will be necessary to implement the ESMMP, as will collaboration with relevant government agencies.

22.2 Environmental Management Systems

22.2.1 Overview

UNRA is committed to international standards of good practice in the areas of environmental protection, social development, and health safety and security. In support of this commitment, UNRA has developed an Environmental and Social Management System, governed by an Environmental and Social Safeguards Policy (2016). The management system provides UNRA with a procedural framework for implementing, achieving, reviewing and maintaining its environmental and community policies and all environmental and social management targets.

The ESMMP provides a link between policy and implementation, essentially, acting as a planning document, summarising environmental and social commitments (as outlined in this ESIA) and presenting the management measures and monitoring programs to be undertaken to achieve these commitments. The ESMMP provides a framework for developing flexible and readily updateable environmental management procedures within a formal EMS. This function of the ESMMP is represented schematically in Figure 22-1.

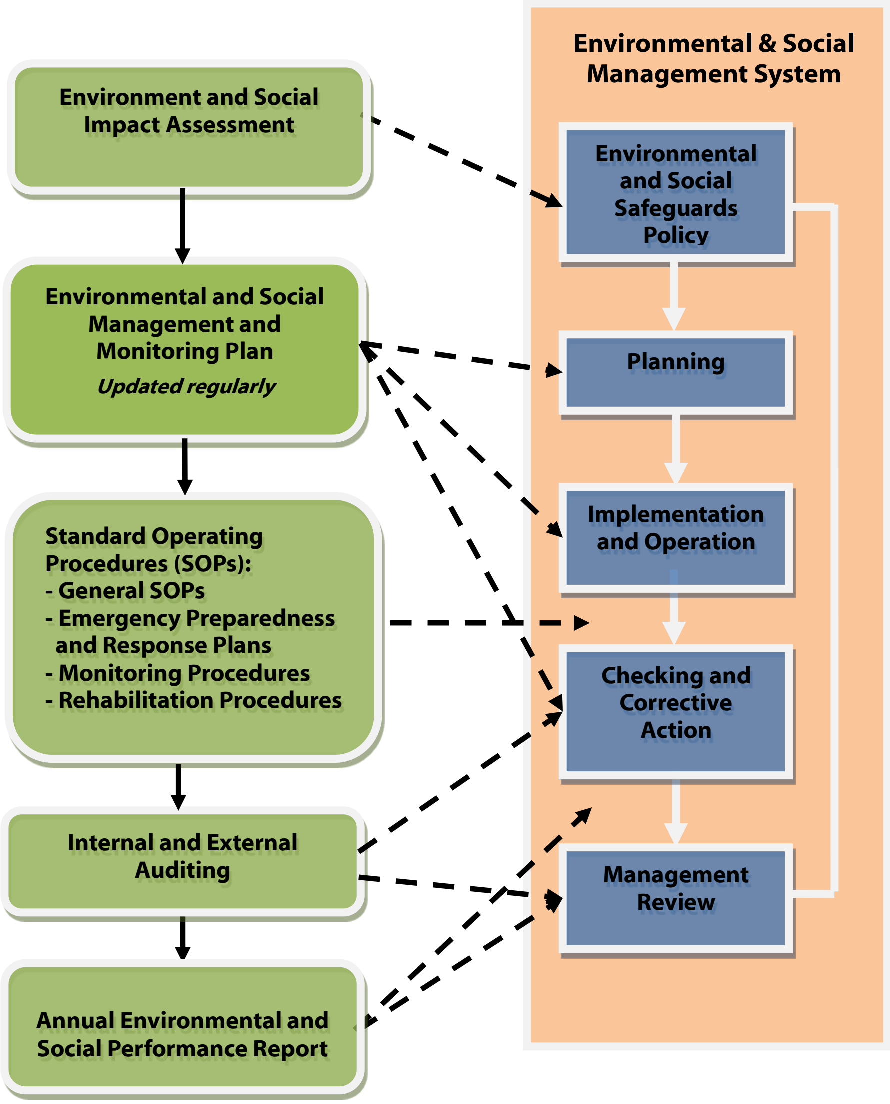


Figure 22-1 Schematic diagram of the ESMMP framework

22.2.2 Responsibilities

Implementation of the ESMMP will require appropriate staff, financial resources, equipment and support systems. UNRA will be responsible for engaging a suitably skilled and experienced team to implement the ESMMP for the Project. It is the responsibility of all Project staff and contractors to comply with the requirements set out in the ESMMP. The responsibilities and duties of Project staff, contractors and suppliers will need to be defined through standard terms and conditions of contracts that are consistent with the commitments of the ESMMP.

UNRA staff and Project contractors are recommended to undertake internal training and education activities to ensure that Project expectations regarding environmental and social performance are achieved and maintain training records. This would include building upon the outcomes of the UNRA Capacity Building Assessment on environmental and social safeguards commissioned by the EU, which identified a number of key areas for UNRA training and future needs applicable for the Project (AECOM International Development Europe, 2017). UNRA is recommended to implement a Competency Based Training Scheme to act as the benchmark for its staff and contractors to improve their levels of competency in their fields.

The recommended key roles and responsibilities for the implementation of the Project ESMMP are outlined below. Figure 22-2 shows the proposed organisational structure for the Project ESMMP implementation.

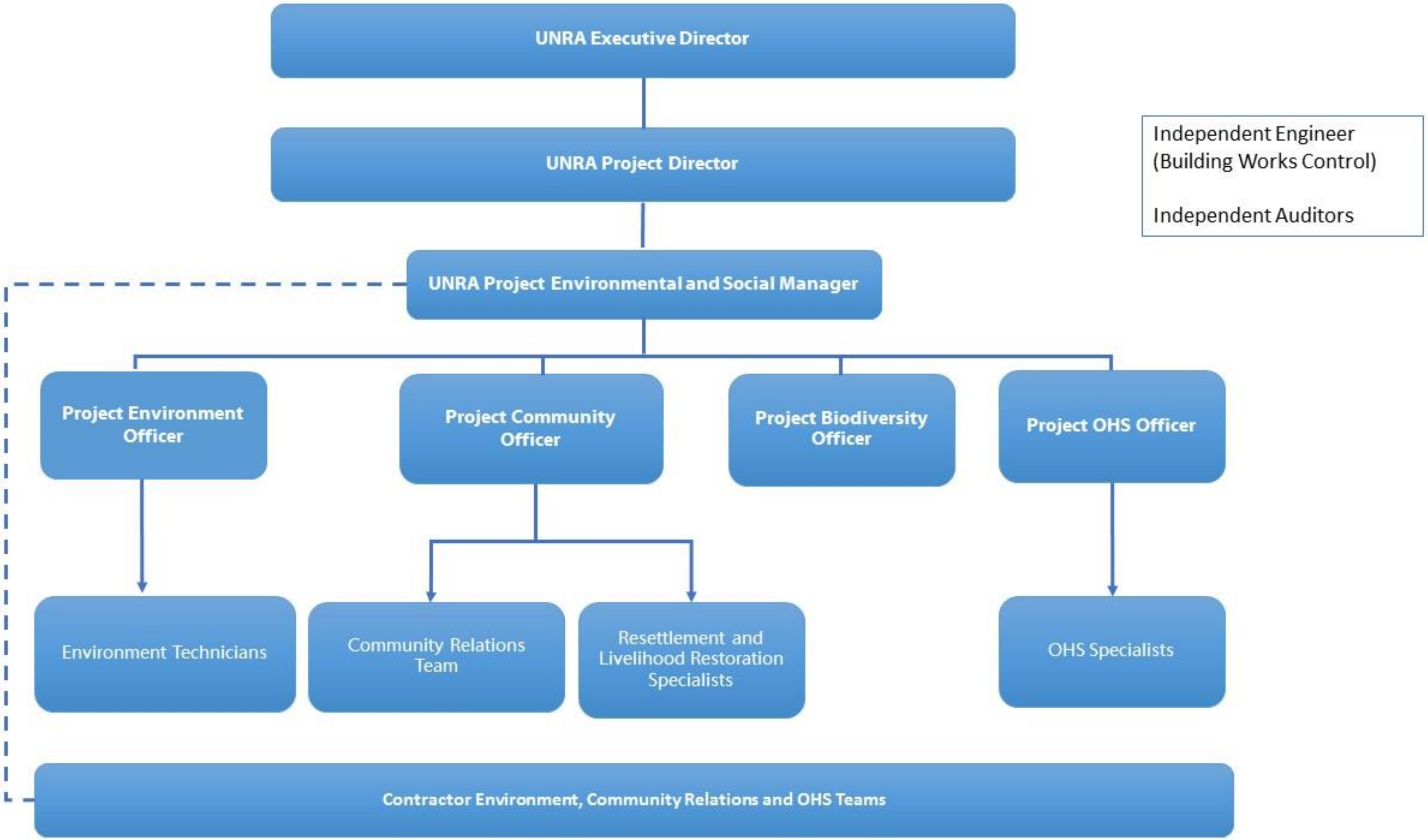


Figure 22-2: Proposed organisational structure for ESMMP implementation

22.2.2.1 UNRA Project Director

The UNRA Project Director would:

- Have overall responsibility of project technical development as well as environmental and social compliance.
- Ensure that appropriate resources are allocated to the environmental and social management of the Project, including budget and human resources.
- Review and approve the Construction Environmental Management Plan (CEMP) and Operations Environmental Management Plan (OEMP) prepared for the Project by the primary contractor/concessionaire, and any major revisions to the ESMMP.
- Ensure that UNRA staff are appropriately trained in environmental, social and safety awareness.
- Sign off close-out of any Project incidents and grievances.
- Ensure the effective implementation of UNRA policies, programs and procedures.

22.2.2.2 UNRA Project Environmental and Social Manager

The UNRA Project Environmental and Social Manager would be in charge of overseeing the implementation and continued improvement of the ESMMP, RLRP and other Project management plans. Dedicated Environment and Social and Occupational Health and Safety (OHS) staff would support the UNRA Project Environmental and Social Manager to manage and monitor social, community, safety, health and environmental issues associated with Project activities. Key responsibilities should include:

- Ensure that the required environmental and social management and monitoring measures identified in the ESMMP, *Resettlement and Livelihood Restoration Plan* (RLRP) and related management plans are undertaken.
- Ensure that the ESMMP, CEMP, OEMP and environmental, social and OHS risk assessment are regularly reviewed and updated as required.
- Ensure compliance is achieved with relevant national and international legislative and policy requirements and other Project environmental and social commitments (e.g. UNRA policies, standards or commitments).
- Oversee the coordination and conduct of community consultation / environmental and social / OHS activities, resettlement and compensation processes, and management of Project grievances and incidents through the UNRA management systems.
- Hold the Project Environmental, Social and OHS staff (see below) responsible for the effective implementation and continued improvement of environmental and social policies, procedures, and management plans.
- Ensure all necessary permits for UNRA are obtained.

22.2.2.3 UNRA Project Environmental, Social and OHS Staff

UNRA should dedicate qualified and experienced Environment, Social and OHS staff comprised of a Project Environment Officer, Project Biodiversity Officer, Project Community Officer and Project OHS Officer supported as needed by a team of professional specialists and technicians responsible for the implementation and monitoring measures of UNRA responsibility. Key responsibilities include:

- Ensure that the requirements in the ESMMP, ESIA, RLRP and related management plans commitments as well as national and international standard requirements are incorporated into the contract specifications for construction.
- Check that contractors fulfil the requirements of the ESMMP and related plans and contract specifications (i.e. through the contractor's CEMP/OEMP, OHS Plan), including for monitoring, surveillance and auditing requirements.
- Approval of relevant contractor's documents, new ancillary sites' opening, building plans for water management, etc. as needed for the Project.
- Ensure community consultation activities, resettlement and compensation processes, community initiatives, managing grievances are conducted in accordance with the Stakeholder Engagement Plan (SEP) and RLRP.
- Log, manage and investigate Project incidents and grievances through UNRA's incident reporting and grievance management systems as needed.
- Prepare surveillance plans for each construction contract and complete regular assessment/review of the environmental, social and OHS risks and amend the surveillance plan as necessary to reflect the risks.
- Undertake regular on-site inspections / audits of work to check compliance and performance with the contract specifications and the contractor's CEMP/OEMP/OHS Plan.
- Review and report environmental and social data regarding the progress of implementation, effectiveness of management measures and monitoring data, and recommended actions or modifications required for non-compliance and continual improvements concerning ESMMP and related management plans implementation.
- Report to the appropriate regulatory authorities on significant reportable incidences and other Project reporting commitments (i.e. NEMA) as per regulations.
- Provide specialist advice on environmental, social and OHS management strategies, as required, to the contractor.
- Plan and carry out as needed environmental and social training programs for Project contractors.
- Work with contractor for development and implementation of appropriate community sensitisation programs for health and safety.
- Work with contractor for development and implementation of appropriate workers code of conduct and gender based violence prevention programs.

The Project Environment Officer would be responsible for the operational and day to day implementation of the environmental components of the ESMMP and related management plans as well as management of environmental technicians (if applicable) while reporting, supporting and assisting the UNRA Project Environmental and Social Manager.

The Project Biodiversity Officer would be responsible for the operational implementation of the Biodiversity Action Plan (BAP) with details of key duties and responsibilities specified in the BAP.

The Project Community Officer would be responsible for the operational and day to day implementation of stakeholder engagement activities as well as social, resettlement and livelihood components of the ESMMP and related management plans (i.e. RLRP, SEP) as well as management of the Community Relations Team and Resettlement and Livelihood Restoration Specialists while reporting, supporting and assisting the UNRA Project Environmental and Social Manager.

The Project OHS Officer would be responsible for the operational and day to day implementation of the OHS components of the ESMMP and related management plans (i.e. OHS Plan) and management of OHS Specialists (if applicable) while reporting, supporting and assisting the UNRA Project Environmental and Social Manager.

22.2.2.4 Contractors

The lead construction contractor/concessionaire is expected to have appropriately qualified and experienced staff to implement the requirements of the ESMMP. This would be expected to include a dedicated Project Sustainability Manager (or equivalent) as well as appropriately resourced Environment Team, Community Relations Team and OHS Team.

The primary contractor/concessionaire for the Project (hereafter referred to as 'Contractor') would:

- Develop a CEMP in line with this ESMMP prior to construction, providing greater detail to meet environmental and social management requirements, and to the satisfaction of UNRA's Project Director. Prior to the Operations Phase, an OEMP will also need to be developed and approved by UNRA's Project Director.
- Effectively implement and manage the CEMP and OEMP to the satisfaction of UNRA's Project Director.
- Monitor, record, audit and conduct surveillance of the implementation and effectiveness of the CEMP/OEMP and report their effectiveness to UNRA's Project Director / Project Environmental and Social Manager.
- Report regularly to UNRA's Project Environmental and Social Manager regarding environmental and social performance.
- Engage an independent, suitably qualified and experienced auditor to conduct audits of implementation of the contract specification.
- Engage specialist environmental advice where required.
- Engage a qualified ecologist to demarcate ecological 'No-go zones' on-site.
- Check that all contractual commitments are honoured.
- Report incidents and grievances to UNRA's Project Director / Project Environmental and Social Manager and relevant government lead agencies. Document and follow actions taken to rectify the situation.
- Check that all other requirements as described in the contract specification are met.
- Inform UNRA's Project Director / Project Environmental and Social Manager of any queries from government lead agencies and respond accordingly.
- Review and update the CEMP/OEMP during construction/operations annually or if any significant changes occur.
- Check that Contractor's staff and subcontractors have been appropriately trained in environmental awareness, are fully informed of the CEMP/OEMP and understand the required measures for environmental and social compliance and performance.

22.2.2.5 Public and Government Agency Involvement

The participation of external parties in the monitoring programme of the Project will be the subject of consultation and will be agreed between UNRA, the construction contractor/concessionaire and other Government agencies. Monitoring is expected to involve at least the following Government authorities:

- National Environment Management Authority (NEMA)

- Ministry of Water and Environment (MWE)
- Ministry of Works and Transport - Environment Liaison Unit (ELU)
- Ministry of Lands, Housing and Urban Development (MLHUD)
- Ministry of Tourism, Wildlife and Antiques (MTWA)
- Ministry of Gender, Labour and Social Developments (MGLSD)
- Department of Occupational Safety and Health
- Uganda Wildlife Authority (UWA)
- Directorate of Water Resources Management (DWRM)
- National Forest Authority (NFA)
- Wetlands Management Department (WMD)
- Department of Museums and Monuments
- Department of Disaster Preparedness.

Communities should also be involved in monitoring where possible, through relevant groups such as Local Environment Committees and/or Road Committees.

22.2.3 General Environmental and Social Management Budget

UNRA is committed to providing sufficient resources to ensure the successful implementation of the environmental and social management and monitoring of the Project as identified in the ESMMP. UNRA will also ensure that contractors include sufficient resources for the environmental management of their activities.

A preliminary analysis of environmental and social management costs associated with the construction and management of the KJE Project has been undertaken and is presented in the ESMMP (refer to Volume D).

22.2.4 Reporting Systems

22.2.4.1 Data Management

Relevant Project environmental management documentation will be established on a web-based platform readily accessible to employees, contractors and consultants. The platform should be linked to a GIS database maintained up to date. Key documents for inclusion are the Project ESIA Report, ESMMP, associated management plans, Standard Operating Procedures (SOPs), registers, forms, and relevant legislation, guidelines and discharge standards.

In addition, computer based databases will be developed and maintained to capture and analyse Project related information collected from the environmental and social monitoring programmes. The databases should be capable of generating summary information (including statistics) on the performance of the Project where required. Databases to be developed for the Project will include:

- Environmental management databases comprising of the following information:
  - Relevant legislation, regulations and guidelines for Project compliance as well as progress in meeting its obligations and environmental and social commitments;
  - Field sampling information, including monitoring locations, description and map reference; sampling frequency, date and time; measurement parameters and unit of measure; monitoring results and

comparison with relevant guidelines and standards; and quality assurance / quality control information;

  - Non-compliances and reported incidents/issues with corrective action required and implementation data, and outcome of corrective actions;
  - Waste inventory, including the quantities, locations and types of materials (e.g. hazardous wastes and non-hazardous waste) for environmental management and rehabilitation/disposal purposes;
  - Hazardous materials and dangerous goods inventory, including type, source, quantity, storage location and physical state of stored materials, relevant Material Safety Data Sheets (MSDS), and transport records);
  - Cultural heritage register;
  - Contaminated soil and spill inventory;
  - Soil stockpile inventory, including location of temporary and long-term stockpiles and approximate volume of material; and
  - Project workforce induction and training records.
- Stakeholder management databases to document information on:
  - Information obtained from Project stakeholder engagement activities;
  - Contact details of Project affected people and other stakeholders;
  - Logged community complaints and grievances through the Project grievance management process;
  - Outcome of investigations and agreed outcomes/actions with affected parties;
  - Requests for community support and funding; and
  - Compensation and resettlement information for each Project affected person.

Supporting forms and templates used to capture relevant information for database recording will be prepared to ensure data is captured consistently, accurately, and meaningfully.

22.2.4.2 Project Reporting Commitments

Templates should be developed and used as needed from the web-based platform to ensure reporting obligations are met.

The Contractor will be required to prepare regular reports (monthly, quarterly, and annual) on environmental, social, health and safety performance.

On an annual basis, UNRA should prepare a summary report on Project environmental and social performance in accordance with the ESMMP. The Global Reporting Initiative (GRI) Sustainability Reporting Guidelines may be used to guide the preparation of the report, where appropriate. However, the report should focus on providing key information and data required to determine compliance with the requirements of the ESMMP, national legislation and international performance standards (IFC, AfDB).

Periodic reports on environmental and social sustainability will be made publicly available (e.g. on the UNRA website).

22.2.4.3 Incident and Project Grievances Reporting

An incident is any event that impacts on, or may potentially impact on the safety, health, environment or community, or any activity resulting in regulatory non-compliance or breach of UNRA policies, standards or

commitments. Project grievances include any complaints or disputes raised by local communities regarding Project activities.

To assist with the management and reporting of environmental and community incidents, UNRA will utilise a computer-based event management system (e.g. INX InControl). These systems are designed for the efficient and effective management and reporting of environmental and social-related incidents. The system will also allow for a reporting scheme that includes:

- Description of the incident and its causes;
- Risk rating of the incident;
- Description of corrective and preventative actions;
- Description of repairs, clean-up or other remedial measures; and
- Actual or estimated costs of repair, clean-up or other remedial measures.

The following situations will constitute an incident:

- Confirmed or likely violation of any law or international agreement;
- Injury or property damage;
- Near miss or hazard;
- Chemical spills;
- Spills of fuel or oil outside of primary containment areas greater than 50 L (environmental incident);
- Non-contained fires within operational areas;
- Uncontrolled gas emissions;
- Biodiversity incidents - e.g. injured or dead animals;
- Employment incidents e.g. collective termination of workers, workers' strikes; and
- Community incidents - primarily related to community grievances, uncontrolled access within blast exclusion zones.

The UNRA Project Environmental and Social Manager should be notified immediately for any significant reportable incidents or community grievances. Incidents should be classified according to their actual and potential safety, environmental or social impact using a standard consequence matrix to ensure consistency. Incidents and significant near misses should be reported by the Contractor OHS Manager (or equivalent) within 24 hours of the occurrence of the incident, and discussed at the first management meeting following the incident, unless the severity of the incident (dependent on the risk ranking of the event) requires immediate notification.

For community grievances, a separate management system will be implemented by the Contractor compatible with UNRA's grievance management system in place. All logged community grievances filed will be recorded and addressed at management meetings and summaries of grievance-related information will be prepared on a regular basis for public disclosure. UNRA already has an online based grievance mechanism where grievances from affected persons and other stakeholders can be submitted and addressed appropriately. This includes an online messaging service, complaints log and FAQs to provide affected people with relevant information.

22.3 Monitoring

22.3.1 Overview

The implementation of an appropriate monitoring strategy as part of the ESMMP is important to ensure that existing management measures are effective, and to identify the need for improved or additional measures. The objectives of the Project environmental and social monitoring programme are to:

- Detect and analyse environmental and social trends or changes to develop an appropriate response, where required;
- Ensure relevant environmental legislation and licensing commitments of the Project are complied with;
- Measure the performance of environmental and social management measures to ensure impacts remain at an acceptable level and there is ongoing improvement of Project's operations; and
- Provide early warning of potential impacts, determine the extent of anticipated impacts and identify any unforeseen impacts associated with Project activities.

The environmental and social monitoring programme for the construction and operation phases includes the following main categories of monitoring:

- **Construction and Operations monitoring**: Routine construction monitoring including visual inspections and 'toolbox' meetings with Project personnel to ensure management measures are employed adequately during construction works and during operations.
- **Discharge (emission) monitoring**: The monitoring of potential contaminants discharged or emitted from the Project to the environment, measured at or near the point of discharge (e.g. discharge from sewage treatment plant at the accommodation camp).
- **Ambient monitoring**: The monitoring of background conditions and the receiving environments that may be affected by Project activities. Ambient monitoring will be undertaken in upstream and downstream surface waters, along with ambient dust and noise monitoring at nearby villages. While operational and discharge monitoring will determine if environmentally significant releases have occurred, effects on sensitive receptors within the receiving environment can only be determined by ambient monitoring.
- **Social monitoring**: The monitoring of socio-economic indicators and feedback from Project affected communities, to identify and quantify the direct and indirect impacts of the Project on the surrounding community.

A further category, **investigation monitoring**, will also be carried out when necessary, to determine the occurrence, nature and extent of impacts following an environmental incident (oil leakage, etc.) from the Project, or to verify/refute third-party claims of environmental / social impact.

During the construction decommissioning phase, **closure monitoring** will be undertaken to assess progress in achieving closure completion criteria for temporary work sites such as decommissioned borrow pits or accommodation camps.

During the Pre-Construction and Construction phase, monitoring will be required to ensure that the following aspects to be developed for the Project undergo due diligence environmental and social studies by the contractor (or concessionaire) to the satisfaction of NEMA and in accordance with international standards (e.g. IFC Performance Standards and AfDB's Operational Safeguards) to ensure potential impacts are avoided and minimised where possible:

- Any new drainage channels required for the Project outside the ROW;

- Associated service stations/rest areas along expressway;
- Plant equipment storage areas;
- Accommodation camp sites;
- Any new quarries and borrow pits; and
- Asphalt plant site.

UNRA should ensure accredited external laboratories are used for analysis of parameters that cannot be routinely analysed on-site. UNRA should also require the use of portable monitoring equipment on-site, where possible, for field measurements such as surface water quality analysis (e.g. refer to the Water Management Plan) and gas monitoring (i.e. SO_2, NO_x, CO). Other recommended monitoring equipment listed in this ESMMP include noise and vibration loggers, continuous aerosol monitoring device (e.g. DustTrack), dust deposition gauges/collectors. SOPs are expected to be developed to ensure that appropriate monitoring methods, equipment and controls (if required) are used to properly meet the ESMMP objectives.

All relevant employees involved in monitoring activities (particularly for field monitoring) will be given appropriate training, where required, by a competent person in the use of:

- Monitoring techniques, including: use, calibration and maintenance of field monitoring equipment, sample collection, labelling and transport;
- Review and interpretation of field and laboratory monitoring results; and
- Record keeping and reporting procedures, including using standard forms and databases.

Relevant environmental and social monitoring programmes for each Project component are detailed in Chapters 5 to 24 of this ESMMP. These monitoring programmes should be revised as appropriate when Project activities or conditions change significantly.

22.3.2 Construction, Construction Decommissioning and Operations Monitoring

All departments will perform routine monitoring of appropriate parameters during construction, construction decommissioning and operation in relation to their specific objectives.

The following monitoring is relevant to environmental and social management, but will primarily be the responsibility of construction contractors, who will require the information for construction process control:

- Diesel and other consumable usage rates;
- Routine safety inspections of facilities to identify potential hazards (e.g. leakage, etc.);
- Energy use;
- Local employment, training and skills development;
- Local procurement;
- Land disturbance and soil stockpiles; and
- Workforce health (Malaria, STDs).

22.3.3 Discharge Monitoring

Discharge monitoring is generally conducted at the point of discharge or within the local catchment area, and provides direct information regarding the contaminants (concentrations and loads of contaminants) being

discharged from the Project. Furthermore, it also acts as a link between ambient monitoring results and the operation itself.

The discharge monitoring program will include:

- Installation of dust gauges near sensitive receptors along the ROW and near ancillary infrastructure for dust monitoring on a monthly basis;
- During pre-construction and construction, conduct water quality monitoring monthly (or more regularly) of major construction worksite discharge points for Turbidity, TSS, DO, temperature, electrical conductivity (EC), pH, and oils and grease contamination;
- Water quality monitoring of treated effluent and wastewater from water treatment plants during discharge for key parameters such as Total and faecal coliform, Total nitrogen, Total Phosphorous, COD, and BOD; and
- Periodic monitoring of noise, airblast, ground vibration and fly rock once blasting has commenced or whenever there is a significant change in operating procedures, e.g. such as blasting location.

22.3.4 Ambient Monitoring

Ambient monitoring is defined as the monitoring of background conditions and the receiving environments that could be affected by Project activities. It is useful in determining the effects of releases or discharges from the Project on the receiving environment, in contrast to operational and discharge monitoring which determine the occurrence of these releases. Typical monitoring points for ambient monitoring include upstream and downstream surface waters, as well as at nearby villages for ambient dust and noise monitoring. Monitoring of aquatic/terrestrial biodiversity and rehabilitation activities will also be conducted.

22.3.4.1 Water Quality

Ambient monitoring of surface water and groundwater quality will be conducted. Field parameters monitored on a monthly basis for surface water, and a lesser basis for groundwater, will include:

- pH;
- Redox potential (ORP);
- Dissolved Oxygen (DO);
- Electrical conductivity (EC);
- Total Dissolved Solids (TDS);
- Turbidity;
- Total Suspended Solids (TSS);
- Nutrients; and
- Water temperature.

Further details of water quality monitoring are provided in the Water Management Plan (Volume D),

22.3.4.2 Terrestrial and Aquatic Biodiversity

All reports of Project-related animal mortalities or injuries will need to be reported by the Contractor in accordance with the incident reporting system.

Land clearance activities will be carefully controlled and monitored.

Additional terrestrial and aquatic flora and/or fauna monitoring requirements are identified as part of the *Biodiversity Action Plan* for the Project (refer to Volume D).

22.3.4.3 Rehabilitation/Revegetation

Rehabilitated/revegetated areas should be monitored regularly. Monitoring records should include the following, as a minimum:

- Area revegetated/rehabilitated;
- Number of type of seeds/seedlings planted;
- Source of seeds/seedlings;
- Number germinated and rate of growth and spread; and
- Photographs.

Further details of monitoring for revegetation are provided in the Biodiversity Action Plan (Volume D),

22.3.4.4 Dust and Noise

During construction, dust deposition collectors will need to be installed and dust deposition rates recorded on a monthly basis during the dry season. Dust monitoring of both PM10 and PM2.5 should also be undertaken at these sites, with continuous monitoring with an aerosol monitor at each site (at least 7 days continuous monitoring at each site per monitoring round).

Noise monitoring will be undertaken at these sites on a monthly basis using a noise logger.

The locations of the dust and noise monitoring points will need to be assessed to ensure impacts on potential sensitive receptors (such as nearby villages and schools) are adequately captured by the monitoring program.

22.3.4.5 Archaeology and Cultural Heritage

A Chance Find Procedure will need to be developed for the Project and any finds will need to be managed and monitored according to this procedure.

22.3.5 Social Monitoring

Social impact monitoring is required to identify and quantify the direct and indirect impacts of the Project on the surrounding community. Social monitoring will also ensure that existing management measures are effective, and will identify the need for improved or additional measures.

The social monitoring will include:

- Local workforce statistics (including employment by contractors);
- Local procurement of goods and services;
- Compensation for land acquisition;
- Livelihood restoration and improvement measures for Project affected villages and individuals;
- General socio-economic parameters in Project affected villages including livelihood, income, expenditure, business activities, cost of living, access to infrastructure and services, demographic trends and access to land and water;

- Road accidents;
- Grievance resolutions; and
- In partnership with the relevant technical agencies, periodic (every two years) monitoring of:
    - Health indicators (e.g. malaria, sexually transmissible infections, etc.) in Project affected villages; and
    - Local attitudes toward the Project.

22.4 Management and Mitigation Program

The proposed management and monitoring strategy for the Project has been documented in the detailed ***ESMMP*** (Volume D). This plan will need to be updated regularly to incorporate any significant changes during the life of the Project.

The ***ESMMP*** refers to a number of standard operating procedures (SOP) which will be important for environmental and social management, such as the Archaeology and Chance Finds Procedure, and SOPs that exist as part of UNRA's Environmental and Social Management System, such as the Works Completion and Site Restoration Procedure.

Other key plans produced as part of the ESIA (refer to Volume D) which will form part of the management system for the Project include the:

- Resettlement and Livelihood Restoration Plan;
- Water Management Plan;
- Revegetation Plan;
- Stakeholder Engagement Plan; and
- Biodiversity Action Plan.

A Project-specific Emergency Preparedness and Response Plan will also be developed for the Project, prior to construction (see below for further details).

The effective implementation and regular updating of these plans in response to changing needs will ensure that environmental and social impacts attributable to the Project are minimised and potential environmental and social benefits are maximised. Ongoing consultation with the Government of Uganda, local communities and other stakeholders will also be important to ensure consideration of stakeholder interests in the planning and development of the Project.

22.5 Emergency Response

22.5.1 Overview

There are a number of inherent risks associated with any Project, and potential impacts cannot be avoided with certainty, even with application of robust management and mitigation measures. It is therefore critically important that the Project has properly prepared for the most likely emergency situations and has a process in place for responding appropriately, safely, and in a timely manner to protect people and the environment.

22.5.2 Assessment of Risk and Priority

Where an event takes place that impacts on or may potentially impact on the environment, or triggers the specific conditions or limitations of a license or permit to be exceeded, the event is classified as an environmental incident. The following situations are environmental incidents which require an emergency response for the Project:

- All hazardous chemical spills;
- All spills of fuel or oil greater than 500 litres within workshop areas;
- All spills of fuel or oil outside of primary containment areas greater than 50 litres;
- All non-contained fires within operational areas; and
- All uncontrolled gas emissions.

Emergency response to an incident prioritises actions undertaken according to the following sequence:

1. Protection and rescue of human life;
2. Minimisation of the area impacted by the incident;
3. Protection of the environment and property;
4. Rendering the area safe in which the emergency has occurred;
5. Restoration of all disrupted services; and
6. Decontamination and rehabilitation of the incident scene and surrounding area (if applicable).

Routine environmental and social risk assessments will be conducted on a regular basis to review potential emergency situations that may arise from the Project. The methodology to be used for the periodic risk assessments will be consistent with that outlined in the ESIA and below.

Depending upon the severity of an environmental incident, emergency response may also involve using or notifying external agencies and groups, including the police, ambulances and medical clinics, government authorities (e.g. Department of Disaster Preparedness, Ministry of Defence), and nominated representatives within the local community.

22.5.3 Emergency Preparedness and Response Planning

An Emergency Preparedness and Response Plan (EPRP), based on the risks identified in the ESIA, will be developed for the Project prior to the Construction phase. The Project risk assessment will be reviewed on an annual basis to identify potential environmental emergency situations that may arise.

Key elements of the EPRP will include:

- Emergency response procedures:
  - Informing the public and emergency response agencies;
  - Taking emergency response actions; and
  - Reviewing and updating the emergency response plans to reflect changes, and ensuring that employees are informed of such changes.
- Communication procedure;
- Functions and responsibilities;
- Evacuation and shutdown procedures;

- Risk management;
- Emergency response equipment – procedures should be prepared for using, inspecting, testing and maintaining the emergency response equipment; and
- Emergency Response Training – employees and contractors should be trained on emergency response procedures.

22.5.4 Spill Management

Spills may pose environmental risk depending on the chemical constituents of the spill, the size of the spill and the location of the spill. Spill management broadly covers the management of a range of liquids including fuel, oil, process water, wastewater and chemical reagents. Spill ratings definitions fall within the following categories:

- Contained within primary protection system (i.e. spills contained within first bund);
- Contained within secondary protection area (i.e. spills contained by second bund or drainage control);
- Contained within operational area (i.e. spills that occur away from fixed spill containment structures such as bunds but within the operational area. Examples include the haul road and pit);
- Contained within non-operational area (i.e. spills that occur away from fixed spill containment structures such as bunds but not within the normal operational areas);
- Off-site spill (i.e. spills that originate from activities not within the Project area. Examples include container transport to site); and
- Non-compliance discharge (i.e. all spills that originate from within the Project Area and flow out of this area. Examples include spills that affect the river environment or flow down creeks beyond the Project Area).

22.6 Auditing and Review

Regular audits of the Project ESMMP and associated management systems will be required. The audits will assess:

- Adequacy of the ESMMP and associated plans with respect to the scale and nature of anticipated impacts and current development stage of the Project;
- Workforce awareness, competence and compliance with the ESMMP and associated plans and procedures;
- Performance of managers and operators in implementing, maintaining and enforcing the ESMMP and associated plans; and
- Suitability of allocated resources, equipment and budget for implementation of the ESMMP.

Corrective actions will require documentation including reporting of progress towards their completion.

Internal audits of ESMMP implementation should be conducted by the construction contractor/concessionaire on a quarterly basis during construction, and at least annually during operations. After the concession period, UNRA should continue these internal audits annually in line UNRA's current audit schedule for their ESMS.

Independent external audits will need to be conducted during the construction phase and on an annual basis (over the 5 years of construction). The first external audit should be conducted at the commencement of construction to ensure all required environmental management and monitoring plans and procedures are

established. The frequency of subsequent operational audits will be based on the recommendations from the initial audits ensuring they are in line with the environmental audit regulatory regime in Uganda.

In addition, site inspections of all Project facilities should be required on a routine basis using a visual inspection form to record observations onsite. It is expected these site inspections would be conducted by dedicated environment staff from both UNRA and the contractor/concessionaire. The frequency of inspection should be informed by risk but will typically be on at least a weekly basis during the construction phase. Key Performance Indicators (KPIs) should be developed to enable environmental performance to be assessed objectively and quantitatively across the operation.

KJE PPP Project Phase 1 ESIA

CHAPTER 23 Conclusions

23. CONCLUSIONS

The ESIA has identified the potential impacts of the Project and a professional management and mitigation program has been developed in accordance with Ugandan legislation and relevant international standards. The ESIA investigations have identified that the Project has the potential to result in a variety of benefits for local communities and the national economy, however, there will be environmental and social impacts and risks that will need to be effectively managed to ensure that the Project is delivered and operated successfully.

Being an integral part of a regional and international transport corridor, the KJE Project Phase 1 will contribute to key strategic transport priorities for the region and help meet the objectives of regional integration, socio-economic development and investment in transportation infrastructure outlined in key national policies. The Project is expected to provide a range of direct and indirect benefits at the national, regional and local levels. Direct benefits include; government revenue through fees and taxes, increased foreign direct investment in the country and new employment opportunities. Indirect benefits include flow on effects, training / skills development and infrastructure development. For road users, the Project will significantly reduce transit times and is expected to help to improve community safety and reduce road traffic accidents in the region through the provision of a dedicated roadway which isolates vehicle traffic from pedestrians and non-motorised vehicles.

While some impacts on land, assets, water quality and biodiversity will not be able to be avoided due to the establishment of the Right of Way and associated construction activities, impacts can be minimised and potential benefits maximised through appropriate management and mitigation as outlined in this ESIA. If mitigation and management measures identified in the ESMMP, Resettlement and Livelihood Restoration Plan and other ESIA management plans (refer to Volume D) are implemented diligently and successfully, the Project is expected to deliver a net socio-economic benefit to Uganda and the East African region as a whole without significantly compromising the key environmental values of the surrounding environment. Ongoing consultation with the Government of Uganda, regional communities and other stakeholders will be important to ensure stakeholder interests continue to be taken into account in the planning and development of the Project.

Development Partners' requirements for the Project to be developed in accordance with international standards such as those of the IFC and AfDB provides significant opportunities to develop the Project in line with industry best practice for environmental and social sustainability. If implemented successfully this project could set a benchmark for the environmental and social management of future major road developments in Uganda and other parts of Africa.

23.1 Summary of Key Impacts, Risks and Opportunities

23.1.1 Economic Development and Employment

The development of the Project is considered necessary by the Government of Uganda to ease traffic congestion in Kampala, facilitate the movement of exports to and imports from the Port of Mombasa in Kenya and improve the economic efficiency of the country. The investment required for securing the ROW and constructing the expressway is significant, and its anticipated that it will be a key driver of economic activity in Uganda and particularly in Kampala and the surrounding districts.

The anticipated economic benefits of the KJE Project include direct economic benefits (e.g. capital expenditure, taxes, and salaries) and indirect economic benefits (e.g. flow on effects, training and skills development, infrastructure development).

An investment of approximately $1.1 billion in capital expenditure will be required for Phases 1 and 2. This expenditure will likely result in flow on effects to the Ugandan economy, resulting in an increase in GDP and Foreign Direct Investments of at least US $300 million. Additional revenue will also be generated through taxes

and toll payments over the concession term. For road users, the presence of the Project is expected to generate significant savings in transit times and vehicle operating costs, valued at US $1,132 million and US $3,254 million respectively over the concession period compared to the baseline scenario. The Project will also generate significant employment through the creation of approximately 1,500 jobs during construction and 250 jobs during operations.

The Project has been the subject of a series of feasibility studies reviewing the best options for the development of the expressway. As well as minimising costs and technical risks, option analysis has focused on reducing environmental and social impacts. The current alignment does reduce the impact on residences and businesses and also seeks to avoid sensitive ecological environments.

However, there will be environmental and social impacts and risks associated with the development of the KJE PPP that will need to be effectively managed to ensure that the Project is delivered and operated successfully. The key environmental and social impacts and risks are detailed below.

23.1.2 Displacement and Land Impacts

The Project (Phase 1) is estimated to displace approximately 29,983 people from the Project Right of Way, most of whom reside in Kampala District, in particular Nakawa Division and Kira Municipality.

The Project Right of Way will acquire 593.5 ha of land; 116.6 ha for the KSB and 476.9 ha for Phase 1 of the KJE. Most of the land to be acquired is currently used as agro-pastoral land in Mukono District and settlement areas in Kampala. The Right of Way also covers a significant area of wetland. Based on high resolution satellite imagery analysis and ground truthing, a total of 8,105 structural assets will be impacted that are fully or partially within the Project Right of Way; 4,888 within the KJE mainline section for Phase 1, and 3,617 within the KSB section. It is estimated that 76% of all non-industrial structures identified are residential.

5,378 businesses were identified as directly within the Project ROW. 3,482 (65%) of businesses were informal small-sole-trader or vendor businesses, with primary business activities focussed on residential rentals and retail of ready-made or raw food. Many rental businesses shared residential premises, however other businesses including retail and salons also operated out of multi-use residential-business premises.

103 major and prominent businesses were identified in or proximal to the alignment, 16 of which were considered large, with each respectively employing more than 20 staff. 35 major and prominent businesses had a structure or facility directly within the ROW, and 63 had major access restrictions to the business. The majority of major businesses are situated within urban and industrial areas of Nakawa Division—particularly along the existing Jinja Road, and Kira Municipality.

A number of community facilities were identified within the alignment, many of which have a structure or access significantly impacted by the ROW. These facilities included: 2 major pedestrian access points; 55 places of worship, 32 schools, 10 health centres, 3 community groups, 3 gravesites, 2 recreation centres and 1 police post. Again, these facilities were concentrated around urban and peri-urban areas in Nakawa Division and Kira Municipality. 34 public water and sanitation facilities were identified as within the ROW, including: 5 toilets, 25 water points and 4 water pipes connecting water services.

Livelihood restoration will play a key role in transitioning affected people through the land acquisition process and assisting them in re-establishing their livelihoods and a place of residence. The Project's Resettlement and Livelihood Restoration Plan (RLRP) aims to achieve at minimum; pre-Project conditions for affected people, and where possible better conditions. Given the sensitivities associated with land tenure and vulnerability within informal settlements, the measures described in this RLRP aim to provide affected persons, especially those that are most vulnerable, with a better outcome for their wellbeing than they currently experience.

Given that many businesses will be impacted by the Project, it's important to ensure that these businesses are properly compensated for losses and assisted in their re-establishment as a way of mitigating commercial losses associated with the development.

UNRA has completed a detailed compensation assessment for the Project as required under Ugandan law and the requisite UNRA policy. This has identified 9,050 individuals, families or entities requiring compensation amounting to a total payment of UGX 704,850,000,000 (USD 190.5 million) which includes a 15% disturbance allowance. A 15% contingency for procurement and a 25% livelihood restoration fund should be established to ensure that the Project's livelihood restoration objectives are fully met. The details of the proposed expenditure are described in the RLRP.

23.1.3 Traffic, Transport and Accessibility

The Project will relieve current congestion and cater for future growth within the city of Kampala. It will facilitate greater access to towns serviced by the expressway, thus promoting economic development. The Project will also help improve the amenity of the towns along the expressway through a reduction of noise, air pollution and visual impacts associated with a reduction in traffic congestion and the separation of local and through traffic.

The Project will facilitate greater accessibility to the industrial and economic hubs in Kampala, Namanve, and Mukono, as well as to Kampala city through the KSB. This is expected to have a positive impact on the economy through the reduction of costs arising from congestion and the longer than expected delivery times for goods and services.

As a result of the Project, road users are expected to experience the following benefits:

- Increased capacity, which would enable the road network to accommodate the expected future traffic volumes;
- Time travel savings through a reduction in the number of intersections, provision of continuous overtaking opportunities and removing the need to reduce speed when driving through towns;
- Reduced vehicle operating costs and fuel saving through a more efficient road network; and
- Improved efficiency and safety for national and international road freight.

The Project will also improve road safety by providing an alternative to the existing undivided roads in Kampala and the Kampala-Jinja road, with a dual carriageway, improved alignment geometry, more overtaking opportunities and controlled access via interchanges.

The construction of the Project would have short term impacts on the existing road network including reduced speed limits near construction sites and access routes. Construction of the Project would be staged and traffic management plans will need to be implemented to reduce these impacts.

Land acquisition for the Project will result in significant accessibility issues for residents and businesses in areas where the Projects alignment disrupts or cuts off local access routes for motorised vehicles and pedestrians. Provision of motorised vehicle and pedestrian crossings in over passes and under passes will partially mitigate this impact.

23.1.4 Materials and Waste

The Project will generate a number of different waste streams, with the most significant waste expected to be generated during construction. The largest amounts of waste are likely to be demolition waste from land clearance and demolition activities during Project land acquisition, and construction waste (e.g. concrete, asphalt, piping, scrap metal etc.) from the production and sourcing of materials for road construction.

An opportunity exists to sustainably manage Project resources and minimise the amount of waste generated from the Project through the re-use and recycling of recovered materials either for Project activities or within the local industry and community. This is particularly the case for demolition and construction waste where a number of materials such as excavated material, timber, bricks, concrete, asphalt and steel can be recycled or reprocessed.

This is expected to help avoid excessive waste from being channelled to landfill, thereby reducing potential environmental and social impacts associated with waste generation.

23.1.5 Air Quality and Greenhouse Gases

The Project will lead to a change of traffic patterns including current traffic congestion in Kampala. There will be reduced air emissions associated with more efficient transportation, although traffic is expected to increase due to the more efficient transportation provided by the expressway. Air emissions especially during the dry season are a major issue in Kampala, especially as the city grows and the use of vehicles increases. In particular, the impacts of fine particulates from vehicle emissions is well known to affect the health of people living in proximity to major roads.

During construction of the Project, dust emissions from the unpaved road base and rock blasting at quarries may cause short-term impacts to near-field receptors. Maximum concentrations of CO, NO_2 and PM_{10} generated by the Project are not predicted to exceed WHO or draft Ugandan air quality criteria on any section of the existing Kampala-Jinja Road, the Kampala-Jinja mainline expressway or Kampala Southern Bypass. However, $PM_{2.5}$ WHO guidelines are expected to be exceeded at several sections of each road. Receptor impacts are predicted to be relative to the angle of the highway to the prevailing wind, with maximum concentrations predicted within 30 m of the roadside.

The greenhouse gas assessment indicates that the impact of the Project's emissions during construction and operations will only contribute to the country's emissions minimally (under 1% of the country's 2012 emissions). The Project is expected to generate more greenhouse gas emissions when compared to baseline emissions (under the 'Do Minimum' scenario) due to the increased traffic flows under the Project development scenario. Greening of the expressway route through the planting of vegetation has the potential to at least partly mitigate greenhouse gas emissions generated from vehicles using the expressway.

23.1.6 Noise

Noise generated by expressways is significant and measures will be required to protect people from the adverse impacts, especially in urban areas where there are a lot of dwellings close to the Project (e.g. <20m). In rural areas, the Project may add a new source of noise (e.g. where the alignment passes through communities in Mukono District). Noise mitigation via sound barriers will be required in certain sections of the expressway to ensure that noise emissions are within regulatory requirements, enabling remaining residences to not be severely impacted by the development.

Maximum noise levels remain relatively consistent along the KSB, but levels reduce with distance from Kampala along the KJE mainline section of the Project. Both expressways are predicted to exceed WHO and Ugandan daytime noise criteria without mitigation. Noise impacts from the Project include annoyances to community and wetland wildlife, with maximum noise receptor impacts predicted to be typically within 50 m of the roadside.

Construction noise activities will primarily be associated with the clearing of land, earthworks and hauling of construction materials. Some noise and vibration is also expected during the construction phase and this will be associated with rock blasting, excavation of rock, road cuttings and construction of overpasses. However, impacts will be localised and short-term.

23.1.7 Visual Amenity and Lighting

The Project is primarily located within cityscapes and is therefore not expected to have any major visual impact in urban areas. These landscapes have a high capacity for accommodating visual change and the Project would not significantly diminish the landscape character in these areas. In natural habitat areas such as wetland areas, the presence of the Project will be prominent and will certainly have an effect on landscape character and the ambience of the area. However, locating the expressway on the edge of wetlands reduces the social impact of the Project. Other key areas where landscape character is likely to be affected include areas where the Project does not follow the natural topography, thereby requiring significant cut and fill sections. Whilst there are some tourism features in the area surrounding the Project (e.g. Sezibwa Falls), it is not expected that these will be significantly impacted with regards to visual amenity. The expressway will not be visible from within the Sezibwa Falls site.

The lighting associated with the Project is necessary for safety and It will be prominent although the associated impact will be low. A number of measures to reduce the visual amenity impacts of the Project have been outlined in the ESMMP. In particular, implementation of progressive revegetation works for the Project in line with the Revegetation Plan (Volume D) will greatly assist in reducing visual amenity impacts.

23.1.8 Geology, Geomorphology and Soils

Residual impacts related to excavation of construction materials (rock, clay and sand) from local quarries and borrow areas are expected to be moderate to high in the quarry/borrow areas due to the large quantities of materials required. Rehabilitation of quarry/borrow sites to a state suitable for productive agricultural use or the establishment of a self-sustaining natural ecosystem will assist in reducing this impact over time. Residual impacts related to cuts and fills along the route will be moderate to high due to the extensive nature of the earthworks involved in construction of the Project.

Deposition of road and vehicle derived pollutants on soils proximal to the roadside is considered to have a low impact due to the provision of a sufficient ROW and verge/drain zone to contain and attenuate pollutants.

The excision of soils in the right of way from usable agricultural land area is considered to have a high impact, which is expected to be offset by the economic benefits of the constructed expressway.

23.1.9 Surface and Ground Water

The key potential impact on water quality that will need to be managed during construction will be the potential for increased erosion and sedimentation from construction areas. Careful planning for development of drainage control measures will be required for the Project including appropriate technical systems for sedimentation ponds, vegetation swales and other runoff measures needed to deal with the predicted pollution and flow alteration to minimise the risk of impacting the water quality and potential impacts on wetlands and rivers. Water sources downstream in the form of springs, wells and open water affected by the Project need to be protected and monitored to ensure that the people of Kampala and associated districts are not affected in the short or long term by the expressway.

The Project passes through alternating swamp and hilly terrain and will involve substantial earthworks in the form of a frequent succession of cuts and fills along the majority of its length. Therefore, there is the potential that significant quantities of sediment could be make their way into downstream environments resulting in impacts on downstream water quality, land and water/land users. A project-specific Water Management Plan (Volume D) has been prepared which outlines a variety of measures to minimise water quality impacts from the Project, including a proposed monitoring program.

Once operational, the Project will result in a linear impervious area (where there was previously mixed pervious areas) which will increase surface water run-off. The stormwater drainage system of the Project will need to be

designed to manage these increased flows throughout the Operation Phase and particularly during high rainfall events.

23.1.10 Ecology and Biodiversity

Habitat condition varies throughout the ROW for the Project with natural habitats located within the ROW being significantly impacted by anthropogenic activities, which has resulted in habitat degradation, loss and fragmentation of most vegetation, and the remnant patches of higher quality habitat remain under threat.

No international protected areas or nationally significant protected areas such as National Parks, Wildlife Reserves or Wildlife Sanctuaries occur in the vicinity of the Project. The main protected area impacted by the Project is the Namanve CFR, with the ROW potentially resulting in disturbance to approximately 65 ha of the reserve. While the vegetation of this reserve is significantly disturbed by human activities, the ROW will impact approximately 22 ha of relatively high-quality papyrus wetlands. A small area of the Banda Tree Nursery (approx. 1 ha) in Kampala will also be directly impacted by the ROW; this is also a designated Central Forest Reserve.

In total, vegetation clearance and the construction of the Project is expected to result in the loss of approximately 156.6 ha of natural habitat (i.e. wetlands, forest, grassland and scrubland) and 436.2 ha of modified habitat, including the clearance of approximately 72.8 ha of degraded/cultivated wetland and 33.4 ha of higher quality wetland from the ROW. The higher quality wetlands impacted by the Project occur mainly in the Namanve CFR. The hydrology of some wetlands will be partially restored during the Operations phase in areas where viaducts are constructed, which will minimise long term impacts on key wetlands such as those within the Namanve CFR. All natural habitats to be removed from the ROW have been directly disturbed by anthropogenic sources in some way, but some retain important biodiversity values.

Habitat clearance and disturbance arising from noise, vibration, airblast, light-spill, and other human activity during construction will result in the displacement of fauna and the permanent loss of a small proportion of habitat for nationally and / or globally rare or threatened birds and mammals (i.e. hooded vultures, grey crowned crane, saddle-billed stork and sitatungas).

There is a significant risk of accidental mortality and injury to mammals and birds as a result of collision with vehicles during operation and the proposed expressway will fragment habitats and is likely to act as a barrier limiting the movement of fauna in some areas.

The Project is aligned with best practice with plans to avoid, minimise and restore adverse impacts to biodiversity. However, it is recognised that even after all feasible mitigation measures are put in place, residual impacts will remain for some priority habitats and species. A key priority for the Project is the conservation of priority habitats (particularly wetlands) and species including the Critically Endangered hooded vulture, the Endangered grey crowned crane and the Endangered grey parrot. It is therefore recommended that UNRA follows industry good practice guidance on biodiversity to develop and implement a biodiversity offsets programme that adequately compensates for significant residual impacts as part of the *Biodiversity Action Plan* for the Project (refer to Volume D).

23.1.11 Ecosystem Services

Ecosystem services provided by environments in the Project Footprint and surrounding area are varied and provide important benefits to the surrounding communities. Of particular concern are the wetland habitats impacted by the Project which provide several regulatory ecosystem services that will be costly to replace. These services have historically been, and continue to be, important for the city of Kampala and the ecological integrity of Lake Victoria.

The Project will lead to a loss of natural habitats (including areas of wetland and forest) but a more severe risk to ecosystems services are represented by the potential indirect loss of habitat due to urbanisation promoted by the

improved transportation network. The further degradation of wetland ecosystems may lead to a loss of associated regulatory ecosystem services. If appropriate management and mitigation measures are implemented (as outlined in relevant chapters throughout the ESIA), then impacts on ecosystem services will be reduced.

23.1.12 Archaeology and Cultural Heritage

The Project will not impact on any known archaeological or cultural heritage sites of national or international significance. However, the alignment of the Project is proximal to some of the most significant archaeological finds that have been made in Uganda including being 800 m from where the 1000-year-old Luzira Head (which is now displayed in the British Museum) was found in 1929. The Sezibwa Falls is also a site of cultural and spiritual importance that is located approximately 600 m from the proposed alignment.

The Project Footprint passes directly over and near to sites of local cultural importance including churches, graves and cemeteries. As a result, several places of worship and burial sites will be directly impacted by the proposed Project and will likely to need to be removed/relocated prior to the construction of the expressway. The other impacts on cultural heritage may be the separation of sections of the population from their places of worship as a result of severance attributed to the expressway. This may result in people having to travel long distances to find appropriate crossing points along the expressway to get to their places of worship. However, this impact can be mitigated by the appropriate establishment of pedestrian crossings.

The Project has the potential to impact on cultural heritage resources which currently lay unknown; buried beneath the ground surface. The extensive groundwork activities that will need to be undertaken may reveal unknown resources. The case of the discovery of the Luzira head during the construction of Luzira prison by the British colonial authorities is an indicator that future chance finds may be encountered during excavations and the construction of the expressway. A Chance Finds Procedure has been developed as part of the ESMMP and will need to be implemented during construction.

23.1.13 Community Health and Safety

The Project should help to reduce road traffic incidents in the region through the provision of a dedicated roadway with an improved alignment, which isolates vehicle traffic from pedestrians and non-motorised vehicles, provides a dual carriageway with central medians to separate oncoming traffic and also diverts traffic from the towns and villages bypassed by the expressway.

Aside from a potential improvement in the rate of road accidents, the largest impact on community health will be improvements in air quality in some areas. The air quality in Uganda is already heavily affected by traffic, cooking fuel and burning activities. Once operational, the Project should lead to more efficient motorised transport in Kampala and potentially a slight improvement in overall air quality due to reduced congestion. Improved fuel and car technology will be the biggest potential driver of air quality in Kampala.

Traffic on the expressway will generate significant traffic related noise for potential receptors in close proximity to the Project. Implementation of the outlined measures such as noise barriers will be important to minimise potential noise disturbance to acceptable levels in these areas.

Fencing of the expressway with appropriate barriers will be important to ensure that the community, animals and vehicle types which would be at risk in fast moving traffic (such as non-motorised vehicles, low powered motorcycles and agricultural vehicles) do not inappropriately access the expressway and compromise health and safety.

Some short-term localised impacts on community health and safety may occur during the construction period including air emissions, noise disturbance and changes in accessibility. Construction of the Project is expected to be staged and construction management plans will be implemented to reduce these impacts.

Finally, ensuring that construction contractors interact positively with the local community is an aspect that will need to be carefully managed and monitored.

23.1.14 Gender

In the context of the Project, women are typically more vulnerable to livelihood changes due to fewer available education, employment and training opportunities, and a higher reliance on agricultural activities. Women tend to be employed in less lucrative economic sectors and have substantially less access to inputs such as land and credit. Gender discrimination may limit women's access to resources, opportunities, and public services necessary to improve the standard of living for themselves and their families. As a result, the livelihoods of women affected by the Project may be disproportionately impacted if not managed appropriately. There is also the potential for instances of Gender-Based Violence (GBV) to increase as result of changes to the community structure in and around the expressway, as well as from increased pressure on livelihoods, with a higher rate of GBV typically directed towards women than men.

The management program for the Project includes a number of gender based practical measures and strategic gender initiatives to help ensure women are not disproportionately impacted by the Project. These include specific measures to enhance the provision of prevention programs and response services for those at risk of GBV in the Project area.

23.1.15 Occupational Health and Safety

UNRA is committed to building a workforce that is motivated, healthy and has a good working ability, and to creating healthy and safe workplaces that are free from accidents and work-related disease, in compliance with the Ugandan Occupational Safety and Health Act (2006). The OHS program for the Project will also take into account the IFC *Environmental Health and Safety Guidelines for Toll Roads* (2007).

Workers on the Project will be exposed to a number of risks from dust, noise, blasting activities, traffic, and handling of hazardous materials. Appropriate precautions will need to be taken to avoid work-related accidents, injuries or illness. UNRA and the Contractor will work to: (i) identify potential hazards to workers, particularly those that may be life threatening; (ii) provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) train workers; (iv) document and report occupational accidents, diseases, and incidents; and (v) organise for emergency prevention, preparedness, and response.

Key OHS measures for the Project have been outlined in the ESMMP (Volume D). The construction contractor/concessionaire will also be required to develop, maintain and disseminate a detailed standalone OHS Plan for the Project, incorporating the measures outlined in the ESIA and other measures required to meet legislative requirements and relevant international standards.

23.1.16 Cumulative Impacts

The environmental health of Kampala City is affected by a complex network of natural and manmade features. At the centre of much of Kampala's environmental health, particularly in relation to water, lies the vast network of wetlands surrounding Lake Victoria, providing key environmental services in the filtration of surface water flowing from the city back into the Lake at Murchison Bay as well as a variety of provisioning services for local communities.

Wetlands in Kampala are under severe threat and are important for the provision of regulatory ecosystem services (e.g. water filtration, flood control, waste treatment) and regulating the quality of water entering Lake Victoria. If appropriate mitigation and management measures are not utilised, the Project may increase the current levels of degradation adding cumulatively to the impacts on wetlands from other existing and planned Projects in the region.

It is important that the construction of the Project takes into account the protection of wetlands, as well as considers the indirect impacts of land acquisition in a city already experiencing land pressures. Ensuring that the Project contributes positively to local communities is critical to ensure that wetlands are not further 'reclaimed' for residential uses and thus decreased in size and quality further.

23.2 Stakeholder Consultation

UNRA aims to meet the IFC Sustainability Framework (2012) and AfDB Integrated Safeguards Systems (2013), which require that informed stakeholder consultation and participation should be conducted throughout each phase of the Project life cycle. UNRA's approach to stakeholder engagement aims to fulfil the following core principles:

- Proactively engage to enable the early identification of potential issues and risks;
- Respect local culture and established political, social and economic relations; and
- Generate ideas and alternative solutions on early design questions.

Informal and formal consultations have been undertaken with relevant Government authorities, local communities and stakeholders dating back to the 2011 feasibility and preliminary environmental and social investigations. These were undertaken in accordance with NEMA EIA Guidelines (1997, 2004) for seeking opinions and views on social and environmental aspects relating to the Project. The overall stakeholder consultation and engagement process focussed on:

- Identifying and notifying stakeholders of the proposed project activities and the ESIA;
- Establishing dialogue between the Project and stakeholders;
- Collect perceptions, concerns, and proposals from stakeholders relating to concerns with the development of the Project; and
- Making provisions for incorporating stakeholder feedback into the planning and design of the Project.
- In general, stakeholder feedback has been supportive of the Project provided fair compensation is paid to those who suffer loss as a result of the land acquisition for the Project. Most stakeholder feedback and concerns related to ensuring that Affected Persons are adequately and promptly compensated. Both the local community and local leaders had expectations for employment opportunities to be created for local people during the construction phase. The private sector stakeholders were primarily concerned with ensuring compensation for businesses affected (including impacts on access) and the potential for disruption of utility services for businesses. Other stakeholders have identified the need for the wetlands in the vicinity of the Project to be protected. Consultations with villages and businesses affected by the Project have also allowed them to provide input into the development of livelihood restoration strategies for the Project through identifying key priorities.

The future program for priority stakeholder engagement activities will involve regular consultations with affected stakeholders, including: (i) Project affected communities, with consideration of vulnerable groups, host communities and informal settlements; (ii) affected businesses and industries; (iii) service providers/infrastructure owners; and (iv) relevant governments and institutions. UNRA will be responsible for all communication activities related to the Project and will collate and document any comments and feedback associated with future activities in line with the Stakeholder Engagement Plan (Volume D).

The Project will consider and address stakeholder concerns, complaints and grievances through a formal Grievance Mechanism to ensure an open and transparent dialogue between the community and UNRA throughout the life of the Project. Implementation of a formal grievance mechanism that applies to all environmental and social aspects of the Project is considered good industry practice for major development

projects, and is in line with the AfDB Integrated Safeguard Systems and the principles outlined in the IFC *Good Practice Note – Addressing Grievances from Project-Affected Communities* (2009). The Project will use UNRAs established grievance mechanism which is considered to be in alignment with relevant international standards.

23.3 Management and Monitoring

A professional management and mitigation program has been developed in accordance with Ugandan legislation and relevant international standards. The proposed management strategy for the construction and operation phases of the Project has been documented in the *Environmental and Social Management and Monitoring Plan* (ESMMP, Volume D). This plan also outlines the framework for the overall environmental and social management system for the Project including responsibilities and implementation arrangements for management and monitoring activities.

A *Resettlement and Livelihood Restoration Plan* (RLRP, Volume D) for the Project has also been prepared to meet Ugandan requirements and international standards. The RLRP provides the necessary strategic framework for the social planning of the Project and encompasses resettlement, livelihood restoration and compensation strategies. The RLRP identifies the potential needs for physical displacement and/or compensation resulting from the loss of land, livelihood and assets, and outlines the proposed institutional arrangements and cost estimates for the implementation of these measures.

Other management plans prepared as part of the ESIA (refer to Volume D) include a *Stakeholder Engagement Plan* (SEP), which outlines the approach for ongoing consultation and engagement and a Biodiversity Action Plan (BAP) which outlines the proposed framework for biodiversity management and mitigation for all stages of the Project. In addition, a Water Management Plan (WMP) has been prepared outlining the approach to surface and groundwater management, as well as a Revegetation Plan outlining a proposed revegetation scheme for the Project Footprint.

The effective implementation and regular updating of the ESMMP and other management plans in response to changing needs will ensure that environmental impacts attributable to the Project are minimised and potential environmental and social benefits are maximised.

A number of key management strategies are recommended and will be important for ensuring that social and environmental impacts are appropriately mitigated. These include:

- Compensate affected communities and businesses as per the *Resettlement and Livelihood Restoration Plan* (RLRP, refer Volume D);
- Installation of noise barriers to protect dwellings, public buildings and businesses in close proximity to the expressway;
- Establish tree and shrub planting of similar character to existing vegetation at the edge of the expressway to minimise visual and noise impacts and enhance biodiversity values where possible in line with the proposed Revegetation Plan (refer Volume D);
- Incorporate appropriately designed stormwater drainage and erosion/sediment control structures during the detailed design phase to manage erosion and sedimentation during construction and to be able to adequately control flow on a regular basis to prevent the risk of roadway flooding once the Project is operational;
- Develop a Waste Management Plan to reduce, re-use and recycle waste generated by the Project from demolition activities, construction waste, excavations and other activities; and
- Establish a biodiversity management and offset program as outlined in the Biodiversity Action Plan (refer to Volume D).

Ongoing consultation with the Government of Uganda, regional communities and other stakeholders will be important to ensure stakeholder interests continue to be taken into account in the planning and development of the Project.

KJE PPP Project Phase 1 ESIA

CHAPTER 24 References

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